



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 559-2014

**CONSTRUCTION OF A COMMUNITY RESOURCE RECOVERY CENTRE (4R
WINNIPEG DEPOT) AT THE BRADY ROAD RESOURCE MANAGEMENT FACILITY,
INCLUDING ROADWORKS AND BUILDING**

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

- B1.1 Construction of a Community Resource Recovery Centre (4R Winnipeg Depot) at the Brady Road Resource Management Facility, Including Roadworks and Building

B2. SUBMISSION DEADLINE

- B2.1 The Submission Deadline is 12:00 noon Winnipeg time, July 15, 2014.
- 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 make an appointment to view the Site by contacting the Contract Administrator.
- B3.2 The Bidder shall not be entitled to rely on any information or interpretation received at the Site investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

B4. ENQUIRIES

- B4.1 All enquiries shall be directed to the Contract Administrator identified in D33.1.
- 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, only to the Bidder who requested approval of the substitute.
- B7.6.1 The City 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 B16.
- 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.
- B7.10 Notwithstanding B7.2 to B7.9, in accordance with B8.6, deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B16.1(a).

B8. BID COMPONENTS

- B8.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices;
 - (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 B16.1(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 Notwithstanding C12.2.3(c), prices on Form B: Prices shall not include the Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable.

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

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

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

B11. QUALIFICATION

B11.1 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.

B11.2 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>

B11.3 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);

B11.4 Further to B11.3(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) 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
- (b) 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
- (c) 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/>).

B11.5 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.

B11.6 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.

B12. BID SECURITY

B12.1 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.

B12.1.1 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.

B12.1.2 All signatures on bid securities shall be original.

B12.1.3 The Bidder shall sign the Bid Bond.

B12.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B12.2 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.

B12.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B12.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B12.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B12.3 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.

B13. OPENING OF BIDS AND RELEASE OF INFORMATION

B13.1 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.

B13.1.1 Bidders or their representatives may attend.

B13.1.2 Bids determined by the Manager of Materials, or his/her designate, to not include the bid security specified in B12 will not be read out.

- B13.2 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/>
- B13.3 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/>
- B13.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

B14. IRREVOCABLE BID

- B14.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.
- B14.2 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.

B15. WITHDRAWAL OF BIDS

- B15.1 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.
- B15.1.1 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.
- B15.1.2 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.
- B15.1.3 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 B15.1.3(b), declare the Bid withdrawn.
- B15.2 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 B14.2 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.

B16. EVALUATION OF BIDS

- B16.1 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 B11 (pass/fail);
- (c) Total Bid Price;
- (d) economic analysis of any approved alternative pursuant to B7.

B16.2 Further to B16.1(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.

B16.3 Further to B16.1(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.

B16.4 Further to B16.1(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) D.5 E.1 B.2(ii) and B.4(i) in the order listed until a Total Bid Price within the budgetary provision is achieved.

B17. AWARD OF CONTRACT

B17.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B17.2 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.

B17.2.1 Without limiting the generality of B17.2, 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.

B17.3 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 B16.

B17.3.1 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:

D2.1.1 Part A – Road Works

- (a) Preparation of Existing Ground Surface;
- (b) Road Works Excavation;
- (c) Installation and adjustment of drainage inlets and catch basins;
- (d) Sub-grade compaction;
- (e) Installation of CSP culverts;
- (f) Installation of sub-drains behind retaining walls;
- (g) Placement of separation geotextile fabric where necessary;
- (h) Placement of sub-base and base course materials;
- (i) Construction of concrete curbs, bullnoses and sidewalks;
- (j) Construction of asphalt and concrete pavement;
- (k) Ditch and green space grading and sloping;
- (l) Site access control gates;
- (m) Construction of various Stone Rip Rap; and
- (n) Landscaping

D2.1.2 Part B – Structural Works

- (a) Structural Excavation and Backfill;
- (b) Cast-in-Place Concrete Pile Foundations (for buildings, light standards, retaining walls, and stairs);
- (c) Structural Concrete and Reinforcing Installation (for retaining walls, structural slabs, concrete pads, Weigh Scale Foundation, Scale House Foundation, Prefabricated Kiosk Building Foundation, and HHW Building Foundation);
- (d) Installation of guardrails, handrails, and container guide rails; and,
- (e) Installation of Interlocking Pre-cast Concrete Blocks.

D2.1.3 Part C - Buildings

- (a) Scale House;
- (b) Prefabricated Kiosk Building;
- (c) HHW Building;
- (d) Scale House and HHW Building Mechanical Works; and,
- (e) Scale House and HHW Building Electrical Works.

D2.1.4 Part D - Other

- (a) Mobilization and Demobilization;
- (b) New Electrical Service;

- (c) Weigh Scale complete with barrier gates;
- (d) Site Light Fixtures and Poles;
- (e) Site Security System; and,
- (f) Bar Arm Gates (site entrances).

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is Dillon Consulting Limited, represented by:

Ash Raichura, P.Eng.
Project Manager

Telephone No. 204 453 2301

Facsimile No. 204 452 4412

D3.2 At the pre-construction meeting, Ash Raichura, P.Eng. will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D3.3 Bids Submissions must be submitted to the address in B8.8

D4. CONTRACTOR'S SUPERVISOR

D4.1 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.

D4.2 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 D4.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

D5. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

D5.1 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.

D5.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.

D5.3 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.

D5.4 A Contractor who violates any provision of D5 may be determined to be in breach of Contract.

D6. NOTICES

- D6.1 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.
- D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the facsimile number identified in 3.1.
- D6.3 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. FURNISHING OF DOCUMENTS

- D7.1 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

D8. AUTHORITY TO CARRY ON BUSINESS

- D8.1 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.

D9. SAFE WORK PLAN

- D9.1 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.
- D9.2 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>

D10. INSURANCE

- D10.1 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.

D10.2 Deductibles shall be borne by the Contractor.

D10.3 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.

D10.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D11. PERFORMANCE SECURITY

D11.1 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.

D11.1.1 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.

D11.2 If the bid security provided in his/her Bid was not a certified cheque or draft pursuant to B12.1(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.

D12. SUBCONTRACTOR LIST

D12.1 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.

D13. ENVIRONMENTAL PROTECTION PLAN

D13.1 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.

D13.2 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 job 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.
- (l) Monitor and report to ensure implementation of environmental protection measures.

D13.3 Fires

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

D13.4 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 Onsite 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.

D13.5 Hazardous Waste

D13.5.1 Definitions

- (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) 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.
- (c) Hazardous Waste: any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- (d) 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.

D13.5.2 Materials Management

- (a) Only bring on Site quantity of hazardous materials required to perform Work.
- (b) Maintain MSDSs in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.
- (c) Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

D13.5.3 Storage and Handling

- (a) 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 38 degrees C, 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.
 - (vi) Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
- (b) 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
 - (iii) Fuel storage exceeding 100L 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.
- (c) Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg 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 110% capacity.
 - (ix) Do not store within 30 meters of a waterway or drain
 - (x) Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
 - (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.
- (d) Report spills or accidents immediately:
- (i) to the Contract Administrator.
 - (ii) to Manitoba Conservations 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.

D13.5.4 Transportation

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

D13.5.5 Disposal

- (a) 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.

- (iv) Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

D13.1 Erosion and Sediment Control

- (a) 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.
 - (iii) Prevent sedimentation of the land drainage system and receiving streams with dust, particulate matter or eroded sediment.
- (b) 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.
 - (ii) Routinely inspect all erosion and sediment control measures and installations and immediately repair any deficiencies.

D13.2 Work to Adjacent Waterways

- (a) Do not operate construction equipment in waterways and, where possible, avoid operating equipment within 30 meters of the waterway.
- (b) Do not use waterway beds for borrow material.
- (c) Do not dump excavated fill, waste material or debris in ditches or waterway.
- (d) Design and construct temporary crossings to minimize erosion to waterways.
- (e) Dispose of excavated materials above the high water mark and 30 meters away from a watercourse.

D13.3 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.

D13.4 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.
 - (i) Minimize stripping of topsoil and vegetation
 - (ii) Re-grade and plant vegetation on construction Site as soon as possible.
 - (iii) Avoid soil compaction where possible.

D13.5 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 construction Site, temporary and access roads.
- (d) Bring only clean fill, granular, rip rap and other similar construction materials to the project Site.

D14. EQUIPMENT LIST

D14.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at or prior to a pre-construction meeting, or at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the C4.1 for the return of the executed Contract.

D15. DETAILED WORK SCHEDULE

D15.1 The Contractor shall provide the Contract Administrator with a detailed work schedule (Form L: 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 critical path method (C.P.M.) schedule for the Work;
- (b) a Gantt chart for the Work based on the C.P.M. schedule; and
- (c) a daily manpower schedule for the Work

all acceptable to the Contract Administrator.

D15.3 Further to D15.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:

D15.4 Further to D15.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

D15.5 Further to D15.2(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

D16. WEIGH SCALE SUPPLY INFORMATION

D16.1 Detail the construction of the scale's weighbridge and any other relevant information. Discuss how the load cells are to be accessed and the advantages of the weighbridge design.

D16.2 Information is to be submitted for review and acceptance prior to Contractor's purchase of the weigh scale.

D17. WEIGH SCALE LOAD CELL INFORMATION

D17.1 Identify whether the load cells used in the scale proprietary or non-proprietary.

- (a) If the load cells are proprietary, what are the advantages of these load cells over non-proprietary load cells?

- (b) If the load cells are non-proprietary, specify the names of companies and the load cells they carry that are compatible with and can be substituted for one or more of the load cells proposed with the scales.
- (c) Explain how the load cells are accessed.
- (d) Detail the material used in the construction of the load cell.

D17.2 Describe the weigh scale design features that protect the load cells from damage due to freezing/build-up of foreign materials.

D17.3 Information is to be submitted for review and acceptance prior to Contractor's purchase of the weigh scale.

D18. WEIGH SCALE INDICATORS

D18.1 Confirm that scale indicators are compatible with WasteWorks Software and provide evidence explaining the compatibility of the indicator to WasteWorks.

- (a) Identify with which version of WasteWorks software the scale indicators are compatible (include model of indicators quoted as being compatible).

D18.2 Information is to be submitted for review and acceptance prior to Contractor's purchase of the weigh scale.

D19. WEIGH SCALE MAINTENANCE AND CALIBRATION

D19.1 Detail the proposed maintenance and calibration program for the weigh scales.

D19.2 Information is to be submitted for review and acceptance prior to Contractor's purchase of the weigh scale.

SCHEDULE OF WORK

D20. COMMENCEMENT

D20.1 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.

D20.2 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 D8;
 - (ii) evidence of the Workers Compensation Coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D9;
 - (iv) evidence of the Insurance specified in D10;
 - (v) the Performance Security specified in D11
 - (vi) the Subcontractor List specified in D12
 - (vii) the Environmental Protection Plan specified in D13;
 - (viii) the Equipment List specified in D14;
 - (ix) the Detailed Work Schedule specified in D15;
 - (x) The Weigh Scale Supply Information specified in D16;
 - (xi) The Weigh Scale Load Cell Information specified in D17;
 - (xii) The Weigh Scale Indicators specified in D18; and,
 - (xiii) The Weigh Scale Maintenance and Calibration specified in D19.
- (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.

D20.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

D20.3.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D21. DAMAGE TO EXISTING STRUCTURES AND PROPERTY

D21.1 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.

D21.2 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.

D22. PROTECTION OF FIBRE OPTIC CONDUIT

D22.1 The approximate location of the fibre optic conduit is shown on Drawing C2. The Contractor is to take special care to avoid damage to the conduit.

D23. WORK BY OTHERS

D23.1 Work by others on or near the Site will include but not necessarily be limited to:

- (a) Daily operations of Brady Road Resource Management Facility (BRRMF) will be ongoing during construction. Vehicle traffic and heavy machinery operation may be encountered adjacent to the project site;
- (b) Clearing and Grubbing, and sub-grade fill placement and compaction will be completed by the new disposal cell Contractor at the BRRMF;
- (c) Other Contractors – Installation of new radiation detector on the existing Scale Access Road. Construction of a new disposal cell. Construction of water management structures (e.g. ditches and retention ponds) for BRRMF Surface Water Management. The Contractor is expected to cooperate with all other Contractors to facilitate construction activities at the BRRMF; and,
- (d) 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, and notify and cooperate with the City of Winnipeg Traffic Services regarding any disruption to traffic during construction.
- (e) Manitoba Hydro – Installation of underground electrical service to the Scale House.

D24. CRITICAL STAGES

D24.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

- (a) Scale House (19 days prior to Substantial Performance)

D24.2 When the Contractor considers the Work associated with the Scale House 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.

D24.3 The date on which the Scale House Work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of the Scale House has been achieved.

D25. SUBSTANTIAL PERFORMANCE

- D25.1 The Contractor shall achieve Substantial Performance by October 3, 2014.
- D25.2 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.
- D25.3 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.

D26. TOTAL PERFORMANCE

- D26.1 The Contractor shall achieve Total Performance by October 24, 2014.
- D26.2 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.
- D26.3 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.

D27. LIQUIDATED DAMAGES

- D27.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:
- (a) Scale House – Five hundred dollars (\$500.00);
 - (b) Substantial Performance – one thousand five hundred dollars (\$1,500.00).
 - (c) Total Performance – five hundred dollars (\$500.00).
- D27.2 The amounts specified for liquidated damages in D27.1 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.
- D27.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D28. SUSPENSION OF WORK DUE TO INCLEMENT WEATHER

- D28.1 If the Work cannot be completed in 2014 due to weather conditions such as excessive rainfall or freezing, the Contract Administrator will suspend the Work and counting of Working Days until the Spring of 2015.
- D28.2 The Contractor shall commence the Work again in the Spring of 2015 within 10 Working Days of being notified by the Contract Administrator to do so.
- D28.3 Working Days will begin to be counted again after the 10 Working Day notice is given.
- D28.4 If the Work is suspended until the Spring of 2015, the remaining Work will be paid at the Unit Prices provided in the Bid Opportunity and no extra payment will be made for demobilization, remobilization or increases in operating costs.

D29. SCHEDULED MAINTENANCE

- D29.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Reflective Crack Maintenance during Two Year Maintenance Warranty Period as specified in CW 3250;
 - (b) Crack Sealing the interface of Concrete Pads and Asphalt Pavement shall be completed as per E11 one year after Total Performance has been achieved, unless directed by the Contract Administrator; and,
 - (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;
 - (d) Weigh scale as specified in Section 13 27 01, Part 3.6;
 - (e) Trees, Shrubs, and Ground Covers as specified in E31.19.
- D29.2 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

D30. JOB MEETINGS

- D30.1 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 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.
- D30.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D31. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

- D31.1 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).

D32. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

- D32.1 Further to B11.4, 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 B11.4.

D33. CONSTRUCTION SURVEY

- D33.1 Construction and quantity survey will be the responsibility of the Contractor.

D34. LAYOUT OF ROADWORKS

- D34.1 Further to C6 of the General Conditions for Construction, and in addition to D31, the Contract Administrator will provide control lines and final design elevations of the roadways to the Contractor at intervals and offsets deemed necessary by the Contract Administrator.
- D34.2 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 retaining wall, weigh scale, sub-grade, sub-base and base course elevations.
- D34.3 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.
- D34.4 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.
- D34.5 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.
- D34.6 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.
- D34.7 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.

