



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 39-2017

**COMMUNITY RESOURCE RECOVERY CENTRE (4R WINNIPEG DEPOT) – EAST
WINNIPEG SITE, INCLUDING ROADWORKS AND BUILDING**

TABLE OF CONTENTS

PART A - BID SUBMISSION

Form A: Bid	1
Form B: Prices	4
Form G1: Bid Bond and Agreement to Bond	10
Form G2: Irrevocable Standby Letter of Credit and Undertaking	12

PART B - BIDDING PROCEDURES

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

PART C - GENERAL CONDITIONS

C0. General Conditions	1
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PART D - SUPPLEMENTAL CONDITIONS

General

D1. General Conditions	1
D2. Scope of Work	1
D3. Definitions	1
D4. Contract Administrator	2
D5. Contractor's Supervisor	2
D6. Ownership of Information, Confidentiality and Non Disclosure	2
D7. Notices	2
D8. Furnishing of Documents	3

Submissions

D9. Authority to Carry on Business	3
D10. Safe Work Plan	3
D11. Insurance	3
D12. Performance Security	4
D13. Subcontractor List	4
D14. Environmental Protection Plan	5
D15. Detailed Work Schedule	9

Schedule of Work

D16. Commencement	9
D17. Working Days	10
D18. Damage to Existing Structures and Property	10
D19. Work By Others	10
D20. Critical Stages	10
D21. Substantial Performance	11

D22. Total Performance	11
D23. Liquidated Damages	11
D24. Scheduled Maintenance	11
Control of Work	
D25. Job Meetings	12
D26. Prime Contractor – The Workplace Safety and Health Act (Manitoba)	12
D27. The Workplace Safety and Health Act (Manitoba) – Qualifications	12
D28. Construction Survey	12
D29. Layout of The Roadworks	12
D30. Truck Weight Limits	13
Measurement and Payment	
D31. Payment	13
Warranty	
D32. Warranty	13
Form H1: Performance Bond	14
Form H2: Irrevocable Standby Letter of Credit	16
Form J: Subcontractor List	18

PART E - SPECIFICATIONS

General

E1. Applicable Specifications and Drawings	1
E2. Geotechnical Report	3
E3. Shop Drawings	3
E4. Building and Occupancy Permits	6
E5. Operation and Maintenance Manuals	6
E6. Office Facilities	11
E7. Verification of Weights	12
E8. Access	12
E9. Protection Of Existing Trees	12
E10. Traffic Control	13
E11. Traffic Management	14
E12. Water Obtained From the City	14
E13. Surface Restorations	14
E14. Sealing Interface between Concrete and Asphalt Surfaces	14
E15. Line Painting	15
E16. Removal of Trees	16
E17. Three-Strand Barbed Wire Chain Link Fence and Gates	17
E18. Installation of Straw Wattles	18
E19. Cast-in-Place Concrete Pile Foundations	19
E20. Structural Concrete	26
E21. Supplying and Placing Reinforcing Steel	47
E22. Supply, Fabrication and Erection of Miscellaneous Metal	52
E23. Architectural Works	60
E24. Electrical Works	61
E25. Mechanical Works	62
E26. Prefabricated Kiosk Building	62
E27. Supply and Install Parking Curb	63
E28. Supply and Install Bollard	63

Appendix 'A' - Geotechnical Report

Appendix 'B' – SCD-629 Light Proof Barrier Fence

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

- B1.1 Community Resource Recovery Centre (4R Winnipeg Depot) – East Winnipeg Site, Including Roadworks and Building

B2. SUBMISSION DEADLINE

- B2.1 The Submission Deadline is 12:00 noon Winnipeg time, April 28, 2017.
- B2.2 Bids determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.
- B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

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

B4. ENQUIRIES

- B4.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.
- B4.2 If the Bidder finds errors, discrepancies or omissions in the Bid Opportunity, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.
- B4.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator to all Bidders by issuing an addendum.
- B4.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.
- B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B4 unless that response or interpretation is provided by the Contract Administrator in writing.

B5. CONFIDENTIALITY

- B5.1 Information provided to a Bidder by the City or acquired by a Bidder by way of further enquiries or through investigation is confidential. Such information shall not be used or disclosed in any way without the prior written authorization of the Contract Administrator. The use and disclosure of the confidential information shall not apply to information which:
- (a) was known to the Bidder before receipt hereof; or
 - (b) becomes publicly known other than through the Bidder; or
 - (c) is disclosed pursuant to the requirements of a governmental authority or judicial order.
- B5.2 The Bidder shall not make any statement of fact or opinion regarding any aspect of the Bid Opportunity to the media or any member of the public without the prior written authorization of the Contract Administrator.

B6. ADDENDA

- B6.1 The Contract Administrator may, at any time prior to the Submission deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.
- B6.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B6.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/bidopp.asp>
- B6.2.2 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- B6.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B7. SUBSTITUTES

- B7.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.
- B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B7.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.
- B7.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
 - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
 - (c) identify any anticipated cost or time savings that may be associated with the substitute;
 - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;
 - (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.
- B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an "approved equal" or as an "approved alternative", or may refuse to grant approval of the substitute.
- B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.

- B7.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.
- B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B17.
- B7.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B8. BID COMPONENTS

- B8.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices, hard copy;
 - (c) Bid Security
 - (i) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;
- B8.2 Further to B8.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B7.
- B8.3 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, to constitute a responsive Bid.
- B8.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B8.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid.
- B8.4.2 A hard copy of Form B: Prices must be submitted with the Bid. If there is any discrepancy between the Adobe PDF version of Form B: Prices and the Microsoft Excel version of Form B: Prices, the PDF version shall take precedence.
- B8.5 Bidders are advised not to include any information/literature except as requested in accordance with B8.1.
- B8.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B17.1(a).
- B8.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B8.8 Bids shall be submitted to:
- The City of Winnipeg
Corporate Finance Department

Materials Management Division
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B9. BID

- B9.1 The Bidder shall complete Form A: Bid, making all required entries.
- B9.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, his/her name shall be inserted;
 - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
 - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
 - (d) if the Bidder is carrying on business under a name other than his/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.
- B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.
- B9.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.
- B9.4 Paragraph 12 of Form A: Bid shall be signed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, it shall be signed by the Bidder;
 - (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
 - (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, shall be affixed;
 - (d) if the Bidder is carrying on business under a name other than his/her own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.
- B9.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.
- B9.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B10. PRICES

- B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.
- B10.1.1 For the convenience of Bidders, and pursuant to B8.4.2 and B17.4.1, an electronic spreadsheet Form B: Prices in Microsoft Excel (.xls) format is available along with the Adobe PDF documents for this Bid Opportunity on the Bid Opportunities page at the Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B10.2 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.
- B10.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

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

B11. DISCLOSURE

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

B11.2 The Persons are:

- (a) N/A

B12. 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, Materials Management Division website at <http://www.winnipeg.ca/matmgt/debar.stm>

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);

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™) or
 - (i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
 - (ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program or
- (b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information

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

B12.5 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.

B12.6 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 provide bid security in the form of:

- (a) a 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 the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or
- (b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or
- (c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.

B13.1.1 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.

B13.1.2 All signatures on bid securities shall be original.

B13.1.3 The Bidder shall sign the Bid Bond.

B13.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B13.2 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 executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B13.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B13.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B13.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B13.3 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 Bid Opportunity.

B14. OPENING OF BIDS AND RELEASE OF INFORMATION

B14.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.

B14.1.1 Bidders or their representatives may attend.

- B14.1.2 Bids determined by the Manager of Materials, or his/her designate, to not include the bid security specified in B12.1 will not be read out.
- 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 Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B14.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- 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).

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.
- 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 executed and the performance security 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.

B16. WITHDRAWAL OF BIDS

- B16.1 A Bidder may withdraw his/her Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.
- B16.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.
- B16.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.
- B16.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:
- (a) retain the Bid until after the Submission Deadline has elapsed;
 - (b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid; and
 - (c) if the notice has been given by any one of the persons specified in B16.1.3(b), declare the Bid withdrawn.
- B16.2 A Bidder who withdraws his/her Bid after the Submission Deadline but before his/her Bid has been released or has lapsed as provided for in B15.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law, including the right to retain the Bidder's bid security.

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 Bid Opportunity, 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 B7.
- 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.
- B17.3 Further to B17.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is responsible and 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 adjusted, if necessary, as follows:
- (a) if the lowest evaluated responsive Bid submitted by a responsible and qualified Bidder is within the budgetary provision for the Work, no adjustment will be made to the Total Bid Price; or
 - (b) if the lowest evaluated responsive Bid submitted by a responsible and qualified Bidder exceeds the budgetary provision for the Work, the Total Bid Prices of all responsive Bids submitted by responsible and qualified Bidders will be adjusted by progressively deducting item(s) C.1, B.3 i), A.14 i), A.14 ii), and A.14 iii) in the order listed until a Total Bid Price within the budgetary provision is achieved.
- B17.4.1 The electronic Form B: Prices and the formulas imbedded in that spreadsheet are only provided for the convenience of Bidders. The City makes no representations or warranties as to the correctness of the imbedded formulas. It is the Bidder's responsibility to ensure the extensions of the unit prices and the sum of Total Bid Price performed as a function of the formulas within the electronic Form B: Prices are correct.

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 responsible and 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 its own forces;
 - (d) only one Bid is received; or
 - (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.
- B18.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B17.

B18.3.1 Following the award of Contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm
- C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix “**C**” designates a section, clause or subclause in the *General Conditions for Construction*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of:

- (a) Roadworks
 - (i) Preparation of Existing Ground Surface
 - (ii) Road Works Excavation;
 - (iii) Installation and adjustment of drainage pipes and catch basins;
 - (iv) Sub-grade compaction;
 - (v) Installation of subsurface drainage pipe under active roadway;
 - (vi) Installation of sub-drains behind retaining walls;
 - (vii) Placement of separation geotextile fabric where necessary;
 - (viii) Placement of sub-base and base course materials;
 - (ix) Construction of concrete curbs and sidewalks;
 - (x) Construction of asphalt pavement;
 - (xi) Ditch and green space grading and sloping;
 - (xii) Installation of site access control gates;
 - (xiii) Installation of perimeter fencing; and
 - (xiv) Landscaping.
- (b) Structural Work
 - (i) Structural Excavation and Backfill;
 - (ii) Cast-in-Place Concrete Pile Foundations (for building, and light & camera standards);
 - (iii) Structural Concrete and Reinforcing Installation (for retaining walls, structural slabs, concrete pads, Prefabricated Kiosk Building Foundation, and HHW Building Foundation); and
 - (iv) Installation of guardrails, handrails, stairs, and container guide rails.
- (c) Buildings
 - (i) Prefabricated Kiosk Building;
 - (ii) HHW Building;
 - (iii) HHW Building Mechanical Works; and
 - (iv) HHW Building Electrical Works.
- (d) Other
 - (i) New Electrical Service;
 - (ii) Site Light Fixtures and Poles; and
 - (iii) Site Security System.

D3. DEFINITIONS

D3.1 When used in this Bid Opportunity:

- (a) "**HHW**" means Household Hazardous Waste;

(b) "EWASTE" means Electronic Waste;

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is KGS Group, represented by:

Phil Pawluk, P.Eng.
Project Manager

Telephone No. (204) 896-1209

Email Address ppawluk@ksgroup.com

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

D4.3 Bids Submissions must be submitted to the address in B8

D5. CONTRACTOR'S SUPERVISOR

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

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

D6. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

D6.1 The Contract, all deliverables produced or developed, and information provided to or acquired by the Contractor are the property of the City and shall not be appropriated for the Contractors own use, or for the use of any third party.

D6.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.

D6.3 The following shall be confidential and shall not be disclosed by the Contractor to the media or any member of the public without the prior written authorization of the Contract Administrator;

- (a) information provided to the Contractor by the City or acquired by the Contractor during the course of the Work;
- (b) the Contract, all deliverables produced or developed; and
- (c) any statement of fact or opinion regarding any aspect of the Contract.

D6.4 A Contractor who violates any provision of D6 may be determined to be in breach of Contract.

D7. NOTICES

D7.1 Except as provided for in C23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

D7.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D7.3 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the facsimile number identified in D4.1.

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

The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services

Facsimile No.: 204-947-9155

D7.4 Bids Submissions must not be submitted to this facsimile number. Bids must be submitted in accordance with B8.

D8. FURNISHING OF DOCUMENTS

D8.1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him/her at cost.

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

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

D10. SAFE WORK PLAN

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

D10.2 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, Materials Management Division website at <http://www.winnipeg.ca/matmgt/safety/default.stm>

D11. INSURANCE

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

- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;
- (b) if applicable, Automobile Liability Insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than \$2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence;
- (c) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation.

- (d) all risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, written in the name of the Contractor and The City of Winnipeg, at all times during the performance of the Work and until the date of Total Performance.
- (e) Contractor's Pollution Liability (CPL) in the amount of at least one million dollars (\$1,000,000.00) per occurrence and two million dollars (\$2,000,000.00) aggregate insuring against claims for injuries to persons or damages to property which may arise from or in connection with the performance of services. Coverage shall apply suddenly or gradually including further disruption of pre-existing conditions from or in connection with the performance of services. Such insurance shall include clean-up costs, defence and transported cargo and remain in place during the performance of their work.

D11.2 Deductibles shall be borne by the Contractor.

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

D11.4 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D11.5 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D12. PERFORMANCE SECURITY

D12.1 The Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:

- (a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or
- (b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or
- (c) a certified cheque or draft payable to "The City of Winnipeg", drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.

D12.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.

D12.2 If the bid security provided in his/her Bid was not a certified cheque or draft pursuant to B13.1(c), the Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site and in no event later than the date specified in the C4.1 for the return of the executed Contract.

D13. SUBCONTRACTOR LIST

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

D14. ENVIRONMENTAL PROTECTION PLAN

D14.1 Prior to commencing construction activities or delivery of materials to Site, submit an Environmental Protection Plan for review and approval by Contract Administrator. The Environmental Protection Plan shall present a comprehensive plan to address known or potential environmental issues which may be present during construction. Where applicable, the Environmental Protection Plan shall include sub-contractor activities. 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.

D14.2 The Environmental Protection Plan shall address the following:

- (a) name[s] of person[s] responsible for ensuring adherence to Environmental Protection Plan;
- (b) name[s] and qualifications of person[s] responsible for manifesting hazardous waste to be removed from Site;
- (c) name[s] and qualifications of person[s] responsible for training Site personnel;
- (d) erosion and sediment control plan which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations;
- (e) Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features including vegetation to be preserved within authorized Work areas;
- (f) Environmental Emergency Response: including procedures, instructions, and reporting in the event of unforeseen spill of regulated substance;
- (g) non-hazardous solid waste disposal plan identifying methods for reuse and recycling of materials, and locations for solid waste disposal including clearing debris. All materials that are planned for acceptance at the 4R Depot must be segregated and stockpiled as directed by the Contract Administrator for reuse/recycling. Non-hazardous solid waste disposal plan shall include a detailed list of anticipated waste materials;
- (h) hazardous materials and waste management plan outlining storage, transportation and disposal;
- (i) air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project Site;
- (j) contaminant prevention plan that: identifies potentially hazardous substances to be used on project Site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials;
- (k) waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete wash or curing water, clean-up water, dewatering of ground water, hydrostatic test water, and water used in flushing of lines; and
- (l) Monitor and report to ensure implementation of environmental protection measures.

D14.3 Fires

- (a) fires and burning rubbish or waste materials on Site is not permitted.

