THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 516-2008

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

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B1.1 KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, July 29, 2008.

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. ENQUIRIES

B3.1 All enquiries shall be directed to the Contract Administrator identified in D3.1.

B3.2 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.

B3.3 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.

B3.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.

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

B4. ADDENDA

B4.1 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.

B4.2 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.

B4.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.

B4.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Branch internet website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B4.3 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.

B5. SUBSTITUTES

B5.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.

B5.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B5.3 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.

B5.4 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.

B5.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his 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.

B5.6 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.

B5.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely responsible for disseminating information regarding the approval to any person or persons he wishes to inform.

B5.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B5.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his 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 B14.

B5.9 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.

B6. BID COMPONENTS

B6.1 The Bid shall consist of the following components:

(a) Form A: Bid;

(b) Form B: Prices, hard copy;

(c) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;

B6.2 Further to B6.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B5.

B6.3 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.

B6.4 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.

B6.4.1 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.

B6.4.2 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.

B6.5 Bidders are advised not to include any information/literature except as requested in accordance with B6.1.

B6.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, may result in the Bid being determined to be non-responsive.

B6.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B6.8 Bids shall be submitted to:

The City of Winnipeg
Corporate Finance Department
Materials Management Branch
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B7. BID

B7.1 The Bidder shall complete Form A: Bid, making all required entries.

B7.2 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 own name, his 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 own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

B7.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B7.2.

B7.3 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.

B7.4 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 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 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.

B7.4.1 The name and official capacity of all individuals signing Form A: Bid shall be printed below such signatures.

B7.4.2 All signatures should be witnessed, except where a corporate seal has been affixed.

B7.5 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.

B8. PRICES

B8.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B8.1.1 For the convenience of Bidders, and pursuant to B6.4.2 and B14.4.3, an electronic spreadsheet Form B: Prices in Microsoft Excel (.xls) format is available along with the Adobe PDF documents for this Bid Opportunity on the Bid Opportunities page at the Materials Management Branch internet website at http://www.winnipeg.ca/matmgt.

B8.2 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.

B8.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.

B9. QUALIFICATION

B9.1 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.

B9.2 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 Branch internet site at http://www.winnipeg.ca/matmgt).

B9.3 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);

B9.4 Further to B9.3(c), the Bidder shall, within three (3) 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 valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association or by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or

(b) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.)

B9.5 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.

B9.6 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.

B10. BID SECURITY

B10.1 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.

B10.1.1 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.

B10.1.2 All signatures on bid securities shall be original, and shall be witnessed or sealed as required.

B10.2 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.

B10.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B10.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B10.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B10.3 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.

B11. OPENING OF BIDS AND RELEASE OF INFORMATION

B11.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Branch, or in such other office as may be designated by the Manager of Materials.

B11.1.1 Bidders or their representatives may attend.

B11.1.2 Bids determined by the Manager of Materials, or his designate, to not include the bid security specified in B10 will not be read out.

B11.2 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 Branch internet site at http://www.winnipeg.ca/matmgt.

B11.3 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 Branch internet site at http://www.winnipeg.ca/matmgt.

B11.4 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.

B12. IRREVOCABLE BID

B12.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B12.2 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.

B13. WITHDRAWAL OF BIDS

B13.1 A Bidder may withdraw his Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

B13.1.1 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.

B13.1.2 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.

B13.1.3 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 B13.1.3(b), declare the Bid withdrawn.

B13.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B12.2 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.

B14. EVALUATION OF BIDS

B14.1 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 (pass/fail);

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B9 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B5.

B14.2 Further to B14.1(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.

B14.3 Further to B14.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid or in other information required to be submitted, that he is responsible and qualified.

B14.4 Further to B14.1(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.

B14.4.1 If there is any discrepancy between the Total Bid Price written in figures, the Total Bid Price written in words and the sum of the quantities multiplied by the unit prices for each item, the sum of the quantities multiplied by the unit prices for each item shall take precedence.

B14.4.2 Further to B14.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B14.4.3 The electronic Form B: Prices and the formulas imbedded in that spreadsheet are only provided for the convenience of Bidders. The City makes no representations or warranties as to the correctness of the imbedded formulas. It is the Bidder's responsibility to ensure the extensions of the unit prices and the sum of Total Bid Price performed as a function of the formulas within the electronic Form B: Prices are correct.

B15. AWARD OF CONTRACT

B15.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B15.2 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.

B15.2.1 Without limiting the generality of B15.2, 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.

B15.3 Subject to B15.2, 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.

B15.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his 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 Branch internet site at http://www.winnipeg.ca/matmgt.

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

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

(a) Pavement Reconstruction – Asphalt
  (i) King Street from Bannatyne Avenue to William Avenue

(b) King Street Sidewalk Reconstruction
  (i) Adjacent to Old Market Square

(c) Bannatyne Avenue - Re-alignment and North Side Reconstruction
  (i) Albert Street to King Street

(d) Old Market Square Redevelopment Phase I

D2.2 The major components of the Work are as follows:

(a) Pavement Reconstruction
  (i) Remove existing pavement
  (ii) Excavation
  (iii) Installation of subdrains
  (iv) Insulation of water services
  (v) Compaction of existing sub-grade
  (vi) Installation of catchbasins and connection pipe
  (vii) Placement of separation/reinforcement fabric
  (viii) Placement of sub-base and base course materials
  (ix) Construct curb and gutter utilizing slip-form paving equipment 1
  (x) Adjustment of existing manholes
  (xi) Placement of asphalt pavement (average thickness –150mm)
  (xii) Restoration of existing west sidewalk

(b) King Street East Sidewalk
  (i) Remove existing sidewalk and pavers
  (ii) Stittsville lights pile installation and base plate
  (iii) Construction of tree wells and covers
  (iv) Construction of concrete sidewalk
  (v) Supply and install paving stones
  (vi) Supply and install trees and perennials

(c) Bannatyne Avenue - Re-alignment and Road Improvement
- (i) Complete saw cutting for curb and gutter
- (ii) Remove existing pavement
- (iii) Remove existing sidewalk and pavers
- (iv) Excavation
- (v) Planing of existing asphalt pavement
- (vi) Adjustment of existing manholes
- (vii) Construct curb and gutter utilizing slip-form paving equipment
- (viii) Construct 180mm barrier curb
- (ix) Placement asphalt overlay
- (x) Stittsville lights base installation and base plate
- (xi) Construction of concrete sidewalk
- (xii) Supply and install paving stones
- (xiii) Placement of soil mix in the planters and planting beds
- (xiv) Installation of tree flood lighting and electrical services

(d) Old Market Square Redevelopment Phase I
- (i) Removals and salvage
- (ii) Excavation of event area
- (iii) Piling
- (iv) Installation of concrete seating walls
- (v) Installation of concrete planters
- (vi) Installation of irrigation system for event area
- (vii) Installation of water supply system
- (viii) Installation of drainage system for event area
- (ix) Installation of tree flood lighting and electrical services
- (x) Installation of concrete sidewalk with pavers
- (xi) Supply and install trees and perennials
- (xii) Landscaping

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is Stantec Consulting Ltd, represented by:

Vilko Maroti, P.Eng.
Contract Administrator
905 Waverley Street
Winnipeg, MB R3T 5P4

Telephone No. (204) 928-8834
Facsimile No. (204) 453-9012

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

D4. CONTRACTOR'S SUPERVISOR

D4.1 At the pre-construction meeting, the Contractor shall identify his 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 24 hours a day to respond to an emergency.

D5. NOTICES

D5.1 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.

D5.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D5.3, D5.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D3.1.

D5.3 All notices of appeal to the Chief Administrative Officer shall be sent to the following address or facsimile number:

The City of Winnipeg
Chief Administrative Officer Secretariat
Attn: Chief Administrative Officer
Administration Building, 3rd Floor
510 Main Street
Winnipeg MB R3B 1B9

Facsimile No.: (204) 949-1174

D5.4 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 address or facsimile number:

The City of Winnipeg
Corporate Services Department
Legal Services Division
Attn: City Solicitor
185 King Street, 3rd Floor
Winnipeg MB R3B 1J1

Facsimile No.: (204) 947-9155

D6. FURNISHING OF DOCUMENTS

D6.1 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 at cost.

SUBMISSIONS

D7. AUTHORITY TO CARRY ON BUSINESS

D7.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on

business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D8. SAFE WORK PLAN

D8.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D8.2 The Safe Work Plan shall be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.

D9. INSURANCE

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

(a) commercial general liability insurance, in the amount of at least 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) automobile liability insurance for owned automobiles used for or in connection with the Work in the amount of at least two million dollars ($2,000,000.00) at all times during the performance of the Work and until the date of Total Performance;

(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.

D9.2 Deductibles shall be borne by the Contractor.

D9.3 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.

D9.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least fifteen (15) Calendar Days prior written notice to the Contract Administrator.

D10. PERFORMANCE SECURITY

D10.1 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.

D10.1.1 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.

D10.2 If the bid security provided in his Bid was not a certified cheque or draft pursuant to B10.1(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.

D11. SUBCONTRACTOR LIST

D11.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at or prior to a pre-construction meeting, or at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the C4.1 for the return of the executed Contract.

D12. EQUIPMENT LIST

D12.1 The Contractor shall provide the Contract Administrator with a complete list of the equipment which the Contractor proposes to utilize (Form K: Equipment List) at or prior to a pre-construction meeting, or at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the C4.1 for the return of the executed Contract.

D13. DETAILED WORK SCHEDULE

D13.1 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.

SCHEDULE OF WORK

D14. COMMENCEMENT

D14.1 The Contractor shall not commence any Work until he is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.

D14.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:
  (i) evidence of authority to carry on business specified in D7;
  (ii) evidence of the workers compensation coverage specified in C6.15;
  (iii) the twenty-four (24) hour emergency response phone number specified in D4.2.
  (iv) the Safe Work Plan specified in D8;
  (v) evidence of the insurance specified in D9;
  (vi) the performance security specified in D10;
  (vii) the subcontractor list specified in D11;
  (viii) the equipment list specified in D12;
  (ix) the detailed work schedule specified in D13; and

(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.

D14.3 The Contractor shall commence the Work on the Site no later than seven (7) days after issuance of the Letter of Intent.

D14.4 The Contractor shall not commence the Work on the Site before August 11, 2008, and no later than seven (7) days after the issuance of the Letter of Intent, as directed by the Contract Administrator and weather permitting. In addition, the Contractor shall not start sooner than the first (1st) Working Day or later than the sixth (6th) Working Days following the completion of Phase 1 Critical Stages of BO # 56-2008 (D14.1a) 2008 Watermain Renewals – Contract 2.

D15. WORKING DAYS

D15.1 Further to C1.1(gg);

D15.1.1 The Contract Administrator will determine daily if a Working Day has elapsed and will record his assessment. On a weekly basis the Contract Administrator will provide the Contractor with a record of the Working Days assessed for the preceding week. The Contractor shall sign each report signifying that he agrees with the Contract Administrator's determination of the Working Days assessed for the report period.

D15.1.2 Work done to restore the Site to a condition suitable for Work, shall not be considered "work" as defined in the definition of a Working Day.

D15.1.3 When the Work includes two or more major types of Work that can be performed under different atmospheric conditions, the Contract Administrator shall consider all major types of Work in determining whether the Contractor was able to work in assessing Working Days.

D16. RESTRICTED WORK HOURS

D16.1 Further to clause 3.10 of CW 1130, the Contractor shall require written permission 48 hours in advance from the Contract Administrator for any work to be performed between 2000 hours and 0700 hours, or on Saturdays, Sundays, Statutory Holidays and or Civic Holidays.

D17. WORK BY OTHERS

D17.1 Work by others on or near the Site will include but not necessarily be limited to:

(a) Geomatic Services Branch of planning and Property and Development – Various work on survey monuments at various locations throughout the sites.

(b) Adjusting / replacing existing Manitoba Hydro, MTS and, AT&T manholes. These adjustments should be co-ordinated with adjustment of drainage inlets and manholes.

(c) Installing new street light cables at east property line by Manitoba Hydro.

(d) Refurbishing and relocation stittsville lighting standards by Gerald Alcock

(e) City of Winnipeg Traffic Signals Department– Upgrade of Signals.

(f) City of Winnipeg Traffic Services Department– Replace signs and paint lines.

(g) Water and Waste Department performing watermain renewal work on King Street BO # 56-2008.

(h) City of Winnipeg Parks Department and Forestry Department

(i) City of Winnipeg Parking Authority - Removal and Reinstallation of Pay-stations

(j) City of Winnipeg Property Planning and Development will be removing fixtures before the project starts

D18. SEQUENCE OF WORK

D18.1 Further to C6.1, the sequence of work shall be as follows:

D18.1.1 The Work shall be divided into four phases. Each Phase shall be subdivided into stages. Stages are further subdivided into major items of work.

D18.1.2 **Phase I** – King Street - Bannatyne Avenue to William Avenue Pavement Reconstruction

(a) **Stage I** – King Street North Bound Lane (East Side)

(i) Remove existing pavement
(ii) Excavation
(iii) Installation of subdrains
(iv) Compaction of existing sub-grade
(v) Installation of catchbasins and connection pipe
(vi) Placement of separation/reinforcement fabric
(vii) Placement of sub-base and base course materials
(viii) Construct curb and gutter utilizing slip-form paving equipment
(ix) Adjustment of existing manholes
(x) Construction of Asphaltic Concrete Base Course (Type III - average thickness – 75mm)
(xi) Traffic cannot be reopened on the east lane until Manitoba Hydro has completed raising their Manhole.

(b) **Stage II** – King Street North Bound Lane (West Side)

(i) Remove existing pavement
(ii) Excavation
(iii) Installation of subdrains
(iv) Insulation of water services
(v) Compaction of existing sub-grade
(vi) Installation of catchbasins and connection pipe
(vii) Placement of separation/reinforcement fabric
(viii) Placement of sub-base and base course materials
(ix) Construct curb and gutter utilizing slip-form paving equipment
(x) Adjustment of existing manholes
(xi) Construction of Asphaltic Concrete Base Course (Type III - average thickness – 75mm)
(xii) Restoration of existing sidewalk West Side

(c) **Stage III** – King Street North Bound Lane Final Layer of Asphalt All Lanes

(i) Planing of existing asphalt pavement
(ii) Construction of Asphaltic Concrete Pavements (Type IA - average thickness – 75mm)
(iii) All asphaltic concrete work shall be performed using a lane-at-a-time method (see E5 for minimum requirements of traffic lanes to be left open at various times).
(iv) At the end of any day, there shall be no drop-off along any longitudinal joint, excepting the longitudinal joint between the gutter and approaches.

D18.1.3 Immediately following the completion of the asphaltic concrete works of Phase I, the Contractor shall clean up the Site and remove all plant, surplus material, waste and debris, other than that left by the City or other Contractors.

D18.1.4 **Phase II** - King Street Sidewalk (East Side)

(i) Remove existing sidewalk and pavers
(ii) Stittsville lights base installation and base plate and removal of existing concrete bases
(iii) Construction of tree wells and covers
(iv) Construction of concrete sidewalk
(v) Supply and install paving stones

(vi) Supply and install trees and perennials

D18.1.5 **Phase III** – Bannatyne Avenue - Re-alignment and Road Improvement

(i) Complete saw cutting for curb and gutter
(ii) Remove existing pavement
(iii) Remove existing sidewalk and pavers
(iv) Excavation
(v) Planing of existing asphalt pavement
(vi) Adjustment of existing manholes
(vii) Construct curb and gutter utilizing slip-form paving equipment
(viii) Construct 180mm barrier curb
(ix) Placement asphalt overlay
(x) Stittsville lights base installation and base plate and removal of existing concrete bases
(xi) Construction of concrete sidewalk
(xii) Supply and install paving stones
(xiii) Placement of soil mix in the planters and planting beds
(xiv) Installation of tree flood lighting and electrical services

D18.1.6 **Phase IV** - Old Market Square Redevelopment Phase I

(i) Removals and salvage
(ii) Excavation of event area
(iii) Installation of water supply system and irrigation system for event area
(iv) Installation of catchbasins and connection pipe
(v) Installation of drainage system for event area
(vi) Construction of concrete seating walls
(vii) Construction of concrete planters
(viii) Placement of limestone in the planters
(ix) Construction of concrete sidewalk with pavers
(x) Placement of soil mix in the planters and planting beds
(xi) Installation of tree flood lighting and electrical services
(xii) Supply and install trees and perennials
(xiii) Landscaping

D18.1.7 Placing the topsoil and finished grading of all boulevard and median areas shall be completed prior to commencing construction of asphaltic concrete overlays, including scratch courses.

D19. SUBSTANTIAL PERFORMANCE

D19.1 The Contractor shall achieve Substantial Performance by October 17, 2008, excluding landscaping Works to be completed in 2009..

D19.2 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.

D19.3 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.

D20. TOTAL PERFORMANCE

D20.1 The Contractor shall achieve Total Performance by June 19, 2009 .

D20.2 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.

D20.3 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.

D21. LIQUIDATED DAMAGES

D21.1 If the Contractor fails to achieve Substantial Performance in accordance with the Contract by the day fixed herein for Substantial Performance, the Contractor shall pay the City two thousand-five hundred dollars ($2,500.00) per Working Day for each and every Working Day following the day fixed herein for Substantial Performance during which such failure continues.

D21.2 The amount specified for liquidated damages in D21.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Substantial Performance by the day fixed herein for same.

D21.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D22. SCHEDULED MAINTENANCE

D22.1 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 one year warranty period) as specified in CW 3250-R6; ;

(b) Maintenance of sodded areas as specified in E34; and

(c) Maintenance of tree and plant material as specified in E36.

D22.2 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

D23. JOB MEETINGS

D23.1 Regular weekly job meetings will be held at Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D23.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D24. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D24.1 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).

WARRANTY

D25. WARRANTY

D25.1 Notwithstanding C13.2, the warranty period shall begin on the date of Substantial Performance and shall expire one (1) year thereafter unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D25.2 Notwithstanding C13.2 or D25.1, 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) 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; or

D25.2.1 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 D10)

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 dated the

_____ day of _____ , 20____ , for:

BID OPPORTUNITY NO. 516-2008

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I
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)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)
(See D10)

_____
(Date)

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

RE: PERFORMANCE SECURITY – BID OPPORTUNITY NO. 516-2008

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

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

_____ ,
(Name of Contractor)

_____
(Address of Contractor)

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

_____

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

_____
(Address)

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

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

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

_____ .
(Date)

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

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

This credit is subject to the Uniform Customs and Practice for Documentary Credit (1993 Revision), International Chamber of Commerce Publication Number 500.

_____
(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
(See D11)

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

Portion of the Work	Name	Address
SURFACE WORKS:		
Supply of Materials:		
Geotextile Fabrics		
Sub-base and Base Course		
Road Concrete		
Structural Concrete		
Asphalt		
Limestone blocks		
Top Soil / Seed		
Installation/Placement:		
Geotextile Fabrics		
Planing		
Pavement Removal/Excavation		
Sub-base and Base Course		
Concrete		
Asphalt		
Topsoil /Seed		
UNDERGROUND WORKS:		
Supply of Materials:		
Precast Concrete Catch Pit/Catch Basin/Risers		
Catch Pit/Catch Basin/Manhole Frames, Covers, Boxes and Ring Sections		
Catch Basins for Event Lawn		
Drainage Pipe/ Sewer Service Pipe/ Fittings		
Watermain Valve/Service Boxes		
Subdrains		
Installation/Placement:		

FORM J: SUBCONTRACTOR LIST
(See D11)

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

Portion of the Work	Name	Address
Irrigation		
OTHERS:		
Excavation		
Streetscaping		
Installation of Paving Stones		
Installation of Piling for Structural Concrete		
Construction of Concrete Planters and Wall		
Planting Trees		
Electrical		

FORM K: EQUIPMENT
(See D12)

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

1. Category/type: Excavation

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type: Compaction and Grading

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type: Asphalt Planing

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

FORM K: EQUIPMENT
(See D12)

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

4. Category/type: Slip Form Paver for Curb and Gutter

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type: Asphalt Paving

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

6. Category/type:

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 D13)

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

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%
Phase I – King Street - Bannatyne Avenue to William Avenue Pavement Reconstruction					10/17/08
Stage I –King Street North Bound Lane (East Side)					
Remove existing pavement					
Excavation					
Connect Old Market Square drain lead to sewer					
Installation of subdrains					
Compaction of existing sub-grade					
Placement of separation/reinforcement fabric, sub-base and base course materials					
Installation and adjustment of catchbasins and connection pipe					
Construct curb and gutter utilizing slip-form paving equipment					
Construction of Asphaltic Concrete Base Course (Type III - average thickness –75mm)					
Stage II – King Street North Bound Lane (West Side)					
Remove existing pavement					
Excavation					
Installation of subdrains					
Compaction of existing sub-grade					
Placement of separation/reinforcement fabric, sub-base and base course materials					
Installation and adjustment of catchbasins and connection pipe					
Construct curb and gutter utilizing slip-form paving equipment					
Construction of Asphaltic Concrete Base Course (Type III - average thickness –75mm)					
Stage III – King Street North Bound Lane - Final Lift of Asphalt All Lanes					
Planing of existing asphalt pavement					
Construction of Asphaltic Concrete Pavements (Type IA - average thickness –75mm)					
Restoration of west sidewalk					
Phase II - King Street Sidewalk (East Side)					10/17/08
Remove existing sidewalk/pavers					

FORM L: DETAILED WORK SCHEDULE

(See D13)

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

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%
Stittsville lights pile installation and base plate					
Construction of concrete sidewalk/pavers					
Supply and install paving stones					
Construction of tree wells and covers					
Supply and planting trees and perennials					
Phase III – Bannatyne Avenue - Re-alignment and Road Improvement					10/17/08
Complete saw cutting for curb and gutter					
Remove existing pavement					
Remove existing sidewalk					
Excavation					
Planing of existing asphalt pavement					
Adjustment of existing manholes					
Construct 180mm barrier curb and curb and gutter utilizing slip-form paving equipment					
Placement asphalt overlay					
Stittsville lights base installation and base plate					
Construction of concrete sidewalk and installation of paving stones					
Placement of soil mix in the planters and planting beds					
Installation of tree flood lighting and electrical services					
Phase IV - Old Market Square Redevelopment Phase I					10/17/08
Removals and Salvage					
Excavation of event area					
Installation of water supply system and irrigation system for event area					
Installation of catchbasins and connection pipe					
Installation of drainage system for event area					
Installation of concrete sidewalk and pavers					
Construction of concrete seating walls					

FORM L: DETAILED WORK SCHEDULE

(See D13)

KING STREET RECONSTRUCTION
BANNATYNE AVENUE TO WILLIAM AVENUE
OLD MARKET SQUARE REDEVELOPMENT PHASE I

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%
Construction of concrete planters					
Placement of limestone in the planters					
Placement of soil mix in the planters and planting beds					
Installation of tree flood lighting and electrical services					
Installation of concrete sidewalk and pavers					
Supply and install trees and perennials and Landscaping					06/19/09

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 Branch internet site at http://www.winnipeg.ca/matmgt.