D35. ACCESS

- D35.1 The Contractor shall access the Brady Road Resource Management Facility (BRRMF) using Brady Road via the Perimeter Highway, and then entering the Site via Charette Road.
- D35.2 The Contractor shall exit the Site via Brady Road onto the Perimeter Highway.
- D35.3 The Contractor shall not block traffic when entering or exiting the Site.
- D35.4 Heavy equipment shall be moved in and out of the Site during low-traffic hours, as coordinated with the Contract Administrator.
- D35.5 Site access for vehicular traffic and heavy machinery must be maintained at all times.
- D35.6 Ambulance and emergency vehicle access must be maintained at all times.

D36. TRUCK WEIGHT LIMITS

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

D37. PAYMENT

- D37.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.
- D37.2 The City will bear no responsibility for delays in approval of invoices which are improperly submitted.

WARRANTY

D38. WARRANTY

- D38.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire one (1) year 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.
- D38.1.1 For the purpose of Performance Security, the warranty period shall be two (2) years.
- D38.2 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.
- D38.2.1 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 D11)

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. 559-2014

Construction of a Community Resource Recovery Centre (4R Winnipeg Depot) at the Brady Road Resource Management Facility, 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)

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 D12)

Construction of a Community Resource Recovery Centre (4R Winnipeg Depot) at the Brady Road
 Resource Management Facility, Including Roadworks and Building

<u>Portion of the Work</u>	<u>Name</u>	<u>Address</u>
Supply of Materials:		
Concrete		
Asphalt		
Base Course & Sub-Base		
Sod		
Site Access Control Gates and Barriers		
Installation/Placement:		
Concrete		
Asphalt		
Base		
Millings		
Site Access Control Gates and Barriers		
STRUCTURAL WORKS:		
Supply of Materials:		
Guardrails, handrails, and container guide rails		
Pre-cast Concrete Blocks		
Installation/Placement:		
Cast-in-Place Concrete Pile Foundations		
Structural Concrete		
Guardrails, handrails, and container guide rails		
Pre-cast Concrete Blocks		
BUILDINGS:		

FORM J: SUBCONTRACTOR LIST
 (See D12)

Construction of a Community Resource Recovery Centre (4R Winnipeg Depot) at the Brady Road
 Resource Management Facility, Including Roadworks and Building

<u>Portion of the Work</u>	<u>Name</u>	<u>Address</u>
Scale House - General		
Scale House HHW Building - Electrical		
Scale House and HHW Building - Mechanical		
Pre-Fabricated Kiosk Building		
HHW Building – Electrical		
HHW Building - Mechanical		
OTHER		
Supply:		
Weigh Scale		
Barrier Gates for Weigh Scale		
Site Light Fixtures and Poles		
Site Security System		
Bar Arm Gates		
Trees, Shrubs, and Ground Covers		
Installation/Placement:		
Weigh Scale		
Barrier Gates for Weigh Scale		
Site Light Fixtures and Poles		
Site Security System		
Bar Arm Gates		
Trees, Shrubs, and Ground Covers		
Landscaping		
OTHER SUBCONTRACTED PORTIONS OF WORK:		

FORM K: EQUIPMENT
(See D14)

Construction of a Community Resource Recovery Centre (4R Winnipeg Depot) at the Brady Road Resource Management Facility, Including Roadworks and Building

<p>1. Category/type: Roadworks</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p>2. Category/type: Structural Works</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p>3. Category/type: Buildings</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>

FORM K: EQUIPMENT
(See D14)

Construction of a Community Resource Recovery Centre (4R Winnipeg Depot) at the Brady Road Resource Management Facility, Including Roadworks and Building

4. Category/type: Other

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type: Landscaping

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM L: DETAILED WORK SCHEDULE
 (See D15)

Construction of a Community Resource Recovery Centre (4R Winnipeg Depot) at the Brady Road
 Resource Management Facility, Including Roadworks and Building

For each item of Work, indicate the proposed date that each cumulative percentage to be completed will be achieved.					
Items of Work	Percentage of Work Completed				
	Start	25%	50%	75%	100%
ROADWORKS					
Preparation of Existing Ground Surface					
Road Works Excavation					
Installation and adjustment of drainage inlets and catch basins					
Sub-grade compaction					
Installation of CSP culverts					
Installation of sub-drains behind retaining walls					
Placement of separation geotextile fabric where necessary					
Placement of sub-base and base course materials					
Construction of concrete curbs, bullnoses and sidewalks					
Construction of asphalt, concrete pavement, and granular (asphalt millings) surfaces					
Ditch and green space grading and sloping					
Site access control gates and barriers					
Construction of various Stone Rip Rap					
Landscaping					
STRUCTURAL WORKS					
Structural Excavation and Backfill					
Cast-in-Place Concrete Pile Foundations (for buildings, light standards, retaining walls, and stairs)					
Structural Concrete and Reinforcing Installation (for retaining walls, structural slabs, concrete pads, Weigh Scale Foundation, Scale House Foundation, Prefabricated Kiosk Building Foundation, and HHW Building Foundation)					
Installation of guardrails, handrails, and container guide rails					
Installation of Interlocking Pre-cast Concrete Blocks					
BUILDINGS					
Scale House					

FORM L: DETAILED WORK SCHEDULE
 (See D15)

Construction of a Community Resource Recovery Centre (4R Winnipeg Depot) at the Brady Road
 Resource Management Facility, Including Roadworks and Building

For each item of Work, indicate the proposed date that each cumulative percentage to be completed will be achieved.					
Items of Work	Percentage of Work Completed				
	Start	25%	50%	75%	100%
Prefabricated Kiosk Building					
HHW Building					
Scale House and HHW Building Mechanical Works					
Scale House and HHW Building Electrical Works					
OTHER					
Mobilization and Demobilization					
New Electrical Service					
Weigh Scale					
Automated barrier arm gates					
Site Light Fixtures and Poles					
Site Security System					
Bar Arm Gates (site entrances)					

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 01 - GENERAL

014500	Quality Control
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DIVISION 05 - METALS

055000	Metal Fabrications
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DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

061011	Rough Carpentry
061753	Shop Fabricated Wood Trusses
064000	Finish Carpentry Mill Work

DIVISION 07 – THERMAL & MOISTURE PROTECTION

072113	Board Insulation
072116	Blanket Insulation
072600	Vapour Retarders
076113	Metal Roofing System
076210	Metal Siding Flashing and Trim
078400	Firestopping
079210	Joint Sealing

DIVISION 08 – OPENINGS

081114	Metal Doors and Frames
085000	Windows and Glazing
085659	Service Window Unit
087110	Door Hardware

DIVISION 09 – FINISHES

092100	Gypsum Board Assemblies
096516	Resilient Sheet Flooring
099100	Painting and Protective Coatings

DIVISION 10 – SPECIALTIES

102810	Washroom Accessories
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DIVISION 13 – SPECIAL CONSTRUCTION

132700	Prefabricated Kiosk Building
132701	Weigh Scale, Foundation, and Ancillary Devices

DIVISION 21 – FIRE SUPPRESSION

210501	Common Work Results for Mechanical
210720	Thermal Insulation for Piping
212400	Dry Chemical Fire Extinguishing Systems

DIVISION 22 – PLUMBING

221010	Plumbing Pumps
221118	Domestic Water Piping Copper
221317	Drainage Waste and Vent Piping – Cast Iron and Copper
221318	Drainage Waste and Vent Piping – Plastic
223005	Domestic Water Heaters
224201	Plumbing Specialities and Accessories
224202	Plumbing Fixtures

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

230501	Use of HVAC Systems during Construction
230505	Installation of Pipework
230513	Common Motor Requirements for HVAC Equipment
230529	Hangers and Supports for HVAC Piping and Equipment
230593	Testing, Adjusting, and Balancing for HVAC
232300	Copper Tubing and Fittings Refrigerant
233114	Metal Ducts – Low Pressure to 500 Pa
233400	HVAC Fans
233713	Diffusers, Registers, and Grilles
238126	Split System

DIVISION 26 - ELECTRICAL

260500	Common Work Results for Electrical
260520	Wire and Box Connector (0-1000-v)
260521	Wire and Cables (0-1000-v)
260522	Connectors and Termination
260528	Grounding Secondary
260529	Hangers and Support for Electrical Systems
260531	Splitters, Junction, Pull Boxes and Cabinets
260532	Outlet Boxes, Conduit Boxes and Fittings
260534	Conduits, Conduits Fastening and Conduits Fitting
260544	Installation of Cables in Trenches and in Ducts
260923	Metering and Switchboard Instruments
260925	Lighting Control Devices – Photoelectric
261217	Dry Type Transformer up to 600v Primary
262417	Panelboard Breaker Type
262726	Wire Devices

262821	Moulded Case Circuit Breakers
262823	Disconnect Switches, Fuses and Non-Fuses
262903	Control Devices
263353	Static Uninterruptible Power Supply
265619	Roadway Lighting

DIVISION 27 – COMMUNICATIONS

271005	Structured Cabling for Communications Systems
271120	Terminals and Connectors for Communications Conductors Entrance Facility

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

281600	Intrusion Detection
282300	Video Surveillance

DIVISION 32 – EXTERIOR IMPROVEMENTS

329119	Topsoil Placement and Grading
329219	Mechanical Seeding
329310	Trees, Shrubs, and Ground Cover Planting

DIVISION 33 - UTILITIES

333600	Utility Septic Tanks
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Drawing No. Drawing Name/Title
Cover Sheet

CIVIL

C1	Horizontal Geometry
C2	Roadworks Plan
C3	Roadworks Profile
C4	Roadworks Cross Sections
C5	Roadworks Details
C6	Signage and Line Painting

STRUCTURAL

S1	General Arrangement of Structures
S2	Retaining Wall Details 1 of 3
S3	Retaining Wall Details 2 of 3
S4	Retaining Wall Details 3 of 3
S5	Yard Waste Bunkers and Light Standard Base Details
S6	Scale Foundations Plan and Details
S7	Scale House Foundations Plan
S8	Scale House Foundations Sections
S9	Pre-Fabricated Kiosk Building Foundation Plan and Details
S10	Cardboard Disposal Slab Plan and Details
A1	Scale House Plan, Schedules and Millwork
A2	Scale House Cross-Sections, Door Schedule and Details
A3	Scale House Elevations
A4	Scale House Wall Sections and Plan Details
A5	Pre-Fabricated Kiosk Building
L1	Landscape Plan
M1	Scale House – Mechanical Plan and Section
M2	Scale House – Mechanical Schedules
E1	One Line Diagram

E2	Scale House Power Plan
E3	Scale House Lighting Plan
E4	Pre-Fabricated Kiosk Building – Power & Lighting Plan
E5	Electrical Panel Schedules
E6	Site Plan Lighting Layout
E7	Site Plan Security Cameras Layout
E8	Site - Electrical Details
E9	Camera Scale House
E10	Camera Pre-Fabricated Kiosk Building

E2. GEOTECHNICAL INVESTIGATION REPORT

E2.1 Further to C3.1, the geotechnical report is provided to aid the Contractor's evaluation of the pavement structure, cast-in-place piles, and/or 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 show 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) Weigh Scale, fabrication, layout, and erection details;
- (d) Weigh Scale Foundations; and,
- (e) Prefabricated Kiosk Building, fabrication, layout, and erection details.

E3.3 Contractor's Responsibilities

- (a) Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.
- (b) Verify:
 - (i) Field Measurements;
 - (ii) Field Construction Criteria; and,
 - (iii) Catalogue numbers and similar data.
- (c) Coordinate each submission with requirements of Work and Contract Documents. Individual shop drawings will not be reviewed until all related drawings are available.
- (d) Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.

- (e) 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.
- (f) Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.
- (g) 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.
- (h) After Contract Administrator's review and return of copies, distribute copies to Subcontractors and others as appropriate.
- (i) 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

- (a) 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.
- (b) 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.
- (c) Accompany submissions with transmittal letter containing:
 - (i) Date
 - (ii) Project title and Bid Opportunity number
 - (iii) Contractor's name and address
 - (iv) Number of each shop drawing, product data and sample submitted
 - (v) Specification Section, Title, Number and Clause
 - (vi) Drawing Number and Detail / Section Number
 - (vii) Other pertinent data
- (d) Submissions shall include:
 - (i) Date and revision dates
 - (ii) Project title and Bid Opportunity number
 - (iii) Name of:
 - (i) Contractor
 - (ii) Subcontractor
 - (iii) Supplier
 - (iv) Manufacturer
 - (v) Detailer (if applicable)
 - (iv) Identification of product or material
 - (v) Relation to adjacent structure or materials
 - (vi) Field dimensions, clearly identified as such
 - (vii) Specification section name, number and clause number or drawing number and detail / section number
 - (viii) Applicable standards, such as CSA or CGSB numbers
 - (ix) Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents

E3.5 Other Considerations

- (a) Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.
- (b) 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.
- (c) Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.
- (d) No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions and review of shop drawings.

GENERAL REQUIREMENTS

E4. ADDITIONAL SUBMITTALS

E4.1 Submittals

- (a) Submittals: in accordance with E3.
- (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 weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, four 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.

E4.2 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.

E4.3 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.
- (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.
- (e) Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in C11.

E4.4 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.
 - (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.

E4.5 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.

- (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.
 - (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.

E4.6 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 Specification 23 05 93.
- (o) Additional requirements: as specified in individual specification sections.

E4.7 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.

E4.8 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.

E4.9 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.

E4.10 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.

E4.11 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.

E4.12 Warranties and Bonds

- (a) Develop warranty management plan to contain information relevant to Warranties.
- (b) Submit warranty management plan, 30 days before planned pre-warranty conference, to Contract Administrator approval.
- (c) Warranty management plan to include required actions and documents to assure that the City receives warranties to which it is entitled.
- (d) Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- (e) Submit, warranty information made available during construction phase, to Contract Administrator for approval prior to each pay estimate.
- (f) Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - (i) Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - (ii) List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - (iii) Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

- (iv) Verify that documents are in proper form, contain full information, and are notarized.
- (v) Co-execute submittals when required.
- (vi) Retain warranties and bonds until time specified for submittal.
- (g) Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- (h) Conduct joint 12 month and 24 month warranty inspection, measured from time of acceptance, by Contract Administrator.
- (i) Include information contained in warranty management plan as follows:
 - (i) 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.
 - (ii) 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.
 - (iii) 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-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.
 - (xii) Typical response time and repair time expected for various warranted equipment.
 - (iv) Contractor's plans for attendance at 6 and 12 month post-construction warranty inspections.
 - (v) Procedure and status of tagging of equipment covered by extended warranties.
 - (vi) Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- (j) Respond in a timely manner to oral or written notification of required construction warranty repair work.
- (k) Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.

E4.13 Pre-Warranty Conference

- (a) 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.
- (b) Contract Administrator will establish communication procedures for:
 - (i) Notification of construction warranty defects.
 - (ii) Determine priorities for type of defect.
 - (iii) Determine reasonable time for response.

- (c) Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
- (d) Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

E4.14 Warranty Tags

- (a) Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Contract Administrator.
- (b) Attach tags with copper wire and spray with waterproof silicone coating.
- (c) Leave date of acceptance until project is accepted for occupancy.
- (d) Indicate following information on tag:
 - (i) Type of product/material.
 - (ii) Model number.
 - (iii) Serial number.
 - (iv) Contract number.
 - (v) Warranty period.
 - (vi) Inspector's signature.
 - (vii) Construction Contractor.