D14.4 Disposal of Waste

- (a) Dispose all waste at licensed facilities or with licensed haulers.
- (b) All waste disposal grounds receiving debris and construction waste from this project must be operated under the authority of a valid permit issued pursuant to MR 150 (latest edition) Waste Disposal Grounds Regulation under the Environment Act.
- (c) Dispose of all sewage and seepage from the on-site sanitary facilities in accordance with the On-site Wastewater Management Systems Regulation MR 83/2003.
- (d) Do not bury waste materials on Site.
- (e) Do not dispose of solid or liquid wastes in drains or waterways.
- (f) There will be no additional payment for these Disposal of Waste items.

D14.5 Hazardous Waste

D14.5.1 Definitions

- (b) Dangerous Goods: product, substance, or organism that is specifically listed or meets hazard criteria established in the Dangerous Goods Handling and Transportation Act or regulations including hazardous materials and wastes.
- (c) Hazardous Material: product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- (d) Hazardous Waste: any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- (e) Workplace Hazardous Materials Information System (WHMIS): a Canada-wide system designed to give employers and workers information about hazardous materials used in workplace. Under WHMIS, information on hazardous materials is provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

D14.5.2 Materials Management

- (a) Dangerous Goods: product, substance, or organism that is specifically listed or meets hazard criteria established in the Dangerous Goods Handling and Transportation Act or regulations including hazardous materials and wastes.
- (b) Only bring on Site quantity of hazardous materials required to perform Work.
- (c) Maintain MSDSs in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.
- (d) Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

D14.5.3 Storage and Handling

- (e) Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines:
 - (i) Sign storage areas;
 - (ii) store and handle flammable and combustible materials in accordance with current Manitoba and National Fire Code of Canada requirements;
 - (iii) do not transfer of flammable and combustible liquids in vicinity of open flames or heat-producing devices;
 - (iv) do not use flammable liquids having flash point below thirty-eight (38) degrees Celsius, such as naphtha or gasoline as solvents or cleaning agents.
 - (v) store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum; and
 - (vi) observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

- (f) Keep no more than 100 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use:
 - (i) store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval;
 - (ii) storage of quantities of flammable and combustible liquids exceeding 100 litres for Work purposes requires the written approval of the Contract Administrator; and
 - (iii) fuel storage exceeding 100 litres shall be a minimum distance of 100 metres from any water body and in compliance with the requirements of the Storage and Handling of Petroleum Products and Allied Products Manitoba Regulation 188/2001 of the Dangerous Goods Handling and Transportation Act.
- (g) Storage requirements for quantities of hazardous materials and wastes in excess of 5 kilograms for solids, and 5 litres for liquids:
 - (i) store hazardous materials and wastes in closed and sealed containers;
 - (ii) label containers of hazardous materials and wastes in accordance with WHMIS;
 - (iii) store hazardous materials and wastes in containers compatible with that material or waste;
 - (iv) segregate incompatible materials and wastes. Ensure that different hazardous materials or hazardous wastes are not mixed;
 - (v) store hazardous materials and wastes in secure storage area with controlled access;
 - (vi) maintain clear egress from storage area;
 - (vii) store hazardous materials and wastes in location that will prevent them from spilling into environment;
 - (viii) store products on spill trays or berms with one hundred and ten (110) percent capacity;
 - (ix) do not store within 30 metres of a waterway or drain;
 - (x) have appropriate emergency spill response equipment available near storage area, including personal protective equipment; and
 - (xi) maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began and disposal occurred. Maintain tipping and other disposal receipts.
- (h) Report spills or accidents immediately:
 - (i) To the Contract Administrator;
 - (ii) to Manitoba Conservation Accident Reporting Line at 204-944-4888 in accordance with Manitoba Regulation 439/87 of the Dangerous Goods and Transportation Act;
 - (iii) submit a written spill report to the Contract Administrator outlining cause and proposed corrective action and Manitoba Conservation as required. Provide copies of reports submitted to Manitoba Conservation to the Contract Administrator.

D14.5.4 Transportation

- (i) Transport hazardous materials and wastes in accordance with the Manitoba Dangerous Goods Handling and Transportation Act
 - (i) ensure that trained personnel handle, offer for transport, or transport dangerous goods.
 - (ii) use licensed carrier authorized by provincial authorities to accept subject material;
 - (iii) label container[s] with legible, visible safety marks as prescribed by federal and provincial regulations;
 - (iv) provide photocopy of shipping documents and waste manifests to the Contract Administrator;
 - (v) track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to the Contract Administrator; and

- (vi) report discharge, emission, or escape of hazardous materials immediately to the Contract Administrator and appropriate provincial authority. Take measures to control release.

D14.5.5 Disposal

- (j) Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines:
 - (i) recycle hazardous wastes for which there is approved, cost effective recycling process available;
 - (ii) send hazardous wastes to authorized hazardous waste disposal or treatment facilities;
 - (iii) burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited; and
 - (iv) disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

D14.5.6 Erosion and Sediment Control

- (k) Develop an erosion control plan to control negative impacts on water and air quality; plan should meet these objectives:
 - (i) prevent loss of soil during construction by storm water run-off and wind erosion;
 - (ii) protect against erosion from stockpiled topsoil aggregates; and
 - (iii) prevent sedimentation of the land drainage system and receiving streams with dust, particulate matter or eroded sediment.
- (l) Supply, install, maintain and remove (as applicable and when no longer required) effective sediment control barriers and erosion control before starting Work that may result in the deposit of sediment into a ditch or water body to avoid potential impacts to fish and fish habitat:
 - (i) erosion and sediment control measures and installations include, as required, silt socks around storm drains, silt fence barriers, erosion control blanket, straw wattles, and geotextile fabric as appropriate; and
 - (ii) routinely inspect all erosion and sediment control measures and installations and immediately repair any deficiencies.

D14.5.7 Drainage

- (a) Provide temporary drainage and pumping as necessary to keep excavations and Site free from water.
- (b) Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- (c) Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- (d) There will be no additional payment for Drainage items.

D14.5.8 Reducing Site Disturbances

- (a) Do not disturb, in any way, the embankment slopes, roadway shoulders, and adjacent ground surfaces areas outside the limits of the construction areas including the approved lay down, staging and access unless written permission has been obtained from the Contract Administrator. Such written permission will be granted only if it can be shown that there is no alternative.
- (b) Minimize disturbance of any undeveloped areas on Site and maintain existing Site grading where indicated and where possible:
- (c) minimize stripping of topsoil and vegetation;
- (d) re-grade and plant vegetation on construction Site as soon as possible; and
- (e) avoid soil compaction where possible.

D14.5.9 Pollution Control

- (a) Maintain temporary erosion and pollution control features installed under this Contract.
- (b) Maintain construction equipment in good working order. Control emissions from equipment.
- (c) Cover or wet down dry materials and stockpiled soils to prevent blowing dust and debris. Provide dust control for the project Site, temporary and access roads.
- (d) Bring only clean fill, granular, rip rap and other similar construction materials to the project Site.

D15. DETAILED WORK SCHEDULE

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

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

- (a) a Gantt chart for the Work.
all acceptable to the Contract Administrator.

D15.3 Further to D15.2(a), 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.

SCHEDULE OF WORK

D16. COMMENCEMENT

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

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

- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in D9;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the twenty-four (24) hour emergency response phone number specified in D5.2.
 - (iv) the Safe Work Plan specified in D10;
 - (v) evidence of the insurance specified in D11;
 - (vi) the performance security specified in D12;
 - (vii) the subcontractor list specified in D13;
 - (viii) the Environmental Protection Plan specified in D14; and
 - (ix) the detailed work schedule specified in D15.
- (b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.

D16.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

D16.4 The City intends to award this Contract by May 29, 2017

D16.4.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D17. WORKING DAYS

D17.1 Further to C1.1(jj);

D17.1.1 The Contract Administrator will determine daily if a Working Day has elapsed and will record his/her assessment. On a weekly basis the Contract Administrator will provide the Contractor with a record of the Working Days assessed for the preceding week. The Contractor shall sign each report signifying that he/she agrees with the Contract Administrator's determination of the Working Days assessed for the report period.

D17.1.2 Work done to restore the Site to a condition suitable for Work, shall not be considered "work" as defined in the definition of a Working Day.

D18. DAMAGE TO EXISTING STRUCTURES AND PROPERTY

D18.1 Further to Section 3.13 of CW 1130 of the General Requirements, special care shall be taken to avoid damage to existing adjacent structures and properties during the course of Work.

D18.2 Any damage caused by the Contractor or his Subcontractors to the adjacent structures of properties shall be promptly repaired by the Contractor at his own expense to the satisfaction of the Contract Administrator.

D19. WORK BY OTHERS

D19.1 Work by others on or near the Site will include but not necessarily be limited to:

- (a) City of Winnipeg Traffic Services – Installation of permanent and regulatory signage. Installation of sign plates on sign structures. The Contractor shall adhere to the City of Winnipeg Manual of Temporary Traffic Control on City Streets and will notify and cooperate with the City of Winnipeg Traffic Services regarding any disruption to traffic during construction;
- (b) Manitoba Hydro Power – Relocation of poles, supply and installation of new service pole and site electrical services to the HHW Building;
- (c) Manitoba Hydro Gas – Site Servicing;
- (d) MTS – Relocation/Installation of Pedestal; and
- (e) City of Winnipeg Solid Waste – Temporary relocation of recycling depot to south side of Mission Street. The Contractor is expected to cooperate with the City to facilitate operation of the temporary site.

D20. CRITICAL STAGES

D20.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

- (a) The Contractor shall complete Site Works (excluding HHW Building) within sixty (60) consecutive Working Days of the commencement of the Work as specified in D16.
- (b) The Contractor shall complete Site Works and deficiencies (excluding HHW Building) within sixty five (65) consecutive Working Days of the commencement of the Work as specified in D16.

D20.2 When the Contractor considers the Work associated with D20.1 (a) to be completed, 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.

D20.3 The date on which the D20.1 (b) Work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of Site Works has been achieved.

D21. SUBSTANTIAL PERFORMANCE

- D21.1 The Contractor shall achieve Substantial Performance by December 1, 2017.
- D21.2 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.
- D21.3 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.

D22. TOTAL PERFORMANCE

- D22.1 The Contractor shall achieve Total Performance by December 15, 2017.
- D22.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be re-inspected.
- D22.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D23. LIQUIDATED DAMAGES

- D23.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:
- (a) Critical Stage – D20.1 (a) – two thousand five dollars (\$2,500.00);
 - (b) Critical Stage – D20.1 (b) – one thousand dollars (\$1,000.00);
 - (c) Substantial Performance – two thousand five hundred dollars (\$2,500.00);
 - (d) Total Performance – one thousand dollars (\$1,000.00).
- D23.2 The amounts specified for liquidated damages in D23.1 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.
- D23.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D24. SCHEDULED MAINTENANCE

- D24.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Reflective Crack Maintenance as specified in CW 3250;
 - (b) Crack Sealing the interface of Concrete Pads and Asphalt Pavement shall be completed as specified in E14 after one-year Total Performance has been achieved, unless directed by the Contract Administrator;
 - (c) Maintenance of Seeded Areas will commence immediately after the completion of the seeding operation, to the satisfaction of the Contract Administrator, and will continue until

the criteria specified for Termination of the Maintenance Period has been met as specified in CW 3520.

- D24.2 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

D25. JOB MEETINGS

- D25.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.
- D25.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D26. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

- D26.1 Further to C6.24, 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).

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

- D27.1 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 its sole discretion and acting reasonably, require updated proof of compliance, as set out in B12.4.

D28. CONSTRUCTION SURVEY

- D28.1 Construction and quantity survey will be the responsibility of the Contractor.

D29. LAYOUT OF THE ROADWORKS

- D29.1 The Contractor shall be responsible for the layout of any additional grades required as deemed necessary by the Contractor. Grades that the Contractor is responsible for includes but is not limited to roadway control lines, roadway elevations, retaining wall, HHW building, catch basins, curbs, approaches, sub-grade, sub-base and base course elevations.
- D29.2 The Contractor shall be responsible for the true and proper layout of the Work and for the correctness of the location, levels, dimensions, and alignment of all aspects of the Work.
- D29.3 The Contractor shall provide all required instruments and competent personnel for performing all layouts. Any Work found to be defective due to errors in layout completed by the Contractor shall be corrected at the expense of the Contractor.
- D29.4 The Contract Administrator shall be notified at least one (1) Working Day prior to any Work being commenced in order to have the option to check and review elevations and layouts at his discretion.

- D29.5 The Contractor shall carefully protect and preserve all benchmarks, stakes, and other items used to convey the basic data to the Contractor 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. The Contract Administrator shall be notified at least two (2) Working Days prior to replacing any benchmarks, stakes and other items used to convey the basic data to the Contractor.
- D29.6 The Contractor shall arrange and carry on his Work so as not to conflict with the collection of any data and layout of reference lines and design elevations in anyway by the Contract Administrator. The Contractor shall adjust Work and/or remove any interference as directed by the Contract Administrator at the expense of the Contractor.

D30. TRUCK WEIGHT LIMITS

- D30.1 The City shall not pay for any portion of material which results in the vehicle exceeding the maximum gross vehicle weight allowed under the City of Winnipeg Traffic By-Law, unless such vehicle is operating under special permit.

MEASUREMENT AND PAYMENT

D31. PAYMENT

- D31.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D32. WARRANTY

- D32.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire two (2) years thereafter, except where longer warranty periods are specified in the respective Specification sections, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.
- D32.1.1 For the purpose of Performance Security, the warranty period shall be two (2) years.
- D32.2 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.
- D32.2.1 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.

FORM H1: PERFORMANCE BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____ ,
(hereinafter called the "Principal"), and

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

_____ dollars (\$_____)

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

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

BID OPPORTUNITY NO. 39-2017

Community Resource Recovery Centre (4R Winnipeg Depot) – East Winnipeg Site, Including Roadworks and Building

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

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

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

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

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

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

_____ day of _____, 20_____ .

SIGNED AND SEALED
in the presence of:

(Witness as to Principal if no seal)

(Name of Principal)

Per: _____ (Seal)

Per: _____

(Name of Surety)

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

**FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)**
(See D12)

(Date)

The City of Winnipeg
Legal Services Department
185 King Street, 3rd Floor
Winnipeg MB R3B 1J1

RE: PERFORMANCE SECURITY – BID OPPORTUNITY NO. 39-2017

Community Resource Recovery Centre (4R Winnipeg Depot) – East Winnipeg Site, Including
Roadworks and Building

Pursuant to the request of and for the account of our customer,

(Name of Contractor)

(Address of Contractor)

WE HEREBY ESTABLISH in your favour our irrevocable Standby Letter of Credit for a sum not exceeding
in the aggregate

_____ Canadian dollars.

This Standby Letter of Credit may be drawn on by you at any time and from time to time upon written demand for payment made upon us by you. It is understood that we are obligated under this Standby Letter of Credit for the payment of monies only and we hereby agree that we shall honour your demand for payment without inquiring whether you have a right as between yourself and our customer to make such demand and without recognizing any claim of our customer or objection by the customer to payment by us.

The amount of this Standby Letter of Credit may be reduced from time to time only by amounts drawn upon it by you or by formal notice in writing given to us by you if you desire such reduction or are willing that it be made.

Partial drawings are permitted.

We engage with you that all demands for payment made within the terms and currency of this Standby Letter of Credit will be duly honoured if presented to us at:

(Address)

and we confirm and hereby undertake to ensure that all demands for payment will be duly honoured by us.

All demands for payment shall specifically state that they are drawn under this Standby Letter of Credit.

