THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 166-2005

WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

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PART B - BIDDING PROCEDURES

B1. PROJECT TITLE

B1.1 WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, May 18, 2005.

B2.2 Bid Submissions determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.

B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

B3.1 Further to GC:3.1, the Contract Administrator or an authorized representative will be available at the Site from 10:30 a.m. to 12:00 p.m. on May 4, 2005 to provide Bidders access to the Site.

B3.2 The Bidder shall not be entitled to rely on any information or interpretation received at the Site investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.

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

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

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

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

B5. ADDENDA

B5.1 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.

B5.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.

B5.2.1 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.

B5.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Branch internet site for addenda shortly before submitting his Bid.

B5.3 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.

B6. SUBSTITUTES

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

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

B6.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.

B6.4 The Bidder shall ensure that any and all requests for approval of a substitute:

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

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

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

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

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

B6.5 The Contract Administrator, after assessing the request for approval of a substitute, may in 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.

B6.6 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.

B6.6.1 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.

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

B6.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative shall 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 B15.

B6.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B7. BID SUBMISSION

B7.1 The Bid Submission consists of the following components:

(a) Form A: Bid;

(b) Form B: Prices; and

(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.

B7.2 All components of the Bid Submission 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 in ink, to constitute a responsive Bid.

B7.3 The Bid Submission shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.

B7.3.1 Samples or other components of the Bid Submission 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 Submission.

B7.4 Bid Submissions submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B7.5 Bid Submissions shall be submitted to:

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

B8. BID

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

B8.2 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.

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

B8.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B8.4 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, should 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.

B8.4.1 The name and official capacity of all individuals signing Form A: Bid shall be printed below such signatures.

B8.4.2 All signatures shall be original and shall be witnessed except where a corporate seal has been affixed.

B8.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid Submission and the Contract, when awarded, shall be both joint and several.

B9. PRICES

B9.1 The Bidder shall state the lump sum price in Canadian funds for the Work on Form B: Prices.

B10. QUALIFICATION

B10.1 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;

(b) be responsible and not be suspended, debarred or in default of any obligation to the City;

(c) be financially capable of carrying out the terms of the Contract;

(d) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract;

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

(f) employ only Subcontractors who:

(i) are responsible and not suspended, debarred or in default of any obligation 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); and

(ii) have successfully carried out work similar in nature, scope and value to the portion of the Work proposed to be subcontracted to them, and are fully capable of performing the Work required to be done in accordance with the terms of the Contract;

(g) have a written workplace safety and health program in accordance with The Workplace Safety and Health Act (Manitoba);

B10.2 Further to B10.1(g), 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 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 - Option 1 administered by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or

(b) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association; or

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

B10.3 The Bidder shall be prepared to 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.

B10.4 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.

B11. BID SECURITY

B11.1 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.

B11.1.1 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.

B11.2 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.

B11.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B11.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B11.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B11.3 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.

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

B12.1 Bid Submissions 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.

B12.1.1 Bidders or their representatives may attend.

B12.1.2 Bid Submissions determined by the Manager of Materials, or his designate, to not include the bid security specified in B11 will not be read out.

B12.2 After the public opening, the names of the Bidders and their Total Bid Prices as read out (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.

B12.3 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.

B12.4 The Bidder is advised that any information contained in any Bid Submission 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.

B13. IRREVOCABLE BID

B13.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B13.2 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.

B14. WITHDRAWAL OF BIDS

B14.1 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.

B14.1.1 Notwithstanding GC:23.3, 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.

B14.1.2 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.

B14.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials shall:

(a) retain the Bid Submission until after the Submission Deadline has elapsed;

(b) open the Bid Submission 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 B14.1.3(b), declare the Bid withdrawn.

B14.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B13.2 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.

B15. EVALUATION OF BIDS

B15.1 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 B10 (pass/fail);

(c) Total Bid Price;

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

B15.2 Further to B15.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid Submission 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 if the interests of the City so require.

B15.3 Further to B15.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid Submission or in other information required to be submitted, that he is responsible and qualified.

B15.4 Further to B15.1(c), the Total Bid Price shall be the lump sum price shown on Form B: Prices.

B15.4.1 If there is any discrepancy between the lump sum price written in figures and the lump sum price written in words, the price written in words shall take precedence.

B16. AWARD OF CONTRACT

B16.1 The City will give notice of the award of the Contract by way of a letter of intent, or will give notice that no award will be made.

B16.2 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.

B16.2.1 Without limiting the generality of B16.2, 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.

B16.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid.

PART C - GENERAL CONDITIONS

C1. GENERAL CONDITIONS

C1.1 The *General Conditions for Construction Contracts* (Revision 2000 11 09) are applicable to the Work of the Contract.

C1.1.1 The *General Conditions for Construction Contracts* 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.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D1.2 The General Conditions are amended by striking out “The City of Winnipeg Act” wherever it appears in the General Conditions and substituting “The City of Winnipeg Charter”.

D1.3 The General Conditions are amended by striking out “Tender Package” wherever it appears in the General Conditions and substituting “Bid Opportunity”.

D1.4 The General Conditions are amended by striking out “Tender Submission” wherever it appears in the General Conditions and substituting “Bid Submission”.

D1.5 The General Conditions are amended by deleting GC:6.16 and GC:6.17. The City of Winnipeg is now within the jurisdiction of the Manitoba Ombudsman pursuant to The Ombudsman Act.

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of construction of a reinforced concrete clearwell structure including installation of prestressed concrete piles and other components as listed below or as detailed in the Drawings and Specifications.

D2.2 The major components of the Work are:

(a) Supply and installation of steel fabrications as specified in Section 05500 Steel Fabrications, clause 1.1.

(b) Supply and installation of aluminum fabrications as specified in Section 05300 Aluminum Fabrications, clause 1.1.

(c) Construction of cast-in-place concrete clearwell components including slab, walls, baffles and roof as defined in the Drawings and Specifications.

(d) Construction of foundation drainage around clearwell perimeter

(e) Supply and installation of EPDM membrane and related work as specified in Section 07550 EPDM Waterproof Membrane, clause 1.1.

(f) Delivery to the Site and installation of approximately 1123 400mm precast concrete piles 14m to 18m in length.

(g) Installation of seven (7) 2743mm by 2743mm sluice gates and wall thimbles. The Contractor shall accept delivery of the sluice gates from a Supply Contractor (Bid Opportunity 102-2005) and maintain custody of the gates until installation and acceptance.

(h) Fabricate sluice gate testing frame as detailed on Drawing 1-060IT-D-S0040-001-00D and perform leakage tests on sluice gates in accordance with notes on Drawing 1-060IT-G-P001-001-00D. Coordinate with Supply Contractor to sign off on Forms 200, 201, 202 and 203 as Installation Contractor upon successful delivery, training, installation and testing of the gates.

(i) Form around and cast into discharge chamber walls two (2) 2700mm by 2100 eccentric reducers supplied and set in place by the yard piping contractor (Bid Opportunity 153-2005).

(j) Mechanical and electrical installations as shown and noted on the Drawings.

(k) Accept delivery from the yard piping contractor of one 1800mm by 2.2m long wall piece including blind flange and restrained bulkhead, set in place and cast into clearwell wall section at designated future inlet location.

(l) Excavation and backfilling as specified in Section 02223 Excavation and Backfilling for Structures, clause 1.1.

D3. DEFINITIONS

D3.1 When used in this Bid Opportunity:

(a) "**ANSI**" means American National Standards Institute

(b) "**ASME**" means American Society of Mechanical Engineers

(c) "**ASTM**" means American Society for Testing and Materials

(d) "**AWWA**" means American Water Works Association

(e) "**CSA**" means Canadian Standards Association

(f) "**DAF**" means Dissolved Air Flotation

(g) "**DBPS**" means Deacon Booster Pumping Station

(h) "**EPDM**" means Ethylene Propylene Diene Monomer

(i) "**GWWD**" means Greater Winnipeg Water District

(j) "**HDPE**" means High Density Polyethylene

(k) "**IEC**" means International Electrotechnical Commission

(l) "**ISO**" means International Organization for Standardization

(m) "**NACE**" means National Association of Corrosion Engineers

(n) "**NEMA**" means National Electrical Manufacturers Association

(o) "**NSF**" means National Sanitation Foundation, and

(p) "**SAE**" means Society of Automotive Engineer

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is UMA Projects (CM) Ltd., represented by:

Mr. Larry Smith, C.E.T.
Assistant Construction Manager
1479 Buffalo Place
Winnipeg, Manitoba, R3T 1L7

Telephone No. (204) 284-0580
Facsimile No. (204) 453-5172

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

D5. CONTRACTOR'S SUPERVISOR

D5.1 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.

D6. NOTICES

D6.1 Except as provided for in GC:23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3, D6.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D4.1.

D6.3 All notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following address or facsimile number:

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

Facsimile No.: (204) 949-1174

D6.4 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
185 King Street, 3rd Floor
Winnipeg, MB R3B 1J1

Facsimile No.: (204) 947-9155

D7. FURNISHING OF DOCUMENTS

D7.1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him at cost.

SUBMISSIONS

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 GC:4.1 for the return of the executed Contract.

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

D9. INSURANCE

D9.1 The City shall provide and maintain the following Project Insurance Coverages:

(a) Builder's Risk Insurance in the amount of one hundred percent (100%) of the total project cost.

(i) The Contractor shall be responsible for deductibles; amount of the deductibles is $10,000 per claim.

(b) Wrap-Up Liability Insurance in an amount of no less than 10 million dollars ($10,000,000.00)

(i) The Contractor shall be responsible for deductibles; amount of the deductibles is $10,000 per claim.

(c) The City of Winnipeg will carry such insurance to cover all parties engaged in the Work in this Contract. Provision of this insurance by the City of Winnipeg is not intended in any way to relieve the Contractor from his obligations under the terms of the Contract. Specifically, losses relating to deductibles for insurance, as well as losses in excess of limits of coverage and any risk of loss that is not covered under the terms of the insurance provided by the City of Winnipeg remains with the Contractor.

D9.2 Deductibles shall be borne by the Contractor.

D9.3 The Contractor shall provide the City Solicitor with a certified true copy or a certificate of insurance of each policy, in a form satisfactory to the City Solicitor, 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 GC:4.1 for the return of the executed Contract.

D9.3.1 The certificate of insurance for the commercial general liability insurance must clearly state "operations to include demolition work".

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 Submission was not a certified cheque or draft pursuant to B11.1(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 but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D11. DETAILED PRICES

D11.1 The Contractor shall provide the Contract Administrator with a detailed price breakdown (Form I: Detailed Prices) 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 GC:4.1 for the return of the executed Contract.

D12. SUBCONTRACTOR LIST

D12.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at 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 GC:4.1 for the return of the executed Contract.

D13. EQUIPMENT LIST

D13.1 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 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 GC:4.1 for the return of the executed Contract.

D14. DETAILED WORK SCHEDULE

D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D14.2 The detailed work schedule shall consist of the following:

(a) a critical path method (C.P.M.) schedule for the Work; and

(b) a Gantt chart for the Work based on the C.P.M. schedule;

all acceptable to the Contract Administrator.

D14.3 Further to D14.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the activities/tasks making up the Work as well as showing those activities/tasks on the critical path:

D14.4 Further to D14.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

SCHEDULE OF WORK

D15. COMMENCEMENT

D15.1 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.

D15.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:

(i) evidence that the Contractor is 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;

(ii) evidence of the workers compensation coverage specified in GC:6.14;
(iii) the Safe Work Plan specified in D8;
(iv) evidence of the insurance specified in D9;
(v) the performance security specified in D10;
(vi) the detailed prices specified in D11;
(vii) the Subcontractor list specified in D12;
(viii) the equipment list specified in D13; and
(ix) the detailed work schedule specified in D14;

(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.

D15.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent or upon completion of excavation of the south half of the clearwell by the excavation contractor (not later than June 17, 2005.)

D16. SCHEDULE RESTRICTIONS

D16.1 As noted in D17. Critical Stages, the Contractor is required to complete the piling and slab construction for the discharge chamber by **August 10, 2005**. The yard piping contractor (Bid Opportunity 153-2005) will then install the piping from the discharge chamber to a point outside the clearwell structure and perimeter drainage. To permit access for the yard piping contractor's activities and equipment the Contractor shall not have access to the following items of work until **August 29, 2005**:

- Piles within lines T3 to T7 from TN to TL.
- South outside wall and footing from T3 to T7.

D16.2 Sluice gates (supplied under Bid Opportunity 102-2005). Thimbles for discharge chamber gates are scheduled for delivery by **August 22, 2005**; remainder of thimbles are scheduled for delivery by **October 7, 2005**.

D16.3 Yard piping components cast into clearwell walls: At the discharge chamber, the yard piping contractor will set in place two (2) 2700mm by 2100mm AWWA 301 reducers and will connect three (3) downstream pipe sections to each in order to assure correct alignment. Delivery of the reducers and connecting pipe is scheduled for August 15, 2005 and will be in place by August 29, 2005. At the clearwell inlet, the Contractor shall set and cast into the wall, one (1) 1800mm by 2.2m long wall piece complete with blind flange and topospherical bulkhead (supplied by the yard piping contractor). These components are scheduled for delivery **September 2, 2005**.

D17. CRITICAL STAGES

D17.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) August 10, 2005. Complete shoring, excavation and construction of discharge chamber base slab

(b) October 31, 2005. South cell of clearwell shall be complete and ready for leakage testing.

(c) December 9, 2005. Clearwell concrete works complete.

D18. SUBSTANTIAL PERFORMANCE

D18.1 The Contractor shall achieve Substantial Performance by June 30, 2006.

D18.2 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 reinspected.

D18.3 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.

D19. TOTAL PERFORMANCE

D19.1 The Contractor shall achieve Total Performance by July 31, 2006.

D19.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D19.3 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.

D20. LIQUIDATED DAMAGES

D20.1 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, six hundred dollars ($2,600) per Calendar Day for each and every Calendar Day following the day fixed herein for Substantial Performance during which such failure continues.

D20.2 The amount specified for liquidated damages in D20.1 is based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve Substantial Performance by the day fixed herein for same.

D20.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D20.4 If the Contractor fails to achieve critical stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:

(a) August 10, 2005. – Complete shoring, excavation and construction of discharge chamber base slab – two thousand, six hundred dollars ($2,600)

(b) October 31, 2005. South cell of clearwell shall be complete and ready for leakage testing - two thousand, six hundred dollars ($2,600)

(c) December 9, 2005. Clearwell concrete works complete – two thousand, six hundred dollars ($2,600)

(d) Substantial Performance - two thousand, six hundred dollars ($2,600)

(e) Total Performance – six hundred dollars ($600)

D20.5 The amounts specified for liquidated damages in D20.3 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.

D20.6 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

CONTROL OF WORK

D21. JOB MEETINGS

D21.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D21.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D22. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D22.1 Further to GC:6.26, UMA Projects (CM) Ltd. 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).

D22.2 As Prime Contractor, UMA Projects (CM) Ltd. will administer a Safety and Health Management Plan. Compliance with this Plan will be mandatory for all personnel on the construction site and training and certification of all staff by the Prime Contractor's Safety Officer will be required. Further to GC:6.26, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D22.3 The Water Treatment Program Project Safety and Health Management Plan is available on the City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt/projects

D23. COOPERATION WITH OTHERS

D23.1 The Contractor shall note that several other contracts will be underway at the time of construction, including, but not limited to;

(a) Bid Opportunity 32-2005 Winnipeg Water Treatment Program - Supply of Butterfly Valves for Yard Piping (Awarded)

(b) Bid Opportunity 70-2005 Winnipeg Water Treatment Program – Bulk Excavation for Clearwell and Water Treatment Plant Sites

(c) Bid Opportunity 101-2005 Winnipeg Water Treatment Program – Clearwell Piling Supply

(d) Bid Opportunity 102-2005 Winnipeg Water Treatment Program – Supply of Sluice Gates

(e) Bid Opportunity 153-2005 Winnipeg Water Treatment Program – Yard Piping and Valve Chambers

D23.2 Bid Opportunities for the above are available at the City of Winnipeg Materials Management website at http://www.winnipeg.ca/matmgt/bidopp.asp

D23.3 The Contractor will not have exclusive use of the site. The Contractor shall coordinate activities with others and minimize disruptions to others, where possible.

D23.4 Where site access requires relocation for installation of works, the Contractor shall construct suitable, all-weather detours, as required.

D23.5 The Contractor shall note that the Deacon Booster Pumping Station and surrounding compound will be in use during the construction period. The Contractor shall maintain reasonable access to all existing plant, valve chambers, rail, mechanical and electrical facilities at all times. The Contractor shall provide all reasonable assistance to Operations personnel to provide safe, secure access to operational facilities.

D24. PARTNERING

D24.1 In order to effectively and efficiently accomplish the Work of this Contract, The City of Winnipeg, Water and Waste Department is encouraging the formation of a cohesive, mutually beneficial working relationship with the Contractor, his Subcontractors and representatives from the successful bidder for Bid Opportunity 166-2005 Winnipeg Water Treatment Program – Clearwell Construction. This working relationship will endeavour to draw on individual and corporate and community strengths, skills and knowledge to achieve a quality project to the benefit of all participants. The objective of Partnering is to build co-operative relationships, avoid or minimize disputes and actively pursue the attainment of common goals. Success will depend upon teamwork with open and effective communication while adhering to the highest professional standards. Participation in Partnering will not in any way affect the application or legal obligation of the Contract. The Partnering Initiation Workshop is typically a one and one-half (1 ½) day session for a project of this magnitude, which would be held in conjunction with the pre-construction meeting. The Partnering Initiation Workshop will be scheduled for a date in the last 2 weeks of June, 2005.

D24.2 The Partnering Initiation Workshop shall be carried out at no cost to the Contractor nor shall any payment be made for time and travel expenses incurred by the Contractor associated with participation in the Partnering Initiation Workshop. It shall be considered incidental to the Work included in this project.

MEASUREMENT AND PAYMENT

D25. PAYMENT SCHEDULE

D25.1 Further to GC:12, payment shall be in accordance with the following payment schedule:

(a) Eighty-seven percent (87%) of the Lump Sum Price listed in Form B: Prices will be paid on the basis of monthly progress estimates in accordance with GC:12.

(b) Two percent (2%) of the Lump Sum Price listed in Form B: Prices will be paid upon satisfactory completion of a water leakage test of each of the north and south clearwell cells and the inlet chamber. This will include testing of three (3) components (six (6) percent in total).

(c) One percent (1%) will be paid upon satisfactory installation of each sluice gate and thimble, including completion of Form 203: Certificate of Satisfactory Performance for each sluice gate assembly (seven (7) percent in total).

D25.2 The supply contractor for the sluice gates is required to certify satisfactory installation and initiate Form 203: Certificate of Satisfactory Performance for the sluice gates. The Contractor shall sign Form 203 as the Installation Contractor.