E4.15 Request for Information and Non-Conformance Reports

- (a) For all Request for Information (RFI's) and Non-Conformance Reports (NCR's) submissions, the Contractor shall assume a minimum of 48 hour response time will be required per submission.
- (b) The Contractor shall not undertake work associated with these submissions until the Contract Administrator review is completed and responded to in writing

E5. OFFICE FACILITIES

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

- (a) The field office shall be for the exclusive use of the Contract Administrator.
- (b) The building shall be conveniently located near the Site of the Work.
- (c) The building shall have a minimum floor area of 25 square metres, 2.4m with two window 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 desk, one drafting table, one stool, one four drawer legal size filing size filing cabinet with lock, and a minimum of 5 chairs.
- (g) Provide a medium sized fridge, microwave, water cooler with disposable cups and coffee maker.
- (h) 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.
- (i) 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.

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

E5.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance or as agreed upon in writing by the Contract Administrator. .

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

E6. VERIFICATION OF WEIGHTS

E6.1 All material which is paid for on a weight basis shall be weighed on a scale certified by Consumer & Corporate Affairs, Canada.

E6.1.1 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.

E6.1.2 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 & 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.
- (ii) Checking tare weights shown on delivery tickets against a current tare.

E6.1.3 No charge shall be made to The City for any delays or loss of production caused by such inspection and verification.

E6.2 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.

E6.2.1 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).
- (d) The time and date of weighing.

E7. TRAFFIC CONTROL

E7.1 Further to clauses 3.6 and 3.7 of CW 1130:

- (a) Where directed, 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 in Work Areas on City Streets, the Contractor ("Agency" in the manual) shall make arrangements with the Traffic Services Branch of the City of Winnipeg to place all temporary regulatory signs. The Contractor shall bear all 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.

E8. TRAFFIC MANAGEMENT

E8.1 Protect traffic lanes to the existing Weigh Scale during construction.

E8.1.1 Should the Contractor be unable to maintain vehicular access to BRRMF, he/she shall review the planned disruption with the City and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of

twenty-four (24) hours notification to the City and the Contract Administrator, prior to disruption of access.

E8.1.2 Ambulance/emergency vehicle access must be maintained at all times.

E9. MOBILIZATION AND DEMOBILIZATION

DESCRIPTON

E9.1 This Specification covers all operations relating to the mobilization and demobilization of the Contractor to the Site, as specified herein.

E9.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E9.3 Scope of Work

E9.3.1 The Work under this Specification shall include but not be limited to:

- (a) Submission of Site Layout Plan;
- (b) Mobilizing and demobilizing on-site Work facilities;
- (c) Supplying, setting up, laying out, and removing site office facilities as detailed in E5;
- (d) Install, maintaining and removing any access roadway; and,
- (e) Traffic control (E7) and traffic management (E8).

REFERENCES

E9.4 Mobilization and Demolition are in accordance with the most recent Standard Construction Specifications:

- (a) CW 1120 – Existing Services, Utilities and Structures; and,
- (b) CW 1130 – Site Requirements.

SUBMITTALS

E9.5 The Contractor shall submit the following to the Contract Administrator fourteen (14) Days prior to mobilization on site, a plan highlighting the Site Layout which includes; laydown area location(s), staging areas, office facility location, access road(s), temporary secure fencing limits, and gate locations for review and approval.

E9.6 Contractor shall refer to the Drawings for Limits of Construction.

MATERIALS AND EQUIPMENT

E9.7 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.

E9.8 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.

E9.9 All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

CONSTRUCTION METHODS

E9.10 Site Inspection

- (a) Inspect the Site with the Contract Administrator to verify existing conditions prior to mobilizing on site.
- (b) Inspect the Site with the Contract Administrator soon after demobilizing on site, confirming Site has been restored to its original condition prior to initiation of Work.

E9.11 Layout of On-Site Work Facilities

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

E9.12 Cellular Telephone Communication

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

E9.13 Traffic Gates

- (a) The Contractor shall supply, install, maintain, and remove steel gates to keep non-Contract traffic and pedestrians out of the Work site.
- (b) The gates shall be removed upon completion of construction activities.

E9.14 Access Roadway

- (a) The Contractor shall maintain any access roadway they install.
- (b) The access road shall be maintained on a regular basis to provide continual unrestricted site access, to the satisfaction of the Contract Administrator.
- (c) Upon completion of the Work, the area shall be restored to its original condition.

E9.15 Snow and Ice Removal

- (a) Snow clearing shall be done by the Contractor on a regular basis.
- (b) Snow cover shall be cleared from the construction Site prior to commencement of the Work. The methodology to clear the snow shall be subject to the approval of the Contract Administrator.

E9.16 Restoration of Existing Facilities

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

MEASUREMENT AND PAYMENT

E9.17 Mobilization and demobilization will be paid for at the Contract Lump Sum Prices for "Mobilization and Demobilization" 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.

E9.18 Mobilization and demobilization will be paid for at a percentage of the Contract Lump Sum Prices, as specified herein. These percentages shall be as follows:

- (a) When Contract Administrator is satisfied that construction has commenced. 30%
- (b) During construction, percentage distributed equally on a monthly basis at the discretion of the Contract Administrator. 60%
- (c) Upon completion of the project. 10%

ROADWORKS

E10. ASPHALT MILLINGS WEARING SURFACE OF OPERATIONAL VEHICLE AREA

E10.1 Description

- E10.1.1 The Work covered under this item shall include all operations related to Works for the placement and compaction of wearing surface of the operational vehicle area.
- E10.1.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E10.2 Materials

E10.2.1 General

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

E10.2.2 Asphalt Millings

- (a) The asphalt millings as shown on the Drawings, shall be supplied by the City.

E10.3 Construction Methods

E10.3.1 Placement of Asphalt Millings

- (a) Asphalt millings shall be placed in uniform lifts no greater than 50mm in thickness.
- (b) Asphalt millings shall be raked prior to compaction to ensure uniform material size distribution.
- (c) Any particles larger than 75mm in diameter shall be removed.

E10.3.2 Compaction of Asphalt Millings

- (a) Each lift shall be rolled with a vibratory roller a minimum of 10 times or to the satisfaction of the Contract Administrator.

E10.4 Measurement and Payment

- E10.4.1 Placement and compaction of asphalt millings will be measured on a square meter basis. This item of Work will be paid for at the Contract Unit Price "Placement and Compaction of Asphalt Millings", performed in accordance with the Specification and accepted by the Contract Administrator.

E11. SEALING INTERFACE BETWEEN CONCRETE AND ASPHALT SURFACES

DESCRIPTION

- E11.1 The Contractor shall seal the interface of the weigh scale concrete approach pads and asphalt roadway pavement one year after construction is completed.

MATERIALS

- E11.2 Joint sealant shall be supplied as per CW 3250.

CONSTRUCTION METHODS

- E11.3 Sealing of the interface shall be completed using joint sealant in accordance with Clause 3 of CW 3250.

MEASUREMENT AND PAYMENT

- E11.4 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.

E12. RUMBLE STRIPS

DESCRIPTION

E12.1 The Contractor shall construct milled in rumble strips on the roadways as shown on the Drawings.

EQUIPMENT

E12.2 The Contractor shall provide all equipment and labour necessary for the construction of the rumble strips.

General

E12.3 Rumble strips constructed outside of the tolerances shown on the Plans, or exhibiting any defects will be rejected and the Contractor shall be responsible for repairing such work.

E12.4 The milling machine used shall either be equipped with an integral sweeping device mounted directly behind the cutter, or a separate sweeping operation shall be conducted as construction of the rumble strips progresses. The Contractor shall pick up and stockpile/dispose of all debris created from the milling operation, as directed by the Contract Administrator.

E12.5 Rumble strips should be interrupted through intersections with side roads. At intersections with deceleration/acceleration lanes, rumble strips shall be applied along shoulder taper and straight section, and stop at the beginning of the curve radius or as staked by the Engineer.

MEASUREMENT AND PAYMENT

E12.6 Installation of rumble strips shall be measured on a length basis and paid for at the Contract Unit Price for "Rumble Strip", which shall include 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. The length to be paid for will be the total number of meters of rumble strips constructed in accordance with this specification, accepted and measured by the Contract Administrator.

E13. LINE PAINTING

DESCRIPTION

E13.1 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

E13.2 Paint shall conform to City of Winnipeg specification for reflectorized traffic paint or suitable equivalent for application to asphalt and/or concrete surface.

E13.2.1 CGSB 1-GP-74M + Amdt-May-81, alkyd traffic paint

E13.2.2 High Gloss Traffic Paint (IBIS Products Limited)

E13.3 Paint colours shall be:

- (a) Yellow - all centre lines, parking stall lines, painted medians, and handicap symbols illustrated on plan
- (b) White - stop bars, passing lane lines, bicycle symbols, and arrows.

- (c) 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)
- (d) Federal Traffic Paint, Yellow 40-3597 Qual No 80087, White 40-3596 Qual No 80086 (IBIS Products Limited)
- (e) High Gloss Traffic Paint, Yellow 40-1821 (IBIS Products Limited)

E13.4 Thinner to CGSB 1-GP-5M

E13.5 Glass Beads: Overlay Type: To CGSB 1-GP-74 ÷ Amdt-May-81

CONSTRUCTION METHODS

- E13.6 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.
- E13.7 No markings shall be performed when the temperature is below 10⁰ 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.
- E13.8 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.
- E13.9 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.
- E13.10 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.
- E13.11 The Contractor shall provide an experienced technician to supervise the location, alignment, layout, dimension, and application of the paint.
- E13.12 Paint shall be applied at a rate of 200 lineal feet per gallon (60m per 4.5L) and maintain a uniform lines unless otherwise indicated on specifications drawings.
- E13.13 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.
- E13.14 Glass beads are to be added to paint as per manufacturer's specifications.
- E13.15 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.
- E13.16 In the application of straight strips, any deviation in the edges exceeding 1/2 inch in 50 feet shall be obliterated and the marking corrected. The width of the markings shall be as designated within a tolerance of 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.
- E13.17 Thoroughly clean distribution tank before refilling with paint of different colour.
- E13.18 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, spillage drippings, of paint or other materials.

- E13.19 Parking stall lines will be painted as per drawing and/or as directed by the Contract Administrator. Each stall line will be 75 mm wide and 4.5 m long.

MEASUREMENT AND PAYMENT

- E13.20 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.

E14. POLY POSTS

DESCRIPTION

- E14.1 The Contractor shall supply and install poly posts on the roadways as shown on the Drawings.

EQUIPMENT

- E14.2 The Contractor shall provide all equipment and labour necessary for the supply and installation of the poly posts.
- (a) Permanent Poly Posts shall consist of channelizer post system comprised of a tubular marker, a top cap and an integrated anchor bolt assembly.
 - (b) Removable Poly Posts shall consist of channelizer post system comprised of a tubular marker and a top cap.
 - (c) Finished height: minimum 1.1 metres
 - (d) Approved Product (removable poly post): Pexco City Post or equivalent in accordance with B7.

General

- E14.3 Poly posts installed outside of the tolerances shown on the Plans, or exhibiting any defects will be rejected and the Contractor shall be responsible for repairing such work.

MEASUREMENT AND PAYMENT

- E14.4 Supply and installation of poly posts shall be measured on a unit basis and paid for at the Contract Unit Price for "Poly Posts", which shall include 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. 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.

E15. TOPSOIL AND SEEDING

- E15.1 Description

- E15.1.1 General

- (a) Further to CW 3520-R7 and CW3540-R5, this specification covers supply and placement of topsoil and seed.
- (b) Referenced Standard Construction Specifications
 - (i) CW 3520-R7 – Seeding
 - (ii) CW3540-R5 – Topsoil and Finish Grading for Establishment of Turf Areas

- E15.2 Materials

- E15.2.1 Topsoil

- (a) Topsoil for the site shall conform to the standards outlined in CW 3540-R5, Clause 5.
- E15.2.2 Seed
 - (a) Seeding shall conform to the standards outlined in CW 3520-R7, Clause 5.
 - (b) The seed mixture shall be composed of:
- E15.3 Sixty (60%) percent Kentucky Wheatgrass (100% Class 1 or 2 cultivars, 3 cultivars in equal proportion), thirty (30%) percent Creeping Red Fescue and ten (10%) percent Perennial Ryegrass Construction Methods
- E15.3.1 Topsoil
 - (a) Prior to placing topsoil, all sub-grade areas shall be scarified to a minimum depth of 50 mm. The Contractor shall use soil scarifying or pulverizing equipment suitable for the area involved and to the satisfaction of the Contract Administrator.
- E15.3.2 Seed
 - (a) Seed, hydro-mulching, and maintenance shall be applied as per CW 3520-R7, Clause 9 to the topsoil all areas of the site.
 - (b) Seeding shall be sown at a rate of 1.0 kg per 100 square meters.
- E15.4 Measurement and Payment
- E15.4.1 Topsoil
 - (a) Measurement and Payment for topsoil as per CW 3540-R5, Clause 12 and 13.
- E15.4.2 Seed
 - (a) Measurement and Payment for seed as per CW 3520-R7, Clause 12 and 13.

STRUCTURAL WORKS

E16. CAST-IN-PLACE CONCRETE PILE FOUNDATIONS

DESCRIPTION

- E16.1 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.
- E16.2 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

- E16.3 General
- E16.3.1 The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.
- E16.4 Handling and Storage of Materials
- E16.4.1 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 A23.1-09.
- E16.5 Testing and Approval
- E16.5.1 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.

E16.5.2 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.

E16.6 Patching Mortar

E16.6.1 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 1 part cement to 2 parts sand by damp loose volume. White Portland Cement shall be substituted for a part of the grey Portland Cement on exposed concrete in order to produce a colour matching the colour of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling and placing.

E16.7 Cement

E16.7.1 Cement shall be Type HS or HSb, high-sulphate-resistant hydraulic cement, conforming to the requirements of CAN/CSA A23.1-09.

E16.8 Concrete

E16.8.1 General

(a) Concrete repair material shall be compatible with the concrete substrate.

E16.8.2 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 A23.1-09:

- (a) Class of Exposure: S-1
- (b) Compressive Strength @ 56 days = 35 MPa
- (c) Water / Cementing Materials Ratio = 0.4
- (d) Air Content: Category 2 per Table 4 of CAN/CSA A23.1-09 (4-7%)
- (e) Cement – shall be as specified in E16.7.

E16.8.3 Mix design for ready mix concrete shall be submitted to Contract Administrator at least two (2) weeks prior to concrete placing operations.

E16.8.4 The workability of each concrete mix shall be consistent with the Contractor's placement operations. Self-compacting concrete may be used for pile foundations.

E16.8.5 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.

E16.8.6 The temperature of all types of concrete shall be between 15°C and 25°C at discharge. Temperature requirements for concrete containing silica fume shall be between 10°C and 18°C at discharge unless otherwise approved by the Contract Administrator.

E16.8.7 Concrete materials susceptible to frost damage shall be protected from freezing.

E16.9 Aggregate

E16.9.1 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.

E16.9.2 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%.
- (c) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, and excess of thin particles or any other extraneous material.
- (d) Coarse aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.
- (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.

E16.9.3 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.

E16.10 Cementing Materials

E16.10.1 Cementing materials shall conform to the requirements of CAN/CSA A3001.

E16.10.2 Silica Fume

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

E16.10.3 Fly Ash

- (a) Fly ash shall be Type C1 or Type F and shall not exceed 25% by mass of cement.

E16.10.4 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.

E16.11 Admixtures

E16.11.1 Air entraining admixtures shall conform to the requirements of ASTM C260.

E16.11.2 Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

E16.11.3 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.

E16.11.4 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.

E16.11.5 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.