Subject to the condition hereinafter set forth, this Standby Letter of Credit will expire on

(Date)

It is a condition of this Standby Letter of Credit that it shall be deemed to be automatically extended from year to year without amendment from the present or any future expiry date, unless at least 30 days prior to the present or any future expiry date, we notify you in writing that we elect not to consider this Standby Letter of Credit to be renewable for any additional period.

This Standby Letter of Credit may not be revoked or amended without your prior written approval.

This credit is subject to the Uniform Customs and Practice for Documentary Credit (2007 Revision), International Chamber of Commerce Publication Number 600.

(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
 (See D13)

Community Resource Recovery Centre (4R Winnipeg Depot) – East Winnipeg Site, Including Roadworks and Building

<u>Portion of the Work</u>	<u>Name</u>	<u>Address</u>
SITE WORKS		
<u>Supply of Materials:</u>		
Concrete		
Asphalt		
Base Course & Sub-Base		
Underground Materials (MH, CB, Pipe, Frame & Covers)		
Chain Link Perimeter Fence		
Access Control Gates and Barriers		
Site Light Fixtures and Poles		
Site Security System		
Guardrails, Handrails, and Container Guide Rails		
<u>Installation/Placement</u>		
Concrete		
Asphalt		
Base & Sub-Base		
Underground Works		
Sewer Televising		
Cast-in-Place Concrete Pile Foundations		
Structural Concrete		
Guardrails, Handrails, and Container Guide Rails		
Chain Link Perimeter Fence		
Access Control Gates and Barriers		
Site Light Fixtures and Poles		
Site Security System		
Landscaping		

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/Spec/Default.stm>
- E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.2.3 Further to C2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.3 The following are applicable to the Work:

<u>Specification No.</u>	<u>Specification Title</u>
Division 05	Metals
05 50 00	Metal Fabrications
Division 06	Wood, Plastics and Composites
06 10 00	Rough Carpentry
06 17 53	Fabricated Wood Trusses
06 40 00	Architectural Woodwork
Division 07	Thermal and Moisture Protection
07 21 13	Board Insulation
07 21 16	Blanket Insulation
07 26 00	Vapour Retarders
07 61 00	Metal Roofing System
07 62 00	Sheet Metal Cladding, Flashing and Trim
07 84 00	Firestopping
07 92 00	Joint Sealing
Division 08	Openings
08 11 00	Metal Doors and Frames
08 36 13.02	Sectional Metal Doors
08 50 00	Windows
08 71 00	Door Hardware
08 80 50	Glazing
Division 09	Finishes
09 21 16	Gypsum Board
09 30 13	Ceramic Tile
09 51 13	Acoustical Panel Ceilings
09 65 16	Resilient Sheet Flooring
09 91 23	Interior Painting
Division 10	Specialities
10 28 10	Washroom Accessories
10 44 20	Fire Extinguishers
10 51 13	Metal Lockers
Division 12	Furnishings
12 24 13	Roller Shades
Division 13	Special Construction
13 27 00	Prefabricated Kiosk Building
Division 22	Plumbing
22 05 00	Common Work Results for Plumbing
22 11 16	Domestic Water Piping

22 13 18	Drainage Waste and Vent Piping - Plastic
22 30 05	Domestic Water Heaters
22 42 01	Plumbing Specialities and Accessories
22 42 03	Commercial Plumbing Fixtures
Division 23	Heating, Ventilation and Air Conditioning (HVAC)
23 05 00	Common Work Results for HVAC
23 05 05	Installation of Pipework
23 05 13	Common Motor Requirements for HVAC Equipment
23 05 29	Hangers and Supports for HVAC Piping and Equipment
23 05 53.01	Mechanical Identification
23 05 93	Testing, Adjusting and Balancing for HVAC
23 07 13	Duct Insulation
23 07 15	Thermal Insulation for Piping
23 09 33	Electric and Electronic Control for HVAC
23 31 14	Metal Ducts – Low Pressure to 500 PA
23 33 00	Air Duct Accessories
23 33 15	Dampers – Operating
23 34 00	HVAC Fans
23 37 13	Diffusers, Registers, and Grilles
23 37 20	Louvres, Intakes, and Vents
23 55 01	Duct Heaters
23 72 00	Air-to-Air Energy Recovery Equipment
23 73 11	Air Handling Units – Packaged
23 82 39	Unit Heaters
Division 26	Electrical
26 05 00	Common Work Results for Electrical
26 05 01	Mechanical Equipment Connections
26 05 20	Wire Box Connectors 0-1000 V
26 05 21	Wires and Cables
26 05 28	Grounding and Bonding
26 05 29	Hangers and Supports for Electrical Systems
26 05 31	Splitters, Junction, Pull Boxes and Cabinets
26 05 32	Outlet Boxes, Conduit Boxes and Fittings
26 05 34	Conduits, Conduit Fastenings and Conduit Fittings
26 05 80	Fractional Horsepower Motors
26 05 81	Motors: 1 to 200 HP, to 600 V
26 12 17	Dry Type Transformers
26 24 01	Service Equipment
26 24 02	Service Entrance Board
26 24 16	Panelboards Breaker Type
26 27 16	Electrical Cabinets and Enclosures
26 27 26	Wiring Devices
26 28 21	Moulded Case Circuit Breakers
26 28 23	Disconnect Switches – Fused and Non-Fused
26 29 03	Control Devices
26 29 10	Motor Starters to 600 V
26 50 00	Lighting
26 52 01	Emergency Lighting
26 53 00	Exit Signs
Division 27	Communications
27 10 05	Structured Cabling – Communications
27 11 20	Terminals and Connectors for Communications Conductors – Entrance Facility
Division 28	Electronic Safety and Security
28 16 00	Intrusion Detection
28 23 00	Video Surveillance
28 31 10	Fire Alarm

<u>Drawing No.</u>	<u>Drawing Name/Title</u>	<u>Drawing (Original) Sheet Size</u>
C00	COVER SHEET	A-1
C01	SITE GEOMETRY	A-1
C02	GRADING PLAN	A-1
C03	PROFILES	A-1
C04	UNDERGROUND UTILITIES AND LAND DRAINAGE SEWER	A-1
C05	TYPICAL SECTIONS	A-1
C06	POND AND FENCING DETAILS	A-1
C07	SITE FENCING AND PAINTING	A-1
B01	GENERAL ARRANGEMENT OF STRUCTURES	A-1
B02	HHW BUILDING – MAIN FLOOR PLAN AND NOTES	A-1
B03	HHW BUILDING - SECTIONS	A-1
B04	HHW BUILDING – SECTIONS, ROOM FINISH SCHEDULE & DETAILS	A-1
B05	HHW BUILDING – DOOR SCHEDULE & NOTES	A-1
B06	HHW BUILDING – WALL SECTIONS	A-1
B07	HHW BUILDING - DETAILS	A-1
B08	KIOSK – FLOOR PLAN, ELEVATIONS, WALL SECTION & DETAILS	A-1
S01	STRUCTURAL MAIN FLOOR PLANS	A-1
S02	HHW BUILDING – ROOF FRAMING PLAN	A-1
S03	RETAINING WALL SECTIONS AND DETAILS	A-1
S04	RETAINING WALL SECTIONS AND DETAILS	A-1
S05	RETAINING WALL STAIR SECTIONS	A-1
M01	HHW BUILDING – PLUMBING PLAN	A-1
M02	HHW BUILDING – HVAC PLAN	A-1
M03	HHW BUILDING – SECTIONS, DETAILS AND SCHEDULES	A-1
M04	HHW – CONTROLS SCHEMATICS	A-1
E01	SYMBOL LEGEND AND DRAWING LIST	A-1
E02	ELECTRICAL – SITE PLAN	A-1
E03	SINGLE LINE DIAGRAM AND PANEL SCHEDULES	A-1
E04	HHW BUILDING – POWER PLAN	A-1
E05	HHW BUILDING – LIGHTING PLAN	A-1
E06	HHW BUILDING – SYSTEMS PLAN	A-1
E07	KIOSK BUILDING	A-1
E08	MECHANICAL EQUIPMENT SCHEDULE	A-1
E09	LUMINAIRE SCHEDULE	A-1
E10	ELECTRICAL – DETAILS	A-1
E11	ELECTRICAL – DETAILS	A-1
E12	ELECTRICAL – DETAILS	A-1
E13	SECURITY CAMERA SYSTEM	A-1
E14	SECURITY CAMERA SYSTEM – DETAILS	A-1
E15	FIRE ALARM MOUNTING STANDARD	A-1
L01	PLANTING PLAN	A-1

E2. GEOTECHNICAL REPORT

E2.1 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'.

E3. SHOP DRAWINGS

E3.1 Description

E3.1.1 This Specification provides instructions for the preparation and submission of shop drawings:

- (a) the term 'shop drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, including Site erection drawings which are to be provided by the Contractor to illustrate details of a portion of the Work; and
- (b) submit specified shop drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be shown on all submissions for Contract Administrator review.

E3.2 Shop Drawings

- E3.2.1 Original drawings shall be prepared by Contractor, Subcontractor, supplier, distributor or manufacturer to illustrate appropriate portion of Work including fabrication, layout, setting or erection details as specified in appropriate sections.
- E3.2.2 Shop drawings for the following components shall bear the seal of a Professional Engineer registered in the province of Manitoba:
 - (a) Temporary Shoring, as requested by the Contract Administrator;
 - (b) all Form Details, as requested by the Contract Administrator;
 - (c) prefabricated Kiosk Building, fabrication, layout, and erection details;
 - (d) all miscellaneous metal fabrications including but not limited to stairs;
 - (e) structural steel;
 - (f) steel reinforcing for all cast in place concrete
 - (g) wood roof trusses; and
 - (h) precast concrete components.

E3.3 Contractor's Responsibilities

- E3.3.1 Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.
- E3.3.2 Verify:
 - (a) field measurements;
 - (b) field construction criteria; and
 - (c) catalogue numbers and similar data.
- E3.3.3 Coordinate each submission with requirements of Work and Contract Documents. Individual shop drawings will not be reviewed until all related drawings are available.
- E3.3.4 Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.
- E3.3.5 Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless Contract Administrator gives written acceptance of specified deviations.
- E3.3.6 Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.
- E3.3.7 Make any corrections required by the Contract Administrator and resubmit the required number of corrected copies of shop drawings. Direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.
- E3.3.8 After Contract Administrator's review and return of copies, distribute copies to Subcontractors and others as appropriate.
- E3.3.9 Maintain one (1) complete set of reviewed shop drawings, filed by Specification Section Number, at the Site of the Work for use and reference of the Contract Administrator and Subcontractors.

E3.4 Submission Requirements

- E3.4.1 Schedule submissions at least fourteen (14) Calendar Days before dates reviewed submissions will be needed, and allow for a fourteen (14) Calendar Day period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.
- E3.4.2 Submit two (2) paper prints of shop drawings. The Contract Administrator will retain one (1) copy of all submittals and return one (1) copy to the Contractor.
- E3.4.3 Accompany submissions with 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; and
 - (g) Other pertinent data.
- E3.4.4 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; and
 - (v) Detailer (if applicable).
 - (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; and
 - (i) Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.
- E3.5 Other Considerations
- E3.5.1 Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.
- E3.5.2 Material and equipment delivered to the Site of the Works will not be paid for at least until pertinent shop drawings have been submitted and reviewed.
- E3.5.3 Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.
- E3.5.4 No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions or review of shop drawings.

E4. BUILDING AND OCCUPANCY PERMITS

- E4.1 Further to C6.13, the Contractor shall be responsible for the procurement of all foundation, building and occupancy permits.
- E4.2 There shall be no additional payment for these permits.

E5. OPERATION AND MAINTENANCE MANUALS

E5.1 Submittals

- (a) Submittals: in accordance with E3.4
- (b) Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- (c) Copy will be returned after final inspection, with Contract Administrator comments.
- (d) Revise content of documents as required prior to final submittal.
- (e) Two (2) weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, four (4) final copies of operating and maintenance manuals in English and French.
- (f) Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- (g) Furnish evidence, if requested, for type, source and quality of products provided.
- (h) Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- (i) Pay costs of transportation.

E5.2 Format

- (a) Organize data as instructional manual.
- (b) Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- (c) When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- (d) Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- (e) Arrange content by systems, under Section numbers and sequence of Table of Contents.
- (f) Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- (g) Text: manufacturer's printed data, or typewritten data.
- (h) Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- (i) Provide 1:1 scaled CAD files in drawing format on CD.

E5.3 Contents – Each Volume

- (a) Table of Contents: provide title of project; date of submission; names:
 - (i) addresses and telephone numbers of Contract Administrator and Contractor with name of responsible parties; and
 - (ii) schedule of products and systems, indexed to content of volume.
- (b) For each product or system:
 - (i) list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

- (c) Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information;
- (d) Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams; and
- (e) Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

E5.4 As-Builts and Samples

- (a) Maintain, in addition to requirements in General Conditions, at site for Contract Administrator one record copy of:
 - (i) Contract Drawings;
 - (ii) Specifications;
 - (iii) Addenda;
 - (iv) Change Orders and other modifications to Contract;
 - (v) reviewed shop drawings, product data, and samples;
 - (vi) field test records;
 - (vii) inspection certificates; and
 - (viii) Manufacturer's certificates.
- (b) Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- (c) Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- (d) Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- (e) Keep record documents and samples available for inspection by Contract Administrator.

E5.5 Recording Actual Site Conditions

- (a) Record information on set of black line drawings, provided by Contract Administrator.
- (b) Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- (c) Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- (d) Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - (i) measured depths of elements of foundation in relation to finish first floor datum;
 - (ii) measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements;
 - (iii) measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction;
 - (iv) field changes of dimension and detail;
 - (v) changes made by change orders;
 - (vi) details not on original Contract Drawings; and
 - (vii) references to related shop drawings and modifications.
- (e) Specifications: mark each item to record actual construction, including:
 - (i) manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items; and
 - (ii) changes made by Addenda and Change Orders.

- (f) Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records required by individual specifications sections.

E5.6 Equipment and Systems

- (a) Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- (b) Panel Board Circuit Directories: provide electrical service characteristics, controls, and communications.
- (c) Include installed colour coded wiring diagrams.
- (d) Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- (e) Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- (f) Provide servicing and lubrication schedule, and list of lubricants required.
- (g) Include manufacturer's printed operation and maintenance instructions.
- (h) Include sequence of operation by controls manufacturer.
- (i) Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- (j) Provide installed control diagrams by controls manufacturer.
- (k) Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- (l) Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- (m) Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- (n) Include test and balancing reports as specified in C11 and NMS Specification 23 05 93.
- (o) Additional requirements: as specified in individual specification sections.

E5.7 Materials and Finishes

- (a) Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
- (b) Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- (c) Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- (d) Additional Requirements: as specified in individual specifications sections.

E5.8 Spare Parts

- (a) Provide spare parts, in quantities specified in individual specification sections.
- (b) Provide items of same manufacture and quality as items in Work.
- (c) Deliver to location as directed by Contract Administrator; place and store.
- (d) Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.
- (e) Obtain receipt for delivered products and submit prior to final payment.

E5.9 Maintenance Materials

- (a) Provide maintenance and extra materials, in quantities specified in individual specification sections.
- (b) Provide items of same manufacture and quality as items in Work.
- (c) Deliver to location as directed by Contract Administrator; place and store.
- (d) Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.
- (e) Obtain receipt for delivered products and submit prior to final payment.

E5.10 Special Tools

- (a) Provide special tools, in quantities specified in individual specification section.
- (b) Provide items with tags identifying their associated function and equipment.
- (c) Deliver to location as directed by Contract Administrator; place and store. Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

E5.11 Storage, Handling, and Protection

- (a) Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- (b) Store in original and undamaged condition with manufacturer's seal and labels intact.
- (c) Store components subject to damage from weather in weatherproof enclosures.
- (d) Store paints and freezable materials in a heated and ventilated room.
- (e) Remove and replace damaged products at own expense and to satisfaction of Contract Administrator.