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:

Drawing No.	Drawing Name/Title	Drawing (Original) Sheet Size
G-001	Cover Sheet and Drawing List	A1
C-201	King Street - Bannatyne Avenue to William Avenue - Sta. 2+00 to Sta. 3+50	A1
C-501	King Street - Bannatyne Avenue to William Avenue - Landscaping	A1
C-101	Bannatyne Avenue – King Street to Albert Street – Road Realignment	A1
C-102	Old Market Square – Sewer and Water Services	A1
L-1	Old Market Square – Material and Planting Site Plan	A1
L-2	Old Market Square – Removals Plan	A1
L-3	Old Market Square – Grading	A1
L-4	Old Market Square – Layout Plan	A1
L-5	Old Market Square – Sections and Details	A1
L-6	Old Market Square – Sections and Details	A1
S-101	Old Market Square – Structural Site Plan	A1
S-102	Old Market Square – Structural Details	A1
E-101	Old Market Square – Electrical Demolition	A1
E-102	Old Market Square – Electrical New Works	A1
E-501	Old Market Square – Miscellaneous Electrical Details	A1

E2. GEOTECHNICAL REPORT

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

E3. OFFICE FACILITIES

E3.1 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, a height of 2.4m with two windows for cross ventilation and a door entrance with a suitable lock.

.

(d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18^{o}C or 24-25^{o}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 two desks, one drafting table, table 3m x 1.2m, one stool, one four drawer legal size filing cabinet, and a minimum of 8 chairs. .

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

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

E3.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E3.3 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance.

E4. TRAFFIC CONTROL

E4.1 Further to clauses 3.6 and 3.7 of CW 1130-R1:

(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. No measurement for payment will be made for this work.

(b) In accordance with the Manual of Temporary Traffic Control, the Contractor (“Agency” in the manual) shall make arrangements with the Traffic Services Section 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 Section of the City of Winnipeg in connection with the works undertaken by the Contractor.

E5. TRAFFIC MANAGEMENT

E5.1 Further to clause 3.7 of CW 1130-R1:

E5.1.1 Maintain a minimum of one lane of traffic northbound on King Street (Phase I) and (Phase II) during their respective construction times;

E5.1.2 A minimum of one (1) lane for the westbound through lane at Bannatyne Ave intersection must be maintained during the (Phase I), (Phase II) and (Phase III) construction time.

E5.1.3 Intersecting street and private approach access shall be maintained at all times.

E5.1.4 When feasible maintain a short right turn storage lane at Kings Street to William Avenue.

E5.1.5 When feasible maintain a short right turn storage lane at Bannatyne Avenue to King Street.

E5.1.6 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

E5.1.7 Pedestrian and ambulance/emergency vehicle access must be maintained at all times.

E5.1.8 During this staging, there will be grade differentials between the existing pavement and the new concrete. To ensure a smooth travelling surface, the Contractor shall plane existing asphalt and/or temporarily asphalt over the existing pavement as directed by the Contract Administrator.

E5.1.9 During Phase III and Phase IV, two lanes shall be maintained on King Street.

E6. PEDESTRIAN SAFETY

E6.1 During the project, a temporary snow fence shall be installed at open excavation to replace CB's or make connection that are adjacent to pedestrian facilities. The Contractor shall be responsible for maintaining the snow fence in a proper working condition. No measurement for payment shall be made for this work.

E7. WATER USED BY CONTRACTOR

E7.1 Further to clause 3.7 of CW 1120-R1, the Contractor shall pay for all costs associated with obtaining water in accordance with the Waterworks By-law. Sewer charges will not be assessed for water obtained from a hydrant.

E8. SURFACE RESTORATIONS

E8.1 Further to clause 3.3 of CW 1130-R1, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E9. INFRASTRUCTURE SIGNS

E9.1 The Contractor shall obtain infrastructure signs from the Traffic Services Sign Shop at 421 Osborne Street. The Contractor shall mount each sign securely to a rigid backing material approved by the Contract Administrator. The Contractor shall fasten each sign to a suitable support and erect and maintain one sign at each street as directed by the Contract Administrator. When the Contract Administrator considers the Work on the street complete, the Contractor shall remove and dispose of the signs and supports. No measurement for payment will be made for performing all operations herein described and all other items incidental to the work described

E10. SAWCUTTING PAVEMENT

E10.1 At the limits of excavation, the Contractor shall sawcut the existing pavement to produce a clean straight edge when excavated.

E10.2 For asphaltic concrete pavements, the cost of sawcutting and disposal of any surplus material shall be included in the unit price bid for "Excavation" for concrete pavements, the cost of sawcutting and disposal of surplus material shall be included in the unit price for the various Works.

E10.3 The edge of existing concrete pavement, at the limits of excavation, shall be re-sawcut the day of paving if the edge has been damaged during construction to produce a clean straight edge.

E11. SIGN SUPPORT CLAMPS

E11.1 The Contractor shall install all new sign support clamps at the locations as shown on the Drawings or as directed by the Contract Administrator. The City shall supply all sign support clamps and parking meter poles.

E11.2 All costs in connection with the installation of sign support clamps are incidental.

E12. RECYCLED CONCRETE BASE COURSE MATERIAL

DESCRIPTION

E12.1 General

E12.1.1 Further to CW 3110, this specification covers supply and placement of recycled concrete base course material for Full-Depth Partial Slab Patches (Class A, B, C, & D), miscellaneous concrete slabs and sidewalks.

E12.2 Definitions

E12.2.1 Deleterious material – are materials such as vegetation, organic material, wood, glass, plastic, metal, reinforcing steel, building rubble, brick, salvaged asphalt materials, clay, shale, and friable particles.

E12.3 Referenced Standard Construction Specifications

(a) CW 3110 – Sub-Grade. Sub-Base and Base Course Construction.

(b) CW 3230 – Full-Depth Patching of Existing Pavement Slabs and Joints.

(c) CW 3235 – Renewal of Existing Miscellaneous Concrete Slabs.

(d) CW 3325 – Portland Cement Concrete Sidewalk.

MATERIALS

E12.4 Recycled Concrete Base Course Material

E12.4.1 Recycled concrete base course material when used for Full-Depth Partial Slab Patches (Class A, B, C, & D), miscellaneous concrete slabs and sidewalks will be considered equal to granular or limestone base course material specified in Section 2.2 of CW 3110.

E12.4.2 Recycled concrete base course material will be approved by the Contract Administrator.

E12.4.3 Recycled concrete base course material will consist of sound durable particles produced by crushing, screening, and grading of recovered concrete materials, free from soft material that would disintegrate through decay or weathering.

E12.4.4 The recycled concrete base course material will be well graded and conform to the following grading requirements:

Recycled Concrete Base Course Material Grading Requirements

CANADIAN METRIC SIEVE SIZE	PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE
20 000	100%
5 000	40% - 70%
2 500	25% - 60%
315	8% - 25%
80	6% - 17%

E12.4.5 Recycled concrete base course material when subjected to the abrasion test will have a loss of not more than 35% when tested in accordance with grading B of ASTM C131, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

E12.4.6 The amount of deleterious material will be limited to a maximum of two percent of the total dry weight.

CONSTRUCTION METHODS

E12.5 Placement of Recycled Concrete Base Course Material

E12.5.1 Place and compact recycled concrete base course material as a levelling course to a maximum thickness of 50 millimetres.

E12.5.2 Spread materials uniformly to avoid segregation free of pockets of fine and coarse material.

E12.5.3 Level and compact to the finished elevation. Compact to 100% Standard Proctor Density for Full-Depth Partial Slab Patches (Class A, B, C, & D) and 90% Standard Proctor Density for miscellaneous concrete slabs and sidewalks.

E12.5.4 Maintain the finished material until the pavement or sidewalk is placed.

MEASUREMENT AND PAYMENT

E12.6 Recycled Concrete Base Course Material

E12.6.1 The supplying, placing and compaction of recycled concrete base course material will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for the "Supplying and Placing Base Course Material" as specified in accordance with CW 3110.

E12.6.2 No measurement or payment will be made for material placed as a levelling course under miscellaneous concrete slabs and sidewalks where the costs are included in accordance with CW 3235 and CW 3325.

E12.6.3 No measurement or payment will be made for materials rejected by the Contract Administrator.

E13. ARCHAEOLOGICAL INVESTIGATION

E13.1 The contractor shall provide the Contract Administrator with a minimum of seventy-two (72 hours notice of the commencement of any excavation to allow the Contract Administrator to notify the Project Archaeological Consultant as required under the Environmental Requirements.

E13.2 If heritage material is located during the construction and soil removal process, all work shall cease and the Contractor shall immediately contact the Contract Administrator. The Historic Resources Branch, Manitoba Culture, Heritage and Citizenship, or the Project Archaeologist, shall be contacted by the Contract Administrator to determine the nature and extent of the archaeological material and to arrange for its recovery in accordance with the Environmental Act Licence No. 1412. The archaeological remains shall be recovered by salvage excavation upon authorization by the Contract Administrator, having consulted with the Historic Resources Branch, Manitoba Department of Culture, Heritage and Citizenship.

E13.3 The Contractor shall be prepared to continue his work elsewhere on the project while the Archaeologist investigates the finding and determines its heritage value.

E13.4 The Contractor is advised that he may be denied access to such areas of the project until such time as a thorough archaeological investigation is conducted or the finding is deemed to have no heritage value.

E13.5 Construction and excavation work shall not resume until the Contract Administrator, having consulted with the Historic Resources Branch, Manitoba Culture, Heritage and Citizenship, or the project archaeologist, authorizes a resumption of work.

E13.6 If human remains are uncovered during the construction and soil removal process, all work shall cease and the Historic Resources Branch, Manitoba Culture, Heritage and Citizenship shall be

contacted by the Contract Administrator. The Historic Resources Branch shall contact the City of Winnipeg Police.

E13.7 If the human remains are not considered forensic, i.e. no foul play suspected, they shall be removed by the Historic Resources Branch, Manitoba Culture, Heritage and Citizenship or the project archaeologist and turned over to the Province.

E13.8 Of the human remains are considered forensic, the City of Winnipeg Police shall be responsible for their removal.

E14. EXISTING UNDERGROUND UTILITIES

E14.1 The Contractor's attention is being drawn to the existing underground duct lines, and manholes involved in this project. It will be the responsibility of the Contractor to familiarize himself with the requirements of all the utility involved within the street right-of-way.

E14.2 The Contractor shall take all the necessary precautions when removing the existing pavement, excavating unsuitable material, backfilling and compaction and construction of watermain renewals as to ensure no damage to existing underground utilities. All costs incurred in connection with the above mentioned precaution are incidental and shall be included in the unit price bid for "Excavation".

E15. BOULEVARD RESTORATION

E15.1 Any excess damage to the boulevard areas caused by the Contractor, his employees and equipment shall be restored by replacing with original material at the Contractor's expense to the satisfaction of the Contract Administrator.

E15.2 The King Street sidewalk located on the west side was reconstructed in 2007. The Contractor shall proceed with minimal damage to this sidewalk.

E16. MATCHING EXISTING GRADES

E16.1 Wherever the proposed sidewalk meets existing pavement, building edge, doorway or property line, the Contactor shall construct the sidewalk to an acceptable grade, as directed by the Contract Administrator, to ensure that proper drainage and accessibility are maintained. Where maintenance of existing grade is not possible, Contractor to adjust grade as specified in E18.

E16.2 All costs associated with matching existing grades shall be included in the unit price bid for "Supply and Install Concrete Sidewalk Paving".

E17. 100 MM CONCRETE SIDEWALK WITH PAVING STONE, AND BRICK INSET

E17.1 Further to Specification CW 3325-R2 the Contractor shall construct the proposed concrete sidewalk with block-outs (for paving stone and brick) with a minimum 100 mm depth of Concrete as shown on the Drawings. The "block-outs" shall be constructed utilizing forming techniques capable of accommodating the proposed paving stone and brick paving to the dimensions and tolerances as shown on the Drawings and as confirmed with paving stone and brick manufacturer.

E17.2 The concrete sidewalk shall be poured such that the block-outs and remaining sidewalk act as a monolithic section.

E17.3 The concrete sidewalk below the existing MTS phone booth, Pay-stations and electrical power pedestal installations shall have a minimum depth of 250 mm over the area of the phone booth and pedestal base as shown on the drawings. Contractor to co-ordinate with MTS and Manitoba Hydro and City of Winnipeg Parking Authority for location of conduit, etc. Contractor to supply and install sleeves for electrical in concrete base as required by MTS and Manitoba Hydro City of Winnipeg Parking Authority. All costs in connection with this Work are included in

the unit price bid for “100 mm Concrete Sidewalk c/w reveal for paving band & saw cut & 100mm Compacted A-base”. There shall be a separate pay item for 250mm concrete sidewalk paid for at the Contract Unit Price measured in square metres.

E17.4 All costs in connection with the additional forming and placement of concrete as a result of the "block-outs", and additional depths in areas as shown on the Drawing are incidental and shall be included in the unit price bid for "100 mm Concrete Sidewalk c/w reveal for paving band & saw cut & 100mm Compacted A-base ". Minimum 75mm depth compacted granular levelling course shall be included in unit price bid for “100 mm Concrete Sidewalk c/w reveal for paving band & saw cut & 100mm Compacted A-base”.

E17.5 Sidewalk to be poured adjacent to transformer pits, areaways and buildings with approved bond breaker. Cost of bond breaker and shall be included in the unit price bid for "100 mm Concrete Sidewalk c/w reveal for paving band & saw cut & 100mm Compacted A-base ".

E17.6 All saw cutting required and shall be included in the unit price bid for “100 mm Concrete Sidewalk c/w reveal for paving band & saw cut & 100mm Compacted A-base”. All sawcut joints shall be laid out as shown on the drawings, on Site for review and approval by Contract Administrator prior to construction. All sawcutting to City of Winnipeg Specifications.

E18. EXPOSING EXISTING UNDERGROUND SERVICES AND UTILITITES

E18.1 The exact location and depth of some of the existing underground services and utilities within the project limits are unknown.

E18.2 Therefore, the Contractor shall supply all labour, equipment and materials required to expose all underground services and/or utilities sufficiently far enough in advance of the proposed works to permit the Contract Administrator where necessary and feasible, to adjust for the alignment and grade to avoid existing line and ducts.

E18.3 All costs in connection with this item of work shall be included in the unit price bid for the various bid items.

E19. PRIVATE SIDEWALKS, SIDE STREET SIDEWALKS

E19.1 The Contractor shall be responsible for the removal and reinstallation of any concrete paving and/or interlocking paving stones/brick on private sidewalks as a result of vertical grade changes in the proposed pavement. The Contractor shall be responsible for the removal and reinstallation of any concrete and/or interlocking paving stones/ brick on side street sidewalks and City owned Property as a result of vertical grade changes in the proposed pavement.

E19.2 The removal and reinstallation of concrete sidewalk paving and/or interlock paving stones/brick on private sidewalks, side streets and City owned property, to meet new pavement grades, shall be included in the area calculations for these items of work.

E20. REMOVAL OF EXISTING INTERLOCK PAVING STONE

E20.1 Description

E20.1.1 This Specification shall supplement Standard Construction Specification CW 3330 – R3 and shall cover all operations related to the removal of existing Interlock Paving Stones.

E20.2 Construction Method

E20.2.1 Removal of existing interlock paving stones shall be understood to include removal and disposal of interlock concrete sidewalk pavement and lean mix, regardless of depth.

E20.2.2 Removal of interlock concrete paving stone for reinstallation shall include removal of paving stones and lean mix as required, disposal of unusable paving stone and base course material and stockpiling of paving stones in approved area for future reinstallation.

E20.2.3 Any existing lean mix concrete base found is to be removed and disposed to City of Winnipeg Standards and will be paid for at the Contract Unit Price for "Removal of Lean Mix".

E20.2.4 Any existing lean mix concrete base at the limits of the designated removal area shall be sawcut for the full depth of the pavement prior to the demolition and removal operations. All costs in connection with sawcutting are incidental and shall be included in the unit price bid for "Removal of Interlock Paving Stone" and Removal of Interlock Paving Stone for Reinstallation".

E20.2.5 The Contractor shall exercise due caution during the Interlock paving stone removal Works so as to limit vibration. The Contractor shall take all necessary precautions when Working in the vicinity of any existing areaways, coal chutes, duct lines, trees, hedges, etc.

E20.3 Method of Measurement

E20.3.1 Removal of existing interlock paving stone will be measured on a surface area basis as follows:

i) Removal of Interlock Paving Stone.
ii) Removal of Interlock Paving Stone for Reinstallation.
iii) Removal of Lean Mix.

E20.4 Basis of Payment

E20.4.1 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.

E21. SUPPLYING AND PLACING REINFORCING STEEL

E21.1 Description

(a) This Specification covers the supply, fabrication, and placement of all reinforcing steel.

(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.

E21.2 Materials

E21.2.1 General

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

E21.2.2 Handling and Storage of Materials

(a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the latest edition of CSA Standard CAN3-A23.1, Storage of Materials, except as otherwise specified herein.

E21.2.3 Reinforcing Steel

(a) All reinforcing steel shall conform to the requirements of CSA Standard G30.18, Grade 400W, Billet-Steel Bars for concrete reinforcement. If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete works exhibits flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel.

(b) All galvanized reinforcing steel shall be straight and free from paint, oil, mill-scale, and injurious defects. Surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross section area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard G30.18.

E21.2.4 Field-Applied Galvanizing

(a) Field-applied galvanizing shall be a one-pack compound containing 99.995 percent pure electrolytic zinc dust. On application, it shall cure to a minimum of 96 percent zinc content in the dry film. The field galvanizing product shall be Zinga as distributed by Continental Mine & Industrial Supply, Saskatoon, Saskatchewan, phone (306) 975-1944, or approved equal in accordance with B5.

E21.2.5 Bar Accessories

(a) Bar accessories shall be of a type approved by the Contract Administrator and shall be non-rusting. They shall be made from High Performance Concrete (HPC) or PVC. An approved HPC rebar support is supplied by Con Sys Inc. of Pinawa, Manitoba, phone: 753-2404, fax: 753-8329. They shall not stain, blemish, or spall the concreted surface for the life of the concrete.

(b) Bar accessories shall include bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices that may be approved by the Contract Administrator. The supplying and installation of bar accessories shall be deemed to be incidental to the supplying and placing of reinforcing steel.

E21.2.6 Bonding Agent

(a) Epoxy resin shall be of a type listed in the approved products list, Specification CW 3710 conforming to the requirements of ASTM Standard C881. Type 1, Grade 3 epoxy shall be used for bonding reinforcing steel into hardened concrete.

(b) Bonding agents for bonding reinforcing steel into holes in hardened concrete other than epoxy resin may be permitted provided that they develop a minimum pullout resistance of 50 kN within 48 hours after installation. Alternative bonding agents are listed in the approved products list.

E21.3 Construction Methods

E21.3.1 Fabrication of Reinforcing Steel

(a) Fabricate reinforcing steel in accordance with CSA Standard G30.18 to the lengths and shapes as shown on the Drawings.

E21.3.2 Placing of Reinforcing Steel

(a) Place reinforcing steel accurately in the positions shown on the Drawings and retain 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. Remove any dry concrete, which may have been deposited on the steel from previous concrete placement, before additional concrete may be placed. Intersecting bars shall be tied positively at each intersection.

(c) Make splices in reinforcing steel only where indicated on the Drawings. Obtain prior approval of the Contract Administrator where other splices must be made. Welded splices shall conform to CSA Standard W186, and are subject to prior written approval of the Contract Administrator.

(d) Reinforcing steel shall not be straightened or rebent in a manner that will injure the metal. Bars with bends not shown on the Drawings shall not be used. Heating of reinforcing steel will not be permitted without the prior approval of the Contract Administrator. Give a minimum of twenty-four (24) hours' advance notice to the Contract Administrator prior to the placing of any concrete to allow for inspection of the reinforcement.

(e) All field cut ends of galvanized steel and damaged galvanizing shall have one coat of a field-applied galvanizing coating applied.

E21.4 Quality Control/Quality Assurance

E21.4.1 Inspection

(a) After all concrete reinforcement has been placed, a final inspection shall be made prior to the placement of concrete to locate any damage or deficiencies. All visible damage or any deficiencies shall be repaired to the satisfaction of the Contract Administrator before concrete is placed.

E21.4.2 Access

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

E21.4.3 Quality Testing

(a) Quality control testing will be used to determine the acceptability of the reinforcing steel supplied by the Contractor.

(b) The Contractor shall provide, without charge, the samples of reinforcing steel required for quality control tests and provide such assistance and use of tools and construction equipment, as is required.

E21.5 Method of Measurement

E21.5.1 Supplying and Placing Reinforcing Steel

(a) The supplying and placing reinforcing steel will not be measured.

E21.6 Basis of Payment

E21.6.1 Supplying and Placing Reinforcing Steel

(a) The supplying and placing of reinforcing steel shall be included in the cost Structural Concrete E23. There shall be no separate payment for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

E22. STRUCTURAL CONCRETE

E22.1 Description

(a) This Specification shall cover the preparation of portland cement concrete for, and all concreting operations related to, the construction of Portland Cement Concrete Works as specified herein.

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

E22.2 Submittals

(a) Concrete mix design(s) that meets the minimum performance criteria for the various types of concretes as shown on the Drawings and described in Clause 10.3.13 “Concrete” of this Specification. The concrete mix design shall be sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba. Any changes to the concrete mix design(s) shall be reviewed by the Contract Administrator prior to the Contractor implementing the change.

The concrete mix design(s) for the required type(s) of concrete shall specify the following:

(i) Cementitious content in kilograms per cubic metre or equivalent units, and type of cementitious materials.

(ii) Designated size, or sizes, of aggregates, and the gradation.

(iii) Aggregate source location(s).

(iv) Weights of aggregates in kilograms per cubic metre or equivalent units. Mass of aggregates is saturated surface dry basis.

(v) Maximum allowable water content in kilograms per cubic metre or equivalent units and the water/cementitious ratio.

(vi) The limits for slump.

(vii) The limits for air content.

(viii) Quantity of other admixtures.

(b) The intended method of placement shall be taken into consideration in the development of the concrete mix design as concrete to be pumped must be designed accordingly.

(c) Any change in the constituent materials of the concrete shall require a new concrete mix design. If, during the progress of the Work, the mix design is found to be unsatisfactory for any reason, including poor workability, the Contract Administrator may require the Contractor to make the necessary adjustments.

(d) The Contractor shall also submit test data showing that the concrete supplied will meet the performance criteria stated in this Specification for each concrete type. At a minimum, the test data shall prove that the minimum compressive strength, flexural strength (Fibre Reinforced Concrete only), air content, and slump of the concrete to be supplied meets or exceeds the performance criteria. 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 should the Contractor wish to pump the concrete into place.

(e) Notification of Ready Mix Supplier

(i) The Contractor shall advise the Contract Administrator of the qualified Ready Mix Concrete Supplier that he is proposing to use at least 14 days prior to placing concrete. 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.

(f) Detailed design calculations and Shop Drawings for any temporary works, including falsework and formwork, that are sealed, signed and dated by a Professional Engineer licensed to practice in the Province of Manitoba. **Shop Drawings are to be submitted to the Contract Administrator prior to the Contractor proceeding with the Work.**

(g) 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.

(h) The Contractor shall furnish in writing to the Contract Administrator the location of the sources where aggregate will be obtained in order that same may be inspected and tentatively accepted by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract will not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(i) Copies of all material quality control test results.

E22.3 Materials

E22.3.1 General

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

E22.3.2 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.

E22.3.3 Testing

(a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the The City for any materials taken by the Contract Administrator for testing purposes.

(b) All materials shall conform to CSA Standard CAN/CSA-A23.1.

(c) All testing of materials shall conform to CSA Standard CAN/CSA-A23.2.

(d) All materials shall be accepted by the Contract Administrator at least less fourteen (14) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the specifications detailed herein or are found to be defective in manufacture or have become damaged in transit, storage, or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

E22.3.4 Bonding Agents

(a) If a concrete bonding agent is used, the Contractor shall identify the product(s) and submit product information to the Contract Administrator for review.

E22.3.5 Curing Compound

(a) Curing compounds shall be liquid membrane-forming and conform to the requirements of ASTM Standard C309. Rate of application shall be the rate required to meet the requirements of ASTM C309 for the texture of concrete the curing compound is being applied to.