E16.12 Water

E16.12.1 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.

E16.13 Concrete Supply

E16.13.1 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.

E16.13.2 Unless otherwise directed by the Contract Administrator, the discharge of ready mixed concrete shall be completed within 90 minutes after the introduction of the mixing water to the cementing materials and aggregates.

E16.13.3 The Contractor shall maintain all equipment used for handling and transporting the concrete in a clean condition and proper working order.

E16.14 Reinforcing Steel

E16.14.1 Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

E16.14.2 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.

E16.14.3 Reinforcing steel supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

E16.15 Anchor Bolts, Nuts, and Washers

E16.15.1 Anchor bolts, nuts, and washers shall be in accordance with ASTM F1554, 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 mm long. Anchor bolt supply and installation will be incidental to the Work and no separate payment will be made.

E16.16 Anchor Bolt or Dowel Templates

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

E16.17 Miscellaneous Materials

(a) Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator.

CONSTRUCTION METHODS

E16.18 Location and Alignment of Piles

E16.18.1 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.

E16.18.2 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 1 percent from the vertical.

E16.19 Buried Utilities

- E16.19.1 The Contractor shall exercise extreme caution when constructing the pile foundations in the vicinity of existing buried utilities and buildings. The Drawings show the approximate locations of existing buried utilities. The Contractor shall be responsible for obtaining the exact location of the buried utilities from the appropriate Utility Authorities prior to installing the piles.
- E16.19.2 The proposed locations of the pile foundations may be changed by the Contract Administrator if they interfere with the buried utilities.
- E16.19.3 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.

E16.20 Excavation

- E16.20.1 Pile excavation shall be accomplished by hydro-jet and/or boring for the full depth of all piles.
- E16.20.2 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.
- E16.20.3 Upon reaching the required elevation, the bottom of the excavation shall be cleaned as directed by the Contract Administrator in the field.
- E16.20.4 All excavated material from the piles shall be promptly hauled away from the Site to an approved disposal area as located by the Contractor.
- E16.20.5 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.
- E16.20.6 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 mm minimum cover around the utility. Payment will not be made for condemned piles.

E16.21 Sleeving

- E16.21.1 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.
- E16.21.2 The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.
- E16.21.3 The sleeving shall be withdrawn as the concrete is placed in the excavation. The sleeving shall extend at least 1 m below the top of the freshly deposited concrete at all times.
- E16.21.4 The clearance between the face of the excavation and the sleeving shall not exceed 75 mm.
- E16.21.5 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 mm below the top of sidewalk.

E16.22 Inspection of Excavations

- E16.22.1 Concrete shall not be placed in an excavation until the excavation has been inspected and approved by the Contract Administrator.
- E16.22.2 The Contractor shall have available suitable light for the inspection of each excavation throughout its entire length.
- E16.22.3 Any improperly set sleeving or improperly prepared excavation shall be corrected to the satisfaction of the Contract Administrator.

E16.23 Placing Reinforcing Steel

- E16.23.1 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.
- E16.23.2 Spacers shall be utilized to properly locate the reinforcing steel cage in the excavation.

E16.24 Placing Anchor Bolts

- E16.24.1 The anchor bolts shall be aligned with a steel template matching the bolt holes in the sign structure base plate. 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.
- E16.24.2 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.

E16.25 Forms

- E16.25.1 For hydro-jet excavated piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1500 mm below final grade.
- E16.25.2 For bored piles the top of the piles shall be formed with tubular forms (Sonotube) to a minimum depth of 1000 mm below final grade.
- E16.25.3 In locations of caving, the tubular form (Sonotube) should extend a minimum of 500 mm below where the shaft becomes uniform.
- E16.25.4 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.

E16.26 Placing Concrete

- E16.26.1 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.
- E16.26.2 Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length of the pile.
- E16.26.3 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.
- E16.26.4 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.
- E16.26.5 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.

E16.27 Tremie Concrete

E16.27.1 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.

E16.27.2 Tremie concrete shall be poured up to a depth of 600 mm or as the Contract Administrator directs. Pumps shall then be lowered into the excavation and the excess water pumped out. The laitance that forms on top of the tremie shall then be removed and the remainder of the concrete shall be placed in the dry excavation.

E16.28 Protection of Newly Placed Concrete

E16.28.1 Newly laid concrete threatened with damage by rain, snow, fog, or mist shall be protected with a tarpaulin or other approved means.

E16.29 Curing Concrete

E16.29.1 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°C for at least seven (7) consecutive days thereafter.

E16.29.2 After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

E16.29.3 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.

E16.29.4 Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3° in one (1) hour or 20° in twenty-four (24) hours.

E16.30 Form Removal

E16.30.1 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.

E16.30.2 The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.

E16.30.3 Field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.

E16.31 Patching of Formed Surfaces

E16.31.1 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.

E16.31.2 All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.

E16.31.3 Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement shall be well-brushed onto the area

to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the surface and left for one (1) hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.

E16.32 Cold Weather Concreting

E16.32.1 Protection of concrete shall be considered incidental to its placement. The temperature of the concrete shall be maintained at or above 10°C 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.

E16.33 Removal and Restoration of Adjacent Surface Treatments

E16.33.1 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 mm beyond the perimeter of the pile, the Contractor shall remove a square section of the existing slab that is 300 mm beyond the pile perimeter. The surface of the slab shall be saw-cut to a depth of 50 mm around the perimeter of the square section. Care shall be taken to ensure that the saw-cut edge of the section is not chipped or broken during the removal of the concrete. Concrete slabs damaged beyond the specified limits shall be replaced at the Contractor's cost to the satisfaction of the Contract Administrator. After the pile has been constructed, the concrete sidewalk/median slab shall be restored flush with the adjacent surface level.

E16.33.2 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

E16.33.3 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.

E16.33.4 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

E16.34 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.

E16.35 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.

E16.36 Concrete Quality Control Testing shall be performed in accordance with the quality control requirements of E17.

MEASUREMENT AND PAYMENT

E16.37 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.

E16.38 Items of Work:

- (a) Cast-in-Place Concrete Pile Foundations:
 - (i) 305 mm Diameter x 6 m Long
 - (ii) 610 mm Diameter Light Standard Bases
 - (iii) 915 mm Diameter x 10 m Long

E16.39 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.

E16.40 Abandonment of piles due to utility interference will be considered incidental to the Work and no separate measurement or payment will be made.

E17. STRUCTURAL CONCRETE

E17.1 Description

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

E17.2 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 structural slabs
 - (iii) Supplying and placing structural concrete for weigh scale foundation piers
 - (iv) Supplying and placing structural concrete for the scale house foundations
 - (v) Supplying and placing structural concrete for the prefabricated kiosk foundations
 - (vi) Supplying and placing structural concrete for the HHW foundations.

E17.3 Submittals

E17.3.1 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.

E17.3.2 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 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.
 - (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.

E17.3.3 Concrete Mix Design Test Data

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

E17.3.4 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.

E17.3.5 The Contractor shall submit to the Contract Administrator copies of all material quality control test results.

E17.3.6 Notification of Ready Mix Supplier

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

E17.3.7 Temporary False Work, Formwork and Shoring Works

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least twenty (20) Business Days prior to the scheduled commencement of concrete placement, detailed design calculations and shop drawings for any temporary Works, including falsework, formwork, and shoring, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba.
- (b) Design Requirements
 - (i) All forms shall be of wood, metal or other materials as approved by the Contract Administrator.

- (ii) The falsework, formwork, and shoring for these Works shall be designed by a Professional Engineer registered in the Province of Manitoba. Falsework shall be designed according to the requirements of CSA S269.1, "False Work for Construction Purposes." The shop drawings shall bear the Professional Engineer's seal. Shop drawings submitted without the seal of a Professional Engineer will be rejected. The submission of such shop drawings to the Contract Administrator shall in no way relieve the Contractor of full responsibility for the safety and structural integrity of the formwork and shoring.
 - (iii) The falsework, formwork, and shoring for these Works shall be designed to safely support all vertical and lateral loads until such loads can be supported by the concrete all in accordance with CSA Standard CAN/CSA S269.3-M92. All proposed fastening methods to the existing deck superstructure must be submitted to the Contract Administrator for review and approval.
 - (iv) The loads and lateral pressures outlined in Part 3, Section 102 of "Recommended Practice for Concrete Formwork", (ACI 347) and wind loads as specified by the National Building Code shall be used for design. Additional design considerations concerning factors of safety for formwork elements and allowable settlements outlined in Section 103 of the above reference shall apply.
 - (v) As a minimum, the following spacing's shall apply for studding and walers:
 - ◆ 20-mm plywood: studding 400 mm centre to centre (max.),
 - ◆ walers 760 mm centre to centre (max.)
 - (vi) Forms shall be designed and constructed so that the completed Work will be within minus 3 mm or plus 6 mm of the dimensions shown on the Drawings.
 - (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 mm unless otherwise noted on the Drawings.
 - (xiii) Formwork shall be designed to have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
 - (xiv) Forms shall be designed to be sufficiently tight to prevent leakage of grout or cement paste.
- (c) Shop drawings shall show design loads, type, and number of equipment to be used for placing the concrete, method of construction, method of removal, type and grade of materials, and any further information that may be required by the Contract Administrator. The Contractor shall not proceed with any Work on Site until the shop drawings have been reviewed and approved in writing by the Contract Administrator. Falsework must be designed to carry all loads associated with

construction of overhangs including deflection due to dead loads, placement of concrete, hoarding, construction live loads, and any other loads that may occur.

- (d) For timber formwork and falsework, the shop drawings shall specify the type and grade of lumber and show the size and spacing of all members. The shop drawings shall also show the type, size and spacing of all ties or other hardware, and the type, size and spacing of all bracing.

E17.4 Materials

E17.4.1 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.

E17.4.2 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-A23.1-09.

E17.4.3 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 E17.1.

TABLE E17.1 REQUIREMENTS FOR HARDENED CONCRETE					
Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size
Type 1	Cast-in-place Piles	(Refer to Specification E16)			
Type 2	Retaining Walls, Stairs, Structural Slabs, Scale Foundations, Scale House Foundations, Pay Booth Foundations, and other miscellaneous concrete unless otherwise indicated	35 @ 28 Days	C-1	1	20 mm

- (c) Design Requirements
 - (i) The Contractor shall design falsework, formwork and shoring for the scale deck slab overhang.

E17.4.4 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 28 days.
- (c) The Working Base shall be considered incidental to the Work and no separate payment will be made.

E17.4.5 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 mm of the ground level. This material shall remain undisturbed to avoid contaminating the aggregate being used with the ground material.
 - (ii) The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA A23.2-27A-04. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A-04 or CSA A23.2-25A-04 is required.
 - (iii) Petrographic analysis when performed shall be in accordance with MTO (Ministry of Transportation Ontario) Lab Test Method LS 609. The (weighted) petrographic number shall not exceed 130.

E17.4.6 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 3% shall pass a 75 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.
- (b) Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-04, Table 12.

E17.4.7 Coarse Aggregate - Standard

- (a) The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1-04, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 2% shall pass a 75 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. Coarse aggregate shall be clean and free from alkali, organic or other deleterious matter; shall have a minimum of two fractured faces; and shall have an absorption not exceeding 3%.
- (b) The aggregate retained on the 5 mm sieve shall consist of clean, hard, tough, durable, angular particles with a rough surface texture, and shall be free from organic material, adherent coatings of clay, clay balls, an excess of thin particles or any other extraneous material.
- (c) Course aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.
- (d) Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1-04, Table 12, for concrete exposed to freezing and thawing.

E17.4.8 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.

E17.4.9 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 8% by mass of cement.
- (c) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class CI or F and the substitution shall not exceed 30% by mass of cement.
- (d) Cementitious materials shall be stored in a suitable weather-tight building that shall protect these materials from dampness and other destructive agents. Cementitious materials that have been stored for a length of time resulting in the hardening, or the formation of lumps, shall not be used in the Work.

E17.4.10 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.

E17.4.11 Synthetic Fibres

- (a) The synthetic fibres shall consist of 100% virgin polypropylene or 100% virgin polyolefin as accepted by the Contract Administrator. The dosage shall be designed by the Contractor to meet the requirements for post-cracking residual strength index (Ri) and fibre dispersion in accordance to the CHBDC CSA-S6-06, Fibre-Reinforced Structures, Clause 16.6 except the post-cracking residual strength index (Ri) shall be determined in accordance with ASTM C1609.

E17.4.12 Formwork

- (a) Formwork materials shall conform to CSA Standard A23.1-04, and American Concrete Publication SP4, "Formwork for Concrete."
- (b) Form sheeting plywood to be covered with form liner or to be directly in contact with soil shall be exterior Douglas Fir, concrete form grade, conforming to CSA Standard O121-M1978, a minimum of 20 mm thick.
- (c) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-M1978. Approved Manufacturers are "Evans" and "C-Z."
- (d) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.
- (e) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place must be made from a non-rusting material or stainless steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.
- (f) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.

- (g) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion all the forces to which the forms shall be subjected.
- (h) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.
- (i) Stay-in-place formwork or falsework is not acceptable and shall not be used by the Contractor unless specifically shown on the Drawings.

E17.4.13 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.

E17.4.14 Permeable Formwork Liner

- (a) Formwork liner shall be Texel Drainaform, Hydroform, 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.

E17.4.15 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.

E17.4.16 Curing Blankets

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

E17.4.17 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 28 days in age.
- (b) Bonding Grout
 - (i) The grout for bonding the new deck slab concrete to the existing concrete deck slab concrete shall be mixed in an agitating hopper slurry pump and shall consist of the following constituents, by weight:
 - ◆ 1 part water;
 - ◆ 1 part latex bonding agent; and,
 - ◆ 1½ parts Type GUSF Portland cement.
 - (ii) The consistency of the bonding grout shall be such that it can be brushed on the existing concrete surface in a thin, even coating that will not run or puddle in low spots.

- E17.4.18 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.
- E17.4.19 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.
- E17.4.20 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 28 days shall be 40 MPa.
- E17.4.21 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 1 part cement to 2 parts sand by damp loose volume. White Portland Cement shall be substituted for a part of the grey Portland Cement on exposed concrete in order to produce a colour matching the colour of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling or placing.
- E17.4.22 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,.
- E17.4.23 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.
- E17.4.24 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 100% acrylic, water-based emulsion, factory coated with highway-grade, fuel resistant silicone;
- (ii) Field-applied epoxy adhesive primer; and,
- (iii) Field-injected silicone sealant bands.
- (c) Impregnation agent to have proven non-migratory characteristics. Silicone coating to be highway-grade, low-modulus, fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellows. Depth of seal as recommended by manufacturer. BEJS foam seal to be installed into manufacturer's standard field-applied epoxy adhesive. The BEJS SYSTEM is to be installed recessed from the

surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be ½" (12 mm) down from the substrate surface.

- (d) Material shall be capable, as a dual seal, of movements of +50% to -50% (100% total) of nominal material size. Changes in plane and direction shall be executed using factory fabricated "Universal 90" transition assemblies. Transitions shall be warranted to be watertight at inside and outside corners through the full movement capabilities of the product.
- (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°C for three (3) hours while compressed down to the minimum of movement capability dimension of the basis of design product (-50% of normal material size) without evidence of any bleeding of impregnation medium from the material; and,
 - (ii) That the same material after the heat stability test will self-expand to the maximum of movement capability dimension of the basis-of-design product (+50% of nominal material size) within twenty-four (24) hours at room temperature 20°C.

E17.4.25 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.