E5.12 Warranties and Bonds

E5.12.1 Develop warranty management plan to contain information relevant to Warranties.

E5.12.2 Submit warranty management plan, thirty (30) days before planned pre-warranty conference, to Contract Administrator approval.

E5.12.3 Warranty management plan to include required actions and documents to assure that the City receives warranties to which it is entitled.

E5.12.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

E5.12.5 Submit, warranty information made available during construction phase, to Contract Administrator for approval prior to each pay estimate.

E5.12.6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:

- (a) separate each warranty or bond with index tab sheets keyed to Table of Contents listing;
- (b) list Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal;
- (c) obtain warranties and bonds, executed in duplicate by Subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of work.
- (d) verify that documents are in proper form, contain full information, and are notarized;
- (e) co-execute submittals when required; and
- (f) retain warranties and bonds until time specified for submittal.

- (i) Except for items put into use with City's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
 - (ii) Conduct joint twelve (12) month and twenty-four (24) month warranty inspection, measured from time of acceptance, by Contract Administrator.
 - (iii) Include information contained in warranty management plan as follows:
 - (g) roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of contractors, subcontractors, manufacturers or suppliers involved;
 - (h) listing and status of delivery of Certificates of Warranty for extended warranty items, to include site light fixtures and commissioned systems such as alarm systems and security systems;
 - (i) provide list for each warranted equipment, item, feature of construction or system indicating:
 - (i) name of item;
 - (ii) model and serial numbers;
 - (iii) location where installed;
 - (iv) name and phone numbers of manufacturers or suppliers;
 - (v) names, addresses and telephone numbers of sources of spare parts;
 - (vi) warranties and terms of warranty: include one (1)-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates;
 - (vii) cross-reference to warranty certificates as applicable;
 - (viii) starting point and duration of warranty period;
 - (ix) summary of maintenance procedures required to continue warranty in force;
 - (x) cross-reference to specific pertinent Operation and Maintenance manuals;
 - (xi) organization, names and phone numbers of persons to call for warranty service; and
 - (xii) typical response time and repair time expected for various warranted equipment.
- E5.12.7 Contractor's plans for attendance at six (6) and twelve (12) month post-construction warranty inspections;
- E5.12.8 procedure and status of tagging of equipment covered by extended warranties; and
- E5.12.9 post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
 - (a) Respond in a timely manner to oral or written notification of required construction warranty repair work.
 - (b) Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.
- E5.13 Pre-Warranty Conference
 - E5.13.1 Meet with Contract Administrator, to develop understanding of requirements of this section. Schedule meeting prior to Contract completion, and at time designated by Contract Administrator.
 - E5.13.2 Contract Administrator will establish communication procedures for:
 - (a) notification of construction warranty defects;
 - (b) determine priorities for type of defect; and
 - (c) determine reasonable time for response.
 - E5.13.3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.

- E5.13.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.
- E5.14 Warranty Tags
- E5.14.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Contract Administrator.
- E5.14.2 Attach tags with copper wire and spray with waterproof silicone coating.
- E5.14.3 Leave date of acceptance until project is accepted for occupancy.
- E5.14.4 Indicate following information on tag:
- (a) type of product/material;
 - (b) model number;
 - (c) serial number;
 - (d) contract number;
 - (e) warranty period;
 - (f) inspector's signature; and
 - (g) construction Contractor.
- E5.15 Request for Information and Non-Conformance Reports
- E5.15.1 For all Request for Information (RFI) and Non-Conformance Reports (NCR) submissions, the Contractor shall assume a minimum of forty-eight (48) hour response time will be required per submission.
- E5.15.2 The Contractor shall not undertake work associated with these submissions until the Contract Administrator review is completed and responded to in writing.

E6. OFFICE FACILITIES

- E6.1 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 twenty-five (25) square metres, 2.4m with two 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°C or 24-25°C.
 - (e) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three wall outlets.
 - (f) The building shall be furnished with one (1) desk, one (1) drafting table, one (1) stool, one (1) four (4)-drawer legal size filing cabinet with lock, and a minimum of five (5) 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; and
 - (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 he/she deems it necessary.
- E6.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E6.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance or as agreed upon in writing by the Contract Administrator.

E7. VERIFICATION OF WEIGHTS

E7.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer and Corporate Affairs, Canada.

E7.1.1 All weight tickets shall have the gross weight and the time and date of weighing printed by an approved electro/mechanical printer coupled to the scale.

E7.1.2 The tare weight and net weight may either be hand written or machine printed. All weights, scales and procedures shall be subject to inspection and verification by the Contract Administrator. Such inspection and verification may include, but shall not be limited to:

- (a) checking Contractor's scales for Consumer and Corporate Affairs certification seals;
- (b) observing weighing procedures;
- (c) random checking of either gross or tare weights by having such trucks or truck/trailer(s) combinations as the Contract Administrator shall select weighed at the nearest available certified scale; and
- (d) checking tare weights shown on delivery tickets against a current tare.

E7.1.3 No charge shall be made to The City for any delays or loss of production caused by such inspection and verification.

E7.2 The Contractor shall ensure that each truck or truck/trailer(s) combination delivering material which is paid for on a weight basis carries a tare not more than one (1) month old.

E7.2.1 The tare shall be obtained by weighing the truck or truck/trailer(s) combination on a certified scale and shall show:

- (a) upon which scale the truck or truck/trailer(s) combination was weighed;
- (b) the mechanically printed tare weight;
- (c) the license number(s) of the truck and trailer(s); and
- (d) the time and date of weighing.

E8. ACCESS

E8.1 The Contractor shall access and exit the Site using Mission Street, east of Panet Road.

E8.2 The Contractor shall not block traffic when entering or exiting the Site.

E8.3 Heavy equipment shall be moved in and out of the Site during low-traffic hours, as coordinated with the Contract Administrator.

E9. PROTECTION OF EXISTING TREES

E9.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

- (a) The Contractor shall not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.
- (b) Trees identified to be at risk by the Contract Administrator are to be strapped with 25 x 100 x 2400mm wood planks, or suitably protected as approved by the Contract Administrator.
- (c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.

- (d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.
- (e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

E9.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his/her designate.

E9.3 No separate measurement or payment will be made for the protection of trees.

E9.4 Except as required in clause E9.1(c) and E9.1(e), Elm trees shall not be pruned at any time between April 1 and July 31.

E10. TRAFFIC CONTROL

E10.1 Further to clauses 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 CW3410.
- (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 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.

E10.2 Notwithstanding E10.1, in accordance with the MTTC, the Contract Administrator shall make arrangements with the **Traffic Services Branch of the City of Winnipeg** to place, maintain, and remove all **regulatory signs** and traffic control devices authorized and/or required by the Traffic Management Branch in the following situations:

- (a) Parking restrictions,
- (b) Stopping restrictions,
- (c) Turn restrictions,
- (d) Diamond lane removal,
- (e) Full or directional closures on a Regional Street,
- (f) Traffic routed across a median,
- (g) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.
- (h) Approved Designated Construction Zones with a temporary posted speed limit reduction. Traffic Services will be responsible for placing all of the advance signs and 'Construction Ends' (TC-4) signs. The Contractor is still responsible for all other temporary traffic control including but not limited to barricades, barrels and tall cones.

E10.2.1 An exception to E10.2 is the 'KEEP RIGHT/KEEP LEFT' sign (RB-25 / RB-25L) which shall be supplied, installed, and maintained by the Contractor at their own expense.

E10.2.2 Further to E10.2, where the Contract Administrator has determined that the services of the Traffic Services Branch are required, the City shall bear the costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E11. TRAFFIC MANAGEMENT

E11.1 Further to clause 3.7 of CW 1130:

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

E11.1.1 Flag persons may be necessary to maintain the flow of traffic during certain work operations.

E11.1.2 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.

E11.1.3 Pedestrian access must be maintained on the west side at all times. One pedestrian crossing in the north-south direction must be maintained on the west side of the Panet/Mission intersection at all times.

E11.1.4 Ambulance/emergency vehicle access must be maintained at all times.

E12. WATER OBTAINED FROM THE CITY

E12.1 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

E13. SURFACE RESTORATIONS

E13.1 Further to clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E14. SEALING INTERFACE BETWEEN CONCRETE AND ASPHALT SURFACES

DESCRIPTION

E14.1 The Contractor shall seal the interface of all concrete pads and asphalt roadway pavement one (1) year after construction is completed.

MATERIALS

E14.2 Joint sealant shall be supplied as per CW 3250.

CONSTRUCTION METHODS

E14.3 Sealing of the interface shall be completed using joint sealant in accordance with Clause 3 of CW 3250.

MEASUREMENT AND PAYMENT

E14.4 Sealing the interface of the concrete and asphalt surfaces will not be measured. This Work shall be paid for at the Contract Lump Sum Price for "Structural Concrete", which price shall be payment in full for supplying all materials and for performing all operations herein described,

and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E15. LINE PAINTING

DESCRIPTION

E15.1 The work of this section comprises the furnishing of all labour, equipment and materials required to complete the painted pavement markings for parking stalls as shown on the drawings and as hereinafter specified.

MATERIALS

E15.2 Paint shall conform to City of Winnipeg specification for reflectorized traffic paint or suitable equivalent for application to asphalt and/or concrete surface.

E15.2.1 CGSB 1-GP-74M + Amdt-May-81, alkyd traffic paint

E15.2.2 High Gloss Traffic Paint (IBIS Products Limited)

E14.3 Paint colours shall be:

(b) Yellow - all centerlines, parking stall lines, painted medians, and handicap symbols illustrated on plan;

(c) White - stop bars, passing lane lines, bicycle symbols, and arrows;

(d) CGSB 1-GP-12C + Amdt-Dec-84, yellow 505-308, white 513-301 (MTO Spec. 1710);(White 40-2478, Yellow 40-3057-IBIS Products Limited);

(e) Federal Traffic Paint, Yellow 40-3597 Qual No 80087, White 40-3596 Qual No 80086 (IBIS Products Limited); and

(f) High Gloss Traffic Paint, Yellow 40-1821 (IBIS Products Limited).

E14.4 Thinner to CGSB 1-GP-5M

E14.5 Glass Beads: Overlay Type: To CGSB 1-GP-74f + Amdt-May-81

CONSTRUCTION METHODS

E15.6 Line painting to be done upon completion of asphalt paving work and curing time. All lines are to be to as per the drawings or as required by TAC standards.

E15.7 No markings shall be performed when the temperature is below ten (10) degrees Celsius nor during rainfall or fog, or until the surface is perfectly dry. No markings shall be done if, in the opinion of the Site supervisor, the conditions are not conducive to provide a top quality result.

E15.8 Immediately before application of the paint, the existing surface shall be dry and entirely free from dirt, grease, oil acids, laitance, or other foreign matter which would reduce the bond between the coat of paint and the asphalt/concrete. The surface shall be thoroughly cleaned by sweeping and blowing as required to remove all dirt, laitance and loose materials.

E15.9 Suitable chalkline layouts of proposed lines and arcs shall be spotted in advance of the paint application. Control points shall be spaced at such intervals as will ensure accurate location of all markings.

E15.10 When discrepancies between the drawings and the field layout occur, these discrepancies are to be reported to the Contract Administrator for further action before proceeding with the application of paint.

E15.11 The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimension and application of the paint.

- E15.12 Paint shall be applied at a rate of 200 lineal feet per gallon (60 metres per 4.5 litres) and maintain a uniform lines unless otherwise indicated on specifications drawings.
- E15.13 The paint shall be mixed in accordance with the manufacturer.s instructions before application. The paint shall be thoroughly mixed and applied to the surface of the concrete with the marking machine. The surface shall receive two (2) coats; the first coat shall be thoroughly dry before the second coat is applied.
- E15.14 Glass beads are to be added to paint as per manufacturer's specifications.
- E15.15 The paint applicator to be an approved pressure type mobile distributor capable of applying paint in single or double and dashed lines, and that will ensure uniform application and having a positive shut-off.
- E15.16 In the application of straight strips, any deviation in the edges exceeding 1/2 inch in fifty (50) feet shall be obliterated and the marking corrected. The width of the markings shall be as designated within a tolerance of five (5) percent. All paintings shall be performed to the satisfaction of the Contract Administrator by competent and experienced equipment operators, labourers, and artisans in a neat and workmanlike manner.
- E15.17 Thoroughly clean distribution tank before refilling with paint of different colour.
- E15.18 After application of the paint, all markings shall be protected while the paint is drying. The fresh paint shall be protected from injury or damage of any kind. The Contractor shall be directly responsible and shall erect or place suitable warning signs, flags, or barricades, protective screens, or coverings as required. All surfaces shall be protected from disfiguration by spatter, splashes, and spillage drippings, of paint or other materials.
- E15.19 Parking stall lines will be painted as per drawing and/or as directed by the Contract Administrator. Each stall line will be 75 millimetres wide and 4.5 metres long.

MEASUREMENT AND PAYMENT

- E15.20 Line painting will be measured and paid for at the Contract Lump Sum Price for "Line Painting" measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E16. REMOVAL OF TREES

DESCRIPTION

- E16.1 General
- E16.1.1 This specification covers the removal of existing trees necessary for the completion of the Works.

MATERIALS AND EQUIPMENT

- E16.2 Not Applicable.

CONSTRUCTION METHODS

- E16.3 General
- E16.3.1 Contractor shall remove designated trees as shown on the drawings and as directed by the Contract Administrator on an "as required" basis in accordance with the requirements hereinafter specified.
- E16.3.2 The Contractor shall not complete a tree removal unless they receive authorization from the Contract Administrator.

- E16.3.3 The Contractor shall remove trees in a manner satisfactory to the Contract Administrator or designate and agrees that the Work may be inspected by City personnel.
- E16.3.4 The Contractor shall cut down designated trees and grub out the stumps and rootballs.
- E16.3.5 The Contractor shall remove and/or dispose of all material resulting from the Work immediately by removing to a landfill site, or by chipping and removing material to an appropriate location.
- E16.3.6 The Contractor shall repair any damage resulting from the Work to adjacent trees and shall report all damage immediately to the Contract Administrator.

MEASUREMENT AND PAYMENT

- E16.4 Removal of Trees will be measured on a unit basis and paid for at the Contract Unit Price per tree and associated stump/roots for "Removal of Trees". The number to be paid for will be the total number of trees and associated stump/roots removed and disposed of in accordance with this specification and accepted by the Contract Administrator.

E17. THREE-STRAND BARBED WIRE CHAIN LINK FENCE AND GATES

DESCRIPTION

- E17.1 Further to CW 3550 specification for chain link and drift control fence this specification shall cover the supply and installation of 2440 millimetre height chain link fencing with three-strand barbed wire and vehicle gates.
- E17.2 Unless otherwise indicated in this Specification, materials, submittals, construction methods and quality assurance shall conform to the requirements of CW-3550.
- E17.3 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all works hereinafter specified.

MATERIALS

- E17.4 Chain link fencing as per CW3550. The fence shall come complete with three (3)-strands of 13.5 gauge barbed wire spaced 150 mm apart on a forty-five (45) degree angle away from the Site, as shown on the Drawings.
- E17.5 The vehicle access gates shall be supplied complete with tamper proof locking mechanisms as shown on the drawings. The tamper proof locking mechanisms shall allow the gates to be easily locked while protecting the padlock from vandalism or exposure to the elements. The gate must be functional in all seasons and provide adequate clearance.
- E17.6 Contractor to provide shop drawings for approval prior to manufacture.