(b) Curing compound for approach slabs shall be resin-based and white-pigmented.

E22.3.6 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. Accepted products are Vulkem 116 by Mameco, Sonolastic NP 1 by Sonneborn, Sikaflex-1a by Sika, Bostik 915 by Bostik, or equal in accordance with B5.

E22.3.7 Form Coating

(a) Form coating shall be "Sternson C.R.A." by Sternson, "SCP Strip Ease" by Specialty Construction Products, or equal in accordance with B5.

E22.3.8 Fibre Joint Filler

(a) Fibre joint filler shall be rot-proof and of the preformed, non-extruding, resilient type made with a bituminous fibre such as Flexcell and shall conform to the requirements of ASTM Standard D1751 or equal in accordance with B5r.

E22.3.9 Low Density Styrofoam

(a) Low density styrofoam shall be the type specified on the Drawings or equal in accordance with B5r.

E22.3.10 Patching Mortar

(a) The 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 l part cement to 2 parts sand by damp loose volume. White Portland Cement shall be substituted for a part of the grey Portland Cement on exposed concrete in order to produce a colour matching the

colour of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling or placing.

E22.3.11 Formwork

(a) Formwork materials shall conform to CSA Standard CAN/CSA-A23.1, and American Concrete Publication SP:4, “Formwork for Concrete.”

(b) No "stay-in-place" formwork or falsework is permitted.

(c) 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.

(d) Where form liner is not being used, form sheeting shall be Douglas Fir, overlay form liner type conforming to CSA Standard O121-M1978. Approved manufacturers are "Evans" and "C-Z".

(e) Boards used for formwork shall be fully seasoned and free from defects such as knots, warps, cracks, etc., which may mark the concrete surface.

(f) No formwork accessories will be allowed to be left in place within 50 mm of the surface following form removal. Items to be left in place, must be made from a non-rusting material or galvanized steel; and they shall not stain, blemish, or spall the concrete surface for the life of the concrete.

(g) Forms for exposed surfaces that do not require a form liner may be either new plywood or steel as authorized by the Contract Administrator.

(h) Studding shall be spruce or pine and shall have such dimensions and spacing that they shall withstand without distortion, all the forces to which the forms will be subjected.

(i) Walers shall be spruce or pine, with minimum dimensions of 100 mm x 150 mm. Studding shall be spruce or pine, with minimum dimensions of 50 x 150.

(j) Stay-in-place forms are not acceptable and will not be accepted unless shown on the Drawings.

(k) All forms are incidental to these Works and must be removed by the Contractor once adequate strength and curing of the concrete has been achieved.

E22.3.12 Permeable Formwork Liner

(a) Form Liner shall be “Drainform,” “Hyroform,” or equal in accordance with B7 as accepted by the Contract Administrator. This form 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.

E22.3.13 Non-Shrink Cementitous Grout

(a) Where non-shrink cementitious grout is used, it shall be Sternson M-bed Standard, Specialty Construction Products CPD Non-Shrink Grout, Sika 212 Non-Shrink Grout, Meadows CG-86, or equal in accordance with B7 as accepted by the Contract Administrator. The minimum compressive strength of the grout at 28 days shall be 40 MPa.

E22.3.14 Epoxy Grout

(a) Where epoxy grout is used, it shall be Sternson Talygrout 100, Sika Sikadur 42, CPD Epoxy Grout by Specialty Construction Products, Meadows Rezi-Weld EG-96, or equal in accordance with B5.

E22.3.15 Backer Rod

(a) Backer rod shall be preformed compressible polyethylene, urethane, neoprene, or vinyl foam backer road, extruded into a closed cell form and oversized 30 to 50%.

E22.3.16 Precompressed Foam Joint Filler

(a) Precompressed foam joint filler shall be compressed to 20% of its expanded width and be a polyurethane foam, impregnated throughout with a latex modified asphalt. Approved products are “Emseal,” by Emseal Corporation. Manufacturer’s recommended primer and top coat are to be used.

E22.3.17 Dowel Bars

(a) Dowel bars shall of the type specified on SD 211B.

E22.3.18 PVC Water Stop

(a) Extruded Polyvinyl Chloride (PVC) in accordance with CGSB 41-GP-35M.

(b) 125 millimetres wide by 9.5 millimetres thick.

(c) Multi-ribbed with center bulb.

(d) Minimum 12 MPa tensile strength.

(e) 275% allowable elongation.

(f) .5 -45 degree C to 80 degree C working temperature range.

E22.3.19 Miscellaneous Materials

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

E22.3.20 Concrete

(a) Concrete

(i) Concrete Materials susceptible to frost damage shall be protected from freezing.

(ii) Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table.

Type of Concrete	Nominal Compressive Strength at 28 Days [MPa]	Class of Exposure	Air Content Category
Concrete	35	S-1	2

(iii) 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.

(b) Aggregates

(iv) General

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.

The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA A23.2-27A. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA A23.2-14A or CSA A23.2-25A is required.

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.

(v) Coarse Aggregate

The maximum nominal size of coarse aggregate shall be 20 mm and meet the grading requirements of CSA A23.1, Table 11, Group I. Coarse aggregate shall be uniformly graded and not more than 1% shall pass a 75 um sieve. Coarse aggregate shall consist of crushed stone or gravel or a combination thereof, having hard, strong, durable particles free from elongation, dust, shale, earth, vegetable matter or other injurious substances. 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 percent.

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.

Course aggregate when tested for abrasion in accordance with ASTM C131 shall not have a loss greater than 30%.

Tests of the coarse aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1, Table 12, for concrete exposed to freezing and thawing.

(vi) Fine Aggregate

Fine aggregate shall meet the grading requirements of CSA A23.1, Table 10, FA1, be graded uniformly and not more than 3% shall pass a 75 um sieve. Fine aggregate shall consist of sand, stone, screenings, other inert materials with similar characteristics or a combination thereof, having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, lumps, shale, alkali, organic matter, loam or other deleterious substances.

Tests of the fine aggregate shall not exceed the limits for standard requirements prescribed in CSA A23.1, Table 12.

(c) Admixtures

(i) Air-entraining admixtures shall conform to the requirements of ASTM C260.

(ii) Chemical admixtures shall conform to the requirements of ASTM C494 or C1017 for flowing concrete.

(iii) All admixtures shall be compatible with all other constituents. The addition of calcium chloride, accelerators and air-reducing agents, will not be permitted, unless otherwise approved by the Contract Administrator.

(d) Cementitious Materials

(i) Cementitious materials shall conform to the requirements of CAN/CSA-A3001 and shall be free from lumps.

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

(iii) Should the Contractor choose to include fly ash in the concrete mix design, the fly ash shall be Class CI and the substitution shall not exceed 25% by mass of cement.

(iv) 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.

(e) Water

(i) Water to be used for mixing and curing concrete or grout and saturating the substrate shall conform to the requirements of CSA A23.1 and shall be free of oil, alkali, acidic, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

E22.4 Equipment

E22.4.1 General

(a) All equipment shall be of a type accepted by the Contract Administrator. The equipment shall be in good working order, kept free from hardened concrete or foreign materials, and shall be cleaned at frequent intervals.

(b) The Contractor shall have sufficient standby equipment available on short notice at all times.

E22.4.2 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 use rubber coated vibrators for consolidating concrete containing epoxy-coated reinforcing steel.

(c) The Contractor shall have standby vibrators available at all times during the pour.

E22.4.3 Miscellaneous Equipment

(a) The Contractor shall provide all miscellaneous equipment as required to properly and thoroughly execute and complete all operations related to the supply and placement of structural concrete.

E22.5 Construction Methods

E22.5.1 Scope of Work

(a) It is intended that this Specification cover the construction of the following items, as indicated on the Drawings:

(i) Raised Concrete Planters
(ii) 'C' Planters
(iii) Concrete Seating Wall
(iv) Concrete Stairs
(v) Cast-in-Place Piles 400mm Diameter
(vi) Cast-in-Place Concrete Base and Base Plate

(b) Replacement of existing curb is covered by the applicable standard City of Winnipeg specifications.

E22.5.2 Supplying Concrete

(a) Proportions of Concrete Materials

(i) Coarse and fine aggregate materials shall be separated and measured separately by weighing, except as otherwise specified in the Special Provisions or where other methods are approved by the Contract Administrator. The apparatus provided for weighing the aggregates and cement shall be suitably designed and constructed for this purpose. The course and fine aggregate and the cement shall be weighed separately. The accuracy of all weighing devices shall be such that successive quantities can be measured to within one percent

of the desired amount. The mixing water shall be measured by volume or by weight. The water measuring device shall be capable of control accurate to ± 0.5% of the design quantity. All measuring devices will be subject to approval by the Contract Administrator Unless otherwise approved, air entraining agent and other admixtures shall be added to the mix in a water-diluted solution. The dilution of the solution shall meet the Manufacturer's requirements. For mix adjustments at the Site, the Contractor shall maintain facilities and equipment to control the amount of superplasticizer and air entrainment so that the required tolerances can be met.

(ii) The Contractor shall ensure that all scaling devices have been calibrated within one year. They shall be tested and approved for accuracy prior to the commencement of batching operations. Scaling devices shall be subject to testing by the Contract Administrator at any time. The standard masses used for the testing of scaling devices shall be supplied to the Contract Administrator upon request. No adjustments to scaling devices shall be made without the Contract Administrator's approval.

(b) Mixing Concrete

(i) General

Ready-mix concrete shall be mixed and delivered by one of the following operations:

(1) Mixed completely in a stationary mixer and the mixed concrete transported to the point of delivery in a truck agitator or in a truck mixer operating at agitating speed, or

(2) Mixed completely in a truck mixer.

Continuous mixers used in conjunction with volumetric proportioning will not be approved. Concrete shall not be mixed and delivered without first obtaining the approval of the Contract Administrator.

(ii) Stationary Mixer

The mixing of concrete shall be done in a batch mixer of a size and type approved by the Contract Administrator. Mobile continuous mixers or other such concrete supply equipment will not be approved for use.

Each mixer and agitator shall have attached by the Manufacturer in a prominent place, a metal plate or plates on which it is plainly marked the various uses for which the equipment is designed, the capacity of the drum or container in terms of the volume of concrete that can be mixed or agitated and the speed of rotation of the mixing drum or blades.

All concrete shall be mixed thoroughly until it is uniform in appearance, with all ingredients uniformly distributed. In no case shall the mixing time per batch be less than one minute for mixers of one cubic metre capacity or less. The "batch" is considered as the quantity of concrete inside the mixer. This figure shall be increased by 15 seconds for each additional half cubic metre capacity or part thereof. The mixing period shall be measured from the time all materials are in the mixer drum.

Stationary mixers shall be equipped with an acceptable timing device that will not permit the batch to be discharged until the specified mixing time has elapsed.

Batches shall be used that do not require fractional bags of cement.

Each batch shall be entirely discharged from the mixer before any of the ingredients for a following batch shall be placed in the drum of the mixer.

All water used for cleaning the inside of the drum of the mixer shall be entirely drained before ingredients for a batch of concrete shall be placed in the drum.

The Contractor shall in no case load the mixer above its rated capacity. The Contractor shall maintain the mixer in good condition. Inner surfaces of the mixer shall be kept free of hardened concrete and mortar. Mixer blades that are bent or worn down so as to affect the mixing efficiency shall be repaired. Any mixer leaking mortar or causing waste of materials through faulty charging shall be taken out of service until repaired. The Contractor shall, at all times, operate the mixer at the speed recommended by the Manufacturer and shall, if requested, supply the Manufacturer's certification of the mixing capacity of the machine in use.

The mixer shall be fitted with an accurate and dependable means for measuring the water added that is not affected by variation in pressure in the water supply line. All joints, valves and other parts shall be maintained so that there is no leakage of water into the mixer drum. Failure of the Contractor to have an accurately working and dependable water gauge on a mixer shall be cause for the Contract Administrator to prohibit the mixer to be used.

Water shall be released first and continue to flow while the solid materials are entering the mixer. The water discharge pipe shall be so arranged and be of such size that the flow into the mixer is completed within the first quarter of the mixing time, and the water is delivered well within the mixer where it will be quickly mixed with the entire batch.

Air entraining agents and admixtures shall be placed in the mixer after the initial water is in the mixer drum but before the remaining materials are added. Superplasticizer shall be added after initial mixing and as per the Manufacturer’s recommendation.

A record of the actual proportions used for each batch shall be kept by the Contractor and a copy of this record shall be submitted to the Contract Administrator after each pour.

The Contract Administrator may, from time to time, make slump tests of individual batches in order to determine the uniformity of the concrete consistency at approximately one-quarter and three-quarter points of the load. If these tests indicate a variation in the slump exceeding 50 mm, the mixer or agitator shall not be used until the condition is corrected.

(iii) Truck Mixing

Truck mixers, unless otherwise approved by the Contract Administrator, shall be of the revolving drum type, watertight, and constructed so that the concrete can be mixed to ensure uniform distribution of materials throughout the mass. All materials for the concrete shall be accurately measured, and charged concurrently at the proportions that satisfy the approved mix design into the drum at the proportioning plant. Increases in water/cementitious ratio will not be permitted.

The maximum size of batch in truck mixers shall not exceed the maximum rated capacity of the mixer as stated by the Manufacturer and stamped in metal on the mixer. Truck mixing shall commence immediately upon introduction of ingredients into the drum and be continued for not less than 50 revolutions. The speed shall not be less than 4 revolutions per minute (rpm), nor more than a speed resulting in a peripheral velocity of the drum of 70 m per minute. Not more than 100 revolutions of mixing shall be at a speed in excess of 6 rpm.

When adjustment to the mix by adding water, air entrainment or superplasticizer at the Site is approved by the Contract Administrator, the mixer shall be run for a minimum of 20 additional revolutions to ensure homogeneity of the concrete before discharge.

Discharge chutes shall be kept clean and free from hardened concrete and shall be wetted down prior to use.

(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 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) Under no circumstances shall the Contract Administrator allow the Contractor to add retarders to the concrete mix without first obtaining the approval of the Contract Administrator.

(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.

(vi) A record of the actual proportions used for each concrete placement shall be kept by the Supplier and a copy of this record shall be submitted to the Contract Administrator or the City upon request.

(d) Delivery

(i) The Contractor shall satisfy himself that the Concrete Supplier has sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that the development of cold joints will not occur. The methods of delivering and handling the concrete shall facilitate placing with a minimum of rehandling, and without damage to the structure or the concrete.

(e) Placement Schedules

(i) The Contractor shall provide to the Contract Administrator the proposed placement schedule for all concrete placements. 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:

(1) Limit the amount to be placed at any time (using adequate construction joints), or

(2) Augment his facilities and Plant in order to complete the proposed placement, or

(3) In the case of continuous placing, provide additional crews and have adequate lighting to provide for proper placing, finishing, curing and inspecting.

(ii) The Contractor shall adhere strictly to the concrete placement schedule, if shown on the Drawings or otherwise specified.

(f) Falsework and Formwork

(i) General

The Contractor shall construct the formwork and falsework in accordance with the submitted Shop Drawings. Variations from the formwork and falsework Shop Drawings will not be permitted unless the Contract Administrator is provided with revised Shop Drawings that have been sealed, signed and dated by the Professional Engineer.

(ii) Design

All forms shall be of wood, metal or other materials as approved by the Contract Administrator, and shall be designed and built mortar-tight. The forms shall be sufficiently rigid to prevent distortion due to the pressure of vibrated concrete and other loads incidental to the construction operations. The forms shall be substantial and unyielding, and shall be designed so that finished concrete will conform to the design dimensions and contours. The shape, strength, rigidity, watertightness and inner surface smoothness of re-used forms shall be maintained at all times. Any warped or bulged formwork shall be not be used. Forms that are deemed unsatisfactory by the Contract Administrator in any respect shall not be used.

All forms shall be oiled or otherwise treated to facilitate stripping.

The tying of forms with wires or welded ties or the driving of bolts or nails by hand or by power tools into exposed and finished concrete surfaces will not be permitted.

For narrow walls and columns, where the bottom of the form is inaccessible, or wherever necessary, removable panels shall be provided in the bottom form panel to enable cleaning out of extraneous material immediately before placing the concrete.

The supporting of formwork on mudsills on the ground will not be permitted.

All falsework shall be designed and constructed to provide the necessary rigidity and to support the loads without appreciable settlement or deformation.

Falsework shall be set to give the completed structure the camber specified on the Drawings, and allowance shall be made for dead load deflection and form crushing.

(g) Forms for Exposed Surfaces

(i) All form material for exposed surfaces shall be full-sized sheets in good condition, and approved by the Contract Administrator. The re-use of any forms shall be approved by the Contract Administrator.

(ii) All forms for exposed surfaces shall be mortar-tight, filleted at all sharp corners, and given a bevel or draft in the case of all projections. At the top edges of exposed surfaces, the chamfers are to be formed by chamfer strips. Where fillets have been omitted, the concrete shall be thoroughly worked into the corners of the forms and, upon removal of the forms, the sharp edges of the concrete shall be carefully rubbed down to a 6 mm radius. The form lumber for filleted corners shall be a hard grade lumber which will leave a sharp, straight edge.

(iii) Metal bolts or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least 50 mm from the concrete surface. Break-back type form ties shall have all spacing washers removed and the tie shall be broken back a distance of at least 20 mm from the concrete surface. 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 color.

E22.5.3 Permeable Formwork Liner

(a) Form liners shall be used on all exposed surfaces, except underside of the deck, or where a normal form finish is specified.

(b) The supply and use of the plain form liner finish shall be considered incidental to the Works of this Specification, and no additional payment will be made.

(c) The form liner shall be used for only one (1) application.

E22.5.4 Placing Structural Concrete

(a) 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. Pumping of concrete will be allowed for all concrete. All equipment and processes are subject to acceptance by the Contract Administrator.

(b) 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.

(c) Runways for concrete buggies and all pumping equipment shall be supported directly by the formwork and not on reinforcement.

(d) 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.

(e) Form liners shall be cooled immediately prior to placing concrete by spraying with cold water.

(f) 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.

(g) Concrete shall be placed as nearly as possible in its final position. Rakes or mechanical vibrators shall not be used to transport concrete.

(h) 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.

(i) 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.

(j) 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. Spare vibrators in good working condition shall be kept on the job Site during all placing operations.

(k) Concrete shall not be placed during rain or snow unless adequate protection is provided for formwork and concrete surfaces.

(l) Finishing of Concrete Surfaces

(i) Exposed Formed Surfaces

- Form liner finish shall be applied to all exposed formed surfaces.

- Exposed surfaces imply all surfaces exposed to view including surfaces to 300 mm below finish grade elevations.
- A light sand-blasting finish shall be used on all exposed vertical surfaces and the staircases. The sand-blasting intensity and method of application shall be approved by the Contract Administrator prior to Construction.
- The surfaces shall be patched as specified in this Specification. The surface shall be rubbed with a carborundum brick or other abrasive, to achieve a smooth-rubbed finish.

(ii) Unformed Concrete Surfaces

- Screeding of all unformed concrete surfaces shall be performed by sawing movement of a straightedge along wood or metal strips or form edges that have been accurately set at required elevations.
- 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.
- After screeding, the concrete shall not be worked further until ready for floating. Floating Shall begin when the water sheen has disappeared. The surface shall then be consolidated with hand floats. Concrete surfaces after floating shall have a uniform, smooth, granular texture.
- The top surface of the concrete works slabs shall be given a smooth finish. Upon completion of finishing operations, and when excessive moisture has evaporated, the plastic surface of the concrete shall be given a textured finish by means of wooden trowel of a type accepted by the Contract Administrator. Surface shall not be more than 3mm deep.

E22.5.5 General Curing

(a) Refer to Clause E10.5.9 (Cold Weather Concreting) for cold weather curing requirements.

(b) Refer to Clause E10.5.10 (Hot Weather Concreting) for hot weather curing requirements.

(c) The use of curing compound will not be allowed on concrete areas that are to receive additional concrete or waterproofing.

(d) Unformed concrete surfaces shall be covered and kept moist by means of wet polyester blankets for seven (7) consecutive days immediately following finishing operations or otherwise approved by the Contract Administrator and shall be maintained at above 10ºC for at least seven (7) consecutive days. Construction joints shall only be covered and kept saturated by means of wet polyester curing blankets for the curing period.

(e) Unformed surfaces shall have curing compound applied immediately after the wet curing period.

(f) 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 hours after the end of the curing period.

(g) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3º in any one hour period or 20º in any twenty-four hour period.

(h) 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.

E22.5.6 Form Removal

(a) All forms shall remain in place for a minimum of three (3) days and 70% of the design concrete strength. The Contract Administrator must be notified at least 24 hours prior to any form removal. The Contractor must receive approval from the Contract Administrator prior to beginning Work.

(b) The minimum strength of concrete in place for safe removal of soffit forms for horizontal or inclined members, as well as vertical forms shall be 25 MPa, with the added provisions that the member shall be of sufficient strength to carry safely its own weight, together with superimposed construction loads, and that the forms shall stay in place a minimum of seven (7) days unless otherwise approved by the Contract Administrator.

(c) Field-cured test specimens, representative of the in-place concrete being stripped, may be tested to verify the concrete strength.

E22.5.7 Patching of Formed Surfaces

(a) Immediately after forms have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair or surface finishing started before this inspection may be rejected and required to be removed.

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

(c) Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be thoroughly 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 adjacent surface and left for one 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.

(d) All objectionable fins, projections, offsets, streaks, or other surface imperfections shall be removed by approved means to the Contract Administrator's satisfaction. Cement washes of any kind shall not be used.

(e) Concrete shall be cast against forms that will produce plane surfaces with no bulges, indentations, or protuberances other than those shown on the Drawings. The arrangement of panel joints shall be kept to a minimum. Panels containing worn edges, patches, or other defects that will impair the texture of concrete surfaces shall not be used. All fins on the concrete surfaces shall be removed.

E22.5.8 Cold Weather Concreting

(a) The requirements of this section shall be applied to all concreting operations during cold weather; i.e., if the mean daily temperature falls below 5°C during placing or curing.

(b) The Contract Administrator will advise the Contractor, in writing, as to the degree of heating of water and aggregates.

(c) Supplementary equipment, as required below, shall be at the job Site if concrete is likely to be placed in cold weather.

(d) Formwork and reinforcing steel shall be heated to at least 5°C before concrete is placed.

(e) The temperature of the concrete shall be maintained at not less than 10°C for seven days or 15°C for five days or 20°C for three days after placing. The concrete shall be kept above freezing temperature for at least a period of seven days. In no case shall

the heating be removed until the concrete has reached a minimum compressive strength, which will be specified by the Contract Administrator for Work under construction, and as determined from compressive strength tests for specimens secured under the same conditions as the concrete works in question.

(f) Aggregates shall be heated to a temperature of not less than 20ºC and not more than 65ºC. Water shall be heated to a temperature between 55ºC and 65ºC. The temperature of the concrete at the time of placement shall be within the range specified in CSA Standard CAN/CSA-A23.1 for the thickness of the section being placed.

(g) When the mean daily temperature may fall below 5ºC, a complete hoarding of the Work, together with supplementary heat, shall be provided.

(h) When the ambient temperature is below -15ºC, the hoarding shall be constructed so as to allow the concrete to be placed without the hoarding having to be opened. If the mixing is done outside of the hoarding, the concrete shall be placed by means of hoppers installed through the hoarding. The hoppers are to be plugged when not in use.

(i) When the ambient temperature is equal to or above -15ºC, the Contractor will be permitted to open small portions of the hoarding for a limited time to facilitate the placing of the concrete.

(j) Before depositing any of the concrete, the Contractor shall show that enough heating equipment is available to keep the air temperature surrounding the forms within the specified range. This shall be accomplished by bringing the temperature inside of the hoarding to the specified 20ºC, at least 12 hours prior to the start of the concrete placing.

(k) The Contractor shall supply all required heating apparatus and the necessary fuel. When dry heat is used, a means of maintaining atmospheric moisture shall be provided. The relative humidity within the heated enclosure shall be maintained at a minimum of 40 percent during concrete placing and finishing operations. Surface moisture evaporation rates shall not exceed the limits specified in E10.5.10(b) (Hot Weather Concreting). Following finishing operations, exposed concrete surfaces shall be protected from excessive drying by applying curing compound, covering the surfaces with polyethylene, or providing water curing.

(l) Sufficient standby heating equipment must be available to allow for any sudden drop in outside temperatures and any breakdowns which may occur in the equipment.

(m) Combustion-type heaters may be used if their exhaust gases are vented outside the enclosures and not allowed to come into contact with concrete surfaces. Fire extinguishers must be readily at hand wherever combustion-type heaters are used.

(n) The Contractor shall keep a curing record of each concrete pour. The curing record shall include: date and location of the pour, mean daily temperature, hoarding relative humidity, temperatures above and below the concrete surface at several points, and notes regarding the type of heating, enclosure, unusual weather conditions, etc. This record shall be available for inspection by the Contract Administrator at the end of the concrete operations.

E22.5.9 Hot Weather Concreting

(a) General

(i) The requirements of this section shall be applied during hot weather; i.e. air temperatures above 25ºC during placing.

(ii) Concrete shall be placed at as low a temperature as possible, preferably below 15ºC, but not above 22ºC. Aggregate stockpiles may be cooled by water sprays and sunshades.

(iii) Ice may be substituted for a portion of the mixing water, providing 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) Sunshades 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 approval 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 then appear in the Mix Design Statement submitted to the Contract Administrator.

(viii) Curing shall follow immediately after the finishing operations.

(b) Hot-Weather Curing

(i) When the air temperature is at or above 25ºC, curing shall be accomplished by water spray or by using saturated absorptive fabric, in order to achieve cooling by evaporation. Mass concrete shall be water cured for the basic curing period when the air temperature is at or above 20ºC, in order to minimize the temperature rise of the concrete.

(c) Job Preparation

(i) When the air temperature is at or above 25ºC, or when there is a probability of it’s rising to 25ºC during the placing period, facilities shall be provided 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 fogging and evaporation.

(d) Concrete Temperature

(i) The temperature of the concrete as placed shall be as low as practicable and in no case greater than that shown below for the indicated size of the concrete section.

Thickness of Section (m)	**Temperatures, ºC**	
	Minimum	Maximum
Less than 0.3	10	35
0.3 to 1.0	10	30
1.0 to 2.0	5	25

E22.5.10 Cleanup

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

E22.5.11 Protection From Drying

(a) Placement of deck concrete will not be permitted when the surface moisture evaporation exceeds 0.75 kg/m^2/h. Fog misting is mandatory regardless of drying conditions. The Contractor shall use fog misting operations as accepted by the Contract Administrator. The chart, Figure D.1, Annex D of CSA Standard CAN/CSA-A23.1 shall be used to estimate surface moisture evaporation rates.

E22.6 Quality Control

E22.6.1 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.

E22.6.2 Access

(a) The Contract Administrator shall be afforded full access for the inspection and control 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.

E22.6.3 Materials

(a) All materials supplied under this Specification shall be subject to testing and acceptance by the Contract Administrator in accordance with this Specification.

E22.6.4 Concrete Quality

(a) Quality control tests will be used to determine the acceptability of the concrete supplied by the Contractor.

(b) The Contractor shall provide, without charge, the samples of concrete and the constituent materials required for quality control tests and provide such assistance and use of tools and construction equipment as is required.

(c) The frequency and number of concrete quality control tests shall be in accordance with the requirements of CSA Standard CAN/CSA-A23.1.

(d) An outline of the quality tests is as follows:

(e) Slump tests shall be made in accordance with CSA Standard Test Method CAN/CSA-A23.2-5C, "Slump of Concrete". If the measured slump falls outside the limits specified in this Specification, a second test shall be made.

(f) In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

(g) Air content determinations shall be made in accordance with CSA Standard Test Method CAN/CSA-A23.2-4C, "Air Content of Plastic Concrete by the Pressure Method". If the measured air content falls outside the limits specified in 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.

(h) The air-void system shall be proven satisfactory by data from tests performed in accordance with CSA Test Method CAN/CSA A23.1-17C. The spacing factor, as determined on concrete cylinders moulded in accordance with CSA Standard Test Method CAN/CSA-A23.2-3C, shall be determined prior to the start of construction on cylinders of concrete made with the same materials, mix proportions, and mixing procedures as intended for the project. If deemed necessary by the Contract Administrator to further check the air-void system during construction, testing of cylinders may be from concrete as delivered to the job Site and will be carried out by the Contract Administrator. The concrete will be considered to have a satisfactory air-void system when the average of all tests shows a spacing factor not exceeding 230 microns with no single test greater than 260 microns.

(i) Samples of concrete for test specimens shall be taken in accordance with CSA Standard Test Method CAN/CSA-A23.2-1C, "Sampling Plastic Concrete".

(j) Test specimens shall be made and cured in accordance with CSA Standard Test Method CAN/CSA-A23.2-3C, "Making and Curing Concrete Compression and Flexure Test Specimens".

(k) 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 CAN/CSA-A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the average of the strengths of the two specimens. A compressive strength test at seven (7) days shall be taken, the strength of which will be used only as a preliminary indication of the concrete strength, a strength test being the strength of a single standard cured specimen.

(l) 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 Clause E10.5.6b) and also to check the adequacy of curing and/or cold weather protection. At least two (2) field-cured test specimens will be taken to verify strength of the in-place concrete. For each field-cured strength test, the strength of a single field-cured test specimen shall be determined in accordance with CSA Standard Test Method CAN/CSA-A23.2-9C, "Compressive Strength of Cylindrical Concrete Specimens", and the test result shall be the strength of the specimen.

(m) Notwithstanding CSA A23.2, cores taken from deck must achieve the concrete design strength as a minimum.

E22.6.5 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.

E22.7 Measurement and Payment

E22.7.1 Method of Measurement

(a) Structural Concrete, as defined in this Specification, will be paid for at the Contract Unit Price basis as accepted by the Contract Administrator and will be measure per cubic metre. All stair railing, tiling and cladding, reinforcement, ducting, connection plates and forming will be included in the Contract Unit Price and is considered incidental and no measurement will be made for these items. Items that are included in structural concrete are:

(i) Raised Concrete Planters
(ii) ‘C’ Planters
(iii) Concrete Seating Wall
(iv) Concrete Stairs
(v) All structural concrete not-listed in this specification but shown on the Contract Drawings and incidental to the Work.

(b) Cast-in-Place Concrete Piles 400mm Diameter will be paid for on a unit basis accepted by the Contract Administrator and will measured per lineal meter. All reinforcement will be included in the Unit Price.

(c) Cast-in-Place Concrete Base and Base Plate will be paid for on a unit basis accepted by the Contract Administrator and will measured as each. All stair railing, tiling and cladding, reinforcement, ducting, connection plates and forming will be included in the Contract Unit Price and is considered incidental and no measurement will be made for these items.

E22.7.2 Basis of Payment

(a) Structural Concrete shall be paid for at the Contract Unit Price for “Structural Concrete”, which price shall be payment in full for performing all operations herein described including the cost of furnishing all necessary labour, materials and all other items incidental to the work included in this Specification.

(b) Cast-in-Place concrete piles shall be paid for at the Contract Unit Price for “Cast-in-Place Concrete Piles 400mm Diameter”, which price shall be payment for all operations herein described including the cost of furnishing all necessary labour, materials and all other items incidental to the work included in this Specification.

(c) Cast-in-Place Concrete Base and Base Plate will be paid for at the Contract Unit Price for “Cast-in-Place Concrete Base and Base Plate”. Which price shall be payment for all operations herein described including the cost of furnishing all necessary labour, materials and all other items incidental to the work included in this Specification.

E23. TRENCH DRAIN

E23.1 Description

(a) The specification covers the supply and install of a trench drain to provide drainage at the entrance of a garage.

E23.2 Construction Methods

(a) Installation of trench drain to be installed in accordance with the Suppliers recommendations.

(b) Consent shall be received, and the schedule shall be reviewed with owner prior to installation.

E23.3 Materials

(a) The trench drain shall be manufactured by ACO model number S100K or equal in accordance with B5. Products specified shall be as noted on Drawing.

E23.4 Measurement and Payment

(a) The supply and install of the trench drain will be measured on a lump sum basis.

(b) The supply and install of the trench drain shall be paid for on a lump sum basis for “Supply and Install of Trench Drain” 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.

E24. ELECTRICAL WORK

E24.1 Electrical Scope of Work

E24.1.1 Description

(a) A brief list of electrical work to be performed under this contract is given herein and as identified on the Contract Drawings.

(b) The Contractor shall supply all labour, material, equipment, transportation, services and facilities necessary to make, test and place into operation a complete electrical installation as shown on the drawings and/or as specified herein.

(c) Where the term "provide" is used herein, it shall mean "supply, install, adjust, test and place into operation".

(d) All systems shall be completely assembled, adjusted, tested and demonstrated to be ready for operation to the satisfaction of the Contract Administrator.

(e) The Contractor shall satisfy himself as to working space, storage space, access facilities and all other conditions pertaining to the Site, relating to the conduct of his operations, by the inspection of the Site and examination of the drawings.

E24.1.2 Extent of Work

(a) This work shall consist of furnishing of all labour, material, equipment and all incidentals required for the King St. / Old Market Square Electrical Upgrade.

(b) Work shall include, but not be limited to:

(i) Provision of new electrical system as required.

(ii) Wire to and make connections to, all electrical equipment required, including panels, lights, receptacles, etc.

(iii) The contract shall bid as per the Contract Drawings. There shall be a site inspection meeting with all prospective bidders on site on July 22, 2008 between 1330 hours and 1530 hours. The electrical contact will be:

Mr. Dave Dowhan, P.Eng.
Senior Electrical Engineer

Stantec Consulting Ltd.
905 Waverley Street
Winnipeg, MB R3T 5P4

Telephone No. (204) 488-5707
Facsimile No. (204) 453-9012

E24.1.3 General

(a) All work to be carried out by qualified journeymen of the related trades.

E24.1.4 Installation

(a) Install to make a complete and working system.

E24.1.5 Electrical Measurement and Payment

(a) No measurement will be made for all electrical work described and will be paid for at the lump sum contract price for “Electrical Works”.

E24.2 General Electrical Provisions

E24.2.1 Scope

(a) Refer to Electrical Scope of Work for general description of electrical work to be carried out under this Contract.

E24.2.2 Examination of Drawings

(a) The electrical drawings do not show all architectural, mechanical and civil details. All electrical schematics are shown diagrammatically unless otherwise noted. The Contractor shall review the mechanical and structural drawings to obtain dimensions and details. Verify dimensions accurately by measurements.

(b) To change the location of proposed or existing electrical equipment, submit a request in writing to the Contract Administrator for approval. If approved, such changes are to be made at no additional cost to the City.

(c) No extra will be allowed for any additional labour or materials required for relocation of equipment due to interference with equipment of other trades, beams, joists, walls, etc.

E24.2.3 Approved Design and Installation

(a) Equipment and material to be of approved design and manufactured in accordance with all governing regulations such as "Canadian Standards Association", "Canadian Electrical Code", "Provincial Department of Labour", "Underwriters Laboratory", etc. Equipment and material must bear applicable acceptance labels of all associations and governing bodies recognized by the municipal, provincial and federal authorities.

(b) Install equipment in strict accordance with manufacturer's recommendations and governing rules, regulations and codes.

(c) Where requirement conflict occurs, install all materials in accordance with the most severe requirements.

(d) Material installed under this Division to be new and of uniform construction.

(e) All installation to ensure maximum headroom, minimum interference with free use of surrounding areas, and best access to equipment.

(f) To deviate major service runs from the location shown on the drawings, submit to the Contract Administrator suitable drawings showing such deviations together with reasons for deviations and obtain approval from the Contract Administrator before proceeding with the installation.

E24.2.4 Codes and Standards

(a) Install all equipment in accordance with current editions of CSA 22.1 and 22.2, including all local amendments unless otherwise specified.

(b) Perform all work in accordance with drawings, specifications, applicable municipal and provincial regulations, and any pertinent inspection bulletins issued by the electrical inspection authority having jurisdiction over the installation. In no instance shall the standard established by the drawings and specifications be reduced.

(c) Provide a copy of all standards referred to in this Section for use on Site.

E24.2.5 Permits, Inspections and Fees

(a) Deliver to the Contract Administrator all necessary interim and final certificates of inspection and approval which may be required by all inspection authorities having jurisdiction over the Work, as evidence that the Work installed conforms with the laws and regulations of all governing authorities.

(b) Submit copies of all plans and specifications to the authority having jurisdiction for inspections as may be required prior to commencement of work to comply with the above.

(c) Notify the inspection authorities in sufficient time for them to arrange to inspect the Work.

(d) Pay all associated fees.

E24.2.6 Abbreviations

(a) Abbreviations for electrical terms shall be to CSA Z85-1983.

(b) Names used throughout these specifications are:

EEMAC	Electrical & Electronic Manufacturers Association of Canada (formerly CEMA)
CSA	Canadian Standards Association
FM	Factory Mutual
NEMA	National Electrical Manufacturers Association (U.S.)
JIC	Joint Industry Conference
IPCEA	Insulated Power Cable Contract Administrators Association
ISA	Instrument Society of America
CEC	Canadian Electrical Code
IEEE	Institute of Electrical and Electronic Contract Administrators
IES	Illuminating Contract Administratoring Society
NBC	National Building Code
ANSI	American National Standards Institute

E24.2.7 Record Drawings

(a) Submit record drawings in accordance with General Requirements.

(b) The Contractor shall record all changes made during construction and provide record drawings to the City upon completion of the Work.

(c) At the completion of the project, the Contractor shall submit one (1) set of record drawings on disk, accurately recording all changes, deviations and relocations necessitated by job conditions and equipment approved shop drawings all done on CADD using AutoCad Release 2005 or later to the satisfaction of the Contract Administrator.

(d) Include with the record drawings a list for each motor indicating motor or equipment number and name, nameplate voltage, horsepower and current, the size of overload and breaker or fuse protection provided.

E24.2.8 Definitions

(a) The following are definitions of terms and expressions used in the specification:

(i) "Inspection Authority" means agent of any authority having jurisdiction over construction and safety standards associated with any part of electrical work on Site.

(ii) "Supply Authority" means electrical power company or commission responsible for delivery of electrical power to project.

(iii) "Electrical Code" means Canadian Electrical Code C22.1 or code in force at project location.

(iv) "Indicated" means as shown on contract drawings or noted in contract documents.

(b) Refer to CSA C22.2 No.0 for "Definitions and General Requirements".

E24.2.9 Cooperation and Coordination

(a) Schedule expediting of all materials and execution of the Work.

(b) Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete shall be schedule 40 galvanized steel pipe, sized for free passage of conduit, and protruding 50 mm (2").

(c) Cables, conduits and fittings to be embedded or plastered over neatly and close to building structure so furring can be kept to a minimum.

(d) Arrange for holes through exterior walls and roof to be flashed and made weatherproof.

E24.2.10 Source Quality Control

(a) Arrange for a plant inspection by Contract Administrator where specified.

(b) Inform Contract Administrator of manufacturing progress and arrange inspections at appropriate times.

(c) Action required by factory inspection shall not be construed as final acceptance.

(d) Obtain a Certificate of Acceptance from the inspection authority on completion of the Work and provide it to the Contract Administrator.

(e) The Contract Administrator may carry out inspections and prepare deficiency lists for action by the Contractor, during and on completion of project.

E24.2.11 Guarantee

(a) Guarantee all work of the specification against all defects and labour and materials.

E24.2.12 Care, Operation and Start-Up

(a) Instruct the City's operating personnel in the operation, care and maintenance of equipment.

(b) Arrange and pay for services of manufacturer's factory service representative to supervise start-up of installation, check, test, adjust, balance and calibrate components.

(c) Provide these services for such period, and for as many visits as necessary, to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

E24.2.13 General

(a) All materials shall be fully approved by the Canadian Standards Association (CSA) for use as installed and meet the requirements of this specification in all respects.

(b) Where there is no alternative to supplying equipment which does not have CSA approval, submit such equipment to Provincial Hydro inspection authorities for special inspection and obtain approval. Pay all associated fees.

(c) Materials and equipment shall be of Canadian manufacture except where specified otherwise or where Canadian made materials or equipment do not exist.

(d) Where two or more units of the same class or type of equipment are required, the units shall be the product of a single manufacturer, although components of equipment need not be products of the same manufacturer.

(e) Use material and equipment available from regular production of manufacturer.

(f) Control panels and component assemblies to be shop manufactured.

E24.2.14 Finish

(a) Finish metal enclosure surfaces by removing rust and scale, cleaning, and applying rust resistant primer inside and outside with at least two coats of finish enamel.

(b) Paint all outdoor electrical equipment "equipment green" finish to EEMAC-Y1.

(c) Paint all indoor switchgear and distribution enclosure "light grey" to ASA 61 grey.

(d) Clean, prime and paint exposed hangers, racks, fastenings, etc., to prevent rusting.

E24.2.15 Voltage Ratings

(a) Operating voltages to be within those defined in CSA Standard C235-1969.

(b) All motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment must be able to operate in extreme operating conditions established in above standard without damage to equipment.

E24.2.16 Wiring Terminations

(a) Lugs, terminals, screws used for termination of wiring must be suitable for copper conductors.

E24.2.17 Enclosures

(a) Minimum enclosure type to be used is EEMAC 3R unless otherwise specified.

E24.2.18 Manufacturers and CSA Labels

(a) Manufacturers' nameplates and CSA labels are to be visible and legible after equipment is installed.

E24.2.19 Warning Signs

(a) Provide warning signs with suitable background color and lettering as required to meet requirements of inspection authorities and Contract Administrator. Use decal signs, minimum size 178 mm x 250 mm.

E24.2.20 Workmanship

(a) Where sheet metal enclosures are not provided with knockouts, Greenlee punches shall be used in all cases. Cutting torches shall not be used for making holes.

E24.2.21 Installation

(a) Determine manufacturers' recommendations regarding storage and installation of equipment and adhere to these recommendations.

(b) Check all factory joints and tighten where necessary to ensure continuity.

E24.2.22 Mounting Heights

(a) Mounting height of equipment shall be as indicated on drawings.

E24.2.23 Special Protection

(a) Accept the responsibility to protect those working on the project from any physical danger due to exposed electrically energized equipment such as panel mains, outlet wiring, etc. Shield and mark all live parts "LIVE - 600 VOLTS" or with the appropriate voltage.

(b) Arrange for the installation of temporary doors, barriers, etc., for all electrical equipment. Keep these doors locked at all times except when under direct supervision.

E24.2.24 Equipment Identification

(a) Supply and install identification nameplates on all equipment such as motor starters, safety switches, panelboards, pushbutton stations, etc. and any equipment not so supplied. All nameplates shall be securely fastened to equipment with galvanized steel screws.

(b) All identification nameplates, except for motors, shall be laminated phenolic with minimum 6 mm (1/4 inch) black letters on white background, the wording of which shall be identical to that on the single line diagrams and the title of the equipment controlled. Motor nameplates to be of non-corroding metal stamped or engraved with black lettering on light background.

(c) Warning nameplates shall be laminated phenolic with minimum 6 mm (1/4 inch) white letters on red background, the wording to be reviewed by the Contract Administrator. All warning nameplates to be screwed to equipment.

(d) Warning nameplates required by inspection authorities shall be provided for all electrical switchgear and equipment and on access doors to electrical rooms, vaults, switchyards, etc. in accordance with the applicable Code regulations. Obtain all necessary details from the inspection authorities.

(e) Where nameplate wording not specified on the drawings, obtain exact wording from the Contract Administrator.

(f) Identify pull boxes, terminal cabinets and junction boxes enclosing cables or connections with nameplates indicating voltage, box number and circuit number.

(g) Provide junction boxes, relay panels and miscellaneous equipment energized from two or more sources with a warning nameplate prominently displayed, noting number and location of sources and their voltage.

(h) Provide a typewritten circuit directory with a clear plastic cover for each panelboard in a suitable holder on the inside of each panel door. Unless otherwise noted, the directory shall indicate breaker or switch circuit number, rating, load description and associated load data.

(i) Manufacturer's nameplates and CSA labels to be visible and legible after equipment is installed.

E24.2.25 Wiring Identification

(a) Provide permanent indelible identifying markings, either numbered or colored plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. Maintain phase sequence and identification throughout system, i.e. panelboards, starters, terminal blocks, disconnect switches.

(b) Maintain identification system at all junction boxes, splitters, cabinets and outlet boxes.

(c) Use color coded wires in communication cables, matched throughout system. All color coding must adhere to CSA C22.1.

E24.2.26 Touch-Up Painting

(a) Be responsible for field touch-up painting of all shop painted electrical equipment installed in this Contract.

(b) All surfaces to be painted shall be dry, clean, free from dust, dirt, grease, frost, rust, loose crystals or extraneous matter, tool and machine marks. Feather out edges of scratch marks to make patch inconspicuous.

(c) Apply one or more coats of paint until the damaged surface has been restored to original finish condition. Do not apply succeeding coats until preceding coat is dry and hard. Sand lightly between coats with No. 00 sandpaper.

(d) Be responsible for obtaining the necessary touch-up paint of the original type and quality from the equipment manufacturer.

(e) Supervise priming and finish painting of all electrical equipment and material not shop painted.

E24.2.27 Sleeves and Openings

(a) Provide sleeves and openings for exposed conduits, busways, and wireways, where they pass through walls or floors conforming to relevant fire codes where applicable.

(b) Sleeves for individual conduits shall be galvanized or stainless steel.

(c) Pack or fill sleeves and openings after the completed work is in place. Filling shall provide a waterproof seal to prevent leakage of water or other liquids through the sleeve or opening.

(d) Sleeves and openings shall not displace reinforcing steel, and shall receive approval of the Contract Administrator prior to placement.

E24.2.28 Cutting and Patching

(a) Do all drilling, cutting, fitting and patching necessary for the running and securing of conduits, wireways, and other electrical equipment.

(b) Provide supports necessary for same.

(c) Provide bracing and anchorage of work subject to Contract Administrator's approval.

(d) No cutting of the structural members or of the fireproofing shall be done without the written consent of the Contract Administrator.

(e) Caulk and flash all conduits passing through walls, roofs or other surfaces exposed to weather or as indicated on the drawings to prevent the passage of water and/or sewer gases.

E24.2.29 Hangers and Supports

(a) Provide hangers, angles, channels, and other supports necessitated by field conditions to install all items of electrical equipment. Design of supports and methods of fastening to building structures shall be subject to the Contract Administrator's approval.

(b) Provide weight-distribution facilities, where required, so as not to exceed the load-bearing capacities of floors or walls that bear the weight of, or support, electrical items.

(c) Paint all exposed parts of hangers and supports with an anti rust inhibiting primer.

(d) Equipment shall not be held in place by its own weight. Provide base anchor fasteners in each case.

E24.2.30 Protection of Equipment

(a) Protect conduit and wireway openings against the entrance of foreign matter by means of plugs or caps.

(b) Fixtures, materials, equipment, or devices damaged prior to final acceptance of the Work shall be restored to their original condition or replaced by the Contractor.

E24.2.31 Testing of Electrical Systems

(a) General

(i) Prior to the Contract Administrator's acceptance, all electrical equipment, materials and systems installed shall be subject to an inspection and applicable performance tests supervised by the Contract Administrator to ensure that the operation of the system and components satisfy the requirements of the Specifications.

(ii) Ensure that the system and its components are ready prior to the inspection and test for acceptance.

(iii) All testing shall be conducted by fully qualified personnel only. Tests requiring initial power energization of a system shall not be made without notification of the Contract Administrator. Tests, checks and the like carried out by or on behalf of the Contractor shall be documented and certified at no additional cost to the City. Submit six copies of the test certificates to the Contract Administrator. Carefully check wiring for each system and/or part of a system to ensure that the system will function properly as indicated by wiring and schematic diagrams, description of operation, etc.

(iv) Carefully check wiring for each system and/or part of a system to ensure that the system will function properly as indicated by wiring and schematic diagrams, description of operation, etc.

(v) Manually operate alarms and control devices to check whether their operation during normal and abnormal operating conditions causes the proper effect.

(vi) Supply the necessary labour and for all electrical systems equipment for operational tests required and make final adjustments to the electrical controls at no additional cost to the City.

(vii) Perform tests on auxiliary or specialized systems with the assistance of the manufacturer's representative. Upon successful conclusion of the tests, obtain a certificate from the manufacturer stating that the system has been installed to their satisfaction and that it is in good working order.

(viii) Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to values and settings as indicated.

(ix) Supply all instruments, meters and personnel required for the tests.

E24.2.32 Cable and Wire 1000 Volt and Below

(a) Tests on cables in this voltage range shall be limited to insulation resistance measurements using a 500V megger for systems up to 350V and a 1000V megger for 351-600V systems.

(b) Record all test results in a log book and submit to the Contract Administrator for reference. Replace or repair all circuits which do not meet minimum requirements specified in the CEC, Table 24. Insulation resistance of the following circuits shall be measured:

(i) Power, lighting and motor feeders (with equipment disconnected): phase-to-phase, phase-to-neutral and phase-to- ground.

(ii) Control circuits: measure to ground only.

(iii) Do not perform megger tests on control circuits containing transistorized or solid- state components.

(iv) Where power factor correction equipment is installed, it may be necessary to disconnect the capacitors from the system prior to testing to avoid overvoltage.

E24.2.33 Ground System

(a) Test the grounding system efficacy for compliance with CSA Standard C22.1 and Supply Authority requirements. Verify that the ohmic resistance values specified therein are not exceeded.

(b) Notify inspection and supply authorities that they may be present to witness Contractor testing and provide any assistance required by these authorities for their own testing procedures.

E24.2.34 Training

(a) Provide for the training of the City's representatives in the operation, maintenance and testing of all systems and equipment including the provision of qualified manufacturer's technical representatives for specialized systems.

(b) Provide these services for such period, and for as many visits as necessary to put installation in working order, and to ensure that operating personnel are conversant with all aspects of its care and operation.

E24.3 Conduit, Conduit Fastenings and Conduit Fittings

E24.3.1 Scope

(a) Furnish all labour, materials, supervision, equipment and services specified, indicated or requested to install a complete conduit raceway system. The raceway systems shall be comprised of the supply and installation of all conduits, fittings, supports, hangers and miscellaneous support materials and hardware required.

E24.3.2 Quality Assurance

(a) Flexible Liquid-Tight Non-metallic conduit to CSA C22.2 No. 211.2-93. RGS metal conduit to CSA C22.2 No. 56-1977.

E24.3.3 Location of Conduit

(a) The drawings do not show every specific conduit run. All wiring shall be surface or run in the slab unless otherwise indicated in the specifications and/or shown on the drawings. All devices shall be surface mounted type except as shown.

E24.3.4 Conduits

(a) Flexible Liquid-Tight PVC conduit for all cast-in-place concrete installation.

(b) RGS metal conduit for all underground installation.

E24.3.5 Fish Cord

(a) Polypropylene

E24.3.6 General Installation Requirements

(a) Cut conduit ends square and ream to remove burrs and sharp edges. Ensure that conduits butt in couplings and other fittings.

(b) Bends and offsets shall have a minimum radius of curvature not less than the minimum bending radius of the cable to be installed.

(c) Temporarily plug all conduits terminating in cabinets and boxes where moisture and foreign matter may enter.

(d) Blow all conduits through with clean compressed air to clear all foreign matter and moisture prior to the installation of wires or cables.

(e) Install fish cord in all conduits.

E24.4 Wire and Cable

E24.4.1 Scope

(a) Furnish all labour, materials, supervision, equipment and services specified herein, indicated or requested to install the complete wiring system including but not limited to:

(i) Low voltage wire and cable (1000 V and below)

(b) The wiring system shall include all wiring, terminations, wire markers, cable tags, cable ties, splice fittings, insulating tapes, connectors and miscellaneous materials necessary to complete the wiring system.

E24.4.2 Low Voltage Wire 1000 Volt and Below

(a) All wire shall have stranded, annealed copper or compact stranded 8000 Series aluminium alloy conductors, 600 volt rating, cross-linked polyethylene (XLPE) insulation, minus 40°C, 90°C maximum conductor temperature, limited flame spread.

(b) The wiring shall be suitable for installation in wet environment and rated RW-90.

(c) For direct buried installations or for installation in direct buried polyethylene pipe, the cable shall be cross-linked polyethylene, rated RWU-90.

(d) Minimum conductor size shall be #12 AWG unless otherwise specified.

(e) Use GTF fixture wire, 600 volt, 125 C, flexible copper conductor for all connections between lighting fixtures and outlet boxes.

(f) Color coding of insulated conductors shall conform to the following:

Single Phase Systems

Phase A	Red
Phase B	Black
Neutral	White
Ground	Green

Three Phase Four Wire Systems

Phase A	Red
Phase B	Black
Phase C	Blue
Neutral	White
Ground	Green

(g) Insulated ground conductors forming part of a multi-conductor cable assembly shall have green color coding.

(h) Cable and wire shall be as manufactured by Alcatel Canada Wire Inc., Phillips Cables Ltd., Pirelli Cables Inc., Alcan Cable Inc.

E24.4.3 Wiring Accessories

(a) Wire markers, black letters on white background, shall be heat shrink type as manufactured by Critchley.

(b) Cable markers for cables or conductors greater than 13 mm (1/2 inch) diameter, shall be strap-on type, rigid PVC, black letters on white background, with PVC covered aluminum straps, as manufactured by Electrovert Cat. No. 510.

(c) Terminal blocks shall be minimum 600 volt rated, modular, sized to accommodate conductor size used, as manufactured by Weidmuller, Phoenix, Allen-Bradley.

(d) Where screw-type terminals are provided on equipment, field wiring shall be terminated with insulated fork tongue terminals, as manufactured by Thomas & Betts, Sta-Kon.

(e) Splice connectors for wire sizes #14-10 AWG inclusive, shall be of the compression spring type, as manufactured by Ideal Waterproof Type DP.

(f) Splice connectors for wire sizes #8 AWG and larger shall be split-bolt type, sized to suit number and size of conductors, as manufactured by Burndy Servit Type KS.

(g) Cable ties shall be nylon, one-piece, self-locking type, as manufactured by Thomas & Betts, Burndy, Electrovert.

(h) Electrical insulating tape as manufactured by 3M Scotch 88.

(i) Cable grips shall be provided for all vertical and catenary cable suspension installations to reduce cable tension at connectors or at cable bends. The cable grips shall be selected to accommodate the type and geometry of cable supported and shall be of the single wave, variable mesh design, as manufactured by Kellems, Arrow-Hart.

(j) Cable pulling lubricant shall be compatible with cable covering and shall not cause damage and corrosion to conduits or ducts.

E24.4.4 Installation

(a) Install all wire according to the drawings with a minimum size of #12 AWG unless indicated otherwise.

(b) Pull wire into ducts and conduits in accordance with the manufacturer's recommendations, using patented wire grips suitable for the type of wire or using pulling eyes to be installed directly onto the conductors.

(c) Limit pulling tensions to those recommended by the manufacturer to avoid overstressing wire.

(d) Utilize adequate lubricant when pulling wires through ducts and conduits to minimize wear on cable jackets.

(e) Make connections to equipment "pig-tails" with mechanical, insulated, screw-on connectors for wire sizes #14-10 AWG. For wire sizes #8 AWG and larger utilize split-bolt connectors, taped with three layers minimum of insulating tape. For both copper and aluminium terminations, wire through the conductor, apply joint compound anti-oxidant, and torque to lug manufacturer’s recommended torque levels.

(f) No splices shall be permitted in cable or wiring runs without the written permission of the Contract Administrator, and shall only be permitted in junction boxes.

(g) Neutral conductors shall be identified. Paint or other means of coloring the insulation shall not be used.

(h) Unless otherwise specified, make all wiring taps, splices and terminations with identified compression screw type terminal blocks, securely fastened to avoid loosening under vibration or normal strain. Make connections for interior and exterior lighting circuits and 120 volt, 15 amp convenience receptacle circuits using screw-on or split-bolt connectors and insulating tape.

(i) Determine the exact length of cable required to avoid splices.

(j) Identify each conductor by specified markers at each termination indicating the circuit designation or wire number.

(k) Identify each cable by attaching a suitable marker, stamped or indelibly marked with the cable number, at each end of the cable and in all junction boxes and pull boxes.

E24.5 Wire and Box Connectors

E24.5.1 Scope

(a) This section covers the supply and installation of all wire and box connectors.

E24.5.2 Quality Assurance

(a) Solder lugs to CSA C22.2 No. 19-1935 (R1981).

(b) Wire connectors to CSA C22.2 No. 65-M1988.

(c) Connectors shall be copper or copper alloy.

(d) Bushing stud connectors to EEMAC 1Y-2-1961 and shall be suited for conductor type.

(e) Clamps or connectors for cable to CSA-C22.2 No. 18, 1972.

E24.5.3 Materials

(a) All lugs, terminals and screws used for termination of wiring must be suitable for copper conductors.

(b) Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.

(c) Fixture type splicing connectors: with current carrying parts of copper sized to fit copper 10 AWG or less.

(d) Clamps or connectors for flexible conduit, as required.

(e) All cable terminations shall be with compression type connectors.

E24.5.4 Installation

(a) Remove insulation carefully from ends of conductors.

(b) Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65-M1988.

(c) Install fixture type connectors and tighten. Replace insulating cap.

(d) Install crimp type connectors to the satisfaction of the Contract Administrator.

(e) Install box connectors to CSA requirements.

E24.6 Fastenings and Supports

E24.6.1 Scope

(a) This section covers the supply and installation of all fastenings and supports for equipment mounted under the electrical contract.

E24.6.2 Materials

(a) Expansive screw anchors, shields, or other fastening items containing lead or other material that might loosen or melt under fire conditions shall not be used. All fastenings used shall be corrosion resistant stainless steel.

(b) Power-actuated fasteners and devices shall not be used.

(c) Support channels, length as required, U shaped, size as required, of stainless steel.

(d) Support equipment, conduit or cable clips, spring loaded bolts, cable clamps etc., to be purpose-built accessories to basic channel members.

(e) Two-hole PVC straps to secure surface conduits 50 mm and smaller.

(f) Beam clamps to secure conduit to exposed steel work.

(g) Support individual cable or conduit runs with 6.0 mm diameter galvanized steel threaded rods and spring clips.

(h) Support two or more cables or conduits on channels supported by 6.0 mm diameter stainless steel threaded rod hangers where direct fastening to building construction is impractical.

E24.6.3 Installation

(a) Install fastenings and supports as required for each type of equipment, cables and conduit to manufacturer's installation recommendations.

(b) Provide metal brackets, frames, hangers, clamps and related support structures where indicated or as required to support conduit and cable runs.

(c) Do not use wire lashing or perforated strap to support or secure raceways or cables.

(d) Provide adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

(e) Do not use supports of other equipment installed for conduit or cable support except with permission and approval of the Contract Administrator.

(f) Any aluminum support bracket or channel that is in direct contact with concrete is required to have inert spacers to reduce chemical reaction between support and concrete.

E24.7 Outlet Pull, Splitter and Junction Boxes

E24.7.1 Scope

(a) Furnish all labour, materials, equipment and services specified, indicated or requested to install the electrical boxes specified herein and on the drawings.

E24.7.2 Outlet Boxes

(a) Size boxes in accordance with CSA C22.1-1986.

(b) 100 mm square or larger outlet boxes as required for special devices.

(c) Gang boxes where wiring devices are grouped.

(d) Blank cover plates for boxes without wiring devices.

(e) Outlet boxes to be RGS.

(f) All outlet boxes shall be supplied with ground stud.

(g) Outlet boxes to be Series FS or FD as manufactured by Ipex.

(h) Surface mounted outlet boxes shall be EEMAC 12 unless otherwise indicated.

(i) All outlet boxes to CSA C22.2 No. 18-M1987.

E24.7.3 Installation

(a) Install boxes to clear all building and mechanical services equipment. Where two or more devices are shown at one location, utilize multi-gang boxes. Supply all outlet boxes with covers as required.

(b) Size all boxes to accommodate the number of conduits, conductors and terminal blocks. Provide junction boxes with 20% spare terminal blocks.

(c) Securely fasten surface-mounted boxes to the building or mounting structure and support independently of the conduits entering the box.

(d) Install junction and pull boxes mounted on brick, concrete or block walls with 3 mm (1/8 inch) thick lead or nylon washers between box and wall face.

(e) Provide pull boxes sized to CEC requirements, in all conduit raceway systems to limit length of straight conduit runs to 30 m (100 ft). Reduce this length by 7.5 m (25 ft) for each 90 degrees bend or 4 m (12 ft) for each 45 degree bend or offset.

(f) Mark location and size of all pull boxes on the record drawings.

E24.7.4 Application

(a) Location of outlets indicated may be changed by the Contract Administrator at no extra cost or credit, providing distance moved does not exceed 3000 mm, and notice is given before installation is completed.

E24.7.5 Mounting Heights

(a) Refer to General Electrical Provision.

(b) Exact mounting height of unnoted equipment must be verified with the Contract Administrator before proceeding with installation.

E24.8 Wiring Devices

E24.8.1 Scope

(a) This section covers the supply and installation of all receptacles and cover plates.

(b) All wiring devices shall be at the same manufacturer throughout the Contract.

E24.8.2 Receptacles

(a) This specification applies to single and duplex receptacles and receptacles of other voltage and ampacity as indicated on the drawings.

(b) Type EEMAC 5-15R, 125V, 15A, U-ground, heavy duty specification grade to CSA C22.2 No. 42-M1984.

(c) Receptacle shall have heavy duty nylon face with steel reinforcing plate in centre.

(d) Receptacle shall have spring loaded back wiring.

(e) Receptacle shall have raised ground for safety.

(f) Receptacle contacts shall have spring steel clips to reduce contact fatigue.

(g) Receptacle shall be suitable for No. 10 AWG back and side wiring.

(h) All screws shall be combination slotted socket head design to accept #6 socket head screwdriver on all screws.

(i) Acceptable manufacturer is Bryant, Arrow Hart, Levton No. 5262 duplex receptacle.

E24.8.3 Weatherproof Cover Plates

(a) Weatherproof covers for duplex receptacles shall be self closing, two spring loaded independent doors, PVC complete with non-corrosion stainless steel springs and stainless steel mounting screws.

(b) Weatherproof covers for light switches shall be plunger style, PVC complete with non-corrosive stainless steel mounting screws.

(c) Covers shall be complete with EPDM gasketry material suitable for -45°C to 85°C.

(d) Acceptable manufacturers are IPEX, Leviton.

E24.8.4 Installation

(a) Receptacles:

(i) Install all 15A receptacles with “U” ground slot up.

(ii) Install receptacles in gang type outlet box when more than one receptacle is required in one location.

(iii) Mount receptacles at height as indicated.

(iv) The location of all outlets as shown on the electrical plans is approximately correct at the time of planning, but as these drawings do not show all structural details, measure any work requiring accurate dimensions either on the project or from the architectural details.

(v) The location of outlets shown on the drawings may be changed by the Contract Administrator at no extra cost to the City, providing the distance does not exceed 3000 mm and the information is given before installation.

(b) Cover Plates:

(i) Install all cover plates prior to energization.

(ii) Cover plates shall be straight and true.

(iii) Flush-mounted cover plates shall be flush with the wall.

(iv) Do not use cover plates meant for flush-mounted outlet boxes on surface-mounted boxes.

E24.9 Grounding

E24.9.1 Scope

(a) Furnish all labour, materials, equipment and services specified, indicated or requested to install a complete grounding system. The grounding system shall include ground rods, all wiring, ground bus, thermit welds, mechanical fittings, connectors, links and miscellaneous materials necessary to complete a grounding system acceptable to the inspection authorities.

E24.9.2 Quality Assurance

(a) Grounding equipment to CSA C22.2 No. 41-M1987.

(b) Copper grounding conductors to ASA A7.1 1964.

E24.9.3 Ground Conductors

(a) Ground conductors shall be concentric stranded, soft drawn copper. Insulated conductors, where required by inspection authorities or specified, shall be type TW, 600 volt rating, green color.

(b) Where direct buried bare ground conductor comes into contact with corrosive material, the conductor shall be tinned.

E24.9.4 Ground Clamps

(a) Ground clamps for connecting ground conductors to metal water piping not suitable for thermit weld connections shall be sized to accommodate the system ground conductor and the water pipe, as manufactured by T & B, Burndy.

E24.9.5 Compression Connections

(a) Compression devices shall be of pure wrought copper material, factory fitted with oxide inhibiting compound and shall meet latest IEEE 80 Standard, as manufactured by T & B, Burndy.

E24.9.6 Mechanical Connections

(a) Mechanical connectors shall be of bronze , copper or brass construction with stainless steel hardware selected and sized specifically for the particular application and shall meet latest IEEE standard.

E24.9.7 Ground Rods

(a) Ground rods shall be 19 mm (3/4") diameter, 3 m (10 feet) long, copper clad steel construction with the copper exterior coating permanently bonded to the steel core.

E24.9.8 Installation

(a) Make all conductor joints, splices and connections with permanent type thermit welds or mechanical compression connectors utilizing hydraulic tools.

(b) Make ground connections to building steel or flat metallic surfaces with thermit welds. Locate connections where they will not be subject to mechanical damage and, where possible, be accessible for inspection.

(c) Protect grounding conductors or bus subject to mechanical damage by rigid steel conduit or steel guards which shall be effectively grounded at both ends to the ground conductor they are protecting, regardless of their length.

(d) Make connections to ground bus using mechanical clamp type connectors.

(e) Securely bond metal enclosures, motor frames, steel supports for starters, panels, switches, etc., which are not rigidly secured to and in contact with grounded structural steel of a building or conduit system, or which are subject to excessive vibration, to building steel or conduit system with stranded copper conductors.

(f) Install ground conductors passing through masonry walls, floors, foundations, etc. in 25 mm (1") rigid PVC conduit sleeves. Where sleeves are installed in walls or floors below grade, seal the sleeves watertight after installation of ground conductor.

E24.9.9 Equipment Grounding

(a) Install grounding connections to typical equipment included in, but not necessarily limited to the following list: service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steelwork, distribution panels, outdoor lighting, telephone backboard.

E24.9.10 Tests

(a) Perform tests in accordance with general provisions.

(b) Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the Contract Administrator and inspection authority having jurisdiction.

(c) Perform tests before energizing electrical system.

(d) Disconnect ground fault indicator during tests.

(e) Perform tests in presence of the Contract Administrator.

(f) Submit written test results to the Contract Administrator.

E24.10 Circuit Breakers

E24.10.1 Scope

(a) This section covers the supply and installation of all magnetic and thermal magnetic circuit breakers.

(b) Specific circuit breaker voltage, phase, ampacity, pole numbers, interrupting capacity, breaker type and setting are indicated elsewhere in the specifications or on the drawings.

E24.10.2 Quality Assurance

(a) All equipment to CSA Standard 22.2, No. 5-M1986.

E24.10.3 Submittals

(a) Submit shop drawings in accordance with these provisions, including:

(i) Component function, make and model no.

(ii) Breaker voltage and amperage.

(iii) Breaker phase, number of poles & number of wires.

(iv) Indication of solid neutral if required.

(b) Submit time-current characteristic curves for breakers with ampacity of 15 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

E24.10.4 Breakers – General

(a) Bolt-on moulded case circuit breakers, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40^{o}C ambient.

(b) Common-trip breakers with single handle for multipole applications.

(c) Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-10 times current rating.

(d) Circuit breakers with interchangeable trips as indicated.

(e) Circuit breakers shall be lockable in “Off” position.

E24.10.5 Thermal Magnetic Breakers

(a) Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping.

E24.10.6 Magnetic Breakers

(a) Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping.

E24.10.7 Enclosures

(a) All breakers shall be housed in an existing EEMAC 3R rated panelboard.

E24.10.8 Manufacturers

(a) For circuit breakers protecting fans, heating elements, transformers and panelboards, acceptable manufacturer is Schneider Canada Federal Pioneer FHL, Cutler-Hammer Series C, Siemens type SB.

(b) For circuit breakers protecting electric motors, acceptable manufacturer is Schneider Canada Square “D” Mag-Guard MCP, Culter-Hammer Series C HMCP, Siemens.

E24.10.9 Installation

(a) Install circuit breakers in panelboard as indicated.

E24.11 Lighting Fixtures

E24.11.1 Scope

(a) This section covers the supply and installation of lighting fixtures and lamps.

E24.11.2 General Requirements

(a) Supply and install where shown and as specified on the drawing, all lighting fixtures c/w suspension devices, lamps and other attachments as specified or required to give the best appearance and mechanical installation.

(b) All fixtures shall carry the approval of the Canadian Standards Association and/or the approval of the Inspection Department having jurisdiction.

(c) All fixtures, stem hangers, ballast compartments, canopies, reflectors, wireways, brackets, etc., used in conjunction with the fixtures shall be factory finished, baked white enamel, unless otherwise specified.

(d) All fixtures which have minor scratches after installation shall be "touched up" with an approved enamel to match the fixture finish to the complete satisfaction of the Contract Administrator.

E24.11.3 Submittals

(a) Submit shop drawings in accordance with these provisions showing information such as width, depth, finish, etc. of each fixture in addition to all pertinent lamp data.

E24.11.4 Fixture Schedule

(a) Type "A"

(i) Outdoor in grade Metal Halide up-light, CSA approved or ULC listed, Suitable for wet locations, IP68 or higher rating construction, c/w internal glare control options and decorative rock guard. Fixture shall be adjustable up to 15° from vertical and rotate 360°. Lamp shall be 120V, 70W MH.

Hydrel PDX7 SS 70CMT6 120 NSP FLC 34S ISS RG LPI

E24.11.5 Installation

(a) As per C.E.C. Section 22 and Section 30.

(b) Installation of all lighting equipment shall comply with the relevant Section of this Specification and the Canadian Electrical Code.

(c) At the completion of construction and acceptance of the Work, all lighting fixtures shall be clean, complete with all necessary accessories and provided with the required operating lamp(s).

(d) The Contractor shall meet the Contract Administrator on site to verify/aim up-lights on completion of the work. Note that the site visit will be required after dark.

E25. DOUBLE CHECK VALVE AND METER ENCLOSURE

E25.1 Further to CW3530, install the double check valve and meter assembly as per SD-241B. Pit to be modified as shown on the drawings.

E25.2 Double Check Valve to be non-draining. Approved valve: WATTS Model 719.

E25.3 Checker plate to be painted matte black as approved by the Contract Administration.

E26. TREE REMOVAL

DESCRIPTION

E26.1 General

E26.1.1 This Special Provision shall amend the City of Winnipeg Standard Construction Specification CW 3010-R4 “Clearing and Grubbing”, and shall cover the removal of trees as specified on the Contract Drawings. The City of Winnipeg, Forestry Branch must be contacted prior to removing any trees.

CONSTRUCTION METHODS

E26.2 General

E26.2.1 Remove Trees in accordance with CW 3010-R4.

MEASUREMENT AND PAYMENT

E26.3 Tree Removal

E26.3.1 Tree removal will be measured on a unit basis. The Contractor will be paid according to the total number of trees removed within the limits of the work and approved by the Contract Administrator.

E26.3.2 The removal of trees shall be paid for at the Contract Unit Price per tree for “Tree Removal”, 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.

E27. PROTECTION OF EXISTING TREES

E27.1 General

(a) This Specification covers the protection of all existing trees. 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.

E27.1.1 Definitions

(a) The following definitions shall apply.

(i) TREE PROTECTION AREA: Generally, a tree protection area should consist of the ground encompassing from 1.0 (minimum) to 1.5 times the distance between the trunk and dripline, or as shown in the table below, whichever is greater. Areas of ground covered by pavement, buildings, or other permanent structures where the presence of roots is minimal or negligible may be excluded at the discretion of the Contract Administrator.

Trunk Diameter	Minimum Protection Area Radius

< 100 mm	1.8 m
110 – 400 mm	2.4 m
410 – 500 mm	3.0 m
510 – 600 mm	3.6 m
610 – 700 mm	4.2 m
710 – 800 mm	4.8 m
810 – 900 mm	5.4 m
910 – 1000 mm	6.0 m

With groups of trees or where an array effect is present, there may be discontinuous (non-overlapping) perimeters of tree protection areas, which result in difficult to maintain or ineffective tree protection fencing. In these cases, even though tree protection areas do not overlap, they should be treated as though they do if the distance between the perimeters of such areas is less than 10M. In effect, this will artificially enlarge the area of tree protection, but will result in a more clearly defined, manageable area.

(ii) DRIPLINE: The outermost edge of the tree's canopy or branch spread. The area within a tree's dripline is all the ground under the total branch spread.

(iii) CRITICAL ROOT ZONE: Generally, all of the ground area included in the dripline.

(iv) DIAMETER (CALIPER): The size (millimetres) of a tree's trunk is measured at:

- 150mm above grade for trunk diameters up to and including 100mm;
- 600mm above grade for trunk diameters from 100mm up to and including 200mm; and
- 1.2M above grade for trunk diameters greater than 200mm.

(v) ARBORIST: An individual who has obtained accreditation from the Manitoba Arborists Training and Examination Program or the International Society of Arboriculture Arborist Certification Program (ISA) and possesses a valid Manitoba Arborist's License.

E27.2 Execution

E27.2.1 Tree Protection Area

(a) Existing trees and planted areas shall be protected and preserved as noted on the drawings. The Protection Area shall be as described above, unless otherwise approved by the Contract Administrator.

(b) Motorized equipment and trailers, including tractors, bobcats, bulldozers, trackhoes, trucks, cars, and carts shall not be allowed access within tree protection areas. Should access be necessary within designated tree protection areas, the existing grade shall be covered with 150 -200mm of wood mulch to help distribute the weight of equipment and to minimize soil compaction and rutting. Plywood and/or mulch is not acceptable bridging material for driving over exposed tree roots. Exposed tree roots shall not be driven over. The Contract Administrator must approve the access and driving surface prior to its use.

(c) Materials and supplies shall not be stockpiled or stored within the tree protection area. Should temporary storage be necessary within designated tree protection areas, the existing grade shall be covered with double, overlapping sheets of ¾ inch thick plywood, or 150 -200mm of wood mulch to help distribute the weight of materials or supplies and to minimize soil compaction.

(d) No objects or materials may be leaned against or supported by a tree's trunk, branches, or exposed roots. The attachment or installation to trees of any sign, cable,

wire, nail, swing, or any other material that is not needed to help support the natural structure of the tree is prohibited. Standard arbouricultural techniques such as bracing or cabling that are performed by professional arbourists are acceptable upon approval by the Contract Administrator.

(e) Concrete or chemicals spilled with tree protection areas should be completely removed. Contaminated soil shall be completely removed at the time of the spill and removed by hand without disturbance to root systems. Appropriate soil should be added as necessary to restore the grade.

(f) Appropriate tree pruning and/or removal permits must be secured prior to beginning work.

E27.2.2 Tree Protection Fencing

(a) Tree protection areas and fencing locations shall be approved by the Contract Administrator prior to construction. Layout and staking shall be done by the Contractor.

(b) Tree protection fences should be constructed of one of the following:

(i) Moulded plastic construction fencing, 1.2M in height, colour: orange.

(c) Fencing should be installed to completely surround the limits of tree protection areas, and should extend at least 3.0M beyond the designated construction limits.

(d) Tree protection fencing must be installed prior to any site activity and shall remain in good condition until its removal is authorized by the Contract Administrator.

E27.2.3 Trunk Protection

(a) As shown on the drawings, trees so identified will require 1x6x8' wood planks strapped to the tree trunk to completely protect the tree trunk from impact damage (smaller trees will be similarly protected using proportionally sized wood planks).

(b) Further to item 3.1.1, all trees within or immediately adjacent to the proposed construction area will have a 1.0m (minimum) radius protective zone calculated from the circumference at the base of the trunk which will remain free of digging, trenching, grade changes, stock piling of materials and soil compaction throughout the duration of the Contract.

(c) Should the demands of construction require an unfenced Tree Protection Area, protective fencing must be installed for the area described in above.

E27.2.4 Overhead Branch and Limb Protection

(a) Tree limbs and branches overhanging the construction area shall not be damaged. The Contractor shall be responsible for ensuring that the above ground portions of trees are not damaged during Work.

(b) Should pruning be required, the Contractor shall contact the Contract Administrator for approval. Pruning work must be using proper pruning techniques by a licensed Arbourist.

E27.2.5 Excavation

(a) During all excavation a representative of the Contract Administrator shall be present at all times unless otherwise agreed upon.

(b) The Contract Administrator shall be notified prior to any trenching or excavation known or suspected to involve cutting of more than:

(i) Two (2) roots, 75mm or more in diameter; and/or

(ii) Four (4) roots between 50mm and 75mm in diameter.

(iii) In the event of the above, roots shall be exposed using hydro excavation techniques. This work must be done with the City Forester and Contract Administrator present.

(iv) Should root pruning be required the Contractor must ensure proper root pruning techniques are employed by a licensed Arbourist.

(v) Further to the above, the Contract Administrator shall be notified and all work excavation suspended in the event that roots in excess of that described above are cut, torn ripped, or otherwise injured.

(c) Upon approval by the Contract Administrator, prior to any excavation, removal of sidewalk, or other activity that will result in removal of soil and tree roots, all tree roots within work area will be pruned to a depth equal to the depth of excavation. Pruning shall occur with a Dosko Root Pruner, or equivalent, in accessible areas, and by hand in areas inaccessible to the root pruning machine. Proper root pruning techniques must be used and employed by a licensed Arbourist.

(d) All work under the Dripline of any tree shall be done by hand or by other methods which will prevent breakage or other injury to branches and roots.

(e) Where it is necessary to excavate within the critical root zone of existing trees, contractor shall use all possible care to avoid injury to trees and tree roots. Excavation, in areas where 50mm diameter and larger roots occur, shall be done by hand with approved hand tools. Where possible, tree roots 50mm inches or larger in diameter shall be tunnelled or bored under and shall be covered with moistened burlap to prevent excessive drying.

(f) Wherever roots smaller than two 50mm in diameter are exposed, such roots extending through the excavation shall be hand pruned. All excavated areas within critical root zones shall be closed within twelve (12) hours - if this is not possible, the excavation walls shall be covered with burlap and kept moistened. Prior to backfilling, the Contractor shall contact the Contract Administrator to inspect the condition and treatment of roots larger than 50mm in diameter injured by excavation.

(g) Horizontal directional boring (auger tunnelling), rather than open trenching, shall be used for irrigation line or other utility or utility drain installation within 150mm linear distance from the trunk base for every 25mm of trunk diameter, if root disruption or utility installation occurs on no more than one side of the tree. If trenching or utility installation will occur on two or more sides of a tree trunk (e.g. N,S,E, or W), then horizontal directional boring shall be used if line installation is within 600mm linear distance from the trunk base for every inch of trunk diameter.

E27.2.6 Notification

(a) The Contract Administrator is to be notified 48 hours in advance of any large equipment to be working in the vicinity of existing trees. The Contractor shall provide adequate personnel on foot to supervise equipment operators in the vicinity of the trees to ensure that no damage occurs.

E27.2.7 Demolition of Existing Concrete

(a) Caution should be used during removal of existing street, curb, gutter, sidewalk, drain inlets, and other concrete and asphalt demolition, to minimize injury to tree root systems. The following procedures should be used when removing existing concrete.

(i) Breaking of the existing concrete and asphalt for removal should be done in a manner that will minimize ground disturbance and vibration.

(ii) Curbs and sidewalks within designated tree protection areas and critical root zones shall be removed by hand. When removing existing sidewalks and curbs, care should be taken to avoid injury to roots located under, over, or adjacent to paved surfaces.

(iii) Roots and root-trunk flares growing over curbs should not be injured during breaking of curbs and removal of debris. Wood and bark tissues shall not be injured by striking tissues with equipment.

(iv) During the removal of concrete, all root systems and soil areas exposed shall not be disturbed.

(v) Motorized equipment and trailers, including tractors, Bobcats, bulldozers, trackhoes, trucks, cars, and carts are to be limited to access on the existing paved street only. Access is not allowed behind the curb within tree protection areas.

E27.2.8 Irrigation or Utility Installation

(a) All irrigation lines shall be indicated on construction plans and pre-approved by the Contract Administrator. Unless absolutely necessary, no irrigation / utility lines shall be located within 2.4M of any existing tree trunk.

(b) All trenching or other work under the dripline of any tree shall be done by hand or by other methods which will prevent breakage or other injury to branches and roots.

(c) Wherever a trenching machine exposes roots smaller than 50mm in diameter, such roots extending through the trench wall shall be hand pruned. All trenches within critical root zones shall be closed within twelve (12) hours-if this is not possible, the trench walls shall be covered with burlap and kept moistened. Prior to backfilling, Contractor shall contact the Contract Administrator to inspect the condition and treatment of roots larger than 50mm in diameter injured by trenching.

(d) Horizontal directional boring (auger tunnelling), rather than open trenching, should be used for irrigation line or other utility installation within 150mm linear distance from the trunk base for every 25mm of trunk diameter, if root disruption or utility installation occurs on no more than one side of the tree. If trenching or utility installation will occur on two or more sides of a tree trunk (e.g. N,S,E, or W), then horizontal directional boring should be used if line installation is within 300mm linear distance from the trunk base for every 25mm of trunk diameter.

E27.3 Measurement and Payment

E27.3.1 Measurement

(a) No measurement will be made for protection of existing trees.

E27.3.2 Basis for Payment

(a) No separate payment will be made for protection of existing trees.

E28. REMOVALS AND SALVAGE (OLD MARKET SQUARE)

E28.1 GENERAL

E28.1.1 Description

(a) This Specification shall cover all aspects of the site preparation work, including equipment mobilization and demobilization, erection and maintenance of safety fence, clock, Letinksy Monument base and salvage of an electrical panel and Heritage Plaque.

E28.2 Execution

E28.2.1 Site Access

(a) The location of access points for the construction equipment and materials, and the methodology to facilitate construction shall be subject to the approval of the Contract Administrator. All material excavated for access ramps shall be hauled away from the Site at no additional cost. Care shall be taken to prevent damage to existing Site facilities, services and roads. In the event of damage to existing Site facilities or services caused by the Contractor's access and construction activities, the Contractor shall be held liable, and shall be required to provide appropriate restoration, to the satisfaction of the Contract Administrator. The Contractor shall be required to submit his proposed access methodology for review and approval prior to undertaking the Work.

E28.2.2 Removals and Salvage

(a) Removals and salvage shall be undertaken for items shown on the drawings.

(b) Salvaged items are to be stored at the adjacent Bijoux site for pick-up by the City. Salvaged items shall be safely stored and all reasonable measures shall be taken to ensure no damage occurs during removals, hauling and storage.

(c) All items identified for removal shall be removed from the Site prior to excavation and/or fill placement.

(d) Material shall be disposed off site immediately upon collection, and stockpiling at the Site will not be permitted. The Contract Administrator shall identify the limits of the tree and vegetation removal. No trees or vegetation outside these limits shall be disturbed or damaged.

E28.3 Measurement and Payment

E28.3.1 Method of Measurement

(a) Removals and salvage will be measured on a lump sum basis, and shall include all Items of Work completed in accordance with this Specification and accepted by the Contract Administrator.

E28.3.2 Basis for Payment

(a) Removals and salvage will be paid for at the Contract Unit Price for each "Items of Work", listed below, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification.

Items of Work:

i) Removals and Salvage

E29. EARTHWORK AND GRADING

E29.1 General

E29.1.1 Description

(a) This specification shall cover all Work associated with general Site preparation and grading. The Contractor shall furnish all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified. This specification shall supplement CW3170-R3.

E29.2 Construction Methods

E29.2.1 General

(a) The Contractor shall excavate and grade to the levels and contours allowing for surface treatment as shown on the drawings. Existing topsoil shall be stockpiled on-Site as directed by the Contract Administrator. Prior to placing any fill over existing ground the Contractor shall scarify to surface to a depth of 150mm. Moisture content of filling and existing surface material shall be the same in order to facilitate proper bonding.

(b) All fill shall be clean fill.

E29.2.2 Compaction

(a) Compact fill and undisturbed areas to Standard Proctor Density to ASTM D698-78 as follows:

(i) Landscaped Areas - 85%
(ii) Paved Areas - 95%

E29.2.3 Approvals

(a) The Contractor shall stake grades and receive approval from the Contract Administrator prior to any construction.

(b) The Contract Administrator shall approve grading work prior to installation of topsoil and/or surfacing materials.

E29.3 Measurement and Payment

E29.3.1 Measurement

(a) Earthwork and Grading will be measured on a square meter basis. The amount to be paid for shall be the total number of square metres constructed in accordance with this Specification and as accepted by the Contract Administrator.

E29.3.2 Basis of Payment

(a) Payment for Earthwork and Grading shall be paid for at the contract unit price for the "Items of Work" listed below, which price shall include all costs of labour and material supply, including fill, and all other items incidental to the Work included in this specification.

Items of Work:

i) Earthwork and Grading

E30. UNIT PAVERS

E30.1 General

E30.1.1 Description

(a) This Specification shall cover the supply and installation of unit pavers and bedding course of sand for areas as indicated on the Drawing. The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory performance and completion of all work as specified and in accordance with CW 3330.

E30.1.2 Submittals

(a) Contractor to submit sufficient samples of pavers to the Contract Administrator to show texture and finish and anticipated range of colour to be supplied for each type of paver specified below.

E30.2 Materials

E30.2.1 Clay Pavers

(a) Endicott clay pavers shall be Endicott Clay Pavers, colour : Dark Ironspot, Sizes to be 92mm x 194mm x 57mm depth (3 5/8" x 7 5/8" x 2 1/4")

(b) Endicott ADA clay pavers shall be Endicott ADA pavers, colour: Dark Ironspot

E30.2.2 Concrete Pavers

(a) Concrete unit pavers shall be Barkman Concrete Holland Stone (60mm thick) – colour: natural. Size as noted on the drawings.

(b) Munich Pavers shall be as existing.

(c) Roadway pavers shall be Barkman Concrete Holland Stone (80mm thick) – colour: mahogany. Size as noted on the drawings.

E30.2.3 Tyndall Stone Irregulars

(a) Tyndall Stone irregular pavers shall be building veneer seconds salvaged from Gillis Quarries discard piles.

E30.2.4 Sand

(a) In accordance with Specification CW 3330.

E30.2.5 Equipment

(a) All equipment shall conform to Specification CW 3330.

E30.3 Construction Methods

E30.3.1 General

(a) Construction methods shall conform to Specification CW 3330 and as shown on the drawings.

E30.3.2 Shipping and Handling

(a) All unit pavers shall be carefully packed and loaded for shipment using all reasonable and customary precautions against damage in transit. No material which may cause staining or discoloration shall be used for blocking or packing.

E30.4 Measurement and Payment

E30.4.1 Method of Measurement

(a) The supply and placing unit pavers shall be measured on a per square metre basis. The supply and placing of the sand levelling layer shall be considered included to the work.

E30.4.2 Basis of Payment

(a) Payment for Unit Pavers shall be paid for at the contract unit price for the "Items of Work" listed below, which price shall include all costs of labour and material supply, and all other items incidental to the Work included in this specification.

Items of Work:

i) Endicott Clay Pavers
ii) Endicott 'ADA' Clay Pavers
iii) Tyndall Stone Irregulars
iv) Barkman Holland Stone Pavers (60mm)
v) Munich Pavers
vi) Barkman Holland Stone Road Pavers (80mm)

E31. SHRUB BED PREPARATION

E31.1 General

(a) This specification shall cover shrub bed planting bed preparation. The work to be done by the Contractor under this specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as specified.

E31.2 Materials

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

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

E31.2.1 Planting Soil

(a) Planting Soil shall consist of black top soil, a fertile friable natural loam containing by volume not less than 4% and no more than 25% of organic matter for clay loams, and not less than 2% and no more than 25% for sandy loams, with an acidity value ranging from pH 6.0 to 8.0 and capable of sustaining vigorous plant growth. Topsoil is to be free of any mixture of subsoil, clay lumps and free of stones and other extraneous matter. It is not to contain couch or crab grass rhizomes.

E31.2.2 Bark Mulch

(a) Bark Mulch shall be wood chip mulch free of small branches and leaves and ranging in size from 5mm to 75mm long and 5mm to 20mm thick. Submit sample of mulch for approval by the contract Administrator prior to shipping to site.

E31.2.3 Water

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

E31.2.4 Weed Barrier

(a) Weed Barrier shall be Nilex product DeWitt Pro5 weed barrier or approved equal in accordance with B5. The fabric shall be supplied to the site in widths no less than 1.8 metres and free of defects.

E31.2.5 Fertilizer

(a) Fertilizer shall be complete synthetic slow release fertilizer with maximum 35% water-soluble nitrogen.

E31.2.6 Insulation

(a) Planter Insulation shall be 37 mm thick rigid styrofoam.

E31.2.7 Waterproofing

(a) Planter waterproofing shall be "bituthene 3000" membrane.

E31.2.8 Filter Cloth

(a) Filter cloth to be Terra Fix 270R.

E31.2.9 Drain tiles

(a) Drain tiles to be perforated 100mm diameter (no.6) drain tile.

E31.2.10 Granular

(b) Granular shall be clean and washed granite aggregate free of fines and small particles. Aggregate sizes to be no less than 25mm and no greater than 38mm diameter. Sample of granular material to be provided to Contract Administrator for approval prior to shipment to site.

E31.3 Construction Methods

E31.3.1 General

(b) The Contractor shall co-ordinate the installation in accordance with the Drawings and as specified herein.

E31.3.2 Planting Bed Preparation

(c) General Contractor shall co-ordinate excavation and fill works for panting beds to ensure minimal additional excavation for shrub beds required by Landscaper. All remaining areas to be filled shall be in locations and to the depths shown on the drawings.

(d) Planting beds areas shall be filled with soil mixture. After filling top of bed shall be set to level shown on drawings. Soil should be lightly compacted and indicated soil depths shall be depths after light compaction.

(e) All areas and locations provided for planting shall be staked according to layout shown on the drawings. Fill / Excavation shall not proceed until the layout has been inspected and approved by the Contract Administrator. Fill / Excavation shall not be undertaken until all underground utilities have been located and protected.

E31.3.3 Raised Planter Preparation

(f) For planting beds in raised planters install waterproofing, granular material, filter cloth, and styrofoam insulation in the planters as shown on the drawings and as described in this specification. Install topsoil to within 100 mm of top planter and bark mulch to within 50mm of top of planter.

E31.3.4 Weed Barrier Installation

(a) The weed barrier shall be installed full width for the length of all planting beds, in accordance with the manufacturer's recommended procedure. The weed barrier shall be laid smooth and free of tension, stress, folds, wrinkles or creases.

(b) Joints in the weed barrier shall be overlapped not less than 0.5 metres.

(c) Securing pins with washers shall be inserted through the fabric at intervals not greater than 1.5 metres along a line 100 mm from both the lowest and highest exterior edge of the weed barrier.

(d) Additional pins shall be installed as necessary, regardless of location, to prevent any slippage of the fabric.

(e) The supply and installation of the securing pins shall be incidental to the cost of the weed barrier.

E31.3.5 Installation of Mulch

(a) Bark mulch shall be spread to a consistent depth over entire planting bed area, taking care not to damage the plants.

E31.4 Measurement and Payment

E31.4.1 Measurement

(b) Shrub Bed Preparation will be measured on a square meter basis. The amount to be paid for shall be the total number of square metres constructed in accordance with this Specification and as accepted by the Contract Administrator.

E31.4.2 Basis of Payment

(c) Payment for Shrub Bed Preparation shall be paid for at the contract unit price for the “Items of Work” listed below, which price shall include all costs of labour and material supply, including fill, and all other items incidental to the Work included in this specification.

Items of Work:

i) Shrub Bed Preparation

E32. SILVA CELLS

E32.1 General

E32.1.1 The following generally describes the scope of this Section:

(a) Excavate and grade pit.

(b) Supply and install granular drainage course.

(c) Supply and install perforated drainage pipe where required.

(d) Supply and install Silva Cell base.

(e) Supply and install Silva Cells.

(f) Supply and install geotextile and geogrid.

(g) Supply and install root barrier where required.

(h) Supply and install planting soil.

(i) Supply and install backfill.

(j) Supply and install mulch.

(k) Supply and install tree grate.

E32.2 Materials

E32.2.1 Silva Cells

(a) Silva Cell Frames: 400mm x 600mm x 1200mm (16 inches x 24 inches x 48 inches). Manufacturer: DeepRoot Partners, L.P. (Deep Root); 530 Washington Street, San Francisco, CA 94111; 415.781.9700; 800.458.7668; fax 415.781.0191; www.deeproot.com.

(b) Silva Cell Deck: 5cm x 600mm x 1200mm (2 inches x 24 inches x 48 inches). Deck to include manufactured installed galvanized steel tubes.

(c) Silva Cell Strongback: 400mm x 600mm x 150mm (24 inches x 48 inches x 6 inches) modified Silva Cell Frame units designed to stiffen and align the frames as planting soil and backfill material is placed. Strongbacks are to be removed prior to placing decks. They are to be reused as the work progresses.

(d) Silva Cell Deck Screws: Manufacturer's supplied stainless steel screws to attach decks to frames.

E32.2.2 Anchoring Spikes

(a) Anchoring Spikes to be 10" (250mm) long X 19/64" (8mm) diameter, spiral, galvanized timber spikes. Utilize 4 nails in each frame on the first layer of Silva Cells to anchor the frames to the aggregate subbase.

E32.2.3 Drain Lines

(a) To City of Winnipeg standard specification CW3120, Installation of Subdrains.

E32.2.4 Inspection Riser and Cap

(a) Inspection riser shall consist of a rigid, schedule 40 non-perforated PVC pipe, 4 inches in diameter. Cut slots in the bottom to allow water access for inspection risers that extend to the sub base aggregate.

(b) Cap shall be PVC solid threaded cleanout or removable inlet grate designed to fit standard PVC schedule 40 pipefittings.

E32.2.5 Geogrid

(a) Miragrid 2XT as manufactured by Ten Cate Nicolon, Norcross, GA, or approved equal in accordance with B5, www.tcmirafi.com

E32.2.6 Geotextile

(b) Geotextile shall be non woven polypropylene geotextile, Mirafi 180 N as manufactured by Ten Cate Nicolon, Norcross, GA, or approved equal in accordance with B5, delivered in;

(c) 12 feet (3600mm) wide rolls min., with the following properties:

Grab tensile strength: 370 lb.

Grab tensile elongation: 50%

Mullen burst strength: 380 psi

Puncture strength : 130 lb.

Apparent opening size: US sieve 80 (0.180 mm)

Water flow rate: 95 gpm/SF

E32.2.7 Root Barrier

(a) Root Barrier to be Nilex Deep root UB 48, 48” x 24” panels or approved equal in accordance with B5.

E32.2.8 Aggregate Sub Base (Below Cell Frame)

(a) Sub base material in accordance with CW3110.

E32.2.9 Aggregate Base Course (Above Cell Deck)

(a) Base course material in accordance with CW3110.

E32.2.10 Backfill Material (Adjacent to Silva Cells)

(a) Backfill Material to be supplied In accordance with CW2030, Backfill class as determined by Contract Administrator.

E32.2.11 Planting medium

(a) Refer to Section E33 Street Tree Planting Medium.

E32.2.12 Mulch

(a) Wood chip mulch composed of woodchips from hardwood trees, free of bark, branches, and leaves varying in size from 6-20 mm thick.

E32.2.13 Tree grate

(a) Tree Grate to be Urban Accessories, Jamison T-Grate, 5’x5’, cast iron, natural finish; as supplied by Playworks, (780) 453-6903, contact: Selena Nichols.

E32.2.14 Product Certificates

(a) Certificates shall be provided for each type of manufactured product, from manufacturer, and complying with the following:
   i) Manufacturer's certified analysis for standard products.
   ii) Silva Cell manufacturer's letter of review and approval of the project, plans, details and specifications for compliance with product installation requirements.

E32.3 Quality Control

E32.3.1 Compaction testing results

(a) Submit results of all compaction testing required by the specifications including the bulk density test of the mock up and installed soil, and the compaction testing log of penetrometer and moisture meter readings to the Contract Administrator for approval.

E32.3.2 Qualification Data

(a) Submit documentation of the qualifications of the Silva Cell installer sufficient to demonstrate that the installer meets the requirements of paragraph "Quality Assurance".

E32.4 Construction Method

E32.4.1 Layout Approval

(a) Prior to the start of work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the Silva Cells and required drainage features in the correct locations.

E32.4.2 Soil Installation Mock Up and Compaction Evaluation:

(a) Prior to the installation of Silva Cells, construct a mock up of the complete installation at the site. The installation of the mock up shall be in the presence of the Contract Administrator. The mock up shall be a minimum of 100 square feet in area and include the complete Silva Cell system installation with sub base compaction, drainage installation, Base course aggregate and geotextile as required, geogrids, backfill, planting soil with compaction, decks, and top geotextile. The mock up area may remain as part of the installed work at the end of the project provided that it remains in good condition and meets all the conditions of the Specifications.

E32.4.3 Excavation

(a) When warranties are required, verify with The City's counsel that special warranties stated in this article are not less than remedies available to The City under prevailing local laws. Excavate to the depths and shapes indicated on the drawings. Base of excavation shall be smooth soil, level and free of lumps or debris. Do not over-excavate existing soil beside or under the limits of excavation required for the installation. If soil is over-excavated, install compactable fill material in lifts not more than 8 inches (200mm) deep and compact to the required density. Confirm that the depth of the excavation is accurate to accommodate the depths and thickness of materials required throughout the extent of the excavation. Confirm that the width and length of the excavation is a minimum of 6 inches (150mm), in all directions, beyond the edges of the Silva Cells.

E32.4.4 Sub Grade Compaction

(a) Compact subgrade below the Silva Cells to a minimum of 95% of maximum dry density at optimum moisture content in accordance with ASTM D 698 Standard Proctor Method.

(b) Proof compact the subgrade with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate. Apply additional compaction forces at optimum water levels.

E32.4.5 Installation of Geotextile Over Sub Grade

(a) Install geotextile over the compacted subgrade material with a minimum joint overlap of 18 inches (450mm) between sections of material.

E32.4.6 Installation of Drain Lines

(a) Layout the location of all drains lines. Adjust the alignments to conform to the final locations of sleeves and risers. Do not locate drain lines within 6 inches (150mm) of the edge of any Silva Cell post. Ensure positive drainage toward intended outfalls.

(b) Excavate a trench a minimum of 12 inches (300mm) wide to a depth required to provide positive drainage from the high points of the system to the outfall or connection point to storm sewer. Eliminate dips or rises that will trap water. Minimum slope shall be 1%.

(c) Install the perforated drain lines as indicated on the Drawing. All connections and splices shall use the manufacturer's standard splice and fitting connections. Joints shall be secure.

(d) Place perforated pipe with drain slots on the bottom side of the pipe.

E32.4.7 Installation of Inspection Risers

(a) Install 4" solid P.V.C. inspection risers to grade. Install manufacturer's PVC solid "T's," elbows, and reducers. Use the proper sized "T's" and reducers. Extend risers into sub base aggregate and or make connections to drain lines where indicated on the Drawings. Where inspection risers are indicated to be placed on top of the Silva Cell Deck, assemble riser and fittings to dimensions requires such that the rim of the riser is

flush with the paving. Set the rim top with a slope consistent with the slope of the pavement.

(b) Adjust the location of the riser such that the center of the riser falls along the centerline of one of the ribbed sots in the deck. Cut the deck geotextile with an X cut and insert the riser through the geotextile.

(c) Make a geotextile collar secured to the riser with zip ties that over lap the surrounding geotextile a minimum of 12-inches. Secure in place with tape.

(d) Brace all risers while backfill and paving is being installed to secure its location and elevation.

(e) Install clean-out caps on top of each riser flush to grade.

E32.4.8 Installation of Aggregate Sub Base

(a) Install aggregate sub base to the depths indicated on the Drawings, under the first layer of Silva Cell frames.

(b) Compact aggregate sub base layer to a minimum of 95% of maximum dry density at optimum moisture content in accordance with ASTM D 698 Standard Proctor Method.

(c) Compact the subgrade with a minimum of three passes of a suitable vibrating compacting machine or apply other compaction forces as needed to achieve the required subgrade compaction rate.

(d) Grade surface in a plane parallel to the grades of the paving above. The tolerance for dips and bumps in the aggregate under Silva Cells shall be a 3/8-inch (9mm) deviation from the plane in 10 feet (3m) and 1/8-inch (3mm) in 4 feet (1200mm).

(e) The grade and elevations of the base under the Silva Cells shall be approved by the Contract Administrator prior to proceeding with the installation of the Silva Cells.

E32.4.9 Root barrier

(a) Install root barrier along roadway edge of tree pit where required.

E32.4.10 Installation of Silva Cells

(a) Identify the outline layout of the structure and the edges of paving around tree planting areas on the floor of the excavation, using spray paint or chalk line. The layout shall be calculated to include shift in layout locations due to depth and the slope of the Cells.

(b) Lay out the first layer of Silva Cell frames on the sub base. Verify that the layout is consistent with the required locations and dimensions of paving edges to be constructed over the Silva Cells.

(c) Check each Silva Cell frame unit for damage prior to placing in the excavation. Any cracked or chipped unit shall be rejected.

(d) Place frames no less than 1 inch (25mm) and no more than 3 inches (75mm) apart. Assure that each frame sits solidly on the surface of the sub base. Frames shall not rock or bend over any stone or other obstruction protruding above the surface of the sub base material. Frames shall not bend into dips in the sub base material.

(e) The maximum tolerance for deviations in the plane of the sub base material under the bottom of the horizontal beams of each Silva Cell frame shall be 1/4 inch (6mm) in 4 feet (1200mm). Adjust sub base material including larger pieces of aggregate under each frame to provide a solid base of support.

(f) Anchor each Silva Cell into sub base with four-10 inch (250mm) spikes, driven through the molded holes in the Cell frame base to maintain cell spacing and layout during the installation of planting soil and backfill.

(g) For applications over waterproofed structures, develop a spacing system consistent with requirements of the waterproofing system. Do not use anchoring nails that will come within 150mm of any waterproofing material. Submit spacing system procedure for approval by the waterproofing provider.

(h) Install the second layer of Silva Cell frames on top of the first layer. Comply with manufacturer's requirements to correctly register and connect the Cell frames together.

(i) Register each frame on top of the lower frame post. Rotate each frame registration arrow in the opposite direction from the frame below to assure that connector tabs firmly connect. Each frame shall be solidly seated on the one below.

(j) Build layers as stacks of frames set one directly over the other. Do not set any frame half on one Cell frame below and half on an adjacent frame.

(k) Install Strongbacks on top of the Silva Cell frames prior to installing planting soil and backfill. Strongbacks are required only during the installation and compaction of the planting soil and backfill. Strongbacks should be moved as the work progresses across the installation and prior to the installation of Silva Cell decks.

E32.4.11 Installation of Planting Medium and Geogrid

(a) Install planting soil, geogrid curtain and backfill as indicated on the Drawings. The process of installation requires that these three materials be installed and compacted together in several alternating operations to achieve correct compaction relationships within the system.

(b) Geogrid curtains are required between the edge of the Silva Cells and any soils to be compacted to support paving beyond the area of Silva Cells. Do not place geogrid curtains between the edge of the Cells and any planting area adjacent to the Cells.

(c) Pre-cut the geogrid to allow for 6 inches (150mm) minimum under lapping below backfill, and 12 inches (300mm) minimum overlapping top of Silva Cell stack.

(d) Where cell layout causes a change direction in the plane of the geogrid, slice the top and bottom flaps of the material so that it lies flat on the top of the cell deck and aggregate base course along both planes.

(e) Provide a minimum of 300mm (12 inch) overlaps between different sheets of geogrid.

(f) Place the geogrid in the space between the Silva Cell frames and the sides of the excavation. Attach the geogrid to the Silva Cell frames using 3/16 inch x 12-inch (5x300mm) zip ties. Attach with zip ties at every cell and at Cell Deck.

(g) Install no more than two layers of Silva Cell frames before beginning to install planting soil and backfill.

(h) Compact the planting soil within the Silva Cell frames and the backfill material outside the frames in alternating lifts until the desired elevations and density is achieved in both soils.

(i) Install and compact backfill material in the space between the Silva Cells and the sides of the excavation in lifts that do not exceed 8 inches (200mm).

(j) Compact backfill to 95% of maximum dry density using a powered mechanical compactor. Use a pneumatic compacting tool or narrow foot jumping jack compactor for spaces less than 12 inches (300mm) wide and a 12-inch wide jumping jack compactor or larger equipment in wider spaces.

(k) Maintain the geogrid curtain between the Silva Cells frames and the backfill material.

(l) Install backfill in alternating lifts with the planting soil inside the Silva Cells. Fill the first layer or layers of frames with planting medium, specified in Section E33 Street Tree Planting Medium. Install in lifts that do not exceed 8 inches (200mm).

(m) Lightly compact the soil to a maximum dry density of 85% inside the frames at each lift to remove air pockets and settle the soil within the frames. If the planting soil becomes overly compacted, remove the soil and reinstall. Use hand tools or other equipment that does not damage the Silva Cell frames.

(n) Do not walk directly on horizontal beams of the frames.

(o) Work soil under the horizontal frame beams of the second level of Cell frames and between columns eliminating air pockets and voids. Fill each frame such that there is a minimum of 10 inches (250mm) of soil over the top of horizontal frame beams before

beginning compaction. The top 1-2 inches (25-50mm) of each frame post should remain exposed above the soil to allow the placement of the next frame or deck.

E32.4.12 Installation of Third Silva Cell Layer

(a) After the first two layers of Silva Cell frames have been installed, filled with planting soil and backfilled, proceed to install the third layer of Silva Cells frames where indicated on the Drawings. Comply with manufacturer's requirements to correctly register and connect the cell frames together. Remove the strongbacks.

(b) Sweep any soil from tops before adding the next layer of frames. Install strongbacks on top of third layer of Silva Cells.

(c) Continue to install and compact the planting soil within the Silva Cell frames and the backfill material outside the frames in alternating lifts until the desired elevations and density is achieved in both soils.

E32.4.13 Preparation for Installing Silva Cell Decks

(a) When using mulch, add a final layer of planting soil as required to bring the planting soil level to not more than 3 inches (75mm) below the bottom of the Silva Cell Deck when installed. When using air space rather than compost, the planting soil shall be brought to level not more than 1 inch (25mm) below the bottom of the Silva Cell Deck when installed.

(b) Obtain final approval by the Contract Administrator of soil installation prior to installation of the Silva Cell deck.

(c) Remove strongbacks after planting soil and backfill has been compacted to the top of the entire set of Silva Cells.

(d) Install 3 inches (75mm) of mulch, or leave 1-inch (25mm) air space, below Silva Cell Deck as indicated on the Drawings.

E32.4.14 Silva Cell Deck Installation

(a) Install the Silva Cell Decks over the top of each frame stack. Clean dirt from the tops of the Silva Cell frame columns. Register the deck and make connections as recommended by the manufacturer to secure the deck to the top of the Silva Cell Frame.

(b) Secure each deck at the four corners with screw fasteners as recommended by the manufacturer. Assure that each deck is seated firmly on the frame top with all connectors attached.

(c) Install and compact remaining backfill material such that the soil outside the limits of the Silva Cells is flush with the top of the installed deck.

E32.4.15 Installation of Geotextile, Geogrid, Inspection Riser and Aggregate Over the Deck

(a) Overlap geogrid over the top of the Silva Cell Decks, with minimum of 12 inches (300mm) overlap.

(b) Place geotextile over the top of the deck where indicated on the Drawings, extending beyond the outside edge of the excavation by at least 18 inches (450mm). Any joints must be overlapped by a minimum of 18 inches (450mm).

(c) Cut geotextile a minimum of 20 percent larger than the size of the deck area to be covered to accommodate for required conforming of the geotextile and stone to the deck contours.

(d) Install 4-inch (100mm) diameter inspection risers above geotextile.

(e) Install the aggregate base course over the geotextile immediately after completing the installation of the fabrics and inspection risers. Work the aggregate from one side of the deck to the other to assure that the fabric and aggregate conforms to the cell deck contours. Do not apply aggregate in several positions at the same time.

(f) Load the aggregate from equipment that is outside the limits of the excavated area. Use small, low impact material mover such as a concrete buggy or Georgia Buggy to move aggregate over the cells. Work over material already in place. Never allow any motorized equipment of any size to operate directly on the Silva Cell Deck. For large or confined areas, where aggregate cannot easily be placed from the edges of the excavated area, obtain approval for the installation procedure and types of equipment to be used in the installation from the Silva Cell manufacturer.

(g) Compact aggregate base course, in lifts not to exceed 6" in depth, to 95% of maximum dry density. Utilize a roller or plate compactor with a maximum weight of 1000 pounds. Make sufficient passes with the compacting equipment to attain the required compaction.

E32.4.16 Installation of Paving

(a) Place paving material over Silva Cell system as per drawings and specifications.

(b) Take care when placing paving or other backfill on top of Silva Cell system not to damage the system components.

E32.4.17 Installation of Planting Soil and Mulch within the Tree Planting Area

(a) Prior to planting trees, install additional planting soil, to the depths indicated, within the tree opening adjacent to paving supported by Silva Cells.

(b) Remove all rubble, derbies, dust and silt from the top of the planting soil that may have accumulated after the initial installation of the planting soil within the Silva Cells.

(c) Assure that the planting soil under the tree root ball is compacted to approximately 85-90% to prevent settlement of the root ball. The planting soil within the tree opening shall be the same soil as in the adjacent Silva Cells.

(d) Cover the planting soil finished grade with mulch or tree grate as indicated on the Drawings.

E32.4.18 Repair of Cut Geotextile

(a) In the event that any geotextile over subgrade or the Silva Cell decks must be cut during or after installation, repair the seam with a second piece of geotextile that overlaps the edges of the cut by a minimum of 12-inches in all directions prior to adding aggregate material.

E32.4.19 Tree Grates

(a) Where indicated on the Drawings, install tree grate as per drawings and manufacturer’s specifications.

E32.4.20 Protection

(a) Ensure that all construction traffic is kept away from the limits of the Silva Cells until the final surface materials are in place. No vehicles shall drive directly on the Silva Cell deck or aggregate base course.

(b) Provide fencing and other barriers to keep vehicles from entering into the area with Silva Cell supported pavement.

(c) Maintain a minimum of 4 inches (100mm) of aggregate base course over the geotextile material during construction.

(d) When vehicle must cross Silva Cells that does not have final paving surfaces installed, use construction mats designed to distribute vehicle loads to levels that would be expected at the deck surface once final paving has been installed. Use only low impact track vehicles with a maximum surface pressure under the vehicle of 4 pounds per square inch, on top of the mats over Silva Cells prior to the installation of final paving. Acceptable construction mats include: Mud-Traks as distributed by SEV Sales, Charlotte, NC 28216, 800 762 8267 or approved alternate. Mat strength shall be as required for the vehicle loading application.

E32.4.21 Clean Up

(a) Perform cleanup during the installation of work and upon completion of the work. Maintain the site free of soil and sediment, free of trash and debris. Remove from site all excess soil materials, debris, and equipment. Repair any damage to adjacent materials and surfaces resulting from installation of this work.

E32.5 Measurement and Payment

E32.5.1 Measurement

(a) Tree Well Concrete Curb will be measured on a linear meter basis. The amount to be paid for shall be the total number of linear metres constructed in accordance with this Specification and as accepted by the Contract Administrator.

(b) No measurement will be made for Silva Cells.

(c) Tree Grates will be measured on a per unit basis. The amount to be paid for shall be the actual number of tree grates installed in accordance with this Specification and as accepted by the Contract Administrator.

E32.5.2 Basis of Payment

(a) Payment for the work shall be paid for at the contract unit price for the “Items of Work” listed below, which price shall include all costs of labour and material supply, including excavation, drains, base material, tree planting medium, backfill, and all other items incidental to the Work included in this specification.

Items of Work:

i) Tree Well Concrete Curb
ii) Silva Cell
iii) Tree Grates

E33. STREET TREE PLANTING MEDIUM

E33.1 General

(a) This Specification covers the supply and installation of planting medium for street tree planting on downtown and regional streets.

E33.2 Materials

E33.2.1 Topsoil:

(a) Mixture of particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.

(b) Soil texture to be based on The Canadian System of Soil Classification, to consist of 20 to 70% sand, minimum clay, and contain 2 to 20% organic matter by weight.

(c) Contain no toxic elements or growth inhibiting materials.

(d) Finished surface free from debris over 50mm diameter and coarse vegetative material occupying more than 2% of soil volume.

(e) Consistency: friable when moist.

(f) (Fertility: major soil nutrients in following amounts:

(i) Nitrogen (N): 20 to 40 micrograms of phosphate per gram of planting medium

(ii) Phosphorus (P): 40 to 50 micrograms of phosphate per gram of planting medium

(iii) Potassium (K): 75 to 110 micrograms of potassium per gram of planting medium

(iv) Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.

(v) PH value: 6.5 to 8.0

(vi) Conductivity value less than 2.5 dS/m

E33.2.2 Peatmoss:

(a) Derived from partially decomposed species of sphagnum mosses.

(b) Elastic and homogeneous, brown in colour.

(c) Free of wood and deleterious material which could inhibit growth.

(d) Shredded particle minimum size: 5mm

E33.2.3 Sand

(a) Sand to be washed silica sand, medium to coarse textured.

E33.2.4 Organic matter

(a) Organic matter to be compost Category A, in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

E33.2.5 Fertilizer

(a) Fertilizer to be industry-accepted standard medium containing nitrogen, phosphorous, potassium and any other micro-nutrients suitable to the specific plant species or application.

E33.2.6 Source Quality Control

(a) Advise Contract Administrator of sources of topsoil to be utilized with sufficient lead time for testing.

(b) Soil testing by recognized testing facility for pH, N, K, organic matter and conductivity value.

(c) Testing of planting medium will be carried out by testing laboratory designated by Contract Administrator. Soil sampling, testing, and analysis to be in accordance with Provincial standards.

(d) Contractor to incorporate soil amendments to planting medium only as recommended by the soil test lab.

E33.2.7 Planting Medium Mix Proportions

(a) Mix thoroughly, crush and screen topsoil and soil amendments in following proportions: 4 way mix of 45% topsoil, 35% peatmoss, 15% sand and 5% organic matter by volume.

E33.3 Construction Methods

E33.3.1 Inspection and Approval of Planter/Planting Pit

(a) Verify that planter/planting pit's waterproofing, rigid insulation and drainage medium are in place and approved by Contract Administrator prior to commencement of work.

(b) Ensure geotextile is properly laid and joints are overlapped as recommended by the manufacturer. Obtain approval before proceeding.

E33.3.2 Installing Planting Medium

(a) Place planting medium in uniform layers not exceeding 150mm unless otherwise specified.

(b) Spread planting medium to minimum depths after settlement as indicated on the Drawings.

(c) Manually spread planting medium around trees and other obstacles.

(d) Apply fertilizer in amount as recommended by soil test lab based on test results.

(e) Incorporate fertilizer into 50mm depth of planting medium by racking.

E33.3.3 Finish Surface

(a) Rake to eliminate rough spots and low areas.

(b) Consolidate planting medium to require bulk density using equipment approved by Contract Administrator. Leave exposed surfaces smooth, uniform and firm against deep foot imprinting.

E33.3.4 Placing of Mulch

(a) Place mulch as indicated in the Drawings and planting specifications.

E33.3.5 Acceptance

(a) Contract Administrator will inspect planting medium in place and determine acceptance of material, depth of planting and finish grading.

E33.3.6 Surplus Material

(a) Dispose of unused materials off site in accordance with good waste management practices.

E33.4 Measurement and Payment

E33.4.1 Measurement

(a) No measurement will be made for street tree planting medium as it is to be considered part of the supply and installation of Silva Cells.

E33.4.2 Basis for Payment

(a) No separate payment will be made for street tree planting medium.

E34. SODDING

E34.1 General / Description

(a) This Specification shall supplement City of Winnipeg Specification CW 3510-R9 Seeding.

(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 and in accordance with CW 3510-R9

E34.1.1 Maintenance

(a) The Contractor shall be responsible for the maintenance of sodded areas from the time of installation and for ninety (90) Calendar days from the date of Total Performance.

E34.1.2 Warranty

(a) The Contractor shall guarantee the sodded areas against any and all defects or deficiencies resulting from insect infestation, disease and mechanical damage due to improper handling, installation or initial maintenance, for a period of one (1) year from the date of the Certificate of Total Performance. Seeded areas damaged by vandalism or reasons beyond the control of the Contractor shall be repaired by the City

(b) End-of-Warranty inspection will be conducted by the Contract Administrator.

E34.2 Materials

E34.2.1 General

(a) Growing Medium shall be supplied as specified in section E35 – Event Lawn

E34.2.2 Sod

(b) Sod shall be Brett Young Seeds – "Executive Blend" on mineral base, from Gusta Sod Farms, Stead Manitoba, (204) 635-2636.

E34.2.3 Fertilizer

(c) Pre-sodding fertilizer shall be slow release granular 18-24-12.

E34.3 Construction Methods

(a) Construction methods shall be in accordance with CW 3510-R9.

E34.4 Measurement and Payment

E34.4.1 Method of Measurement

(a) Sodding shall be measured on a square metre basis. The amount to be paid for shall be the total number of square metres installed as measured by the Contract Administrator.

E34.4.2 Basis of Payment

(a) Sodding shall be paid for at the contract unit price for the "Items of Work" listed below, which price shall include all costs of labour, maintenance, and material supply, and all other items incidental to the work included in this specification.

Items of Work:

i) Sodding

E35. EVENT LAWN

E35.1 General

E35.1.1 Description

(a) This Specification shall the construction of the Event Lawn, as shown on the Drawings.

(b) The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for an incidental to the satisfactory performance and completion of all work as shown on the Drawings, including finish grading, growing medium, sub-surface drainage system and hereinafter specified.

E35.1.2 Related Sections

(a) CW 3510 – Earthwork and Grading

(b) CW 3550 - Topsoil and Finish Grading for the Establishment of Turf Areas

(c) CW 3510 – Sodding

E35.2 Materials

E35.2.1 General

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

(b) All soil and material mixing shall be done off-site.

E35.2.2 Testing

(a) All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator. There shall be no charge to the Client for any materials taken by the Contract Administrator for inspection and testing purposes.

(b) Growing medium will be subject to tests for nitrate, phosphate, potassium, sulphate, pH, E.C. (salinity), particle size, clay and silt content, porosity, and volume of organic matter by a testing laboratory designated by the Contract Administrator.

(c) Drainage layer will be subject to tests for particle size and permeability by a testing laboratory designated by the Contract Administrator.

E35.2.3 Drainage Layer

(a) The drainage layer shall be clean, washed pea gravel.

E35.2.4 Event Lawn Growing Medium

(a) The Event Lawn Growing medium shall be 55% sand and 20% Elm Creek Loam and 25% sphagnum peat, as supplied by Cheetham Soil Supplies Co Ltd. 895-7005.

(b) Sand shall conform to the following:

Particle Size Distribution		
Name	**Particle DIA.**	**Amount**
Fine Gravel	2.0 – 3.4MM	Not more than 10% 0f the total particles, including a maximum of 3% fine gravel
Very Coarse Sand	1.0 – 2.0mm	
Coarse Sand	0.5 – 1.0mm	60% (min.)
Medium Sand	0.25 – 0.50mm	20% (max.)
Fine Sand	0.15 – 0.25mm	5% (maximum)
Very Fine Sand	0.05 – 0.15mm	5% (max.)
Silt	0.002 – 0.05mm	5% (max.)
Clay	Less than 0.002mm	3% (max.)
Total Fines	Very fine sand + silt + clay	Less than or equal to 10%

(c) All topsoil required shall consist of Elm Creek Loam. Topsoil shall be free of subsoil contamination, roots, stones over 25mm in diameter, baler twine or subsoil clay lumps over 25mm in diameter and other extraneous matter. Topsoil shall not contain quackgrass rhizomes, Canada thistle roots or other noxious weeds. Upon delivery or thirty (30) days following delivery, salinity rating shall be less than 4.0mm hos/cm on a saturated paste basis. The pH range shall be between 6.0- 8.0.

(d) The Contractor shall inform the Contract Administrator of proposed source of topsoil to be supplied. The Contract Administrator reserves the right to reject topsoil not conforming to the requirements of this Specification.

(e) The Event Lawn Mix shall conform to the following:

Physical Properties of Event Lawn Growing Medium	
Physical Property	**Range**
Total Porosity	35% - 55%

Air Filled Porosity	15% - 30%
Capillary Porosity	15% - 25%
Saturated Hydraulic Conductivity	Minimum 150mm / hour

E35.2.5 Fertilizer

(a) Chemical fertilizer with an N-P-K analysis of 1-2-1 ratio at a rate to provide 48 kg actual Nitrogen, 96 kg actual Phosphate and 48 kg actual Potassium per hectare.

(b) Fertilizer shall be standard commercial brands meeting the requirements of the Canada Fertilizer Act and the Canadian Fertilizer Quality Assurance Program.

(c) All fertilizers shall be granular, pellet or pill form, and shall be dry and free flowing.

E35.2.6 Sub-surface Drain Pipe and Connectors

(a) Subsurface drains shall be 6” (150mm) MultiFlow, as supplied by Nilex.

(b) Connectors shall be MultifFlow suitable for horizontally installed pipe and as shown on the drawings.

(c) Connector pipe shall be as shown on the drawings.

E35.2.7 Catch Basins

(a) Catch Basins to be as manufactured by NDS, 851 N. Harvard Avenue, Lindsay, CA, 93247, Ph. 800-726-1994 or approved equal in accordance with B5 and shall be as noted on Drawings with fittings to connect Multiflow Drain piping. Products specified shall be as noted on Drawings.

E35.3 Construction Methods

E35.3.1 Preparation of Sub-grade

(a) Subsoil shall be graded to eliminate uneven areas and low spots, ensuring positive drainage. Any soil contaminated by toxic materials shall be removed and disposed off site.

(b) All surface debris, roots, vegetation, branches and stones in excess of 25mm shall be removed.

(c) Grades on the area to receive event lawn mix that have been previously established in conformance with the Drawings and/or other applicable specifications shall be maintained in a true and even grade.

E35.3.2 Drainage Pipe

(a) Drain pipe shall be installed as per the drawings and manufacturers specifications.

E35.3.3 Placing Drainage Layer

(a) The Contractor shall not commence placement of drainage layer until the sub-grade and drain system has been inspected and approved by the Contract Administrator.

(b) The Contractor shall provide the Contract Administrator with a minimum of two working days notice for inspection.

E35.3.4 Placing Event Lawn Growing Medium

(a) The Contractor shall not commence placement of growing medium until the drainage layer has been inspected and approved by the Contract Administrator.

E35.3.5 Application of Fertilizer

(a) The Contractor shall provide the Contract Administrator with a report for each work site indicating the fertilizer formulation used, the rate of application and the date of application.

(b) Fertilizer shall be spread uniformly over the entire area of topsoil at a rate to provide 48 kg actual Nitrogen, 96 kg actual Phosphate and 48 kg actual Potassium per hectare.

E35.3.6 Finish Grading and Rolling

(a) The area shall be fine graded and the growing medium loosened. Eliminate rough spots and low areas to ensure positive drainage. Prepare a loose friable bed by means of cultivation and subsequent raking.

(b) The event lawn shall be rolled with a mechanical roller of a minimum weight of 220kg, minimum width of 760mm roller, to consolidate it in areas to be seeded, leaving the surface smooth, uniform, firm against deep foot printing and to the satisfaction of the Contract Administrator.

E35.3.7 Installation of Catch Basins

(a) Catch Basins shall be installed in accordance with CW-2130.

E35.4 Measurement and Payment

E35.4.1 Method of Measurement

(a) No measurement will be made for subsurface drainage

(b) Drainage and growing medium shall be measured on a cubic metre basis. The amount to be paid for shall be the total number of cubic metres installed as measured by the Contract Administrator.

(c) Catch Basins shall be measured on a unit basis.

E35.4.2 Basis of Payment

(a) Construction of the Event Lawn shall be paid for at the contract unit price for the "Items of Work" listed below, which price shall include all costs of labour and material supply, and all other items incidental to the work included in this specification.

Items of Work:

i) Subsurface Drainage
ii) Drainage Layer
iii) Growing Medium
iv) Catch Basins

E36. PLANTING – TREES AND SHRUBS

E36.1 General/Description

(a) This specification shall cover the supply and installation of trees and shrubs.

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

E36.1.1 Source Quality Control

(a) All plant material shall be randomly inspected at the source upon request of the Contract Administrator.

(b) Trees are to be grown in nurseries under proper cultural practices as recommended by the Canadian Nursery Trade Association.

(c) Only those trees will be accepted which have been grown for at least the four (4) previous years in local Manitoba nurseries located in an Agricultural Canada Plant Hardiness Zone designation of 2(a or b) or 3(a or b), and within a 250 kilometres radius of Winnipeg. Trees that have grown in plant hardiness zones 1 and 4 or greater will be rejected.

E36.1.2 Warranty and Maintenance

(a) The Contractor shall maintain and guarantee the Work against any and all defects or deficiencies resulting from insect infestation, disease and mechanical damage due to improper handling, installation or maintenance, for a period of two (2) years from the date of the Certificate of Total Performance. Nursery stock damaged by vandalism or reasons beyond the control of the Contractor shall be replaced by the City.

(b) End-of-Warranty inspection will be conducted by the Contract Administrator with representation by the City.

(c) The Contract Administrator reserves the right to request material replacement or extend the Contractor's responsibilities for an additional one (1) year if, at the end of the Warranty Period, leaf development and growth are not sufficient to ensure future survival of the tree or shrub.

E36.1.3 Replacements

(a) During the Maintenance Period, the Contractor shall remove from Site any plant material that has died or failed to grow satisfactorily as determined by the Contract Administrator and replace as per Specifications within a maximum thirty-day period from notification.

(b) Defective plants shall be replaced within three (3) days of notification to the Contractor.

(c) The Contractor shall extend the Warranty on replacement tree for a period equal to the original Warranty Period.

(d) The Contractor shall continue such replacement, Maintenance and Warranty until tree is acceptable.

E36.2 Materials

E36.2.1 Miscellaneous Materials

(a) **Water** – Water is to be potable and free of minerals which may be detrimental to plant growth.

(b) **Fertilizer** – Fertilizer is to be a slow release formulation of low nitrogen and high phosphorus e.g. 10-50-12. Apply quantities at rates stated by product manufacturer.

(c) **Rootball burlap** shall be 150g, Hessian burlap, biodegradable.

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

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

E36.2.2 Plant Material

(a) All nursery stock supplied shall be Canadian Prairie nursery grown, and of species and sizes indicated in the plant list on the drawings. Its quality shall be in accordance

with the "Guide Specification for Nursery Stock of the Canadian Nursery Trades Association".

(b) Any nursery stock dug from native stands, wood lots, orchards, or neglected nurseries and which have not received proper cultural maintenance as advocated by the Canadian Nursery Trades Association shall be designated as "collected plants". The use of "collected plants" will not be permitted unless specified below. 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.

(c) All trees are to be supplied in accordance with the Work of this Contract and shall be inspected by the Contract Administrator at the nursery site. At the time of inspection, the Contractor shall permanently tag a suitable branch of each tree with a distinct code clearly indicating that THE CITY OF WINNIPEG will be the intended recipient of that tree. The tag and code must be approved at least two (2) weeks in advance of their use by the Contract Administrator.

(d) The tag must be kept on the tree at the time of planting, and removed only when authorized in writing by the Contract Administrator. The Contract Administrator will reject each and every tree that has not been delivered with its tag intact at the planting site.

(e) Each tag will identify the species of the tree and its caliper at the time in which the tag is placed permanently on the tree. All trees tagging operation shall be conducted after Award of Contract to the Bidder. The use of trees requiring treatments as ordered by Agriculture Canada is prohibited.

(f) Plants larger than specified may be used if approved by the The City or his representative. The use of such plants shall not increase the contract price.

(g) All nursery stock shall be measured when the branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to root base or from branch tip to branch tip. Where trees are measured by caliper (cal), reference is made to the diameter of the trunk measured 300mm above ground as the tree stands in the nursery.

(h) All nursery stock shall be well branched, densely foliated when in leaf, true to type, structurally sound, possess a well developed, undamaged root system and shall be free of disease, insect infestations, rodent damage, sun scald, frost cracks, and other abrasions or scars to the bark. All parts of the nursery stock shall be moist and show live, green cambium when cut. All trees shall have one (1) sturdy, reasonably straight and vertical trunk and a well-balanced crown with fully developed leader. At least one (1) plant of each variety supplied shall bear a tag showing both the botanical and common name of the plant.

(i) Trees are to have been root pruned regularly, but not later than one growing season prior to arrival on Site. The Contractor may be required to furnish documentation to THE CITY OF WINNIPEG on his root-pruning program. Trees in excess of 75 mm caliper are to have been half root pruned during each of two successive growing seasons, the latter at least, one growing season prior to arrival on Site.

E36.2.3 Tree Quantity and Size

(a) Trees are to be planted at the quantities and calipers listed on the Plant List. Any variation from the specified quantity is to be clearly identified on the Schedule of Prices. Any variations to species, size or caliper of specified trees will require a request for approval from the Contract Administrator.

(b) Any changes in planting locations shall be determined on-site by the Contract Administrator.

(c) Trees are to conform to the measurements specified in the PLANT LISTS, except that trees larger than specified may be used if approved by the Contract Administrator.

(d) Trees are to be measured when the branches are in their normal position. Height dimensions specified are to refer to the main body of the tree and not from branch tip to root base. Where trees have been measured by caliper or diameter, reference is to be made to the diameter of the trunk measured 300 mm above the ground as the tree stands in the nursery prior to lifting. Caliper of tree shall be appropriately designed on a permanently fixed tag on one of the branches.

E36.2.4 Shipment and Pre-Planting Care

(a) Shipment of trees and the excavation of holes shall be coordinated to ensure minimum time lapse between digging and planting.

(b) Branches of trees shall be tied securely, and trees shall be protected against abrasion, exposure and extreme temperature change during transit. Avoid binding of trees with rope or wire which would damage bark, break branches or destroy natural shape of tree. Give full support to root ball of trees during lifting.

(c) Tree foliage shall be covered with a tarpaulin, and bare roots shall be protected by means of dampened straw, peat moss, saw dust or other acceptable material to prevent loss of moisture during transit and storage.

(d) Broken and damaged roots shall be removed with sharp pruning shears. Make clean cuts, and cover cuts over 10 mm diameter with a tree wound dressing.

(e) Roots shall be kept moist and protected from sun and wind. Heel-in trees, which cannot be planted immediately in shaded areas, and water well.

E36.3 Construction Methods

E36.3.1 Workmanship

(a) Location of trees shall be staked out or painted on Site by the Contractor. Locations shall be approved by the Contract Administrator prior to installation.

(b) Anti-desiccant shall be applied in accordance with material manufacturer's instructions with prior approval of the Contract Administrator.

(c) Coordinate operations. Keep Site clean and planting holes drained. Immediately remove soil or debris spilled onto street pavement, grass or sidewalk.

E36.3.2 Planting Time

(a) Deciduous trees shall be planted during dormant period before buds have broken. Trees noted for spring planting only, must be planted in dormant period.

(b) When permission has been obtained from the Contract Administrator to plant deciduous trees after buds have broken, plants shall be sprayed with anti-desiccant to slow down transpiration prior to transplanting.

(c) Plant only under conditions that are conducive to health and physical conditions of trees.

(d) Provide planting schedule to Contract Administrator. Extending planting operations over long period using limited crew will not be accepted.

(e) The Contractor must obtain all above and belowground clearances from all the utilities as well as the appropriate District Operations Branch in a timely manner so as not to jeopardize the schedule of the complete tree-planting Contract.

E36.3.3 Excavation of Tree Pits

(a) Excavation of planting pits shall be located as indicated by stakes or paint marks.

(b) The Contractor must not commence excavation of any tree pits until the full extent of all buried utilities and services are located and protected.

(c) The Contractor shall hand excavate all tree pits located over underground utility lines. Tree wells not located over underground utilities may be machine excavated. Tree wells shall be excavated with vertical sides to the full width of the surface area. as shown on the drawings. All excavated material shall be disposed of off site.

E36.3.4 Planting of Nursery Stock

(a) Each balled specimen shall be handled with great care so that the root balls shall not be broken. Burlap shall be folded back only at the top and sides.

(b) Broken root balls or balls consisting of loose soil shall not be accepted and shall be replaced. Broken roots of deciduous stock shall be pruned back prior to planting.

(c) Where the root ball of plant material is enclosed in wire baskets, the wire baskets shall be removed from the root ball once the tree has been located properly in the pit. Removal shall be by a min. of 4 vertical cuts equally spaced around the baskets without damaging the rootball. Cutting of the 2 lowest horizontal strands of the wire basket before placing the tree in the pit is acceptable provided that the bottom of the root ball will remain intact.

E36.3.5 Planting Procedure

(a) With balled and burlapped root balls and root balls in wire baskets, burlap shall be loosened and cut away from the top 1/3 without disturbing root ball. Burlap or rope shall not be pulled from under root ball. Non-biodegradable wrapping shall be removed.

(b) After inserting the tree and tamping the root system with topsoil in layer of 150 mm, water shall be poured in until the pit is thoroughly soaked. Filling of the hole shall then be completed and the fill-in soil shall be packed firmly around the roots, leaving a concave surface for convenient watering. After filling, the planting shall be watered at frequent intervals. No tree pit shall be left open at the end of the Contractor's Work Day.

(c) Each tree is to have an earth saucer at its base having a diameter as large as the excavation with a 10 cm lip formed at the perimeter of the saucer to retain water.

(d) Planting shall be done during periods suitable to weather conditions and locally accepted practice. All nursery stock shall be set plumb in the centre of pits and at levels as shown on the planting details after settlement has taken place.

(e) Nursery stock shall be faced to give the best appearance or relationship to adjacent structure and to the approval of the The City of his representative. Trees shall be placed equal to depth they were originally growing in nursery.

E36.3.6 Fertilizing

(a) When planting is completed, surface of planting saucer shall be fertilized, meeting the requirements of Specification. Fertilizer shall be mixed thoroughly with top layer of planting soil and watered in well.

E36.3.7 Pruning

(a) All deciduous trees shall be pruned immediately after planting. The amount of pruning shall be limited to the minimum necessary to remove dead or injured branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as to preserve the natural character of the plants. Leaders shall not be removed. Only clean, sharp tools shall be used. All cuts shall be clean and flush, leaving no stubs. Cuts, bruises or scars on the bark shall be traced back to living tissue and removed. The affected areas shall be shaped so as not to retain water and all cuts of more than 25 mm (1") in diameter shall be painted within approved tree paint.

E36.3.8 Watering

(a) Trees shall be watered during the planting procedure as described previously, and once a week thereafter, or more frequently if required.

(b) A complete record shall be kept of each series of waterings for all planted trees, noting: 1) location, and 2) date of watering. This record shall be sent bi-weekly to the Contract Administrator – Fax: (204) 927-3443.

(c) Forty (40) litres of water per 25 mm calliper per application shall be applied using deep root feeder or low/pressure nozzle and hose. The water stream shall not gouge out a hole in the soil and mulch.

E36.3.9 Staking

(a) All trees shall be staked and tied in accordance with the Drawings.

E36.4 Measurement and Payment

E36.4.1 Method of Measurement

(a) Trees and Shrubs shall be measured on a per unit basis. The amount to be paid for shall be the total number of trees and shrubs supplied and installed in accordance with this specification, the drawings and as accepted by the Contract Administrator.

E36.4.2 Basis of Payment

(a) Payment for Trees and Shrubs shall be paid for at the contract unit price for the “Items of Work” listed below, which price shall include all costs of labour and material supply, and all other items incidental to the work included in this specification.

Items of Work:

(i) American Elm
(ii) Calgary Carpet Juniper
(iii) Halcyon Hosta

E37. ROUGH LIMESTONE WALLS

E37.1 General

E37.1.1 Description

(a) This Specification shall the construction of the limestone planter and ramp walls, as shown on the Drawings.

(b) The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for an incidental to the satisfactory performance and completion of all work as shown on the Drawings, including earthwork and grading, granular base, and all other items considered incidental to the work.

E37.2 Materials

E37.2.1 Granular Base

(a) Granular base material shall be supplied as shown on the drawings and in accordance with CW 3110-R10.

E37.2.2 Limestone

(a) Limestone shall be supplied as shown on the drawings and as on file with Gillis Quarries LTD, (204) 222-8319, contact - Jeffrey Dolovich.

E37.3 Construction Methods

E37.3.1 Granular Base

(a) Granular base material shall be installed as shown on the drawings and in accordance with CW 3110-R10.

(b) Limestone shall be installed to the grades and levels shown on the drawings. Joints shall be tight.

E37.4 Measurement and Payment

E37.4.1 Method of Measurement

(a) Limestone walls shall be measured on a linear metre basis. The amount to be paid for shall be the total number of linear metres supplied and installed in accordance with this specification, the drawings and as accepted by the Contract Administrator.

E37.4.2 Basis of Payment

(a) Payment for limestone walls shall be paid for at the contract unit price for the “Items of Work” listed below, which price shall include all costs of labour and material supply, and all other items incidental to the work included in this specification.

Items of Work:

(i) Limestone Block 500x300x1300
(ii) Limestone Block 500x750x1300
(iii) Limestone Block 300x500x500
(iv) Limestone Block 500x750x500

E38. IRRIGATION

E38.1 General

E38.1.1 Description

(a) This specification shall cover all Work associated with the supply, installation and commissioning of an automated irrigation system. The Contractor shall furnish all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified. This specification shall supplement CW3530-R3.

E38.1.2 Commissioning

(a) The Contractor shall supply a complete set of operational manuals to the City upon completion of the work. The handing over of manuals shall include a thorough demonstration of the systems operation to City staff.

E38.2 Materials

E38.2.1 Controller

(a) 1 only Toro TMC-212, 4 station (expandable-future) controller c/w non-volatile memory. Toro TMC 212 compatible options to include:

(i) 1 only TWRS Toro wireless rain sensor c/w water conservation mode + smart bypass functions.

(ii) 1 only EZR-KIT Toro Maintenance Remote

(iii) Irrigation controls and 110 outlets to be enclosed in lockable, air vented panel box.

E38.2.2 Irrigation water service:

(a) 2” supply from City main to summer service. Summer service to include: 2” double check back flow preventer, 2” water meter, 2” brass isolation gate valve, 1” Buckner/Storm QCV 101 1pc, single lug blow out connection.

E38.2.3 Mainline

(a) To be 2” HDPE SDR 13.5 pipe c/w (4) 1” Buckner/Storm QCV 101 1pc, single lug at designated hand watering locations. Quick Coupler Valves to be installed on (4) Lasco 1” x 12” prefabricated swing joints 1 ½” MACME x 1”MIPT and (4) Lasco 2 x 1 ½ PVC saddle IPS x FACME.

E38.2.4 Lateral Lines

(a) Sodded areas to be controlled by (2) Toro P220-26-06 1 ½” electric solenoid valves cw lockable Carson 910 valve box. Poly pipe to be 2” HDPE SDR13.5. Turf sprinkler to be (8) Toro SS 2001 adjustable 12-15 GPM on (8) Lasco 1” x 12” prefabricated swing joints 1 ½” MACME x 1”MIPT and (8)Lasco 2 x 1 ½ PVC saddle IPS x FACME.

(b) Tree wells to be controlled by (1) Toro EZF-06-04 1” electric solenoid valve c/w lockable Carson 1419 valve box. Valve to include a Toro PMR-25MF in-line pressure reducer and 1” screen filter. Poly pipe to be 1” LDPE 75 CSA red to be run adjacent to King Street to supply 10 tree wells. Approx 10-20’ of subsurface drip line to be installed per tree well. Drip line to be Netafim Techline, 18” space, .9 GPH emitter, 1.0 GPM/100’.

E38.2.5 Heads and Bibs

(a) Sprinkler heads and hose bibs shall be as shown on the Drawings.

E38.3 Construction Methods

E38.3.1 General

(a) Construction shall be in accordance with CW 3530-R3.

E38.4 Measurement and Payment

E38.4.1 Method of Measurement

(a) No measurement shall be made for Irrigation.

E38.4.2 Basis of Payment

(a) Payment for Irrigation shall be paid for at the Lump Sum for the “Items of Work” listed below, which price shall include all costs of labour and material supply, and all other items incidental to the work included in this specification.

Items of Work:

(i) Irrigation

E39. TIMBER WALL

E39.1 Supply and install timber fence as shown on the drawings or as directed by the Contract Administrator.

E39.2 Measurement and Payment

E39.2.1 Supply and install timber fence will be measured for payment per metre and paid for at the Contract Unit Price for “Timber Wall”, which price shall include all costs of labour and material supply, and all other items incidental to the work included in this specification.