E17.4.26 Low Density Styrofoam

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

E17.4.27 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 30 to 50%.

E17.4.28 Dampproofing

- (a) Dampproofing materials shall be applied to all buried concrete surfaces in contact with the soil to within 300 mm of Finished Ground Elevation, with the exception of those surfaces cast directly against the soil or in contact with prefabricated drainage composite. Dampproofing materials shall be mineral colloid emulsified asphalt complying with Canadian General Standards Board Specification No. 37.16-M89. Acceptable product is Bakelite/Flintguard 710-11 Foundation Coating as manufactured by Bakor, Elsro Fibrated Foundation Coating, Insulmastic 7103 Fibrated 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.

E17.4.29 Miscellaneous Materials

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

E17.4.30 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.

E17.5 Equipment

E17.5.1 General

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

E17.5.2 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.

E17.6 Construction Methods

E17.6.1 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.

E17.6.2 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 mm or plus 6 mm of the dimensions shown on the Drawings.
 - (v) Formwork shall be cambered, where necessary to maintain the specified tolerance to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete, due to construction loads.
 - (vi) Slots, recesses, chases, sleeves, inserts, bolts, hangers, and other items shall be formed or set in coordination and cooperation with the trade concerned. No openings shall be made in structural members that are not shown on the shop drawings without the prior written approval of the Contract Administrator.
 - (vii) Shores shall be provided with positive means of adjustment (jacks or wedges). All settlement shall be taken up before or during concreting as required.
 - (viii) Mud sills of suitable size shall be provided beneath shores, bedded in sand or stone, where they would otherwise bear on soil. The soil below shores must be adequately prepared to avoid settlement during or after concreting. Shores must not be placed on frozen ground.
 - (ix) Shores shall be braced horizontally in two directions and diagonally in the same two vertical planes so that they can safely withstand all dead and moving loads to which they will be subjected.

- (x) All exposed edges shall be chamfered 20 mm unless otherwise noted on the Drawings.
 - (xi) Formwork shall have sufficient strength and rigidity so that the resultant finished concrete conforms to the shapes, lines, and dimensions of the members shown on the Drawings.
 - (xii) Forms shall be constructed so as to be sufficiently tight to prevent leakage of grout or cement paste.
- (b) Form panels shall be constructed so that the contact edges are kept flush and aligned.
 - (c) Forms for the concrete barriers shall be accordingly aligned to each other and to the geometry shown on the Drawings so as to provide a smooth, continuous barrier. Any misalignments in the barrier shall be cause for rejection and removal of same. No snap ties within the barriers shall be placed below 250 mm above the top of the upper lift elevation.
 - (d) Forms shall be clean before use. Plywood and other wood surfaces shall be sealed against absorption of moisture from the concrete by a field applied form coating or a factory applied liner as accepted by the Contract Administrator.
 - (e) Where prefabricated panels are used, care shall be taken to ensure that adjacent panels remain flush. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface.
 - (f) Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be commercially manufactured types. The portion remaining within the concrete shall leave no metal within 50 mm of the surface when the concrete is exposed to view. Spreader cones on ties shall not exceed 30 mm in diameter. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in matching colour of surrounding concrete.
 - (g) Formwork shall be constructed to permit easy dismantling and stripping and such that removal will not damage the concrete. Provision shall be made in the formwork for shores to remain undisturbed during stripping where required.
 - (h) It shall be permissible to use the forms over again where possible to a maximum of three uses, provided they are thoroughly cleaned and in good condition after being removed from the former portions of the Work. The Contract Administrator shall be the sole judge of their condition and his decision shall be final regarding the use of them again.
 - (i) Where required by the Contract Administrator, the Contractor shall cast test panels not using less than two panels of representative samples of the forms he proposes for reuse and shall strip them after forty-eight (48) hours for the Contract Administrator to judge the type of surface produced.
 - (j) All form lumber, studding, etc., becomes the property of the Contractor when the Work is finished, and it shall be removed from the concrete and the Site by the Contractor after the concrete is set, incidental to the Work of this Specification, and the entire Site shall be left in a neat and clean condition.

E17.6.3 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 E17.6.10, "Preparation for Concreting Against Hardened Concrete", for the requirements to prepare the hardened concrete at a construction joint for receiving new concrete.

E17.6.4 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.

E17.6.5 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.

E17.6.6 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.

E17.6.7 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.

E17.6.8 Supply of Structural Concrete

- (a) All structural concrete shall be supplied from a plant certified by the Manitoba Ready Mix Concrete Association. The Contractor, upon request from the Contract Administrator, shall furnish proof of this certification.
- (b) All mixing of concrete must meet the provisions of CSA A23.1-04, Clause 5.2, Production of Concrete.
- (c) Time of Hauling
 - (i) The maximum time allowed for all types of concrete to be delivered to the Site of the Work, including the time required to discharge, shall not exceed 120 minutes after batching. Batching of all types of concrete is considered to occur when any of the mix ingredients are introduced into the mixer, regardless of whether or not the mixer is revolving. For concrete that includes silica fume and fly ash, this requirement is reduced to 90 minutes.
 - (ii) Each batch of concrete delivered to the Site shall be accompanied by a time slip issued at the batching plant, bearing the time of batching. In hot or cold weather, or under conditions contributing to quick stiffening of the concrete, a time less than 120 and/or 90 minutes may be specified by the Contract Administrator. The Contractor will be informed of this requirement twenty-four (24) hours prior to the scheduled placing of concrete.

- (iii) To avoid the reduction of delivery and discharge time in hot weather, the Contractor will be allowed to substitute crushed ice for a portion of the mixing water provided the specified water/cementitious ratio is maintained. All of the ice shall be melted completely before discharging any of the concrete at the delivery point.
 - (iv) Unless otherwise noted in Table E17.1, "Requirements for Hardened Concrete", no retarders shall be used.
 - (v) The concrete, when discharged from truck mixers or truck agitators, shall be of the consistency and workability required for the job without the use of additional mixing water. If the slump of the concrete is less than that designated by the mix design statement, then water can be added on site provided the additional water meets the requirements of CSA A23.1-04 5.2.4.3.2. If additional water is to be added on site, it must be done under the guidance of the Suppliers' designated quality control person. The Supplier shall certify that the addition of water on site does not change the Mix Design for the concrete supplied. Any other water added to the concrete without such control will be grounds for rejection of the concrete by the Contract Administrator.
 - (vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the Owner upon request.
- (d) Delivery of Concrete
- (i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of rehandling, and without damage to the structure or the concrete.

E17.6.9 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.

E17.6.10 Preparation for Concreting Against Hardened Concrete

- (a) All hardened concrete against which new concrete is to be placed shall be prepared in the following manner:
 - (i) Concrete shall be removed to sound concrete or to the limits as shown on the Drawings, whichever is greater. The resulting surface shall be roughened to remove latent cement and miscellaneous debris.
 - (ii) All existing surfaces and exposed reinforcing steel are to be sandblasted to reveal a clean substrate and kept clean until concrete placement. Sandblasting shall be followed by a high pressure water wash to remove all residues.
 - (iii) Immediately prior to placing new concrete, bonding grout shall be thoroughly brushed onto the entire surface of the existing hardened concrete in a thin and even coating that will not run or puddle.

E17.6.11 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 m, otherwise rubber tubes or pouring ports spaced not more than 1.5 m vertically and 2.5 m horizontally shall be used. The Contractor shall obtain the Contract Administrator's acceptance, prior to pouring concrete, of all placing operations.
- (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 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 mm). Apply the vibrator at any point until the concrete is sufficiently compacted (5 to 15 seconds), but not long enough for segregation to occur. The vibrators shall be inserted vertically and withdrawn out of the concrete slowly. Spare vibrators in good working condition shall be kept on the job Site during all placing operations.
- (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.

E17.6.12 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 mm below finish grade elevations.
 - (iii) All surfaces to receive a formwork liner finish shall be formed using an approved permeable formwork liner.
 - (iv) The surfaces shall be patched as specified in this Specification.
- (c) Type 2 Finish – Unformed Surfaces
 - (i) All unformed concrete surfaces shall be finished as outlined hereinafter.
 - (ii) Screeding of all unformed concrete surfaces shall be performed by the sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.
 - (iii) Screeding shall be done on all concrete surfaces as a first step in other finishing operations. Screeding shall be done immediately after the concrete has been vibrated.
 - (iv) After screeding, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared. Concrete surfaces after floating shall have a uniform, smooth, granular texture.
- (d) Type 3 Finish - Surfaces Below Finished Grade
 - (i) All surfaces below 300 mm below finished grade except underside of footings shall be patched in accordance with the requirements of Sections E17.4.17, E17.4.18, and E17.6.15 of this Specification.
 - (ii) All surfaces below 300 mm below finish grade shall receive damp-proofing in accordance with E17.4.28 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.

E17.6.13 General Curing Requirements

- (a) Refer to E17.6.16 for cold weather curing requirements and E17.6.17 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.

E17.6.14 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.

E17.6.15 Patching of Formed Surfaces

- (a) The Contractor shall notify the Contract Administrator at least one (1) Working Day prior to removal of forms. Immediately after forms have been removed and before the Contractor commences any surface finishing or concrete patching operations, all newly exposed concrete surfaces shall be inspected by the Contract Administrator.
- (b) Any repair or surface finishing started before this inspection may be rejected and required to be removed.
- (c) Patching of formed surfaces shall take place within twenty-four (24) hours of formwork removal.
- (d) All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back 75 mm from the surface before patching.
- (e) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched, then applying bonding grout followed by patching mortar. Bonding grout shall be well brushed onto the area immediately prior to patching. When the bonding grout begins to lose the water sheen, the patching mortar shall be thoroughly trowelled

into the repair area to fill all voids. It shall be struck off slightly higher than the adjacent concrete surface and left for one (1) hour before final finishing to facilitate initial shrinkage of the patching mortar. It shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification. The final colour shall match the surrounding concrete.

- (f) Concrete shall be cast against forms which will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. All objectionable fins, projections, offsets, streaks, or other surface imperfections on the concrete surface shall be removed by means acceptable to the Contract Administrator. Cement washes of any kind shall not be used.
- (g) The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects which will impair the texture of concrete surfaces shall not be used.

E17.6.16 Cold Weather Concreting

- (a) The requirements of CSA Standard A23.1-09 shall be applied to all concreting operations during cold weather, i.e., if the mean daily temperature falls below 5°C during placing or curing.

E17.6.17 Hot Weather Concreting

- (a) General
 - (i) The requirements of this section shall be applied during hot weather, i.e., air temperatures forecast to go higher than 27°C during placing.
 - (ii) Concrete at discharge shall be at as low a temperature as possible, preferably as low as 15°C, but not above 25°C. Concrete containing silica fume shall be between 10°C minimum and 18°C maximum at discharge. Aggregate stockpiles should be cooled by water sprays and sun shades.
 - (iii) The Contractor shall use cold water and/or ice in the mix to keep the temperature of the fresh concrete down, if required. Ice may be substituted for a portion of the mixing water; provided it has melted by the time mixing is completed.
 - (iv) Form and conveying equipment shall be kept as cool as possible before concreting by shading them from the sun, painting their surfaces white and/or the use of water sprays.
 - (v) Sun shades and wind breaks shall be used as required during placing and finishing.
 - (vi) Work shall be planned so that concrete can be placed as quickly as possible to avoid "cold joints".
 - (vii) The Contract Administrator's acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water reducing agents to maintain Workability and strength, and these must appear in the Mix Design Statement submitted to the Contract Administrator.
 - (viii) Hot weather curing shall follow immediately after the finishing operation.
- (b) Hot-Weather Curing
 - (i) When the air temperature is at or above 25°C, curing shall be accomplished by fog misting and by using saturated absorptive fabric, in order to achieve cooling by evaporation. Note that fog misting is mandatory for all deck slab and median slab pours at all temperatures.
 - (ii) Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20°C, in order to minimize the temperature rise of the concrete.
- (c) Job Preparation
 - (i) When the air temperature is forecast to rise to 25°C or higher during the placing period, provisions shall be made by the Contractor for protection of the concrete in place from the effects of hot and/or drying weather conditions.

Under severe drying conditions, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by mist fogging and evaporation, to the satisfaction of the Contract Administrator.

- (d) Concrete Temperature
 - (i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than the following temperatures, as shown in Table E17.2, "Acceptable Concrete Temperature", for the indicated size of the concrete section.

TABLE E17.2: ACCEPTABLE CONCRETE TEMPERATURES		
THICKNESS OF SECTION	TEMPERATURE °C	
	MINIMUM	MAXIMUM
Less than:		
1.0 m	10	27
1.2 m	5	25

E17.6.18 Cleanup

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

E17.7 Quality Assurance and Quality Control

E17.7.1 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.

E17.7.2 The frequency and number of concrete Quality Control tests shall be in accordance with the requirements of CSA Standard A23.1-04. 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.

E17.7.3 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.

E17.7.4 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 A23.1-09.
- (c) All testing of materials shall conform to CSA Standard A23.2-09.
- (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.

E17.7.5 Concrete Testing

- (a) Slump tests shall be made in accordance with CSA Standard Test Method A23.2-5C-04, "Slump of Concrete". If the measured slump falls outside the limits in E17.3.2 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-04, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits in E17.3.2 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-04, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.
- (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-04, "Sampling Plastic Concrete".
- (f) Test specimens shall be made and cured in accordance with CSA Standard Test Method A23.2-3C-04, "Making and Curing Concrete Compression and Flexure Test Specimens".
- (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-04, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.

- (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 E17.1 of this Specification and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens shall be taken to verify strength of the in-place concrete. For each field-cured strength test, the strength of field-cured test specimens shall be determined in accordance with CSA Standard Test Method A23.2-9C-04, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

E17.7.6 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.

E17.8 Measurement and Payment

E17.8.1 Structural Concrete

- (a) Supplying and placing structural concrete will not be measured. This Work shall be paid for at the Contract Lump Sum Price for the "Items of Work" listed here below, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.
- (b) Items of Work:
 - (i) Retaining Walls
 - (ii) Structural Slabs
 - (iii) Weigh Scale Foundation Piers (excluding Piles)
 - (iv) Scale House Foundations (excluding Piles)
 - (v) Prefabricated Kiosk Foundations
 - (vi) HHW Foundations
- (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.

E17.8.2 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.

E17.8.3 Rigid Insulation

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

E18. SUPPLYING AND PLACING REINFORCING STEEL

E18.1 Description

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

E18.2 Scope of Work

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

E18.3 References

- (a) All related Specifications and reference Standards are in accordance with the most current issue or latest revision:
 - (i) ASTM A955M – Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcing;
 - (ii) ASTM A615M – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement;
 - (iii) ASTM A143 – Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.
 - (iv) ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings;
 - (v) ASTM A767/A767M – Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement;
 - (vi) CAN/CSA A23.1/A23.2 – Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete;
 - (vii) CAN/CSA G30.18-M92 – Billet Steel Bars for Concrete Reinforcement;
 - (viii) ACI 315R – Manual of Engineering and Placing Drawings for Reinforced Concrete Structures; and,
 - (ix) Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.

E18.4 Submittals

E18.4.1 General

- (a) At least twenty-one (21) Days prior to the scheduled commencement of any fabrication, the qualifications of the Contractor and its Operators shall be submitted to the Contract Administrator for review and approval.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least fourteen (14) Days prior to commencement of any schedule Work on the Site, a proposed schedule, including methods and sequence of operations.
- (c) The Contractor shall submit to the Contract Administrator for review, at least fourteen (14) Days prior to the commencement of any Work on Site a Certificate of Compliance from the Manufacturer stating that the stainless steel materials supplied comply with the provisions of ASTM A955M and these Specifications, including corrosion resistance.
- (d) Contractor shall submit all original mill certificates to the Contract Administrator prior to placement of reinforcing on site.
- (e) Contractor to submit Quality Control Testing Program to the Contract Administrator.

- (f) 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).

E18.5 Materials

E18.5.1 General

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

E18.5.2 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.

E18.5.3 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 E17.8.3.1, "Type of Stainless Steel Reinforcing". Reinforcing deformations shall conform to the requirements of ASTM A615M. All hooks and bends shall be bent using pin diameters and dimension recommended by Reinforcing Steel Institute of Canada (RSIC), Manual of Standard Practice.
- (d) If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete Works exhibit flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel. No additional costs will be applied to this Contract for the replacement of deficient reinforcing steel.
- (e) All reinforcing steel shall be straight and free from paint, oil, millscale, and injurious defects. Rust, surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross-sectional area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard CAN/CSA G30.18-M92 and ASTM A955M.

TABLE E17.8.3.1 TYPE OF STAINLESS STEEL REINFORCING		
Common or Trade Name	AISI Type	UNS Designation
Type 316 LN	316 LN	S31653
Type 2205	Duplex 2205	S31803
Type 2304	EnduraMet 2304	S32304

E18.5.4 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) Preclean reinforcing steel using acceptable methods to produce an acceptable surface for quality hot-dip galvanizing. If sulphuric acid or hydrochloric acid is used as a pickling bath for precleaning, care shall be exercised to minimize the immersion time. If signs of hydrogen embrittlement are present after pickling due to excessive immersion time, all reinforcing in that shipment will be rejected and shall be replaced at no additional cost to this Contract.
- (iv) Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.
- (v) The surface finish shall be continuous, adherent, as smooth and evenly distributed as possible, and free from any defect detrimental to the stated end use of the coated article.
- (vi) Coating adhesion shall withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.
- (vii) Sheared ends of bars shall be coated with a zinc-rich formulation before rusting occurs and before shipment to the 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 92% in the dried film.
- (iii) At least seven (7) days prior to any field applied galvanizing, the Contract shall submit the galvanizing product and application details to the Contract Administrator for review.
- (iv) Spray applied field galvanizing will not be permitted. Where restrictions occur that brush applied field galvanizing is not possible, spray applied field galvanizing may be permitted if accepted in writing by the Contract Administrator prior to application.
- (v) All field applied galvanized coatings shall be applied in accordance with the manufacturer's recommendations and as directed by the Contract Administrator.
- (vi) The maximum area to be repaired in the field shall be 2,000 mm². Any damaged article with a damaged area greater shall be rejected, removed, and replaced at the Contractor's expense.

E18.5.5 Bar Accessories

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

E18.5.6 Mechanical Splices

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

E18.6 Construction Methods

E18.6.1 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°C prior to bending and galvanizing operations, regardless of ambient temperatures in the plant. Where ambient temperatures fall below 10°C, 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 E18.4.1(c).
 - ◆ Contractor is to carry out a Quality Control Testing Program following the requirements as per ASTM A143/A143M-latest addition. This will include but not limited to random bent bars to be tested after galvanizing, photos of items before and after testing, and a report submitted to the Contract Administrator for each trailer load received on site. Testing criteria shall be submitted for review and approval to the Contract Administrator at least ten (10) Business days prior to manufacturing of reinforcing.
- (d) Stainless Steel Reinforcing
 - (i) Heating shall not be used as an aid in bending stainless steel reinforcing.
 - (ii) Hooks and bends should be smooth and not sharp.
 - (iii) Fabrication of the solid stainless steel reinforcing shall be such that the bar surfaces are not contaminated with deposits of iron and/or non-stainless steel or damage to the surface of the bars.
 - (iv) The stainless steel reinforcing shall be mechanically or chemically de-scaled prior to fabrication, leaving a totally passive stainless steel finish free of 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.

E18.6.2 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 E18.5.4(b).

E18.7 Quality Control

E18.7.1 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.

E18.7.2 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.

E18.7.3 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.

E18.8 Measurement and Payment

- E18.8.1 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.

E19. SUPPLY, FABRICATION, AND ERECTION OF MISCELLANEOUS METAL

E19.1 Description

- (a) 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.
- (b) Miscellaneous metal includes, but is not limited to;
 - (i) Galvanized steel guardrail and stairway handrails, steel fabrications including the container guides, steel nosings, pole structures for security and facility lighting, anchor bolts, and anchor rods.
 - (ii) Quality control of materials and fabrication, including magnetic particle testing of welds.

- (iii) Galvanizing of miscellaneous metal.
- (c) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.
- (d) Scope of Work
 - (i) Supply and install galvanized steel guardrails and handrails
 - (ii) Supply and install galvanized container guides to the structural slabs
 - (iii) Supply and install of anchor bolts and anchor rods.
 - (iv) Supply and install of miscellaneous pre or post- installed mechanical or adhesive fasteners or anchors related to any of the above works.

E19.2 References and Related Specifications

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

E19.2.1 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

E19.3 Submittals

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

E19.4 Materials

E19.4.1 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.

E19.4.2 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.

E19.4.3 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 & Addendum.

E19.4.4 Zinc

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

E19.4.5 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.

E19.4.6 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.

E19.4.7 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. 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.

E19.4.8 Anchor Bolts

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

E19.5 Construction Methods for Fabrication

E19.5.1 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.

E19.5.2 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.

E19.5.3 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.

E19.5.4 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 mm.

E19.5.5 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 mm smaller than the nominal hole diameter, and enlarged by reaming to the correct diameter. The diameter of the die shall not exceed the diameter of the punch by more than 2 mm. Holes shall be clean-cut without torn or ragged edges. Reamed holes shall be truly cylindrical and perpendicular to the member and all burrs shall be removed carefully. All reaming shall be done with twist reamers which shall be directed by mechanical means.
- (e) Allowable Tolerance for Holes - All matching holes for bolts shall register with each other so that a gauge 2 mm less in diameter than the hole shall pass freely through the assembled members in a direction at right angles to such members. Finished holes shall be not more than 2 mm in diameter larger than the diameter of the bolt passing through them unless otherwise specified by the Contract Administrator. The centre-to-centre distance between any two holes of a group of holes shall not vary by more than 1 mm from the dimensioned distance between such holes. Mispunched or misdrilled members shall not be corrected by welding.

E19.5.6 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 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°C.
 - (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°C 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°C and 260°C before they are used. Electrodes conforming to

AWS A5.5 shall be purchased & delivered in hermetically sealed containers or shall be dried 1 hour + 15 min. at a temperature of 425°C + 15°C 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 1 hour + 15 min. at a temperature of 425°C + 15°C 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°C.
 - (ix) E70XX electrodes that are not used within four (4) hours, E80XX within 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 mm shall be discarded. Flux that has been wet shall not be used. Flux fused in welding shall not be reused.
- (e) Preheat and Interpass Temperature
- (i) The minimum preheat and interpass temperatures for welding miscellaneous metal shall conform to AWS D1.1, D1.6 and CSA W59.
- (f) Welding Processes
- (i) Welding processes which do not conform to the provisions of AWS D1.1, D1.6 or CSA W59 shall not be used without the written approval of the Contract Administrator.
- (g) Distortion and Shrinkage Stresses
- (i) Distortion and shrinkage stresses shall be kept to a minimum by the use of jigs and fixtures, utilizing heat distribution and a welding sequence. Areas contiguous to welding operations shall be preheated to a maximum temperature of 120 C, if necessary in the estimation of the Contract Administrator to prevent distortion or weld cracking. The provisions of AWS D1.1, D1.6 and CSA W59 shall be followed in the control of distortion and shrinkage stresses.
- (h) Tack Welding
- (i) All tack welds shall be a minimum of 10 mm in length and made with low hydrogen electrodes and shall not be incorporated in the final structure without specific written authorization by the Contract Administrator.

E19.5.7 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.

E19.5.8 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.

E19.5.9 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 Contactor's expense will be final and binding.
- (d) Field Welding
 - (i) All field welding shall be electric arc welding, and shall be carried out in accordance with the Drawings, AWS D1.1 and CSA W59.
- (e) Final Cleaning
 - (i) All metal surfaces shall be left free of dirt, dried concrete, debris or foreign matter to the satisfaction of the Contract Administrator.

E19.6 Quality Control / Quality Assurance

E19.6.1 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 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.

E19.6.2 Quality Assurance

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

E19.7 Measurement and Payment

E19.7.1 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.

E19.7.2 Items of Work:

- (a) Miscellaneous Metal:
 - (ii) Roll-Off Bin Guide Rail Assembly
 - (iii) Handrail and Guardrail
- (a) Supply and installation of anchor bolts shall be considered incidental to the Work and no separate payment will be made.
- (b) 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.

E20. INTERLOCKING PRECAST MASS CONCRETE BLOCK UNITS

E20.1 Description

- (a) This Specification shall cover all operations relating to the supply and installation of dry-stacking interlocking precast mass concrete block units, herein referred to as "concrete blocks".
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E20.2 Scope of Work

- (a) The Work under this Specification shall include supplying and placing concrete blocks for the yard waste bunker walls, as shown on the Drawings.

E20.3 Materials

E20.3.1 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.

E20.3.2 Interlocking Precast Mass Concrete Block Units shall:

- (a) Bear a legible permanent batch identification mark that can be correlated to archived representative plastic concrete testing.
- (b) Have a mating key clearance that allows a maximum of 12mm of tolerance longitudinally and transversely prior to the binding of the key.
- (c) Have a key mating plane angle minimum of 60 degrees from horizontal.
- (d) Have overall dimensions of 750mm x 750mm x 1500mm + / - 6mm for a standard unit as delivered.
- (e) Have a lifting loop that is designed by a Registered Professional Engineer licensed in Canada.
- (f) Be poured monolithically with concrete having a minimum twenty eight day compressive strength of 20 Mpa.
- (g) Have an entrained air content of 4 to 8 % as tested by plastic concrete testing
- (h) Have a quality assurance program under the direct supervision of a Professional Engineer.

E20.4 Construction Methods

E20.4.1 Foundation Preparation

- (a) The Contractor shall prepare the block wall foundation in accordance with the Drawings.

E20.4.2 Block Wall Assembly

- (a) The Contractor shall carefully assemble the block walls as shown on the Drawings.
- (b) The Contractor shall follow the block manufacturer's installation instructions and guidelines.

E20.5 Measurement and Payment

- E20.5.1 Supplying and placing blocks will be measured on a unit basis. One unit is defined as a single 750 mm x 750 mm x 1500 mm standard block. Blocks with different sizes where required will be measured as the ratio of volume of the standard block. This Work shall be paid for at the Contract Unit Price for the "Supply and Place Precast Concrete Blocks", 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.

E21. ARCHITECTURAL WORKS

DESCRIPTION

- E21.1 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.

E21.2 Scope of Work

- E21.2.1 Refer to the Drawings and Appendix B: NMS Specifications, for Scope of Work.

- E21.3 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.

GENERAL

E21.4 Refer to the Drawings and Appendix B: NMS Specifications, for Materials and Construction Methods.

MEASUREMENT AND PAYMENT

E21.5 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, 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.

E21.5.1 Items of Work:

(a) Scale House Architectural Works:

- (i) Metals stairs, landings
- (ii) Rough carpentry
- (iii) Insulation and metal siding
- (iv) Doors, hardware, windows
- (v) Finishes
- (vi) Washroom accessories
- (vii) Equipment – safes
- (viii) Misc. – window coverings

(b) HHW Building Architectural Works

E21.5.2 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.

E22. ELECTRICAL WORKS

DESCRIPTION

E22.1 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.

E22.2 Scope of Work

E22.2.1 Refer to the Drawings and Appendix B: NMS Specifications, for Scope of Work.

E22.3 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.

GENERAL

E22.4 Refer to the Drawings and Appendix B: NMS Specifications, for Materials and Construction Methods.

MEASUREMENT AND PAYMENT

E22.5 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,

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.

E22.5.1 Items of Work:

- (a) Scale House – Electrical Works
- (b) Prefabricated Kiosk Building – Electrical
- (c) HHW Building – Electrical Works
- (d) Buried Cabling for Site Light Fixtures
- (e) Supply and Install Site Light Fixtures & Poles
- (f) Site Security System
- (g) Electrical – Miscellaneous Materials

E22.5.2 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.

E23. MECHANICAL WORKS

DESCRIPTION

E23.1 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.

E23.2 Scope of Work

E23.2.1 Refer to the Drawings and Appendix B: NMS Specifications, for Scope of Work.

E23.3 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.

GENERAL

E23.4 Refer to the Drawings and Appendix B: NMS Specifications, for Materials and Construction Methods.

MEASUREMENT AND PAYMENT

E23.5 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.

E23.5.1 Items of Work:

- (a) Scale House Mechanical Works:
 - (i) Plumbing - Domestic
 - (ii) Plumbing - Sanitary
 - (iii) Heating
 - (iv) Ventilation
- (b) HHW Building Mechanical Works

- E23.5.2 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.

E24. BARRIER GATES

DESCRIPTION

- E24.1 This Specification shall cover all operations relating to the supply, fabrication, and erection of the barrier gates at the Scale House and Prefabricated Kiosk Building as shown on the Drawings and as specified herein.
- E24.2 Scope of Work
- E24.2.1 Furnish and install a complete microprocessor based parking gate operator system, with a solid-state board to control all functions of the barrier gate, as described herein and shown on the plans. Include all necessary boards, power supplies, loop detectors, barrier arm(s), connectors, and accessories for a complete operational system.
- E24.2.2 Barrier gate foundation design certified by a Professional Engineer registered in the Province of Manitoba.
- E24.2.3 All necessary conduit, raceways and pull boxes shall be installed.
- E24.2.4 Installation of the barrier gate system shall be coordinated with the installation of other site related systems (e.g. weigh scale).
- E24.3 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.

QUALITY CONTROL

- E24.4 Installation shall comply with all applicable codes.
- E24.5 All equipment shall be new, in current production, and the standard products of a manufacturer of vehicular access and parking control equipment.
- E24.6 Manufacturer shall guarantee availability of parts, for a minimum of seven (7) years from date of shipment.
- E24.7 If required, manufacturer shall be able to demonstrate features, functions, operating characteristics to the City.
- E24.8 System shall be installed by a factory authorized contractor, with technicians specifically trained in this system.

REFERENCE STANDARDS

- E24.9 Vehicular Parking Gate Operator shall be in compliance with Underwriters Laboratories Inc. (UL) Standard for Safety - Door, Drapery, Gate, Louver and Window Operators and Systems, UL 325 Fourth Edition; and Underwriters Laboratories Inc. (UL) Standard for Safety - Tests for Safety-Related Controls Employing Solid-State Devices, UL 991 Second Edition.
- E24.10 Vehicular Parking Gate Operator shall be tested for compliance to UL 325 and UL 991 and shall be LISTED by a Nationally Recognized Testing Laboratory (NRTL).

GENERAL

E24.11 Refer to the Drawings and Appendix B: NMS Specifications, for Materials and Construction Methods.

WARRANTY

E24.12 Products shall include a factory warranty that equipment is free from defects in design, material, manufacturing and operation. Factory warranty period shall be for five (5) years; 60-months from date of shipment, for parts and workmanship.

E24.13 Installing contractor shall guarantee the equipment, wire and installation for 12-months from date of acceptance.

SYSTEM DESCRIPTION

E24.14 Barrier Gate Operator:

- (a) The barrier gate operator shall use a microprocessor based solid-state control board that controls all functions of the barrier gate operator. The system shall be designed so that mechanical relays or limit switches are not required. Operators shall be rated for continuous duty for use in commercial and industrial applications.
- (b) Gear reducer output shall use 360° rotation to avoid wear.
- (c) Power shall be transmitted to the gate arm drive shaft through harmonic acting crank and connecting arm.
- (d) Crank, connecting arm and main shaft shall be solid steel construction and plated to avoid rusting.
- (e) Mechanical action of the driven arm shall be such that mechanical stops or braking devices are not necessary.
- (f) Operator housing shall use 12-gauge G90 galvanized steel to avoid rusting.
- (g) Operator shall be designed for either left or right-hand mount.

E24.15 Control Circuit:

- (a) The parking gate operator shall use magnetic sensing to set the up and the down arm limits.
- (b) An adjustable timer shall be built into the control board to allow the barrier arm to automatically close.
- (c) The control board shall be capable of interfacing with card readers, RF transmitters, and coin and ticket machines.
- (d) Functions will be user programmable by DIP-switches located on the control board.
- (e) Control circuit shall include auto-manual toggle switch and power on-off switch.

E24.16 Electronic Reverse: The parking gate operator shall be equipped with an inherent electronic current sensor. The electronic reverse shall automatically cause a descending arm to rise if it strikes an object during the down cycle.

E24.17 Secondary Entrapment Prevention

- (a) Non-contact sensors, or contact sensors, or combination thereof, shall be utilized to prevent persons from becoming entrapped in the gate system.
- (b) Warning signs shall be installed in accordance with manufacturer's installation instructions and UL 325 guidelines.

E24.18 A complete operational system shall be provided.

EQUIPMENT

E24.19 Parking Gate Operators:

- (a) High-cycle single-lane applications.
- (b) Minimum gate arm length is 3.5 metres.

E24.20 Barrier Arms:

- (a) Aluminum or Plastic Arm with red/white retro-reflective warning tape.

INSTALLATION

E24.21 Install barrier gate foundation as per the design certified by a Professional Engineer registered in the Province of Manitoba. Submit foundation design as a Shop Drawing prior to installation, in accordance with E4.

E24.22 Equipment shall be mounted directly to a concrete pad, firmly secured, plumb, and level.

E24.23 Wiring shall be uniform and in accordance with national electric codes and manufacturer's instructions.

E24.24 All splices shall be in easily accessible junction boxes or on terminal boards.

E24.25 All cable runs in all junction boxes shall be tagged and identified.

E24.26 Coordinate all work with other effected trades and contractors.

SYSTEM INITIALIZING AND PROGRAMMING

E24.27 System shall be turned on and adjustment made to meet requirements of specifications and on-site conditions.

E24.28 System shall function as specified.

SYSTEM TEST PROCEDURES

E24.29 System shall be completely tested to assure that all components and accessories are hooked-up and in working order.

E24.30 System shall be pre-tested by contractor and certified to function in accordance with plans and specifications.

E24.31 System shall be tested in presence of owner's representative.

MANUALS AND DRAWINGS

E24.32 Contractor shall provide owner with (2) copies of standard factory prepared operation, installation and maintenance manuals. Manuals shall include typical wiring diagrams.

E24.33 Contractor shall provide owner with (2) copies of any risers, layouts, and special wiring diagrams showing any changes to standard drawings, if required on project.

MEASUREMENT AND PAYMENT

E24.34 Supply and installation of barrier gates will not be measured and paid for at the Contract Lump Sum Price for "Barrier Gates", 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.

E24.34.1 Supplying and installing all the listed materials, concrete design requirements, electrical connections, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Barrier Gates", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E25. PREFABRICATED KIOSK BUILDING

DESCRIPTION

E25.1 Description

E25.1.1 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.

E25.2 Scope of Work

E25.2.1 Refer to the Drawings and Appendix B: 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.

E25.3 General

E25.3.1 Refer to the Drawings and Appendix B: NMS Specifications, for Materials and Construction Methods.

E25.4 Measurement and Payment

E25.4.1 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, 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 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.

E26. WEIGHT SCALE

DESCRIPTION

E26.1 This Specification shall cover all operations relating to the supply, fabrication, and erection of the weigh scale shown on the Drawings and as specified herein.

E26.2 Scope of Work

E26.2.1 Refer to the Drawings and Appendix B: NMS Specifications, for Scope of Work.

E26.3 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.

GENERAL

E26.4 Refer to the Drawings and Appendix B: NMS Specifications, for Materials and Construction Methods.

MEASUREMENT AND PAYMENT

E26.5 Supply and installation of weigh scale will not be measured and paid for at the Contract Lump Sum Price for "Weigh Scale", 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.

- E26.5.1 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 "Weigh Scale", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E27. BAR ARM GATES

E27.1 Description

E27.1.1 General

- (a) This specification covers the supply and installation of bar arm gates and receiver posts at the site entrances off Charette Road.

E27.2 Materials and Equipment

E27.2.1 As per Contract Drawings.

E27.2.2 All steel shall be supplied in accordance with details on the Contract Drawings. All steel shall be hot dip galvanized after fabrication and all hardware shall be stainless steel.

E27.3 Construction Methods

E27.3.1 General

- (a) Supply and install the bar arm gate supports as per the bar arm gate support design submitted to the Contract Administrator.
- (b) Submit the bar arm gate support specifications in accordance with E3 – Shop Drawings.

E27.4 Measurement and Payment

E27.4.1 Bar Arm Gates will be measured on a unit basis and paid for at the Contract Unit Price per gate as "Bar Arm Gate". The number to be paid for will be the total number of bar arm gates installed in accordance with this specification and accepted by the Contract Administrator.

E28. TREES, SHRUBS AND GROUND COVERS

E28.1 Description

E28.1.1 General

- (a) This specification covers the supply and installation of nursery-grown trees and shrubs plantings in areas indicated on the Drawings, including preparation, digging, transport and planting, and maintenance.

E28.1.2 Nomenclature

- (a) Nomenclature of specified nursery stock shall conform to the International Code of Nomenclature for Cultivated Plants and shall be in accordance with the approved scientific names given in the latest edition of Standardized Plant Names. The names of varieties not named therein are generally in conformity with the names accepted in the nursery trade.

E28.1.3 Source Quality Control

- (a) All nursery stock supplied shall be nursery grown and of species and sizes as indicated on the Drawings. Nursery stock shall be No. 1 Grade material in

accordance with the "Canadian Standards for Nursery Stock" as set out by the Canadian Nursery Landscape Association (CNLA).

- (b) The Contractor shall notify Contract Administrator of source of plant material at least seven (7) days in advance of shipment.
- (c) Acceptance of plant material at source does not prevent rejection of same plant material on site prior to or after planting operations.
- (d) Imported plant material must be accompanied with necessary permits and import licenses. Conform to federal and provincial regulations.

E28.1.4 Shipment and Pre-Planting Care

- (a) Coordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.
- (b) Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire, which would damage bark, break branches or destroy natural shape of plant. Give full support to root balls, during lifting.
- (c) Cover plant foliage with tarpaulin, and protect bare roots by means of dampened straw, peat, saw dust or other acceptable material to prevent loss of moisture during transit and storage.
- (d) Keep roots moist and protect from sun and wind. Heel-in trees and shrubs that cannot be planted immediately in shaded areas; water well.

E28.1.5 Replacement

- (a) During the first two (2) years following completion of planting operations, remove from site any plants that have died or failed to grow satisfactorily, as determined by the Contract Administrator. As an example, plant material installed in 2010 that has failed to grow satisfactorily and has not been replaced by October 31, 2011 would be required to be replaced in the Spring of 2012.

E28.2 Materials

E28.2.1 Water

- (a) Water shall be potable and free of minerals that may be detrimental to plant growth.

E28.2.2 Fertilizer

- (a) Fertilizer shall be slow release organic. Fertilizer shall contain N-P-K in ratio as recommended by soil test results from an approved agricultural soil testing laboratory.

E28.2.3 Root Ball Burlap

- (a) Root ball burlap shall be 150 g Hessian burlap.

E28.2.4 Anti-desiccant

- (a) Anti-desiccant shall be wax-like emulsion to provide film over plant surfaces reducing evaporation but permeable enough to permit transpiration.

E28.2.5 Wound Dressing

- (a) Wound dressing shall be horticultural accepted non-toxic, non-hardening emulsion.

E28.2.6 Plant Material

- (a) All plant material specified for this project shall be containerized nursery stock. All plants shall be from the Winnipeg area and the Oak-Aspen Forest Eco-region.

- (b) Comply with latest edition of the “Canadian Standards for Nursery Stock” Stock”, produced by Canadian Nursery Landscape Association (CNLA), referring to quality, size and development of nursery-grown plant material and root balls.
- (c) Nursery stock shall be No. 1 grade shrubs, trees and perennials.
- (d) All plant material shall be measured when branches are in their natural position. Height and spread dimensions and container size shall conform to CNLA standards.
- (e) All plant material shall be measured when branches are in their natural position. Height and spread dimensions specified in the Plant List on the Drawings refer to the main body of the plant, and not from branch tip to root base or from branch tip to branch tip. Where trees are measured by calliper (cal.), reference is made to the diameter of the trunk measured at 300 mm above ground as the tree stands properly planted in the nursery.
- (f) Any plants designated as nursery stock but dug from native stands, wood lots, orchards, or neglected nurseries that have not received proper cultural maintenance, shall be designated as “collected stock”. Material sources are to be approved by Contract Administrator prior to ordering or collecting. The Contractor shall provide all of the necessary nursery certificates to ensure that the plant species comply with this specification.
- (g) All containerized whips and herbaceous plant material shall have a minimum of one full year's growth. Roots shall be healthy, reaching the sides of the containers, and developed such that the root ball can be kept intact during transplanting. Roots shall not encircle each other to the extent of inhibiting plant growth.
- (h) All trees shall have one, only, sturdy, reasonably straight and vertical trunk, and a well-balanced crown with fully developed leader, unless designated “multi-stem”. All evergreens shall be symmetrically grown and branched from ground level, up
- (i) Use trees, shrubs and perennials with structurally sound, strong fibrous root systems, and free of disease, insects, defects or injuries, including rodent damage, sun scald, frost cracks, abrasions or scars to the bark. Plants must have been root pruned regularly, but not later than one growing season prior to arrival on site.
- (j) All parts of the plants shall be moist and show live, green cambium tissue when cut.
- (k) At least one (1) plant of each variety supplied shall bear a tag showing both the botanical and common name of the plant.
- (l) Additional Plant Material Qualifications:
 - (i) Imported Plant Material
 - ◆ Plant material obtained from areas with milder climatic conditions from those of site acceptable only when moved to site prior to the breaking of buds in their original location and heeled-in in a protected area or placed in cold storage until conditions suitable for planting. Obtain Contract Administrator's approval to use imported plant material.
 - (ii) Cold Storage
 - ◆ Approval required for plant material that has been held in cold storage.
 - (iii) Container-Grown Stock
 - ◆ Acceptable if containers large enough for root development. Trees and shrubs must have grown in container for minimum of one growing season but not longer than two. Root system must be able to hold soil when removed from container. Plants that have become root bound are not acceptable. Container stock must have been fertilized with slow releasing fertilizer.
 - (iv) Balled and Burlapped Plant Material

- ◆ Deciduous trees in excess of 3 m height must have been dug with large firm ball. Root balls must include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil. Secure root balls with burlap, heavy twine and rope. For large trees: wrap ball in double layer of burlap and drum lace with minimum 10 mm diameter rope. Protect root balls against sudden changes in temperature and exposure to heavy rainfall.
- (v) Tree Spade Dug Material
 - ◆ Obtain approval of the Contract Administrator for digging plant material with mechanized digging equipment, hydraulic spade or clam-shell type. Dig root balls to satisfy Landscape Canada (CNTA) standards. Lift root ball from hole, place in wire basket designed for purpose, line with burlap. Tie basket to ball with heavy rope. Take care not to injure trunk of tree with wire basket ties or rope.
- (vi) Substitutions
 - ◆ Substitutions to plant material as indicated on the Plant List will not be permitted unless written approval has been obtained as to type, variety and size prior to award of Contract. Plant substitutions must be of similar species and of equal size to those originally specified.

E28.3 Construction Methods

E28.3.1 Workmanship

- (a) The Contractor shall layout location of shrubs and planting beds as per the Drawings. Obtain Contract Administrator's approval prior to excavating.
- (b) The Contractor shall obtain clearances from all utilities, with respect to underground lines located in the areas to be excavated, prior to commencing planting operations.
- (c) The Contractor shall apply anti-desiccant in accordance with material manufacturer's instructions.
- (d) The Contractor shall coordinate planting operations; keep the site clean and planting holes drained, and immediately remove soil or debris spilled onto pavement.

E28.3.2 Planting Time

- (a) The Contractor shall plant deciduous plant material during dormant period before buds have broken. Plant material noted for spring planting only must be planted in dormant stage.
- (b) Plant material imported from region with warmer climatic conditions may only be planted in early spring.
- (c) When permission has been obtained to plant deciduous plant material after buds have broken, spray plants with anti-desiccant to slow down transpiration prior to transplanting.
- (d) When permission has been obtained, trees, shrubs and perennials growing in containers may be planted throughout growing season.
- (e) Plant only under conditions that are conducive to health and physical conditions of plants.
- (f) The Contractor shall provide the Contract Administrator with a planting schedule at least two weeks prior to planting operations. Extending planting operations over long period using limited crew will not be accepted.

E28.3.3 Excavations

- (a) Shrub beds: excavate to minimum depth of 450 mm, as indicated on the Drawings. Individual shrubs shall be planted in 600 mm deep holes backfilled with planting soil mixture.
- (b) Trees: excavate to depth such that the top of the root ball is below existing grade, with a surface width of two times the diameter of the root ball. Backfill around trees with planting soil mixture such that the top of the root ball is even with existing grade.
- (c) The sides of all shrub beds shall be scarified to the depth of 150 mm.
- (d) Provide drainage for planting holes in heavy soil. Have method approved by Contract Administrator.
- (e) Protect the bottoms of excavations against freezing.
- (f) Remove water that enters excavations prior to planting. Ensure source of water is not ground water.

E28.3.4 Planting

- (a) Trees shall be placed on undisturbed soil and to a depth equal to that at which they were originally growing at the nursery.
- (b) For shrubs, loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum of 150 mm of planting soil mixture.
- (c) Plant trees and shrubs vertically, with roots placed straight out in hole. Orient plant material to give best appearance in relation to structures, roads and walkways.
- (d) Place plant material to depth equal to depth they were originally growing in nursery or in locations collected.
- (e) Ball and burlap root balls: loosen burlap and cut away minimum top 1/3 without disturbing root ball. Do not pull burlap or rope from under root ball. With container stock, remove entire container without disturbing root ball. Non-biodegradable wrappings must be removed.

Tree spade excavated materials:

- (f) Tree spade planting shall be permitted only by approval of the Contract Administrator.
- (g) Dig tree pit with same mechanical equipment as used to dig plant material. Ensure hole dug is upright as possible. Place in hole a mixture of 40 L of planting soil and fertilizer mixed with water to soupy consistency. This will be forced up sides of ball as root ball is placed in hole.
- (h) Loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum 150 mm topsoil mixture.
- (i) Tamp planting soil mixture around root system in layers of 150 mm eliminating air voids. Frozen or saturated planting soil is unacceptable. When 2/3 of planting soil has been placed, fill hole with water. After water has been completely penetrated into soil, complete backfilling.
- (j) Excavate 200 mm depth an additional 600 mm beyond planting pits around the perimeter of all tree planting pits, and fill with planting soil mixture.
- (k) Construct 100 mm deep saucers around the outer edge of planting pits to assist with maintenance watering.
- (l) When planting is completed apply slow release organic fertilizer at minimum rate of 12 kg/100 m for shrub beds or as recommended by the soil analysis. Mix fertilizer thoroughly with top layer of planting soil and water in well.

E28.3.5 Pruning

- (a) Prune trees, shrubs and groundcover after planting, as indicated. Postpone pruning of those trees where heavy bleeding may occur, until in full leaf. Employ clean sharp

tools and make cuts flush with main branch, smooth and sloping as to prevent accumulation of water. Remove projecting stumps on trunks or main branches. Remove dead and injured branches and branches that rub causing damage to bark. Trim trees and shrubs without changing their natural shape. Do not damage lead branches or remove smaller twigs along main branches.

E28.3.6 Standards

- (a) All roots shall be cleanly cut; split roots are not acceptable.
- (b) Branches and trunks shall be tied and protected; broken or abraded branches or trunks are not acceptable.
- (c) Planting shall be protected from drying conditions; desiccated material not acceptable.
- (d) All plants shall be free of insects and disease: galls, blight and other manifestations of insect infestation or disease not acceptable.

E28.3.7 Wood Mulch

- (a) All planting beds shall be covered with a 75 mm depth of wood chip mulch to the limits shown on the planting details.
- (b) Wood mulch shall extend to the limits of the beds shown on drawings, but shall not be installed within 50 mm of the plant stem.
- (c) The saucers of all trees not planted in beds shall be covered with a 100 mm depth of wood chip mulch.

E28.4 Maintenance

E28.4.1 Watering

- (a) Plant material shall be watered once a week for first four weeks following installation, and once every second week, thereafter. Ensure adequate moisture in root zone at freeze-up.

E28.4.2 Weeding

- (a) Keep mulched shrub and perennial grass beds weed-free by manually removing weeds during the maintenance period.

E28.4.3 Insects and Diseases

- (a) Spray plants to combat pests and diseases. Use organic chemical insecticides approved by Agriculture Canada.

E28.4.4 Adjustments

- (a) Make adjustments requested by the Contract Administrator, including straightening trees, tightening guy wires and removing tree stakes.

E28.4.5 Maintenance Period

- (a) Maintain plant material for a period of two years following acceptance to start maintenance period of planting operations, as determined by the Contract Administrator.

E28.5 Measurement and Payment

E28.5.1 Trees, Shrubs and Ground Covers

- (a) Supply and installation of trees, shrubs and perennials will be measured on a unit price basis and will be paid for at the Contract Unit Price per unit for "Items of Work", 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 the specification.
 - (i) Items of Work:

- ◆ Deciduous Trees (60-75 mm cal., 3700 – 4600 mm Height)
- ◆ Coniferous Trees (2400 mm Height)
- ◆ Ornamental Deciduous Trees (50 – 60 mm cal., 3700 - 4600 mm Height)

(b) Supply and installation of fertilizer for plant material will be included in payment for the plant material. The supply of mulch for saucers around deciduous trees not is included in the unit price for those trees and no separate payment will be made.

E29. PLANTING SOIL

E29.1 Description

E29.1.1 General

(a) This specification shall amend and supplement City of Winnipeg Standard Construction Specification CW 3540-R5 "Topsoil and Finish Grading for Establishment of Turf Areas", and shall cover supply, preparation and placement of planting soil.

E29.1.2 Referenced Standard Construction Specifications

(a) CW 3540-R5 Topsoil and Finish Grading for Establishment of Turf Areas

E29.2 Materials

E29.2.1 Compost

(a) Compost shall be decomposed plant material, fairly elastic and homogenous, free of colloidal residue, wood, sulphur and iron; containing a minimum of 60% organic material by weight, with moisture content not exceeding 15%. Shredded particles shall not exceed 6 mm in size. Minimum pH value of peat shall be 4.5; maximum 6.0.

(b) The Owner will supply compost to the Contractor for installation.

E29.2.2 Sand

(a) Sand shall be hard, granular, sharp sand to CSA A82.56-M1976, well-washed and free of impurities, chemicals and organic matter.

E29.2.3 Bonemeal

(a) Bonemeal shall be raw, finely ground with a minimum chemical analysis of 3% nitrogen and 20% phosphoric acid.

E29.2.4 Wood Mulch

(a) Wood mulch shall be chipped ash, maple, poplar, birch and other deciduous trees. Mulch shall be chipped to sizes ranging from 50mm to 100mm. Mulch may NOT contain stringy twigs and seed. Mulch shall be free of non-organic material, wood preservatives or diseased wood. The mulch shall contain no more than 5% of the following materials in total: soil, sawdust, peatmoss, coniferous wood and needles.

(b) The Owner will supply wood mulch to the Contractor for installation.

E29.2.5 Fertilizer

(a) Chemical fertilizers shall have N-P-K compositions as recommended by an agricultural soil-testing laboratory approved by the Contract Administrator provided for each of the following:

- (i) Horticultural shrubs and perennial grasses with planting soil mix;

E29.2.6 Chemical Application

(a) Roundup or similar chemical herbicides approved by Agriculture Canada shall be used only with the approval of the Contract Administrator.

E29.3 Construction Methods

E29.3.1 Planting Soil Mixture for Trees, Shrubs Perennials

- (a) Planting soil mixture shall be a mix of 75% topsoil and 20% peatmoss, loose by volume. Incorporate 5% sand, or as required, to improve soil texture. Incorporate bonemeal at 3 kg/cubic metre of planting soil mixture.

E29.3.2 Construction of Planting Beds

- (a) Core or excavate centre island and planting beds to a depth of 450 mm, and sufficient width to allow 450 mm topsoil to the side of all rootballs.
- (b) Install planting soil mixture, loosely compacted in planting beds with a smooth top surface to match surrounding contours. Level planting soil mixture by hand around existing and newly planted shrubs and perennials.
- (c) Install 75 mm depth wood mulch in all beds following planting operations.

E29.4 Measurement and Payment

- E29.4.1 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 "Trees, Shrubs, and Ground Covers", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E30. LONG TERM SCHEDULED MAINTENANCE OF PLANT MATERIAL

E30.1 Description

E30.1.1 General

- (a) This specification covers the maintenance of plant material and planting beds following acceptance of the work by the Contract Administrator.

E30.2 Materials

- E30.2.1 The Contractor shall provide all necessary materials and equipment including: additional topsoil, soil ameliorates, mulches, sod, seed, fertilizers and pesticides, and tractors, mowers, hand mowers, trimmers, fertilizer spreaders, pruning tools, water trucks, hoses, water metres and any other items necessary for the maintenance of the areas indicated in this specification.

E30.3 Construction Methods

E30.3.1 Provision of Maintenance Personnel

- (a) The Contractor shall provide all necessary personnel for the ongoing maintenance operations.

E30.3.2 Capability of Personnel

- (a) Maintenance personnel should have at least one year of experience in landscape maintenance and should be under the direction of a foreman, in all cases, with not less than five years of experience with similar maintenance operations.
- (b) The maintenance foreman shall be familiar with native plantings and plant identification techniques.

E30.3.3 Maintenance Period

- (a) Maintain trees, shrubs and planting beds for a period of two (2) years from the completion of the Maintenance for Establishment period, as determined by the Contract Administrator. Note: Completion shall not occur after October 30, or before May 15 of any year.

E30.3.4 Maintenance Schedule

- (a) Provide the Contract Administrator a Schedule of Proposed Maintenance Activities for the two-year scheduled maintenance period, based on the requirements outlined herein. The scheduled maintenance period shall not commence until the schedule has been reviewed by the Contract Administrator.

E30.3.5 Recording Maintenance Operations

- (a) The Contractor shall provide a detailed maintenance log, including but not limited to the following: hours of labour undertaken, number of personnel employed and equipment used. The log will itemize watering, spraying and any other maintenance work. Contractor shall submit logs monthly at regularly scheduled meetings with the Contract Administrator. Maintenance log will be included in payment for the maintenance work

E30.3.6 Maintenance of Trees, Shrubs, Perennials and Planting Beds

- (a) Maintain shrubs, grasses and planting beds as indicated in E28.4.
- (b) Watering Trees, Shrubs and Perennials
 - (i) Newly planted trees, perennials, and shrubs require water to become established; however, watering too often can kill a plant. During the summer, if temperatures are fairly high and there has been no rainfall, water approximately once a week.
 - (ii) Contractor shall determine the need for watering by taking soil tests weekly with a one-inch auger. Take a test sample from the planting soil by drilling to a minimum depth of 600 mm. The soil shall contain enough moisture to hold together when compressed in the hand, but shall not be muddy.
 - (iii) Testing shall be undertaken at a minimum of 10 sites per week at a minimum of 10m between sites. The installed plant material and bioengineering shall not be allowed to dry out to the detriment of the viability of the plant material. Contractor shall monitor and submit lots to the Contract Administrator monthly. Contractor shall water-in plant material works in late fall during the scheduled maintenance period.
 - (iv) Thoroughly soak coniferous trees prior to winter freeze-up.
- (c) Pruning Trees and Deciduous Shrubs
 - (i) Prune in accordance with E28.3.5 by thinning out unnecessary limbs or portions of limbs and by cutting back the terminal growth. Cut with pruning shears. When cutting the terminal growth, make the cuts one-quarter inch above the bud or lead twig. Where an entire limb is removed, make the cuts flush with the main stem or trunk.
- (d) Cultivation
 - (i) Cultivate only as required to reconstruct planting beds, or tree saucers to remove significant weed growth.
 - (ii) Do not cultivate around plants with a shovel or spade. The tendency is to penetrate too deeply and cause root injury. Cultivate with a hoe or similar tool. When using a hoe never penetrate soil more than 50 mm. Maintain natural elevation of the surrounding area when cultivating. Create a gentle saucer to contain water around the tree root zone.
 - (iii) Avoid pyramiding soil around the base of any plant as this causes water to drain away and will encourage undesirable top root growth.
 - (iv) The boundary between the adjacent sod and soil saucer should be crisp and well formed.
 - (v) Restore wood mulch when cultivation completed.

- (e) Spraying
 - (i) Spray trees and shrubs to control insect pests and diseases. Use horticultural compounds approved by Agriculture Canada, which are specific for the problem to be contained.
- (f) Straightening
 - (i) Straighten trees as required or as directed by the Contract Administrator
- (g) Mulching Chip
 - (i) Add wood mulch to planting areas as required to maintain an even fresh surface.
- (h) Weeding
 - (i) Hand weed and lightly rake a minimum of once per month, or as determined by the Contract Administrator, to remove competition for installed plant material/undesirable plant material. Dispose of undesirable material within the BRRMF, as directed by the Contract Administrator.
 - (ii) The Contractor shall be responsible for any fines or weed control notices issued for the planting areas. All such notices shall be dealt with by the Contractor in a timely fashion. Copies of any fines and notices shall be provided to the Contract Administrator within five (5) working days of receipt by the Contractor.
- (i) General Cleanup
 - (i) Remove garbage and debris from planting beds as required or as directed by the Contract Administrator

E30.4 Measurement and Payment

E30.4.1 General Maintenance of Trees, Shrubs, Perennials and Planting Beds

- (a) Two year general maintenance of trees and shrubs, and planting beds including fertilizing, pruning, spraying for insects, disease control, cultivation, care of guy wires and turnbuckles, straightening, mulching, watering, weeding and cleanup will be measured twice each season, typically in July and October, for a six month annual growing season from April 15 to October 15 each year
- (b) All measured work will be in accordance with the Drawings and this specification and accepted by the Contract Administrator, as computed by the Contract Administrator.

E30.4.2 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 "Trees, Shrubs, and Ground Covers", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E31. PLANT MATERIAL WARRANTY

E31.1 Description

E31.1.1 General

- (a) This specification covers the provision of warranty for all plant material itemized on the Plant List, for the two-year maintenance period and for the individual areas identified within the overall Contract Area.

E31.1.2 Timing

- (a) Warranty shall be for two (2) years, commencing upon acceptance of installed plant material.

E31.1.3 Warranty

- (a) The Contractor hereby warrants that the plant material as itemized on the Plant Lists and on the Drawings will remain free of defects for the maintenance period.
- (b) All plant material will be accepted by the Contract Administrator when the entire project has reached Substantial Performance and the planting operation is complete, provided that the plant material exhibits healthy vigorous growth and is free from disease, insects and fungal organisms.
- (c) All plant material installed less than 90 days prior to frost will be reviewed for acceptance in the following spring, 30 days after the start of the growing season, provided that acceptance conditions are fulfilled.

E31.2 Maintenance During Warranty Period

E31.2.1 From time of acceptance by the Consultant to end of warranty period, perform following maintenance operations.

- (a) Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
- (b) Reform damaged watering saucers.
- (c) Remove weeds monthly.
- (d) Replace or respread damaged, missing or disturbed mulch.
- (e) For non-mulched areas, cultivate monthly to keep top layer of soil friable.
- (f) Apply pesticides in accordance with Federal, Provincial and Municipal regulations as and when required by the Consultant to control insects, fungus and disease. Obtain product approval from the Consultant prior to application.
- (g) Apply fertilizer in early spring as indicated by soil test.
- (h) Remove dead, broken or hazardous branches from plant material.
- (i) Keep trunk protection and tree supports in proper repair and adjustment.
- (j) Remove trunk protection, tree supports and level watering saucers at end of warranty period.
- (k) Submit monthly written reports to the Consultant identifying:
 - (i) Maintenance work carried out.
 - (ii) Development and condition of plant material.
 - (iii) Preventative or corrective measures required which are outside Contractor's responsibility.
- (l) An inspection of plant material will occur after the first year following Substantial Performance. Replacements may be required at that time depending on the extent of plant deficiencies noted. Replacements shall be planted as soon as possible, during the proper planting season, in accordance with accepted horticultural practices.

E31.3 End-of-Warranty Inspection

E31.3.1 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

E31.3.2 Remove trunk protection and tree supports.

E31.3.3 Adjust rodent protection, leave intact.

E31.3.4 Contract Administrator reserves the right to extend the Contractor's warranty responsibilities for an additional year, at the end of the designated warranty period for the appropriate area, if at that time plant material leaf development and growth are not sufficient to ensure future survival.

E31.4 Replacement

- E31.4.1 During the warranty period, remove from site any plant material that has died or failed to grow satisfactorily, as determined by the Contract Administrator and replace with healthy plant material of the same species and size.
- E31.4.2 Replace plant material in the following spring or fall as directed.
- E31.4.3 Extend warranty on replacement plant material for an additional period until the end of the specified warranty period or for one full growing season, whichever is the longer period.
- E31.4.4 Continue such replacement and warranty until plant material is acceptable.
- E31.4.5 Trees determined by the Contract Administrator to have been damaged by vandalism shall be replaced and such replacement trees will be paid for at the Contract Unit Prices for the species indicated on the Drawings.

MEASUREMENT AND PAYMENT

- E31.5 Measurement and Payment
 - E31.5.1 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 "Trees, Shrubs, and Ground Covers", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.