INSTALLATION

- E17.7 Measure length of fencing to be installed prior to construction. Install posts and adjust post spacing at ends of fencing runs to provide minimum 1.5 metre length panels at ends. Post spacing maybe adjusted for up to 5 panels.
- E17.8 Construct cast-in place concrete pile foundations as per the vehicle access gate detail in Drawings.
- E17.9 Construct fence as per manufacturers' specifications and details.

MEASUREMENT AND PAYMENT

- E17.10 The 2.44 metre high three (3)-strand barbed wire chain link fence will be measured on a lineal metre basis and paid for at the Contract Unit Price for "Chain Link Fence" listed under the "Items of Work" in E17.12. The amount to be paid for will be the total number of lineal metres installed in accordance with this Specification, drawings, and accepted and measured by the Contract Administrator.
- E17.11 The vehicle gates will be measured on a unit basis and paid for at the Contract Unit Price for "Vehicle Access Gate" listed under the "Items of Work" in E17.12. The amount to be paid for will be the total number of units installed in accordance with this specification, drawings, and accepted and measured by the Contract Administrator.
- E17.12 Items of work
- (a) Chain Link Fence
 - (i) 2.44 m Height c/w Three Strand Barbed Wire.
 - (b) Vehicle Access Gate
 - (i) 2.44 m Height
- E17.13 Cast-in-place concrete pile foundations shall be considered incidental to the work.

E18. INSTALLATION OF STRAW WATTLES

DESCRIPTION

- E18.1 Straw wattles are required to be installed as erosion control measures to mitigate any deleterious materials from entering the existing Land Drainage System.

MATERIALS

- E18.2 The straw wattles shall be Stenlog or other biodegradable straw wattles.

CONSTRUCTION METHODS

- E18.3 Install 300 millimetres Stenlog or other straw wattle sediment control material in accordance with the manufacturer's specifications around all riprap areas related to drainage inlets and outlets, and catchbasins within seeded areas.
- E18.4 Install straw wattles so that no gaps exist between the soil and the bottom of the wattle, and the ends of adjacent wattles are overlapped 150 millimetres minimum to prevent water and sediment passing. Achieve a tight seal between the wattle segments.
- E18.5 Dogleg terminal ends of straw wattle up the slope to prevent channelling of sedimentation.
- E18.6 Use 300 millimetres wooden stakes to fasten straw wattle to the soil. Place stakes on each side of the straw wattle, lying across the natural fibre twine, spaced 1200 millimetres on center. Leave 30 to 50 millimetres of wood stake exposed above the wattle.
- E18.7 Avoid damage to wattles. Damaged areas of wattles should be cut and tied off, then treated as terminal ends.
- E18.8 At the direction of the Contract Administrator, the straw wattles shall be removed after seeding has established and before the end of the warranty period.

MEASUREMENT AND PAYMENT

- E18.9 Installation of straw wattles will be considered incidental to the Contract and no separate measurement for payment will be made.

E19. CAST-IN-PLACE CONCRETE PILE FOUNDATIONS

DESCRIPTION

- E19.1 The Work covered under this Item shall include all concreting operations related to construction of cast-in-place concrete pile foundations in accordance with this Specification and as shown on the drawings.
- E19.2 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.

MATERIALS

E19.3 General

- E19.3.1 The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

E19.4 Handling and Storage of Materials

- E19.4.1 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 CAN/CSA A23.1-14.

E19.5 Testing and Approval

- E19.5.1 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.
- E19.5.2 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 his own expense.

E19.6 Patching Mortar

- E19.6.1 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.

E19.7 Cement

- E19.7.1 Cement shall conform to the requirements of CAN/CSA A23.1-14 and the durability requirements noted in the concrete specification.

E19.8 Concrete

E19.8.1 General

- (a) Concrete repair material shall be compatible with the concrete substrate. Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

- E19.8.2 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 CAN/CSA A23.1-14:
- (a) Class of Exposure: S-1;
 - (b) Compressive Strength fifty six (56) days = 35 MPa;
- E19.8.3 Mix design for ready mix concrete shall be submitted to Contract Administrator at least two (2) weeks prior to concrete placing operations.
- E19.8.4 The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self-compacting concrete may be used for pile foundations.
- E19.8.5 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.
- E19.8.6 The temperature of all types of concrete shall be between 15 degrees Celsius and 25 degrees Celsius at discharge. Temperature requirements for concrete containing silica fume shall be between 10 degrees Celsius and 18 degrees Celsius at discharge unless otherwise approved by the Contract Administrator.
- E19.8.7 Concrete materials susceptible to frost damage shall be protected from freezing.
- E19.9 Aggregate
- E19.9.1 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 CAN/CSA A23.1.
- E18.9.2 Coarse Aggregate
- (a) The maximum nominal size of coarse aggregate shall be sized to suit the Contractor's mix design. Gradation shall be in accordance with CAN/CSA A23.1, Table 11, Group 1. The coarse aggregate shall satisfy the Standard Requirements specified in CAN/CSA A23.1, Table 12, "Concrete Exposed to Freezing and Thawing".
 - (b) 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 2.25 percent.
 - (c) The aggregate retained on the 5 millimetres 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.
 - (d) Coarse aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than thirty (30) percent.
 - (e) Tests of the coarse aggregate shall not exceed the limits for standard for requirements prescribed in CAN/CSA A23.1, Table 12, for concrete exposed to freezing and thawing.
- E19.9.2 Fine Aggregate
- (a) Fine aggregate shall meet the grading requirements of CAN/CSA A23.1, Table 10, Gradation FA1.
 - (b) 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.
 - (c) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CAN/CSA A23.1, Table 12.

E19.10 Cementing Materials

E19.10.1 Cementing materials shall conform to the requirements of CAN/CSA A3001.

E19.10.2 Silica Fume

- (a) Should the Contractor choose to include silica fume in the concrete mix design, it shall not exceed eight (8) percent by mass of cement

E19.10.3 Fly Ash

- (a) 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.

E19.11 Admixtures

E19.11.1 Air entraining admixtures shall conform to the requirements of ASTM C260.

E19.11.2 Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

E19.11.3 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.

E19.11.4 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.

E19.11.5 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.

E19.12 Water

E19.12.1 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.

E19.13 Concrete Supply

E19.13.1 Concrete shall be proportioned, mixed, and delivered in accordance with the requirements of 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.

E19.13.2 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.

E19.13.3 The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

E19.14 Reinforcing Steel

E19.14.1 Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

E19.14.2 All reinforcing steel shall conform to the requirements of CAN/CSA Standard G30.18, Grade 400 W, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall be new deformed billet steel bars.

E19.14.3 Reinforcing steel supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E19.15 Anchor Bolts, Nuts, and Washers

E19.15.1 Anchor bolts, nuts, and washers shall be in accordance with ASTM F1554 (Grade 105), and shall be hot-dip galvanized full length in accordance with ASTM F2329 for a minimum net retention of 610 g/m², for the entire length of the anchor bolts. The threaded portion of the anchor bolts shall be 300 millimetres long. Anchor bolt supply and installation will be incidental to the Work and no separate payment will be made.

E19.16 Anchor Bolt or Dowel Templates

E19.16.1 Anchor bolt or dowel templates shall be CAN/CSA G40.21 Grade 300W, minimum 10 millimetres thick, and will be incidental to the Work and no separate payment will be made.

E19.17 Miscellaneous Materials

E19.17.1 Miscellaneous materials shall be of the type specified on the drawings or approved by the Contract Administrator.

CONSTRUCTION METHODS

E19.18 Location and Alignment of Piles

E19.18.1 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.

E19.18.2 Piles shall be installed in the locations shown on the Drawings. The deviation of the axis of any finished pile shall not differ by more than one (1) percent from the vertical.

E19.19 Buried Utilities

E19.19.1 The Contractor shall exercise extreme caution when constructing the pile foundations in the vicinity of existing buried utilities and buildings. The drawings may or may not 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.

E19.19.2 The proposed locations of the pile foundations may be changed by the Contract Administrator if they interfere with the buried utilities.

E19.19.3 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.

E19.20 Excavation

E19.20.1 Pile excavation shall be accomplished by hydro-jet and/or boring for the full depth of all piles.

E19.20.2 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.

E19.20.3 Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.

E19.20.4 All excavated material from the piles shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.

E19.20.5 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.

E19.20.6 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, or as directed by the Contract Administrator. In locations where underground utilities have been exposed, the underground utilities shall be covered with clean sand to 300 millimetres minimum cover around the utility. Payment will not be made for condemned piles.

E19.21 Sleeving

E19.21.1 Steel or corrugated metal pipe sleeving shall be used to temporarily line the excavation to prevent bulging or caving of the walls and to protect men at work in the excavation.

E19.21.2 The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.

E19.21.3 The sleeving shall be withdrawn as the concrete is placed in the excavation. The sleeving shall extend at least 1 metre below the top of the freshly deposited concrete at all times.

E19.21.4 The clearance between the face of the excavation and the sleeving shall not exceed 75 millimetres.

E19.21.5 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 millimetres below the top of grade.

E19.22 Inspection of Excavations

E19.22.1 Concrete shall not be placed in an excavation until the excavation has been inspected and approved by a geotechnical engineer.

E19.22.2 The Contractor shall have available suitable light for the inspection of each excavation throughout its entire length.

E19.22.3 Any improperly set sleeving or improperly prepared excavation shall be corrected to the satisfaction of the Contract Administrator.

E19.23 Placing Reinforcing Steel

E19.23.1 Reinforcement shall be:

- (a) placed in accordance with the details shown on the drawings;
- (b) rigidly fastened together; and
- (c) lowered into the excavation intact before concrete is placed.

E19.23.2 Spacers shall be utilized to properly locate the reinforcing steel cage in the excavation.

E19.24 Placing Anchor Bolts

E19.24.1 The anchor bolts shall be aligned with a steel template matching the bolt holes in the component to accept the anchor bolts. The setting template 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.

E19.24.2 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.

E19.24.3 Required anchor bolt projections shall be determined by the Contractor. If anchor bolt projections are shown on the Contract Drawings these should be considered the minimum required and the Contractor should confirm the required anchor bolt projection given the on-site conditions. The anchor bolt shall extend a minimum of three threads past the last nut on the bolt.

E19.24.4 Contractor shall coordinate all anchor bolt location dimensions with equipment and fixture suppliers.

E19.25 Forms

- E19.25.1 For hydro-jet excavated piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1500 millimetres below final grade.
- E19.25.2 For bored piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1000 millimetres below final grade.
- E19.25.3 In locations of caving, the tubular form (Sonotube) should extend a minimum of 500 millimetres below where the shaft becomes uniform.
- E19.25.4 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.

E19.26 Placing Concrete

- E19.26.1 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.
- E19.26.2 Concrete shall not have a free fall of more than 2.0 metres and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 millimetres. The concrete shall be vibrated throughout the entire length of the pile.
- E19.26.3 Concrete shall be placed to the elevations as shown on the drawings. The top surface of the pile shall be finished smooth and even with a hand float.
- E19.26.4 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.
- E19.26.5 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.

E19.27 Tremie Concrete

- E19.27.1 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.
- E19.27.2 Tremie concrete shall be poured up to a depth of 600 millimetres 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.

E19.28 Protection of Newly Placed Concrete

- E19.28.1 Newly laid concrete threatened with damage by rain, snow, fog, or mist shall be protected with a tarpaulin or other approved means.

E19.29 Curing Concrete

- E19.29.1 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 10 degrees Celsius for at least seven (7) consecutive days thereafter.
- E19.29.2 After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

- E19.29.3 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.
- E19.29.4 Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3 degrees in one (1) hour or 20 degrees in twenty-four (24) hours.
- E19.30 Form Removal
- E19.30.1 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.
- E19.30.2 The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.
- E19.30.3 Field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.
- E19.31 Patching of Formed Surfaces
- E19.31.1 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.
- E19.31.2 All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 50 millimetres from the surface before patching.
- E19.31.3 Minor surface defects caused by honeycomb, air pockets greater than 5 millimetres 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.
- E19.32 Cold Weather Concreting
- E19.32.1 Protection of concrete shall be considered incidental to its placement. The temperature of the concrete shall be maintained at or above 10 degrees Celsius for a minimum of three (3) days or until 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 his own expense. Also, concrete allowed to freeze prior to the three (3) days will not be accepted for payment.
- E19.33 Removal and Restoration of Adjacent Surface Treatments
- E19.33.1 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 millimetres beyond the perimeter of the pile, the Contractor shall remove a square section of the existing slab that is 300 millimetres beyond the pile perimeter. The surface of the slab shall be saw-cut to a depth of 50 millimetres 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.

- E19.33.2 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
- E19.33.3 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.
- E19.33.4 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

- E19.34 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. 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.
- E19.35 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.
- E19.36 Concrete Quality Control Testing shall be performed in accordance with the quality control requirements of E19.7.

MEASUREMENT AND PAYMENT

- E19.37 Cast-in-place concrete piles will be measured on a unit basis and paid for at the Contract Unit Price for "Items of Work" listed here below. The amount to be paid for will be the total number of units installed in accordance with this Specification, drawings, and accepted and measured by the Contract Administrator.
- E19.38 Items of Work:
- (a) Cast-in-Place Concrete Pile Foundations:
 - (i) 610 mm Diameter Pile x 11 m Long
 - (ii) 405 mm Diameter Foundation Piles x 11 m Long
- E19.39 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 "Cast-in-Place Concrete Pile Foundations", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.
- E19.40 Abandonment of piles due to utility interference will be considered incidental to the Work and no separate measurement or payment will be made.

E20. STRUCTURAL CONCRETE

E20.1 Description

- E20.1.1 This Specification shall cover all operations relating to the preparation of Portland Cement structural concrete for, and all concreting operations related to, the construction of structural concrete works as specified herein and as shown on the drawings.
- E20.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all

things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E20.2 Scope of Work

- (a) The Work under this Specification shall include:
- (i) supplying and placing structural concrete for the retaining walls;
 - (ii) supplying and placing structural concrete for reinforced slabs (bin slabs and cardboard collection slab);
 - (iii) supplying and placing structural concrete for the prefabricated kiosk foundations; and
 - (iv) supplying and placing structural concrete for the HHW foundations and floor slabs.

E20.3 Submittals

E20.3.1 General

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

E20.3.2 Concrete Mix Design Requirements

- (a) The Contractor shall submit a concrete mix design statement to the Contract Administrator for each of the concrete types specified herein that reflects the specified performance properties of the concrete. The mix design statement shall contain all the information as outlines on the concrete mix design statement as shown on the Manitoba Ready Mix Concrete Association website (www.mrmca.com). In addition, the mix design statement must indicate the expected method of placement (buggies, chute, or pump) 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 in accordance with B7 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 in accordance with B7 units. Mass of aggregates is saturated surface dry basis;
 - (v) maximum allowable water content in kilograms per cubic metre or equivalent in accordance with B7 units and the water/cementitious ratio;
 - (vi) the limits for slump;
 - (vii) the limits for air content; and
 - (viii) quantity of other admixtures.
- (c) The concrete mix design statements must be received by the Contract Administrator a minimum of 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; and
- (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.

E20.3.3 Concrete Mix Design Test Data

- (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) 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.

E20.3.4 Aggregates

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

E20.3.5 The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E20.3.6 Notification of Ready Mix Supplier

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

E20.3.7 Temporary False Work, Formwork and Shoring Works

- (c) 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.