D25.3 All signatures are required on each Form 203 in order for the form to be considered satisfactorily completed.

D26. WARRANTY

D26.1 Notwithstanding GC:13.2, the Contractor shall warrant the clearwell membrane system as stated in Form W1: Manufacture Guarantee Agreement. This form is in Section 07550, EPDM Waterproof Membrane, Page 7 of 10.

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. 166-2005

WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

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. 166-2005

WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

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 I: DETAILED PRICES
(See D11)

WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

ITEM NO.	DESCRIPTION	SPEC. REF.	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
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18.						
19.						
20.						
21.						
22.						
23.						
24.						
25.						
26.						
27.						
28.						

FORM I: DETAILED PRICES
(See D11)

WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

ITEM NO.	DESCRIPTION	SPEC. REF.	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
29.						
30.						
31.						
32.						
33.						
34.						
35.						
36.						
37.						
38.						
39.						
40.						
41.						
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53.						
54.						
55.						

FORM J: SUBCONTRACTOR LIST
(See D12)

WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

Name	Address

FORM K: EQUIPMENT
(See D13)

WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

1. Category/type: Pile driving – hammer(s)

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

2. Category/type: Pile driving – Crane(s) and leads

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

3. Category/type: Excavation equipment: backhoes, FEL's

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 D13)

WINNIPEG WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION

4. Category/type: Hoisting and lifting: cranes, other

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

Registered owner: _____

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

Registered owner: _____

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

Registered owner: _____

5. Category/type: Miscellaneous

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: _____

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

E1.1 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.1.1 *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.

E1.1.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.

E1.1.3 Further to GC:2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.2 The following Drawings are applicable to the Work:

DRAWING No.	TITLE
1-0601T-D-G0100-001-00D	INDEX
1-0601M-D-G0001-001-00D	CIVIL - LEGEND
1-0601M-D-G0002-001-00D	CIVIL - EXISTING SITE TOPOGRAPHY
1-0601M-D-G0003-001-00D	CIVIL - EXISTING SITE UTILITIES
1-0601M-D-G0004-001-00D	CIVIL - EXISTING SITE PARTIAL PLAN AND SURVEY PLAN
1-0601M-D-G0005-001-00D	GENERAL - OVERALL PROPOSED SITE PLAN
1-0601Y-C-C0001-001-00D	CIVIL - YARD PIPING - SITE PLAN - PLAN & COORDINATE GEOMETRY
WT-A001	ARCHITECTURAL - DOOR TYPES & DOOR FRAMES DETAILS ROOM FINISH & DOOR SCHEDULES
WT-A002	ARCHITECTURAL - INLET BUILDING, OUTLET BUILDING & EMERGENCY EXIT HUTS - FLOOR PLANS
WT-A003	ARCHITECTURAL - INLET BUILDING, OUTLET BUILDING & EMERGENCY EXIT HUTS - ROOF PLANS
WT-A004	ARCHITECTURAL - INLET BUILDING - BUILDING ELEVATIONS
WT-A005	ARCHITECTURAL - OUTLET BUILDING & EMERGENCY EXIT HUTS - BUILDING ELEVATIONS
WT-A006	ARCHITECTURAL - INLET BUILDING, OUTLET BUILDING & EMERGENCY EXIT HUTS - BUILDING SECTIONS
WT-A007	ARCHITECTURAL - INLET BUILDING - WALL SECTIONS
1-601T-D-S0001-001-00D	STRUCTURAL - GENERAL NOTES
1-0601T-B-S0002-001-00D	STRUCTURAL - OVERALL PILING PLAN
1-0601T-B-S0003-001-00D	STRUCTURAL - PARTIAL PILING PLAN
1-0601T-B-S0004-001-00D	STRUCTURAL - PARTIAL PILING PLAN
1-0601T-B-S0005-001-00D	STRUCTURAL - PARTIAL PILING PLAN
1-0601T-B-S0006-001-00D	STRUCTURAL - PARTIAL PILING PLAN
1-601T-B-S0007-001-00D	STRUCTURAL - FOUNDATION FRAMING PLAN

DRAWING No.	TITLE
1-0601T-B-S0008-001-00D	STRUCTURAL - FOUNDATION SLAB REINFORCING PLAN
1-0601T-B-S0009-001-00D	STRUCTURAL - FOUNDATION SLAB REINFORCING PLAN
1-0601T-B-S0010-001-00D	STRUCTURAL - FOUNDATION SLAB ELEVATIONS PLAN
1-0601T-A-S0011-001-00D	STRUCTURAL - ROOF FRAMING PLAN
1-0601T-A-S0012-001-00D	STRUCTURAL - ROOF SLAB REINFORCING PLAN
1-0601T-A-S0013-001-00D	STRUCTURAL - ROOF SLAB REINFORCING PLAN
1-0601T-A-S0014-001-00D	STRUCTURAL - BUILDING SECTIONS
1-0601T-A-S0015-001-00D	STRUCTURAL - BUILDING SECTIONS
1-0601T-A-S0016-001-00D	STRUCTURAL - SECTIONS AND DETAILS
1-0601T-A-S0017-001-00D	STRUCTURAL - SECTIONS AND DETAILS
1-0601T-A-S0018-001-00D	STRUCTURAL - SECTIONS AND DETAILS
1-0601T-A-S0019-001-00D	STRUCTURAL - WEIR WALL SECTIONS AND DETAILS
1-0601T-A-S0020-001-00D	STRUCTURAL - EXPANSION AND CONSTRUCTION JOINT DETAILS
1-0601T-A-S0021-001-00D	STRUCTURAL - OUTLET BUILDING PLANS
1-0601T-A-S0022-001-00D	STRUCTURAL - OUTLET BUILDING - REINFORCING PLANS
1-0601T-A-S0023-001-00D	STRUCTURAL - OUTLET BUILDING - ELEVATIONS
1-0601T-A-S0024-001-00D	STRUCTURAL - OUTLET BUILDING - BUILDING SECTIONS
NOT IN SET - RESERVED	STRUCTURAL - OUTLET BUILDING - WALL SECTIONS AND DETAILS
NOT IN SET - RESERVED	STRUCTURAL - OUTLET BUILDING - WALL SECTIONS AND DETAILS
1-0601T-A-S0027-001-00D	STRUCTURAL - INLET BUILDING PLANS
1-0601T-A-S0028-001-00D	STRUCTURAL - INLET BUILDING ELEVATIONS
1-0601T-A-S0029-001-00D	STRUCTURAL - INLET BUILDING - BUILDING SECTIONS
1-0601T-A-S0030-001-00D	STRUCTURAL - INLET BUILDING WALL SECTIONS & DETAILS
NOT IN SET - RESERVED	STRUCTURAL - INLET BUILDING WALL SECTIONS AND DETAILS
1-0601T-D-S0032-001-00D	STRUCTURAL - STANDARD DETAILS
1-0601T-D-S0033-001-00D	STRUCTURAL - STANDARD DETAILS
1-0601T-A-S0034-001-00D	STRUCTURAL - STAIRS PLANS
1-0601T-A-S0035-001-00D	STRUCTURAL - STAIRS SECTIONS AND DETAILS
1-0601T-A-S0036-001-00D	STRUCTURAL - INLET AND OUTLET COVERS PLANS
1-0601T-A-S0037-001-00D	STRUCTURAL - INLET AND OUTLET BUILDINGS - COVERS SECTIONS AND DETAILS
1-0601T-A-S0038-001-00D	STRUCTURAL - ROOF DRAINAGE PLAN - DETAIL SECTION OF MANHOLE
1-0601T-A-S0039-001-00D	STRUCTURAL - ROOF DRAINAGE SECTIONS AND DETAILS
1-0601T-D-S0040-001-00D	STRUCTURAL - MISCELLANEOUS DETAILS
1-0601T-G-P0001-001-00D	PROCESS - PROCESS AND INSTRUMENTATION DIAGRAM
1-0601T-A-P0002-001-00D	PROCESS - OVERALL LAYOUT

DRAWING No.	TITLE
1-0601T-A-P0003-001-00D	PROCESS - OVERALL SECTIONS
1-0601T-A-P0004-001-00D	PROCESS - INLET PLANS
1-0601T-A-P0005-001-00D	PROCESS - INLET BUILDING - SECTIONS 1 AND 2
1-0601T-A-P0006-001-00D	PROCESS - INLET BUILDING - SECTIONS 3 AND 4
1-0601T-A-P0007-001-00D	PROCESS - OUTLET BUILDING PLAN
1-0601T-A-P0008-001-00D	PROCESS - OUTLET BUILDING - SECTIONS 5 AND 6
1-0601T-D-P0009-001-00D	PROCESS - STANDARD DETAILS
WT-M001	MECHANICAL - LEGEND
WT-M002	MECHANICAL - WASHDOWN PIPING SYSTEM - PLAN AND SECTIONS
WT-M003	MECHANICAL - VENTILATION - PLAN
WT-M004	MECHANICAL - VENTILATION - SECTIONS
1-0601T-D-M0005-001-00D	MECHANICAL - DETAILS AND SCHEMATICS
WT-M006	MECHANICAL - VENTILATION DETAILS
WT-M007	MECHANICAL - PIPING DETAILS - VENTILATION SCHEMATICS
WM-E010	ELECTRICAL - LEGEND SINGLE LINE & SCHEMATIC SYMBOLS
WM-E011	ELECTRICAL - LEGEND PLAN SYMBOLS
WT-E001	ELECTRICAL - PARTIAL SITE PLAN AND SINGLE LINE DIAGRAM
WT-E002	ELECTRICAL - INLET BUILDING - LIGHTING AND EMERGENCY LIGHTING FLOOR PLAN
WT-E003	ELECTRICAL - INLET BUILDING - POWER & FIRE ALARM FLOOR PLAN
1-0601T-A-E0004-001-00D	ELECTRICAL - INLET BUILDING - CONDUIT FLOOR PLAN
WT-E005	ELECTRICAL - OUTLET BUILDING & EMERGENCY EXIT HUT - LIGHTING AND EMERGENCY LIGHTING FLOOR PLAN
WT-E006	ELECTRICAL - OUTLET BUILDING & EMERGENCY EXIT HUT - POWER AND FIRE ALARM FLOOR PLAN
1-0601T-A-E0007-001-00D	ELECTRICAL - OUTLET BUILDING & EMERGENCY EXIT HUT - CONDUIT FLOOR PLAN
WT-E008	ELECTRICAL - CLEARWELL - SCHEDULES AND DETAILS
WM-I001	INSTRUMENTATION IDENTIFICATION - PIPING AND INSTRUMENTATION DIAGRAM
WM-I002	INSTRUMENT & PROCESS SYMBOLS - PIPING AND INSTRUMENTATION DIAGRAM
WT-I001	INSTRUMENTATION - INLET BUILDING - LOCATION PLAN
WT-I002	INSTRUMENTATION - OUTLET BUILDING - LOCATION PLAN
1-0601-T-D-I0003-001-00D	INSTRUMENTATION - ULTRASONIC LEVEL TRANSDUCER - INSTALLATION DETAIL

E2. SOILS INVESTIGATION REPORT

E2.1 Further to GC:3.1, a copy of the geotechnical information is available on the Winnipeg Water Treatment Program – Project Site Information page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt/projects

E2.2 Test Hole Logs

E2.2.1 Geotechnical information has been compiled from various sources to summarize subsurface conditions within the work area. Test_Hole_Logs-Set1.pdf at the aforementioned internet site.

(a) By UMA Engineering

(i) TH's 04-01 to 04-10, 04-12 to 04-24, 04-31, and 04-33 to 04-50 (2004)

(ii) TH's 1 to 3 (1996)

(b) By Others

(i) TH A13 by KGS Group (1991)

(ii) TH's 3 to 6 by RM Hardy & Associates (1977)

(iii) TH 1 and 2 by Dyregrov Consultants (1993)

(c) The Figure attached with the Water Treatment Plant Test Pile Program in Appendix B of these Specifications illustrates the test pile locations in relation to the work area.

(d) Within the City of Winnipeg Water Treatment Plant Preliminary Design Report – Section 14 Geotechnical Investigation (2005), UMA Test Hole information is considered accurate at the locations drilled and at the time of the investigations. The inclusion of test hole data recorded by others does not represent any guarantees to the accuracy of this data.

(e) Test hole information is provided to assist in the Bidder's evaluation of subsurface conditions and the Bidder shall solely be responsible for any interpretation that they make from this information. Variations in soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities or operation of the Floodway.

E2.3 Test Pile Driving Records

E2.3.1 Test_Pile_Driving_Records-Set1.pdf at the internet site identified in E2.2. shows data recorded by UMA Engineering Ltd. during driving of ten (10) test piles at the site in March, 2005.

E2.4 Reports

E2.4.1 Additional reports and geotechnical information listed as follows are available for viewing at the offices of Earth Tech Canada Inc., 850 Pembina Highway, Winnipeg, Manitoba.

(a) The City of Winnipeg Water Treatment Plant Preliminary Design Report – Section 14 Geotechnical Investigation (2005)

(b) Water Impounding Reservoir - Cell #2 and Booster Pumping Station Deacon Manitoba by RM Hardy & Associates Ltd. (1977)

(c) Proposed Venturi Chambers Deacon Reservoir by Dyregrov Consultants (1993)

(d) Deacon Reservoir Expansion Proposed Groundwater Monitoring Program by KGS Group (1993)

(e) Shoal Lake Aqueduct Program 5 – Deacon Drainage Improvements by UMA Engineering Ltd. (1996)

(f) Pile Driving records from Deacon Booster Pumping Station by RM Hardy and Associates (1979).

Information in these reports has been provided to assist in the Bidder's evaluation of subsurface conditions and the Bidder shall solely be responsible for any interpretation that they make from this information.

GENERAL REQUIREMENTS

E3. OFFICE AND SITE FACILITIES

E3.1 The Contractor shall supply office facilities for his own use and also for Concrete Quality Testing. The facilities may be situated at the area designated on the drawings.

(a) Facilities for Concrete Quality Testing:
  (i) The minimum facility floor area shall be 10 square metres
  (ii) The facility shall have a door with lockable hardware
  (iii) The facility shall have heating and cooling provisions to maintain a temperature between 15C and 25C
  (iv) The facility shall be set up so that it is vibration free
  (v) The facility shall be accessible seven (7) days a week for test sample pickup

E3.2 The City will provide to the Contractor without cost:

(a) Granular pad for office location

(b) Non-potable water supply

(c) Power supply for heating, lighting and office plugs

(d) Communications connections for telephone, facsimile and internet (high speed equivalent)

(e) Washroom and toilet facilities within the office compound, and

(f) 600 volt and 110/220 volt on-site power supply for construction purposes. Three (3) portable distribution panels for 125A. 110/220V power will be available at the site. Also, a 225A 3 phase 600V power supply suitable for tower crane will be available northeast of the clearwell near the south limit of the GWWD right-of-way (exact location has not been determined). Cables and installation by Contractor.

E4. FIELD ENGINEERING

E4.1 The Contractor shall engage a qualified surveyor to layout the works and record as-constructed measurements for record drawings.

E4.2 The surveyor shall be a registered Manitoba Land Surveyor, or an instrumentman or surveying firm experienced in layout of similar projects, subject to the approval of the Contract Administrator.

E4.3 Survey reference points for horizontal and vertical control are indicated on the drawings. The Contractor shall locate, confirm and preserve the reference points during construction.

E5. SITE DRAINAGE AND DEWATERING

E5.1 Bid Opportunity 70-2005 requires that the earthworks contractor dewater the south half of the clearwell until June 20, 2005 when the completed portion of the excavation is turned over to the Contractor. The earthworks contractor will also be responsible for dewatering of all excavations and for site drainage until completion of the contract (scheduled July 29, 2005).

E5.2 Subsequent to the dates identified in E6.1, provision of adequate site drainage during the entire construction phase shall be the Contractor's responsibility. The Contractor shall maintain site grading as necessary to provide for proper drainage away from the excavated areas. This water is to be re-directed into ditches outside of the site. Silt fences shall be properly erected and keyed into the primary ditches to prevent eroded materials from leaving the site. No extra payment or time extension will be granted as a result of difficulties associated with site access resulting from poor site drainage during any part of the construction phase.

E5.3 The Contractor shall be responsible for keeping the excavated areas dewatered at all times. The Contractor shall prepare and submit a plan to dewater the excavations at the pre-construction meeting. The plan will be reviewed and approved by the Contract Administrator prior to commencement of a construction. If at any time the Contract Administrator deems the dewater efforts to be insufficient, the Contract Administrator may order the Contractor to modify and/or increase efforts at the sole discretion of the Contract Administrator with no additional time or compensation. The Contractor shall maintain dewatering until final completion of the contract.

E6. CLEARWELL FROST PROTECTION

E6.1 Frost protection shall be installed for the Clearwell footings and base slab no later than December 7, 2005 and shall be maintained until the mean air temperature is above freezing.

E6.2 Frost protection for the exposed exterior perimeter footing shall be protected by one of the following methods:

a. A minimum of 1.2 metres of flax straw complete with the tops and outer sides covered with 0.250 millimetres thick polyethylene sheeting weighted down with sand bags or other suitable weighting system.

b. A system reviewed and acceptable to the Contract Administrator that provides frost protection equivalent to 1.2 metres of straw.

E6.3 Frost protection for the interior footings and base slabs shall be protected by one of the following methods:

a. If the wall construction and sluice gate installation permits, for the Clearwell or parts that are ready, frost protection shall consist of a minimum of 1.8 metres of water complete with a bubbler system to prevent ice pressures on the walls.

b. If the wall construction and sluice gate installation does not permit, for the Clearwell or parts that are not ready, frost protection shall consist of a minimum of 1.2 metres of flax straw complete with the top and outer sides covered with 0.250 millimetres thick polyethylene sheeting weighted down with sand bags or other suitable weighting system.

c. A system reviewed and acceptable to the Contract Administrator that provides frost protection equivalent to 1.2 metres of straw or 1.8 metres of water..

E6.4 Source of water for frost protection and disposal of water shall be as indicated in specification Section 03300, Clause 3.15, Watertightness Testing.

E6.5 Straw used for frost protection shall be thoroughly cleaned of and disposed of off site.

E7. WASTE CONTAINER

A waste container to dispose of garbage produced from the site shall be provided by the Contractor. It shall be located in a safe, convenient location, and be emptied as necessary by

the Contractor. The provision, maintenance and removal of a waste container shall be considered a subsidiary obligation of the Contractor.

E8. CONDITION, PROTECTION OF, AND ACCESS TO THE AQUEDUCT

E8.1 Condition of the Aqueduct

E8.1.1 The Aqueduct is constructed of reinforced concrete and in some areas, contains numerous cracks. The Aqueduct, therefore, shall be considered as a fragile structure. All work procedures conducted by the Contractor on and/or near the Aqueduct shall be well planned and executed to ensure that the Aqueduct is not subjected to construction related loads, including excessive vibrations and concentrated or asymmetrical lateral loads.

E8.2 Protection of the Aqueduct

E8.2.1 Contractors working in the vicinity of the aqueduct shall ensure that:

(a) Equipment shall only be permitted to cross the Aqueduct at designated bridge crossing locations and shall come to a complete stop before crossing.

(b) Granular material, construction material, soil or other material shall not be stockpiled on the Aqueduct or within 10 metres of the Aqueduct centreline.

(c) Construction practices shall not subject the Aqueduct arch to asymmetrical loading at any time.

(d) Construction practices or procedures at or near the Aqueduct shall not impart excessive vibration loads on the Aqueduct and/or cause settlement of the subgrade below the Aqueduct.

E8.2.2 It is the Contractors' responsibility to ensure that all work crew members understand, observe, and work to the requirements of Specifications.

E8.3 Equipment Restrictions

E8.3.1 Equipment must cross the Aqueduct in a responsible and careful manner (i.e. slowly).

E8.3.2 Loads for Highway No. 207 shall be limited to the weight restrictions in place for the road.

E9. ENVIRONMENTAL PROTECTION

E9.1 The Contractor shall be aware that the Aqueduct is for potable water supply and no contamination by fuel, chemicals, etc. shall be permitted at any time. Fuels or chemicals shall not be stored within 30 metres of the Aqueduct.

E9.2 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the environmental protection measures as herein specified.

E9.3 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

E9.3.1 Federal

(a) Canadian Environmental Protection Act (CEPA) c.16

(b) Transportation of Dangerous Goods Act and Regulations c.34

E9.3.2 Provincial

(a) The Dangerous Goods Handling and Transportation Act D12

(b) The Endangered Species Act E111

(c) The Environment Act c.E125

(d) The Fire Prevention Act F80

(e) The Manitoba Nuisance Act N120

(f) The Public Health Act c.P210

(g) The Workplace Safety and Health Act W120

(h) Current applicable associated regulations.

(i) The Fisheries Act

(j) The Migratory Birds Act

(k) The Historic Resources Act

(l) Drinking Water Safety Act

E9.3.3 The Contractor is advised that the following environmental protection measures apply to the Work.

E9.3.4 Materials Handling and Storage

(a) Construction materials shall not be stored within ten (10) metres of the Aqueduct centerline.

E9.3.5 Fuel Handling and Storage

(a) The Contractor shall abide by the requirements of Manitoba Conservation storage and handling of Petroleum Products and Allied Products Regulations for handling and storage of fuel products.

(b) All fuel handling and storage facilities shall comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products Regulation and any local land use permits.

(c) Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.

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

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

(f) When servicing requires the drainage or pumping of fuels, lubricating oils or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill. No repairs within 30 m of aqueduct or watercourse will be permitted.

(g) Refuelling of mobile equipment and vehicles shall take place at least 30 m from a watercourse.

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

(i) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on-site. The Contractor shall ensure that additional material can be made available on short notice. All refuelling vehicles shall be equipped with a spill response kit.

E9.3.6 Waste Handling and Disposal

(a) The construction area shall be kept clean and orderly at all times during and at completion of construction.

(b) At no time during construction shall personal or construction waste be permitted to accumulate for more than one day at any location on the construction site, other than at a dedicated storage area as may be approved by the Contract Administrator.

(c) Indiscriminate dumping, littering, or abandonment shall not take place.

(d) No on-site burning of waste is permitted.

(e) Equipment shall not be cleaned within 30 m of watercourses; contaminated water from onshore cleaning operations shall not be permitted to enter watercourses.

E9.3.7 Dangerous Goods/Hazardous Waste Handling and Disposal

(a) Dangerous goods/hazardous waste are identified by, and shall be handled according to, The Dangerous Goods Handling and Transportation Act and Regulations.

(b) The Contractor shall be familiar with The Dangerous Goods Handling and Transportation Act and Regulations and meet training requirements for these Regulations.

E9.3.8 Emergency Spill Response

(a) The Contractor shall ensure that due care and caution is taken to prevent spills.

(b) The Contractor shall report all major spills of petroleum products or other hazardous substances with the potential for impacting the environment and threat to human health and safety to the Contract Administrator and Manitoba Conservation, immediately after occurrence of the environmental accident, by calling the 24-hour emergency telephone phone number (204) 945-4888.

(c) The Contractor shall designate a qualified supervisor as the on-site emergency response coordinator for the project. The emergency response coordinator shall have the authority to redirect manpower in order to respond in the event of a spill. (Should include reference to a site-specific Emergency Response Plan and Environmental Protection Plan.)

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

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

- identify exact location and time of accident
- indicate injuries, if any
- request assistance as required by magnitude of accident Manitoba Conservation 24-hour Spill Response Line (204) 945-4888, RCMP (Oakbank Detachment) (911), City of Winnipeg Fire Department (911), Springfield Ambulance (911), company backup, contact Contract Administrator.

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

- personnel on site
- cause and effect of spill
- estimated extent of damage
- amount and type of material involved
- proximity to waterways and the Aqueduct

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

- approach from upwind
- stop or reduce leak if safe to do so

- dyke spill material with dry, inert sorbent material or dry clay soil or sand
- prevent spill material from entering waterways and utilities by dyking
- prevent spill material from entering Aqueduct manholes and other openings by covering with rubber spill mats or dyking

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

The emergency response coordinator shall ensure that all environmental accidents involving contaminants shall be documented and reported to the Manitoba Conservation according to The Dangerous Goods Handling and Transportation Act Environmental Accident Report Regulation 439/87.

E10. SHOP DRAWINGS AND PRODUCT DATA

Further to CW1110:

(a) Arrange for the preparation of clearly identified Shop Drawings as specified or as the Contract Administrator may reasonably request. Shop Drawings are to clearly indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work. Where articles or equipment attach or connect to other articles or equipment, clearly indicate that all such attachments and connections have been properly coordinated, regardless of the trade under which the adjacent articles or equipment will be supplied and installed. Shop Drawings are to indicate their relationship to design Drawings and Specifications. Notify the Contract Administrator in writing of any deviations in Shop Drawings from the requirements of the Contract Documents.

(b) Shop Drawings shall be submitted with a copy of the associated Specification. For each Specification clause, note compliance or deviation from Specification. Provide full explanation for any deviation. Shop Drawings submitted without the associated Specification Sections will be returned to the Contractor as “Rejected”.

(c) Examine all Shop Drawings prior to submission to the Contract Administrator to ensure that all necessary requirements have been determined and verified and that each Shop Drawing has been checked and coordinated with the requirements of the Work and the Contract Documents. Examination of each Shop Drawing shall be indicated by stamp, date and signature of a responsible person of the Subcontractor for supplied items and of the General Contractor for fabricated items. Shop Drawings not stamped, signed and dated will be returned without being reviewed and stamped Re-submit".

(d) Submit Shop Drawings with reasonable promptness and in an orderly sequence so as to cause no delay in the Work. Failure to submit Shop Drawings in ample time is not to be considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed. Jointly prepare a schedule fixing the dates for submission and return of Shop Drawings.

(e) The Contract Administrator will review and return Shop Drawings in accordance with the schedule agreed upon or otherwise with reasonable promptness so as to cause no delay in the Work.

(f) Submit six (6) copies of white prints, plus one (1) copy of reproducibles, and six (6) copies of all fixture cuts and brochures.

(g) Shop Drawing review by the Contract Administrator is solely to ascertain conformance with the general design concept. Responsibility for approval of detail design inherent in Shop Drawings rests with the Contractor and review by the Contract Administrator shall not imply such approval.

(h) Review by the Contract Administrator shall not relieve the Contractor of his responsibility for errors or omissions in Shop Drawings or for proper completion of the Work in accordance with the Contract Documents.

(i) Responsibility for verification and correlation of field dimensions, fabrication processes, techniques of construction, installation and coordination of all parts of the Work rests with the Contractor.

(k) Shop Drawings will be returned to the Contractor with one of the following notations:

- When stamped "REVIEWED" or "NO EXCEPTIONS TAKEN", distribute additional copies as required for execution of the Work.

- When stamped "REVIEWED AS MODIFIED" or "MAKE NOTED CORRECTIONS", ensure that all copies for use are modified and distributed, same as specified for "REVIEWED".

- When stamped "REVISE & RESUBMIT", make the necessary revisions, as indicated, consistent with the Contract Documents and submit again for review.

- When stamped "NOT REVIEWED" or "REJECTED", submit other Drawings, brochures, etc. for review consistent with the Contract Documents.

- Only Shop Drawings bearing "REVIEWED", "NO EXCEPTIONS TAKEN", "MAKE NOTED CORRECTIONS", or "REVIEWED AS MODIFIED" shall be used on the Work unless otherwise authorized by the Contract Administrator.

(l) After submittals are stamped "REVIEWED", "NO EXCEPTIONS TAKEN", "MAKE NOTED CORRECTIONS" or "REVIEWED AS MODIFIED", no further revisions are permitted unless re-submitted to the Contract Administrator for further review.

(m) Any adjustments made on Shop Drawings by the Contract Administrator are not intended to change the Contract Price. If it is deemed that such adjustments affect the Contract Price, clearly state as such in writing prior to proceeding with fabrication and installation of Work.

(n) Make changes in Shop Drawings, which the Contract Administrator may require, consistent with Contract Documents. When re-submitting, notify the Contract Administrator in writing of any revisions other than those requested by the Contract Administrator.

(o) Shop Drawings indicating design requirements not included in the Contract Documents require the seal of a qualified Professional Engineer, registered in the province of the place of the Project. Consulting calculations shall be submitted for review, if requested, and sealed by a qualified Professional Engineer.

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

E11. SITE RESTORATION

E11.1 The Contractor shall remove the temporary Site office and storage facilities prior to Total Performance being issued.

E11.2 The Contractor will be responsible for grounds restoration (seeding or sodding), as determined necessary by the Contract Administrator.

E11.3 The Contractor will be responsible for any damage caused by his forces on roadways or accesses.

E12. FORMS

E12.1 The following forms will be used on this Contract:

Form 200 Certificate of Equipment Delivery
Form 201 Certificate of Instruction
Form 202 Certificate of Satisfactory Installation
Form 203 Certificate of Equipment Satisfactory Performance

Samples of these forms are found in Appendix A – Forms.

EXCAVATION AND BACKFILLING FOR STRUCTURES

1. GENERAL

1.1 Work Included

.1 Work under this Section includes, but is not necessarily limited to the following items:

.1 Final excavation to required elevations for the base slabs and footings.

.2 Excavation to required elevations for the Outlet Building Substructure.

.3 Design, install, and remove shoring for the Outlet Building Substructure excavation.

.4 Supply and placement of granular levelling material.

.5 Supply, placement, and compaction of backfill and fill materials to attain indicated grades and profiles.

.6 Disposal of surplus excavated material.

.7 Dewatering of excavations.

1.2 Job Conditions

.1 Examination

.1 Visit the Site and note all characteristics and irregularities affecting the Work of this Specification.

.2 To proceed with the Work will mean acceptance of the conditions, and failure to comply with the above will in no way form the basis for any claim.

.3 Review the geotechnical information prior to submitting Bid for the Work.

.2 Protection

.1 Use all means necessary to protect all materials of this Section before, during, and after installation, and to protect all objects designated to remain.

.2 In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Contract Administrator and at no additional cost.

.3 Protect benchmarks and structures against damage from equipment and vehicular traffic.

1.3 Reference Standards

.1 Conform to requirements of the National Building Code (NBC) and the Canadian Construction Safety Code.

.2 Comply with excavation and trenching regulations of Provincial authorities.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Specification E11.

.2 Submit shop drawings for shoring, bracing, and sheet piling required in connection with excavation for the Outlet Building Substructure, in accordance with Specification E11, for review two (2) weeks prior to commencement of the Work.

.3 Employ a qualified Professional Engineer registered in the Province of Manitoba for the shoring, bracing, and sheet piling design and to prepare and seal the shop drawings.

1.5 Samples

.1 All materials incorporated into the Work of this Specification shall be subject to review and testing by the Contract Administrator, including all operations from the selection and separation of the materials, through to final acceptance of the specified Work.

.2 The Contractor shall be wholly responsible for the control of all operations incidental to the Work, notwithstanding any review or acceptance that may have previously been given.

.3 The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

.4 There shall be no charge for any materials taken by the Contract Administrator for testing purposes.

.5 All materials shall be reviewed and accepted by the Contract Administrator at least ten (10) days before any construction is undertaken.

.6 For granular materials, submit a 25 kg sample for coarse, gravelly soil or 75 kg sample for coarse, crushed stone of each type, clearly labelled for type and source of the materials, for analysis by testing laboratory. Ship samples prepaid or deliver in tightly closed containers to testing laboratory designated by Contract Administrator.

.7 Costs for analysis will be paid by the City.

1.6 Compaction Testing

.1 Testing of compacted fill materials will be performed by an independent inspection and testing firm appointed and paid by the City. Testing will be performed so as to least encumber the performance of the Work.

.2 The City will pay for the first series of tests only, on the area being evaluated. Pay costs for additional testing, if required, due to improper performance of Work.

.3 Tests will be performed in accordance with American Society for Testing and Materials (ASTM) D698 for Standard Proctor Density on representative samples to control compaction

requirements. The Contract Administrator will decide the frequency and number of tests required.

.4 The field density of the compacted layers shall be verified by field density tests in accordance with ASTM D2922, using nuclear methods performed by the inspection and testing firm. The frequency and number of tests required will be decided by the Contract Administrator.

.5 Notify the Contract Administrator when Work of this Section or portions of Work are completed to own satisfaction. Do not proceed with additional portions of Work until test results have been verified and accepted.

.6 During Work tests, if tests indicate that compacted materials do not meet specified required materials, remove defective Work, replace and re-test at own expense as directed by the Contract Administrator.

.7 Ensure compacted fills are tested and accepted before proceeding with placement of surface materials.

1.7 Geotechnical Information

.1 Refer to Specification E2 for a list of test hole logs and reports available associated with the Site.

.2 The Contractor should be aware that the surface soil condition in the excavations performed by the Bulk Excavation Contract may be soft.

2. PRODUCTS

2.1 General

.1 All materials to be subject to Contract Administrator's acceptance.

.2 Granular materials to be composed of sound, hard, uncoated particles, free from injurious quantities of clay, flaky particles, soft shale, friable materials, roots, vegetable matter, and frozen lumps.

.3 Grading of granular materials to show no marked fluctuations between opposite ends of extreme limits.

.1 Type 1: pit run granular backfill shall consist of a clean, well-graded, and free-draining pit run material with a maximum size of 75 millimetres, and less than 5% by weight finer than 0.075 millimetres.

.2 Type 2: crushed gravel graded within following limits:

Canadian Metric Sieve Size	Percent Passing	
	Crushed Granular	Crushed Limestone
25,000	100	-
20,000	80 - 100	100
5,000	40 - 70	40 - 70
2,500	25 - 55	25 - 60
315	13 - 30	8 - 25
80	5 - 15	6 - 17

At least 60% of material retained on 5 millimetres sieve to have at least one (1) freshly fractured face.

.4 Type 3: pit run sand for levelling with maximum stone size 40 millimetres.

.5 Type 4: common backfill shall be free from organic material and rocks larger than 150 millimetres in size and building debris. Fill under landscaped areas to be free from alkali, salt, petroleum products and other materials detrimental to plant growth. Common backfill shall be obtained from Disposal Sites 1 and 2 indicated on the Drawings subject to review by Contract Administrator.

.6 Type 5: Impervious clay fill shall consist of high plasticity clay (CH) material as defined by the Unified Soil Classification System, with liquid limit (LL) greater than 50%, and permeability lower than 10-7 centimetres per second, and shall be free from stones, roots, or any other deleterious material as accepted by the Contract Administrator.

.7 Type 6: Sand bedding shall be clean, well-graded, and free-draining pit run sand, with a maximum particle size of 25 millimetres, and a maximum of 5% by weight finer than 0.075 millimetres. The material shall be free from sod, roots, organics, and all other deleterious material.

.8 Subdrain granular material is specified in Section 02620.

3. EXECUTION

3.1 General

.1 Familiarization

.1 Prior to all Work of this Section, become thoroughly familiar with the Site, the site conditions, and all portions of the Work falling within this Section.

.2 Review and understand the geotechnical information.

.2 Protection

.1 Before starting Work, locate all utilities crossing the Work Site. Notify all agencies or companies having jurisdiction over the specific utilities and protect, relocate, remove,

or discontinue service according to their requirements. Any damages shall be repaired at the Contractor's expense.

.2 Protect and restore pavements, boulevards, grassed areas, etc., that may be opened or damaged in the performance of the Work.

.3 During construction, maintain roadways in a clean and safe condition and, at the completion of the Contract, clean and restore all roads used to perform the Contract.

3.2 Finish Elevations and Lines

.1 For setting and establishing finish elevations and lines, secure the services of a registered surveyor or experienced instrumentman acceptable to the Contract Administrator.

.2 Carefully preserve all data and all monuments set by the registered surveyor. If displaced or lost, immediately replace to the acceptance of the Contract Administrator, at no additional cost to the City.

3.3 Excavation

.1 Submit excavation plan sealed by qualified Professional Engineer registered in the Province of Manitoba to the Contract Administrator for review two (2) weeks prior to commencement of the Work.

.2 Perform excavation in strict compliance to Work Place Safety and Health and authorities have jurisdiction.

.3 Excavate to noted limits and as required for walls and foundations. Stockpile material to be used for backfilling on-site as directed by the Contract Administrator. Excess material is to be disposed of immediately as per Item 3.7, Disposal.

.4 When complete, request Contract Administrator to review excavations.

.5 Local pockets of material which, in the opinion of the Contract Administrator are unsuitable, shall be removed to such depths as required by the Contract Administrator.

.6 The completed excavation shall provide clean, level, solid, and water-free surfaces at the required elevations, ready to receive construction.

.7 Excavations are not to encroach on existing slopes and as indicated in the geotechnical information.

.8 Backfill and compact all over-excavated areas under structure surfaces with Type 1 fill and compact to 90% Standard Proctor Density and at no additional cost to the City.

.9 Make good all damage occurring as a result of inadequate, unauthorized, or defective methods of protection.

.10 Areas used for temporary stockpiling shall be restored to existing condition or better.

3.4 Shoring, Bracing, and Sheet Piling

.1 Provide all shoring, bracing, and sheet piling required to prevent damage to existing structures, excavations, and injury to personnel where indicated on the Drawings. The shoring, bracing, and sheet piling shall account for the yard piping to be connected to the Outfall Building Substructure

.2 Comply with all applicable rules and regulations of governmental authorities.

.3 Erect shoring, bracing, and sheet piling independent of utilities and structures.

.4 Prefabricated cages or shields may be used to supplement or replace conventional shoring, provided they comply with all applicable safety regulations and permit placing and compacting of backfilling material around new construction.

.5 Maintain shoring, bracing, and sheet piling during backfilling and remove in stages as backfilling progresses.

.6 Remove all shoring, bracing, and sheet piling unless otherwise permitted by Contract Administrator.

.7 If shoring, bracing, and sheet piling are allowed to remain, cut off to an elevation at least 1,000 millimetres below finish grade and structures.

.8 Assume full responsibility for any failure, collapse, or movement of existing structures, shoring, bracing, sheet piling, earth banks, trenches, and other excavations.

3.5 Dewatering

.1 The Contractor shall be responsible for the control of surface drainage on the excavations completed by the Bulk Excavation Contract.

.2 Dewatering systems shall be designed to expeditiously remove water from both the Clearwell excavation until wall backfilling is completed and from the Water Treatment Plant excavation until October 31, 2005.

.3 The dewatering systems must protect the subgrade soils from excessive softening and saturation. Perimeter slope cutoff ditching shall not be cut lower than elevation 229.400 and shall not extend beyond a 2 metre distance from the edge of wall footings.

.4 All access roadways shall employ culverts as required for the Contractor’s proposed excavation dewatering plan.

.5 The Contractor shall submit the proposed dewatering plan two (2) weeks prior to commencement of construction to the Contract Administrator for review and acceptance.

.6 All temporary ditching and water retention areas shall be lined with an impervious membrane to the satisfaction of the Contract Administrator.

.7 Discharge from pumps or other dewatering equipment shall be located and controlled such that loss, damage, nuisance, or injury to the work does not result.

.8 Additional excavation made necessary by water in the excavation shall be at no additional cost to the City.

3.6 Backfilling, Fill, and Compaction

.1 Preparation

.1 Ensure areas to be backfilled are free from debris, snow, ice, and water and that ground surfaces are not in a frozen condition.

.2 Backfilling and Filling

.1 Backfill and fill to grades, contours, levels, and elevations indicated on Drawings.

.2 Backfilling shall be performed only after the watertightness testing has been performed and the structure has been accepted by the Contract Administrator. If backfilling or partial backfilling is performed for construction reasons prior to watertightness testing, the fill shall be excavated for the watertightness testing to fully expose the Clearwell walls.

.3 Exercise care when backfilling on top of new structures. Contractor shall submit to the Contract Administrator for review at least one (1) week in advance the type of equipment proposed to be used for backfilling on top of the roof slab. Refer to the geotechnical information for requirements.

.4 Do not backfill against foundation walls until the perimeter drainage system and the waterproofing membrane have been installed and accepted by the Contract Administrator.

.5 Do not backfill against foundation walls until the roof and floor slabs have been completed and without the prior permission of the Contract Administrator. The wall concrete must have attained the twenty-eight (28) day minimum compressive strength before backfilling. The roof concrete must have attained 75% of the twenty eight (28) day minimum compressive strength before backfilling.

.6 After the Clearwell structure has been accepted by the Contract Administrator, spread accepted fill material in layers, not exceeding specified uncompacted thickness, and then compact to required density prior to the addition of the next layer.

.7 Maintain optimum moisture content of materials to permit compaction to specified densities.

.8 Compact each soil layer to at least the specified minimum degree; repeat compaction process until plan grade is attained. Compaction densities indicated herein are based on ASTM D698 for Standard Proctor Density.

.3 Bedding over Sub-Grade

.1 Type 1 pit run gravel fill for over excavation shall be placed in uniform lifts not greater than 200 millimetres in thickness and shall be compacted to a density of at least 95% Standard Proctor Density.

.2 Type 3 pit run sand for the levelling layer shall be spread on the subgrade in varying thickness as required (nominal 50 millimetres) to attain smooth surfaces and required elevations indicated on the Drawings for the placement of the voidform under the footings and base slabs.

.4 Backfill around Clearwell

.1 Type 1 pit run gravel fill and Type 4 common backfill shall be placed in lifts not greater than 200 millimetres in thickness to the extents shown on the Drawings and shall be compacted to a density of at least 95% Standard Proctor Density to allow equipment tractability and limit settlement, but not result in a significant decrease in permeability of the Type 1 pit run gravel.

.2 Successive lift placement of Type 1 and Type 4 shall be coordinated so that the maximum difference in the elevations of the respective working surfaces shall not exceed 200 millimetres.

.3 Type 5 impervious clay fill shall be placed in lifts not great than 150 millimetres in thickness to the extents shown on the Drawings and shall be compacted to a density of at least 95% Standard Proctor Density. Each compacted lift shall be scarified a minimum of 50 millimetres prior to placement of successive lifts to ensure adequate bonding between each lift.

.4 A homogeneous, continuous, low permeability zone of impervious clay shall be achieved, free from any clay lumps, cracks, rutting, or deleterious material, to the satisfaction of the Contract Administrator.

.5 The geotextile material for use as a separator between the impervious clay and Type 1 pit run gravel shall conform to Geotextile A as specified in specification Section 02620 and shall extend onto the Clearwell roof to the extents shown on the Drawings.

.6 Care shall be taken when placing fill materials immediately adjacent to the Clearwell to ensure no damage occurs to the wall and any covering materials. Any damage shall be repaired by the Contractor at his expense.

.5 Sub-drain

.1 Requirements for the sub-drain coarse granular drainage material for the perimeter and roof are specified in Section 02620.

.6 Roof Cover

.1 Type 6 bedding sand on top of the Clearwell roof shall be spread to the thickness indicated on the Drawings and shall be compacted to a density of approximately 85% Standard Proctor Density.

.2 Type 4 common backfill on top of the Clearwell roof shall be placed in lifts not greater than 300 millimetres in thickness and shall be compacted to a density of at least 85% Standard Proctor Density.

.3 The geotextile material for use as a separator between the roof insulation and sand bedding shall conform to Geotextile B as specified in specification Section 02620 and shall extend down the Clearwell walls to the extents shown on the Drawings.

.4 The proposed construction method and type of equipment to be used for placing the roof cover shall be submitted by the Contractor to the Contract Administrator for review and acceptance at least two (2) weeks prior to commencement of this portion of the Work.

.5 The bedding sand and common backfill may be placed concurrently to provide adequate cover support for equipment overtop of the insulation or temporary surface material placement such as plywood may be utilized for the protection of the insulation. Any damage to the insulation and roofing membrane shall be repaired by the Contractor at his expense.

.6 The Contractor shall coordinate installation of the specific items of the roof assembly to satisfy the Manufacturer's procedure instructions and material restrictions of each part of the roof cover assembly.

.7 Installation and schedule shall be submitted to the Contract Administrator for review and acceptance prior to commencement of the roof cover installation.

3.7 Disposal

.1 Surplus material not required for backfill and fill purposes shall be disposed of on site to a location designated by the Contract Administrator at no extra cost to the City.

3.8 Clean-Up

.1 As excavation proceeds, keep roads, streets, and sidewalks clean of dirt and excavated material.

.2 Clean-up and wash down to remove all dirt and excavated materials caused by Work of this Section.

.3 Clean at the end of each working day as directed by the Contract Administrator.

END OF SECTION

PILE FOUNDATIONS, GENERAL

1. GENERAL

1.1 Work Included

.1 Pick-up and delivery of precast concrete piles from supplier's yard (Winnipeg) to the Site.

.2 Coordinate with precast concrete pile supplier for the delivery schedule.

.3 Installation of precast concrete piles for the Clearwell for piles supplied as specified in Section 02468.

.4 Installed test piles as per Test Pile information by UMA Engineering Ltd. and as shown on the Drawings are to be incorporated into the Work.

1.2 Storage, Handling, and Installation

.1 Protect piles from damage due to excessive bending stresses, impact, abrasion, or other causes during storage and handling. Install piles to stated driving tolerances.

.2 The Contract Administrator shall be the sole judge of the acceptability of supplied piles.

.3 Replace rejected piles to satisfaction of Contract Administrator. Causes for pile rejection are as follows:

.1 Out of fabrication tolerances at time of installation.

.2 Cracked, spalled, or broken piles.

.3 Out of stated driving tolerances.

1.3 Geotechnical Information

.1 Refer to Specification E2 for a list of test hole logs and reports available associated with the Site.

.2 The Contractor should be aware that the surface soil condition in the excavations performed by the Bulk Excavation Contract may be soft.

.3 Notify Contract Administrator in writing if subsurface conditions at Site differ from those indicated and await further instructions from Contract Administrator.

2. PRODUCTS

2.1 Materials

.1 Piles have been fabricated and supplied as specified in Section 02468.

.2 Piles have been fabricated full length piles as indicated without cutting and splicing requirements. Contractor shall provide equipment to handle full length piles.

.3 If pile extensions are required and allowed by the Contract Administrator, the pile extensions shall be constructed as shown on the Drawings.

3. EXECUTION

3.1 Delivery, Storage, and Handling

.1 Protect piles from damage due to excessive bending stresses, impact, abrasion, or other causes during delivery, storage, and handling.

3.2 Equipment

.1 Prior to the commencement of pile installation, submit details of equipment for installation of piles to Contract Administrator for review.

.1 Impact hammers: give Manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions.

.2 Hammer:

.1 Hammers to be selected on the basis of driveability analysis using wave equation theory, performed to show that piles can be driven to levels indicated.

.2 The driveability analysis shall include, but not be limited to, the following: hammer, cushion, and capblock details; static soil parameters; quake and damping factors, total soil resistance, blow count, pile stresses, and energy throughput at representative penetrations.

.3 Driveability analysis shall be submitted to the Contract Administrator for review of the hammer or hammers.

.4 When required criteria cannot be achieved with the proposed hammer, use larger hammer and take other measures as required.

.5 Drop hammers are not permitted.

.3 Leads:

.1 Construct pile driver leads to provide free movement of hammer. Hold leads in position at top and bottom, with guys, stiff braces, or other means to ensure support to pile while being driven.

.2 Length: provide length of leads so that use of a follower is unnecessary.

.3 Swing leads: firmly guy top and bottom to hold pile in position during driving operation.

.4 Followers: when permitted, provide followers of such size, shape, length, and mass to permit driving pile in desired location to required depth and resistance. Provide followers with socket or hood carefully fitted to top of pile to minimize loss of energy and prevent damage to pile.

3.3 Preparation

.1 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation. Make provision for access and support of piling equipment during performance of work.

.2 Pre-bore with an oversized auger bit to a depth no lower than elevation 224.600.

.3 Completely infill any air space between wall of pre-bore hole and outside of pile for the full depth of pre-bore with a grout seal.

3.4 Field Measurement

.1 Maintain accurate records of driving for each pile, including:

.1 Type and make of hammer, stroke, and related energy.

.2 Other driving equipment including water jet, driving cap, and cushion.

.3 Pile size and length, location of pile in pile group, and location or designation of pile group.

.4 Sequence of driving piles in group.

.5 Number of blows per 25 millimetres for last 150 millimetres.

.6 Initial tip, final tip, and cut-off elevations.

.7 Re-driving records in accordance with items 3.3.1.1 to 3.3.1.6 above.

.8 Other pertinent information such as interruption of continuous driving and pile damage.

.9 Record elevation taken on adjacent piles during, before, and after driving of each pile.

.10 All measurements, observations, and calculations associated with pile driving analyzer and wave equation analysis.

.2 Provide Contract Administrator with three (3) copies of records.

3.5 Driving

.1 Drive precast piles only when concrete has attained strength of 35 megapascals as determined by related concrete compression testing in accordance with Canadian Standards Association (CSA) A23.2-00.

.2 Use driving caps and cushions to protect piles. Reinforce pile heads as required by Contract Administrator. Piles with damaged heads as determined by Contract Administrator will be rejected.

.3 Hold piles securely and accurately in position while driving.

.4 Deliver hammer blows along axis of pile.

.5 Drive piles to practical refusal, as outlined in the geotechnical information. Blow count requirements shall be determined by the Contract Administrator. If followers are used, established criteria for refusal will be increased by 50%.

.6 When driving precast concrete piles, adjust hammer, as required, to deliver reduced impact so that reflected tensile stress in pile does not exceed allowable.

.7 Do not drive piles within 10 metres of masonry or concrete which has been in place less than seven (7) days. Do not drive piles within 30 metres of masonry or concrete which has been in place less than one (1) day.

.8 Re-strike already driven piles lifted during driving of adjacent piles to confirm and assure set.

.9 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.

.10 Cut off piles neatly and squarely at elevation ranges as indicated on the Drawings. Final cut off elevations will be confirmed during construction. Provide sufficient length above cut-off elevation so that the part damaged during driving is cut off. Do not cut tendons or other reinforcement which will be used to tie supported structure above to pile. A minimum of 450 millimetres of strands shall remain for this purpose. The cut off surface of the piles shall be mechanically chipped to expose sound concrete.

.11 Remove cut-off lengths from Site on completion of work.

3.6 Design Load Capacity

.1 Allowable design load capacity of piles at specified loads is:

.1 400 millimetres diameter hex - 800 kilonewtons.

.2 Installation of each pile will be subject to the review of the Contract Administrator. Contract Administrator will be the sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration, or other criteria used to determine load capacity. Contractor

shall allow Contract Administrator to review final driving of all piles prior to removal of pile driving rig from Site.

3.7 Driving Tolerances

.1 Pile heads shall be within ± 100 millimetres of locations as indicated.

.2 Piles shall not to be more than 2% of length out of vertical alignment.

3.8 Obstructions

.1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, proceed as directed by Contract Administrator.

3.9 Repair/Restoration

.1 The Contract Administrator may require one (1) or more of the following remedial measures:

.1 Pull out rejected piles and replace with new piles.

.2 Remove rejected pile and replace with a new, and if necessary, a longer pile.

.3 Remove rejected pile and fill hole as directed by Contract Administrator.

.4 Leave rejected pile in place and cut off as directed by Contract Administrator.

.5 Leave rejected pile in place, place adjacent pile(s), and modify pile cap as directed by Contract Administrator.

.2 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

3.10 Protection

.1 Protect adjacent structures, services, and work of other sections from hazards due to pile driving operations.

.2 Arrange sequencing of pile driving operations and methods such that no damage occurs to adjacent existing structures. If damaged, remedy damaged items to restore to original or better condition at own expense.

.3 Undertake review of all adjacent infrastructures with the Contract Administrator complete with a photographic record sufficient to establish pre-driving conditions of the existing adjacent infrastructure.

.4 Protection for pile strand ends:

.1 Highly visible protection safety caps shall be installed for all pile reinforcing strand ends immediately following strand exposure operations. One protection cap may be used for each pile by grouping and securely tying the strands.

.2 The protection caps shall be highly visible and shall be made secure so that accidental contact will not easily dislodge the caps, all subject to review and acceptance by Contract Administrator. Dislodged caps shall be re-installed immediately.

.3 Pile reinforcing strands shall be protected from severe bending. Kinked or broken strands shall be repaired to the satisfaction of the Contract Administrator.

END OF SECTION

PRECAST CONCRETE PILES

THIS SECTION IS INCLUDED FOR INFORMATION ONLY FOR A DESCRIPTION OF THE FABRICATION AND DELIVERY OF PRECAST CONCRETE PILES FOR THE WATER TREATMENT PLANT CLEARWELL.

1. GENERAL

1.1 Work Included

.1 Fabrication, storage, and loading of precast concrete piles, FOB (free on board) Supplier's yard (Winnipeg) of approximately 20,500 linear metres of 400 millimetres diameter in accordance with a length schedule and delivery schedule to be agreed upon with the Contract Administrator.

1.2 References

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1-00/A23.2-00, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.2 CSA A23.4/A251, Precast Concrete – Materials and Construction/ Qualification Code for Architectural and Structural Precast Concrete Products.

.3 CAN/CSA-A3000, Cementitious Materials Compendium (consists of A5, A8, A23.5, A362, A363, A456.1, A456.2, and A456.3).

.2 American Society for Testing and Materials Standard (ASTM)

.1 ASTM A82, Cold-drawn steel wire for concrete reinforcement.

.2 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.

.3 ASTM C494, Standard Specification for Chemical Admixtures for Concrete.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Specification E11.

.2 Each drawing submitted shall bear the signature and stamp of a qualified Professional Engineer registered in the Province of Manitoba.

.3 Indicate the following items:

.1 Lifting point details and locations.

.2 Storage support point locations.

.3 Connector details complete with calculations.

.4 Rock points.

.5 Concrete strength.

.6 Steel grades.

.7 Reinforcing details.

.8 Type and grade of steel.

1.4 Certificates

.1 Piles delivered to the Site to be certified by Manufacturer that each batch of piles to have strength of 35 megapascals at twenty eight (28) days.

1.5 Review and Monitoring

.1 Provide free access to all portions of Work and cooperate with appointed firm.

2. PRODUCTS

2.1 Materials

.1 Concrete mixes and materials: to CSA-A23.1-00 and CSA-A23.4.

.2 Reinforcing steel: to CAN/CSA-G30.18.

.3 Cold-drawn steel wire for concrete reinforcement: to ASTM A82.

.4 Supply or fabricate full length piles as indicated and provide equipment to handle full length piles without cutting and splicing.

2.2 Concrete Mixes

.1 Proportion normal density concrete in accordance with CSA-A23.1-00, Alternative 1, to give following properties:

.1 Use Type 50 Portland Cement.

.2 Minimum compressive strength at twenty eight (28) days: 35 megapascals.

.3 Minimum cement content: 365 kilograms per cubic metre of concrete.

.4 Maximum water to cementitious material ratio: 0.45.

.5 Nominal size of coarse aggregate: 16 millimetres maximum (20 millimetres maximum is acceptable).

.6 Air content: 5 to 8%, to ASTM Standard C260.

.7 Chemical admixtures: in accordance with ASTM Standard C494.

.8 Pozzolanic mineral admixtures: in accordance with CAN/CSA-A3000.

3. EXECUTION

3.1 Fabrication

.1 Fabricate precast concrete piles to lengths as specified.

.2 Fabricate piles to following finish tolerances:

.1 Length: plus or minus 3 millimetres per metre of length.

.2 Cross section:

.1 Solid sections: minus 5 to plus 10 millimetres.

.2 Deviation from straight line: not more than 3 millimetres per metre of length and not more than 10 millimetres in full length.

.3 Deviation of internal core or void from true position: 10 millimetres.

.4 Pile head: 10 millimetres per metre from true right angle plane; surface irregularities 3 millimetres.

.5 Location of reinforcing steel main reinforcing cover: minus 3 to plus 5 millimetres; spiral: 10 millimetres.

.3 Prestress piles under the direction of an experienced and competent supervisor. All personnel operating the stressing equipment shall have been trained in its use.

.4 De-tension in a manner to keep eccentricity to a minimum. Release prestress prior to cutting prestress strands.

.5 Quality and dimensions of piles will be determined by Contract Administrator. Remove rejected piles from Site.

3.2 Handling, Storage, and Delivery

.1 Inspection of the fabricated product upon shipment and certification that the product is free from any damage or defects.

.2 Replace damaged piles to satisfaction of Contract Administrator

.3 Protect piles from damage due to excessive bending stresses, impact, abrasion, or other causes during delivery (by others), storage, and handling.

.4 The supplier shall provide cranage or other capacity for loading of piles on to trucks for delivery (by others) to the Site.

END OF SECTION

SUB-DRAINAGE

1. GENERAL

1.1 Section Includes

.1 Materials and installation for constructing subdrains and geotextile filter material.

1.2 Job Conditions

.1 Examination

.1 Visit the Site and note all characteristics and irregularities affecting the Work of this Specification.

.2 To proceed with the Work will mean acceptance of the conditions, and failure to comply with the above will in no way form the basis for any claim.

.2 Protection

.1 Use all means necessary to protect all materials of this Section before, during, and after installation.

.2 In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Contract Administrator and at no additional cost.

1.3 Reference Standards

.1 Conform to requirements of the National Building Code (NBC) and the Canadian Construction Safety Code.

.2 Comply with excavation and trenching regulations of Provincial authorities.

1.4 Samples

.1 Submit samples in accordance with Specification E10.

.2 All materials incorporated into the Work of this Specification shall be subject to review and testing by the Contract Administrator, including all operations from the selection and separation of the materials, through to final acceptance of the specified Work.

.3 The Contractor shall be wholly responsible for the control of all operations incidental to the Work, notwithstanding any review or acceptance that may have previously been given.

.4 The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

.5 There shall be no charge for any materials taken by the Contract Administrator for testing purposes.

.6 For granular materials, submit a 25 kg sample. Ship samples prepaid or deliver in tightly closed containers to testing laboratory designated by Contract Administrator.

.7 Costs for analysis will be paid by the City.

1.5 Delivery, Storage, and Handling

.1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris, and rodents.

.2 The geotextile shall remain wrapped in a protective covering until it is used.

.3 The Contractor shall ensure that breakdown or contamination of the subdrain materials does not occur due to any handling or hauling, including contamination from hauling equipment.

2. PRODUCTS

2.1 Material

.1 Coarse Granular Drain Material

.1 The coarse granular for the subdrains and roof granular drainage zones shall consist of a clean and processed, free draining granular material for use as a high permeability backfill.

.2 The granular drain material shall consist of clean, crushed limestone aggregate or a processed granular material (pea-gravel), ranging in size from 4.75 millimetres to 19 millimetres. If limestone is used, durable white crystalline limestone shall be used. Softer buff or yellow dolomite or dolostone will not be accepted. The material shall be free from sod, roots, organics, snow, and any other deleterious material.

.3 Individual rock particles shall be dense, sound, and resistant to abrasion and shall be free of cracks, seams, and other defects that would tend to reduce resistance to destruction by water and frost action. The Los Angeles Abrasion Loss, determined using American Society for Testing and Materials (ASTM) test procedures, shall not exceed 30%.

.2 Geotextile

.1 Two geotextile filter fabrics shall be required for the Work, Geotextile A for use in the subdrains and roof drains and Geotextile B for use as part of the roof cover system.

.2 Geotextile A

.1 Nonwoven geotextile filter fabric at least 4.6 metres in width.

.2 Minimum tensile strength: 800 newtons to ASTM D4632 Grab Test or CAN/CGSB 4.2 No. 9.2.

.3 Minimum trapezoid tear: 330 newtons to ASTM D4533 or CAN/CGSB 4.2 No. 11.2.

.4 Minimum equivalent opening size: 0.210 millimetres to ASTM D4751.

.5 Acceptable products: Trevira 1125 or Texel 7612 or accepted alternate.

.3 Geotextile B

.1 Nonwoven geotextile filter fabric at least 4.6 metres in width.

.2 Minimum tensile strength: 440 newtons to ASTM D4632 Grab Test or CAN/CGSB 4.2 No. 9.2.

.3 Minimum trapezoid tear: 175 newtons to ASTM D4533 or CAN/CGSB 4.2 No. 11.2.

.4 Minimum equivalent opening size: 0.210 millimetres to ASTM D4751.

.5 Acceptable products: Trevira 1114 or Texel 7609 or accepted alternate.

.3 Drainage Pipe

.1 Perforated Polyvinyl Chloride (PVC) Pipe

.1 The perforated pipe shall be 200 millimetres nominal diameter, Schedule 80 PVC pipe with standard perforations of 2 rows of 5 millimetres diameter holes positioned at 120˚ radially along the pipe. The longitudinal spacing of the holes shall be at 75 millimetres center to center along the length of the pipe.

.2 All fittings for the drain pipe, including bends, tees, elbows, and couplings shall be 200 millimetre nominal diameter, Shedule 80 PVC.

.2 Solid PVC Pipe

.1 The solid pipe shall be 200 millimetres nominal diameter, Schedule 80 PVC pipe.

.2 All fittings for the drain pipe, including bends, tees, elbows, and couplings shall be 200 millimetre nominal diameter, Shedule 80 PVC.

.4 Manholes

.1 Manholes to allow access to the subdrain pipes as shown on the Drawings shall conform to CW 2131-R3.

3. EXECUTION

3.1 General

.1 Prior to all Work of this Section, become thoroughly familiar with the Site, the Site conditions, and all portions of the Work of this Specification.

3.2 Finish Elevations and Lines

.1 For setting and establishing finish elevations and lines, secure the services of a registered surveyor or experienced instrumentman acceptable to the Contract Administrator.

.2 Carefully preserve all data and all monuments set by the instrumentman. If displaced or lost, immediately replace to the acceptance of the Contract Administrator, at no additional cost to the City.

3.3 Geotextile

.1 All work related to the geotextile storage, handling, and installation shall comply with the procedures and recommendations of the manufacturers

.2 Prior to placing the fabric, the bedding material shall be cleared of all unsuitable material to provide a smooth uniform surface to prevent puncturing or tearing the fabric.

.3 The fabric shall be overlapped at all joints a minimum of 600 millimetres. The overlap shall be pinned or secured as acceptable to the Contract Administrator.

.4 The fabric shall be loosely placed in order to allow conformity to the bedding surface. Folds and wrinkles in the fabric shall be avoided. Pin, nails, or weights shall be installed to hold the fabric in place. A minimum of 300 millimetres of material shall be placed over the fabric prior to equipment passage.

.5 Damaged geotextile, as identified by the Contract Administrator, shall be repaired immediately. All fill material shall be cleared a minimum of one metre around the damaged area. The damaged area shall be covered with a geotextile patch extending 1 metre beyond the perimeter of the damage. The fill material shall be replaced and compacted to the specified density.

3.4 Granular Drain Material

.1 The coarse granular drain material in the subdrains and roof drains shall be placed in such a manner that no damage to the geotextile will occur.

.2 Some hand placing and levelling may be required to procure a neat and uniform surface conforming to the shape, dimensions, and grads shown on the Drawings and to ensure that adequate support below the haunches of the drain pipe is provided.

.3 The coarse granular drain material shall be placed in lifts not greater than 150 millimetres in thickness and shall be compacted to a density of at least 95% Standard Proctor Density to ASTM D698. Surround the perforated pipes as shown on the Drawings.

.4 Do not place granular material in frozen conditions.

3.5 Perforated and Solid PVC Pipe

.1 All pipes shall be placed at the locations and inverts shown on the Drawings.

.2 Care shall be taken to protect the pipe from damage, collapse, or crushing, particularly from equipment passage. Damaged pipe shall be replaced at the Contractor's expense.

.3 The perforated pipes shall be placed on a minimum 50 millimetres of bed of coarse granular drain material at invert elevations shown on the Drawings. Place pipe true to line and grade with inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with bed through out full length with particular attention below the haunches.

.4 Lay perforated pipes with perforations downwards at 4 o'clock and 8 o'clock positions.

.5 Make joints tight in accordance with manufacturer's instructions.

.6 Plug open upstream ends of pipes with watertight covers.

.7 Backfill of the solid PVC pipe and all interconnections to the existing manholes shall conform to CW 2130-R5.

3.6 Manholes

.1 The manholes shall be installed to the dimensions and at the grades as shown on the Drawings, in accordance with CW 2131-R3, and as accepted by the Contract Administrator.

3.7 Disposal

.1 Surplus material not required shall be disposed of off-site within the City limits to a location designated by the Contract Administrator at no extra cost to the City.

3.8 Clean-Up

.1 As work proceeds, keep all work areas clean of dirt, excavated material, and construction debris.

.2 Clean at the end of each working day.

END OF SECTION

CONCRETE FORMWORK

1. GENERAL

1.1 Work Included

.1 Forms for all concrete and supporting falsework including design.

.2 Formliner all for interior wall surfaces of water retaining structures.

.3 Wood or steel forms for all cast-in-place concrete.

.4 Void forms between structural elements and soil below.

.5 Shoring, bracing, and anchorage.

.6 Form openings for other trades.

.7 Coordinate installation of concrete accessories.

.8 Set anchor bolts, anchors, sleeves, frames, and other items supplied by other trades.

.9 Clean erected formwork prior to concrete placement.

.10 Remove forms and supporting falsework.

1.2 Design Standards

.1 Design and detail forms and supporting falsework in accordance with the National Building Code of Canada (NBC), Canadian Standards Association CAN/CSA-A23.1-00, CSA S269.1, CAN/CSA S269-3, ACI 347R, and applicable construction safety regulations.

.2 Design to be done by a Professional Structural Engineer, registered in the Province of Manitoba.

1.3 Quality Assurance

.1 Construct and erect concrete formwork in accordance with CAN/CSA-A23.1-00, CAN/CSA S269.3, ACI 347R, and all applicable construction safety regulations for the place of Work.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Specification E10.

.2 Clearly indicate sizes, methods of construction, materials, arrangement of joints, ties and shores, location and size of falsework, schedule of erection and stripping, reshoring, etc.

.3 Shop Drawings and design briefs are to bear the seal of a Professional Structural Engineer, registered in the Province of Manitoba.

.4 Formwork, falsework, and reshoring are to be reviewed by the same Professional Structural Engineer prior to each concrete pour.

.5 Professional Structural Engineer to report, in writing, that reviewed formwork, falsework, and reshoring are in accordance with the design prior to each concrete pour.

2. PRODUCTS

2.1 Exposed Surfaces

.1 Square-edged, smooth surfaced panels true in plane, free of holes, surface markings, or defects.

2.2 Unexposed Surfaces

.1 Square-edged T&G lumber, plywood or other material, suitable to retain concrete without leakage or distortion.

2.3 Wood Materials

.1 Plywood: douglas fir, conforming to CSA O121-M solid one side, sheathing grade. Sound undamaged sheets with clean true edges.

.2 Lumber: conforming to CSA O141-M.

.3 Nails, Spikes and Staples: galvanized; conforming to CSA B111.

2.4 Prefabricated Forms

.1 Steel Type: minimum 1.6 millimetres steel thickness; well matched, tight fitting, and adequately stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.

.2 Tubular Column Type: round, spirally wound laminated fibre material, internally treated with release agent; sizes indicated on Drawings.

.3 Void Forms:

.1 Void Form 1: Moisture resistant treated paper faces; bio-degradable, structurally sufficient to support weight of reinforcing steel, wet concrete mix and a minimum of 2.4 kilopascals construction live load, until initial set, sealed (i.e. shrink wrapped) with minimum 0.254 millimetres thickness polyethylene film. Acceptable product is FloorVoid Super Strength by Void Form International Ltd., ultimate capacity of 95.8 kilopascals, two (2) layers of 150 millimetres each.

.2 Void Form 2: Expanded polystyrene, structurally sufficient to support weight of reinforcing steel, wet concrete mix, and a minimum of 2.4 kilopascals construction live load, until initial set. The depth of collapse shall be a minimum of 250 millimetres. Acceptable product is Geospan by Plasti-Fab Ltd.

.3 Protection for both Void Form 1 and Void Form 2 shall be one (1) layer of 12.7 millimetres thick spruce plywood sheeting.

2.5 Accessories

.1 All materials used on surfaces that will be in contact with potable water shall satisfy the requirements of National Sanitary Foundation 60/61.

.2 Plain Form Liner: acceptable product is Zemdrain MD-2 by Dupont, complete with drainage profile on exterior surface of the form liner.

.3 Form Ties: removable snap-off metal type, galvanized, fixed length, minimum working strength of 13 kilonewtons when assembled. For water retaining structures use form ties that leave a minimum cutback of 50 millimetres. For non-water retaining structures use minimum 25 millimetres deep plastic cone snap type or screw type on exposed surfaces. Wire ties are not permitted.

.4 Form Release Agent: colourless mineral oil which will not stain concrete or impair natural bonding or colour characteristics of coating intended for use on concrete.

.5 Corner or Chamfer Fillets: mill finished pine, widths as indicated on the Drawings, maximum possible lengths, mitre ends.

.6 Reglets: mill finished pine, shaped to required cross-section, maximum possible lengths, mitre ends.

.7 Sealing Tape: reinforced, self-adhesive, waterproof kraft.

3. EXECUTION

3.1 Examination

.1 Before starting this Work, examine Work done by others which affects this Work.

.2 Notify the Contract Administrator of any conditions which would prejudice proper completion of this Work.

.3 Commencement of Work implies acceptance of existing conditions.

3.2 Erection

.1 Verify lines, levels, and centres before proceeding with formwork. Ensure dimensions agree with Drawings.

.2 Construct formwork and falsework to meet design and regulatory requirements, and to produce finished concrete conforming to surfaces, shapes, lines, and dimensions indicated on Drawings.

.3 Arrange and assemble formwork to permit removal without damage to concrete.

.4 Align joints and make watertight to prevent leakage of cement paste and disfiguration of concrete. Keep form joints to a minimum. Tape as necessary.

.5 Arrange forms to allow removal without removal of principal shores, where these are required to remain in place.

.6 Obtain Contract Administrator's acceptance before framing openings in concrete slabs, walls, beams, and columns not indicated on Drawings.

.7 Provide falsework to ensure stability of formwork. Brace or strengthen all previously constructed parts liable to be overstressed by construction loads.

.8 Position form joints to suit any expressed lines required in exposed concrete.

.9 Provide chamfer on all internal and external corners and edges of exposed concrete unless shown otherwise.

.10 Form chases, slots, openings, drips, and recesses as detailed on Drawings.

.11 Set screeds with top edge level to required elevations.

.12 Check and readjust formwork to required lines and levels during placing of concrete.

.13 Locate construction joints for beams and suspended slabs where shown or noted on the Drawings.

.14 Provide reveals or reglets on construction joints as shown on the Drawings.

3.3 Void Form

.1 Void forms shall be placed on prepared surfaces of levelling sand so that the top of the void forms present flat forming surfaces.

.2 Void Form 1 shall be handled with care so as to maintain the integrity of the polyethylene film seal. Repair any damage to restore the seal.

.3 Void Form 1 polyethylene film exposed edge around the Clearwell perimeter shall be cut just prior to installation of the perimeter subdrain system. The cuts shall be full length and close to the bottom of each layer.

3.4 Tolerance

.1 Construct formwork to produce concrete with dimensions, lines, and levels within tolerances specified in ACI 347R, Guide to Formwork for Concrete.

.2 Camber slabs and beams 6 mm per 3 m of span unless otherwise indicated on the Drawings. Review method of providing camber with Contract Administrator prior to proceeding. Maintain beam depth and slab thickness from cambered surface.

3.5 Inserts/Embedded Items/Openings

.1 Provide formed openings where required for pipes, conduits, sleeves, and other Work to be embedded in and passing through concrete members.

.2 Accurately locate and set in place items which are to be cast directly into concrete.

.3 Coordinate Work of other Sections and cooperate with trades involved in forming openings, slots, recesses, chases, and setting sleeves, bolts, anchors, and other inserts.

.4 Coordinate installation of concrete accessories specified in Section 03250.

.5 Provide temporary ports or openings in formwork where required to facilitate cleaning and construction review. Locate openings at bottom of forms to allow flushing water to drain.

.6 Close temporary ports or openings with tight fitting panels, flush with inside face of forms, neatly fitted so no leakage occurs, and to provide uniform surface on exposed concrete.

3.6 Field Quality Control

.1 Inspect and check complete formwork, falsework, shoring, and bracing to ensure that Work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and parts are secure. Submit written report from Professional Structural Engineer responsible for this work as specified in Clause 1.4 Shop Drawings.

.2 Inform Contract Administrator when formwork is complete and has been cleaned, to allow for review. Contract Administrator's review will be for verification that forms are clean and free from debris.

.3 Allow Contract Administrator to review each section of formwork prior to re-use. Formwork may be re-used if acceptable to the Contract Administrator.

3.7 Cleaning

.1 Clean forms to remove foreign matter as erection proceeds. Remove cuttings, shavings, and debris from within forms. Flush completely with water to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

.2 During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and concrete construction

proceed within a heated enclosure. Use compressed air or other means to remove foreign matter.

3.8 Formwork Preparation

.1 Apply form release agent in accordance with Manufacturer's recommendations, prior to placing reinforcing steel, anchoring devices, and embedded parts.

.2 Do not apply form release agent where concrete surfaces are to receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces moist prior to placing concrete.

.3 Form liner shall be used on all columns and water retaining wall surfaces of the Clearwell. The form liner shall be installed in strict accordance with the Manufacturer's instructions. The Manufacturer's Representative shall be on-site at the beginning of the formliner installation and as required to ensure recommended procedures are followed. Wrinkles or folding of the formliner during concrete placement will not be accepted.

3.9 Form Removal

.1 Notify Contract Administrator prior to removing formwork.

.2 Do not remove forms and falsework until concrete has gained sufficient strength to carry its own weight, plus construction and design loads which are liable to be imposed. Verify strength of concrete by compression tests to satisfaction of Contract Administrator.

.3 Forms shall remain in place a minimum of two (2) days and the concrete shall have attained 75% of design strength verified by field cured test cylinders.

.4 Remove falsework progressively, in accordance with regulatory requirements and ensure that no shock loads or imbalanced loads are imposed on structure.

.5 Loosen forms carefully without damaging concrete surfaces. Do not apply tools to exposed concrete surfaces.

.6 If forms are left loosely in place for protection until curing requirements are complete, ensure all concrete surfaces are kept continuously wet with use of soaker hoses. Otherwise remove forms and start wet cure immediately by use of soaker hoses or accepted curing compound.

3.10 Reshoring

.1 If reshoring is required, prepare and submit a schedule to Contract Administrator for review.

.2 Reshore structural members where required due to design requirements or construction conditions under the direction of the Professional Structural Engineer responsible for this work.

.3 Install reshoring as required to permit progressive construction.

END OF SECTION

CONCRETE REINFORCEMENT

1. GENERAL

1.1 Work Included

.1 Reinforcing steel bars and welded steel wire fabric for cast-in-place concrete complete with tie wire.

.2 Support chairs, bolsters, bar supports, and spacers for reinforcing.

1.2 Quality Assurance

.1 Perform concrete reinforcing Work in accordance with Canadian Standards Association CAN/CSA-A23.1-00.

1.3 Inspection and Testing

.1 If requested by Contract Administrator, submit three (3) certified copies of mill test report of reinforcement supplied, indicating physical and chemical analysis.

1.4 Shop Drawings

.1 Submit bar lists and placing drawings in accordance with Specification E10.

.2 Clearly indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.

.3 Drawings and details to conform to CAN/CSA-A23.1-00, CAN/CSA-A23.3, and Reinforcing Steel Institute of Canada's (RSIC) Reinforcing Steel Manual of Standard Practice.

.4 Detail placement of reinforcing where special conditions occur.

.5 Detail lap lengths and bar development lengths to CAN/CSA-A23.1-00, unless otherwise shown on the Drawings.

1.5 Delivery and Storage

.1 Deliver, handle, and store reinforcement in a manner to prevent damage and contamination.

.2 Deliver bars in bundles, clearly identified in relation to bar lists.

2. PRODUCTS

2.1 Reinforcing Materials

.1 Reinforcing Steel: minimum 400 MPa yield grade; deformed billet steel bars conforming to CAN/CSA-G30.18; plain finish.

.2 Welded Steel Wire Fabric: plain type, conforming to ASTM A185; flat sheets; plain finish.

.3 Stainless Steel Bars: ASTM Type 316.

2.2 Accessory Materials

.1 Tie Wire: minimum 1.6 mm annealed type, or patented system accepted by Contract Administrator.

.2 Chairs, Bolsters, Bar Supports, Spacers: adequately sized for strength and support of reinforcing steel during construction.

.3 Bar Chairs for exposed surfaces: to be non-corrosive polyvinyl chloride (PVC) chairs or concrete chairs purpose made. Steel bar chairs, galvanized bar chairs, concrete bricks, broken concrete blocks, or wood supports are not acceptable.

.4 Bar Chairs for non-exposed surfaces: Broken concrete blocks, stones, and wood supports are not acceptable.

.5 Threaded Couplers: conforming to CSA-A23.3, American Concrete Institute (ACI) 318, and ACI 349, complete with temporary cap, sizes as shown on Drawings, as manufactured by Bar Grip Canada or accepted alternate.

3. EXECUTION

3.1 Examination

.1 Before starting this Work, examine Work done by others which affects this Work.

.2 Notify the Contract Administrator of any conditions which would prejudice proper completion of this Work.

.3 Commencement of Work implies acceptance of existing conditions.

3.2 Fabrication

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1-00 and Drawings.

.2 Locate reinforcing splices not indicated on Drawings at points of minimum stress.

.3 Fabricate within the following tolerances:

.1 Sheared length: plus 0, minus 25 millimetres.

.2 Depth of truss bars: plus 0, minus 10 millimetres.

.3 Stirrups, ties, and spirals: plus 0, minus 10 millimetres.

.4 Other bends: plus 0, minus 25 millimetres.

.4 All bending shall be done cold with a suitable machine accurately producing all lengths, depths, and radii shown on the bending details.

.5 After initial fabrication, reinforcing steel shall not be rebent or straightened unless so indicated on the Drawings.

.6 Heating of reinforcing steel will not be permitted.

3.3 Installation

.1 Place reinforcing steel in accordance with reviewed placing Drawings and CAN/CSA-A23.1-00. Chair slab reinforcing not further apart than 1.2 metres in either direction. Tie reinforcing steel at maximum spacing 600 millimetres.

.2 Adequately support reinforcing and secure against displacement within tolerances permitted.

.3 Place reinforcing steel to provide concrete cover required by CAN/CSA-A23.1-00, but not less than shown on Drawing Concrete Notes.

.4 Maintain alignment as follows:

Item	**Tolerances (millimetres) Plus or Minus**
Slabs	5
Other Structural Members	10
Rebar Bends and Ends	50

.5 Do not disturb or damage polyethylene film or void form while placing reinforcing steel.

.6 Install protective sleeves on horizontal slab and footing dowels and projecting bars to prevent concrete splatter from contaminating bars. Remove sleeves prior to next concrete pour.

.7 Install purpose made highly visible protective safety caps on all exposed projecting bar ends to the satisfaction of the Contract Administrator.

3.4 Cleaning

.1 Ensure concrete reinforcing is clean and free from oil and deleterious matter.

.2 Remove all loose scale, loose rust, concrete from prior pours, and other deleterious matter from surfaces of reinforcing.

.3 Remove concrete splatter on bars before concrete has hardened.

END OF SECTION

CONCRETE ACCESSORIES

1. GENERAL

1.1 Work Included

.1 Joint Sealants.

.2 Joint Filler.

.3 Polyvinyl Chloride (PVC) Waterstops.

.4 Epoxy grout.

.5 Non-ferrous Grout.

.6 Latex Patching Agent.

.7 Epoxy Bonding Agent.

.8 Curing Compound.

.9 Moisture Retention Film.

.10 Fasteners.

2. PRODUCTS

2.1 General

.1 All materials that will come in contact with potable water shall meet the requirements of National Sanitation Foundation (NSF) 60/61.

.2 All materials shall be subject to the acceptance of the Contract Administrator.

2.2 Materials

.1 Joint Sealants:

.1 Sealants for all joints shall be non-sag two-part polysulphide to CAN/CGSB-1925M, NSF approved for contact with potable water, Thiokol 2235M by PolySpec or accepted alternate.

.2 Use compatible primer as per sealant Manufacturer's requirements.

.2 Joint Filler:

.1 Expansion joint filler: rigid closed cell foam, CPD PVC Closed Cell Joint Filler or accepted alternate.

.3 Waterstops:

.1 PVC waterstops stall conform to CGSB 41-6P-35M polyvinyl chloride, size indicated on Drawings, edges wire looped for tying. Acceptable product is Wirestop CR-9380 by Paul Murphy.

.2 PVC waterstop joints (tees, crosses, and L's) shall be mitred and welded.

.3 Waterstop PVC shall meet or exceed the performance criteria of Corps of Engineers Specification CRD-C 572-74 and the following:

.1	Tensile strength	13.8 megapascals
.2	Ultimate elongation	370% minimum
.3	Hardness Shore A	80 ± 3
.4	Stiffness in flexure	4.8 megapascals
.5	Water absorption	0.5 maximum (48 hours)

.4 All PVC waterstop material shall be Arctic Grade.

.5 Expansive Waterstop: acceptable products are SikaSwell S Sealant by Sika and CS-231 Controlled Expansion Waterstop by ConSeal Concrete Sealants.

.4 Epoxy grout: Sika Talygrout, CPD Epoxy Grout, or accepted alternate.

.5 Non-ferrous Grout: Pre-mixed, non-shrink, Master Builders 713, Sika M-Bed, CPD Non-Shrink Grout, Steel C1 Grout, Grace In-Pakt Grout, minimum 35 megapascals compressive strength.

.6 Latex Patching Agent: Acrl Stix, Daraweld-C Latex Bonding Agent, or accepted alternate.

.7 Epoxy Bonding Agent: Master Builders Concresive 1001 LPL, Dural Duralbond, Sikadur 32 HI-bond, or accepted alternate.

.8 Moisture Retention Film: Master Builders Confilm or accepted alternate.

.9 Fasteners: fasteners (all nuts, bolts, washers, screws, etc.) stainless steel for all aluminum items, conforming to American Society for Testing and Materials (ASTM) 304 or 316, sizes and locations as required by item manufacturer.

2.3 Shop Drawings

.1 Submit shop drawings in accordance with Specification E10.

.2 Submit product information for review for materials to be incorporated into the Work.

3. EXECUTION

3.1 Installation

.1 Coordinate Work of this Section with other construction.

.2 Install all concrete accessories in accordance with Drawings and Manuacturer's recommendations and ensure compatibility. Install straight, level, and plumb.

.3 Ensure items are not disturbed during concrete placement.

.4 Curing and sealing compounds are to be used for curing purposes of all concrete where practical or compatible with finishes. Main floor of the Outlet and Inlet Buildings shall be moist cured as per Section 03300.

.5 Joint sealant shall be applied per manufacturer’s instructions. If joint surfaces are damp, dry and apply primer as recommended by Manufacturer.

.6 Joint filler shall be installed per manufacturer’s instructions in expansion joints as indicated on Drawings.

.7 PVC Waterstop:

.1 Install PVC waterstop in expansion joints as indicated on Drawings.

.2 All joints other than straight butt joints shall be plant fabricated by the waterstop Supplier.

.3 Install waterstop continuous without displacing reinforcement. Butt weld splices too Manufacturer’s directions. Secure in place to prevent dislodgment during placing of concrete. All filed splices to be heat-fused and tested for complete seals by use of a corona discharge unit. Costs for testing to paid for by Contractor.

.4 Take particular care to correctly position the waterstop during installation. Tie the waterstop adequately for support in accordance with Manufacturer’s instructions, but at spacings no greater than 300 millimetres to ensure proper embedment, symmetrical about the joint, and to prevent displacement during concrete placement. Fully compact the concrete in the region of the waterstop during the placing of the concrete.

.5 Do not place concrete until waterstop has been reviewed by the Contract Administrator.

.8 Latex Patching Agent is to be used for patching formed concrete surfaces where required.

.9 Epoxy Bonding Agent is to be used to bond new concrete to existing concrete surfaces.

END OF SECTION

CAST-IN-PLACE CONCRETE

1. GENERAL

1.1 Work Included

.1 All reinforced cast-in-place concrete shown on the Drawings.

.2 Setting anchors, inserts, frames, sleeves, and other items supplied by other Sections.

.3 Repairing concrete imperfections.

.4 Finishing formed concrete surfaces.

.5 Watertightness testing of water retaining structures.

.6 Curing of concrete.

1.2 Quality Assurance

.1 Cast-in-place concrete shall conform to the Canadian Standards Association (CSA) CAN/CSA-A23.1-00.

.2 Testing shall conform to CAN/CSA-A23.2-00.

.3 These standards shall be available in the Contractor's Site office for the use of the Contractor, sub-trades, and Contract Administrator.

.4 A Concrete Pour Release Form shall be completed prior to each concrete pour. The Contractor shall be responsible for completing the forms. Each form shall be signed by the Contractor and Contract Administrator prior to each pour.

1.3 Qualification

.1 Concrete flatwork finishing is to be done by an established firm having at least five (5) years of proven, satisfactory experience in this trade and employing skilled personnel.

.2 Submit proof of qualifications in writing to the Contract Administrator.

1.4 Inspection & Testing

.1 Notify the Contract Administrator at least forty eight (48) hours before complete formwork and concrete reinforcement is ready for review. Reinforcing in walls shall be reviewed prior to closing forms.

.2 Allow ample time for notification, review, and corrective Work, if required, before scheduling concrete placement.

.3 Concrete sampling, inspection, and testing is to be performed by a CSA certified inspection and testing firm appointed and paid for by the City.

.4 Provide unencumbered access to all portions of Work and cooperate with appointed firm.

.5 Submit proposed mix design of each class of concrete to the Contract Administrator for review two (2) weeks prior to commencement of the Work.

.6 Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.

.7 Notify the Contract Administrator at least twenty four (24) hours in advance of any concrete placement.

.8 At least three (3) concrete test cylinders will be taken for every seventy five (75) or less cubic metres of each class of concrete placed.

.9 At least three (3) test cylinders will be taken daily for each class of concrete placed.

.10 One (1) slump test and one (1) air content test will be taken for each set of test cylinders taken.

.11 Additional slump and air content tests may be taken as necessary (up to every truck) to verify quality of concrete at the discretion of the Contract Administrator.

.12 Testing of concrete will be performed in accordance with CAN/CSA-A23.2-00. Test results will be issued to the Contractor, the Contract Administrator, and the City.

.13 The Contractor shall pay costs for required retesting due to defective materials or workmanship.

.14 If accepted by the Contract Administrator, the Contractor may arrange and pay for additional tests for use as evidence to expedite construction.

.15 To conform to the strength requirements, the average of all tests shall exceed the specified strength. When three (3) or more tests of the same class of concrete are available, the average of any three (3) consecutive tests shall be equal to, or greater than the specified strength, and no strength test shall fall more than 3.5 megapascals below the specified strength. If any of the criteria of the above clause are not met, the Contract Administrator shall have the right to require one or more of the following:

.1 Changes in mix proportions for the remainder of the Work.

.2 Cores drilled and tested from the areas in question as directed by the Contract Administrator and in accordance with CAN/CSA-A23.2-00. The test results shall be indicative of the strength of the in-place concrete.

.3 Load testing of the structural elements.

.4 The changes in the mix proportions, cores drilled and tested, and load testing shall be at the Contractor's expense.

.5 Concrete failing to meet the strength requirements of this Specification shall be strengthened or replaced at the Contractor's expense and to the satisfaction of the Contract Administrator.

2. PRODUCTS

2.1 General

.1 All materials that will come in contact with potable water shall meet the requirements of National Sanitary Foundation (NSF) 60/61.

2.2 Concrete Materials

.1 Cement: Normal Type 10 and Type 50 Portland Cement conforming to CSA-A3000.

.2 Fine Aggregate: Conforming to Normal-Density Fine Aggregate, CAN/CSA-23.1-00. If requested by the Contract Administrator, submit evidence at least two (2) weeks before use in concrete mix showing conformance to Normal-Density Fine Aggregate, CAN/CSA-A23.1-00, Table 4 and Table 6.

.3 Coarse Aggregate: Conforming to Normal-Density Coarse Aggregate, CAN/CSA-23.1-00, Group I, 40-5 millimetres, 20-5 millimetres, and 10 to 2.5 millimetres. If requested by the Contract Administrator, submit evidence at least two (2) weeks before use in concrete mix showing conformance to Normal-Density Coarse Aggregate, CAN/CSA-A23.1-00, Table 5 and Table 6. Group II may be used for special requirements such as gap grading, pumping, or for blending two (2) or more sizes to produce Group I gradings.

.4 Ensure that no aggregates are used that may undergo volume change due to alkali reactivity, moisture retention, or other causes. Confirm suitability of aggregate with a petrographic analysis if deemed necessary by the Contract Administrator.

.5 Water: Potable, clean, and free from injurious amounts of oil, alkali, organic matter, or other deleterious matter.

.6 Materials are to be obtained from the same source of supply or Manufacturer for the duration of the project.

.7 Pozzolans: Type C fly ash, conforming to CSA-A23.5, source of material to be acceptable to the Contract Administrator.

2.3 Admixtures

.1 No admixtures other than air-entraining agent, water-reducing agent, and superplasticizer shall be used without the written authorization of the Contract Administrator, unless specified.

.2 Air entrainment: conforming to American Society for Testing and Materials (ASTM) Standard C260.

.3 Water-reducing agent: Type WN conforming to ASTM Standard C494.

.4 Superplacticizer: conforming to ASTM Standard C494.

.5 General Chemical Admixtures: conforming to ASTM Standard C494.

.6 Calcium chloride or admixtures containing calcium chloride shall not be used in concrete.

2.4 Accessories

.1 Curing Sealer: sodium silicate, Miracle Kote or accepted alternate.

.2 Moisture Retention Film: Master Builders Confilm or accepted alternate.

2.5 Concrete Mixes

.1 Pay all costs for mix design. Submit mix design to the Contract Administrator for review a minimum of two (2) weeks prior to concrete pour.

.2 Provide concrete mixed in accordance with requirements of CAN/CSA-A23.1-00 and as indicated on the Drawings. The Drawing requirements shall govern where there is a difference between the Drawings and CAN/CSA-A23.1-00, Tables 6 to 10 requirements.

.3 Maximum allowable substitution of cement with fly ash material shall be 20% by weight when acceptable to the Contract Administrator.

.4 Use accelerating admixtures in cold weather only when accepted by the Contract Administrator. If accepted, the use of admixtures will not relax cold weather placement requirements. Do not use calcium chloride.

.5 Use set-retarding admixtures during hot weather only when accepted by the Contract Administrator.

.6 All admixtures must be compatible within the mix. Concrete with freezing and thawing exposure must satisfy the durability requirements of CAN/CSA-A23.1-00, Sections 14 and 15.

.7 All admixtures are subject to acceptance by the Contract Administrator. List all proposed admixtures in mix design submission. Do not change or add admixtures to accepted design mixes without the Contract Administrator's review and acceptance.

.8 The water:cementing ratio must be calculated and shown based on all available mixing water excluding aggregate absorption.

.9 Concrete delivered to Site must be accompanied by a delivery slip indicating time of completion of mixing, design strength of concrete, air content, and actual water-cement ratio.

.10 Patching Mortar:

.1 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 one (1) part cement to two and a half (2.5) parts sand by damp loose volume.

.2 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.

.3 The quantity of mixing water shall be no more than necessary for handling or placing. Mixing water shall include one (1) part latex bonding agent to three (3) parts water. Maximum water to cement ratio shall be 0.40.

.11 Elastomeric Concrete:

.1 Solvent-free three-part polyurethane mortar for pinned connection at Clearwell wall to roof slab joints, Wabocrete II by Watson Bowman Acme or accepted alternate.

.12 Self-compacting concrete mixes will not be permitted for use on this project.

3. EXECUTION

3.1 Examination

.1 Before starting this Work examine Work done by others that affects this Work.

.2 Notify the Contract Administrator of any conditions that would prejudice proper completion of this Work.

.3 Commencement of Work implies acceptance of existing conditions.

3.2 Placing Concrete

.1 Place concrete in accordance with requirements of CAN/CSA-A23.1-00 and as indicated on the Drawings. Layout of the Work and accuracy of same is the Contractor's sole responsibility.

.2 Notify the Contract Administrator a minimum of twenty four (24) hours prior to pouring concrete. Under no circumstances shall concrete be poured without notifying Contract Administrator, or in his absence, arranging for review of the Work and sampling of concrete.

.3 The concrete shall be placed rapidly and evenly as near to its final position as possible to reduce the risk of segregation, flowlines, and cold joints. Concrete shall be placed within one and a half (1.5) hours of mixing.

.4 Ensure all anchor bolts, seats, plates, and other items to be cast into concrete are securely placed and will not interfere with concrete placement.

.5 All equipment for transporting the concrete shall be cleaned of hardened concrete and foreign materials before placing concrete.

.6 Immediately before concrete is placed, Contractor shall carefully inspect all forms to ensure that they are properly placed, sufficiently rigid and tight, and that all reinforcing steel and embedded parts are in the correct position and secured against movement during the placing operation. All forms shall be thoroughly cleaned and material removed.

.7 Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods, which will prevent the separation or loss of the ingredients. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling or flowing. Vibrators shall not be used to move concrete. Under no circumstances shall the concrete, which has partially hardened, be deposited in the forms.

.8 Concrete shall be thoroughly compacted by mechanical vibrators during placing operations. It shall be thoroughly worked around the reinforcement, embedded fixtures, and into the corners of the forms.

.9 Vibrate concrete using the appropriate size equipment as placing proceeds, in accordance with CAN/CSA-A23.1-00. Check frequency and amplitude of vibrations prior to use. Provide additional standby vibrators in the event of equipment failure.

.10 Prepare set or existing concrete by removing all laitance and loose or unsound materials and apply bonding agent in accordance with Manufacturer's recommendations.

.11 Where placing operations would involve dropping the concrete more than 1500 millimetres, it shall be placed through canvas hoses or galvanized iron chutes. Concrete shall not be raised at a rate greater than that for which proper vibration may be affected.

.12 In locations where new concrete is dowelled to existing concrete, drill holes in existing concrete, insert steel dowels, and pack solidly with non-shrink grout.

.13 A minimum of three (3) days shall elapse between adjacent pours separated by construction joints or expansion joints.

.14 Do not place concrete if carbon dioxide producing equipment has been in operation in the building or in the enclosure during the twelve (12) hours preceding the pour. This equipment shall not be used during placing or for twenty four (24) hours after placing. During placing and curing concrete, surfaces shall be protected by formwork or an impermeable membrane from direct exposure to carbon dioxide, combustion gases, or drying from heaters.

.15 Honeycomb or embedded debris is not acceptable.

.16 Remove and replace defective concrete.

.17 Maintain accurate records of cast-in-place concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.3 Cold Weather Concreting

.1 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.

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

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

.4 The temperature of the concrete shall be maintained at not less than 10°C for seven (7) days. The concrete shall be kept above freezing temperature for at least a period of seven (7) 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 as determined from compressive strength tests on specimens cured under the same conditions as the concrete Works in question.

.5 Aggregates shall be heated to a temperature of not less that 20°C and not more than 65°C. Water shall be heated to a temperature between 55°C and 65°C. The temperature of the concrete at the time of placing in the forms shall be within the range specified in CAN/CSA-A23.1-00 for the thickness of the section being placed.

.6 When the mean daily temperature may fall below 5°C, a complete housing of the Work, complete with heaters, fuel, maintenance, and attendants, shall be provided.

.7 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.

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

.9 When the ambient temperature is equal to or above -15°C, the Contractor will be permitted to open small portions of the housing for a limited time to facilitate the placing of the concrete.

.10 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 housing to the specified 10°C at least twelve (12) hours prior to the start of the concrete placing.

.11 The Contractor shall supply all required heating apparatuses and the necessary fuel. When dry heat is used, a means of maintaining atmospheric moisture shall be provided.

.12 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.

.13 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, temperatures above and below the concrete within the enclosures, temperatures of the concrete surface at several points, and notes regarding the type of heating, enclosure, unusual weather conditions, etc. This record shall be available for review by the Contract Administrator at all times, and shall be turned over to the Contract Administrator at the end of the concreting operations.

3.4 Hot Weather Concreting

.1 General

.1 The requirements of this section shall be applied during hot weather, i.e., air temperatures above 25°C during placing.

.2 Concrete shall be placed at as low a temperature as possible, preferably below 15°C, but not above 27°C. Aggregate stockpiles may be cooled by water sprays and sun shades.

.3 Ice may be substituted for a portion of the mixing water provided the ice has melted by the time mixing is completed.

.4 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.

.5 Sun shades and wind breaks shall be used as required during placing and finishing.

.6 Work shall be planned so that concrete can be placed as quickly as possible to avoid “cold joints”.

.7 The Contract Administrator’s acceptance is necessary before the Contractor may use admixtures such as retardants to delay setting, or water-reducing agents to maintain workability and strength, and these are to be included in the mix designs submitted to the Contract Administrator.

.8 Curing shall follow immediately after the finishing operation.

.2 Hot-Weather Curing

.1 When the air temperature is at or above 25°C, curing shall be accomplished by water 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 20°C, in order to minimize the temperature rise of the concrete.

.3 Job Preparation

.1 When the air temperature is at or above 25°C, or when there is the probability of its rising to 25°C 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, as defined in Clause 3.4.5.2 of this Specification Section, the formwork, reinforcement, and concreting equipment shall be protected from the direct rays of the sun or cooled by fogging and evaporation.

.4 Concrete Temperature

.1 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 (metres)	**Temperatures (°C)**	
	Minimum	**Maximum**
less than 0.3	10	27
0.3 – 1	10	27
1.2	5	25

.5 Protection from Drying

.1 Moderate Drying Conditions

.1 When surface moisture evaporation exceeds 0.75 kilogram per square metre per hour, windbreaks shall be erected around the sides of the structural element.

.2 Severe Drying Conditions

.1 When surface moisture evaporation exceeds 1.0 kilogram per square metre per hour, additional measure shall be taken to prevent rapid loss of moisture from the surface of the concrete. Such additional measures shall consist of the following:

.1 Erecting sunshades over the concrete during finishing and placing operations.

.2 Lowering the concrete temperature.

.3 Increasing humidity by applying fog spray immediately after placement and before finishing.

.4 Care shall be taken to prevent accumulation of water that may reduce the quality of the cement paste.

.5 Beginning the concrete curing immediately after trowelling.

.3 Surface Moisture Evaporation Rate

.1 The monograph, Figure D1, Appendix D of CAN/CSA-A23.1-00 shall be used to estimate surface moisture evaporation rates.

3.5 Concrete Protection for Reinforcement

.1 Ensure reinforcement is placed to provide minimum concrete cover in accordance with Section 03200.

3.6 Construction Tolerance

.1 The Work shall be carefully and accurately set out; true to the positioning, levels, slopes, and dimensions shown on the Drawings and conforming to Sections 03100 and 03200.

.1 Sizes of Member or Thickness of Slabs: +6 millimetres, - 0 millimetres.

.2 Cover of Concrete over Reinforcement: ±3 millimetres.

.3 Variations from Plumb: 6 millimetres in 3.0 metres, 10 millimetres maximum.

.4 Variations from Flat: 3 millimetres in 3.0 metres, 6 millimetres maximum.

.2 If these tolerances are exceeded the Contractor may, at the discretion of the Contract Administrator, be required to remove and replace or to modify the placed concrete before acceptance. The costs incurred by the Contract Administrator for such investigation, testing, or review of reconstruction and the cost of reconstruction shall be borne by the Contractor.

3.7 Finishing Slab Surfaces

.1 Finish all slab surfaces conforming to CAN/CSA-A23.1-00, Clause 22 and as specified below.

.2 Bull Floating

.1 Flatness for suspended concrete slabs to be achieved by means of hiway straight edge (minimum 3 metres width) in lieu of standard bull float. Immediately after screeding, bull float floor surfaces to remove ridges and fill voids.

.2 Complete bull floating before any excess moisture or bleed water is visible on surface.

.3 Mechanical Floating

.1 Mechanical float floor surfaces when bleed water has disappeared and surfaces are sufficiently hard to prevent working excess mortar to surface.

.2 Continue floating as necessary to produce surfaces of uniform texture, free from hollows, bumps, and screed marks.

.3 For surfaces to be trowelled, continue floating as necessary to embed coarse aggregate particles firmly below surface mortar.

.4 Hand float in corners, restricted areas, and around cast-in items.

.4 Trowelling

.1 Trowel floor surfaces with mechanical trowelling machines fitted with steel blades.

.2 Commence trowelling when surfaces are sufficiently hard to prevent working excess fine material to surface.

.3 Perform additional trowelling at intervals so final trowelling is done just before concrete becomes so hard that further trowelling is ineffective.

.4 Finish trowelled surfaces to be hard, dense, and free from blemishes and other imperfections.

.5 Hand trowel in corners, restricted areas, and around cast-in items.

.6 Cure concrete as specified.

.7 Protect all floors from damage during construction.

3.8 Curing and Protection

.1 Cure and protect freshly placed concrete in accordance with Clause 21 of CAN/CSA-A23.1-00.

.2 All concrete shall receive moist curing for a period of at least seven (7) days. One (1) of the following methods shall be used as soon as the concrete has hardened sufficiently to prevent marring:

.1 Surface covered with canvas or other satisfactory material and kept thoroughly and continuously wet with soaker hoses.

.2 A liquid membrane forming curing sealer, applied at the rate recommended by the Manufacturer. Curing sealer shall not be used on a surface where bond is required for the finishes.

.3 Surfaces of concrete, which are protected by formwork that is left in place for seven (7) days, shall not require any additional curing (except as specified for hot weather). If the formwork is removed in less than seven (7) days, the concrete shall receive moist curing as above.

.3 No concreting will be allowed until all materials required for the curing phase are on Site and ready for use.

.4 At the end of the curing and protection period, the temperature of the concrete shall be reduced gradually at a rate not exceeding 10°C per day until the outside air temperature has been reached.

.5 Concrete that is allowed to freeze or attain insufficient curing conditions shall be subject to all necessary investigations and testing as deemed necessary by the Contract Administrator and all such concrete shall be removed and the portion reconstructed as directed by the Contract Administrator, at Contractor's cost.

.6 The supply (both quantity and time of supply) of water for curing concrete shall be subject to control of the City and prior arrangements shall be made by the Contractor with the City for its supply. The Contractor shall be responsible for, at his own cost, to supply, install, maintain, and move extensions to water services as required for conveying water to the work

Site. Water required for curing concrete will be supplied by the City, from the Deacon Booster Pumping Station (DBPS).

3.9 Formed Concrete

.1 Allow the Contract Administrator to review concrete surfaces immediately upon removal of the forms.

.2 Modify or replace concrete not conforming to qualities, lines, details, and elevations specified herein or indicated on the Drawings to the acceptance of the Contract Administrator.

3.10 Finishing Formed Surfaces

.1 Interior formed concrete surfaces.

.1 Columns and walls of water retaining structures to receive form liner finish as per Section 03100.

.2 Finish surfaces exposed to view surfaces to Smooth-Form Finish conforming to CAN/CSA-A23.1-00, Clause 24.3.6.

.3 Finish non-exposed surfaces to Rough-Formed Finish conforming to CAN/CSA-A23.1-00, Clause 24.3.5.

.2 Exterior formed concrete surfaces.

.1 Surfaces to receive vapour barrier, insulation, waterproofing material, or roofing material are to be finished to Smooth-Formed Finish conforming to CAN/CSA-A23.1-00, Clause 24.3.6.

.2 Other surfaces to be finished to Rough-Formed Finish conforming to CAN/CSA-A23.1-00, Clause 24.3.5.

3.11 Equipment Pads and Cast in Metal Frames

.1 Provide concrete pads and supports for equipment where and as indicated on Drawings. Adjust dimensions to reviewed equipment Shop Drawings.

.2 Insert bolts and sleeves and pack solidly with non-shrink grout, in accordance with setting details and templates.

.3 Steel trowel surface smooth. Chamfer exposed horizontal and vertical edges.

.4 Clean excess concrete from metal frames, inserts, weld plates, etc. Clean and tool concrete around the above noted items.

3.12 Grouting

.1 Grout all miscellaneous anchor bolts with non-ferrous or epoxy grout as specified using templates for accurate positioning.

.2 Grout under base plates and other items to provide continuous support over the entire contact area as required and shown on the Drawings.

3.13 Defective Concrete

.1 Concrete not meeting the requirements of the Specifications and Drawings will be considered defective concrete.

.2 Concrete not conforming to the lines, details, and grades specified herein or as shown on the Drawings shall be modified or replaced at the Contractor's expense and to the satisfaction of the Contract Administrator. Finished lines, dimensions, and surfaces shall be correct and true within tolerances specified herein and in Section 03100.

.3 Concrete not properly placed resulting in honeycombing and other defects shall be repaired or replaced at the Contractor's expense and to the satisfaction of the Contract Administrator.

3.14 Patching

.1 Allow Contract Administrator to review concrete surfaces immediately upon removal of all formwork.

.2 Remove all exposed metal form ties, nails and wires, break off fins, and remove all loose concrete.

.3 Any imperfect joints, voids, stone pockets, or other defective areas and tie holes, as specified, shall at once be patched before the concrete is thoroughly dry. Defective areas shall be chipped away to a depth of not less than 40 millimetres with the edges perpendicular to the surface. The area to be patched and a space at least 150 millimetres wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar.

.4 Cure all patches thoroughly in accordance to Manufacturer’s instructions.

3.15 Watertightness Testing

.1 All water retaining structures shall be watertight and all precautions shall be taken, especially joint treatment, to construct watertight structures.

.2 Notify the Contract Administrator at least two (2) working days before commencing the watertightness test.

.3 The structures, when full, shall be reviewed over a forty eight (48) hour period for leakage including monitoring of visible leaks and testing for leaks by measurement. Each compartment or cell shall be tested independently.

.4 Filling the structures in preparation of the watertightness test shall be performed only after the wall concrete has attained 100% of the design strength and may be performed prior to

roof construction. Fill the tanks with clean water forty eight (48) hours prior to the watertightness test to allow for full saturation of the concrete.

.5 The supply (both quantity and time of supply) of water for the watertightness test shall be subject to control of the City and prior arrangements shall be made by the Contractor with the City for its supply. The Contractor shall be responsible for, at his own cost, to supply, install, maintain, and move extensions to water services as required for conveying water to the Work Site. Water required for the watertightness testing will be supplied by the City, from the DBPS.

.6 The Contractor shall measure leakage during next forty eight (48) hour period. The measurements shall be witnessed by the Contract Administrator. With the water at maximum operating level for forty eight (48) hours, there shall be no visible moisture or wetness on areas that will be seen or backfilled and the leakage measured over a period of twenty four (24) hours shall not exceed 0.10% of the water volume in the test period.

.7 Locate and repair all leaks until all leakage is remedied and repeat the forty eight (48) hour watertightness test following each repair operation, at no additional cost to the City.

.8 All water used for retesting shall be supplied by the City as outlined in Paragraph 5 above. Disposal of the water for the initial test and all retests shall be overland on site as directed by the Contract Administrator and shall be at the Contractor's expense.

3.16 Construction Joints

.1 Construction joint locations shall be as shown on the Drawings.

.2 Joints not indicated on the Drawings shall be located so as to least impair the strength of the structure. The location of these joints shall be subject to prior review and acceptance by the Contract Administrator. Joints shall be in accordance with CAN/CSA-A23.1-00, or as indicated on the Drawings.

.3 The surface of hardened concrete shall be thoroughly cleaned of foreign matter and laitance by sand blasting, and shall be thoroughly wetted with water, but not saturated, and the forms shall be re-tightened against the face of the hardened concrete before depositing additional concrete. Any concrete splatter on reinforcing bars shall be removed by sand blasting.

.4 Polyvinyl chloride (PVC) waterstop shall be protected with suitable 12 millimetres thick protection boards on both sides secured firmly together by mechanical clamps (i.e. c-clamps) or other method acceptable to the Contract Administrator during the sand blast cleaning operations.

.5 For horizontal construction joints, the concrete shall be thoroughly compacted by hand trowel in and around the reinforcing bars and along the PVC waterstops.

3.17 Clean-Up

.1 As Work progresses and at the completion of Work, remove from Site all debris, excess materials, and equipment.

END OF SECTION

STEEL FABRICATIONS

1. GENERAL

1.1 Work Included

.1 Shop fabricated steel and stainless steel items. The following is a list of principal items only. Refer to Drawing details for items not specifically listed.

.1 Installation of galvanized exterior masonry support weld plates.

.2 Supply and installation of blind flange plates and frames for water pressure testing sluice gates.

.3 Anchors, plates, bolts, nuts, screws, brackets, etc. required for Work of this Section.

1.2 Design Code, Quality Assurance

.1 Perform welding in accordance with requirements of Canadian Standards Association (CSA) W59.

.2 Welding Work on all load carrying structures and assemblies is to be performed by a firm certified by the Canadian Welding Bureau to the requirements of CSA W47.1 in Division 2.1.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Specification E10.

.2 Clearly indicate profiles, sizes, connections, attachments, reinforcing, anchorage, size and type of fasteners and accessories.

.3 Include erection drawings, elevations, and details where applicable.

.4 Indicate welded connections using Canadian Institute of Steel Construction (CISC) standard welding symbols. Clearly indicate net weld lengths.

.5 Shop drawings and design briefs are to bear the seal of a Professional Engineer registered in the Province of Manitoba.

2. PRODUCTS

2.1 Materials

.1 Steel: conforming to CAN/CSA-G40.21; Type W with minimum yield strength of 300 MPa.

.2 Stainless Steel: conforming to American Society for Testing and Materials (ASTM) 316.

.3 Welding Materials: conforming to CSA W59.

.4 Bolts, Nuts, and Washers: conforming to ASTM A325.

2.2 Finishes

.1 All components for the blind flanges to remain permanently in place shall be stainless steel and all associated anchorages to remain permanently in place shall be stainless steel.

.2 All components for the blind flanges not to remain permanently in place shall remain unpainted.

.3 Galvanizing: Galvalume for touch-up.

2.3 General Fabrication

.1 Verify all dimensions on-site prior to shop fabrication.

.2 Fabricate items of sizes and profiles detailed on Drawings, with joints neatly fitted and properly secured.

.3 Fit and shop assemble in largest practical sections, for delivery to Site.

.4 Supply all components required for proper anchorage of steel fabrications. Fabricate anchorages and related components of same material and finish as steel fabrications, unless otherwise specified or shown.

.5 Weld connections where possible, otherwise bolt connections. Cut off bolts flush with nuts.

.6 Accurately form all connections and joints with exposed faces flush, mitres and joints tight.

.7 Exposed welds and steel sections shall be smooth and flush, grind as required.

.8 Provide for flush welded or hairline butt field joints.

.9 Provide lugs, clips, brackets, hangers, and struts as required for attaching steel fabrication items securely to building structure.

3. EXECUTION

3.1 Examination

.1 Before starting erection, examine other Work which may affect this Work.

.2 Notify the Contract Administrator of any conditions which would prejudice proper installation of this Work.

.3 Commencement of erection Work implies acceptance of existing conditions.

3.2 Erection

.1 Obtain Contract Administrator's permission prior to Site cutting or making adjustments which are not part of scheduled Work.

.2 Install items plumb, square, and level, fit accurately, and maintain free from distortion or defects detrimental to appearance and performance.

.3 Make provision for erection stresses and temporary bracing. Keep Work in alignment at all times.

.4 Replace items damaged in course of installation.

.5 Perform required field welding. All visible field welds shall be smooth, grind as required.

.6 Perform necessary cutting and altering for the installation of Work of other Sections, and as indicated on Drawings. No additional cutting is to be done without the permission of the Contract Administrator.

.7 Perform all field assembly bolting and welding to match standard of shop bolting and welding. Bolts and screws are to be concealed whenever possible.

.8 After installation, touch up damaged galvanized surfaces with galvalume.

.9 Supply to appropriate Sections items required to be cast into concrete complete with necessary setting templates.

END OF SECTION

ALUMINUM FABRICATIONS

1. GENERAL

1.1 Work Included

.1 Supply and installation of aluminum stairs, railings, and landings.

.2 Supply and installation of aluminum ladders.

.3 Supply and installation of aluminum guard railings.

.4 Installation of aluminum access hatch frames supplied by others to be cast into concrete.

.5 Installation of galvanized steel weld plates supplied by others to be cast into concrete.

.6 Stainless steel bolts for bolted connections.

.7 Stainless steel anchor bolts and anchorages for all aluminum equipment supplied.

1.2 Standards

.1 Do aluminum Work to Canadian Standards Association (CSA) CAN3-S157.

.2 Welding to CSA W59.2.

.3 Company certification to CSA W47.2.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Specification E10.

.2 Clearly indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

.3 Include erection drawings, elevations and details where applicable.

.4 Indicated welded connections using Canadian Institute of Steel Construction (CISC) standard welding symbols. Clearly indicate net weld lengths.

2. PRODUCTS

2.1 Materials

.1 Aluminum: to CSA Standard HA, 6061-T6 or 6351-T6 Alloy unless specified otherwise.

.2 Nuts, bolts, and fastening devices connecting aluminum parts to aluminum, concrete, or other materials: stainless steel ASTM Type 316 , with appropriate isolation devices.

.3 Bituminous Paint: alkali-resistant, to CGSB 1.108M.

.4 Aluminum Grating: acceptable Manufacturer is Fisher & Ludlow Fisholoid Aluminum Grating, Type 30-102M, sizes as indicated on the Drawings.

2.2 General Fabrication

.1 Verify all dimensions on-site prior to fabrication.

.2 Connect bearing bars in a panel with a bar of same depth as bearing bars and minimum thickness of 5 millimetres.

.3 Finish openings requiring the cutting of four (4) or more bearing bars in the same manner as the end of the panel.

.4 Match position of bars and tie rods in adjacent panels to preserve a continuous appearance.

.5 Cover exposed aluminum surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating before shipping to Site. Leave protective covering in place until final cleaning of structures. Provide instruction for removal of protective covering.

3. EXECUTION

3.1 Examination

.1 Before starting erection, examine Work done under other Sections which may affect the Work.

.2 Notify the Contract Administrator of any conditions which would prejudice proper installation of the Work.

.3 Commencement of erection Work implies acceptance of existing conditions.

3.2 Erection

.1 Obtain the Contract Administrator's permission prior to Site cutting or making adjustments which are not part of the scheduled Work.

.2 Install items plumb, square and level; fit accurately, and maintain free from distortion or defects detrimental to appearance and performance.

.3 Make provisions for erection stresses and temporary bracing. Keep Work in alignment at all times.

.4 Replace items damaged in course of installation.

.5 Perform required field welding. Visible field welds to be smooth, grind as required.

.6 Perform necessary cutting and altering for the installation of Work of other Sections, and as indicated the Drawing. No additional cutting is to be done without the acceptance of the Contract Administrator.

.7 Perform all field assembly bolting and welding to match standard of shop bolting and welding. Bolts and screws are to be concealed whenever possible.

.8 Clip adjacent grating panels edges together at 1,500 millimetre spacing to prevent differential vertical movement.

.9 Provide two (2) hold-down clips at each end of the panels if not detailed on the Drawings.

.10 Provide anchors for setting in concrete with minimum 100 millimetre embedment.

.11 Paint aluminum surfaces in contact with concrete with two (2) coats of alkali-resistant bituminous paint.

.12 Prevent electrolysis between aluminum and dissimilar metals in contact with appropriate isolation devices.

END OF SECTION

EPDM WATERPROOF MEMBRANE

1. GENERAL

1.1 Work Included

.1 Supply and installation of ethylene propylene diene monomer (EPDM) roof membrane and insulation over the Clearwell roof to extents shown on the Drawings including the following major items of Work:

.1 Roof and wall membrane.

.2 Expansion joints.

.3 Flashings at Inlet and Outlet Buildings and ventilation shafts.

.4 Membrane and polyethylene slip sheets at perimeter of Clearwell roof.

.5 Roof insulation.

1.2 Storage and Handling

.1 Provide and maintain dry, off-ground weatherproof storage.

.2 Store materials on supports to prevent deformation.

.3 Remove only in quantities required for same day use.

.4 Store uncured flashing and jointing materials to prevent premature curing and freezing.

.5 Store materials in accordance with Manufacturer's written instructions.

1.3 Environmental Requirements

.1 Do not proceed with Work when wind chill effect would tend to set bitumen before proper curing takes place.

.2 Maintain air temperature and substrate temperature at membrane installation area above 5°C for twenty four (24) hours before, during, and twenty four (24) hours after installation, or as recommended by the Manufacturer.

.3 Do not apply membrane in wet weather.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Specification E10.

.2 Shop drawings shall include a completed Table 1 indicating conformance with the required membrane characteristics.

.3 Shop drawings shall indicate material and membrane sheet joint layout.

1.5 Mock-Up

.1 Construct mock-up of minimum 10 square metres size showing typical lap joint, typical expansion joint, intersection with walls at Outlet and Inlet Buildings, and insulation over joints

.2 Reviewed and accepted mock-up may form part of completed Work.

.3 Allow twenty four (24) hours for review of mock-up by Contract administrator before proceeding with membrane work.

.4 Arrange for membrane Manufacturer's representative to be on-site during mock-up and periodically during progress of the Work to ensure installation is in accordance with Manufacturer's instructions and requirements.

1.6 Qualifications

.1 The installation contractor shall provide documentation showing the firm to be a membrane material roofing applicator approved by the membrane Manufacturer.

.2 Roofing work is to be performed in accordance with Canadian Roofing Contractors Association (CRCA) Roofing Specifications Manual, unless specified otherwise.

.3 Roofing work is to be performed in accordance with elastomeric membrane Manufacturer's printed application instructions unless specified otherwise.

1.7 Guarantees

.1 The membrane Manufacturer shall provide a pro-rated written guarantee against manufacturing defects in the membrane materials for a period of twenty (20) years from the date of Total Performance. The Manufacturer shall complete and sign the enclosed Form W1: Manufacture Guarantee Agreement (attached to this Section) upon Award of Contract. The Manufacturer shall indicate his written approval in Form W1 of the selected Applicator for the installation of the membrane system.

.2 The approved Applicator shall provide a written guarantee stating that the membrane system will provide leak-free service for a period of five (5) years from the date of Total Performance. The Applicator shall complete and sign the enclosed Form W2: Application Guarantee Agreement (attached to this Section) upon Award of Contract.

2. PRODUCTS

2.1 Materials

.1 EPDM Membrane:

.1 EPDM membrane shall be felt-backed EPDM synthetic rubber waterproofing membrane applied with hot Type III asphalt for the roof and rubberized asphalt for the

walls. Membrane shall be Lexcan Design D, 1.5 millimetre thick felt-backed membrane or accepted alternate.

.2 Splice cleaner, adhesive, tape, and sealant shall conform to the membrane Manufacturer's recommendations.

.3 Asphalt for roof application shall conform to CSA A123.4, Type III.

.4 Asphalt for wall application shall conform to CAN/CGSB-37.5-M89, 7106 Foundation Mastic by Insulmastic Building Products or accepted alternate.

.5 Membrane material shall conform to the performance characteristics shown on Table 1 attached to this Section. Table 1 shall be filled out and submitted with the Shop Drawing submittals.

.2 Polystyrene Insulation:

.1 Polystyrene insulation shall conform to CAN/CGSB-51.20M87, 100 millimetres in thickness, shiplapped edges, and minimum compressive strength of 275 kilopascals (40 pounds per square inch), Foamular 400 by Owens Corning or accepted alternate.

.3 Polyethylene Slip-Sheet:

.1 Polyethylene Slip-Sheet shall conform to CAN2-51.34, Type 1, 0.25 millimetres thick.

.4 Geotextile, Sand, and Earth Cover

.1 Geotextile, sand, and earth cover shall be as specified in Section 02223.

3. EXECUTION

3.1 Substrate Examination

.1 Before starting this Work examine Work done by others that affects this Work.

.2 Notify the Contract Administrator of any conditions that would prejudice proper completion of this Work.

.3 Commencement of Work implies acceptance of existing conditions.

.4 Prior to commencement of Work ensure substrates are firm, straight, smooth, dry, free of snow, ice, or frost, and swept clean of dust and debris

3.2 Protection

.1 Place plywood runways over the Work to enable movement of material and other traffic.

.2 At end of each day's Work or when stoppage occurs due to inclement weather, provide protection for completed work and materials out of storage.

.3 Seal and ballast exposed edges.

3.3 Membrane Application

.1 General:

.1 Do not install EPDM membrane when air and substrate temperature remains below 5°C in accordance with Manufacturer's recommendations or when wind chill gives equivalent cooling effect.

.2 Install EPDM membrane on dry substrate, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into the system.

.3 Ensure that temperature of substrate and its moisture content conforms to Manufacturer's minimum requirements, before proceeding with Work.

.2 Positioning Membrane Sheets

.1 Ensure substrate is clean, flat, and free from dirt or debris that might be detrimental to the performance of the membrane.

.2 Unroll membrane sheets and position according to accepted Shop Drawings, ensuring a tight butt-edge with adjacent sheets. Do not over-lap sheets.

.3 Bonding to Substrate:

.1 Fold one half of membrane sheet back lengthwise so underside of sheet is exposed. Apply a thin mopping of asphalt to felt over factory seams to keep felt flaps in place.

.2 Apply a full mopping of Type III roofing asphalt at the rate of 1.0 to 1.2 kilograms per square metre onto the substrate immediately ahead of the membrane fold. Apply asphalt to a small area at a time extending the width of the membrane and approximately 60 centimetres out from the membrane fold. While the asphalt is still at an equiviscous temperature, roll the membrane into asphalt, avoiding air bubbles or wrinkles. Brush down on the membrane with a push broom to achieve maximum contact. Continue this procedure until one-half of sheet is fully bonded.

.3 Fold back unbonded half of sheet and repeat the bonding procedure. Apply remaining membrane sheets in a similar manner.

.4 Wall EPDM membrane shall be applied while the wall asphalt is in an adhesive state (refer to flash cure set period from Manufacturer's product information).

.4 Splicing Membrane Sheets

.1 Clean a 20 centimetre wide strip of EPDM membrane with Seam Cleaner. Ensure any asphalt spills are scraped off. Apply a 20-centimetre wide strip of splice adhesive to the membrane, centred over the seam. Apply with a paint brush using straight painting strokes (not a circular motion). Allow adhesive to dry until it is tacky, but does not stick to a dry finger touch.

.2 Remove paper backing and apply Overlay Seam Tape to the membrane, centred lengthwise over the seam. Overlap tape ends and "T" junctions a minimum of 10 centimetres. Roll tape heavily with a steel roller.

.3 Apply 30 centimetres square overlay patches of flashing centred over all seam "T" junctures, seam overlays, and roof to wall junctures. Apply with Splice Adhesive according to adhesive Manufacturer's application directions.

.4 Caulk both edges of Overlay Seam Tape all exposed membrane of flashing edges with Lap Sealant. Feather sealant with tool provided.

3.4 Insulation Application

.1 Insulation to be loose laid in parallel rows with ends staggered.

.2 Where insulation is in contact with cants, bevel insulation edges to fit snug to cant slope.

.3 Apply insulation and ballast sequentially to ensure proper alignment over expansion joints.

3.5 Flashing Application

.1 Install cured or uncured EPDM membrane flashings in accordance with Manufacturer's written instructions.

3.6 Cleaning

.1 Clean soiled surfaces, spatters, and damage caused by work of this Section to satisfaction of Contract Administrator.

END OF SECTION

Table 1: Required Membrane Characteristics

PROPERTY	ASTM TEST	REQUIREMENTS	YES	NO
Thickness	D751	± 10%		
Breaking Strength, minimum	D751	14.0 kN/m		
Elongation @ Fabric Break	D751	80%		
Elongation @ Rubber Break	D751	350%		
Elongation, Ultimate	D421	400%		
Tearing Resistance, minimum	D624, DIEC	35.0 kN/m		
Tongue Tear Strength, minimum	D751	156 N		
Brittleness Point, maximum	D2137	-60˚C		
Ozone Resistance (7 days @ 100 pphm, 20% elong 40C)	D1149	No cracks @7 x mag		
Water Absorption, maximum	D471	+ 1%		
Factory Seam Strength	D816	9.6 kN/m		
HEAT AGING, 28 DAYS @ 115C				
Breaking Strength, minimum	D751	7.5 kN/m		
Elongation @ Rubber Break	D751	250%		
Elongation, Ultimate	D421	250%		
Tearing Resistance, minimum	D624, DIEC	30.6 kN/m		
Tongue Tear Strength, minimum	D751	111 N		
Linear Dimensional Change, maximum	D1204	±1%		
Hot Applied Roof Asphalt to CSA A123.4-M, Type M				

Form W1: Manufacture Guarantee Agreement
Sheet 1 of 1

CLEARWELL MEMBRANE SYSTEM

GUARANTEE TO THE CITY OF WINNIPEG

FOR PROJECT:

WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION CONTRACT

BID OPPORTUNITY NO. 166-2005

Manufacture's Name and Address

does hereby provide, in accordance with the Specifications of the Contract, the following Guarantee for the herein identified Clearwell Membrane System.

The Reservoir EPDM membrane material is guaranteed against the following defects attributable to defective material for a period of twenty (20) years from the date of issue of the Certificate of Total Performance of the membrane system:

1. Premature deterioration in forms of cracking, brittleness, loss of elongation characteristics, tearing resistance, water absorption qualities to the point of failure under the effects of historical climatic conditions.
2. The membrane system shall be defined as membrane, roofing asphalt, flashing, tapes, adhesives, sealant, and joint reinforcement membrane strips and any other products required for use in the membrane system.
3. Material failure shall be defined as any defects that results in the loss of leak free performance during the guarantee period.

Remedial works covered by this guarantee shall include the repair or replacement of the defective membrane area. The cost of removal and replacement of material above or adjacent to the membrane is not included in this guarantee.

All remedial works shall carry a minimum twenty (20) year guarantee as stipulated above.

MANUFACTURER APPROVAL OF SELECTED APPLICATOR

We, the Manufacturer, approve the selection of _____ as the Applicator of our roof membrane system.

MANUFACTURER

Name of Company Officer	Corporate Position	Signature of Company Officer
Name of Witness	Signature of Witness	Date

Form W2: Applicator Guarantee Agreement

Sheet 1 of 1

CLEARWELL MEMBRANE SYSTEM

GUARANTEE TO THE CITY OF WINNIPEG

FOR PROJECT:

WATER TREATMENT PROGRAM – CLEARWELL CONSTRUCTION CONTRACT

BID OPPORTUNITY NO. 166-2005

Applicator's Name and Address

does hereby provide, in accordance with the Specifications of the Contract, the following Guarantee for the herein identified Clearwell Membrane System.

The Clearwell Membrane System is guaranteed against the following defects attributable to faulty installation for a period of five (5) years from the date of issue of the Certificate of Total Performance with respect to the membrane system:

1. Leak free performance of the membrane system. The membrane system shall be defined as membrane, roofing asphalt, flashing, tapes, adhesives, sealant, and joint reinforcement membrane strips and any other products recommended by the Manufacturer for use in the membrane system.
2. Debonding of the EPDM sheet membrane material from the Clearwell roof deck and side wall construction.
3. Debonding and leak free performance of the roof and wall jointing system as shown in the Drawings with respect to the Clearwell Membrane System.

Remedial works covered by this guarantee shall include the repair or replacement of the defective membrane area. The cost of removal and replacement of material above or adjacent to the membrane is not included in this guarantee.

All remedial works shall carry a minimum five (5) year guarantee as stipulated above.

APPLICATOR

Name of Company Officer	Corporate Position	Signature of Company Officer
Name of Witness	Signature of Witness	Date

APPENDIX A

FORMS

CERTIFICATE OF EQUIPMENT DELIVERY

FORM 200

We certify that the equipment listed below has been delivered into the care of the Installation Contractor. The equipment has been found to be in satisfactory condition and meets its Basic Design Criteria. No defects in the equipment were found.

Project: _____

Item of Equipment: _____

Tag No.: _____

Reference Specification: _____

_____ _____
(Authorized Signing Representative of the Installation Contractor (Date)

_____ _____
(Authorized Signing Representative of the Contractor) (Date)

_____ _____
(Authorized Signing Representative of the Contract Administrator) (Date)

CERTIFICATE OF INSTRUCTION

FORM 201

I have completed instruction of the installation of the equipment listed below:

_____ _____
(Authorized Signing Representative of the Contractor) (Date)

I certify that the party responsible for the installation of the equipment listed below has received satisfactory instructions from the Contractor.

_____ _____
(Authorized Signing Representative of the Installation Contractor) (Date)

Project: _____

Item of Equipment: _____

Tag. No.: _____

Reference Specification: _____

CERTIFICATE OF SATISFACTORY INSTALLATION

FORM 202

I have completed my check and inspection of the installation listed below and confirm that it is satisfactory and that defects have been remedied to my satisfaction except any as noted below:

Project: _____

Item of Equipment: _____

Tag No.: _____

Reference Specification: _____

Outstanding Defects: _____

_____ _____
(Authorized Signing Representative of the Contractor) (Date)

CERTIFICATE OF EQUIPMENT SATISFACTORY PERFORMANCE
FORM 203

We certify that the equipment listed below has been validated and has been operated for at least seven (7) consecutive days and that the equipment operates satisfactorily and meets its specified Basic Design Criteria. No defects in the equipment were found. The equipment is therefore classed as "conforming".

Project: _____

Item of Equipment: _____

Tag No.: _____

Reference Specification: _____

_____ _____
(Authorized Signing Representative of the Contractor) (Date)

_____ _____
(Authorized Signing Representative of the Installation Contractor) (Date)

_____ _____
(Authorized Signing Representative of the Contract Administrator) (Date)

1. Acknowledgement of Receipt of Training for Operation Staff

_____ _____
(Authorized Signing Representative of the City) (Date)

2. Acknowledgement of Receipt of Training for Maintenance Staff

_____ _____
(Authorized Signing Representative of the City) (Date)