(d) Design Requirements

- (i) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.
- (ii) The falsework, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. Falsework shall be designed according to the requirements of CSA S269.1, "False Work for Construction Purposes." The shop drawings shall bear the Professional Engineer's seal. Shop drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such shop drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.
- (iii) The falsework, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with CSA Standard CAN/CSA S269.3-M92. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval.
- (iv) The loads and lateral pressures outlined in Part 3, Section 102 of "Recommended Practice for Concrete Formwork", (ACI 347) and wind loads as specified by the National Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.
- (v) As a minimum, the following spacing's shall apply for studding and walers:
 - (i) 20-millimetre plywood: studding 400 millimetres center to center (max.),
 - (ii) walers 760 millimetres center to center (max.)
- (vi) Forms shall be designed and constructed so that the completed Work will be within minus 3 millimetres or plus 6 millimetres of the dimensions shown on the drawings.
- (vii) Formwork shall be designed to provide chamber, where applicable, to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.
- (viii) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be accommodated in the design, in coordination and cooperation with the trade concerned. No openings in structural members are to be shown on the shop drawings without the prior written approval of the Contract Administrator.

- (ix) Shores shall be designed with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.
 - (x) Mud sills of suitable size shall be designed beneath shores, to be bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.
 - (xi) Shores shall be braced horizontally in two 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.
 - (xii) All exposed edges shall be chamfered 20 millimetres unless otherwise noted on the drawings.
 - (xiii) Formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the drawings.
 - (xiv) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.
- (e) 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.
- (f) 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.

E20.4 Materials

E20.4.1 General

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

E20.4.2 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanship like manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CSA Standard CAN/CSA-A23.1-14.

E20.4.3 Concrete

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

TABLE 1			
REQUIREMENTS FOR HARDENED CONCRETE			
Type of Concrete	Location	Nominal Compressive Strength (MPa)	Class of Exposure

Type 1	Cast-in-place Piles	35 @ 56 Days	S-1
Type 2	Retaining walls, Stairs, Footings, Grade Beams and other miscellaneous concrete unless otherwise indicated	35 @ 56 Days	S-1
Type 3	Interior – HHW Building Slab	32 @ 28 Days	C-2
Type 4	Exterior Slabs	35 @ 56 Days	C-1

E20.4.4 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 twenty eight (28) days.
- (c) The Working Base shall be considered incidental to the Work and no separate payment will be made.

E20.4.5 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 millimetres 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 eighteen (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.

E20.4.6 Fine Aggregate

- (a) Fine aggregate shall meet the grading requirements of CSA A23.1-04, Table 10, FA1, be graded uniformly and not more than three (3) percent 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.
- (b) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-14, Table 12.

E20.4.7 Coarse Aggregate - Standard

- (a) The maximum nominal size of coarse aggregate shall be 20 millimetres and meet the grading requirements of CSA A23.1-14, 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 three (3) percent.

- (b) The aggregate retained on the 5 millimetres sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, an excess of thin particles or any other extraneous material.
- (c) Course aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than thirty (30) percent.
- (d) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-14, Table 12, for concrete exposed to freezing and thawing.

E20.4.8 Admixtures

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

E20.4.9 Cementitious Materials

- (a) Cementitious materials shall conform to the requirements of CSA-A3001 and shall be free from lumps.
- (b) Should the Contractor choose to include a silica fume admixture in the concrete mix design, the substitution of silica fume shall not exceed eight (8) percent by mass of cement.
- (c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class CI or F and the substitution shall not exceed twenty-five (25) percent 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.

E20.4.10 Water

- (a) Water to be used for all operations in the Specification, including mixing and curing of concrete or grout, surface texturing operations, and saturating the substrate shall conform to the requirements of CSA A23.1-04 and shall be free of oil, alkali, acidic, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

E20.4.11 Synthetic Fibres

- (a) The synthetic fibres shall consist of one hundred (100) percent virgin polypropylene or one hundred (100) percent 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.

E20.4.12 Formwork

- (a) Formwork materials shall conform to CSA Standard A23.1-14, 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 millimetres 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 millimetres 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 x 150 millimetres. Studding shall be spruce or pine, with minimum dimensions of 50 x 150 millimetres.
 - (i) Stay-in-place formwork or falsework is not acceptable and shall not be used by the Contractor unless specifically shown on the drawings.

E20.4.13 Form Coating

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

E20.4.14 Permeable Formwork Liner

- (a) Formwork liner shall be Texel Drainform, or equivalent in accordance with B7 as accepted by the Contract Administrator. This formwork liner shall be used on all exposed formed surfaces, except soffit surfaces, or where a normal form finish is specified.
- (b) Paper-lined forms shall be used on all soffit surfaces. The Contractor shall provide conclusive evidence that the paper-lined form proposed for use will not stain or otherwise blemish the hardened concrete surface.

E20.4.15 Curing Compound

- (a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309-98a.
- (b) Curing compound for approach slabs and slope paving shall be resin-based and white-pigmented.
- (c) WR Meadows 1215 WHITE Pigmented Curing Compound is an approved product, or equivalent in accordance with B7 as accepted by the Contract Administrator.

E20.4.16 Curing Blankets

- (a) Curing blankets for wet curing shall be 100 percent polyester, 3 millimetres thick, white in colour. An approved product is "Mirafi Geotextile P150". Alternately, a 10 ounces 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 equivalent in accordance with B7 as accepted by the Contract Administrator.

E20.4.17 Bonding Agents

- (a) Latex Bonding Agent
 - (i) Latex bonding agent shall be Acryl-Stix, SikaCem 810, or equivalent in accordance with B7 as accepted by the Contract Administrator. Polyvinyl acetate-based latexes will not be permitted. Planicrete AC by MAPEI is approved for use as a latex bonding agent on concrete greater than twenty-eight (28) days in age.

(b) Bonding Grout

- (i) The grout for bonding the new deck slab concrete to the existing concrete deck slab concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:
 - ◆ one (1) part water;
 - ◆ one (1) part latex bonding agent; and
 - ◆ one and a half (1½) parts Type GUSF Portland cement.
- (ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

E20.4.18 Epoxy Adhesive

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

E20.4.19 Epoxy Grout

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

E20.4.20 Cementitious Grout

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

E20.4.21 Patching Mortar

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

E20.4.22 Flexible Joint Sealant

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

E20.4.23 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 equivalent in accordance with B7 as accepted by the Contract Administrator.

E20.4.24 EMSEAL Precompressed Foam Joint Filler

- (a) Expansion joint seal shall be EMSEAL BEJS or equivalent in accordance with B7 as approved by the Contract Administrator to ASTM C711 and ASTM G155-00A.

- (b) Sealant system shall be comprised of three components:
 - (i) cellular polyurethane foam impregnated with hydrophobic one hundred (100) percent acrylic, water-based emulsion, factory coated with highway-grade, fuel resistant silicone;
 - (ii) field-applied epoxy adhesive primer; and
 - (iii) field-injected silicone sealant bands.
- (c) Impregnation agent to have proven non-migratory characteristics. Silicone coating to be highway-grade, low-modulus, fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellows. Depth of seal as recommended by manufacturer. BEJS foam seal to be installed into manufacturer's standard field-applied epoxy adhesive. The BEJS SYSTEM is to be installed recessed from the surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be ½ inch (12 millimetres) down from the substrate surface.
- (d) Material shall be capable, as a dual seal, of movements of plus fifty (50) percent to – fifty (50) percent (one hundred (100) percent total) of nominal material size. Changes in plane and direction shall be executed using factory fabricated "Universal 90" transition assemblies. Transitions shall be warranted to be watertight at inside and outside corners through the full movement capabilities of the product.
- (e) All substitute candidates to be certified in writing to be free in composition of any waxes or asphalts, wax compounds or asphalt compounds. All substitute candidates shall be certified in writing to be:
 - (i) capable of withstanding 65 degrees Celsius for three (3) hours while compressed down to the minimum of movement capability dimension of the basis of design product (negative fifty (50) percent of normal material size) without evidence of any bleeding of impregnation medium from the material; and
 - (ii) that the same material after the heat stability test will self-expand to the maximum of movement capability dimension of the basis-of-design product (plus fifty (50) percent of nominal material size) within twenty-four (24) hours at room temperature 20 degrees Celsius.

E20.4.25 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.

E20.4.26 Low Density Styrofoam

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

E20.4.27 Backup Rod

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

E20.4.28 Dampproofing

- (a) Dampproofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 millimetres 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 equivalent in accordance with B7 as accepted by the Contract Administrator.

- (b) All damaged concrete, including tie holes to be filled with non-shrink grout prior to application of dampproofing.
- (c) Primer for dampproofing shall be asphalt primer, penetrating type conforming to CGSB 37-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 equivalent in accordance with B7 as accepted by the Contract Administrator.

E20.4.29 Miscellaneous Materials

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

E20.4.30 Benchmark Plugs

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

E20.5 Equipment

E20.5.1 General

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

E20.5.2 Vibrators

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

E20.6 Construction Methods

E20.6.1 General

- (a) It is intended that this Section cover all construction Work associated with Structural Concreting operations.
- (b) Rate of application shall be the rate required to meet the requirements of ASTM C309-98a for the texture of concrete the curing compound is being applied to.

E20.6.2 Temporary False Work, Formwork, and Shoring

- (a) Construction Requirements
 - (i) The Contractor shall construct falsework, formwork and shoring for the new deck slab concrete overhangs strictly in accordance with the accepted shop drawings.
 - (ii) All forms shall be of wood, metal or other materials as approved by the Contract Administrator. No formwork shall extend beneath the underside of the superstructure.
 - (iii) The falsework, formwork, and shoring for these Works shall be erected, and braced, as designed, and maintained to safely support all vertical and lateral loads until such loads can be supported by the concrete. All proposed fastening shall be as shown on the accepted shop drawings.
 - (iv) Forms shall be constructed and maintained so that the completed Work is within minus 3 millimetres or plus 6 millimetres 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 millimetres 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.
- (b) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.
 - (c) Form panels shall be constructed so that the contact edges are kept flush and aligned.
 - (d) 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 millimetres above the top of the upper lift elevation.
 - (e) 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.
 - (f) 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.
 - (g) 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 millimetres of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 30 millimetres 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.
 - (h) 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.
 - (i) 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.
 - (j) 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.

- (k) 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.

E20.6.3 Concrete Construction Joints

- (a) Concrete construction joints shall be located only where shown on the drawings or as otherwise directed in writing by the Contract Administrator. Concrete construction joints shall be formed at right angles to the direction of the main reinforcing steel. All reinforcing steel shall be continuous across the joints.
- (b) Forms shall be re-tightened and all reinforcing steel shall be thoroughly cleaned at the joint prior to concreting.
- (c) After the forms are stripped off the construction joint, the entire face of the joint, including the reinforcing steel, shall be thoroughly cleaned down to sound concrete and the surface roughened.
- (d) Refer to E20.6.11, "Preparation for Concreting Against Hardened Concrete", for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E20.6.4 Concrete Control Joints

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

E20.6.5 Permeable Formwork Liner

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

E20.6.6 Architectural Formwork Liner

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

E20.6.7 Control Joint Seals

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

E20.6.8 Benchmarks

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

E20.6.9 Supply of Structural Concrete

- (a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.
- (b) All mixing of concrete must meet the provisions of CSA A23.1-14, 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 1, "Requirements for Hardened Concrete", no retarders shall be used.
 - (v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. Additional water shall not be added to the concrete on-site.
 - (vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the Contract Administrator 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.

E20.6.10 Concrete Placement Schedule

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

E20.6.11 Preparation for Concreting Against Hardened Concrete

- (a) All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:
 - (i) concrete shall be removed to sound concrete or to the limits as shown on the drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris;
 - (ii) all existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues; and
 - (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.

E20.6.12 Placing Structural Concrete

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to concrete placement so that an adequate inspection may be made of formwork, shoring, reinforcement, deck joints, mechanical screed setup, movable hoarding, and related Works. No concrete pour shall be scheduled without the prior written approval of the Contract Administrator.
- (b) The nomograph, Figure D1, Appendix D of CSA Standard A23.1-04 shall be used to estimate surface moisture evaporation rates.
- (c) Equipment for mixing or conveying concrete shall be thoroughly flushed with clean water before and after each pour. Water used for this purpose shall be discharged outside the forms. All equipment and processes are subject to acceptance by the Contract Administrator.
- (d) Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent segregation and a marked change in consistency.
- (e) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.
- (f) Before depositing any concrete, all debris shall be removed from the space to be occupied by the concrete, and any mortar splashed upon the reinforcement or forms shall be removed.
- (g) Formwork liners shall be cooled immediately prior to placing concrete by spraying with cold water.
- (h) Placing of concrete, once started, shall be continuous. No concrete shall be placed on concrete which has sufficiently hardened to cause the formation of seams or "cold joints" within the section. If placing must be interrupted, construction joints shall be located where shown on the Drawings or as accepted by the Contract Administrator.
- (i) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.
- (j) The maximum free drop of concrete into the forms shall not be greater than 1.5 metres, otherwise rubber tubes or pouring ports spaced not more than 1.5 metres vertically and 2.5 metres horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.
- (k) All concrete, during and immediately after depositing, shall be consolidated by mechanical vibrators so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into the corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of seven thousand (7000) revolutions per minute immersed.
- (l) Vibrators shall be inserted systematically into the concrete at intervals such that the zones of influence of the vibrator overlap (generally 300 to 900 millimetres). 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.

- (m) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces, to the satisfaction of the Contract Administrator.

E20.6.13 Finishing of Concrete Surfaces

(a) Finishing Operations for Unformed Surfaces

- (i) The Contractor shall ensure that sufficient personnel are provided for the finishing of the slab surfaces. In the event that the depositing, vibrating, and screeding operations progress faster than the concrete finishing, the Contractor shall reduce the rate of concrete placement or cease the depositing of concrete until the exposed area of unfinished concrete has been satisfactorily minimized. The Contract Administrator's judgement in this matter shall be final and binding on the Contractor. All loads of concrete that exceed the 120 minute discharge time limit during the delay, while the finishing operations catch up, shall be rejected.

(b) Type 1 Finish – Exposed Formed Surfaces

- (i) A permeable formwork liner finish shall be applied to all exposed formed surfaces including all exposed concrete surfaces not included in Type 2, Type 3, Type 4 finishes.
- (ii) Exposed surfaces imply all surfaces exposed to view including surfaces to 300 millimetres below finish grade elevations.
- (iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.
- (iv) The surfaces shall be patched as specified in this Specification.

(c) Type 2 Finish – Unformed Surfaces

- (i) All unformed concrete surfaces shall be finished as outlined hereinafter.
- (ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.
- (iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.
- (iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.

(d) Type 3 Finish - Surfaces Below Finished Grade

- (i) All surfaces below 300 millimetres below finished grade except underside of footings shall be patched in accordance with the requirements of Sections E20.4.17, E20.4.18, and E20.6.16 of this Specification.
- (ii) All surfaces below 300 millimetres below finish grade shall receive damp-proofing in accordance with E20.4.28 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.

E20.6.14 General Curing Requirements

- (a) Refer to E20.6.17 for cold weather curing requirements and E20.6.18 of this Specification for hot weather curing requirements.

- (b) The use of curing compound shall not be allowed on concrete areas that are to receive additional concrete, dampproofing, a waterproofing membrane, or an asphalt overlay.
- (c) Freshly finished concrete shall have either a curing compound applied, or shall be moist cured by immediately applying wet curing blankets to the exposed concrete surface immediately following finishing operations and continuously wetted for at least seven (7) consecutive days thereafter. Construction joints shall be cured by means of wet curing blankets only.
- (d) Curing compound shall be applied at the rate required by 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 3°C in one hour or 20°C in twenty-four (24) hours.
- (g) Care shall be exercised to ensure that the polyester curing blanket is well drained and that it is placed as soon as the surface will support it without deformation. The Contractor shall ensure that water from the polyester curing blankets does not run into areas where concrete placement and finishing operations are underway. If this occurs, concrete placement shall stop until the problem is corrected satisfactory to the Contract Administrator.
- (h) Formed surfaces shall receive, immediately after stripping and patching, the same curing as finished surfaces, with the exception of the Bridge deck overhang surfaces.
- (i) For curing of barriers, formwork shall remain in place for six (6) consecutive days following concreting. The top surface of the concrete surface shall be moist cured during this timeframe.

E20.6.15 Form Removal

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to form removal. The Contractor shall not commence any form removal operations without the prior written acceptance of the Contract Administrator.
- (b) All forms shall remain in place and the concrete shall not be loaded for a minimum of seven (7) days after initial concrete placement, unless otherwise authorized by the Contract Administrator in writing.
- (c) Notwithstanding the above, the minimum strength of in-place concrete prior to removal of vertical forms for deck extensions shall be 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.

E20.6.16 Patching of Formed Surfaces

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator.

- (b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.
- (c) Patching of formed surfaces shall take place within twenty-four (24) hours of formwork removal.
- (d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 millimetres from the surface before patching.
- (e) Minor surface defects caused by honeycomb, air pockets greater than 5 millimetres 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.

E20.6.17 Cold Weather Concreting

- (a) The requirements of CSA Standard A23.1-14 shall be applied to all concreting operations during cold weather, i.e., if the mean daily temperature falls below 5 degree Celsius during placing or curing.

E20.6.18 Hot Weather Concreting

(a) General

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

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

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

E20.6.19 Clean-up

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

E20.7 Quality Assurance and Quality Control

E20.7.1 General

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

- E20.7.2 The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CSA Standard A23.1-14. 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.
 - (b) The Contractor shall be wholly responsible for the control of all operations incidental thereto, notwithstanding any inspection or acceptance that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works, which are not in accordance with the requirements of this Specification.
 - (c) Quality Assurance testing shall be undertaken by the Contract Administrator. Quality Control testing shall be undertaken by the Contractor.
- E20.7.3 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.
- E20.7.4 Materials
- (a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Quality Assurance Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City of Winnipeg for any materials taken by the Contract Administrator for testing purposes.
 - (b) All materials shall conform to CSA Standard A23.1-14.
 - (c) All testing of materials shall conform to CSA Standard A23.2-14.
 - (d) All materials shall be submitted to the Contract Administrator for acceptance at least twenty (20) Business Days prior to its scheduled incorporation into any construction. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.
- E20.7.5 Concrete Testing
- (a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-14, "Slump of Concrete". If the measured slump falls outside the limits in E20.3.2 of this Specification, a second test shall be made. In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.
 - (b) Air content determinations shall be made in accordance with CSA Standard Test Method A23.2-4C-14, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E20.3.2 of this Specification, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.
 - (c) The air-void system shall be proven satisfactory by data from tests performed in accordance with the test method of ASTM C457. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method A23.2-3C-14, 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.

- (d) Rapid chloride permeability testing shall be performed in accordance with ASTM C 1202 and shall meet the requirements of each class of concrete.
- (e) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CSA-A23.2-1C-14, "Sampling Plastic Concrete".
- (f) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C-14, "Making and Curing Concrete Compression and Flexure Test Specimens".
- (g) Compressive strength tests at twenty-eight (28) days shall be the basis for acceptance of all concrete supplied by the Contractor. For each twenty-eight (28)-day strength test, the strength of two companion standard-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-14, "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.
- (h) Compressive strength tests on specimens cured under the same conditions as the concrete Works shall be made to check the strength of the in-place concrete so as to determine if the concrete has reached the minimum allowable working compressive strength as specified in Table 1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field-cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-14, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E20.7.6 Corrective Action

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

E20.8 Measurement and Payment

E20.8.1 Structural Concrete

- (a) Supplying and placing structural concrete will not be measured. This Work shall be paid for at the 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.
- (b) Items of Work:
 - (i) Retaining Walls
 - (ii) Structural Bin Slabs
 - (iii) Prefabricated Kiosk Foundation
 - (iv) HHW Building Concrete Items (excluding Piles)
- (c) Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Structural Concrete", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E20.8.2 Concrete Heating and Hoarding

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

E20.8.3 Rigid Insulation

- (a) Supplying and placing rigid insulation will not be measured. This work shall be paid for at the Contract Lump Sum Price for Rigid Insulation, which shall be payment in full for supplying all materials and for performing all operations herein described and all other times incidental to the Work included in this Specification, Drawings, and accepted and measured by the Contract Administrator.

E21. SUPPLYING AND PLACING REINFORCING STEEL

E21.1 Description

E21.1.1 This Specification shall cover all operations relating to the supply, fabrication, delivery, and placement of black steel reinforcing, hot-dipped galvanized steel reinforcing and stainless steel reinforcing, and associated bar accessories, as specified herein and as shown on the drawings.

E21.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E21.2 Scope of Work

E21.2.1 The Work under this Specification shall involve supplying and placing all steel reinforcing, as shown on the drawings.

E21.3 References

E21.3.1 All related Specifications and reference Standards are in accordance with the most current issue or latest revision:

- (a) ASTM A955M – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcing;
- (b) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;
- (c) ASTM A143 – Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.
- (d) ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings;
- (e) ASTM A767/A767M – Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement;
- (f) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
- (g) CAN/CSA G30.18-M92 – Billet Steel Bars for Concrete Reinforcement;
- (h) ACI 315R – Manual of Engineering and Placing Drawings for Reinforced Concrete Structures; and
- (i) Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

E21.4 Submittals

E21.4.1 General

E21.4.1 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.

- E21.4.2 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.
- E21.4.3 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.
- E21.4.4 Contractor shall submit all original mill certificates to the Contract Administrator prior to placement of reinforcing on-site.
- E21.4.5 Contractor to submit Quality Control Testing Program to the Contract Administrator.
- E21.4.6 Contractor to submit shop drawings (including bar lists) in accordance with E3 and the latest edition of the Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada (RSIC).
- E21.5 Materials
- E21.5.1 General
- (a) The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification. All materials 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.
- E21.5.2 Handling and Storage of Stainless Steel Reinforcing
- (a) Stainless steel reinforcing shall be store separately from other reinforcing steel with the bar tags maintained and clearly visible until placing operations commence. Stacks of bundles of straight bars shall have adequate blocking to prevent contact between the layers of bundles.
 - (b) Chains for steel bands used for shipping shall not be in direct contact with stainless steel reinforcing. Wood or approved alternate should be used to protect the bars
 - (c) Nylon or polypropylene slings shall be used for moving stainless steel reinforcing.
 - (d) Keep carbon steel tools, chains, slings, etc. off stainless steel reinforcing.
- E21.5.3 Reinforcing Steel
- (a) Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.
 - (b) All reinforcing steel shall conform to the requirements of CSA Standard CAN/CSA G30.18-M92, Grade 400W, Billet-Steel Bars for Concrete Reinforcement.
 - (c) Stainless steel, as shown on the drawings, shall be a high-manganese, low-nickel, nitrogen-strengthened austenitic stainless steel. Stainless steel reinforcing shall meet or exceed the minimum requirements of ASTM A955M, 300 Series, minimum Grade 420, of the Types listed below in Table 3, "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 3 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

E21.5.4

Galvanizing

(a) Shop Applied

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

(b) Field Applied

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

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

E21.5.5 Bar Accessories

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

E21.5.6 Mechanical Splices

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

E21.6 Construction Methods

E21.6.1 Fabrication of Reinforcing Steel

- (a) General
 - (i) Reinforcing steel shall be fabricated in accordance with CSA Standard CAN/CSA G30.18-M92 to the lengths and shapes as shown on the drawings.
- (b) Black Steel Reinforcing
 - (i) Heating shall not be used as an aid in bending black steel reinforcing.
 - (ii) Hooks and bends should be smooth and not sharp.
 - (iii) Fabrication of the black steel reinforcing shall be straight and free of paint, oil, mill scale, and injurious defects.
- (c) Galvanized Reinforcing Steel
 - (i) The reinforcing fabricator shall consult with the Contractor, Contract Administrator and hot-dip galvanizer regarding potential problems or potential handling problems prior or during the galvanizing process.
 - (ii) Remove all welding slag, splatter, antisplatter compounds, and burrs prior to delivery for galvanizing.

- (iii) Avoid unsuitable marking paints. Consult with the galvanizer about removal of grease, oil, paint, and other deleterious material prior to fabrication.
 - (iv) Remove by blast cleaning or other methods surface contaminants and coatings which would not be removable by the normal chemical cleaning process in the galvanizing operation.
 - (v) Hooks or bends should be smooth and not sharp. Bars are to be bent prior to galvanizing. Minimum bend diameters shall be provided in accordance with ASTM A767 latest edition.
 - (vi) The reinforcing shall be a minimum of 10 degrees Celsius prior to bending and galvanizing operations, regardless of ambient temperatures in the plant. Where ambient temperatures fall below 10 degrees Celsius, bending and galvanizing in a facility that is not enclosed and temperature controlled will not be permitted.
 - (vii) The Contractor is responsible to ensure that accelerated strain-embrittlement does not occur during the manufacturing, bending practices and galvanizing of the reinforcing steel. The Contractor shall submit to the Contract Administrator the following:
 - ◆ reinforcing Supplier standards of practice for working of reinforcing steel. This shall include bending practices as per ASTM A767-latest addition and temperature requirements during fabrication (bending) of reinforcing. This is to be submitted with the Certificate of Compliance from the Manufacturer as specified in E21.4.1(c); and
 - ◆ Contractor is to carry out a Quality Control Testing Program following the requirements as per ASTM A143/A143M-latest addition. This will include but not limited to random bent bars to be tested after galvanizing, photos of items before and after testing, and a report submitted to the Contract Administrator for each trailer load received on-site. Testing criteria shall be submitted for review and approval to the Contract Administrator at least ten (10) Business Days prior to manufacturing of reinforcing.
- (d) Stainless Steel Reinforcing
- (i) Heating shall not be used as an aid in bending stainless steel reinforcing.
 - (ii) Hooks and bends should be smooth and not sharp.
 - (iii) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and/or non-stainless steel or damage to the surface of the bars.
 - (iv) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of 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.

E21.6.2 Placing of Reinforcing Steel

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

- (d) Place reinforcing bars to provide a clear space between the reinforcing bars as shown on the drawings to accurately place preformed holes where necessary.
- (e) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal or create excess damage to the galvanized coating. Bars with bends not shown on the drawings shall not be used.
- (f) Heating of reinforcing steel will not be permitted without prior acceptance by the Contract Administrator.
- (g) A minimum of twenty-four (24) hours advance notice shall be given to the Contract Administrator prior to the pouring of any concrete to allow for inspection of the reinforcement.
- (h) Following placement of galvanized-coated bars, all areas of damaged coating shall be repaired using approved touch-up coating material specified in Clause E21.5.4(b).

E21.7 Quality Control

E21.7.1 Inspection

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

E21.7.2 Access

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

E21.7.3 Quality Testing

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

E21.8 Measurement and Payment

- E21.8.1 Supplying and installing all the listed materials, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Structural Concrete". No measurement or payment shall be made for this Work unless indicated otherwise.

E22. SUPPLY, FABRICATION AND ERECTION OF MISCELLANEOUS METAL

E22.1 Description

- E22.1.1 This specification shall cover all operations relating to the supply, fabrication, and erection of miscellaneous metal as shown or described on the Drawings and in this Specification.

E22.1.2 Miscellaneous metal includes, but is not limited to:

- (a) Galvanized steel guardrail, stairways, and stairway handrails, steel fabrications including the container guides, steel nosings, pole structures for security and facility lighting, anchor bolts, and anchor rods;

- (b) Quality control of materials and fabrication, including magnetic particle testing of welds; and
- (c) Galvanizing of miscellaneous metal.

E22.1.3 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E22.2 Scope of Work:

- (a) supply and install galvanized steel guardrails and handrails;
- (b) supply and install galvanized steel stairways;
- (c) supply and install galvanized container guides to the structural slabs;
- (d) supply and install of anchor bolts and anchor rods; and
- (e) supply and install of miscellaneous pre or post- installed mechanical or adhesive fasteners or anchors related to any of the above works.

E22.3 References and Related Specifications

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

E22.3.1 References

- (a) CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steel
- (b) CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding
- (c) CSA W59, Welded Steel Construction (Metal Arc Welding)
- (d) CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles
- (e) CSA W47.1, Certification of Companies for Fusion Welding of Steel
- (f) ASTM A36, Standard Specification for Carbon Structural Steel
- (g) ASTM A53, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless
- (h) ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
- (i) ASTM A123, Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products
- (j) ASTM A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- (k) ASTM A276, Standard Specification for Standard Specification for Stainless Steel Bars and Shapes
- (l) A312, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
- (m) ASTM A320, Standard Specification for Alloy Steel and Stainless Steel Bolting Materials for Low Temperature Service
- (n) ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- (o) ASTM A404, Standard Specification for General Requirements for Stainless Steel Bars, Billets and Forgings
- (p) ASTM A449, Standard Specification for Quenched and Tempered Steel Bolts and Studs
- (q) ASTM A496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement

- (r) ASTM A500, Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- (s) ASTM A514, Standard Specification for High- Yield- Strength, Clenched and Tempered Alloy Steel Plate, Suitable for Welding
- (t) ASTM A516, Standard Specification for Pressure Vessel Plates, Carbon Steel, For Moderate and Low Temperature Service
- (u) ASTM A517, Standard Specification for Pressure Vessel Plates, Alloy Steel, High Strength, Quenched and Tempered
- (v) ASTM A615, Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement
- (w) ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- (x) ASTM F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- (y) ASTM B22, Standard Specification for Bronze Castings for Bridges and Turntables
- (z) ASTM B29, Standard Specification for Refined Lead
- (aa) ASTM B100, Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use
- (bb) ANSI B46.1, Surface Texture (Surface Roughness, Waviness, and Lay)
- (cc) AASHTO/AWS D1.5M/D1.5, Bridge Welding Code
- (dd) AWS D1.1, Structural Welding Code – Steel
- (ee) AWS D1.6, Structural Welding Code – Stainless Steel

E22.4 Submittals

E22.4.1 The Contractor shall submit the following to the Contract Administrator:

- (a) Copies of Mill Test Certificates showing chemical analysis and physical tests of all miscellaneous metal prior to commencement of fabrication. Miscellaneous metal without this certification will be rejected.
- (b) Certification of chemical analysis and physical tests for all materials.
- (c) A complete set of shop drawings prior to commencement of fabrication. The Contractor shall indicate on the shop drawings all the necessary material specifications for the materials to be used and identify the components in accordance with the drawings and Specifications. Applicable welding procedures, stamped as approved by the Canadian Welding Bureau, shall be attached to the shop drawings. In no case will the Contractor be relieved of responsibility for errors or omissions in the shop drawings.
- (d) Manufacturer's test reports of mechanical tests on high strength bolts, if requested by the Contract Administrator.
- (e) All miscellaneous metals shop drawings shall be stamped by a professional engineer licensed in the Province of Manitoba.

E22.5 Materials

E22.5.1 General

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

E22.5.2 Miscellaneous Metals

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

E22.5.3 Welded Steel Construction

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

E22.5.4 Zinc

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

E22.5.5 Steel Pipe for Handrail and Guardrail

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

E22.5.6 Stainless Steel

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

E22.5.7 Post-installed fasteners

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

E22.5.8 Anchor Bolts

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

E22.6 Construction Methods for Fabrication

E22.6.1 General

- (a) The workmanship shall meet established practice in modern shops. Special emphasis shall be placed in prevention of cracks, notch-like flaws and bruises that may lower the structure's resistance to fatigue and brittle fracture.
- (b) The punching of identification marks on members will not be allowed unless authorized in writing by the Contract Administrator.
- (c) If damage occurs to the miscellaneous metal during fabrication, the Contract Administrator shall be notified immediately to facilitate the implementation of remedial measures. Remedial repair measures are subject to the approval of the Contract Administrator.
- (d) Dimensions and fabrication that control field matching of parts shall receive careful attention in order to avoid field adjustments.

- (e) Field high-tensile bolted connections shall have all holes drilled or sub-punched and reamed using steel templates. Templates shall be located with utmost care as to position and angle and firmly bolted in place.
- (f) Cutting shall be in accordance with AWS D1.1, D1.6 and CSA W59.

E22.6.2 Clean Material

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

E22.6.3 Finish

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

E22.6.4 Bending

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

E22.6.5 Holes

- (a) General - Except where a specific method of holing materials is shown on the Drawings or required in the Special Provisions, all holes shall be either drilled or sub-punched and reamed with the exception of the holes and slots in the rectangular steel guardrail which may be punched. Poor matching holes will be cause for rejection.
- (b) Punched Holes and Slots - For holes and slots punched full size, the diameter or size of the die shall not exceed that of the punch by more than 2 mm. All holes and slots which are punched shall have burrs and sharp edges removed. All holes shall be clean-cut without torn or ragged edges. The punching shall not distort the structural member. If required by the Contract Administrator, a sample of the punching operation shall be carried out to the satisfaction of the Contract Administrator prior to the start of fabrication.
- (c) Drilled Holes - Drilling shall be done with twist drills or core drills, and all burrs and sharp edges shall be removed carefully. Care shall be taken to centre the drill accurately and to ensure that the hole is perpendicular to the member. Holes shall be clean-cut, without torn or ragged edges.
- (d) Sub-Punched and Reamed Holes - All holes shall be sub-punched or sub-drilled to a diameter 5 millimetres smaller than the nominal hole diameter, and enlarged by reaming to the correct diameter. The diameter of the die shall not exceed the diameter of the punch by more than 2 millimetres. Holes shall be clean-cut without torn or ragged edges. Reamed holes shall be truly cylindrical and perpendicular to the member and all burrs shall be removed carefully. All reaming shall be done with twist reamers which shall be directed by mechanical means.
- (e) Allowable Tolerance for Holes - All matching holes for bolts shall register with each other so that a gauge 2 millimetres less in diameter than the hole shall pass freely through the assembled members in a direction at right angles to such members. Finished holes shall be not more than 2 millimetres in diameter larger than the diameter of the bolt passing through them unless otherwise specified by the Contract Administrator. The center-to-center distance between any two holes of a group of holes shall not vary by more than 1 millimetre from the dimensioned distance between such holes. Mispunched or misdrilled members shall not be corrected by welding.

E22.6.6 Welding

- (a) Specifications
 - (i) Welding shall conform to the requirements of the Structural Welding Code - Steel of the American Welding Society AWS D1.1 and addendum and CSA W59 Welded Steel Construction. Welding of stainless steel shall conform to the requirement of the American Welding Society AWS D1.6.
- (b) Welding Operator Qualification
 - (i) Welding operators shall be qualified in accordance with the requirements of C.W.B. at the time of fabrication for the processes that will be required as part of the Work.
 - (ii) Qualification shall have been issued within two (2) years of commencement of fabrication. The reports of the results of the qualification tests shall bear the welding operator's name, the identification mark he will use and all pertinent data of the tests.
 - (iii) Evidence that the welding operators have been executing satisfactory welding in the required processes within the six (6) month period immediately prior to commencement of fabrication shall also be provided to the Contract Administrator.
 - (iv) The Contractor shall bear the whole cost and be fully responsible for the qualification of all welding operators.
- (c) Welding Procedures, Specifications and Qualification
 - (i) Welding procedures that conform in all respects to the approved procedures of AWS D1.1, D1.6 and CSA W59 shall be deemed as pre-qualified and are exempt from tests or qualifications.
 - (ii) Welding procedures that do not conform to approved procedures in AWS D1.1, D1.6 and CSA W59 shall be qualified by tests carried out in accordance with AWS D1.1 or D1.6.
 - (iii) The Contract Administrator may accept previous qualifications of the welding procedure.
- (d) Welding Materials
 - (i) All electrodes for manual shielded metal arc welding shall conform to the low hydrogen classification requirements of the latest edition of the American Welding Society's Filler Metal Specification AWS A5.1 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 -18 degrees Celsius.
 - (ii) All bare electrodes and flux used in combination for submerged arc welding, the electrode and gas shielding used in combination for gas metal-arc welding, or the electrode and shielding medium used in combination for flux cored arc welding of steels shall conform to the requirements in the latest edition of the American Welding Society AWS A5.17, A5.18 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 -18 degrees Celsius or shall be capable of producing low alloy weld metal having the mechanical properties listed in Table 4.1.1 of AWS D1.1.
 - (iii) Low alloy weld properties shall be determined from a multiple pass weld made in accordance with the requirements of the latest edition of the applicable Specification (AWS A5.17, A5.18, or A5.20) or the welding procedure specification.
 - (iv) Every user shall demonstrate that each combination of electrode and shielding medium will produce weld metal having the above mechanical properties until the applicable AWS Filler Metal Specification is issued. At that time, the AWS Filler Metal Specification will control. The test assembly for Grades E100XX and E110XX shall be made using CAN/CSA G40.21M 700Q or ASTM A514/A517 steel.

- (v) The Contract Administrator may accept evidence of record of a combination that has been satisfactory tested in lieu of the test required, provided the same welding procedure is used.
 - (vi) Electrodes conforming to AWS A5.1 shall be purchased & delivered in hermetically sealed containers or shall be dried for at least two (2) hours between 230 degrees Celsius and 260 degrees Celsius before they are used. Electrodes conforming to AWS A5.5 shall be purchased and delivered in hermetically sealed containers or shall be dried for one (1) hour and fifteen (15) minutes at a temperature of 425 degrees Celsius and 15 degrees Celsius before being used.
 - (vii) All electrodes for use in welding ASTM A514/A517 and CSA 700 Q. steel having a strength lower than that of the E100XX classification shall be dried for one (1) hour and fifteen (15) minutes at a temperature of 425 degrees Celsius and 15 degrees Celsius before being used. Electrodes shall be dried prior to use if the hermetically sealed container shows evidence of damage.
 - (viii) Immediately after removal from hermetically sealed containers or from drying ovens, electrodes shall be stored in ovens held at a temperature of at least 120 degrees Celsius.
 - (ix) E70XX electrodes that are not used within four (4) hours, E80XX within two (2) hours, E90XX within one (1) hour, and E100XX and E110XX within 0.5 hours after removal from hermetically sealed containers or removal from a drying or storage oven shall be re-dried before use.
 - (x) In humid atmospheres, these time limits will be reduced as directed by the Contract Administrator.
 - (xi) Electrodes that have been wet shall not be used. Electrodes shall be re-dried no more than once.
 - (xii) Flux used for submerged arc welding shall be non-hygroscopic, dry and free of contamination from dirt, mill-scale, or other foreign material. All flux shall be purchased in moisture-proof packages capable of being stored under normal conditions for at least six (6) months without such storage affecting its welding characteristics or weld properties. Flux from packages damaged in transit or handling shall be discarded or shall be dried before use at a minimum temperature of 120°C for 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 millimetres shall be discarded. Flux that has been wet shall not be used. Flux fused in welding shall not be reused.
- (e) Preheat and Interpass Temperature
 - (i) The minimum preheat and interpass temperatures for welding miscellaneous metal shall conform to AWS D1.1, D1.6 and CSA W59.
 - (f) Welding Processes
 - (i) Welding processes which do not conform to the provisions of AWS D1.1, D1.6 or CSA W59 shall not be used without the written approval of the Contract Administrator.
 - (g) Distortion and Shrinkage Stresses
 - (i) Distortion and shrinkage stresses shall be kept to a minimum by the use of jigs and fixtures, utilizing heat distribution and a welding sequence. Areas contiguous to welding operations shall be preheated to a maximum temperature of 120 degrees Celsius, if necessary in the estimation of the Contract Administrator to prevent distortion or weld cracking. The provisions of AWS D1.1, D1.6 and CSA W59 shall be followed in the control of distortion and shrinkage stresses.
 - (h) Tack Welding

- (i) All tack welds shall be a minimum of 10 millimetres 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.

E22.6.7 Hot-Dip Galvanizing

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

E22.6.8 Handling, Delivery and Storage of Materials

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

E22.6.9 Erection

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

E22.7 Quality Control / Quality Assurance

E22.7.1 Quality Control

- (a) The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Work. All miscellaneous metal shall be free of surface imperfections, pipes, porosity, laps, laminations and other defects.
- (b) Welding

- (i) All welding may be subject to inspection by Non-Destructive Testing. This inspection shall be carried out in a manner approved of the Contract Administrator. The Contractor shall provide sufficient access and shop area to permit the performance of the tests. The Contractor shall give the Contract Administrator 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.
- (ii) All defects revealed shall be repaired by the Contractor at his own expense and to the approval of the Contract Administrator.

E22.7.2 Quality Assurance

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

E22.8 Measurement and Payment

E22.8.1 Miscellaneous Metal will be measured on a unit basis and paid for at the Contract Unit Price for "Items of Work" listed here below. The amount to be paid for will be the total number of units installed in accordance with this Specification, drawings, and accepted and measured by the Contract Administrator.

E22.8.2 Items of Work:

- (a) Roll-off Bin Back Stops
- (b) Handrail and Guardrail;
- (c) Retaining Wall Stairs; and
- (d) Roll-Off Bin Guide Rail Assemblies.

E22.8.3 Supply and installation of anchor bolts shall be considered incidental to the Work and no separate payment will be made; and

E22.8.4 Supply and installation of post-installed anchors or fasteners of any type shall be considered incidental to the Work and no separate payment will be made.

E23. ARCHITECTURAL WORKS

E23.1 Description

E23.1.1 This Specification shall cover all operations relating to the supply, fabrication, and erection of the all architectural works shown on the drawings and as specified herein.

E23.2 Scope of Work

E23.2.1 Refer to the drawings and NMS Specifications, for Scope of Work.

E23.2.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E23.3 General

E23.3.1 Refer to the drawings and NMS Specifications, for Materials and Construction Methods.

E23.4 Measurement and Payment

E23.4.1 Supplying and installing architectural works will not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described, NMS Specifications for Materials and Construction Methods, and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E23.4.2 Items of Work:

(a) HHW Building Shell and Finishes.

E23.4.3 Supplying and installing all the listed materials, design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Architectural Works", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E24. ELECTRICAL WORKS

E24.1 Description

E24.1.1 This Specification shall cover all operations relating to the supply, fabrication, and erection of the all electrical works shown on the drawings and as specified herein.

E24.2 Scope of Work

E24.2.1 Refer to the drawings and NMS Specifications, for Scope of Work.

E25.3 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E24.3 General

E24.3.1 Refer to the drawings and NMS Specifications, for Materials and Construction Methods.

E24.4 Measurement and Payment

E24.4.1 Supplying and installing electrical works will not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described, NMS Specifications for Materials and Construction Methods, and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E24.4.2 Items of Work:

- (a) Electrical – Overhead;
- (b) Electrical – Distribution;
- (c) Electrical – Power;
- (d) Electrical – Security;
- (e) Electrical – Lighting;
- (f) Electrical – Telecommunications; and
- (g) Electrical – Fire Alarm.

E24.4.3 Supplying and installing all the listed materials, design requirements, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to “Electrical Works”, unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E25. MECHANICAL WORKS

E25.1 Description

E25.1.1 This Specification shall cover all operations relating to the supply, fabrication, and erection of the all mechanical works shown on the Drawings and as specified herein.

E25.2 Scope of Work

E25.2.1 Refer to the drawings and NMS Specifications, for Scope of Work.

E25.2.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E25.2.3 The City of Winnipeg shall supply the Energy Recovery Ventilator (ERV-1) to the Contractor for installation in the HHW Building. Installation and commissioning of the Energy Recovery Ventilator shall be considered incidental to the mechanical works.

E25.3 General

E25.3.1 Refer to the drawings and NMS Specifications, for Materials and Construction Methods.

E25.4 Measurement and Payment

E25.4.1 Supplying and installing mechanical works will not be measured. This Work shall be paid for at the Contract Lump Sum Price for the “Items of Work” listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described, Appendix B: NMS Specifications for Materials and Construction Methods, and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E25.4.2 Items of Work:

- (a) Mechanical – Overhead;
- (b) Mechanical – Plumbing; and
- (c) Mechanical – HVAC.

E25.4.3 Supplying and installing all the listed materials, design requirements, equipment, construction methods, and quality control measures associated with this Specification and drawings shall be considered incidental to “Mechanical Works”, unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E26. PREFABRICATED KIOSK BUILDING

E26.1 Description

E26.1.1 This Specification shall cover all operations relating to the supply, fabrication, and erection of the prefabricated kiosk building shown on the drawings and as specified herein.

E26.2 Scope of Work

E26.2.1 Refer to the drawings and NMS Specifications, for Scope of Work.

E26.2.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E26.3 General

E26.3.1 Refer to the drawings and NMS Specifications, for Materials and Construction Methods.

E26.4 Measurement and Payment

E26.4.1 Supply and installation of prefabricated kiosk building will not be measured and paid for at the Contract Lump Sum Price for "Prefabricated Kiosk Building", which price shall be payment in full for supplying all materials and for performing all operations herein described, NMS Specifications, for Materials and Construction Methods, and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E26.4.2 Supplying and installing all the listed materials, concrete design requirements, equipment, construction methods, and quality control measures associated with this Specification and drawings shall be considered incidental to "Prefabricated Kiosk Building", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E27. SUPPLY AND INSTALL PARKING CURB

E27.1 The Contractor shall supply and install 6' Park-it parking curb (or approved equivalent in accordance with B7) as indicated on the Drawings or as directed by Contract Administrator.

E27.2 Parking Curb will be measured and paid for at the Contract Unit Price for "Supply and Install Parking Curb" measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.

E28. SUPPLY AND INSTALL BOLLARD

E28.1 Description

E28.1.1 This Specification shall cover all operations relating to the supply and installation of bollards as indicated on the Drawings or as directed by the Contract Administrator.

E28.2 Materials

E28.2.1 Piping shall consist of 200 mm diameter, Schedule 40 Black Steel Pipe cut to lengths as indicated on the plans and drawings.

E28.2.2 Concrete shall consist of ready-mix concrete prepared in accordance with E19.7.

E28.2.3 Bollard Paint shall consist of 10 mil dry-film thickness of primer and 20 dry-film thickness of oil based paint; colour to be Safety Yellow.

E28.2.4 Provide two (2) - 25 mm wide reflective bands; one red and one silver

E28.3 Construction Methods

E28.3.1 Bollards shall be installed to lines, limits and depths as indicated on the plans and drawings.

E28.3.2 Bollards shall be installed prior to placement of final surface course.

E28.3.3 Fill bollards from base to top of pipe with ready-mix concrete. Mound concrete above top of pipe to create half sphere; depth of concrete to be +/- 30mm.

E28.3.4 Paint bollards and top of concrete with 10 mil dry-film thickness of primer and 20 dry-film thickness of oil based paint.

E28.3.5 Once bollard paint is cured, install reflective bands.

E28.4 Measurement and Payment

E28.4.1 Bollards will be measured and paid for at the Contract Unit Price for "Supply and Install Bollard" measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification.