



THE CITY OF WINNIPEG

TENDER

TENDER NO. 1042-2025

TYLEHURST LIFT STATION 2026 UPGRADES

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 Tylehurst Lift Station 2026 Upgrades

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, February 13, 2026.

B2.2 The Contract Administrator or the Manager of Purchasing may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

B3.1 The Contract Administrator or an authorized representative will conduct a site investigation tour of the site at 499 Tylehurst Street on.

(a) January 29, 2026 at 1:00 p.m

(b) February 02, 2026 at 9:00 a.m.

B3.1.1 Proponents are requested to register for the site investigation by contacting the Contract Administrator

B3.2 Although attendance at the Site Investigations is not mandatory, the City strongly suggests that Bidders attend.

B3.3 The Bidder is advised that they are required to bring their own PPE (safety vest, boots, hard hat, safety glasses and gloves) to the Site Investigation. Proponents without appropriate PPE will not be allowed access inside the Station.

(a) Proponents wanting to access the lower levels of the Lift Station will require to have Confined Space Entry Training and will be asked to show their certification at the site visit. Proponents without Confined Space Entry Training will not be allowed to access the lower levels of the Lift Station.

B3.4 The Bidder shall not be entitled to rely on any information or interpretation received at the Site Meeting unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

B3.5 The Bidder is responsible for inspecting the Site, the nature of the Work to be done and all conditions that might affect their Bid or their performance of the Work, and shall assume all risk for conditions existing or arising in the course of the Work which have been or could have been determined through such inspection.

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 Tender, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.

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

- 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 Tender 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.
- B4.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

B5. CONFIDENTIALITY

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

B6. ADDENDA

- B6.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies or omissions in the Tender, or clarifying the meaning or intent of any provision therein.
- B6.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B6.3 Addenda will be available on the MERX website at www.merx.com.
- B6.4 The Bidder is responsible for ensuring that they have received all addenda and is advised to check the MERX website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- B6.5 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid/Proposal. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.
- B6.6 Notwithstanding B4, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D4.

B7. SUBSTITUTES

- B7.1 The Work is based on the Plant, Materials and methods specified in the Tender.
- B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B7.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.

- B7.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
 - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
 - (c) identify any anticipated cost or time savings that may be associated with the substitute;
 - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;
 - (e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.
- B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in their sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.
- B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.
- B7.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons they wish to inform.
- B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base their Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B18.
- B7.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B8. BID COMPONENTS

- B8.1 The Bid shall consist of the following components:
- (a) Form A: Bid/Proposal;
 - (b) Form B: Prices;
 - (c) Form G1: Bid Bond and Agreement to Bond.
- B8.2 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely.
- B8.3 The Bid shall be submitted electronically through MERX at www.merx.com.
- B8.3.1 Bids will **only** be accepted electronically through MERX.

B8.4 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B18.1(a).

B9. BID

B9.1 The Bidder shall complete Form A: Bid/Proposal, making all required entries.

B9.2 Paragraph 2 of Form A: Bid/Proposal shall be completed in accordance with the following requirements:

- (a) if the Bidder is a sole proprietor carrying on business in their own name, their name shall be inserted;
- (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
- (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
- (d) if the Bidder is carrying on business under a name other than their own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.

B9.3 In Paragraph 3 of Form A: Bid/Proposal, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B9.4 Paragraph 13 of Form A: Bid/Proposal shall be signed in accordance with the following requirements:

- (a) if the Bidder is a sole proprietor carrying on business in their own name, it shall be signed by the Bidder;
- (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
- (c) if the Bidder is a corporation, it shall be signed by their duly authorized officer or officers;
- (d) if the Bidder is carrying on business under a name other than their own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B9.4.1 The name and official capacity of all individuals signing Form A: Bid/Proposal should be entered below such signatures.

B9.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B10. PRICES

B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B10.1.1 Notwithstanding C12.2.3(c), prices on Form B: Prices shall not include the Manitoba Retail Sales Tax (MRST, also known as PST), which shall be extra where applicable.

B10.1.2 Prices stated on Form B: Prices shall not include any costs which may be incurred by the Contractor with respect to any applicable funding agreement obligations as outlined in C24. Any such costs shall be determined in accordance with C24.

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

- B10.3 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.
- B10.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).
- B10.5 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.
- B10.5.1 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

B11. DISCLOSURE

- B11.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.
- B11.2 The Persons are:
- (a) Pinchin Ltd.
 - (b) TREK Geotechnical Inc.
 - (c) Barnes & Duncan Surveying, Engineering and Planning
- B11.3 Additional Material:
- (a) Hazardous Materials Assessment Report by Pinchin Ltd in Appendix B
 - (b) Geotechnical Investigation Report by TREK Geotechnical in Appendix C
 - (c) Topographic Survey of the Site which will be provided to the successful bidder.

B12. CONFLICT OF INTEREST AND GOOD FAITH

- B12.1 Further to C3.3, Bidders, by responding to this Tender, declare that no Conflict of Interest currently exists, or is reasonably expected to exist in the future.
- B12.2 Conflict of Interest means any situation or circumstance where a Bidder or employee of the Bidder proposed for the Work has:
- (a) other commitments;
 - (b) relationships;
 - (c) financial interests; or
 - (d) involvement in ongoing litigation;
- that could or would be seen to:
- (i) exercise an improper influence over the objective, unbiased and impartial exercise of the independent judgment of the City with respect to the evaluation of Bids or award of the Contract; or
 - (ii) compromise, impair or be incompatible with the effective performance of a Bidder's obligations under the Contract;
- (e) has contractual or other obligations to the City that could or would be seen to have been compromised or impaired as a result of their participation in the Tender process or the Work; or
 - (f) has knowledge of confidential information (other than confidential information disclosed by the City in the normal course of the Tender process) of strategic and/or material relevance to the Tender process or to the Work that is not available to other bidders and that could or would be seen to give that Bidder an unfair competitive advantage.

- B12.3** In connection with their Bid, each entity identified in B12.2 shall:
- (a) avoid any perceived, potential or actual Conflict of Interest in relation to the procurement process and the Work;
 - (b) upon discovering any perceived, potential or actual Conflict of Interest at any time during the Tender process, promptly disclose a detailed description of the Conflict of Interest to the City in a written statement to the Contract Administrator; and
 - (c) provide the City with the proposed means to avoid or mitigate, to the greatest extent practicable, any perceived, potential or actual Conflict of Interest and shall submit any additional information to the City that the City considers necessary to properly assess the perceived, potential or actual Conflict of Interest.
- B12.4** Without limiting B12.3, the City may, in their sole discretion, waive any and all perceived, potential or actual Conflicts of Interest. The City's waiver may be based upon such terms and conditions as the City, in their sole discretion, requires to satisfy itself that the Conflict of Interest has been appropriately avoided or mitigated, including requiring the Bidder to put into place such policies, procedures, measures and other safeguards as may be required by and be acceptable to the City, in their sole discretion, to avoid or mitigate the impact of such Conflict of Interest.
- B12.5** Without limiting B12.3, and in addition to all contractual or other rights or rights at law or in equity or legislation that may be available to the City, the City may, in their sole discretion:
- (a) disqualify a Bidder that fails to disclose a perceived, potential or actual Conflict of Interest of the Bidder or any of their employees proposed for the Work;
 - (b) require the removal or replacement of any employees proposed for the Work that has a perceived, actual or potential Conflict of Interest that the City, in their sole discretion, determines cannot be avoided or mitigated;
 - (c) disqualify a Bidder or employees proposed for the Work that fails to comply with any requirements prescribed by the City pursuant to B12.4 to avoid or mitigate a Conflict of Interest; and
 - (d) disqualify a Bidder if the Bidder, or one of their employees proposed for the Work, has a perceived, potential or actual Conflict of Interest that, in the City's sole discretion, cannot be avoided or mitigated, or otherwise resolved.
- B12.6** The final determination of whether a perceived, potential or actual Conflict of Interest exists shall be made by the City, in their sole discretion.

B13. QUALIFICATION

- B13.1** The Bidder shall:
- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba; and
 - (b) be financially capable of carrying out the terms of the Contract; and
 - (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.
- B13.2** The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Purchasing Division website <https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf>
- B13.3** The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

- (a) have successfully carried out work similar in nature, scope and value to the Work; and
- (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
- (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);
- (d) have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B13.5 and C6.19).

B13.4 Further to B13.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

- (a) Written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) in the form of:
 - (i) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
 - (ii) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
- (b) a report or letter to that effect from an independent reviewer acceptable to the City. A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Purchasing Division website at <http://www.winnipeg.ca/matmgt/Safety/default.stm>.

B13.5 Further to B13.3(d), the Bidder acknowledges that they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at <https://accessibilitymb.ca/resources-events-and-training/online-training.html> for anyone that may have any interaction with the public on behalf of the City of Winnipeg.

B13.6 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B13.7 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B14. BID SECURITY

B14.1 The Bidder shall include in their Bid Submission bid security in the form of a digital bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in Form G1: Bid Bond and Agreement to Bond, available at: <https://www.winnipeg.ca/media/4929/>

B14.2 Bid security shall be submitted in a digital format meeting the following criteria:

- (a) The version submitted by the Bidder must have valid digital signatures and seals;
- (b) The version submitted by the Bidder must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.
- (c) The version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

- (d) The verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.
- (e) The results of the verification must provide a clear, immediate and printable indication of pass or fail regarding (b).

B14.3 Bonds failing the verification process will not be considered to be valid and the bid shall be determined to be non-responsive in accordance with B18.1(a).

B14.4 Bonds passing the verification process will be treated as original and authentic.

B14.4.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

B14.5 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly formed with the successful Bidder and the contract securities are furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B14.6 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Tender.

B15. OPENING OF BIDS AND RELEASE OF INFORMATION

B15.1 Bids will not be opened publicly.

B15.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated and pending review and verification of conformance with requirements) will be available on the MERX website at www.merx.com.

B15.3 After award of Contract, the name(s) of the successful Bidder(s) and their Contract amount(s) will be available on the MERX website at www.merx.com.

B15.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).

B15.4.1 To the extent permitted, the City shall treat as confidential information, those aspects of a Bid Submission identified by the Bidder as such in accordance with and by reference to Part 2, Section 17 or Section 18 or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

B16. IRREVOCABLE BID

B16.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B16.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly formed and the contract securities have been furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B17. WITHDRAWAL OF BIDS

B17.1 A Bidder may withdraw their Bid without penalty at any time prior to the Submission Deadline.

B18. EVALUATION OF BIDS

- B18.1 Award of the Contract shall be based on the following bid evaluation criteria:
- (a) compliance by the Bidder with the requirements of the Tender, or acceptable deviation therefrom (pass/fail);
 - (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B13 (pass/fail);
 - (c) Total Bid Price;
 - (d) economic analysis of any approved alternative pursuant to B7.
- B18.2 Further to B18.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.
- B18.3 Further to B18.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in their Bid or in other information required to be submitted, that they are qualified.
- B18.4 Further to B18.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.
- B18.4.1 Further to B18.1(a), in the event that a unit price is not provided on Form B: Prices, the City may determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.
- B18.4.2 Where MRST is shown on Form B as a separate line item, if that Line item is not completed, the MRST shall be considered to be included in the Total Bid Price.
- B18.4.3 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

B19. AWARD OF CONTRACT

- B19.1 The City will give notice of the award of the Contract or will give notice that no award will be made.
- B19.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be qualified, and the Bids are determined to be responsive.
- B19.2.1 Without limiting the generality of B19.2, the City will have no obligation to award a Contract where:
- (a) the prices exceed the available City funds for the Work;
 - (b) the prices are materially in excess of the prices received for similar work in the past;
 - (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with their own forces;
 - (d) only one Bid is received; or
 - (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.
- B19.3 If funding for the Work is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, Bidders are advised that the terms of C24 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.
- B19.4 Where an award of Contract is made by the City, the award shall be made to the qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B18.
- B19.4.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of their Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for Construction* (Revision 2025 11 01) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Purchasing Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm
- C0.2 A reference in the Tender to a section, clause or subclause with the prefix “**C**” designates a section, clause or subclause in the *General Conditions for Construction*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of building upgrades and site improvements of Tylehurst Lift Station.

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

- (a) Structural and architectural upgrades,
- (b) Mechanical process and building services upgrades,
- (c) Supply and installation of wastewater pumping equipment,
- (d) Supply and installation of a standby natural gas generator,
- (e) Electrical upgrades,
- (f) Automation and instrumentation upgrades,
- (g) Civil and municipal services (outside of the station) upgrades,
- (h) Temporary by-pass pumping and manhole installation,
- (i) Excavation, Shoring and Backfill,
- (j) Site restoration and clean up, and
- (k) As per drawings and specifications.

D2.3 The Contractor shall supply and install all materials and equipment shown on the construction drawings and specifications unless otherwise indicated as existing or supplied by others. All materials and equipment shall be new.

D2.4 The Contractor will demolish all materials and equipment shown on the demolition drawings and specifications unless otherwise indicated to remain.

D2.5 The following shall apply to the Services:

- (a) City of Winnipeg Green Building Policy: New City-Owned Buildings and major additions;
<http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=5989>
- (b) Universal Design Policy
<http://clkapps.winnipeg.ca/DMIS/DocExt/ViewDoc.asp?DocumentTypeId=2&DocId=3604>

D3. DEFINITIONS

D3.1 When used in this Tender:

- (a) “**A/C**” means Air Conditioning.
- (b) “**ACH**” means Air Changes per Hour.
- (c) “**ATS**” means Automatic Transfer Switch
- (d) “**Authority Having Jurisdiction**” or “**AHJ**” means an organization, office, or individual responsible for enforcing the requirements of a code, standard, or by-law, or for approving equipment, materials, and installation or a procedure, which is typically in reference to the local inspection authority;

- (e) “**As-Built**” means an accurate and complete record of the construction Work undertaken by the Contractor, resulting in adjustments and markups made to the construction set of documents;
- (f) “**Certificate of Final Inspection**” means the certificate of final inspections, obtained from the City of Winnipeg inspections department;
- (g) “**Code**” or “code” means the latest local code applicable at the project location
- (h) “**C.P.M.**” means critical path method;
- (i) “**CSA**” means Canadian Standards Association;
- (j) “**CSTE**” means Customer Service Termination End;
- (k) “**Demolish**” means to disconnect, remove from site and properly dispose of materials/equipment at an approved disposal.
- (l) “**FAT**” means Factory Acceptance Testing;
- (m) “**FRP**” means Fibre Reinforced Polymer;
- (n) “**H₂S**” means Hydrogen Sulfide;
- (o) “**HMI**” means Human Machine Interface;
- (p) “**HVAC**” means Heating, Ventilation and Air Conditioning;
- (q) “**I/O**” means Input / Output;
- (r) “**Licenced Electrical Contractor**” means an individual meeting the requirements of the Manitoba Electricians’ Licence Act (C.C.S.M. c E50) and the Manitoba Electricians’ Licensing Regulation (186-87 R);
- (s) “**Licenced Mechanical Contractor**” means a M-Prime contractor licensed by the City. M-Prime contractors may obtain permits for any work on HVAC systems, hazardous process systems, or fire protection systems where the work is to be performed by a M1 licenced contractor and/or a M2 licenced contractor;
- (t) “**mASL**” means metres Above Sea Level;
- (u) “**MCC**” means Motor Control Centre;
- (v) “**MH**” means Manhole;
- (w) “**NEWPCC**” means North End Waste Pollution Control Centre;
- (x) “**O&M**” means Operations & Maintenance;
- (y) “**P&ID**” means Piping and Instrumentation Diagram;
- (z) “**PDF**” means Portable Document Format;
- (aa) “**PDWF**” means Peak Dry Weather Flow;
- (bb) “**PLC**” means Programmable Logic Controller;
- (cc) “**Provide**” means to supply, install, and leave in working order all materials and necessary equipment, wiring, supports, access panels, etc., as necessary for item or system indicated;
- (dd) “**PWWF**” means Peak Wet Weather Flow;
- (ee) “**Record Drawing**” means an accurate and complete record of the construction Work undertaken by the Contractor, and prepared by the reviewing professional after verifying in detail the actual conditions of the completed project as a result of adjustments and markups made to the construction set of documents. The drawings shall bear the seal of the responsible professional;
- (ff) “**RTU**” means Remote Terminal Unit;
- (gg) “**SCADA**” means Supervisory Control And Data Acquisition;
- (hh) “**SCR**” means Silicon Controlled Rectifier;
- (ii) “**SEWPCC**” means South End Waste Pollution Control Centre;

- (jj) “**Standard**” or “standard” means the latest standard that is in effect at the project location;
- (kk) “**Standardized Goods**” or “**Standardised Equipment**” means the respective goods that have been standardized by the City.
- (ll) “**Standardized Vendors**” means a Contractor or Supplier of Standardized Goods.
- (mm) “**TDH**” means Total Dynamic Head;
- (nn) “**TVSS**” means Transient Voltage Surge Suppressor;
- (oo) “**VFD**” means Variable Frequency Drive.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is MPE a Division of Englobe, represented by:

Curtis Rawsthorne, P.Eng., PMP
Design Engineer

Telephone No. (431) 554-2606

Email Address crawsthorne@mpe.ca

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

D5. CONTRACTOR'S SUPERVISOR

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

D6. FURNISHING OF DOCUMENTS

D6.1 Upon award of the Contract, the Contractor will be provided with 'issued for construction' Contract Documents electronically, including Drawings in PDF format only.

SUBMISSIONS

D7. AUTHORITY TO CARRY ON BUSINESS

D7.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D8. SAFE WORK PLAN

D8.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site.

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, Purchasing Division website at <http://www.winnipeg.ca/matmgt/Safety/default.stm>

D8.3 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at their sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good

Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D9. INSURANCE

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

- (a) commercial general liability insurance, in the amount of at least five million dollars (\$5,000,000.00) inclusive, with The City of Winnipeg added as an additional insured; such liability policy to also contain a cross-liability clause, contractual liability, non-owned automobile liability, sudden and accidental pollution liability and products and completed operations cover, to remain in place at all times during the performance of the Work;
- (b) if applicable, Automobile Liability Insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than \$2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.
- (c) all risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, including testing and commissioning, written in the name of the Contractor and The City of Winnipeg, at all times during the performance of the Work and until the date of Total Performance

D9.2 Deductibles shall be borne by the Contractor.

D9.3 All policies shall be taken out with insurers licensed to carry on business in the Province of Manitoba.

D9.4 The Contractor shall provide:

- (a) The certificate of insurance, in a form satisfactory to the Supervisor of Insurance, to:

The City of Winnipeg
Risk Management
Insurance Section
185 King Street, 3rd Floor
Winnipeg, MB R3B 1J1

D9.5 The Contract Administrator with a copy of the certificate of insurance. At least two (2) Business Days of notification of the award of the Contract prior to the commencement of any Work on the Site.

D10. CONTRACT SECURITY

D10.1 The Contractor shall provide and maintain the performance bond and the labour and material payment bond until the expiration of the warranty period in the form of:

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

D10.1.1 Bonds are available at:

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

- (b) Labour & Material Payment Bond <https://www.winnipeg.ca/media/4930/>
 - (i) L&M Bond – Schedule A – Notice of Claim
<https://www.winnipeg.ca/media/4834/>
 - (ii) L&M Bond – Schedule B – Acknowledgement of a Notice
<https://www.winnipeg.ca/media/4835/>
 - (iii) L&M Bond – Schedule C – Surety's Position
<https://www.winnipeg.ca/media/4836/>

- D10.1.2 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:
- (a) the version submitted by the Contractor must have valid digital signatures and seals;
 - (b) the version submitted by the Contractor must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.
 - (c) the version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.
 - (d) the verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.
 - (e) the results of the verification must provide a clear, immediate and printable indication of pass or fail regarding D10.1(b).
- D10.1.3 Digital bonds failing the verification process will not be considered to be valid and may be determined to be an event of default in accordance with C18.1. If a digital bond fails the verification process, the Contractor may provide a replacement bond (in hard copy or digital format) within seven (7) Calendar Days of the City's request or within such greater period of time as the City in their discretion, exercised reasonably, allows.
- D10.1.4 Digital bonds passing the verification process will be treated as original and authentic.
- D10.2 The Contractor shall provide the Contract Administrator identified in D4 with the required performance and labour and material payment bonds within seven (7) Calendar Days of notification of the award of the Contract by way of an award letter and prior to the commencement of any Work on the Site.
- D10.3 The Contractor shall, as soon as practicable after entering into a contract with a Subcontractor:
- (a) give the Subcontractor written notice of the existence of the labour and material payment bond in D10.1(b); and
 - (b) post a notice of the bond and/or a copy of that bond in a conspicuous location at the Site of the Work.

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.
- D11.2 The Contractor shall state a price for each item or sub-item of the Work identified on Form I: Detailed Prices. The detailed prices must be consistent with the price(s) provided in the Contractor's Bid.

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.

D12.2 Subcontractors to be included on the subcontract list shall include:

- (a) Automation (Panel Builder) Supplier;
- (b) Lift Pump Supplier;
- (c) Natural Gas Generator Supplier;

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.

D14. DETAILED WORK SCHEDULE

D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule (Form L: Detailed Work Schedule) at least two (2) Business Days prior to the commencement of any Work on the Site.

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.

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

- (a) a critical path method (C.P.M.) schedule for the Work;
 - (b) a Gantt chart for the Work based on the C.P.M. schedule;
 - (c) a daily manpower schedule for the Work;
- 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 following activities/tasks making up the Work as well as showing those activities/tasks on the critical path.

- (a) Construction commencement
- (b) Mobilization and demobilization
- (c) By-pass pumping installations complete
- (d) By-pass pumping operations
- (e) Mechanical Work
- (f) Electrical and Automation Work
- (g) Structural and Architectural work
- (h) Civil site work
- (i) Lift Pump in-person factory testing
- (j) Generator in-person factory testing
- (k) Manhole installation
- (l) Lift station pump installations complete
- (m) Generator installation complete
- (n) Substantial performance
- (o) Training

- (p) Total performance
- (q) Redline as-built markups provided
- (r) Operations and Maintenance Manuals provided

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.

D14.5 Further to D14.2(c), the daily manpower schedule shall list the daily number of individuals on the Site for each trade.

D15. REQUIREMENT FOR SITE ACCESSIBILITY PLAN

D15.1 The Contractor shall provide the Contract Administrator with an Accessibility Plan at least five (5) Business Days prior to the commencement of any Work on the Site.

D15.2 The Accessibility Plan shall demonstrate how the Contractor will accommodate the safe passage of pedestrians and cyclists in accordance with the Manual of Temporary Traffic Control, the Contract Drawings, Staging Plans, and Streets By-Law No. 1481/77 at all times for the duration of the Construction. Unless noted in the Contract, the Accessibility Plan must include a written plan for the following:

- (a) How the Contractor will maintain at least one crossing in each direction for each intersection (one north/south crosswalk and one east/west crosswalk).
- (b) How the Contractor will maintain access to bus stops within the site.
- (c) How the Contractor will maintain access to pedestrian corridors and half signals.
- (d) How the Contractor will maintain cycling facilities.
- (e) How the Contractor will maintain access to residents and businesses unless otherwise noted in the Contract.
- (f) Any required detour signage at adjacent crossings to facilitate sidewalk or active transportation pathway closures.

D15.3 The Accessibility Plan may also include figures, sketches, or drawings to demonstrate the proposed plan.

D15.4 The Accessibility Plan shall include written details on how the Contractor intends to review, maintain, and document all items related to the Accessibility Plan on-site during Construction, including, but not limited to:

- (a) Signage
- (b) Temporary Ramping
- (c) Transit Stops
- (d) Detour Signage

D15.5 At minimum, the Contractor shall review the site conditions on a daily basis to ensure that all features related to the Accessibility Plan are in place. The site review is intended to correct deficiencies as a result of unforeseen events such as wind, traffic, or the general public. Deficiencies that are direct result of the Contractors actions must be corrected immediately.

D15.6 Any changes to the Accessibility Plan must be approved by the Contract Administrator.

D15.7 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.

D15.8 Deficiencies as a direct result of actions by the Contractor that are not immediately corrected and/or failure to produce records that demonstrate that the site was maintained in compliance

with the Accessibility Plan may result in a pay adjustment via the monthly Progress Payment. The rate of pay adjustment will be as per the following schedule:

- (a) First Offence – A warning will be issued and documented in the weekly or bi-weekly site meeting.
- (b) Second Offence - A field instruction to immediately correct the site will be issued by the Contract Administrator.
- (c) Third and subsequent Offences – A pay reduction will be issued in the amount of \$250.00 per instance and per day.

SCHEDULE OF WORK

D16. COMMENCEMENT

D16.1 The Contractor shall not commence any Work until they are in receipt of an award letter from the Award Authority authorizing the commencement of the Work.

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

- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in D7;
 - (ii) evidence of the workers compensation coverage specified in C6.17;
 - (iii) the Safe Work Plan specified in D8;
 - (iv) evidence of the insurance specified in D9;
 - (v) the contract 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;
 - (ix) the detailed work schedule specified in D14;
 - (x) the Requirement for Site Accessibility Plan in D15; and
 - (xi) the direct deposit application form specified in C12.20
- (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.
- (c) ^

D16.3 The Contractor shall commence the Work on the Site no later than June 1, 2026.

D16.4 Work on this project requiring the installation and use of temporary by-pass pumping is limited to the period between November 14 to February 29 of any given year, or as authorized by Contract Administrator. Under no condition shall temporary bypass pumping be utilized during March 1 – October 31.

D17. WORK BY OTHERS

D17.1 Further to C6.26, the Contractor's attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working within the project limit, approach roadway, adjacent roadways or right-of-way. The activities of these agencies may coincide with the Contractors execution of Work and it will be the Contractor's responsibility to cooperate to the fullest extent with other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of Contract.

D17.2 Work by others on or near the Site will include but not necessarily be limited to:

- (a) Coordination with Manitoba Hydro for the installation of the natural gas service.
- (b) Safety watch for work within 1m of the 115kV Manitoba Hydro cables north of the station. Refer to E7.7.

- (c) Vibration Monitoring by the Contract Administrator for protection of the 115kV Manitoba Hydro cables north of the station. Refer to E19.
- (d) Coordination of connections of new communications lines with Bell MTS.

D17.3 Further to D17.1 the Contractor shall cooperate and coordinate all activities with all parties performing required Work by Others identified in D17.1 and accommodate the necessary area on Site required for the Work by Others to complete the Work

D18. WORKING DAYS

- D18.1 Further to C1.1(xx), the Contract Administrator's determination of whether or not atmospheric and Site conditions are such that a Working Day is deemed to have elapsed may be based at one time on one type of work while at another time a Working Day may be based on another type of work. When more than one type of major work is involved, the quantity of equipment that must be able to work in order to meet the requirements of a Working Day may vary considerably from that specified in the General Conditions.
- D18.2 In the event that incidental work is behind schedule which, in the opinion of the Contract Administrator, should have been or could have been carried out by the Contractor in conjunction with or immediately following work of a major type, the City hereby reserves the right to charge Working Days on the incidental work until such time as it is up to schedule.
- D18.3 When the major type of work involves restoration of the site to the condition it was prior to rainfall, Working Days shall not be charged.
- D18.4 The Contract Administrator will furnish the Contractor with a daily record for each major type of work showing various information concerning the equipment, the time it worked, could have worked and Working Days charged. This report is to be signed each day by an authorized representative of the Contractor.

D19. CRITICAL STAGES

- D19.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:
- (a) Bypass Vault and force main valves completed by October 15, 2026.
 - (b) New lift pumps delivered to contractor in Winnipeg by December 31, 2026.
 - (c) New lift station pumps in operation on new controls by February 19, 2027.
- D19.1 Further to D19.1(c), if the new lift station pumps in operation on new controls date is missed, the Contractor will be required to upsize the bypass pumping capacity to meet the station capacity of at their own cost.

D20. SUBSTANTIAL PERFORMANCE

- D20.1 The Contractor shall achieve Substantial Performance by April 7, 2027.
- D20.2 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.
- D20.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.
- D20.4 The Contractor will be responsible for urgent needs and necessary maintenance of the lift station and equipment within, as follows:

- (a) From the date of mobilization to project completion, the contractor will be required, at minimum, to respond to service calls and callouts from SCADA by attending the site, opening the station, and making it safe for City staff to access equipment. This work shall be considered incidental to the contract.
- (b) During bypass pumping operations, and until the date in which Substantial Performance has been reached, the contractor will be required to respond to service calls, after-hours callouts from SCADA, and urgent requests. This includes 24/7 City callouts for any Maintenance and Operation work including:
 - (i) Unclogging of Lift Station equipment (wet well, lift pumps, process piping, etc.).
 - (ii) Responding to alarms that affect pumping (low flow alarm, level transmitters, high wet well, pump unclogging, station flood, etc.)
 - (iii) Providing backup power to the station in the event of a utility power failure until the new generator has been approved for use by AHJ.
 - (iv) For each response to these callouts occurring outside of regular business hours, \$1,000 may be claimed against the cash allowance. See E42.

D20.5 Substantial Performance requires commissioning forms to be completed with the Contract Administrator approval provided. The following items are required to qualify for Substantial Performance:

- (a) New lift pumps in service (including automation seal water operation) along with new controls and starters functioning;
- (b) HVAC system (including duct work, fans, dampers) are installed and operational;
- (c) HVAC controllers are functional;
- (d) PLC Control Panel installed with PLC & HMI screen programmed;
- (e) SCADA can read and control PLC signals;
- (f) Indoor (including emergency) and outdoor lighting installed and working;
- (g) Functional generator that can automatically start and stop with status signals sent to the PLC;
- (h) Station is on permanent power supply approved by City Inspections with no further shutdowns required;
- (i) Two (2) separate training sessions for Wastewater Maintenance and Operations staff provided.

D20.6 The Contractor will be required to provide the following documents prior to Substantial Performance being issued:

- (a) All completed commissioning forms (pdf);
- (b) Any equipment calibration certificates or settings (pdf);
- (c) Lift Pump Performance Reports (pdf);
- (d) All HVAC Balancing Reports (pdf); and
- (e) Final approved Shop Drawings (pdf);

D21. TOTAL PERFORMANCE

D21.1 The Contractor shall achieve Total Performance by June 4, 2027.

D21.2 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.

D21.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D21.4 The following items are required to qualify for Total Performance:

- (a) Site construction work is completed;
- (b) All equipment has been labeled with lamacoids;
- (c) All deficiencies have been resolved;
- (d) Site restoration work has been completed including site left in a clean condition (all garbage removed);
- (e) Site has been fully demobilized (site trailers removed, temporary structures/poles removed);
- (f) No active PLC alarms.

D21.5 The Contractor will be required to provide the following documents prior to Total Performance being issued:

- (a) Spare Parts List (pdf);
- (b) Draft Operations & Maintenance Manual (pdf); and
- (c) Red-Line Markups to capture all construction changes (pdf).

D22. LIQUIDATED DAMAGES

D22.1 If the Contractor fails to achieve Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:

- (a) Critical Stage, Bypass Vault and force main valves - one thousand dollars (\$1,000);
- (b) Critical Stage, Lift Pumps Delivered – three thousand dollars (\$3,000);
- (c) Critical Stage, Lift Pumps in Operation – two thousand dollars (\$2,000);
- (d) Substantial Performance – one thousand dollars (\$1,000);
- (e) Total Performance – five hundred dollars (\$500).

D22.2 The amounts specified for liquidated damages in D22.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve critical stages, Substantial Performance or Total Performance by the days fixed herein for same.

D22.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D23. SCHEDULED MAINTENANCE

D23.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

- (a) Landscaping maintenance as specified in CW3510;

D23.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D24. JOB MEETINGS

- D24.1 During the course of the contract, monthly project update meetings will be held virtually. During the period of November 1 through March 31 (refer to E9), project update meetings shall be biweekly rather than monthly. 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. During construction, site inspections will be weekly at minimum.
- D24.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever they deem it necessary.

D25. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

- D25.1 Further to C6.27, 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).

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

- D26.1 Further to B13.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at their sole discretion and acting reasonably, require updated proof of compliance, as set out in B13.4

D27. STANDARDIZED GOODS

- D27.1 The following goods have been standardized by the City and will be supplied by the Contractor:
- (a) Standardized Control System and Motor Control Equipment as per E13.
 - (b) Standardized Instrumentation as per E14.
 - (c) Standardized Gas Detection Systems as per E15.
- D27.2 Contractual Arrangements
- (a) Each Standardization Vendor shall be a Subcontractor of the Contractor.
 - (b) The City's contract with each of the Standardization Vendors defines the prices and general terms of supply to the Contractor. Each Standardization Vendor is obligated to enter into a contract with the Contractor, based upon such prices and general terms of supply.
 - (i) The City is not a party to any contract between a Standardization Vendor and the Contractor, or any Subcontractor.
 - (c) In the event that a potential dispute arises between the Contractor and a Standardization Vendor, the Contract Administrator shall be notified.
- D27.3 Payment of Standardization Vendors
- D27.3.1 The Contractor is obligated to pay the Standardization Vendors in accordance with general terms of supply applicable to such Standardization Vendor.
- D27.3.2 The Contractor's payment terms to the Standardization Vendor, in respect of Standardized Control System and Motor Control Equipment identified in E13, include the following:

- (a) Except as indicated in (b), payment shall be in Canadian funds net thirty (30) Calendar Days after shipment.
- (b) Payment for motor control centres shall be in Canadian funds net thirty (30) Calendar Days and initiated based upon the following schedule:
 - (i) Upon approval of the shop drawings or forty (40) Calendar days after the last comprehensive submittal, in the event that a response is not made to the submittal: 25% of the total value.
 - (ii) Upon delivery of the complete MCC along with all associated as-manufactured documentation: 60% of the total value; or
 - (iii) In the event that the delivery is intentionally delayed, upon request by the Contractor, the following payment schedule would replace the 60% payment:
 - ◆ Upon completion of the FAT and delivery of all as-manufactured documentation to the Contractor – 30% of the total value.
 - ◆ Forty (40) Calendar days after delivery of the as-manufactured documentation to the Contractor, or upon delivery, whichever comes sooner – 30% of the total value.
 - (iv) Upon successful commissioning and delivery of documentation or six (6) months after delivery, whichever comes first: 15% of the total value.

D27.3.3 The Contractor's payment terms to the Standardization Vendor, in respect of Standardized Gas Detection Systems identified in E15, include the following:

- (a) Payment shall be in Canadian funds net thirty (30) Calendar Days after receipt and approval of the Standardization Vendor's invoice.

D27.3.4 The Contractor's payment terms to the Standardization Vendor, in respect of Standardized Instrumentation identified in E14, include the following:

- (a) Payment shall be in Canadian funds net thirty (30) Calendar Days after receipt and approval of the Standardization Vendor's invoice.

PAYMENT

D28. PAYMENT

D28.1 Further to C12, the City shall make payments to the Contractor by direct deposit to the Contractor's banking institution, and by no other means. Payments will not be made until the Contractor has made satisfactory direct deposit arrangements with the City. Direct deposit application forms are at https://winnipeg.ca/finance/files/Direct_Deposit_Form.pdf.

D28.1 Further to E42 no payment will be made for Cash Allowances other than as set out in E42.5.

D29. PAYMENT SCHEDULE

D29.1 Further to C12, payment shall be in accordance with the following payment schedule:

- (a) Monthly invoices for Work performed during the previous calendar month.

WARRANTY

D30. WARRANTY

D30.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire one (1) year thereafter, except where longer warranty periods are specified in the respective Specification sections, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

D30.1.1 For the purpose of contract security, the warranty period shall be one (1) year.

- D30.2 Notwithstanding C13.2, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.
- D30.2.1 In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.
- D30.2.2 The Contractor will be required to attend a warranty inspection site visit approximately ten (10) months after the date of Total Performance. Any deficiencies found during the site visit along with prior to completion of the warranty period, the Contractor will be provided with a deficiency list and will be required to correct all deficiencies.

INDEMNITY

D31. INDEMNITY

- D31.1 Indemnity shall be as stated in C17.

FORM I: DETAILED PRICES
(See D11)

TYLEHURST LIFT STATION 2026 UPGRADES

ITEM NO.	DESCRIPTION	SPEC. REF.	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
1.						
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FORM I: DETAILED PRICES
(See D11)

TYLEHURST LIFT STATION 2026 UPGRADES

ITEM NO.	DESCRIPTION	SPEC. REF.	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT
31.						
32.						
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FORM K: EQUIPMENT
(See D13)

TYLEHURST LIFT STATION 2026 UPGRADES

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

FORM K: EQUIPMENT
(See D13)

TYLEHURST LIFT STATION 2026 UPGRADES

<p>4. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p>5. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>
<p>6. Category/type:</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p> <p>Make/Model/Year: _____ Serial No.: _____</p> <p>Registered owner: _____</p>

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 *The City of Winnipeg Standard Construction Specifications* in their entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Purchasing Division website at <http://www.winnipeg.ca/matmgt/Spec/Default.stm> .
- E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.2.3 Further to C2.4(d), Specifications included in the Tender shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.3 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B7. In every instance where a brand name or design specification is used, the City will also consider approved equals and/or approved alternatives in accordance with B7.
- E1.4 The following are applicable to the Work:

<u>Specification No.</u>	<u>Specification Title</u>
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01 56 00		Temporary Barriers and Enclosures
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1-0193L-A0001-002	PB	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLAN	PLANS AND SECTIONS	MOTOR AND PUMP ROOM NEW WORK
1-0193L-A0002-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PANEL LAYOUT AND BILL OF MATERIALS	HVAC VENTILATION CONTROL PANEL CP-L82	
1-0193L-A0003-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION POWER DISTRIBUTION WIRING SCHEMATIC	HVAC VENTILATION CONTROL PANEL CP-L82	
1-0193L-A0004-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PANEL LAYOUT AND BILL OF MATERIALS	PLC CONTROL PANEL CP-L81	
1-0193L-A0005-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION BLOCK DIAGRAM	PLC CONTROL PANEL CP-L81	NETWORK BLOCK DIAGRAM
1-0193L-A0006-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION POWER DISTRIBUTION WIRING SCHEMATIC	PLC CONTROL PANEL CP-L81	
1-0193L-A0007-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	DISCRETE INPUT - RACK 0, MODULE 6
1-0193L-A0008-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	DISCRETE INPUT - RACK 0, MODULE 7
1-0193L-A0009-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	DISCRETE INPUT - RACK 0, MODULE 8
1-0193L-A0010-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	DISCRETE OUTPUT - RACK 0, MODULE 9
1-0193L-A0011-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	ANALOG INPUT - RACK 0, MODULE 10
1-0193L-A0012-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	ANALOG INPUT - RACK 0, MODULE 11
1-0193L-A0013-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	ANALOG INPUT - RACK 1, MODULE 2
1-0193L-A0014-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	ANALOG INPUT - RACK 1, MODULE 3
1-0193L-A0015-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	ANALOG INPUT - RACK 1, MODULE 4
1-0193L-A0016-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION PLC I/O WIRING	PLC CONTROL PANEL CP-L81	ANALOUTPUT - RACK 1, MODULE 5
2-0193L-A0017-001	01	TYLEHURST LIFT STATION	2027 UPGRADES	AUTOMATIC PUMP CONTROL WIRING SCHEMATIC	PLC CONTROL PANEL CP-L81	LOCAL MODE AND PLC MODE OF OPERATION
1-0193L-A0018-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	PANEL LAYOUT AND BILL OF MATERIAL	INTRINSICALLY SAFE JUNCTION BOX	JBA-L85
1-0193L-A0019-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	PANEL LAYOUT AND BILL OF MATERIAL	BEARING PROTECTION AND MONITORING	FDP-L010, FDP-L020, FDP-L030
1-0193L-A0020-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	WET WELL LEVEL CONTROLLER	LIC-L100-1, LIT-L100-1
1-0193L-A0021-002	01	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	WET WELL LEVEL CONTROLLER	LIC-L100-2, LIT-L100-2

1-0193L-A0022-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT STATION H2S GAS MONITORING DETECTOR	AIT-L510, AE-L510-1, AE-L510-2
2-0193L-A0023-001	01	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT STATION METHANE GAS MONITORING DETECTOR	AIT-L520, AE-L520-1
1-0193L-A0024-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L01 DISCHARGE FLOW TRANSMITTER	FE-L012, FIT-L012
1-0193L-A0025-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L02 DISCHARGE FLOW TRANSMITTER	FE-L022, FIT-L022
1-0193L-A0026-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L03 DISCHARGE FLOW TRANSMITTER	FE-L032, FIT-L032
1-0193L-A0027-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	WET WELL HIGH HIGH LEVEL FLOAT SWITCH	LSHH-L101
1-0193L-A0028-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	PUMP ROOM AND COMMINUTOR CHAMBER FLOOD FLOAT SWITCHES	LSH-L501, LSH-L502
1-0193L-A0029-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	CSO WEIR OVERFLOW ALARM FLOAT SWITCH	LSH-S663
1-0193L-A0030-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT STATION AIR FLOW SWITCH	FSL-L622, FSL-L613, PDSH-L601
1-0193L-A0031-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT STATION OCCUPANCY AND TEMPERATURE SWITCHES	HS-L604, TSH-L600, TSL-L600
1-0193L-A0032-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT STATION HVAC RECIRCULATION AIR DAMPER	FV-L611, FV-L612, FV-L621
1-0193L-A0033-001	01	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT STATION DUCT HEATER TEMPERATURE AND CONTROL	TE-L600, TY-L651
1-0193L-A0034-001	PB	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	GENERATOR ROOM COMBUSTION AIR DAMPER	FV-L631
1-0193L-A0035-001	PB	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	GENERATOR ROOM RECIRCULATION AIR DAMPERS	FV-L632, FV-L633, FV-L634-1, FV-L634-2, FV-L634-3
1-0193L-A0036-001	PB	TYLEHURST LIFT STATION	2027 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT STATION TEMPERATURE TRANSMITTER	TT-L635
1-0193L-A0037-001	PB	TYLEHURST LIFT STATION	2028 UPGRADES	AUTOMATION LOOP DIAGRAM	GENERATOR MONITORING SIGNALS	GEN-L72
1-0193L-A0038-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L01 SEAL WATER FLOW SWITCH	FSL-L011
1-0193L-A0039-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	PUMP P-L01 SHAFT BEARING TEMP/VIB MONITORING	TE-L010-1, TE-L010-2, VE-L010-1, VE-L010-2
1-0193L-A0040-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L02 SEAL WATER FLOW SWITCH	FSL-L021
1-0193L-A0041-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	PUMP P-L02 SHAFT BEARING TEMP/VIB MONITORING	TE-L020-1, TE-L020-2, VE-L020-1, VE-L020-2
1-0193L-A0042-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L03 SEAL WATER FLOW SWITCH	FSL-L031
1-0193L-A0043-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	PUMP P-L03 SHAFT BEARING TEMP/VIB MONITORING	TE-L030-1, TE-L030-2, VE-L030-1, VE-L030-2
1-0193L-A0044-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	MAIN FLOOR TEMPERATURE TRANSMITTER	TT-L661
1-0193L-A0045-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	MOTOR ROOM TEMPERATURE TRANSMITTER	TT-L691

1-0193L-A0046-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	PUMP ROOM TEMPERATURE TRANSMITTER	TT-L692
1-0193L-A0047-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	POTABLE WATER SUPPLY LOW PRESSURE	PSL-L526
1-0193L-A0048-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L01 MOTOR HIGH TEMPERATURE SWITCH	TSH-L011
1-0193L-A0049-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L02 MOTOR HIGH TEMPERATURE SWITCH	TSH-L021
1-0193L-A0050-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	LIFT PUMP P-L03 MOTOR HIGH TEMPERATURE SWITCH	TSH-L031
1-0193L-A0051-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	CSO PANEL UPSTREAM OF WEIR FLOW	FE-S761-1, FE-S761-2, FIT-S761
1-0193L-A0052-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	CSO LEVEL TRANSMITTER UPSTREAM AND DOWNSTREAM	LI-S751, LI-S751, LIT-S951, LI-S951
1-0193L-A0053-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	CSO PANEL FLAP GATE MONITORING	ZI-S851, ZT-S851
1-0193L-A0054-001	01	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION LOOP DIAGRAM	AUTOMATIC TRANSFER SWITCH	ATS-L72

AUTOMATION DOCUMENTS

5-0193L-A0001-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION SETTING LETTER	HVAC TEMPERATURE CONTROLLER	TIC-L600
5-0193L-A0002-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	AUTOMATION SETTING LETTER	HVAC TEMPERATURE CONTROLLER	TIC-L630
5-0193L-A0003-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	DNP3 MAPPING I/O LIST	PLC-L81	
5-0193L-A0004-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	INSTRUMENT LIST		
5-0193L-A0005-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	PROCESS CONTROL NARRATIVE	PLC-L81	
5-0193L-A0006-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	PLC PROGRAMMING REPORT	PLC-L81	

ELECTRICAL DOCUMENTS

5-0193L-E0001-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	ELECTRICAL SETTING LETTER	VARIABLE FREQUENCY DRIVE VFD-L01	LIFT PUMP P-L01
5-0193L-E0002-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	ELECTRICAL SETTING LETTER	VARIABLE FREQUENCY DRIVE VFD-L02	LIFT PUMP P-L02
5-0193L-E0003-001	00	TYLEHURST LIFT STATION	2026 UPGRADES	ELECTRICAL SETTING LETTER	VARIABLE FREQUENCY DRIVE VFD-L03	LIFT PUMP P-L03

E2. SOILS INVESTIGATION REPORT

E2.1 Further to C3.1,

- (a) A Geotechnical test hole has been drilled in the vicinity of the proposed Works at the Tylehurst Lift Station site to determine the character of subsurface soil to facilitate the design of the Work. The information listed is considered accurate at the location indicated in the Site Plan and at the time of the investigation. However, considerable variations in the soil conditions may exist between the test hole and fluctuations in ground water levels can be expected seasonally. The Geotechnical Report is included in Appendix C.
- (b) Bidders are responsible for any interpretation they place on the supplied information and are expected to make such additional investigation of the soil at the Site as they feel necessary to satisfy themselves.
- (c) Any test borings made by the Bidder shall be done in accordance with the requirements of the appropriate authority of the City of Winnipeg. Bidders shall notify the Contract Administrator prior to starting any soil boring operation.

GENERAL REQUIREMENTS

E3. OFFICE FACILITIES

E3.1 The Contractor shall supply a site trailer with available space for intermittent use by the Contract Administrator.

E3.2 The Contractor shall supply office facilities meeting the following requirements:

- (a) Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
- (b) Provide marked and fully stocked first-aid case in a readily available location.
- (c) Subcontractors to provide their own offices as necessary. Direct location of these offices.
- (d) Supply temporary office facilities for the Contract Administrator on Site, meeting the following requirements
 - (i) Minimum floor area of 20 square metres, with windows and a door entrance complete with suitable lock satisfactory to the Contract Administrator.
 - (ii) Suitable for all-weather use and capable of maintaining a temperature range between 20 and 25 degrees C.
 - (iii) Equipped with fluorescent lights and 120 volt ac electrical wall outlets.
 - (iv) Furnished with one desk, one filing cabinet, and two chairs, all satisfactory to the Contract Administrator.
 - (v) All of the temporary structures provided by the Contractor for this project shall be stabilized in a sufficient manner to prevent the temporary structure from being overturned by wind forces as defined in the National Building Code (NBC). The stabilization provided shall be designed by a Professional Engineer registered in the Province of Manitoba. Detailed drawings and design notes for the stabilization works bearing the Engineer's seal shall be provided to the Contract Administrator for review.
 - (vi) Maintain in clean condition.
- (e) The Contractor shall be responsible for installation, maintenance, removal, operating costs, and service installation costs for the office facilities as described herein.

E4. HAZARDOUS MATERIALS

E4.1 The Hazardous Materials Assessment is included in Appendix B of this tender.

- E4.2 The Contractor shall note the presence of lead in paints and asbestos containing materials used in existing construction and handle such elements in strict compliance with provincial regulations such as “Managing Demolition Debris Containing Hazardous Materials” by Environmental Compliance and Enforcement, The Dangerous Goods Handling and Transportation Act, Hazardous Waste Regulation etc.
- E4.3 The Hazardous Materials Assessment does not include construction materials which are hidden from view such as superstructure roof base layers, wall finishes hidden from view or any other materials that were not assessed and which are to be demolished. The Contractor shall treat such materials as containing asbestos and shall handle these materials in strict compliance with any provincial regulations such as “Managing Demolition Debris Containing Hazardous Materials” by Environmental Compliance and Enforcement, The Dangerous Goods Handling and Transportation Act, Hazardous Waste Regulation etc.
- (a) As an alternative to handling unassessed materials as hazardous, the Contractor may test them, and in the event that laboratory testing reveals no hazardous contents, the tested materials can be handled as non-hazardous. Cost for such testing shall be responsibility of the Contractor. Provide testing results to Contract Administrator as soon as they become available.

E5. MOBILIZATION AND DEMOBILIZATION PAYMENT

- E5.1 Description
- (a) This Specification shall govern mobilization and demobilization from site.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, Materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.
- E5.2 The Work under this Specification shall include, but not be limited to:
- (a) submission of Site layout plan
- (b) mobilizing and demobilizing on-Site Work facilities;
- (c) supplying, setting up, laying out and removing Site office facilities;
- (d) install, maintaining and removing any access roadway; and traffic control and traffic management.
- (e) Providing 24/7 security watch while workers are not on site during period when building is being demolished until new building is constructed with a lockable door installed to prevent unauthorized access.
- E5.3 Mobilization and demolition are in accordance with the most recent Standard Construction Specifications:
- (a) CW 1120 – Existing Services, Utilities and Structures; and
- (b) CW 1130 – Site Requirements.
- E5.4 Submittals
- (a) The Contractor shall submit the following to the Contract Administrator fourteen (14) days prior to mobilization on-Site:
- (i) a plan highlighting the Site layout plan which includes laydown area location(s), staging areas, office facility location, access road(s), temporary secure fencing limits and gate locations for review and approval.
- (b) Contractor shall refer to the Drawings for limits of construction.
- E5.5 Materials and Equipment
- (a) All Materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.

- (b) The Contractor shall be responsible for the supply, safe storage, and handling of all Materials as set forth in this Specification. All Materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.
- (c) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E5.6 Construction Methods

- (a) Site Inspection:
 - (i) inspect the Site with the Contract Administrator to verify existing conditions prior to mobilizing on-Site; and
 - (ii) inspect the Site with the Contract Administrator soon after demobilizing on-Site, confirming Site has been restored to its original condition prior to initiation of Work;
- (b) Layout of On-Site Work Facilities:
 - (i) the Contractor shall mobilize all on-Site Work and other temporary facilities; and
 - (ii) upon completion of construction activities, the Contractor shall remove all on-Site Work and other temporary facilities;
- (c) Cellular Telephone Communication:
 - (i) the Contractor's Site supervisor is required to carry, at all times, a cellular telephone, with voicemail;
- (d) Access Roadway:
 - (i) the Contractor shall maintain any access roadway they install;
 - (ii) the access road shall be maintained on a regular basis to provide continual unrestricted Site access, to the satisfaction of the Contract Administrator; and
 - (iii) upon completion of the Work, the area shall be restored to its original condition;
- (e) Snow and Ice Removal:
 - (i) if required, snow clearing shall be done by the Contractor on a regular basis; and
 - (ii) if required, snow cover shall be cleared from the construction Site prior to commencement of the Work. The methodology to clear the snow shall be subject to the approval of the Contract Administrator;
- (f) Restoration of Existing Facilities:
 - (i) upon completion of the Work and demobilization, the Contractor shall restore existing facilities to their original condition, including snow removal, to the approval of the Contract Administrator.

E5.7 Measurement and Payment

E5.7.1 Mobilization and Demobilization

- (b) Mobilization and demobilization will be measured on a lump sum basis and paid for at the Contract Unit Price for "Mobilization and Demobilization" as shown in Form B for supplying all Materials and for performing all operations herein described and all other item incidental to the Work included in this Specification and accepted by the Contract Administrator.
- (c) Thirty percent (30%) payment when Contract Administrator is satisfied that construction has commenced;
- (d) Fifty percent (50%) during construction percentage distributed equally on a monthly basis at the discretion of the Contract Administrator; and
- (e) Twenty percent (20%) upon completion of the Work.

E6. TRAFFIC CONTROL

- E6.1 In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), the Contract Administrator shall make arrangements with the Traffic Services Branch of the City of Winnipeg to place, maintain, and remove all regulatory signs and traffic control devices authorized and/or required by the Traffic Management Branch in the following situations:

- (a) Parking restrictions,
 - (b) Stopping restrictions,
 - (c) Turn restrictions,
 - (d) Diamond lane removal,
 - (e) Full or directional closures on a Regional Street,
 - (f) Traffic routed across a median,
 - (g) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.
 - (h) Approved Designated Construction Zones with a temporary posted speed limit reduction. Traffic Services will be responsible for placing all of the advance signs and 'Construction Ends' (TC-4) signs. The Contractor is still responsible for all other temporary traffic control including but not limited to barricades, barrels and tall cones.
- E6.2 Further to E6.1, the Contractor shall make arrangement with the Traffic Services Branch of the City of Winnipeg to supply regulatory signs as required.
- E6.3 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the Site has been maintained.
- E6.4 Further to (c) and E6.2 the Contractor shall make arrangements with the Traffic Services Branch of the City of Winnipeg to reinstall the permanent regulatory signs after the Contract Work is complete. At this time the Contractor shall make arrangements to drop off the stockpiled materials to Traffic Services at 495 Archibald Street.
- E6.5 Any changes to the approved traffic management plan must be submitted to the Contract Administrator a minimum of (five) 5 Working Days prior to the required change for approval.
- E6.6 If the Contract Administrator determines that the Contractor is not performing Traffic Control in accordance with this specification, Traffic Services Branch may be engaged to perform the Traffic Control. In this event the Contractor shall bear the costs associated charged to the project by the Traffic Services Branch of the City of Winnipeg in connection with the required Works undertaken by the Contractor.
- E6.7 No stockpiling of material will be permitted on the roadway.
- E6.8 Intersecting street and private approach access shall be maintained at all times.
- E6.9 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, they shall review the planned disruption with the residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.
- E6.10 Pedestrian access and ambulance/emergency vehicle access must be maintained at all times.
- E6.11 Pedestrian access shall be restricted by maintaining a security fence around the perimeter of the Work site.
- E6.12 Payment
- (a) Traffic Management shall be considered incidental to the Works of this Contract and no separate payment will be made for this item.
 - (b) Payment shall be distributed equally on a monthly basis at the discretion of the Contract Administrator.

E7. DANGEROUS WORKS CONDITIONS

- E7.1 Further to clause C6.24 of the General Conditions, the Contractor shall be aware that underground chambers, lower levels of the lift station, manholes, and sewers are considered a confined space and shall follow the "Guidelines for Confined Entry Work" as published by the Manitoba Workplace Safety and Health Division. The Contractor will be required to have Confined Space Entry Training and complete a permit each time work is to be performed in a Confined Space Area. The following locations are considered Confined Spaces:
- (a) Hazardous Confined Spaces:
 - (i) Gate Chamber.
 - (ii) Lift Station Wet Well.
 - (iii) Sewer pipes and manholes.
 - (b) Confined Spaces:
 - (i) Lift Station Dry Well (including Pump Room, Motor Room, Comminutor Chamber, Main Floor).
 - (ii) Any other areas labelled as 'Confined Space' at the Site.
- E7.2 The Contractor shall be aware of the potential hazards that can be encountered in confined spaces such as toxic gases and oxygen deficiency. The Contractor's Safe Work Plan should address these issues.
- E7.3 The air in a confined space must be tested before entry and continuously during the time that personnel are inside the space. Equipment for continuous monitoring of gases must be explosion-proof and equipped with a visible and audible alarm. The principal tests are for oxygen deficiency, explosion range, and toxic gases. Testing equipment must be calibrated in accordance with manufacturer's specifications. The Contractor is responsible for all testing requirements.
- E7.4 The Contractor shall provide temporary ventilation for all confined spaces including underground chambers, tunnels, pipes and shafts as required and approved by the Manitoba Workplace Safety and Health Act (the "Act"), until permanent ventilation and gas detection infrastructure is in place. If no ventilation is supplied, a Worker must wear a respirator or supplied air to enter the confined space.
- E7.5 Workers must wear a respirator or have supplied air at all times when entering a chamber, manhole or sewer where live sewage is present.
- E7.6 If products containing volatile organic carbons (VOCs) are used, the Contractor shall provide a photoionization detector (PID) on Site to monitor potential VOCs in the confined spaces. The gas detector and safety equipment conforming to the Act shall be made available to the Contract Administrator for his use during inspections. In addition, the Contract Administrator may collect discrete air samples for laboratory analysis.
- E7.7 The project requires excavation near high-voltage Manitoba Hydro cables just north of the lift station. This is considered dangerous work. A safety watch is required during this work. Refer to E7.
- E7.8 The Contract Administrator may issue a Stop Work order to the Contractor if the above guidelines are not being followed. The Contractor shall not resume his operations until the Contract Administrator is satisfied the Contractor is following the appropriate procedures. The Contractor shall have no claim for extra time or costs due to the Stop Work order for not following these safety guidelines.
- E7.9 Measurement and Payment
- E7.9.1 This item will be paid on a "Lump Sum" basis based upon the additional cost incurred during construction due to the requirements of E7.

E8. BY-PASS CHAMBER AND WET WELL ACCESS VAULT

E8.1 Description

E8.1.1 The Work to be done by the Contractor under this Specification shall include the supply and construction of the By-Pass Chamber and Valve Assembly, excavation, bedding, and backfill. Furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary for an incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E8.2 Construction

- (a) The Contractor shall be responsible to obtain all necessary permits from the concerned offices/agencies in regard to the construction of the by-pass valve chamber and valve assembly. The Contractor will satisfy all permits and application requirements including any testing (e.g., geotechnical, etc.) if required to obtain the permit at no extra cost.
- (b) Survey and locate all existing services and limits of proposed excavation relative to existing structures. The Contractor shall provide all survey and layout Work necessary to accurately layout and position the new construction. The Contract Administrator, at their sole discretion, may undertake a confirmatory survey of the Contractor's Work if considered necessary.
- (c) Design, supply, and install shoring system necessary for opening the new excavation to the required depth and dimensions necessary to install the new assembly.
- (d) All excavations within 1.5 metres of sewers and 3 meters of underground power lines to be soft dug, either hydro excavated or by hand, as necessary to avoid potentially damaging the existing utilities. All work conducted within 3 meters of the 115kV underground cable is required to be supervised by a Manitoba Hydro safety watch. Once the structure is erected, work that is fully encompassed inside the structure but is within 3 meters of the 115kV underground cable does not require a Manitoba Hydro safety watch.
- (e) Any service interruption shall conform to E34.
- (f) The requirements of D20.4(b) apply.

E8.3 Excavation Security Fence

- (a) According to E20.2.2

E8.4 Restoration

- (a) Restore the disturbed area and surface during construction to match the existing surroundings as per the City requirements and applicable standards.

E8.5 Bedding and Backfill

E8.5.1 Bedding and Backfill

- (a) Pipe bedding and initial backfill material to be sand in accordance with CW 2030. Backfill under the force main connections shall extend past the flexible couplings to the base of the concrete with cement stabilized fill and bear against undisturbed soil.
- (b) Otherwise backfill to be class 1 backfill in accordance with CW 2030.
- (c) The Contractor shall provide heating and hoarding of backfill material when the temperature is at or below 5° C or if the temperature will fall below 5° C within 24 hours after placing material.

E8.5.2 Bypass pumping of the lift station will convey flows from the sewer upstream of the lift station to a new bypass valve chamber in the lift station.

- (a) Therefore, the valve chamber must be constructed prior to bypass pumping operations.
- (b) The gate valve in the comminutor room is inoperable and to be replaced during this project. Therefore, an inflatable sewer plug is to be used. Therefore, the 1800mm manhole must be installed prior to bypass pumping operations.

- (c) The Bypass Valve Chamber must be installed between May 1 and October 15. Under no circumstances shall bypass valves be installed on the force main on a day where rain is forecasted. Provide OSS to the contract administrator for approval a minimum of two (2) weeks prior to the installation of bypass valves.

E8.5.3 Special Requirements

- (a) Refer to 1-0193L-C0003-001 for construction sequencing to maintain station operation during construction.
- (b) Contractor to note the presence of the buried 115kV Manitoba Hydro cables to the north of the lift station building. Refer to E19 for requirements.
- (c) Excavation and the installation of shoring piles is to be coordinated with Manitoba Hydro due to the depth and proximity to the nearby Manitoba Hydro compound fence and grounding grid.

E8.6 Measurement and Payment

- E8.6.1 This item will be paid for at the Contract Lump Sum Price for "Bypass Chamber and Wet Well Access Vault". Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this specification, accepted by the Contract Administrator.

E9. WASTEWATER BYPASS PUMPING

E9.1 Description:

- E9.1.1 This section specifies the requirements for the temporary by-pass pumping of wastewater flows during the Work.
- E9.1.2 Refer to the contract civil drawings for bypass pumping notes.
- E9.1.3 Contractor to provide a Bypass Pumping Plan and OSS to the contract administrator for approval a minimum of two (2) weeks prior to the commencement of any work.
- E9.1.4 Bypass pumping of the lift station will convey flows from the sewer upstream of the lift station to a new bypass valve chamber in the lift station. Therefore, the valve chamber must be constructed prior to bypass pumping operations.
 - (a) Under dry weather flows, the time to overflow is listed below. The Contractor will be required to raise the existing weir during bypass pumping such that there is at least one (1) hour of storage time prior to an overflow occurring.
 - (i) Time to overflow existing weir: 15 minutes.
 - (ii) Time to overflow weir raised by 900mm: 2hours and 45 minutes
 - (b) Under dry weather flows, the time to basement flooding (overflow blocked) is listed below. The Contractor will be required to ensure that there is no basement flooding while bypass pumping is performed.
 - (i) Critical manhole: S-MH70013355 (intersection of Richmond Way & Richmond Street).
 - (ii) Critical manhole rim elevation: 231.396 maSL.
 - (iii) Critical basement flooding elevation: 228.996 maSL.
 - (iv) Monitoring manhole: S-MH20010427 (egg sewer MH at intersection of Wolseley Avenue West and Tylehurst Street).
 - (v) Monitoring manhole rim elevation: 231.600 maSL.
 - (vi) Time to basement flooding elevation at monitoring manhole: 36 hours.
- E9.1.5 Refer to 1-0193L-C0003-001.
- E9.1.6 Bypass pumping is to include two (2) electric pumps (duty and stand-by) installed and ready for duty at any time.

- (a) A new bypass valve chamber is to be constructed directly north of the lift station. The chamber shall be constructed in accordance with the drawings.
- (b) Each pump is to be sized for a flow of 105 L/s, at a total dynamic head to be determined by the bypass pumping system designer. Only one pump will be required to run at any given time.
- (c) Pumps must be electric and submersible.
- (d) The contractor shall install temporary plugs and piping in accordance with the drawings to create a new sump in the sewer or CSO outfall structure for installation of the pumps.
- (e) A backup generator capable of powering a single bypass pump, along with the existing RTU and CSO Panels, are required to be on-site at all times during any bypass pumping operations.
- (f) Temporary force mains will be required to tie into bypass vault valve. Contractor shall ensure that temporary force mains are protected in order to avoid releasing wastewater to the site. Contractor to ensure that the force mains do not restrict access to the lift station for City operations staff.

E9.1.7 Contractor to provide 24-hour availability every day for the duration of the bypass pumping operations to immediately address interruptions in bypass pumping and mitigate the risks of spills, overflows, or basement flooding. Emergency contact information will be provided in the bypass pumping plan & OSS.

E9.1.8 Contractor to review and verify the critical basement elevation in the catchment area.

E9.1.9 Sewers can receive flow of an undetermined amount from watermain breaks, snow melt, rain, and other unforeseen sources. The Contractor will be responsible to monitor the flow in the sewer and adjust work activities accordingly, such as putting the spare standby bypass pump into operation to handle any excessive flows due to unforeseen flow.

E9.1.10 All instrumentation in the sewer and lift station are to be protected and avoided at all times.

E9.2 Materials

E9.2.1 Temporary By-Pass Pumping Equipment

- (a) Non-clog submersible pumping units, or self-priming skid-mounted units, each sized to meet or exceed the required capacity. Complete with all required piping, fittings, floats, alarms, back-up generator, pump controls, and related appurtenances suitable for temporary installation in the existing manhole.
- (b) Duty pump and stand-by pump(s) to each provide a duty point flow of one hundred and five 105 L/s.
- (c) Provide model and capacity curves to the Contract Administrator for approval.
- (d) Surface mount, vertical lift suction pumps are not acceptable.
- (e) Power supply to be suitably sized for pumping equipment complete with all required controls. Fuel to be in lockable, tamperproof container, approved by Contract Administrator.
- (f) Contractor shall take special precautions and supply noise abatement measures as required to reduce the public exposure to noise to ensure all work is conducted in accordance with the City of Winnipeg Neighbourhood Liveability By-Law, Part 5 – Noise Control. Such measures may include but are not limited to:
 - (i) Enclosures for noise producing equipment (pumps, generators, etc.)
- (g) The Contractor shall provide separate temporary motor starters for each pump and arrange for any temporary power required from Manitoba Hydro. Motor starters shall be installed at an easily accessible and secured location. Motor starters shall include automatic and manual modes of operation along with pilot indicating lights (run, fault, etc.).

- (h) Provide a check valve on the by-pass pumping discharge pipe to prevent cycling when the pumping station is activated.
- (i) The Contractor is advised that the pumping station will remain in service while the Work is being completed, except for planned temporary shutdowns as described in E34. The Contractor shall cooperate and coordinate with the City to allow full access at all times for City staff to carry out maintenance and operational duties.
- (j) If a temporary pump in use fails, it must be replaced immediately.
- (k) The Contractor shall ensure temporary by-pass pumping equipment and Materials will be properly insulated and heated, if required, to be protected from freezing and to maintain proper functioning during cold weather.
- (l) Under no circumstances shall wastewater levels in the sewer rise above the critical basement elevation indicated.
- (m) Temporary by-pass pumping equipment and Materials shall remain on-Site until the lift station construction is completed as described in these Specifications and to the satisfaction of the Contract Administrator.

E9.2.2 Pumps Controls

- (a) Control system complete with float switches for automatic level control. Pumps shall automatically turn on and off along with include manual operation.
- (b) Temporarily connect all pump controls and signals to the RTU control panel. The monitoring points shall include all pump controls, auto modes, manual modes, pumps running, pump faults along with monitoring a high level alarm and loss of utility power.
- (c) All signals going to/from the RTU control panel shall be hard wired.

E9.2.3 Backup Power

- (a) Provide a portable fuel generator during the entire time temporary bypass pumping is in place to provide backup power in the event of a utility failure. Switching to generator and back to utility shall be a manual transfer switch. Contractor shall monitor generator fuel levels and top up as needed.

E9.2.4 Fittings and Appurtenances

- (a) Fittings, coupling and appurtenances to be used for repairs to existing force mains and sewers to be approved products for underground use in the City of Winnipeg.

E9.2.5 Inflatable Rubber Sewer Plugs may be used as needed

- (a) Except for gates and valves, only inflatable rubber sewer plugs or weir structures shall be used to plug sewers.
 - (i) Made of rubber, capable of remaining in place when inflated to the pressure required to withstand the expected sewer levels.
 - (ii) Provided with an inflation/deflation hose, monitoring pressure valve, removal rope or cable and safety chain, all of sufficient length to reach ground elevations for monitoring and removal.
- (b) Clean sewer pipe as required to properly install inflatable sewer plug(s) in accordance with the manufacturer's instructions.
- (c) Secure inflatable sewer plugs at or near the ground surface.
- (d) Continuously monitor air pressure while sewer plug is in place and have proper inflation equipment available at all times.

E9.3 Construction Methods

E9.3.1 General

- (a) Provide a plan for monitoring the temporary by-pass pumping to ensure proper operation at all times. The Contractor shall provide 24 hour personnel to address any issues with the temporary by-pass pumping. A 24 hour contact person shall be specified for the project.

- (b) Diversion of wastewater flow directly or indirectly to the environment, Land Drainage Sewers or Storm Relief Sewers will not be allowed. Pumping shall be controlled to show no overflows during by-pass pumping.
- (c) Contractor shall include plans for their initial temporary by-pass pumping to facilitate installation of the by-pass chamber in their overall temporary by-pass pumping flow control plan.
- (d) All instrumentation in lift station and manholes shall be protected and avoided at all times. Any damage to the lift station instrumentation by the Contractor will be repaired or replaced to the satisfaction of the Contract Administrator.
- (e) Maintain level of sewage in existing sewers below the critical basement elevation at all times.
- (f) A clear marker shall be installed within the upstream CSO Outfall Structure sump to facilitate on-site monitoring.
- (g) The downstream flows of the temporary pumping system can be installed directly into the force main through the new flange in the wet well access vault or the gate valve in the new by-pass valve chamber.
- (h) Temporary pumping equipment and materials shall remain on-site until station construction is completed as described in these Specifications and to the satisfaction of the Contract Administrator.
- (i) Provide a temporary by-pass flow control plan to the Contract Administrator for review and approval prior to starting construction. It shall provide detailed information for pumping equipment to be used including pump capacity and dimensions, depth of submergence, pump controls and installation details. Also include discharge piping details, arrangements to protect manhole openings required to run piping and power to the pumps and power supply details.
- (j) Power supply connection to the existing site power supply shall be approved by the Contract Administrator before set-up.
- (k) Provide suitable traffic ramps approved by the Contract Administrator if the by-pass pumping discharge pipe and power supply cables are laid across vehicle or pedestrian traffic areas on the force main site.
- (l) Cooperation and coordination will always be required with the City to allow full access to the lift station to carry out maintenance and operational duties on the site.
- (m) If wastewater gate operations are required, they shall only be operated by the City.

E9.3.2 Measurement and Payment

- (a) Wastewater Temporary By-Pass Pumping will be paid for at the Contract Lump Sum Price for "Wastewater Temporary By-Pass Pumping". Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this specification, accepted by the Contract Administrator.
- (b) A maximum of ninety-five percent (95%) may be submitted for progress payments prior to the total completion of the associated services, including the provision of As-Built Drawing mark-ups and O&M Manuals.

E10. 1800 MM SERVICE MANHOLE

E10.1 Description:

- E10.1.1 This section specifies the requirements for the supply and installation of the 1800 mm service manhole.
- E10.1.2 This section shall supplement CW 2130.
- E10.1.3 Refer to the civil drawings for service manhole details and notes.

E10.2 Materials

- E10.2.1 Approved Products
- (a) Use only those products listed as Approved Products for Underground Use in the City of Winnipeg found on the City of Winnipeg, Materials Management web site at: <http://www.winnipeg.ca/matmgt/spec/>
- E10.2.2 Sewer and Sewer Service Pipe
- (a) Mainline and sewer connection pipe to be in accordance with AT 4.2.1.10 and AT 4.2.2.10 of the Approved Products for Underground Use in the City of Winnipeg
- E10.2.3 Sewer and Sewer Service Fittings and Connection Saddles
- (a) 450 millimetre and larger gasketed push-on style PVC fabricated fittings in accordance with AT 4.2.1.61 of the Approved Products for Underground Use in the City of Winnipeg.
- E10.2.4 Sewer Pipe Gaskets
- (a) PVC pipe gaskets, flexible rubber in accordance with ASTM F477 .2 Concrete pipe gaskets, flexible rubber in accordance with ASTM C443.
- E10.2.5 Manholes
- (a) Pre-cast concrete sections as indicated on SD-010 to CSA A257.4 and ASTM Standard C 76 Class II and C 478 (circular sections)
 - (b) Cast iron frames and covers to be in accordance with AP-006, AP-007, AP-008, AP-009, and AP-010 in accordance with AT 4.2.1.73, AT 4.2.1.75, AT 4.2.1.83B, and AT 4.2.1.83M of the Approved Products for Underground Use in the City of Winnipeg.
 - (c) Ladder rungs to be in accordance with AT 4.2.1.72 of the Approved Products for Underground Use in the City of Winnipeg.
 - (d) Pre-cast concrete adjusting rings in accordance with CAN/CSA A257.4 and ASTM C478.
 - (e) Concrete brick in accordance with CAN3-A165 Series.
 - (f) Manhole joint gaskets to be in accordance with AT 4.2.1.71 of the Approved Products for Underground Use in the City of Winnipeg.
 - (g) Core and seat boot type flexible rubber connection for PVC pipe in accordance with material requirements of ASTM C923. 2.8 Fasteners
 - (h) Fasteners, tie rods, clamps, straps, bands, nuts and bolts to be stainless steel in accordance with ASTM A320, ANSI Type 316 marked as such with raised or indented numerals.
- E10.2.6 Cast-in-Place Concrete, Grout, Mortar and Cement-Stabilized Fill
- (a) Cast-in-place concrete, grout, mortar and cement stabilized fill in accordance with CW 2160.
- E10.2.7 Cement Patching Compound
- (a) Cement patching compound to be fast hardening, high strength non-shrink mixture suitable for use on vertical surfaces.
- E10.2.8 Bedding and Backfill
- (a) Place and compact initial backfill above pipe in accordance with CW 2030 and SD-001. Class 1 Backfill the remainder of the trench or excavation in accordance with CW 2030 and SD-002.
- E10.2.9 Fittings and Appurtenances
- (a) Fittings, coupling and appurtenances to be used for repairs to existing force mains and sewers to be approved products for underground use in the City of Winnipeg.
- E10.3 Construction Methods
- E10.3.1 Refer to 1-0193L-C0003-001

E10.3.2 Excavation

- (a) Remove existing concrete pavement slabs, miscellaneous concrete slabs, curbs and asphalt pavement in accordance with CW 3110, CW3230, CW 3235, CW 3240 and CW 3410.
- (b) Excavate in accordance with CW 2030. Excavate and prepare trench a sufficient distance in ahead to not to interfere with installation of the pipe.

E10.3.3 Foundation and Bedding

- (a) Place and compact foundation material, where required and bedding material in bottom of trench or excavation in accordance with CW 2030 and SD-001 to grade and elevation shown on the Drawings. Level across full width of trench or excavation and leave ready for pipe installation.

E10.3.4 Line and Grade

- (a) Correct alignment and grade exceeding the allowable variance in a manner acceptable to the Contract Administrator.

E10.3.5 Manhole

- (a) Level bedding to ensure manhole base is uniformly supported and the floor is level.
- (b) Construct manholes in accordance with SD-010 and as shown on the Drawings. Install manhole sections plumb and level.
- (c) Install approved gasket or joint sealer between pre-cast concrete sections including riser adjusting rings and between frame and pre-cast concrete riser as construction progresses. Alternately install grout between frame and pre-cast concrete risers as approved and directed by Contract Administrator. Ensure grout completely fills space between frame and riser to make joint watertight and finish flush with inside surface of risers.
- (d) Grout and plug lifting holes, joints and frame with mortar to make watertight. Remove excess mortar from inside surface of manhole.
- (e) Compact backfill between manholes, catch basins or catch pits and the sides of the trench or excavation in accordance with CW 2030.

E10.4 Measurement and Payment

- E10.4.1 Bypass Source Manhole and connection to existing sewer will be paid for at the Contract Lump Sum Price for "Supply and Installation of 1800 mm Manhole". Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this specification, accepted by the Contract Administrator.

E11. SHOP DRAWINGS

- E11.1 Submit shop drawings in accordance with Section 01 33 00. Refer to Appendix D for shop drawings to be submitted on this contract.

E12. CONTRACTOR SUPPLIED STANDARDIZED EQUIPMENT

- E12.1 Comply with the general requirements of E12 for all Standardized Goods supplied by the Contractor.

- E12.2 Comply with the following Standardization Goods requirements:

E12.2.1 PLC Control System and Motor Control Equipment in accordance with E13.

E12.2.2 Instrumentation in accordance with E14.

E12.2.3 Gas Detection Systems in accordance with E15.

- E12.3 Contact the Contract Administrator regarding any potential uncertainty as to whether a good is covered under a standardization agreement.
- E12.4 The Contractor may utilize a Standardization Vendor to provide other goods required under the Contract, in addition to Standardized Goods.
- E12.5 The Contractor shall separately track all goods supplied under each standardization agreement.
- E12.5.1 In the event that one or more Standardization Vendors are utilized to procure goods not covered under a standardization agreement, the Contractor shall ensure such goods are quoted, ordered, tracked and accounted in a separate manner.
- E12.6 Pricing:
- E12.6.1 The City has obtained discounted pricing for Standardized Goods. Each Standardization Vendor is obligated to sell Standardized Goods to all prospective Contractors at the discounted price, provided the goods are for the City of Winnipeg.
- E12.6.2 The Standardization Vendors may at their option provide lump sum pricing for goods packages. The Standardization Vendor is not required to provide breakout pricing details to the Contractor.
- E12.6.3 The Contractor and Subcontractors shall not utilize the City's agreements with the Standardization Vendors for any purpose other than City work.
- E12.6.4 The City may audit the goods purchased from the Standardization Vendors under the standardization agreements and may identify to the Standardization Vendors any goods procured that are not associated with the Contract.
- E12.7 The Contractor is responsible for ensuring that the Material supplied by the Standardization Vendors meets the requirement of the Contract. The Contractor shall review and confirm quotations supplied by the Standardization Vendors to ensure that all required Material is supplied.
- E12.8 The City is not a party to any contract between a Standardization Vendor and the Contractor, or any Subcontractor.
- E12.8.1 The supply of goods through a Standardization Vendor shall not relieve the Contractor of their obligations.
- E12.8.2 Errors or omissions by a Standardization Vendor shall not be a cause for a Change in Work.
- E12.8.3 Delays by a Standardization Vendor shall not be a cause for a Change in Work where the delay could have been avoided through reasonable planning, contingency allocation, or communication by the Contractor.
- E12.8.4 The Contractor shall engage directly with the persons listed as the Standardized Vendor contact in sections E13, E14, and E15 unless otherwise directed by the Contract Administrator.
- E12.9 Submittals
- E12.9.1 Submittals shall be provided for Standardized Goods in accordance with the Specifications and typical industry practice. Submittals shall not be bypassed for Standardized Goods.

E13. STANDARDIZED CONTROL SYSTEM AND MOTOR CONTROL EQUIPMENT

- E13.1 The City has standardized on a specific vendor for the supply and delivery of control system and motor control equipment. The Standardization Vendor was selected via RFP 756-2013 and was awarded to Schneider Electric Canada Inc. (Schneider).
- (a) Refer to E13.6 for contact information.
- (b) Copies of the tender documents are available from City of Winnipeg Material Management's website.

- E13.2 Goods to be procured via this standardization agreement and applicable to this Tender includes but is not limited to:
- (a) Programmable Controllers (PLCs) including all associated components, hardware and software.
 - (b) Touchscreen HMI systems such as Magellis HMIs.
 - (c) Motor Control Centers (MCCs) including all components.
 - (d) Variable Frequency Drives (VFDs) including all components.
- E13.3 For clarity, this standardization agreement does not include:
- (a) Computer workstation hardware including operating systems;
 - (b) Computer server hardware, including operating systems and general terminal server / client software;
 - (c) Thin client terminals;
 - (d) Fused and un-fused disconnect switches not incorporated into a MCC or other motor starters;
 - (e) Control stations and pendants not incorporated into a MCC or other motor starters;
 - (f) Electrical Transformers not in a MCC or motor starter;
 - (g) Panelboards not integrated in a MCC;
 - (h) Switchboards / Switchgear not integrated in a MCC;
 - (i) System Integration Services (including programming and configuration);
 - (j) Control Panels to house PLCs;
 - (k) Instrumentation;
 - (l) Power supplies not integrated with the PLC / HMI systems; and
 - (m) Terminal blocks not integrated with the PLC / HMI systems
- E13.4 The following model series shall be utilized unless otherwise indicated in the Specifications, Drawings or otherwise approved by the Contract Administrator:
- (a) Schneider Electric M580 PLC;
 - (b) Schneider Electric X80 PLC I/O;
 - (c) Schneider Electric EcoStructure Control Expert programming software;
 - (d) Schneider Electric Local HMI – Harmony HMIGTO or HMIGTU series;
 - (e) Schneider Electric Model 6 MCC – NEMA rated starters;
 - (f) Schneider Electric Altivar 600 series VFD drives.
- E13.5 Commissioning and start-up:
- E13.5.1 Refer to E40.
- E13.5.2 Except as identified in E13.5.3, commissioning and start-up of all goods purchased under this standardization agreement shall be performed by the Contractor.
- E13.5.3 Schneider shall provide MCC start-up services but not commissioning services. Coordinate with Schneider as required to understand the limitations of Schneider's MCC start-up services and provide all remaining testing, commissioning and start-up services to provide a complete commissioning and start-up.
- E13.5.4 City of Winnipeg commissioning forms must be used. Forms are provided in Appendix E. The forms provided are subject to change prior to commissioning.
- E13.6 The contact information for all quotations and purchases from Schneider is:
- Derrick Cook

Omands Creek Blvd
Winnipeg, MB, R2R 2V2
Telephone: 204-218-1938
E-mail: Derrick.Cook@SE.com

- E13.6.1 Goods to be procured via Choice Electric along with Eecol Electric, as Schneider's High Tech Automation Distributor (HTAD):
- (a) Further to E13.2, goods to be procured via Eecol includes but is not limited to:
 - (i) Programmable Controllers (PLCs) including all associated components hardware and software;
 - (ii) Programmable Controller Programming Software;
 - (iii) HMI System software;
 - (iv) Touchscreen HMI systems such as Magellis HMIs;
 - (v) Touchscreen HMI systems such as Magellis HMIs;
 - (vi) Motor Control Centers including all components;
 - (vii) Loose VFDs, motor starters, soft starters, and associated components; and
 - (viii) Industrial Ethernet Switches as per design. Note that some Ethernet switches may be specified to be from other vendors due to application requirements. Refer to drawings and specifications.
 - (b) The Eecol Electric contact:
Trevor Hambleton
1760 Wellington Avenue
Winnipeg, MB, R3H 0E9
Telephone: 204-774-2800
E-mail: hambleton@eecol.com
 - (c) The Choice Electric contact:
Ofer Margovski
2130 Notre Dame Ave.
Winnipeg, MB, R3H 0K1
Telephone: 204-783-233
E-mail: oferm@choicesupply.ca
 - (d) All correspondence related to requests-for-quotations to the Supplier for goods listed under (a) shall be copied to the Schneider contact listed under E13.6.
 - (e) For whatever reason, if the Supplier is unable to receive or respond to request-for-quotations for goods listed under (a) request-for-quotations may be issued directly to the Schneider contact listed under E13.6.
- E13.7 Quotations and orders:
- E13.7.1 Reference the following in all quotation requests and purchase orders:
- (a) This Bid Opportunity number; and
 - (b) A statement indicating: "This request / purchase order is subject to the Terms and Conditions of City of Winnipeg Request for Proposal RFP 756-2013."
- E13.8 Measurement and Payment:
- E13.8.1 Payment will be based on the item labelled "Standardized Control System and Motor Control Equipment" in Form B.
- (a) Indicate base costs for material supply under the standardization agreement. Any material mark-up or installation costs, as applicable, shall be included in other line items of Form B.

E14. STANDARDIZED INSTRUMENTATION

- E14.1 The City has standardized on a specific vendor for the supply and delivery of specific instrumentation. The Standardization Vendor was selected via RFP 449-2014 and was awarded to Trans-West Supply Company Inc. (Trans-West).
- (a) Copies of the tender documents are available from City of Winnipeg Material Management's website.
- E14.2 Goods to be procured via this standardization agreement and applicable to this Tender include but are not limited to:
- (a) Temperature Transmitters including temperature elements and thermowells;
 - (b) Electromagnetic Flowmeter Transmitters;
 - (c) Differential Pressure (Level) Transmitters;
 - (d) Gas Monitoring Equipment; and
 - (e) Associated accessories.
- E14.3 For clarity, this standardization agreement does not include:
- (a) Flowmeters - Coriolis;
 - (b) Flowmeters - Thermal Dispersion;
 - (c) Flowmeters - Ultrasonic;
 - (d) Flow switches (i.e. mechanical);
 - (e) Pressure switches;
 - (f) Temperature switches;
 - (g) Radar Level Transmitters; and
 - (h) Level Switches (non-ultrasonic based).
- E14.4 The following model series shall be utilized unless otherwise indicated in the Specifications, Drawings or otherwise approved by the Contract Administrator:
- (a) Temperature Transmitters
 - (i) Siemens SITRANS TF (Process Applications)
 - (ii) Siemens SITRANS TH300 (HVAC applications)
 - (b) Electromagnetic Flowmeter Transmitters;
 - (i) Siemens SITRANS TF (Process Applications)
 - ◆ Model MAG5100W DN 200 c/w MAG6000 Transmitter
 - (ii) Siemens SITRANS F M MAG 6000 series transmitter (Process Applications)
 - (iii) Siemens Remote Wall Mount Kit FDK:085U1053;
 - (iv) Siemens Cable Kit
 - (c) Differential Pressure (Level) Transmitters
 - (i) Siemens SITRANS P DS III (Process Applications)
- E14.5 Field setup and commissioning:
- E14.5.1 Refer to E40.
- E14.5.2 Field setup and commissioning of the instrumentation shall be performed by the Contractor. Some commissioning of the standardized instrumentation may be performed by Trans-West under the standardization agreement for the following:
- (a) The first instrument of each type installed on site; and
 - (b) A minimum of five additional instruments of each type, or 10% of the actuators of that type, whichever is greater.

- E14.5.3 The Contractor may provide field setup and commissioning services for the remaining instrumentation via alternate means, provided that this does not result in a reduction of the services or quality of work.
- E14.5.4 The services provided are to include at all standard manufacturer recommended start-up and commissioning procedures, as well as the following:
- (a) Visual Inspection
 - (i) Inspect instrument for signs of damage,
 - (ii) Verify mechanical and piping installation per drawings and manufacturer requirements,
 - (iii) Verify wiring installation per drawings and manufacturer requirements, and
 - (iv) Inspect electrical terminal compartment for foreign objects.
 - (b) Mechanical Inspection
 - (i) Check all connections and bolts for tightness and to the correct torque,
 - (ii) Check for alignment, and
 - (iii) Ensure appropriate clearances for all connecting bushings and connecting faces.
 - (c) Electrical Inspection
 - (i) Check all power wiring connections for tightness,
 - (ii) Check all fuses in the instrument for continuity,
 - (iii) Confirm input voltage is correct, and
 - (iv) Confirm that the signal / fieldbus connections are correct.
 - (d) Start-up Services
 - (i) Coordinate turning on power to the instrument,
 - (ii) Configure all applicable settings and parameters that could not be configured prior to installation,
 - (iii) Perform functional tests,
 - (iv) Coordinate with City personnel and designated representatives to confirm and finalize the application requirements,
 - (v) Configure and document all settings, as appropriate for the application,
 - (vi) Coordinate to perform test demonstrations to verify instrument performance,
 - (vii) Verify that all configuration values are in the correct state, and
 - (viii) Transfer the configuration settings to on-site personnel.
 - (e) Documentation
 - (i) Provide a signed documented commissioning form for each instrument, in a format acceptable to the Contract Administrator.
 - (ii) City of Winnipeg commissioning forms must be used. Forms are provided in Appendix E. The forms provided are subject to change prior to commissioning.
 - (f) Travel
 - (i) Provide all travel and accommodations at no additional cost.
 - (g) Personnel:
 - (i) Personnel shall be factory trained in the maintenance, configuration, and service of the proposed instrumentation.
- E14.5.5 Responsibility of the Contractor:
- (a) It is the responsibility of the Contractor to ensure that the installation of the instrumentation is complete and that the instrument is ready to commission prior to engaging Trans-West to commission any instrumentation.
- E14.6 The contact for all quotations and purchases:
Amurthan (Amu) Abimanan Branch Manager

126 Bannister Road
Winnipeg, MB, R3R 0S3
Telephone:204-783-0100
Mobile: 204-782-1864
E-mail: amu@transwest-mb.com

E14.7 Quotations and orders:

E14.7.1 Reference the following in all quotation requests, quotations \ proposals, purchase orders, and invoices:

- (a) This Bid Opportunity number; and
- (b) A statement indicating: "This request / purchase order is subject to the Terms and Conditions of City of Winnipeg Request for Proposal RFP 449-2014."

E14.8 Measurement and Payment:

E14.8.1 Payment will be based on the item labelled "Standardized Instrumentation" in Form B.

- (a) Indicate base costs for material supply under the standardization agreement. Any material mark-up or installation costs, as applicable, shall be included in other line items of Form B.

E15. STANDARDIZED GAS DETECTION SYSTEMS

E15.1 The City has standardized on a specific vendor for the supply and delivery of gas detection systems. The Standardization Vendor was selected via RFP 123-2014 and was awarded to Mine Safety Appliances Company, LLC (MSA) c/o Tundra Process Solutions Ltd.

- (a) Copies of the tender documents are available from City of Winnipeg Material Management's website.

E15.2 Goods to be procured via this standardization agreement include but are not limited to:

- (a) Gas detection sensors;
- (b) Gas detection transmitters;
- (c) Gas detection controllers;
- (d) Gas detection sensor consumables; and
- (e) Associated accessories.

E15.3 The following model series shall be utilized unless otherwise indicated in the Specifications, Drawings or otherwise approved by the Contract Administrator:

- (a) X5000 gas detection systems.
- (b) GasGard XL controllers.

E15.4 Field setup and commissioning:

E15.4.1 Refer to E40.

E15.4.2 Field setup and commissioning of the gas detection systems may be performed by MSA under the Standardization Agreement. Coordinate with MSA as required to understand the capabilities and limitations of MSA's field setup and commissioning services and provide all remaining services to provide a complete commissioning and start-up.

E15.4.3 The Contractor may provide field setup and commissioning services for the gas detection system via alternate means, provided that this does not result in a reduction of the services or quality of work.

E15.4.4 City of Winnipeg commissioning forms must be used. Forms are provided in Appendix E. The forms provided are subject to change prior to commissioning.

- E15.4.5 Where MSA is utilized to provide field setup and commissioning, their scope of work has been standardized as follows:
- (a) Provide the services for a factory-trained instrument technician to setup and commission the gas detection instruments and controllers, as requested by the City. It is expected that setup and commissioning will be required for some, but not all, of the equipment.
 - (b) Qualification
 - (i) The personnel provided shall be a factory trained and certified technologist, with a minimum of one year of experience working with the products proposed.
 - (c) Services
 - (i) Provide a full eight hours of on-site labour, for each allocated day, to setup and commission the gas detection systems.
 - (ii) Provide all travel and tools required.

E15.5 Training

E15.5.1 The requirements of E41 apply.

E15.5.2 Local Training Session

- (a) Overview
 - (i) Provide instruction to designated City personnel in the operation and maintenance of the gas detection equipment.
- (b) Location
 - (i) Provide instruction to designated City personnel in the operation and maintenance of the gas detection equipment.
- (c) Travel
 - (i) Provide all travel, meals and accommodations at no additional cost.
- (d) Submittals
 - (i) Submit the names and qualifications of the proposed instructors.
 - (ii) Submit training proposal complete with hour-by-hour schedule including brief overview of content of each training segment a minimum of 30 Working Days prior to the anticipated date of beginning of training.
- (e) Quality Assurance
 - (i) Provide competent instructors thoroughly familiar with all aspects of the gas detection equipment.
 - (ii) The Contract Administrator may reject instructors it determines to not be qualified.
 - (iii) In the event that the training provided is not satisfactory, reduction of payment may be applied.
- (f) Duration
 - (i) The training shall be a minimum of eight (8) hours in duration, excluding coffee and lunch breaks.
 - (ii) Each session shall be assumed to be independent of other training sessions and not necessarily aligned with other on-site work or training.
- (g) Materials
 - (i) Provide equipment, visual and audio aids, and materials.
 - (ii) Supply manual for each trainee, describing in detail the information included in each training program.
- (h) Attendees
 - (i) The attendees are expected to include, but not be limited to:
 - ◆ Electrical and instrumentation maintenance personnel and

- ◆ Operations personnel.

- (i) Content

- (i) Overview of the equipment.
- (ii) Equipment maintenance training including:
 - ◆ Installation,
 - ◆ Configuration,
 - ◆ Troubleshooting, and
 - ◆ Preventative maintenance

- (j) Number of Sessions:

- (i) Provide a minimum of two (2) sessions.

E15.6 The contact for all quotations and purchases:

Darren Bye
Operations Manager, Measurement & Analytical
11061-269 St
Acheson, AB
T7X 6E1
Telephone: 587-689-2158
Mobile: 780-239-7009
E-mail: dbye@tundrasolutions.ca

E15.7 Quotations and orders:

E15.7.1 Reference the following in all quotation requests, quotations \ proposals, purchase orders, and invoices:

- (a) This Bid Opportunity number; and
- (b) A statement indicating:

“This request / purchase order is subject to the Terms and Conditions of City of Winnipeg Request for Proposal RFP 123-2014.”

E15.8 Measurement and Payment:

E15.8.1 Payment will be based on the item labelled “Standardized Gas Detection Equipment” in Form B.

- (a) Indicate base costs for material supply under the standardization agreement. Any material mark-up or installation costs, as applicable, shall be included in other line items of Form B.

E16. PRE-CONSTRUCTION PHOTOGRAPHS

E16.1 The Contractor is responsible for taking photographs and/or video of the surrounding structures, houses and landscaping in order to establish the condition of the area around the pumping station prior to commencement of the Work. The pictures and/or video must be submitted to and approved by the Contract Administrator prior to the commencement of the Work.

E17. WORK AND EQUIPMENT SUPPLIED BY OTHERS

E17.1 Any work activities conducted within 3 meters of the 115kV underground cable located north of the lift station shall require supervision by a Manitoba Hydro supplied safety watch. The safety watch must be supplied by Manitoba Hydro at a cost borne by the Contractor.

E17.2 Refer to E19.3 for work by contract administrator related to vibration monitoring and protection of the 115kV Manitoba Hydro cables.

E17.3 Payment

- (a) Coordination of work by others shall be considered incidental to the Works of this Contract and no separate payment will be made for this item.

E18. PROTECTION OF EXISTING TREES

- E18.1 The Contractor shall take the following precautionary steps to avoid damage from construction activities to any existing trees not marked for removal within the limits of the construction area.
 - E18.1.1 Do not stockpile materials and soil or park vehicles and equipment within 2 metres of trees.
 - E18.1.2 Strap mature tree trunks with 25 x 150 x 2400 wood planks. Smaller trees shall be similarly protected using appropriately sized wood planks.
 - E18.1.3 Excavations shall be carried out in a manner to minimize damage to existing root systems. Where roots must be cut to facilitate an excavation, they shall be neatly pruned at the face of the excavation and coated with an appropriate wound dressing to prevent infection.
 - E18.1.4 Work on Site shall be carried out in a manner to minimize damage to existing tree branches. Where damage to tree branches does occur, the Contractor shall neatly prune the damaged branch.
 - E18.1.5 American elm trees shall not be pruned between April 1st and August 1st and Siberian elm trees between April 1st and July 1st of any year under provisions of The Dutch Elm Disease Act.
- E18.2 All damage to existing trees due to construction activities shall be repaired to the requirements and satisfaction of the City of Winnipeg, Public Works Department and Forestry Branch at the Contractor's expense.
- E18.3 Payment
 - (a) Protection of Existing Trees shall be considered incidental to the Works of this Contract, and no separate payment will be made for this item.

E19. EXCAVATION, BACKFILL, AND VIBRATION REQUIREMENTS

- E19.1 Unless noted otherwise elsewhere, all backfill to be Class 1 according to CW 2030
- E19.2 The first task to be completed related to any of the following work items must be to safely expose the concrete cap of the 115kV Manitoba Hydro Cables north of the lift station and allowing the Contract Administrator to install vibration monitoring equipment as described in E19.3(a).
- E19.3 Contractor is to note the 115kV Manitoba Hydro Cables buried to the north of the existing station. Manitoba Hydro imposes a ground vibration limit of 12mm/s to protect this infrastructure.
 - (a) The Contract Administrator will monitor vibration at the concrete cap over the 115kV cable. Vibration is not to exceed the limit as set out by MB Hydro of 12mm/sec. The Contractor is to include in their Construction Phasing Plan their mitigation strategy to reduce vibration in the zone of influence if the monitoring shows vibrations that exceed the acceptable limit. Compaction methods such as static rolling techniques may be required, or smaller equipment with thinner lifts.
 - (b) Given the proximity of the 115kV cables there is concern that the vibration from compaction equipment or pile installation equipment may affect the cables. The contractor is to provide a work plan identifying construction methods selected to mitigate vibration risk to the cables prior to commencement of excavation, pile installation, or compaction works.
 - (c) The contract administrator reserves the right to halt construction in the event that vibrations measured at the cables exceed the 12mm/s limit, and require the contractor to provide a revised work plan to continue construction while complying with the vibration limits.
 - (d) Any damages to the 115kV cable are to be repaired at the Contractor's expense.

E19.4 Hand excavation and Manitoba Hydro safety watch shall be required in proximity to the existing 115kV underground cables located north of the lift station. Refer to Civil (C-Series) construction drawings for more information. Maintain 1m clearance from these cables at all times.

E19.5 Measurement and Payment

E19.5.1 Payment will be based on Form B, "Excavation and Backfill", as accepted and measured by the Contract Administrator.

- (a) A maximum of 95% may be submitted for progress payments prior to the total completion of the associated services, including the provision of as-built drawing mark-ups and O&M manuals.
- (b) No differentiation will be made for class of backfill. All backfill for the contract shall be included in Contract Lump Sum Price for "Excavation and Backfill".
- (c) No differentiation will be made for type of excavation. All excavation for the contract shall be included in Contract Lump Sum Price for "Excavation and Backfill".
- (d) No separate payment will be made for disposal of unsuitable materials and shall be incidental to the work.

E20. SUPPLY AND INSTALLATION OF TEMPORARY SHORING

E20.1 Description

- (a) This Specification shall cover shoring requirements for the Works where required under Manitoba Acts, Regulations, and Guidelines, or as indicated on the Drawings.

E20.2 Construction Methods

E20.2.1 Excavation

- (a) Remove excavated material from the Site immediately. Excavated material shall not be stockpiled on-Site.
- (b) All Working areas below grade shall be kept adequately and securely supported during and after excavation until the shoring and bracing is in place to prevent loss of ground or injury to any person from falling material.
- (c) Any groundwater seepage into the excavation shall be properly managed to protect the bearing surface from disturbance or loss of resistance. Groundwater seepage management may consist of sumps and pumps at the exterior of the bearing surface in the excavation.
- (d) Supply and place lean mix concrete, as directed by the Contract Administrator, as backfill for any portions of the excavation, carried beyond the required limits of excavation. The limits of excavation shall be considered to be the inside face of the shoring system and the underside of the working base slab.
- (e) All working areas below grade shall be kept adequately and securely supported during and after excavation until the shoring and bracing is in place to prevent loss of ground or injury to any person from falling material.
- (f) All below grade activities shall be performed with care and monitoring conducted to ensure that work adheres to the vibrational limits to be set by Manitoba Hydro to protect the integrity of the 115kV underground cable. Refer to E19.

E20.2.2 Excavation Security Fence

- (a) Further to Clause 3.1 of CW 1130, completely cover the excavation and provide a security fence to completely surround the excavation when unattended generally in accordance with the following.
- (b) Security fence shall be chain link fence or approved equal, a minimum 1.80 metres high with metal support posts embedded far enough into the ground and spaced close enough together so the fence will not sag or collapse.
- (c) Attach fencing securely to posts.

- (d) Secure the gate or end of the fencing to a post with chain and a padlock.
- (e) Provide alternate security fence proposal to Contract Administrator for approval.

E20.2.3 Shoring

- (a) The type, strength, amount of shoring and bracing shall be determined by the Contractor's Professional Engineer/Geoscientists registered in Manitoba. The design should consider the nature of the ground and attendance conditions that may be required, taking into account property lines, existing slopes, utilities, roadways and existing structures.
- (b) Shoring and bracing shall be so spaced, embedded, and dimensioned as to prevent the failure of the shoring system, caving, loss of ground, base heave, surface settlement, or squeezing of the soil beyond the neat lines of excavation and to provide control of seepage emanating from the overburden soil layers, including piping through and/or below the shoring system. Shoring structures shall be free from defects that might impair its strength or suitability for the Work. Sheeting/shoring and bracing shall conform to the latest revisions of the "Construction Safety Act" of the Department of Labour of the Government of Manitoba and in accordance with Province of Manitoba "W210 The Workplace Safety and Health Act" and "Guidelines for Excavation Work".
- (c) Supporting design information, including soil log information and stratigraphy, and design calculations as required to facilitate review of the submission for conformance with the Contract Documents.
- (d) Submit AutoCAD Shop Drawings and design calculations for the shoring/excavation system designed as well as the shop drawings sealed by a Professional Engineer registered and licensed to practice in the Province of Manitoba and experienced in the structural design of shoring systems. The designer of the shoring system shall inspect the system during construction and certify, in writing to the Contract Administrator, that construction is in conformance with the approved design.
- (e) Shoring and bracing shall be installed such that the structure size and wall thickness shown on the shop drawings can be obtained subsequent to installation of the shoring system.
- (f) Shoring and bracing shall be designed and installed to prevent settlement and damage to existing structures. In the event of damage, the Contractor will be held liable, and shall be required to provide appropriate restoration at his cost, to the satisfaction of the Contract Administrator.
- (g) Shoring and bracing shall be designed and installed to ensure that there is adequate space to achieve compaction of bedding and backfill and such that it does not impact compaction of bedding and backfill and/or cause settlement when shoring is removed.
- (h) Shoring and bracing shall remain in place until concrete has attained 75% of the design strength.
- (i) All below grade activities, particularly pile driving (soldier piles), shall be performed with care and monitoring conducted to ensure that work adheres to the vibrational limits to be set by Manitoba Hydro to protect the integrity of the 115kV underground cable. Refer to E19.
- (j) Low-vibration methods of pile installation such as drilling are preferred.

E20.2.4 Monitoring Movement of Shoring

- (a) The Contractor shall submit to the Contract Administrator a plan for monitoring the movement of shoring during construction a minimum of two (2) Working Days prior to the installation of shoring. The monitoring plan shall be performed by approved survey methods for vertical or horizontal movement of the shoring, acceptable to the Contract Administrator. Costs for monitoring shall be incidental to the installation of the temporary shoring.

E20.3 Measurement and Payment

- (a) Shoring will be paid for at the Contract Lump Sum Price for “Temporary Shoring”. Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this Specification.

E21. WET WELL CLEANING

E21.1 Description

- (a) Work under this section shall include cleaning and dewatering of the existing wet well and access riser vault located next to the pumping station.
- (b) This Specification shall amend and supplement Standard Specifications CW 2140.

E21.1.1 Construction Methods

- (a) Cleaning to start only after the inflow and outflow wet well outlets are fully blocked and the temporary by-pass pumping system is in place.
- (b) Cleaning shall include washing the surfaces with high pressurized water. Ceiling and walls shall be cleaned first and then finish with cleaning the floor. Surfaces shall be cleaned to a point where there is no residue covering the concrete surfaces of the wet well or as accepted by the Contract Administrator.
- (c) Remove all residue from the wet well including any solids, debris, grit etc. Remove any standing water – wet well floor shall be dry.
- (d) Provide photos of cleaned wet well to Contract Administrator for review and approval.
- (e) Maintain the wet well clean until the completion of the inspection by the Contract Administrator.
- (f) Advise the Contract Administrator immediately when backfill material or large cracks are observed during the cleaning of a sewer and/or chamber. The Contract Administrator will direct one of the following operations be performed:
 - (i) Complete or attempt to complete cleaning of the wet well.
 - (ii) Suspend cleaning operations for inspection of the wet well.
 - (iii) Simultaneously clean and inspect the wet well.

E21.2 Measurement and Payment

E21.2.1 Amend Section 4.1 of Specification CW 2140 to read:

- (a) Wet Well Cleaning will be measured on an area basis and paid for at the Contract Price for “Wet Well Cleaning & Inspection”. Area to be paid for will be the total area of cleaning and inspection, accepted and measured by the Contract Administrator.
- (b) Cleaning shall include all water supply costs, permits (access or otherwise), cleaning, reverse set-up cleaning, dumping, travel time, tipping fees, units, flow control and whatever may be required for the cleaning of the wet well chamber.

E21.2.2 Delete sections 4.3, 4.7 and 4.8 of specification CW 2140.

E22. DEMOLITION OF STRUCTURES

E22.1 Description of Work

The Work required under this section shall include, but is not limited to, the following:

- (a) Demolition of the wet well access entrance concrete as shown on the contract drawings.
- (b) Demolition of the existing lift station superstructure.
- (c) Partial selective concrete demolition in the sub-levels of the pump station.
- (d) Demolition and removal of segments of the asbestos cement force main necessary for the installation of the bypass valve chamber.
- (e) Demolition and removal of the existing water service to the pump station if necessary.

- (f) Removal and disposal of debris found within the wet well.
 - (g) Removal and disposal of construction debris.
- E22.1.1 The Work required under this section shall include, but is not limited to, the following:
- (a) Removal of all existing electrical, mechanical components as indicated in project drawings; concrete and brick masonry demolition; performing saw cutting; demolition and disposal of existing concrete and brick masonry; and clean-up of work site in anticipation of new work for those demolition areas indicated on the drawings.
- E22.1.2 The work to be done by the Contractor under this section shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as described hereinafter.
- E22.2 References
- E22.2.1 CSA S350-M1980, Code of Practice for Safety in Demolition of Structures.
 - E22.2.2 Manitoba Workplace Safety and Health Act, and all applicable National, Provincial and Municipal regulations.
 - E22.2.3 Hazardous Materials Assessment Report, Pinchin Ltd.
- E22.3 Protection
- E22.3.1 Prevent damage of existing structure to remain. Make good any damage caused by the demolition Work.
 - E22.3.2 Take precautions to support adjacent and affected structures and, if safety of structure being demolished or adjacent structures appears to be endangered, cease operations and notify the Contract Administrator.
 - E22.3.3 The Contractor shall take precautions during demolition works to prevent damage to existing structures and adjacent property. In the event of damage, the Contractor will be held liable and shall be required to provide appropriate restoration at his cost, to the satisfaction of the Contract Administrator.
- E22.4 Execution
- E22.4.1 Commencement
 - (a) Demolition shall commence after certification of the shoring system has been received and approved by the Contract Administrator.
 - E22.4.2 Inspection
 - (a) Inspect Site with Contract Administrator and verify extent of items for removal, disposal, salvage and items to remain.
 - (b) Notify and obtain approval of Contract Administrator before starting demolition.
 - E22.4.3 Safety Code and Requirements
 - (a) Unless otherwise specified, carry out demolition in accordance with the City of Winnipeg Safety Directives and Guidelines.
 - E22.4.4 Demolition
 - (a) Demolish structures to permit construction of new work as required.
 - (b) The work shall be done in accordance with E4– Hazardous Materials and the recommendations of the Hazardous Materials Assessment Report.
 - (c) Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as Work progresses.
 - (i) Exception: CSO instruments and CSO panel need to remain powered and operational at all times during construction. Contractor may take CSO equipment offline while the Contractor is on site. A CSO shutdown plan

following the requirements of E34.2(c), with the exception of E34.2(c)(viii), must be approved by the contract administrator prior to taking the CSO panel offline. In such circumstances, the existing RTU panel must remain powered at all times.

(ii) Items marked for salvage in E23

- (d) At end of each day's Work, leave Work in safe condition so that no part is in danger of toppling or falling.
- (e) The requirements of D20.4 apply.
- (f) Do not sell or burn materials on Site.
- (g) Damage to concrete that is to remain shall be minimized. Concrete shall be demolished by saw cutting and subsequent jackhammering using hand-held breakers or jack hammers (maximum 10 kgs/20 lbs unless noted otherwise on drawings). Other methods of performing concrete demolition may be submitted for review and approval to the Contract Administrator. The Contractor shall take measures to ensure that the concrete beyond the limits of demolition is not fractured or shattered. The Contractor shall remove concrete using acceptable methods and replace any concrete which is deemed to be fractured as a result of demolition methods employed by the Contractor. This repair Work shall be performed at no additional cost to the City of Winnipeg.

E22.4.5 Demolition Tolerances

- (a) All demolition shall be done using equipment and procedure to prevent over-breakage of the existing structure.
- (b) Final demolition surfaces must remain locally within (25 mm) of the demolition lines, alignments, or limits shown on the drawings. Demolition beyond the limits shown shall be reviewed by the Contract Administrator. The Contractor shall repair excess demolition to the satisfaction of the Contract Administrator, and at no cost to the City where required.
- (c) All protrusions into the defined limits of demolition shall be removed if they interfere with the placement and alignment of embedded components or reinforcing steel.

E22.4.6 Abrasive Wiresaw and Sawcutting

- (a) Areas of demolition shall be delineated from existing concrete that is to remain using either abrasive disc sawcutting, or abrasive wire sawing.
- (b) All sawcuts shall be performed straight and normal to the surface being cut, following the locations shown on the drawings, or as directed by the Contract Administrator.
- (c) Overruns at the junctions of sawcuts, and mis-starts shall be cleaned and filled with dry patching mortar of matching colour, as directed by the Contract Administrator.
- (d) Overruns at the junctions of sawcuts, and mis-starts shall be cleaned and filled with dry patching mortar of matching colour, as directed by the Contract Administrator.

E22.4.7 Disposal of Demolished Material

- (a) The Contractor shall be responsible for removal of debris and waste from the Work area to the location to an appropriate solid waste disposal area approved by the contract administrator.
- (b) Metal debris, which may include reinforcing steel, shall be removed from Site and disposed of by the Contractor.

E22.5 Measurement and Payment

- (a) Demolition will be measured on a lump sum basis and paid for at the Contract Lump Sum Price for "Demolition."
- (b) No payment shall be made for demolition beyond the limits specified, or those otherwise approved by the Contract Administrator. The separation, as necessary of embedded and structural steel shall be considered incidental to the Work. The installation of temporary supports, shoring or hangers shall also be considered incidental to the Work. Saw cutting of concrete and removal of construction debris shall be considered incidental to the Work.

E23. SALVAGE

- E23.1 Contractor to coordinate with Contract Administrator to arrange for City of Winnipeg Staff to visit site and mark equipment and material for salvage prior to commencement of demolition. Salvaged materials are expected to include, but not necessarily be limited to:
- (a) SCADAPack
 - (b) Undervoltage relay.
 - (c) PSTN module.
- E23.2 All salvaged equipment and materials as determined under E23.1 shall remain property of the City unless specifically noted otherwise. The Contractor shall deliver salvaged equipment and materials to the City of Winnipeg's "Y Yard" outdoor storage compound located at the Northeast corner of the intersection of Dugald Road and Van Bellegham Avenue, Winnipeg, Manitoba.
- E23.3 The Contractor shall notify the Contract Administrator at least 48 hours prior to delivery of salvaged equipment to allow for arrangements to be made to receive the salvaged equipment. All deliveries shall be made between 8:00 am and 3:30 pm on Business days.
- E23.4 The Contractor shall remove and haul all rejected salvage from the site and legally dispose of it.
- E23.5 Removal and delivery of salvageable and non-salvageable equipment and material shall be considered incidental to the Contract Work and no additional payment will be made for such Work.

E24. CAST-IN-PLACE CONCRETE

E24.1 Description

- E24.1.1 This specification will cover construction of cast-in-place concrete for the chamber and shall supplement, revise and amend CW 2160.

E24.2 Materials

(a) Concrete Mix Design

The Contractor shall be responsible for the design and performance of all concrete mixes supplied under this Specification. Concrete shall be supplied in accordance with the requirements of CSA A23.1-14, with the minimum properties as provided below:

- (i) Cast-In-Place Concrete Wet Well Access Vault & By-Pass Chamber, and exterior concrete pad

Class of Exposure	S-1
Maximum Size of Aggregate	20 mm
Cement Type	HS
Compressive Strength at 28 Days	32 MPa
Slump/Flow	80 mm +/- 20 mm
Air Content	5.0% to 8.0%

- (ii) Interior – Topping Slabs, Curbs, Pads, and Pipe Supports

Class of Exposure	C-1
Maximum Size of Aggregate	20 mm
Cement Type	GU
Compressive Strength at 28 Days	25 MPa
Slump/Flow	80 mm +/- 20 mm
Air Content	< 5.0%

- (iii) Lean Mix Concrete

Cement Type	Type HS
Maximum Water/Cementing Materials Ratio	0.49

Compressive Strength at 28 Days	15 MPa
Slump/Flow	80 mm
Air Content	nil

- (b) Provide a "Mix Design Statement" for each type of concrete to be used certifying constituent materials and mixing proportions to the Contract Administrator at least 2 weeks prior to delivery of Concrete to the Site. Supply reasonable evidence to the Contract Administrator that the mix proportions selected will produce concrete meeting the specified strength, workability and yield.
- (c) Admixtures
- (i) All admixtures shall be compatible and meet the following standards:
 - ◆ Air entraining agent shall meet ASTM C260.
 - ◆ Chemical water reducing admixtures shall meet ASTM C494.
 - ◆ Type F high-range water reducing (super-plasticizing) admixture shall be used when a slump of more than 110 mm is desired.
- (d) Grout
- (i) Grout shall be Sika Grout 212 SR or approved equivalent in accordance with B7.
 - (ii) Floor surface in lower pump room to be prepared according to product manufacturer's requirements prior to application of grout.
 - (iii) Grout to be applied as per manufacturer's requirements and sloped towards sump.
 - (iv) Hydraulic cement for form hole patching shall be Xypex Patch-n-Plug or approved equivalent in accordance with B7.
- (e) Reinforcing Steel
- (i) New deformed billet steel bars conforming to CSA G30.18 (latest). Grade to be 400.
 - (ii) Bar accessories:
 - ◆ To be made of a non-corroding material
 - ◆ Shall not stain, blemish or spall the concrete surface for the life of the concrete
 - ◆ Shall be approved by the Contract Administrator
 - ◆ Bar chairs shall be PVC.
- (f) Bonding Agent shall be Sika Latex R or approved equivalent in accordance with B7.
- (g) Reinforcing steel shall be clean, free of rust, dirt, loose scale, oil, grease or any material that could reduce bond with the concrete.
- (h) Waterproofing
- (i) Provide two coats bitumen waterproofing emulsion to all below grade exterior concrete surfaces.
 - (ii) Approved product: Mapai Plastimul or approved equal in accordance with B7.
- (i) Waterstop
- (i) Waterstop shall be 150 mm wide by 10 mm thick vinylex ribbed-center bulb or approved equal in accordance with B7 or
 - (ii) Waterstop shall be Cetco Volclay Waterstop - RX 101 or approved equal, continuous around perimeter of each pour break. Installed as per manufacturer's instructions.
- (j) Miscellaneous Metals and Accessories
- (i) As shown on the Drawings.
- (k) Shop Drawings:
- (i) Provide shop drawings in accordance with E11 of this specification.
 - (ii) Submit shop drawings for reinforcing steel a minimum of two (2) weeks prior to the fabrication of any reinforcing steel.

E24.3 Construction Methods

E24.3.1 Construction Method Submission

- (a) No Work shall commence on construction of cast-in-place concrete until after the Contract Administrator's review of the Contractor's Construction Method submission.
- (b) The Contractor shall prepare for the Contract Administrator's review a Construction Method submission detailing:
 - (i) Construction sequence to be followed including all methods to be employed.
 - (ii) Shoring system(s) to be used.
 - (iii) Proposed method of structure construction.
 - (iv) Specialized equipment to be used.
 - (v) Any design revisions proposed to accommodate the Contractor's proposed construction method.
 - (vi) Water control consideration including details on the Contractor's proposed method of groundwater and surface runoff control.
- (c) The Contractor shall respond to any concerns that may be raised by the Contract Administrator after review of Construction Method submission.

E24.3.2 Pump Station Upgrades

- (a) Construct cast in place concrete in accordance with CW 2160 and CSA A23.1, except as supplemented, revised or amended in this specification and as indicated in the construction notes on the Drawings.
- (b) Adjust the location of reinforcing steel adjacent to openings to frame those openings in accordance with good practice and maintain the bar spacing intent.
- (c) Do not use welded splices for reinforcing steel.
- (d) Remove all form tie plastic cones and patch with hydraulic cement compound.
- (e) Order all wall reinforcement steel in lengths to best suit the spacing of walers so that reinforcing bars will not be bent or deformed in order to remove the walers.
- (f) Reinforcing steel shall be clean, free of rust, dirt, loose scale, oil, grease or any other material which would reduce bond with concrete.
- (g) Tie, support, and space all reinforcing steel with proper approved devices designed for use in reinforced concrete, to prevent displacement of reinforcing and ensure specified concrete cover.
- (h) Provide minimum concrete cover for reinforcing steel as follows:
 - (i) Formed edges not exposed to soil 40 mm
 - (ii) Formed edges exposed to soil 60 mm
 - (iii) Concrete cast against soil 75 mm
 - (iv) Slab top reinforcement 30 mm
 - (v) Structural slab bottom reinforcement 40 mm

E24.3.3 Backfill

- (a) Place and compact backfill material in accordance with CW 2030.
- (b) Do not place backfill material on frozen ground.
- (c) Do not place backfill material in a frozen state.
- (d) Supply heating and hoarding in accordance with CW 2160 if required to ensure material does not freeze before compaction is complete.
- (e) Notify the Contract Administrator at least one (1) full Working Day in advance of any backfilling operation. No Backfill shall be placed against concrete until approved by the Contract Administrator and in no case before field cured test cylinders show the concrete strength to be 75% of that specified.

E24.3.4 Grout & Patching Cement

- (a) Mix and apply grout and patching cement in accordance with the manufacturer's instructions. Consistency is to be suitable for the intended application.

E24.3.5 Measurement and Payment

- (a) Payment will be Lump Sum based on Form B, "Cast-In-Place Concrete". Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this specification, accepted and measured by the Contract Administrator.

E25. COLD WEATHER REQUIREMENTS

E25.1 Should any concrete Work be required to be carried out when the daily mean temperature is below 5°C or anticipated to be below 5°C within the 24-hour cure period, cold weather requirements will be specified herein.

E25.2 All freshly placed concrete shall be protected from the elements and from defacements due to construction operations.

E25.3 The following are minimum requirements for protecting concrete during and after placement during freezing weather, but mere adherence to these requirements will not relieve the Contractor of the necessity for producing concrete which has not been weakened or injured by frost or freezing, or replacing such damaged Work at no additional cost to the City;

- (a) Before any concrete is placed, all ice, snow, and frost shall be completely removed from all formworks, and other surfaces against which concrete temperatures of such surfaces raised above 7°C for twenty-four (24) hours minimum prior to concreting. Where concrete Work is to come in contact with the earth, the surface of the earth shall be completely free of frost when concrete is placed thereon.
- (b) Concrete aggregates and water shall be heated to not over 80°C. Concrete shall be not less than 20°C or more than 30°C in temperature when deposited. Concrete when placed during freezing weather, or if freezing is anticipated during curing period, shall be fully enclosed and the temperature of same maintained at not less than 20°C for five (5) days nor less than 5°C for an additional five (5) days.
- (c) Heating enclosures shall be strong and wind-proof, well ventilated with heating units so located as to prevent local overheating or drying of the concrete or damage from combustion gases. Only indirect fired heaters will be accepted. Units must be vented outside the enclosure. No direct fired units will be accepted.
- (d) The Contractor shall inform the Contract Administrator well in advance as to the methods of enclosure and frost protection he proposes to employ.

E25.4 Measurement and Payment

- (a) Cold weather requirements shall be considered incidental to the construction of Cast-in-Place concrete, and no payment will be made for this item.

E26. METAL FABRICATIONS

E26.1 Refer to Section 05 14 10 – Structural Aluminum

E26.2 Refer to Section 05 50 00 – Metal Fabrication

E26.3 Measurement and Payment

- (a) Supply, fabrication, transportation, handling, delivery and placement of metal fabrications will be paid for at the Contract Lump Sum Price for "Miscellaneous Metals." Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this specification.

E27. PUMPS COMPLETE WITH MOTORS, DRIVE SHAFTS, GUARDS, AND ACCESSORIES

E27.1 General:

- (a) This Specification shall cover the supply and delivery of pumping equipment, motors, and accessories.
- (b) The three (3) existing pumps at the Tylehurst Lift Station are to be replaced with three (3) new pumps. A full pump rebuild kit with spare parts is to be included with select parts excluded. Refer to E28.
- (c) City of Winnipeg records indicate that the existing pumps currently in use are:
 - (i) Ingersoll-Dresser 8MF14A Split-Coupled Non-Clog Pumps
 - (ii) One of the pumps has been replaced with the similarly sized Flowserve 8MFV13-FR5T.
- (d) The pumps will be used to pump raw sewage having a temperature range of 0°C to 30°C with solids up to 75mm.
- (e) Each pump shall be a single stage, non-clogging, centrifugal flow, vertical mounted, pump coupled with a drive shaft to an electric motor suitable for dry pit installation. Pump assemblies that are considered a submersible style pump where the motor is directly coupled to the pump will not be acceptable.
- (f) Submit torsional natural frequency analysis including the pump, motor, and vertical U-joint drive shaft in accordance with ANSI/HI 9.6.8 level 2 analysis or higher with minimum frequency separation margin of +/- 15%. If resonate conditions are found in the required speed range of the pump a forced response stress analysis is required to determine if the stress is below the fatigue limitations. Submit the analysis as a separate submittal prior to pump shop testing. Analysis shall be completed over the full operating range of the pump. Analysis to include a Campbell/interference diagram.
- (g) Durable metal nameplates shall be securely attached to each pumping unit supplied. Pump nameplates shall indicate the serial number, capacity, head, rpm, and other pertinent data.
 - (i) Impeller information nameplate shall also be included and attached to each pump.
 - (ii) Motor nameplates shall indicate the serial number, voltage, phase, hertz, rpm, horsepower, service factor, NEMA Design, insulation class and any other pertinent data.
- (h) Pumping units shall generally comply with the requirements of the Hydraulic Institute Standards and shall be CSA approved. Have equipment comply with the latest edition of the applicable codes and regulations including, but not limited to, the following
 - (i) American Society of Mechanical Engineers (ASME); .
 - (ii) Canadian Standards Association (CSA);
 - (iii) Canadian Electrical Manufacturers Association (CEMA);
 - (iv) National Electrical Manufacturer's Association (NEMA);
 - (v) American Society for Testing and Materials (ASTM);
 - (vi) American National Standard Institute (ANSI);
 - (vii) Electrical Electronics Manufacturing Association of Canada (EEMAC); and
 - (viii) Electrical Safety Association (ESA)
 - (ix) National Electric Code (NEC)
 - (x) American Iron and Steel Institute (AISI)
 - (xi) American Gear Manufacturer's Association (AGMA)
 - (xii) American Institute of Steel Construction (AISC)
 - (xiii) American Welding Society (AWS)
- (i) ANSI Standards:
 - (i) B-16.5 Pipe Flanges and Flanged Fittings
 - (ii) ANSI/HI 9.6.4-2009 American National Standard for Rotodynamic Pumps for Vibration Measurements and Allowable Values

- (iii) ANSI/HI 9.6.5-2009 American National Standard for Rotodynamic (Centrifugal and Vertical) Pumps – Guideline for Condition Monitoring
- (iv) ANSI/HI 9.8-2012 American National Standard for Rotodynamic Pumps for Pump Intake Design
- (ii) ANSI/HI 9.6.8-2014 Rotodynamic Pumps – Guideline for Dynamics of Pumping Machinery
- (j) Have all electrical equipment comply in every respect with the rules and regulations of Manitoba Hydro and be acceptable to their local inspector.
- (k) In cases of any conflict between these Specifications and any of the above standards, the most stringent standard will have precedence.

E27.2 Products & Construction Methods:

E27.2.1 General Pump Performance Requirements

- (a) The head-capacity curve shall have a single flow rate for each pumping head value and have a continuously rising head characteristic to shut-off to ensure stability.
- (b) At no point on the power demand curve between shut-in and the minimum operating head shall the pump power demand, as determined from the shop performance tests, exceed the “Rated Power” of the motor.
- (c) The maximum speed specified for each pump shall not exceed the maximum specific speed recommended in the Hydraulic Institute Standards, for the specified total dynamic head and the suction head at design minimum suction head conditions. Notwithstanding this requirement, the pump shall be free from cavitation, as described in the Hydraulic Institute Standards, throughout the specified operating ranges listed in E27.3.1.
- (d) The pumps and motors shall be capable of being run in reverse rotation (via the variable frequency drive) in an attempt to de-rag the pump. When a de-ragging function is run, the pump will be run in reverse for approximately 5 to 10 seconds at approximately 20% to 40% speed. Approximately four to six attempts will be made, with a 20 to 30 second wait period between each attempt.

E27.3 Pump Requirements:

E27.3.1 Pump General Requirements:

- (a) Required range of continuous stable flow: from Duty Point 2 to Duty Point 1 in (b) below. The best efficiency point of these pumps must fall within this flow range.
- (b) Rated Speed (1200 RPM)
 - (i) Duty Point 1: 165 L/s @ 18.5m TDH
 - (ii) Duty Point 2: 220 L/s @ 14.5m TDH
 - (iii) Duty Point 3 (Shut Off): 0 L/s @ 25-35m TDH
 - (iv) NPHSa: 8.2m
- (c) Minimum Efficiency at all duty points 1-3 listed above, regardless of speed: 75%
- (d) Discharge Orientation: Centerline
 - (i) A tangential discharge pump may be accepted, however, this deviates from construction drawings and space in the pump room is tight for maintenance. Contractor will be responsible for custom piping at pump discharge such that vertical pipe locations and penetrations through the slab above are as shown in the construction drawings
- (e) Rotation (viewed from above): Clockwise
- (f) Type of Impeller: Non-Clog
- (g) Size of sphere impeller shall pass: 75mm
- (h) Maximum volute dimension: 800mm. Pump room is tight for maintenance. Pumps with volute dimensions greater than this compromise the maintainability of the pumps.

- (i) The City of Winnipeg has recognized a historical correlation between the amount an impeller is trimmed and the frequency of pump clogging. Therefore, the ratio of the trimmed impeller diameter to the maximum impeller diameter allowable in the pump volute will not be less than 0.95.
- (j) Diameter of Pump Suction: 200-250mm
- (k) Diameter of Pump Discharge: 200mm
- (l) Suction Elbow to be sized to connect to 350mm suction piping directly.

E27.3.2 The following pumps are approved, conditional upon meeting the above specifications. Suppliers to note E27.3.1(h) in particular. Compliant alternatives to be approved during tender.

- (a) KSB D200-400G V – 402mm Impeller
 - ◆ Provide with 75 HP motor in compliance with E27.4.
- (b) Yeomans 8515-4A - 360mm Impeller.
 - ◆ Tangential Discharge – refer to E27.3.1(d)(i)
 - ◆ Provide with 75 HP motor in compliance with E27.4.
- (c) Fairbanks Nijhuis 10"5711 - 338mm Impeller.
 - ◆ Tangential Discharge – refer to E27.3.1(d)(i).
 - ◆ Provide with 75 HP motor in compliance with E27.4.
- (d) Approved Equal in accordance with B7.

E27.3.3 Unspecified Materials

- (a) All unspecified materials shall be selected specifically for their suitability considering their duty. Unless otherwise specified herein, all materials and equipment shall conform to the appropriate Standard Specifications of the American Society for Testing Materials, referred to as the ASTM Standards except where a higher standard is specifically called herein. Where alternate materials are being offered the bidder shall refer to the material by ASTM standard number.
- (b) The various materials used in the construction of the equipment shall be of the best quality and particularly suited to the requirements. Materials shall conform in general to the composition, physical characteristics and methods of treatment required by the specifications of the American Society for Testing Materials in so far as they apply and as specified herein.

E27.3.4 General Requirements:

- (a) Castings to be free from flaws and imperfections and machined surfaces finished true.
- (b) Round off inside and outside corners and edges of all castings.
- (c) Provide means to prevent nuts and bolts from becoming loose (pins, spring or friction washered fasteners).
- (d) Obtain written permission of the Contract Administrator to patch, plug, shim or employ other means of overcoming defects, discrepancies or errors in manufacturing.
- (e) Statically and dynamically balance all rotating components as an assembled unit in accordance with ISO 1940 G6.3.

E27.3.5 Casing:

- (a) Cast iron conforming to ASTM Specification A48 or A278, for Gray Iron Castings, Class 30 or approved equal in accordance with B7.
- (b) Casing shall be rated for 1.5 times working pressure.
- (c) Eyebolts or hooks shall be provided for lifting.
- (d) Centrifugal volute type design of ample thickness and rigidity to withstand stresses due to hydraulic forces, weight of piping, erection loads, operating and testing.

- (e) Inside water passages shall be smooth and free from any significant projections that would hinder the flow of any solid waste.
- (f) Proportion casings so change in energy of the sewage from the kinetic form, as it leaves the impeller, to the pressure form as it leaves the casing will take place gradually with minimum eddy formation or shock.
- (g) Front head to permit equal distribution of sewage to all parts of the impeller without the use of stationary guides or vanes on the suction side of the impeller.
- (h) Design to permit the removal of the rotating assembly without disturbing the suction and discharge piping.
- (i) Provide a hand hole with bolted cover on the volute to permit access to the inside for cleaning and unclogging of the volute.
- (j) Provide a tapped 10-millimetre (3/8") NPT hole on the top of the volute with a suitable length of brass pipe and a shut off ball valve to allow trapped air within the volute to be bled off.
- (k) Shop test and provide certification that the fully assembled casing is successfully able withstand a hydrostatic test pressure of not less than 1.5 times the shut-off head of the largest impeller size as shown by the characteristic curve.

E27.3.6

Impeller:

- (a) Impeller: cast iron conforming to ASTM Specification A48 or A278, for Gray Iron Castings, Class 30 or approved equal in accordance with Section B7 of the Tender.
- (b) The impeller to be of the non-clog enclosed channel type.
- (c) Design impeller to ensure smooth operation without cavitation in the operating range and with minimum vibration.
- (d) Cast impeller in one piece and balance both statically and dynamically to ISO 1940 G6.3.
- (e) Trim impeller over its full height if the impeller supplied has been trimmed from a larger impeller leaving no lip or protrusion around the bottom edge.
 - (i) Refer to E27.3.1(i)
- (f) Balance trimmed impeller after trimming.
- (g) Cast impeller surface to be free from casting blemishes and finished to 250 RMS or better.
- (h) Securely key the impeller to the tapered shaft and hold in place with an impeller nut.
- (i) The impeller nut shall be dome shaped with a smooth face and blend into the hub so as not to allow any stringy material to accumulate around the nut. Hex shaped nuts shall not be used.
- (j) Design the impeller and retaining nut so that the impeller cannot loosen on the shaft due to torque resulting from rotation.

E27.3.7

Backhead & Stuffing Box:

- (a) Cast iron conforming to ASTM Specification A48 or A278, for Gray Iron Castings, Class 30 or approved equal in accordance with B7.
- (b) Backhead shall be a separate piece from the volute casing.
- (c) Backhead shall be designed to rigidly support the bearing frame and be a self centering and self-indexing fit with the volute casing to ensure proper alignment.
- (d) Provide a minimum of two large openings opposite each other adjacent to the stuffing box to allow access for maintenance.
- (e) Provide for external axial adjustment of the rotating element to maintain proper clearance between the impeller and front head wearing rings.

- (f) Provide tapped 10-millimetre NPT inlet and vent holes complete with suitable lengths of brass pipe and full port shut-off ball valves on opposite sides of the stuffing box for seal water inlet and outlet.
- (g) Provide a tapped drain hole on the stuffing box complete with pipe plug.
- (h) Stuffing box shall be integral with the backhead and suitable for the use of a double mechanical cartridge seal.

E27.3.8 Clean Out Port:

- (a) Clean out port to be located at center of pump.
- (b) Minimum one hundred (100) millimetres (four (4) inches) diameter.

E27.3.9 Wear Rings:

- (a) Provide removable wear rings of the axial or radial type for the front head and impeller.
- (b) Wear Rings: fabricated from stainless steel conforming to ASTM Standard A296, for Corrosion-Resistant Iron Chromium, Iron-Chromium-Nickel, and Nickel-Base Alloy Castings for General Application, Grade CA-15 or approved equal in accordance with B7.
- (c) Impeller ring hardness to be at least 300 Brinell (RC 32.1).
- (d) Casing wear ring to exceed impeller wear ring by at least 50 Brinell.
- (e) Machine the rings for a close fit to minimize the leakage of sewage from the discharge to the suction.
- (f) Attach the rings in such a way as to allow for ready adjustment or replacement and to prevent loosening under normal operation or under reverse pump rotation.

E27.3.10 Impeller Shaft Assembly

- (a) Shaft Assembly: fabricated from steel conforming to ASTM A108, Grade 1045 or approved equal in accordance with B7.
- (b) Shaft assembly to be of sufficient diameter to assure rigid support of the impeller and to transmit loads without slip, vibration or undue deflection at all operating speeds and loads.
- (c) Accurately machine the shaft along its entire length and provide keyways at both ends.

E27.3.11 Bearings:

- (a) Bearings: shall be of the heavy-duty anti-friction type suitable for oil or grease lubrication. Radial bearings shall be of the self-aligning plain roller or ball type and thrust bearings shall be of the tapered roller or angular contact type.
- (b) Design bearings for a B-10 life of not less than 100,000 hours in accordance with AFBMA.
- (c) Rigidly support bearings to counteract any possible tendency towards vibration.
- (d) Grind and match duplex bearings, if used.
- (e) Adapt lubrication of the bearings to the operation of the units without full-time attendance.

E27.3.12 Mechanical Seals:

- (a) Mechanical Seals: double mechanical seals.
 - (i) Cartridge type.
 - (ii) Primary sealing mating faces to be silicon carbide to silicon carbide and secondary sealing mating faces to be carbon to silicon carbide or silicon carbide to silicon carbide.
 - (iii) As manufactured by John Crane, Durametallic, Burgmann, or approved equal in accordance with B7.

E27.3.13 Paint:

- (a) Apply one prime coat of a rust inhibitive primer, a second adhesive prime coat and one finish coat of manufacturer's standard enamel to all exterior metal surfaces, except machined surfaces.
- (b) Do not paint over nameplates.

E27.3.14 Drive Shaft Assembly

- (a) Vertical hollow steel drive shaft with flexible coupling(s) to transmit power from the motor to the pump.
- (b) Drive shaft and coupling(s) shall have a service factor of 2.5 to ensure ample capacity to transmit power continuously for all operating conditions with up to one (1) degrees of misalignment which may occur during or develop after installation and should accommodate any thermal expansion based on a temperature differential of one hundred (100) degrees Fahrenheit (37.8° C).
- (c) The shaft shall be of ample diameter to limit the deflection of shaft and impeller when installed in the pump casing to a minimum and to prevent vibration during acceleration, deceleration and running speeds.
 - (i) The City of Winnipeg has a history of issues related to receiving un-trimmed replacement impellers. Therefore, the shaft must be sized appropriately to drive the pump with a full-size (according to the technical literature for the pump) impeller without failure
- (d) Shaft shall be machined with radiused re-entrant corners at changes of diameters and at keyways to minimize stress concentration and other causes of metal fatigue.
- (e) The drive shaft assembly coupling arrangement shall permit easy removal of either the pump or motor without disturbing the other. Only one length of shaft shall be used between the pump and motor.
- (f) Statically and dynamically balance the drive shaft to obtain vibration free operation. The requirements of E27.1(f) apply.
- (g) The approximate elevations of the pump room floor, suction centre line, and motor room floor for the pumping station is shown in E27.6. The Bidder shall use this to approximate the drive shaft length for bidding purposes. Contractor shall confirm distances prior to manufacture.
- (h) After award of this Contract, the Contractor shall be responsible to take exact measurements for final sizing of the drive shaft lengths.

E27.3.15 Drive Shaft Guard:

- (a) Drive shaft guards, as supplied, shall be meet OSHA standards upon installation without requiring any modification. Installation by others.
- (b) The drive shaft guards shall extend to the ceiling above the pumps.

E27.3.16 Shaft and Sleeve:

- (a) Shaft sleeve where shaft passes through stuffing box: fabricated from 316L stainless steel conforming to ASTM A240 or approved equal in accordance with B7.
- (b) Fit and securely fasten the shaft sleeve in place after shaft grinding.
- (c) Seal shaft sleeve to prevent leakage between the sleeve and shaft.
- (d) Extend shaft sleeve at least 2 millimetres above the top of the gland cover.

E27.3.17 Suction and Discharge

- (a) Suction and discharge shall be flanged, faced and drilled to conform to ASME Specification B 16.1 Class 125.
- (b) Provide a cast or fabricated 90° suction elbow with hand hole and cover plate fastened with bolts, to permit access to the suction side of the impeller for cleaning and inspection.

- (c) Provide gauge connections tapped for 10-millimetre (3/8") NPT threaded pipe on each suction and discharge nozzle. Locate tapped connection close to flange ends. Provide pipe plugs in tapped holes.
- (d) Discharge to be equipped with pressure gauge and diaphragm isolator:
 - (i) Ashcroft Type 1009 Stainless Steel Duralife Gauge. Model: 35-1009SWL-02L-100#-XCG
 - ◆ Range: 0 – 100 PSI
 - ◆ Accuracy: +/- 1% of range
 - ◆ Case Material: Stainless Steel
 - ◆ Wetted Material: 316 Stainless Steel C-type Bourdon tube and Socket
 - ◆ Process connection: 1/4" NPT Bottom
 - ◆ Liquid Filled, Glycerin
 - (ii) Complete with Ashcroft Type 330 All-Welded Flush Mini Seal, Part 08-330-SX-02T-XCG
 - ◆ Process connection to suite pump discharge port
 - ◆ Diaphragm: 316L SS
 - ◆ No bottom housing
 - ◆ Instrument connection: 1/4" NPT
 - ◆ Liquid Filled, Glycerin

E27.3.18 Bearing Frame

- (a) Bearing Frame: cast iron conforming to ASTM Specification A48 or A278, for Gray Iron Castings, Class 30.
- (b) The station includes existing shaft openings through floors and posts supporting bearings on the valve floor.
- (c) Bearing frame shall rigidly support the motor adapter frame with a self-centering and self-indexing fit with the backhead to ensure proper alignment.
- (d) Machine bearing frame for accurate and permanent bearing alignment.
- (e) Completely enclose the shaft between the bearings.
- (f) Provide lip type seals in contact with the shaft.
- (g) Include grease fittings in the bearing frame for bearing lubrication.

E27.3.19 Pump Support

- (a) Provide one (1) rigid fabricated steel four (4) legged stand for each pump. Pump support shall firmly support the entire weight of the pump and withstand the full motor torque.
 - (i) Minimum ASTM A36 carbon steel or approved equal, painted to match the pump or powder-coated
 - (ii) The pump support will be no wider at the base than 850mm.
 - (iii) Horizontal and vertical members shall be angle sections or steel tubing, with diagonal bracing to enhance torsional rigidity. Diagonal bracing shall not obstruct access to cleanout port on suction elbow. The pump support shall provide clear unobstructed access to the cleanout ports on the suction elbow and the pump volute.
 - (iv) Stand shall be designed for anchor bolt installation to a concrete foundation. Bolt holes shall be pre-drilled and sized to accommodate anchor bolts.
 - (v) Design must accommodate pump suction elbow size.
- (b) A cast gusseted suction elbow stand combination is an acceptable alternative to (a)
- (c) stand must support static and dynamic loads associated with hydraulic pump operation, including startup torque and vibration.

- (d) Stand to be designed based on the results of a vibrational analysis to avoid resonances and excessive vibration

E27.4 Motor requirements:

(a) Motor General Requirements:

- (i) Enclosure: Totally Enclosed Fan Cooled (TEFC)
- (ii) Power Supply: 600 VAC, 3-Phase, 60 Hz.
- (iii) Power Rating: 75 HP
- (iv) Power Factor: 0.80 PF Minimum
- (v) Efficiency: Premium - 0.90 Minimum
- (vi) Winding Insulation: Class F or Higher
- (vii) Nominal Speed: 1200 RPM
- (viii) Windings: Copper
- (ix) Motor Service Factor: 1.15
- (x) Approvals: CSA, NEMA MG1
- (xi) Starts per Hour Capability: 10
- (xii) Inverter Duty Rated for Variable Frequency Drive (VFD) Compatibility.
- (xiii) All motors shall be equipped with motor shaft grounding ring, suitable for VFD (inverter) application:
 - ◆ AEGIS SGR Bearing Protection Ring;
 - ◆ Or approved equal in accordance with B7.

(b) Power Cabling General Requirements:

- (i) Include lugs for the connection of power cabling for #8 AWG or larger.
- (ii) Include a power cable enclosure for terminating incoming field power cabling to motor cabling.

(c) Provide motor mount standoff with access to motor shaft;

E27.5 Instruments General Requirements:

- (a) See Section E27.8 for bearing sensor requirements.
- (b) Pump and Motor shop drawings to include locations for motor and bearing monitoring sensors including mounting type to manufacturer specifications.
- (c) Motors to include three (3) internal winding temperature thermostats in series for high temperature alarms.

E27.6 Relevant Approximate Elevations

Detail	Elevation
Motor Room	225.817 m
Pump Room	222.772 m

E27.7 Training

- E27.7.1 The requirements of E41 apply
- E27.7.2 Training to be incorporated into the on-site program outlined in E41.
- E27.7.3 Training to be by a manufacturer's representative. Allow for four (4) hours of on-site training by the representative.

E27.8 Electronic Pump and Motor Bearing Monitoring System general requirements:

- (a) Asset Online Condition Monitoring systems are field devices mounted close to assets like pumps, blowers, fans, etc. to measure and provide information on their health state, process state and to provide at least a basic level of protection to the monitored asset.
- (b) The field device shall have the ability to calculate application results and measure health natively, at the edge, and provide these results directly to the plant resources.

- (c) Data evaluation should follow state of the art analytical methods for bearing and gearbox analysis and must be presented in a simple format, easy to understand, and selectable based on the needs of the plant resource.
- (d) The device must have decision making routines that must be available for identification when data measured is relevant and shall be used for Health calculation and indications.
- (e) The field device shall have modular design with capability to include minimum 12 single measurement channels/ modules
- (f) It must have the ability to host a wide variety of sensor types including piezoelectric accelerometers and velocity sensors, electrodynamic velocity sensors, Eddy Current measurement chains for speed, vibration and static measurements, Hall effect and MPU speed sensors, thermocouples, RTDs and 4-20mA transmitters (for e.g. measuring process parameters like pressure and mass flow).
- (g) The field device shall have the ability to provide a health index based on self-contained assessments of common mechanical anomalies detected via vibration and other technologies. The anomalies shall include imbalance, misalignment, looseness, blade/vane pass issues, flow-related issues, bearing defects, lubrication issues, gear misalignment, cracked- or broken tooth analysis, tooth wear issues as well as electric motor issues.
- (h) Trends of these assessment results shall be visualized in an easy to view trend plots with user options for the length of trend up to 10 years.
- (i) A high frequency detection methodology shall be a native feature of the field device for display. Further the high frequency detection shall be used for early detection of antifriction bearing defects and lubrication issues and must support a frequency range up to 40 KHz.
- (j) This system shall have an A/D resolution of 24bit with the option of displaying data in SI or Imperial units. Frequency units must have the ability to be displayed in CPM or Hz. Further to this, for dynamic measurements, the waveform and spectrum must be made available from screen with proper resolution and screen size.
- (k) Communication:
 - (i) The field device shall have the ability to connect to a plant network via wired Ethernet, wireless Ethernet (Wi-Fi), or both. System access shall be available for transmitting data to other systems via OPC UA as well as Modbus TCP.
 - (ii) This transmitted data shall include the measured value, calculated values, application rule-based values, health status and related status messages
 - (iii) Modbus must be fully flexible for addressing all registers individually with easily accessible and automated data structure reporting opportunities. Both interfaces (Modbus and OPC) must include holding registers (writable) to drive external data into the system and processing it together with the data measured by the system directly.
 - (iv) External data points must be flexible in configuration and scalability within the system.
 - (v) If the device provides more than one LAN interface for network connections, data interfaces (like OPC and Modbus) must be configurable for activation/deactivation at each interface.
- (l) User Interface:
 - (i) User interaction with the field device must be provided via a browser-based user interface (UI) without any software installation needs and must be easily accessible by a typical desktop, laptop computer or a mobile device such as a tablet or smart phone.
 - (ii) The UI shall have multilevel login access limiting access to changing setup parameters and asset details.
 - (iii) Having the ability to change the local language on the field device is a requirement. English language is the default setting.
 - (iv) The UI must be intuitive to use without extensive training needs and start from a single Dashboard bringing all relevant Input-, Output-, Status- and resulting health information to screen. Where standardized information is relevant to the Analytics

configuration of the system, such data must be provided by the system for choice (e.g. bearing database).

- (m) Software Integration and Connectivity:
 - (i) The field device shall have the ability to provide relevant information to machinery management software of same vendor where the field device continuously provides measurement values, asset status, system status & asset health information on top of high resolution waveform and spectra data to the software automatically.
 - (ii) The interval of how often high-resolution waveform/spectrum data shall be provided and must be configurable separately to include decision making routines.
 - (iii) The field device must allow and support interaction from and to the machinery management software to provide such data based on request of the machinery management software and caused by an alarm or on demand.
 - (iv) All data interaction and communication between the field device and the machinery management software must be managed through a completely independent and exclusive interface with Password protection.
- (n) Cyber Security:
 - (i) The manufacturer of the field device needs to take care of cyber security updates for all interfaces and finally allowing operators to stay current with their network infrastructure. This includes hardening the update process with allowing encrypted and signed firmware updates files only and making data "read-only" where possible.
 - (ii) System & Network related audit logs including box & user driven events must be stored and made available for Administrators.
 - (iii) 3rd party components used with the system (like e.g. Browsers like Chrome) must be considered within regular updates and robustness against attacks must be ensured by having an up-to-date On-board firewall.
- (o) Field Device Alert Levels
 - (i) There shall be three levels of alerts, increasing and decreasing (low level warning, intermediate level warning and high-level warning). These alerts shall be assignable to all measured and calculated values.
 - (ii) Default vibration alert values, based on the applicable ISO 20816 standard, shall be easily assigned, based on the size of the asset. Also, it must provide the option to users of customizing all alert value.
 - (iii) Data evaluation and alarming must follow State-of-the-Art analytical methods for bearing and gearbox analysis.
 - (iv) Each level of alert shall provide helpful messaging to assist the user in understanding the health status of the monitored asset.
- (p) Field Device Protection Functionality
 - (i) Based on programmable alerts and those finally being detected by the system, it must provide protection functionality with opportunities to drive alarms from a digital output and/or relay contacts.
 - (ii) the typical system alarm response time should be at least in range <2 seconds.
- (q) Field Device Hazardous Area and Environmental Ratings
 - (i) Hazardous Area Approvals: Min CSA Class I Division II and ATEX Zone II certifications
 - (ii) Enclosure Rating: IP 66 and NEMA 4X, along with Vibration, Shock, and EMC testing.
 - (iii) Operational Requirements: Temperature range of -40°C to +55°C (-40°F to 131°F), relative humidity of 5 – 95% (non-condensing)
 - (iv) Mean Time Between Failure (MTBF): +50 years
- (r) Field Device Installation:
 - (i) Mounting the field device shall be easy and must include options for vertical or horizontal orientation.

- (ii) Mounting shall also be secure and meet any requirements of hazardous areas in which the device is certified for installation.

E27.8.1 Products

- (s) Asset Monitoring System (FDP-L010, FDP-L020, FDP-L030)
 - (i) Acceptable Products:
 - Design based on Emerson AMS Asset Monitoring System.
 - Or approved equal in accordance with B7.
 - (ii) Power Supply: 18-30 VDC
 - (iii) A minimum of 20% spare slots shall be provided within the chassis for the future addition of modules.
 - (iv) Vibration Input CHARM Modules: 4 x VI Piezo (SE8701V01-PZ) (Per Panel, 12 total)
 - (v) Temperature Input CHARM Modules: 2 x RTD Input (SE4303T03) (Per Panel, 6 total)
 - (vi) Discrete Output CHARM Modules: 1 x DO 24VDC High Side (SE4302T01) (Per Panel, 3 total)
 - (vii) Dry contact Terminal Block: SE4503 (Per Panel, 3 total)
- (t) Vibration Accelerometer (VE-L010-1, VE-L010-2, VE-L020-1, VE-L020-2, VE-L030-1, VE-L030-2)
 - (i) Acceptable Products:
 - Design based on CTC, M/AC119-1D series.
 - Or approved equal in accordance with B7.
 - (ii) Dynamic Range: $\pm 80g$
 - (iii) Two axis sensing
 - (iv) Sensitivity: 100mV/g
 - (v) Frequency Response: 1Hz to 6.5KHz
 - (vi) Voltage Source: 18-30 VDC
 - (vii) Settling Time: <2.5 seconds
 - (viii) Operating Temperature Range: -50 to 120°C
 - (ix) Maximum Shock Protection: 5000g peak
 - (x) Sensing Element: PZT Ceramic
 - (xi) Case Material: 316L Stainless Steel
 - (xii) Connector: MIL-C-509
 - (xiii) Cable and Connector:
 - For Pump Room Sensors: CB119-V3NB-015M-Z
 - For Motor Room Sensors: CB119-V3NB-010M-Z
 - (xiv) Number of conductors: 4 Conductor, Shielded Cable.
 - (xv) Max Temp: 200 °C (392 °F)
 - (xvi) Total Cable Length:
 - Pump Room Sensors: 15 Meters
 - Motor Room Sensors: 10 Meters
 - (xvii) Connector 1: 3 Socket MIL-Style Seal-Tight Viton™ Boot Connector with Nylon Insert, Wired for Interface to Biaxial AC119-1D Sensor Wired as X and Z Entry, Permanent Mount, 250 °F (121 °C) Max Temp
 - (xviii) Connector 2: Blunt Cut
 - (xix) Connections: Per drawings

- (u) Temperature Sensor (TE-L010-1, TE-L010-2, TE-L020-1, TE-L020-2, TE-L030-1, TE-L030-2)
 - (a) One hundred (100) ohm platinum 4-wire RTD.
 - (b) NEMA 4X connection head.
 - (c) Terminal blocks for connection to field wiring.
- (v) Bearing Vibration and Temperature Sensor Locations:
 - (a) Pump 1 Lower (pump) Bearing Vibration and Temperature
 - (b) Pump 1 Upper (motor) Bearing Vibration and Temperature
 - (c) Pump 2 Lower (pump) Bearing Vibration and Temperature
 - (d) Pump 2 Upper (motor) Bearing Vibration and Temperature
 - (e) Pump 3 Lower (pump) Bearing Vibration and Temperature
 - (f) Pump 3 Upper (motor) Bearing Vibration and Temperature

E27.8.2 Installation

- (a) Contractor is responsible for installation, wiring, testing, and assisting the contract administrator in commissioning of all AMS equipment, communication equipment, PC equipment and Operator interfaces as per manufacturer instructions and recommendations.
- (b) Contractor shall supply all required cabling to connect hardware above.
- (c) Contractor to install the Vibration Sensors in the appropriate direction of bearing in coordination with client and manufacturer requirements.

E27.8.3 Commissioning

- (a) Provide all required AMS commissioning services as per Section 40 80 11.
- (b) The field device shall have at least an 18-month warranty against defects from the date of shipment with options for contracted support and warranty extension.
- (c) Contractor to provide As-Built Drawings and O&M Manuals.

E27.9 Measurement and Payment

E27.9.1 Lift Pumping Equipment Supply (Pumps, Motors, Drive Shafts and Instruments), Spare Parts, and In-Person Factory Acceptance Testing

- (a) Payment will be Lump Sum based on Form B, "Lift Pumping Equipment Supply (Pumps, Motors, Drive Shafts and Instruments), Spare Parts, and In-Person Factory Acceptance Testing". Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this specification, accepted and measured by the Contract Administrator.
- (b) Payment shall be in accordance with the following payment schedule:
 - (i) Ten (10) percent upon approval of Shop Drawings.
 - (ii) Seventy (70) percent upon all pumping equipment received in Winnipeg.
 - (iii) Ten (10) percent upon completion of commissioning and pumps are in-service.
 - (iv) Ten (10) percent upon providing training and O&M material.

E27.9.2 Electronic Pump and Motor Bearing Monitoring System

- (a) Payment will be Lump Sum based on Form B, "Electronic Pump and Motor Bearing Monitoring System". Said price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the Work included in this specification, accepted and measured by the Contract Administrator.
- (b) Payment shall be in accordance with the following payment schedule:
 - (i) Ten (10) percent upon approval of Shop Drawings.

- (ii) Seventy (70) percent upon equipment installation and wiring verification.
- (iii) Ten (10) percent upon completion of commissioning.
- (iv) Ten (10) percent upon providing training and O&M material.

E28. TOOLS, ACCESSORIES AND SPARE PARTS

E28.1 Tools and Accessories:

- (a) Provide special tools or accessories required for maintenance, adjustment, assembly or disassembly of the pumping equipment supplied.

E28.2 Spare Parts: Provide three (3) sets of pumps rebuild kits. Provide special tools or accessories required for maintenance, adjustment, assembly or disassembly of the pumping equipment supplied.

- (a) Qty 3 sets of wear rings;
- (b) Qty 3 sets of mechanical seals;
- (c) Qty 3 sets of bearings;
- (d) Qty 3 impellers;
- (e) Qty 3 sets of volute and casing gaskets.
- (f) Hardware to install spare parts.

E28.3 Properly package spare parts to resist damage.

E28.4 Clearly identify package as to its contents.

E28.5 Spare parts shall be identical to those supplied in the pumps.

E28.6 Measurement and Payment:

- (a) Refer to E27.9.1

E29. PUMPING EQUIPMENT IN-PERSON FACTORY ACCEPTANCE TESTING (FAT) AND FIELD TESTING

E29.1 General factory acceptance testing shall consist of the following:

- (a) Factory Acceptance Testing (FAT) shall be carried out by the equipment manufacturer. Motor FAT to be unwitnessed provided all required testing reports and documentation is provided. Pump FAT shall be witnessed In-Person by City of Winnipeg personnel and/or City of Winnipeg representatives at no additional cost. A total of two (2) City of Winnipeg representatives (1 City Personnel and 1 Contract Administrator Personnel) shall be participating in In-Person witnessing of the FAT. The City reserves the right to request remote witnessing in place of in-person witnessing at no additional cost.
 - (i) If remote pump FAT witnessing is requested, the manufacturer shall complete all testing required and shall arrange for live video viewing of testing. The manufacturer is responsible for organizing and arranging the live video testing and for distributing video recordings of each test.
 - (ii) The costs of travel and accommodation for the two (2) City of Winnipeg representatives is not to be included in this contract. These costs are to be borne by the Contract Administrator.
- (b) The In-Person FAT shall be carried out on one (1) FAT site visit. The equipment manufacturer shall arrange for FAT to be performed on all pumps during the single FAT site visit.
- (c) Provide a minimum of fifteen (15) business days notice to the Contract Administrator prior to anticipated witness testing date.

- (d) The Contractor shall furnish all power, labour, materials and properly calibrated instruments required for these tests. Instrument calibration shall be as specified in the Test Code of the Hydraulics Institute Standards.
- (e) Allow for an escort at the testing facility for participating City of Winnipeg representatives, equipment pictures to be taken, along with testing equipment, tools and materials to carry out testing. Make all equipment and labour accessible for participating personnel as directed.
- (f) A minimum of five (5) business days prior to anticipated FAT date, submit test facility evidence of ANSI Certification, calibration certificates of all testing equipment to be used along with details on the test arrangement procedures. Submit detailed test procedures including the test layout and instrument test calibration certificate. Include equipment calibrations and test arrangement procedures in the Operation & Maintenance Manual.

E29.2 Pump factory acceptance testing shall consist of the following:

- (a) The pumps shall be subject to unwitnessed hydrostatic tests in accordance with the Test Code of the Hydraulic Institute Standards. Certified test records shall be submitted to the Contract Administrator for review prior to pump shipment.
- (b) Performance testing of a pump shall not be scheduled until satisfactory completion and submission of the certified records of the hydrostatic testing.
- (c) Conduct pump tests in accordance with Hydraulic Institute Standards. All definitions for the purpose of testing shall be as set forth by Hydraulic Institute Standards.
- (d) Pump test to be witnessed performance tested (In-Person FAT) as per Hydraulic Institute Standards 14.6 Grade 1B. Each pump shall be tested for:
 - (i) Flow Test: The pumps shall be tested to determine the head, capacity, efficiency, power, and vibration limit all in accordance with the Hydraulic Institute Standards. The pumps shall be tested at full rated speed and reduced speeds, as specified, over the ranges listed below. Vibration reading shall be recorded for each point tested and included with the test results. Vibration readings shall include FFT graphs for each point.
 - ◆ Test six (6) evenly spaced (by flow) duty points between (and including) shutoff and runout. Do this at relative speeds of 100%, 90%, 80%, and 70%. Record motor TDH, efficiency, running currents and absorbed power usage at each flow rate. Absorbed power usage shall be obtained when power factor has been corrected to 0.95.
 - ◆ Developing Certified Test Curve(s) (per Hydraulic Institute Standards) Showing Pump Performance.
 - ◆ Vibration to be measured at each stage including FFT graphs for each point.
 - ◆ Bearing temperature to be measured at each stage.
 - ◆ If any signs of cavitation or incipient cavitation occur over the specified operating range of the pumping unit, the unit may be rejected.
 - ◆ A test report which includes certified performance curve in showing head in metres, capacity in litres per second, efficiency, speed, power in kilowatts, and vibrations shall be furnished to the Engineer for approval. The Contractor shall include sample calculations, raw data, calibration curves and/or certificates, and assumptions in the report.
 - (ii) Fixed head curve: At each of the speeds above, record at least one (1) of the six (6) data points at 14.5m TDH. Use these data points to produce a "fixed head curve" at 14.5m TDH, varying speed for each pump from 70 – 100%. Data collected at each duty point is to match (i).
 - (iii) Complete a NPSH (Cavitation) testing with methods and allowable tolerances in accordance with Hydraulic Institute Standards at full speed, corrected for difference in atmospheric conditions between testing location and project site. For each pump test the design duty points given in E27.3.1 and the worst-case duty points at flow run-out.

- (e) The approval of the Engineer of the results of the shop tests is not to be construed as being final approval of the pumping unit. Final approval will be given subject to the satisfactory installation and operation in place of this equipment, as demonstrated by Field Performance Tests specified hereinafter.
 - (f) All FAT to be performed is to be provided prior to testing and include pump rated specification and acceptable tolerances with pass/fail indicators.
- E29.3 Motor factory acceptance testing (unwitnessed) to be completed as per ANSI/NETA ATS-2021, NEMA MG 1-2021, and manufacturers requirements with the intent to test the compliance of the motors without causing damage to the equipment. Testing shall consist of the following at minimum for each motor:
- (a) Run Test at Full Voltage and Full Speed.
 - (b) Running Current at Motor Speed tests at:
 - (i) 100% Load.
 - (ii) 75% Load.
 - (iii) 50% Load.
 - (iv) 40% Load.
 - (v) 30% Load.
 - (c) Full Load Steady State Current.
 - (i) High Potential Test.
 - (ii) Noise and Vibration Test.
 - (iii) Insulation Resistance Test.
 - (iv) Winding Resistance Test.
 - (v) Partial Discharge Test.
 - (vi) Surge Test.
 - (vii) Power Factor Test.
 - (viii) Temperature Rise Test at the rated service factor of the motor for the duration applicable to a continuously rated machine using the resistance method.
- E29.4 Instrument factory acceptance testing shall consist of the following:
- (a) All instruments to be provided with calibration certificates:
- E29.5 At no additional cost, make any adjustments or changes required by the participating City of Winnipeg representatives such that each pump and associated equipment will pass every test. Final acceptance by the City of Winnipeg representatives will be a conditional requirement prior to pump shipments from the factory.
- E29.6 All factory acceptance tests shall be documented, dated and signed by the testing technician(s) with electronic copies submitted to Contract Administrator for approval prior to shipments from the factory. Include test results in the Operation & Maintenance Manual.
- E29.7 Any failure to meet the requirements of the Specifications shall be corrected promptly by the Contractor after which the pump shall be retested. If, after correction and retesting, the pump still fails to meet the requirements of the Specifications, it may be rejected.
- E29.8 Do not ship pump or motor to site until:
- (a) Shop tests for both are completed.
 - (b) Shop test reports have been submitted to Contract Administrator.
 - (c) Compliance with performance requirements has been demonstrated.
 - (d) Contract Administrator has given approval for shipping to proceed.
 - (e) Contract Administrator has given approval of Torsional Frequency Analysis results pursuant to E27.1(f).

- E29.9 All FAT to be performed is to be provided prior to testing and include rated specification, acceptable tolerances with pass fail indicators. All FAT documents and testing procedures are to be provided to the Contract Administrator at least 4 weeks ahead of actual FAT. The Contract Administrator will provide comments on the FAT documents which the supplier must review and revise accordingly.
- E29.10 FAT reports are to indicate nominal values and acceptable tolerances in addition to as-found testing results.
- E29.11 Shop Tests:
- (a) Pursuant to E29.2, Test each pump in the manufacturer's shops over the range of operation from shut-off to run-out.
 - (b) Provide a certified test curve in duplicate showing the head, capacity, pump efficiency and power for each pump to the Contract Administrator for review prior to shipping Goods.
 - (c) Test curves to be signed by the pump manufacturer's official responsible for the test.
 - (d) Final payment for the Goods will be made only after the Contract Administrator has received the certified test curve for each pump supplied.
- E29.12 Installation and Field Tests:
- (a) Installation:
 - (i) All equipment and material shall be installed in a workmanlike manner, in accordance with the manufacturer's recommendations.
 - (ii) Install in accordance with the manufacturer's requirements, as provided by the Pump Supplier, including details for anchor bolts, frames and other items to be cast into concrete work, prior to the installation of the equipment.
 - (iii) The Contractor shall install the equipment where shown on the Drawings and in strict accordance with the manufacturer's instructions and in compliance with applicable local, provincial and federal codes and regulations.
 - (iv) The Contractor shall provide concrete and grout, final piping and electrical connections and other appurtenances not herein or elsewhere specifically mentioned or included, but necessary for the installation, operation and testing of the equipment, without additional payment.
 - (v) All possible precautions should be taken to ensure proper alignment of equipment shafts and pipe connections to avoid transmission of piping weight reactions to the equipment at pipe connections or equipment damage due to misalignment.
 - (vi) Comply with requirements of Hydraulic Institute Standards for installation of all pumps.
 - (b) Field tests will be performed on each pumping unit as soon as possible after the Contractor has inspected the installation. Pump supplier is to provide the services of a qualified technical representative to be present for the field tests and verify correct installation of the pumps. Field tests will be to determine and check for the following:
 - (i) Capacity,
 - (ii) Noise (bearing, mechanical seal, cavitation, other),
 - (iii) Vibration,
 - (iv) Electrical energy supplied to the motors from motor control centre, and
 - (v) The liquid pumped during the field test will be raw sewage with a density taken to be 1.00 kilogram per litre.
 - (c) Measurements shall be taken by a qualified representative of the Pump Manufacturer. Prepare a report including all testing data presented graphically in the same units as the shop test results and submit to the Contract Administrator.
 - (d) If the field pump tests indicate the Goods supplied does not meet the specified requirements, the Contractor shall promptly correct the problem at his expense to the Contract Administrator's satisfaction.

- (e) If the Contract Administrator is not satisfied with the procedure of the field tests or the City's interpretation of the results thereof, the Contractor may have the tests repeated, or their interpretation referred to a referee acceptable to both the City and themselves. The cost of the services of such referee shall be borne by the City if the referee rules that the tests as reported by the City were to the detriment of the Contractor but if otherwise, the Contractor shall pay the cost of the services of the referee and of repeating the tests. The decision of the referee shall be final and binding both on the City and the Contractor.

E29.13 Pump Supplier will be required to assist with Lift Pump commissioning activities listed in section E40.

E29.14 Pump supplier will be required to provide training to City staff on site. Pump supplier shall plan for two (2) separate sessions with one (1) session directed towards maintenance staff and another session directed towards operational staff. Each session shall be planned to be two (2) hours in length. Refer to E41.

E29.15 Measurement and Payment

- (a) Pumping Equipment In-Person Factory Acceptance Testing (FAT) Testing shall be paid under Contract Price Lump Sum for "Pumps, Motors, and Associated Parts, Factory Acceptance Testing"

E30. GATE VALVES

E30.1 Reference Standards

- (a) American Water Works Association (AWWA), American National Standards Institute (ANSI)/American society of Mechanical Engineers (ASME).
- (b) ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).

E30.2 Metal / Resilient Seated Gate Valves:

E30.2.1 Description

- (a) Three (3) three hundred fifty (350) millimetre metal seated gate valves – Manually actuated [HV-L011, HV-L021, HV-L031], Rising Stem;
- (b) Three (3) two hundred fifty (250) millimetre metal seated gate valves – manually actuated [HV-L013, HV-L023, HV-L033], Rising Stem;
- (c) Two (2) three hundred fifty (350) millimetre resilient seated gate valves – manually actuated, to be installed within the bypass vault in accordance with contract drawings. non-rising stem.
- (d) One (1) five hundred (500) millimeter gate valve to replace the existing model in the comminutor chamber [HV-L001] – Cast iron body with flanged ends; double rotating disc or solid disc, bronze trimmed cast iron wedge; bronze stem, double O-ring stem seals and fifty (50) millimetre square operating nut.

E30.2.2 Specification

- (a) Solid wedge gate valve, ductile iron body with flanged ends; bronze trimmed, ductile iron wedge; 316 stainless steel stem, double O-ring stem seals, 316 stainless steel fasteners, internal and external fusion-bonded epoxy coating on body and wedge.
- (b) The valves shall conform to AWWA C500.
- (c) Metal seated gate valves to be equipped with outside rising stems, screws and yokes and complete with handwheels. Direction of opening shall be counterclockwise and shall be clearly stamped or indicated with raised letters and arrow.
- (d) Resilient seated gate valves to be equipped with ductile iron bonnet and non-rising stems, and complete with handwheels. Direction of opening shall be counterclockwise and shall be clearly stamped or indicated with raised letters and arrow.
- (e) Body material: Ductile Iron to ASTM-525 or 526.

- (f) Stem: Non-Rising stem and Rising stem as specified in Clause 1.1, one (1) piece stainless steel.
- (g) Disc: Bronze trimmed, ductile iron wedge.
- (h) End connections: flanged to ANSI B16.1, Class 125 with holes straddling centreline.
- (i) Packing and gaskets: non-asbestos.
- (j) Fusion bonded epoxy coating to AWWA C-550 shall be applied to the ferrous surfaces in contact with water.
- (k) All fasteners, nuts and bolts shall be stainless steel.
- (l) Manufacturer's nameplate shall be attached to the valve body with stainless steel Fasteners.
- (m) Knife gate valves are not acceptable.
- (n) Acceptable manufacturers – one (1) of the following:
 - (i) Mueller Canada; or
 - (ii) Approved equal in accordance with Section B7.

E30.3 Valve Operators

- (a) Supply valve operators or actuators for all types of valves specified as follows:
- (b) Supply removable manually operated hand wheels for all valves;
- (c) Ensure that each valve and operator is of suitable construction and rating for the long-term service with the fluid or product being conveyed and at the pressure and operating frequencies required by the relevant service;
- (d) The allowable pull on a manual operator to open or close the valve shall be less than or equal to two hundred seventy (270) N (sixty (60) pound force). Manual operators shall operate in a clockwise motion to close the valve. For valves with greater than two hundred seventy (270) N (sixty (60) pound force), install spur or bevel gear actuators;
- (e) The pump suction valves and replacement valve in the comminutor chamber will have bevel gear operators pointed downstream to avoid interference with concrete walls.
- (f) Supply cast iron hand wheels clearly marked with a flow directional arrow and the word "open" cast in relief on the rim. Provide hand wheels greater than three hundred (300) millimetres (twelve (12) inches) in diameter for all valves greater than two hundred (200) millimetres (eight (8) inches) and four hundred fifty (450) millimetres (eighteen (18) inches) in diameter for larger valves as required to allow for manual operation. In confined areas, furnish smaller hand wheels with higher ratio gearing of the valve to compensate; and
- (g) Supply steel pipe Tee wrenches with socket to suit nut dimensions.

E30.4 General Requirements

- (a) Where there is an applicable recommended standard for the design, construction and testing of a valve and/or actuator, e.g., AWWA, CGA, CSA etc., equipment to be supplied under this section will refer to this standard. Comply with these requirements for all equipment supplied in all regards. Where specifically requested, provide certificates of compliance with the applicable standards.
- (b) Where it is not intended to supply equipment or valves to a specific standard, the Specification will indicate a reference product. Provide flanges as specified for all flanged valves for the line into which they are to be installed. As a minimum standard a Class one hundred twenty-five (125) pound rating will be required.
- (c) The Contractor shall ensure that the valve end connections are compatible with pipe material in which the valve is installed.
- (d) Do not install valves dissimilar with piping to avoid galvanic corrosion.
- (e) All packing, gaskets, seats, diaphragms, lubricants, etc., shall be suitable for the intended operating conditions.

- (f) Supply all valves free of asphalt varnish or other non-potable protective coatings if it is intended for potable water service. Mark valves with size, pressure rating and manufacturer on a corrosion resistant nameplate mounted on the body.
- (g) Equip the valve with a disc position indicator and a direction of flow indicator where applicable.

E30.5 Shop Drawings and Submittals

- (a) Submit submittals in accordance with Section 01 33 00- Submittal Procedures.
- (b) Product Data:
 - (i) Submit manufacturer's instructions, printed product literature and data sheets for all valves and include product characteristics, performance criteria, physical size, finish and limitations.
- (c) Shop Drawings:
 - (i) Submit Shop Drawings in accordance with Section 01 30 00 – Submittal Procedures
- (d) Spare Parts
 - (i) Provide list of recommended spare parts for City's follow-up.
- (e) Submit close-out submittals in accordance with Section 01 78 00- Closeout Submittals.

E30.6 Execution

- (a) Test AWWA valves in the shop in accordance with American Water Works Association requirements. A certified test report shall be submitted.
- (b) On completion of installation and testing, submit the manufacturer's certification of the correctness of the installation to the Contract Administrator.

E30.7 Measurement and Payment:

- E30.7.1 Payment will be Lump Sum based on Form B, "Process Mechanical Work", as accepted and measured by the Contract Administrator.
 - (a) A maximum of 95% may be submitted for progress payments prior to the total completion of the associated services, including the provision of as-built drawing mark-ups and O&M manuals.

E31. PROCESS CHECK VALVES:

E31.1 Reference Standards

- (a) American Water Works Association (AWWA), American National Standards Institute (ANSI)/American society of Mechanical Engineers (ASME).
- (b) ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).

E31.2 Process Check Valves:

E31.2.1 Description

- (a) Three (3) two hundred fifty (250) millimetre check valves with "hold-open" device [CV-L012, CV-L022, CV-L032];

E31.2.2 Specification

- (a) The valves shall be designed, manufactured, tested and certified to American Water Works Association Standard ANSI/AWWA C508.
- (b) The valves shall have flanges with drilling to ANSI B16.1, Class 125 with holes straddling centreline.
- (c) Check valve to be rapid closure rubber flapper (RF) type with a forty-five (45) degree seating face suitable for vertical installation.
- (d) The valves will be specified with a "hold open" device

- (e) The valve body shall be full flow equal to nominal pipe diameter at all points through the valve. The top access port shall be full size, allowing removal of the disc without removing the valve from the line. The access cover shall be domed in shape to provide flushing action over the disc for operating in lines containing high solids content. A threaded port with pipe plug shall be provided in the access cover to allow for field installation of a mechanical disc position indicator.
- (f) The disc shall be of one-piece construction; precision molded with an integral O- ring type sealing surface and reinforced with alloy steel.
- (g) The valve body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron.
- (h) The disc shall be precision molded Buna-N (NBR), ASTM D2000-BG. Optional disc material includes Viton, EPDM, Hypalon.
- (i) Hinge pin to be stainless steel (303/316).
- (j) The exterior and interior of the valve shall be coated with an AWWA C-550 approved fusion bonded epoxy coating.
- (k) All valves shall be hydrostatically tested and seat tested to demonstrate zero (0) leakage. The manufacturer shall provide test certificates, dimensional Drawings, parts list Drawings and Operation and Maintenance Manuals.
- (l) Submit Shop Drawings of check valves in accordance with Section 01 33 00 – Submittal Procedures.
- (m) Approved check valve manufacturers:
 - (i) American Valve Company;
 - (ii) Clow Canada;
 - (iii) Dezurik;
 - (iv) ValMatic
 - (v) Mueller Canada; or
 - (vi) Approved equal in accordance with Section B7.

E31.3 General Requirements

- (a) Where there is an applicable recommended standard for the design, construction and testing of a valve and/or actuator, e.g., AWWA, CGA, CSA etc., equipment to be supplied under this section will refer to this standard. Comply with these requirements for all equipment supplied in all regards. Where specifically requested, provide certificates of compliance with the applicable standards.
- (b) Where it is not intended to supply equipment or valves to a specific standard, the Specification will indicate a reference product. Provide flanges as specified for all flanged valves for the line into which they are to be installed. As a minimum standard a Class one hundred twenty-five (125) pound rating will be required.
- (c) The Contractor shall ensure that the valve end connections are compatible with pipe material in which the valve is installed.
- (d) Do not install valves dissimilar with piping to avoid galvanic corrosion.
- (e) All packing, gaskets, seats, diaphragms, lubricants, etc., shall be suitable for the intended operating conditions.
- (f) Supply all valves free of asphalt varnish or other non-potable protective coatings if it is intended for potable water service. Mark valves with size, pressure rating and manufacturer on a corrosion resistant nameplate mounted on the body.
- (g) Equip the valve with a disc position indicator and a direction of flow indicator where applicable.

E31.4 Shop Drawings and Submittals

- (a) Submit submittals in accordance with Section 01 33 00- Submittal Procedures.

- (b) Product Data:
 - (i) Submit manufacturer's instructions, printed product literature and data sheets for all valves and include product characteristics, performance criteria, physical size, finish and limitations.
- (c) Shop Drawings:
 - (i) Submit Shop Drawings in accordance with Section 01 30 00 – Submittal Procedures
 - (ii) Shop drawings to confirm valve suitability for vertical installation
- (d) Spare Parts
 - (i) Provide list of recommended spare parts for City's follow-up.
- (e) Submit close-out submittals in accordance with Section 01 78 00- Closeout Submittals.

E31.5 Execution

- (a) Test AWWA valves in the shop in accordance with American Water Works Association requirements. A certified test report shall be submitted.
- (b) On completion of installation and testing, submit the manufacturer's certification of the correctness of the installation to the Contract Administrator.

E31.6 Measurement and Payment:

- E31.6.1 Payment will be Lump Sum based on Form B, "Process Mechanical Work", as accepted and measured by the Contract Administrator.
 - (a) A maximum of 95% may be submitted for progress payments prior to the total completion of the associated services, including the provision of as-built drawing mark-ups and O&M manuals.

E32. PROCESS MECHANICAL WORK

E32.1 Description

- E32.1.1 This Specification covers the process piping, equipment, and materials for the Lift Station Upgrade Project.
- E32.1.2 The Contractor shall remove the existing pumping units, motors, piping, equipment and materials as required and install new pumping units, piping, equipment and materials as shown on the drawings or as indicated by the Contract Administrator.
- E32.1.3 Mechanical drawings indicate general layout only. The Contractor is responsible for confirming all dimensions prior to manufacture of piping.
- E32.1.4 All equipment and material shall be supplied by the Contractor.

E32.2 Materials:

- E32.2.1 Pumping Units: Refer to E27.3.
- E32.2.2 Pump Motors:
 - (a) Three (3) pump motors complete with driveshaft assemblies shall be supplied by the Contractor.
 - (b) Refer to Section E27.3 and coordinate with Division 26 – Electrical.
- E32.2.3 Process Gate Valves: Refer to E30.
 - (a) Gate valves shall be supplied by the Contractor.
- E32.2.4 Process Check Valves: Refer to E31
 - (a) Process check valves shall be supplied by the Contractor.
- E32.2.5 Ductile Iron Piping and Fittings:

- (a) Pipe to be in accordance with the latest edition of ANSI/AWWA C151/A21.51 and CSA B131.13 and fittings to ANSI/AWWA C110/A21.10 with cement lining.
- (b) Cement lining: All pipes and fittings to have cement lining to ANSI/AWWA C104/A21.4 latest edition.
- (c) Pipe class: Class 52 unless higher class is specified elsewhere.
- (d) Pressure temperature rating: one thousand fifty (1,050) kPa at forty (40) degrees Celsius.
- (e) Joints:
 - (i) Indoors use all flanged one hundred fifty (150) pounds connections and Victaulic couplings.
 - (ii) Maintenance and connection to other pipe classes: flange adaptors or Victaulic coupling.
 - (iii) Adaptor flanges: Ductile Iron, Grade 65-45-12, conforming to the current ASTM Standard A536 for Ductile Iron Casting. Bolt holes shall be drilled in accordance with AWWA C1115 or ASME B16.1.
 - (iv) Clamping screws on adaptor flanges shall be zinc-plated, heat-treated steel with a minimum tensile strength of twenty-eight (28) MPa.
- (f) Bolting: to ANSI/AWWA C207 (ASTM A 307 Grade B, ANSI B18.2.1) latest edition for diameters one hundred fifty (150) millimetres and larger or ASTM A193-B7 for smaller diameters. Corresponding nuts to be ASTM A 194/A 194M – Grade 2.
- (g) Gaskets:
 - (i) Garlock 7797, or approved equal in accordance with B7.
- (h) Exterior finish
 - (i) Apply epoxy finish to the exterior of all carbon steel or ductile iron piping components in accordance with AWWA C210.
 - (ii) Provide a 1-year warranty from project substantial performance date for entire painting system.
 - (iii) System:
 - ◆ Prepare by mechanical means or shot blasting.
 - ◆ Primer – Amerlock 2.
 - ◆ Finish coat – Amerlock 400 Two-component, high solids epoxy coating.
 - (iv) Piping shall be identified per existing identification standard indicating the product and direction of flow. Provide white lettering / arrows on piping painted black. Provide black lettering / arrows on all other background colours.
 - (v) The exterior final coat colour of all piping shall be as directed by the Contract Administrator
- (i) Submit shop drawings in accordance with Section 01 33 00.

E32.2.6 Stainless Steel Pipe and Fittings

- (a) Schedule 40 Stainless steel pipe and fittings to ASTM A312 for stainless steel pipe; Joints: NPT threaded joints; Pressure rating: 10 bar (150 psi)
- (b) Stainless Steel ball valves, (8 – 80 mm): 2 piece; full port; all 304/316 stainless body, follower and ball; Adjustable stem packing, Buna-N seal and seat; hand operating lever. Pressure rating: 10 bar (150 psi). Temperature range: -20°C – 200°C

E32.2.7 Large Diameter Flanges:

- (a) Thread-on flanges for Ductile Iron Pipe: AWWA C115 or ASME B16.1.
- (b) Adaptor flanges: Ductile Iron, Grade 65-45-12, conforming to the current ASTM Standard A536 for Ductile Iron Castings. Bolt holes shall be drilled in accordance with AWWA C115 or ASME B16.1.
- (c) Clamping screws on adaptor flanges shall be zinc-plated, heat-treated steel with a minimum tensile strength of 28 MPa.

(d) Submit shop drawings in accordance with Section 01 33 00.

E32.2.8 Couplings:

- (a) Piping of 100mm diameter or larger will be flanged, welded or grooved to provide rigid connections. Smaller piping will be welded or have threaded connections. Plastic or copper piping will be joined as recommended by the manufacturer and/or to suit project conditions as required by codes or good trade practice.
- (b) Location of joints and couplers to be positioned to accommodate serviceability and dismantling of piping – especially where pipework penetrates through concrete. Contractor shall supply and install Victaulic Style 31 where necessary to accommodate pipe dismantling and removal, or as indicated on drawings, for grooved end fittings.
- (c) Compression coupling used to connect to the existing buried asbestos cement force main shall be HYMAX HLD large diameter compression coupling or approved equal in accordance with B7.

E32.2.9 Link Seal

- (a) EPDM rubber modular wall penetration seal designed for permanent sealing with all stainless hardware.
- (b) Pressure rating: Up to 12 m head (1.3 bar)
- (c) Sizing: Match manufacturer's recommendations for pipe size / penetration size ratio
- (d) Approved Product: Link Seal by GPT or approved equal in accordance with B7.

E32.2.10 Pipe Supports and Hangers:

- (a) Pipe supports and hangers to be as shown on the Drawings and in accordance with 05 50 00, 23 05 03, and 23 05 29.

E32.2.11 PVC Water and Drain Piping:

- (a) As per Section 22 11 16

E32.2.12 Domestic water valves:

- (a) As per Section 22 11 16.

E32.2.13 Plumbing Specialties and Accessories:

- (a) As per Section 22 05 15

E32.2.14 Sump Pump:

- (a) As per Section 22 10 10.

E32.2.15 Fasteners:

- (a) Flange nuts and bolts shall be ASTM A193-B8M class 2 Type 316 stainless steel bolts, ASTM A194-8M Type 316 stainless steel extra heavy hex nuts coated with anti-galling compound.
- (b) Anchors shall be Kwik-bolt or Rawl Stud ASTM A276, Type 316 stainless steel. Embedment depth and size, where not shown on the Drawings, to be as required for load being carried or resisted.

E32.2.16 Gaskets:

- (a) Flange gaskets shall be full faced rubberized cloth gaskets, 3mm in thickness.
- (b) Rubber gaskets for adaptor flanges shall conform to AWWA C111, Standard for Rubber-gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings.

E32.2.17 Paint:

- (a) As per Section 09 01 90.63. Where there are contradictions with E32.2, E32.2 shall take precedence.

E32.3 Construction Methods:

E32.3.1 General:

- (a) Install the new station piping and pumping equipment as indicated in this specification and shown on the Drawings. Make no changes, revisions or substitutions to the layout without obtaining written approval from the Contractor Administrator.
- (b) Be aware of and contend with the wastewater in the existing force main when preparing to make the required piping modifications.
- (c) Prior to pumping unit installation, provide a portable sewage pump and discharge hose to remove remaining wastewater in the wet well. The wastewater shall be directed to the upstream manhole or to a sewage hauler for disposal.

E32.3.2 Flow Control and Temporary By-Pass Pumping:

- (a) Provide flow control measures and temporary by-pass pumping in accordance with E9.

E32.3.3 Locating Ground Services:

- (a) The contractor shall be responsible for locating all services.
- (b) Costs for locating the services shall be considered to incidental to the Contract Work

E32.3.4 Existing Pump Level Controls and Alarms:

- (a) Maintain and protect existing pump controls and float type alarms, located in the wet well or in the other areas of the Station, during the execution of the work until all the new equipment is ready for installation.

E32.3.5 Miscellaneous Metal Fabrications:

- (a) As per 05 50 00 and 05 14 10

E32.3.6 Cleanup:

- (a) Cleanup construction debris and materials inside the Station at the end of each day and before pumping station operation is restored.

E32.3.7 Replacement of Water Service:

E32.4 Measurement and Payment:

E32.4.1 Payment will be based on Form B, "Process Mechanical Work", as accepted and measured by the Contract Administrator.

- (a) A maximum of 95% may be submitted for progress payments prior to the total completion of the associated services, including the provision of as-built drawing mark-ups and O&M manuals.

E33. MECHANICAL AND BUILDING SERVICES WORK

E33.1 Scope of Work:

- (a) Provide new ventilation, cooling and heating system in accordance with the drawings and specifications, including but not limited to the following:
 - (i) Demolition of the existing supply fan, associated ductwork, control wiring and unit heaters.
 - (ii) Supply and installation of new supply and exhaust fans, duct heater and appurtenances. See Sections 23 34 00 and 23 82 16.14.
 - (iii) Supply and installation of new wall mounted air conditioner for the main floor. See Section 23 81 43.
 - (iv) Supply and installation of mixing section with dampers and controls. See Section 23 33 14, 23 33 15, Division 40, and drawings.
 - (v) Supply and installation of new, insulated ductwork. See Section 23 07 13 and Section 23 31 13, Section 23 33 00 and Section 23 37 20.

- (vi) Supply and installation of new outdoor air and exhaust openings complete with new louvers. See Section 23 37 20.
- (vii) Supply and installation a new electric unit heaters. See Section 23 82 39.23.
- (viii) Supply and installation fire extinguishers as shown on plan drawings and Section 10 44 00.
- (ix) Complete testing, adjusting and air balancing for HVAC equipment. See Section 23 05 93.
- (x) Start-up commissioning and testing in accordance with section 01 91 13 – General Commissioning Requirements.

E33.2 This project involves replacement of the buried water service and a new natural gas service.

- (a) Refer to Civil (C-Series) Construction Drawings
- (b) Both services must cross under the high voltage Manitoba Hydro cables north of the station.
 - (i) The cables must be protected from damage and safety protocol must be followed (Refer to E19.3 and E7) including a safety watch (refer to E8.2(d)). Coordinate service installations with Manitoba Hydro and the City of Winnipeg and make all third parties aware of these requirements.
 - (ii) The services must be installed in bored casings or drilled sleeves installed below the high voltage cables, in order to protect the high voltage cables from movement.
 - (iii) The services must be minimum 1m apart from each other and minimum 1.5m below the high voltage cables. The greater of this depth or those imposed by frost cover requirements shall govern.
- (a) For the water service replacement. Work to be in accordance with CW 2110. The City will provide a water meter to be installed by the Contractor. The Contractor is responsible to supply and install a reduced pressure backflow preventer to NMS Section 22 05 15 and as shown on the drawings.
- (c) Contractor to provide as-built survey coordinates and elevations of the crossing locations. Comply with 01 72 20.

E33.3 Measurement and Payment:

E33.3.1 Payment will be based on Form B, "Mechanical Building Services Work", as accepted and measured by the Contract Administrator.

- (a) A maximum of 95% may be submitted for progress payments prior to the total completion of the associated services, including the provision of as-built drawing mark-ups and O&M manuals Site Development and Restoration.

E34. TEMPORARY SHUTDOWN OF THE LIFT STATION

E34.1 General:

- (a) The facility related to the Work is critical to the transport of wastewater for the City of Winnipeg. Under no condition shall the station pumping be shut down without prior written permission from the Contract Administrator.
- (b) The Contractor is advised that the pumping station will be allowed to be taken out of operation only after the Contractor's schedule of activities to complete the Work is approved by the Contract Administrator. The Contractor shall plan his/her construction activities to allow for the minimum amount of disruption time to normal operating status of the station. Temporary bypass pumping in accordance with E9 is required when the station is not in operation.

E34.2 Temporary shutdown of the wastewater lift station will be allowed for the following work.

- (i) Switch-over between station pumps and temporary by-pass pumps and while temporary by-pass pumping is in operation during the lift station upgrades Work.

- (b) The Contractor is advised that there is a short time window for temporary shutdown of the station. Refer to the requirements of E9. Should installation of bypass pumping require temporary shutdown of the station, prior to the temporary shutdown, the Contractor shall complete a test shutdown of the station to verify the Contractor's time window to install their initial temporary by-pass pumping.
- (c) All shutdowns must be reviewed and approved by the Contract Administrator prior to the shutdown. Prepare and submit shutdown plans to Contract Administrator a minimum of fifteen (15) Working Days prior to proposed shutdown, with the estimated date included in the Contractor's by-pass pumping plan. The by-pass pumping plan and OSS submittals shall be issued ten (10) Working Days prior to the planned shutdown and commencement of Work (see E9). Shutdown plans must include:
 - (i) Location and duration of shutdown;
 - (ii) Purpose/description of the planned shutdown;
 - (iii) List of all relevant stakeholders;
 - (iv) Risks and contingency planning;
 - (v) Outline of shutdown plan;
 - (vi) Monitoring requirements;
 - (vii) Key data and elevations;
 - (viii) Assurance of continued operation of the CSO panel.
- (d) All gate operation and other control relating to the wastewater process will be by the City.
- (e) The Contractor shall monitor the upstream system at all times to ensure the stored level of wastewater will not exceed the critical basement elevation.
- (f) Schedule work activities requiring shutdown of pumping operations to be done at night in dry weather, unless otherwise authorized by the City and Contract Administrator in writing.
- (g) Water and Waste Department, Collection System personnel will be available to aid the Contractor for shutdown of the wastewater pumping station to facilitate transition of station pumping to the Contractor's temporary pumping system.
- (h) Coordination of the lift station shutdown and any associated Work described herein is incidental to Temporary By-Pass Pumping.

E34.3 The Contractor shall cooperate with and provide full access at all times for City personnel to carry out maintenance and operational duties.

- (a) No additional payments will be made for providing access to City forces on the Site or any potential effect City crews might have on the Contractor's Work.

E35. STANDBY BACKUP NATURAL GAS GENERATOR (GEN-L72)

E35.1 Reference Standards

- (a) American Petroleum Institute (API)
 - (i) API Std. 570-2012 Piping Inspection Code 5th Edition.
- (b) Canadian Environmental Protection Act (CEPA)
 - (i) CCME PN 1326-[2008], Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.
- (c) CSA Group (CSA)
 - (i) CSA 282 Emergency Electrical Power Supply for Buildings
 - (ii) CSA-B139-[09], Installation Code for Oil Burning Equipment.
- (d) International Organization for Standardization (ISO)
- (e) ISO 3046-1-[2002], Reciprocating Internal Combustion Engines - Performance - Part 1: Declarations of Power, Fuel and Lubricating Oil Consumptions, and Test Methods - Additional requirements for engines for general use.

- (f) National Electrical Manufacturers Association (NEMA)
 - (i) NEMA MG 1-[2006(R2007)], Motors and Generators.
- (g) Underwriters' Laboratories of Canada (ULC)
 - (i) CAN/ULC-S601-[07], Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.
 - (ii) ULC-S603-[00], Standard for Steel Underground Tanks for Flammable and Combustible Liquids.

E35.2 Product Data:

- (a) Provide manufacturer's printed product literature, specifications and data sheets for power generators and include product characteristics, performance criteria, physical size, finish and limitations.

E35.3 Shop Drawings:

- (a) Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada and include:
 - (i) Engine: make and model, with performance curves.
 - (ii) Alternator: make and model.
 - (iii) Voltage regulator: make, model and type.
 - (iv) Automatic transfer switch: make, model and type.
 - (v) Manual bypass switch: make and model.
 - (vi) Battery: make, type and capacity.
 - (vii) Battery charger: make, type and model.
 - (viii) Alternator control panel: make and type of meters and controls.
 - (ix) Silencer: make and model, with performance data.
 - (x) Governor type and model.
 - (xi) Automatic engine room ventilation system.
 - (xii) Cooling air requirements in m³ /s.
 - (xiii) British standard or DIN rating of engine.
 - (xiv) Flow diagrams for:
 - (xv) Natural gas fuel.
 - (xvi) Cooling air.
 - (xvii) Dimensioned drawing showing complete generating set mounted on steel base, including vibration isolators, exhaust system, drip trays, and total weight.
 - (xviii) Continuous full load output of set at 0.8 PF lagging.
- (b) Description of set operation including:
 - (i) Automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit reaches rated voltage and frequency.
 - (ii) Manual starting.
 - (iii) Automatic shut down and alarm on:
 - Overcranking.
 - Overspeed.
 - High engine temp.
 - Low lube oil pressure.
 - Short circuit.
 - Alternator over voltage.
 - Lube oil high temperature.
 - Over temperature on alternator.
 - (iv) Manual remote emergency stop to be triggered by gas alarm.

E35.4 Closeout Submittals

- (a) Provide operation and maintenance data for diesel generator for incorporation into manual specified in Section [01 78 00 - Closeout Submittals].
- (b) Include in Operation and Maintenance Manual instructions for particular unit supplied and not general description of units manufactured by supplier and:
 - (i) Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, manual bypass switch, battery charger, battery, fuel system, engine room ventilation system, exhaust system and accessories, to permit effective operation, maintenance and repair.
 - (ii) Technical data:
 - Illustrated parts lists with parts catalogue numbers.
 - Schematic diagram of electrical controls.
 - Flow diagrams for: Fuel system, Lubricating oil, Cooling system.
 - Certified copy of factory test results.
 - Maintenance and overhaul instructions and schedules.
 - Precise details for adjustment and setting of time delay relays or sensing controls which require on site adjustment.

E35.5 Delivery, Storage, and Handling

- (a) Deliver, store and handle materials in accordance with manufacturer's written instructions.
- (b) Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- (c) Packaging Waste Management: remove for reuse in accordance with Section 01 74 19 - Waste Management and Disposal.

E35.6 Maintenance Material Submittals

- (a) Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- (b) Include:
- (c) [2] fuel filter replacement elements.
- (d) [2] lube oil filter replacement elements.
- (e) [2] air cleaner filter elements.
- (f) [2] sets of fuses for control panel.
- (g) Special tools for unit servicing.

E35.7 System Description

- (a) Generating system consists of:
 - (i) Natural gas engine.
 - (ii) Alternator.
 - (iii) Alternator control panel.
 - (iv) Battery charger and battery.
 - (v) Automatic engine room ventilation system.
 - (vi) Fuel supply system.
 - (vii) Exhaust system with **hospital grade silencer**.
 - (viii) Steel mounting base.
 - (ix) Synchronizing panel.
 - (x) Manual by-pass switch.

- (b) System designed to operate as an emergency system
- (c) Capacity:
 - (i) Rated continuous power in kW at rated speed, after adjustment for system losses in auxiliary equipment necessary for engine operation; to be calculated as follows:
Rated continuous output = Generator kW divided by Generator efficiency at full load
Under following site conditions:
 - Altitude: 232 m.
 - Ambient temperature: 40 degrees C.
 - Relative humidity: 0 - 95%.
 - (ii) Engine overload capability 110% of continuous output for 1 hour within 12 hours period of continuous operation.
- (d) Cooling System:
 - (i) Air cooled: air cooling duct enveloping cylinder walls with pressure cooling by engine driven blower.
 - (ii) To maintain manufacturer's recommended engine temperature range at 10% continuous overload in ambient temperature of 40 degrees C.
 - (iii) Block heater: thermostatically controlled lube oil or liquid coolant heater connected to line side of automatic transfer switch to allow engine to start in room ambient [0] degrees C.
 - (iv) Switch and fuse in heater circuit, mounted in engine-alternator control cubicle and fed from line side of automatic transfer switch.
- (e) Governor: mechanical hydraulic with:
 - (i) Steady state speed band of plus or minus 0.5%.
 - (ii) Speed regulation no load to full load 5% maximum.
 - (iii) Electronic [load sharing] type, electric actuator, speed droop externally adjustable from isochronous to 5%, temperature compensated with steady state speed maintenance capability of plus or minus 0.25%.
- (f) Lubrication system:
 - (i) Pressure lubricated by engine driven pump.
 - (ii) Lube oil filter: replaceable, full flow type, removable without disconnecting piping.
 - (iii) Lube oil cooler.
 - (iv) Engine sump drain valve.
 - (v) Oil level dipstick.
- (g) Starting system:
 - (i) Positive shift, gear engaging starter 12 or 24V dc.
 - (ii) Cranking limiter to provide [trois (3)] cranking periods of 10s duration, each separated by [5] s rest.
 - (iii) [Lead acid], 12 or 24V storage battery with sufficient capacity to crank engine for 1 min at 0 degrees C without using more than 25% of ampere hour capacity.
 - (iv) Battery charger: constant voltage, solid state, two stage from trickle charge at standby to boost charge after use.
 - Regulation: plus or minus 1% output for plus or minus 10% input variation.
 - [Automatic boost for 6 hours every 30 days].
 - Equipped with dc voltmeter, dc ammeter and on-off switch.
 - Minimum charger capacity: [7] A.
- (h) Vibration isolated engine instrument panel with:
 - (i) Lube oil pressure gauge.
 - (ii) Lube oil temperature gauge.
 - (iii) Lube oil level gauge.

- (iv) Coolant temperature gauge.
- (v) Coolant level gauge.
- (vi) Running time meter: non-tamper type.
- (i) Guards to protect personnel from hot and moving parts.
 - (i) Locate guards so that normal daily maintenance inspections can be undertaken without their removal.
- (j) Drip tray.

E35.8 Alternator

- (a) Alternator: to NEMA MG1
- (b) Rating: 3 phase, 600 V, 4 wire, 150 kW, 60 Hz, at 0.8 PF.
 - (i) Note that the contractor will be responsible for ensuring the generator conforms to the dimensional requirements in E35.12.
- (c) Output at 40 degrees C ambient:
 - (i) 100% full load continuously.
 - (ii) 110% full load for 1 hour.
 - (iii) 150% full load for 1 minute.
- (d) Revolving field, brushless, single bearing.
- (e) Drip proof.
- (f) Amortisseur windings.
- (g) Synchronous type.
- (h) Dynamically balanced rotor permanently aligned to engine by flexible disc coupling.
- (i) Exciter: permanent magnet
- (j) NEMA class H insulation on windings.
- (k) Voltage regulator: thyristor-controlled rectifiers with phase-controlled sensing circuit
- (l) Alternator: capable of sustaining 300% rated current for period for 10 second permitting selective tripping of down line protective devices when short circuit occurs.

E35.9 Control Panel

- (a) Totally enclosed ventilated Code gauge metal panel mounted on unit constructed of channel or angle iron frame finished in enamel over corrosion resistant primer, complete with hinged door
- (b) Instruments: Color Touch Screen Display
 - (i) Resistive Color Touch Screen
 - (ii) Sunlight Readable (1400 NITS)
 - (iii) Easily Identifiable Icons
 - (iv) Multi-Lingual
 - (v) On Screen Editable Parameters
 - (vi) Key Function Monitoring
 - (vii) Three Phase Voltage, Amperage, kW, kVA, and
 - (viii) kVAR
 - (ix) Selectable Line to Line or Line to Neutral
 - (x) Frequency
 - (xi) Engine Speed
 - (xii) Engine Coolant Temperature
 - (xiii) Engine Oil Pressure
 - (xiv) Engine Oil Temperature
 - (xv) Battery Voltage

- (xvi) Hourmeter
 - (xvii) Warning and Alarm Indication
 - (xviii) Diagnostics
 - (xix) Maintenance Events/Information
- (c) Voltmeter selector switch, rotary, panel mounting, [round notched handle,] [four position, labelled "Off-Phase A-Phase B-Phase C"].
- (d) Ammeter selector switch, rotary, maintained contacts, panel mounting, designed to prevent opening of current circuits, round notched handle, four position labelled "OFF- Phase A-Phase B-Phase C"].
- (e) Instrument Transformers
- (i) Potential-dry type for indoor use:
 - Ratio: [600] to 120.
 - Rating: [600] V, 60Hz, BIL 10 kV.
 - (f) Current-dry type for indoor use:
 - Ratio: 400 to 5.
 - Rating: [600] V, 60Hz, BIL 10 kV.
 - Positive action automatic short-circuiting device in secondary terminals.

E35.10 Controls

- (a) Engine start button.
- (b) Selector switch: Off-Auto-Manual - Test full load test no load.
- (c) Engine emergency stop button and provision for remote emergency stop button.
- (d) Alternator output breaker:
 - (i) Circuit breaker: bolt-on, moulded case, temperature compensated for 40 degrees C ambient, dual thermal-magnetic trip.
 - (ii) Circuit breaker, solid state sensing with:
 - Frame containing breaker contacts, arc quenchers, quick- make, quick-break, spring-loaded overcenter switching mechanism, mechanically trip free from handle.
 - Static sensor: current monitors detect overload, short-circuit and ground-fault currents, and send these signals through solid-state circuits to static sensor which acts to trip breaker. Adjustable for current values and time of tripping.
 - Auxiliary contacts minimum rating shall be 125 VDC, 5 A
- (e) Generator Load bank breaker
 - (i) Circuit breaker shall be bolt-on, moulded case
 - (ii) Static sensor: current monitors detect overload, short-circuit and ground-fault currents, and send these signals through solid-state circuits to static sensor which acts to trip breaker. Adjustable for current values and time of tripping.
 - (iii) Flux-transfer shunt trip- magnetic tripping device actuated by signal from static sensor to open breaker contacts. Requires external source of power.
 - (iv) Provide two (2) terminals along for field connection of auxiliary contacts that are pre-wired to breaker shunt trip positions (Positive and Negative).
- (f) Voltage control rheostat: mounted on inside of control panel.
- (g) Operating lights, panel mounted:
 - (i) "Normal power" pilot light.
 - (ii) "Emergency power" pilot light.
 - (iii) Green pilot lights for breaker on and red pilot lights for breaker off.
- (h) Solid state indicator lights for alarm with [1 set] manually reset NO/NC contacts wired to terminal block for remote annunciation on:
 - (i) Low battery voltage.

- (ii) Ventilation failure.
- (iii) Low coolant temperature.
- (i) Solid state controller for automatic shutdown and alarms with [1 set] manually reset NO/NC contacts wired to terminal block for remote annunciation on:
 - (i) Engine overcrank.
 - (ii) Engine overspeed.
 - (iii) Engine high temperature.
 - (iv) Engine low lube oil pressure.
 - (v) Short circuit.
 - (vi) AC over voltage.
- (j) Lamp test button.
- (k) Synchronization and load sharing.
- (l) Provision for remote monitoring.
- (m) Remote Monitoring: In addition to contacts for remote start and damper control, the generator control system shall provide five (5) programmable 120V dry contact output relays to the building BMS as to indicate the following generator alarms:
 - (i) Generator Running
 - (ii) Generator Alarm/Fault
 - (iii) Generator Warning

E35.11 Approved Manufacturers

- (a) Generac (custom skid size required to meet the requirements of E35.12)
- (b) Rehlko
- (c) MTU
- (d) Approved equal in accordance with B7.

E35.12 Generator Skid Sizing Limitations

- (a) The generator skid **must meet the following dimension requirement**. Equipment exceeding these dimensions will not be accepted.
 - (i) Length: 2.96m
 - (ii) Width: 1.26m
 - (iii) Height: Sufficiently low to be able to be removed through louvre opening in north wall
 - (iv) For orientation of exhaust plenum, refer to note 15 on 1-0193L-M0005-001-01

E35.13 Automatic Transfer Switch

- (a) Section 26 36 23

E35.14 Steel Mounting Base

- (a) Complete generating set mounted on structural steel base of sufficient strength and rigidity to protect assembly from stress or strain during transportation, installation and under operating conditions on suitable level surface.
- (b) Assembly fitted with vibration isolators and control console resiliently mounted.
 - (i) Spring type isolators with adjustable side snubbers and adjustable for levelling.
- (c) Sound insulation pads for installation between isolators and concrete base.

E35.15 Exhaust System

- (a) Heavy duty industrial mounted hospital grade exhaust silencer with condensate drain, plug and flanged welded couplings.
- (b) Heavy duty flexible exhaust pipe with flanged couplings as required.

- (c) Fittings and accessories as required.
- (d) Expansion joints: stainless steel, corrugated, of suitable length, to absorb both vertical and horizontal expansion.
- (e) Noise requirements outside the lift station: maximum of 75dB at 7m, averaged from 8 locations at this radius.
- (f) Silencer and exhaust system pressure drop to be suitable for generator exhaust back pressure capacity at maximum rated exhaust flow.

E35.16 Fuel System

- (a) Fuel pressure gauge and vent alarm.
- (b) Primary and Secondary Fuel Shutoff
- (c) Renewable cartridge filter.
- (d) Fire valve.
- (e) Isolating valves on lines serving auxiliaries.
- (f) Low fuel level alarm for remote indication.

E35.17 Cooling Air System

- (a) Engine ventilating system to be controlled by HVAC control panel in generator building and include:
 - (i) 3x recirculating damper assembly with modulating motors.
 - (ii) Cold air inlet damper assembly with modulating motor.
 - (iii) Air discharge damper with modulating motor.
 - (iv) Combustion air inlet damper assembly with open/close motor.
 - (v) Replaceable air intake filters.

E35.18 Equipment Identification

- (a) Provide equipment identification in accordance with Section 26 05 01 - Common Work Results for Electrical.
- (b) Control panel:
 - (i) Size 4 nameplates for controls including alternator breakers and program selector switch.
 - (ii) Size 3 nameplates for meters, alarms, indicating lights and minor controls.

E35.19 Fabrication

- (a) Shop assemble generating unit including:
 - (i) Base.
 - (ii) Engine [and radiator].
 - (iii) Alternator.
 - (iv) Control panel.
 - (v) Battery and charger.

E35.20 Finishes

- (a) Apply finishes in accordance with Section 26 05 01 - Common Work Results for Electrical.
- (b) Alternator control cubicle: paint inside, exterior to match engine and alternator.
- (c) Exhaust and inlet air hoods international orange.
- (d) Other ducts and racks grey.
- (e) Supply 0.25 L of grey touch-up enamel.

E35.21 Measurement and Payment:

- (a) Refer to E36.15

E36. GENERATOR EQUIPMENT IN-PERSON FACTORY ACCEPTANCE TESTING AND FIELD TESTING

E36.1 General factory acceptance testing shall consist of the following:

- (a) Factory Acceptance Testing (FAT) shall be carried out by the equipment manufacturer at the factory, testing done at a third-party location will not be accepted. Generator FAT shall be witnessed In-Person by City of Winnipeg representatives at no additional cost. A total of two (2) City of Winnipeg representatives (1 City Personnel and 1 Contract Administrator Personnel) shall be participating in In-Person witnessing of the FAT. The City reserves the right to request remote witnessing in place of in-person witnessing at no additional cost.
- (i) If remote Generator FAT witnessing is requested, the manufacturer shall complete all testing required and shall arrange for live video viewing of testing. The manufacturer is responsible for organizing and arranging the live video testing and for distributing video recordings of each test.
- (ii) The costs of travel and accommodation for the two (2) City of Winnipeg representatives is not to be included in this contract. These costs are to be borne by the Contract Administrator.
- (b) The In-Person FAT shall be carried out on one (1) FAT site visit. The equipment manufacturer shall arrange for FAT to be performed on all generator equipment during the single FAT site visit.
- (c) Provide a minimum of fifteen (15) business days notice to the Contract Administrator prior to anticipated witness testing date.
- (d) The Contractor shall furnish all power, labour, materials and properly calibrated instruments required for these tests. Instrument calibration shall be as specified in the Test Code of the Hydraulics Institute Standards.
- (e) Allow for an escort at the testing facility for participating City of Winnipeg representatives, equipment pictures to be taken, along with testing equipment, tools and materials to carry out testing. Make all equipment and labour accessible for participating personnel as directed.
- (f) A minimum of five (5) business days prior to anticipated FAT date, submit test facility evidence of ANSI Certification, calibration certificates of all testing equipment to be used along with details on the test arrangement procedures. Submit detailed test procedures including the test layout and instrument test calibration certificate. Include equipment calibrations and test arrangement procedures in the Operation & Maintenance Manual.

E36.2 Factory test generator set including engine, alternator, control panels, transfer switch and accessories in presence of Contract Administrator and City of Winnipeg Staff.

E36.3 Notify Contract Administrator ten (10) working days in advance of date of factory test.

E36.4 Test procedure:

- (a) Prepare blank forms and check sheet with spaces to record data and at top of first sheet record:
- (b) Date.
- (c) Generator set serial no.
- (d) Engine, make, model, serial no.
- (e) Alternator, make, model, serial no.
- (f) Voltage regulator, make and model.
- (g) Rating of generator set, kW, kVA, V, A, r/min, Hz.
- (h) Mark check sheet and record data on forms in duplicate as test proceeds.

- (i) Contract Administrator's signature on completed forms to indicate concurrence in results of test.

E36.5 Non-Running Test and Checks recording the following:

- (a) Angular shaft alignment.
- (b) Resistance of alternator windings.
- (c) All electrical and mechanical safety guards in place.
- (d) All mountings are secured.
- (e) Control Panel is installed.
- (f) All fluids at normal operating levels.

E36.6 Stepped load Running Test: The generator shall be tested at 25% load for thirty (30) minutes, 50% load for thirty (30) minutes and 75% load for thirty (30) minutes and 100% load for 2.5 hours to determine generator operation. Each tested load shall be maintained at 0.8 power factor. Record oil level prior to starting stepped load test and after testing has been completed. Record the following at every fifteen (15) minute intervals.

- (a) Time of reading.
- (b) Area/Room temperature (°C) where test is being performed.
- (c) Generator kW and kVA output along with revolutions per minute (RPM).
- (d) Alternator Voltage, Amperage and Frequency for each phase.
- (e) Power Factor (PF).
- (f) Power in kW indicated and calculated.
- (g) Run time meter.
- (h) Lubricant oil pressure (kPa) and temperature (°C).
- (i) Engine and exhaust temperature (°C).
- (j) Sound (dB).
- (k) Battery charger voltage and current.
- (l) Battery voltage.
- (m) Alternator cooling air outlet temp.

E36.7 Next install continuous strip chart recorders to record frequency and voltage variations during load switching procedures. Each load change delayed until steady state conditions exist. Allow for two (2) minutes at 0% load before starting each application. Switching increments shall be maintained at 0.8 power factor and include:

- (a) 0% load to 25% load to 0% load.
- (b) 0% load to 25% load to 50% load to 75% load to 100% load to 50% load to 0% load.
- (c) 0% load to 50% load to 100% load to 50% load to 0% load.
- (d) 0% load to 75% load to 0% load.
- (e) 0% load to 100% load to 0% load.
- (f) 0% load to 100% load to 25% to 0% load.

E36.8 Demonstrate Generator Operation for:

- (a) Automatic starting of generator and automatic transfer of load on failure of normal power.
- (b) Operation of manual bypass switch.
- (c) Manual start up and stop operation.
- (d) Automatic shut down of engine on resumption of normal power (including generator cooldown).

- (e) Proper operation of battery charger and batteries.
 - (f) That battery charger reverts to high-rate charge after cranking.
 - (g) Operation of auxiliary contacts (running, alarm/fault, etc.)
 - (h) Operation of Generator breaker status contacts.
- E36.9 Test Generator shutdown and preventing generator from starting by:
- (a) auxiliary input(s) to generator controller.
 - (b) Overcranking.
 - (c) Overspeed.
 - (d) Alternator over voltage.
 - (e) Low battery voltage, or no battery charge.
 - (f) Manual remote emergency stop.
- E36.10 Test Generator shutdown and preventing generator from starting (without subjecting engine/alternator to these excesses) for the following:
- (a) High engine temp.
 - (b) Low lube oil pressure.
 - (c) High alternator temperature.
 - (d) Short circuit.
- E36.11 Installation
- (a) Locate generating unit and install as indicated.
 - (b) Install fuel supply system as indicated in CSA-B139
 - (c) Install ventilating air duct system as indicated.
 - (d) Pipe muffler drains to nearest floor drain.
 - (e) Complete wiring and interconnections as indicated.
 - (f) Start generating set and test to ensure correct performance of components.
- E36.12 Field Quality Control
- (a) Perform tests in accordance with Section 26 05 01 - Common Work Results for Electrical.
 - (b) Notify Contract Administrator [10] working days in advance of test date.
 - (c) Provide fuel for testing and leave full tanks on acceptance.
 - (d) Demonstrate:
 - (i) Unit start, transfer to load, retransfer to normal power, unit shut down, on "Automatic" control.
 - (ii) Unit start and shut down on "Manual" control
 - (iii) Unit start and transfer on "Test" control.
 - (iv) Unit start on "Engine start" control.
 - (v) Operation of manual bypass switch.
 - (vi) Operation of automatic alarms and shut down devices.
 - (e) Perform a four-hour load test using a portable test bank. Perform test for four hours with load applied in 20% steps every 30 minutes until full load is applied and one hour at 100% full load. At end of test run, check battery voltage to demonstrate battery charger has returned battery to fully charged state.
- E36.13 Maintenance - Clearances
- (a) Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

E36.14 Site Commissioning

- (a) The requirements of E40 apply.
- (b) The Generator manufacturer representative shall be required to attend site for two (2) separate site visits, each four (4) hours in duration to assist with commissioning activities along with Manitoba Inspections & Technical Services compliance.

E36.15 Generator Supplier will be required to assist with generator and Automatic Transfer Switch commissioning activities listed in section E40.

E36.16 Generator Supplier will be required to provide training to City staff on site. Generator supplier shall plan for two (2) separate sessions with one (1) session directed towards maintenance staff and another session directed towards operational staff. Each session shall be planned to be two (2) hours in length. Refer to E41.

E36.17 Measurement and Payment:

E36.17.1 Payment will be based on Form B, "Generator Supply, Factory Acceptance Testing, Installation", as accepted and measured by the Contract Administrator.

- (b) Payment shall be in accordance with the following payment schedule:
 - (i) Ten (10) percent upon approval of Shop Drawings.
 - (ii) Seventy (70) percent upon all generator equipment received in Winnipeg.
 - (iii) Fifteen (15) percent upon completion of commissioning of all generator equipment.
 - (iv) Five (5) percent upon successful Manitoba Inspections & Technical Services compliance and all generator equipment is in-service.

E37. DRIVEWAYS AND CURBS

E37.1 Concrete Driveways, Curbs

- (a) Concrete driveway including base and sub-base to be constructed according to 1-0193L-C0002-001.
- (b) Construct concrete curb renewal in accordance with CW 3240. Restore curb to match existing. Barrier curb and modified barrier curb will be considered as same for this Contract.

E37.2 Gravel Driveway

- (a) References
 - (i) City of Winnipeg Specification CW 3150
 - (ii) Contract Drawings
- (b) Driving surface to be constructed according to CW 3150 and CW 3110.

E37.3 Low vibration means of compaction must be used. Refer to E19.

E37.4 Method of Measurement and Payment

E37.4.1 Concrete Driveway, Curb, and Curb Renewals

- (a) This work shall be measured on a lump sum basis and paid for at the Contract Lump Sum Price for "Driveways, Curbs, and Curb Renewals," which prices shall be payment in fill for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.

E38. 200 MM PARTIAL SLAB PATCHES

E38.1 Construct full depth partial slab patches in accordance with CW 3230.

E38.2 Measurement and Payment

- E38.2.1 Full depth partial slab patches shall be paid for at the Contract Lump Sum Price for “200 mm Partial Slab Patches”.
- E38.2.2 Pavement removal shall be incidental to the works. No separate payment shall be made for this item.
- E38.2.3 Base Granular shall be considered incidental to the works. No separate payment item shall be made for this item.
- E38.2.4 Any necessary slab patches are assumed to be part of the work associated with extending new water and natural gas services to the facility and will be considered incidental to the works.
- E38.3 Payment
- (a) This work shall be considered incidental to the Works of this Contract and no separate payment will be made for this item.

E39. SITE DEVELOPMENT AND RESTORATION

- E39.1 Description
- (a) This Specification shall supplement the requirements of CW1130.
- (b) This Specification shall cover all aspects of the Site Development and Restoration Work, including:
- (i) Erection, maintenance and removal of safety fencing;
 - (ii) Snow clearing;
 - (iii) Water/flow control;
 - (iv) General access development;
 - (v) Start-up costs;
 - (vi) Equipment setup and removal;
 - (vii) Office facilities;
 - (viii) Access maintenance; and
 - (ix) Site restoration.
- E39.1.1 Additional Site-specific Works included within this Specification are the temporary removal, relocating, and replacing existing site furniture, fencing, and other obstructions within easement right-of-way or as required for site access.
- (a) Works and permits associated with raising and/or relocating overhead power lines and/or light standards as required to facilitate the Works. Contact the local Manitoba Hydro Office to arrange for Manitoba Hydro Staff to lift power lines, temporarily support utilities, and/or relocate utilities as required. Only Manitoba Hydro staff will be permitted to lift power lines.
- (b) Work activities conducted within 3 meters of the 115kV underground cable shall require direct supervision by a Manitoba Hydro supplied safety watch. Contact the local Manitoba Hydro Office well in advance of planned work to arrange for Manitoba Hydro to provide qualified personnel. Only Manitoba Hydro staff shall be permitted to perform safety watch for activities in proximity to the 115kV underground cable.
- E39.1.2 This Specification shall amend and supplement Standard Specification CW 3510 and CW 3520.
- E39.2 Materials
- E39.2.1 Equipment
- (a) All equipment, implements, tools and facilities used shall be of a size and type as required to complete the Work in a reasonable time, approved by the Contract Administrator. The Contractor shall keep all equipment in good working order, and have sufficient standby equipment available at all times, as required.

E39.3 Construction Methods

E39.3.1 Site and Construction Access

- (a) The Contractor shall be responsible to develop suitable Site access. This includes but is not limited to, temporary bridging over structures, temporary removal and reinstallation of safety fencing, any landscaping and grading repairs, restoration of vegetation, etc. necessary to restore any Site and construction access area to their pre-existing condition.

E39.3.2 Vegetation Removal

- (a) Some vegetation removal may be permitted in order to facilitate the work. Existing vegetation shall not be removed without prior approval from the Contract Administrator. The Contractor shall load and haul any removed vegetation and dispose of the material off Site immediately upon collection. Stockpiling shall not be permitted unless written approval has been obtained from the Contract Administrator. Refer to E18 for tree protection.

E39.3.3 Site Security

- (a) At the end of each Workday, all excavations and underground structure openings shall be secured to prevent access. Safety fence shall also be closed and secured to prevent public access.

E39.3.4 Environmental Regulations

- (a) The Contractor shall adhere to all relevant Federal and Provincial environmental regulations.
- (b) The Contractor shall plan to Work in accordance with the current environmental regulations of "Manitoba Stream Crossing Guidelines for Protection of Fish and Fish Habitat", Fisheries and Oceans, and Manitoba Natural Resources.
- (c) The Contractor shall supply, in writing, prior to the commencement of Work On-Site to cleanup minor spills, should they occur. The Contractor shall supply the name, address and phone number of a local supplier, where additional kits are available on short notice.

E39.4 Staging and Laydown Areas

- (a) Prior to mobilization to site, the Contractor shall identify and propose to the City for approval, the areas requested for laydown, staging materials, and placement of the site trailer.

E39.5 General Site Cleanup and Restoration

- (a) All areas of the construction Site shall be restored to a condition at least equivalent to its original condition prior to initiation of Work. This may include but is not necessarily limited to the Contractor's lay down area, and removal of all temporary fencing.

E39.6 Permanent Surface Restorations

- (a) If required, permanently restore all existing surface areas disturbed by construction activities including but not limited to areas disturbed by; construction equipment, placement of equipment trailers and where construction materials were stockpiled, shall be restored as follows:
 - (i) Boulevards, ditches and grassed areas – sodding using imported topsoil in accordance with CW 3510.
 - (ii) Asphalt surfaces – match existing base course and asphalt thickness or a minimum of 150 millimetres of base course and 75 millimetres of Type 1A Asphaltic Concrete, whichever is greater, in accordance with CW 3410.
 - (iii) Miscellaneous concrete slabs, including sidewalk - in accordance with CW 3235.
 - (iv) Interlocking stones – in accordance with CW3330.
 - (v) Concrete curb and gutter – in accordance with CW 3240.

E39.7 Restoration of Grassy Areas

- (a) The primary means of restoration for existing grassy areas will be topsoil and seeding.
 - (i) Topsoil, and seeding, or any site restoration required to restore laydown areas, or similar temporary work areas, shall be considered incidental to Site Development and Restoration. No separate payment shall be made for these areas.
- (b) Sodding is also an acceptable means of restoration for existing grassy areas.
 - (i) Place sod in accordance with CW-3510 and SD-243.
 - (ii) Preparation of the finished topsoil surface shall be completed in accordance with Specification CW-3540.

E39.8 Method of Measurement and Payment

E39.8.1 Site Development and Restoration

- (a) The site development and restoration shall be measured on a lump sum basis and paid for at the Contract Lump Sum Price for "Site Development and Restoration," which prices shall be payment in fill for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.
 - (i) 50% of the Site Development and Restoration unit price will be paid for on the first progress payment following commencement of the work on the specific Site being developed.
 - (ii) The remaining 50% of the Site Development and Restoration unit price will be paid subsequent to the completion of the Work and restoration and cleanup of the Site.

E40. COMMISSIONING

E40.1 The Manufacturer's Technical Representative, installation Contractor and Contract Administrator shall jointly commission all mechanical, electrical, automation and instrument equipment in accordance with the written procedure for commissioning. The installation Contractor will provide sufficient manpower for the duration of the commissioning period. The installation Contractor will make necessary adjustments during commissioning to ensure fully functioning equipment.

- (a) The Contract Administrator will request that the equipment be operated to demonstrate that it performs as specified. If the Contract Administrator notes deficiencies in the installation, the deficiency will be corrected immediately by the installation Contractor. The installation Contractor will advise the Contract Administrator, in writing, when the deficiencies have been corrected. If the Contract Administrator notes deficiencies in the supplied products, the deficiency shall be corrected immediately by this Contractor
- (b) Deficiencies of a serious nature, as determined by the Contract Administrator, shall be corrected by the manufacturer's representative.

E40.2 The following equipment will be required to include separate completed commissioning forms:

- (a) Generator.
- (b) All instruments. For common instruments such as temperature transmitters, it will be acceptable to utilize one (1) commissioning form.
- (c) All PLC I/O Cards.
- (d) All HVAC Controllers.
- (e) All Dampers (including Actuators).
- (f) All HVAC Fans.
- (g) All Motor Control Centres (including Motor Starters).
- (h) All Standalone Motor Starters.
- (i) All Lift Pump VFDs.

- (j) All Lift Pumps (including Motors).
- (k) All Outdoor Lighting Systems.
- (l) All Emergency Lighting Systems.
- (m) All Disconnect Switches.
- (n) All 120/240V/208V Panelboards.
- (o) All 600V Panelboards.
- (p) All Single-Phase Transformers.
- (q) Customer Service Termination End.
- (r) Automatic Transfer Switch.
- (s) Load Bank.
- (t) Main Motor Control Centre Power Meter.
- (u) All HVAC Heaters.
- (v) Heat Recovery Unit.
- (w) Air Conditioning Unit.
- (x) PLC System.

E40.3 Further to E40.2, the Contractor shall perform pre-commissioning for all equipment prior to demonstrating commissioning activities to the Contractor Administrator. Pre-commissioning activities shall include:

- (a) Ensuring equipment lamacoids are installed;
- (b) Ensuring equipment field wiring is labelled at both ends;
- (c) Ensuring equipment is properly powered;
- (d) Ensuring equipment lights, screens, etc. are functioning properly;
- (e) Equipment control signals are verified at the PLC Control Panel;
- (f) Ensuring equipment settings are applied;
- (g) Fill out nameplate information on commissioning forms;

E40.4 Provide the services of a qualified Manufacturer's technical representative to be present to perform unwitnessed pre-commissioning of each piece of equipment supplied under this Contract to perform the following:

- (a) Inspect the equipment to ensure they have been properly installed in accordance with the manufacturer's instructions. If the installation is not in order, the technical representative shall provide instruction for the installation Contractor. The equipment shall be started and run, and adjustments made at this time;
- (b) Conduct visual, electrical and operational testing to ensure fully functioning equipment:
- (c) Check for unusual vibration or noises;
- (d) Verify signals are received at PLC system;
- (e) Ensure proper equipment settings are applied; and
- (f) Inspect and document equipment readings such as current draw, voltage, electrical resistance, instrument readings and temperature.
- (g) Ensure proper equipment settings are applied.

E40.5 Provide the services of a qualified Manufacturer's technical representative to be present at the commissioning of each piece of equipment supplied under this Contract to perform the following:

- (a) Inspect the equipment to ensure they have been properly installed in accordance with the manufacturer's instructions. If the installation is not in order, the technical representative

shall provide instruction for the installation Contractor. The equipment shall be started and run, and adjustments made at this time;

- (b) Conduct visual, electrical and operational testing to ensure fully functioning equipment;
- (c) Check for unusual vibration or noises;
- (d) Verify signals are received at PLC system;
- (e) Ensure proper equipment settings are applied; and
- (f) Inspect and document equipment readings such as current draw, voltage, electrical resistance, instrument readings and temperature.
- (g) Ensure proper equipment settings are applied.

E40.6 Initial Start-Up Inspection and Testing

- (a) Goods supplied under this Contract will be installed under a separate Contract. The pumping equipment supplier will not be responsible for the installation work.
- (b) The Contract Administrator will provide seven (7) Calendar Days notice of requirement for an initial pump start-up inspection.
- (c) Provide the services of a qualified technical representative of each equipment provided to be present during commissioning under this Contract to perform the following:
 - (i) Inspect the equipment to ensure they have been properly installed in accordance with the manufacturer's instructions.
 - (ii) Conduct visual, electrical and operational testing to ensure fully functioning equipment.
 - (iii) Check for unusual vibration or noises.
 - (iv) Verify equipment signals are received at the PLC and on SCADA.
 - (v) Ensure relevant equipment settings are adjusted to match setting letters.
 - (vi) Instruct City personnel in the operation and maintenance of the Goods.
- (d) Promptly correct any deficiencies with the equipment at Contractor's own expense to the Contract Administrator's satisfaction.

E40.7 City of Winnipeg commissioning forms must be used. The forms provided as Appendix E are subject to change prior to commissioning. The Contractor shall ensure equipment is captured on separate commissioning forms unless the appropriate commissioning form lists multiple equipment. All commissioning forms are to be completed with the Contract Administrator representatives on site along with the appropriate trades.

E40.8 After the equipment has been installed and prior to final acceptance, protect the equipment from damage. Ensure that protection measures are to the satisfaction of the Contract Administrator.

E40.9 Measurement and Payment

- (a) Commissioning will be measured on a fixed fee basis at the Contract Unit Price for "Commissioning" as shown in Form B: Prices, for supplying all Documents and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.
- (b) fifty percent (50%) upon completion of commissioning activities;
- (c) fifty percent (50%) upon submission of commissioning forms.

E41. TRAINING

E41.1 Training sessions shall be in accordance with 01 91 13.18 and shall be documented and include the following as a minimum.

- (a) Functional description of equipment operation;
- (b) Identification of components and their purpose;
- (c) Facility overview and review of Process & Instrumentation Diagrams;

- (d) Confirmation of operating parameters and machine limits;
 - (e) Review of routine maintenance procedures and maintenance supplies;
 - (f) Pump and motor operations and maintenance information;
 - (g) Operations and maintenance information for the seal water flushing systems;
 - (h) Operations and maintenance information for VFDs;
 - (i) Operations and maintenance information for electrical equipment and systems;
 - (j) Operations and maintenance information for HVAC and building mechanical systems, including damper and ventilation controls using light switches;
 - (k) Generator operations and maintenance information;
 - (l) Trouble shooting procedures, limits of operator and maintenance competence;
 - (m) Long-term maintenance procedures, including anticipated overhaul frequencies; and
 - (n) Disconnection and removal of motors, drive shafts and pumps for maintenance Work.
 - (o) Training by standardized equipment vendors
- E41.2 Training for the pumping equipment shall be conducted on Site, in conjunction with commissioning. The Contractor shall provide a qualified instructor as well as the necessary course materials.
- (a) Training shall be provided in one (1) session for operation staff and one (1) session for maintenance staff.
- E41.3 Training for standardized equipment shall be conducted on Site, in conjunction with commissioning. The Contractor shall provide a qualified instructor as well as the necessary course materials.
- (a) Training shall be provided in one (1) session for operation staff and one (1) session for maintenance staff.
 - (b) Training to include PLC, MCC, and VFD training by a representative of the standardized vendor.
 - (c) Training to include instrumentation training by a representative of the standardized vendor.
- E41.4 Provide a total of five (5) hardcopy training manuals in 3-ring binders along with an electronic copy for attendees of each session.
- E41.5 Provide a total of five (5) hardcopy training manuals in 3-ring binders along with an electronic copy for attendees of each session. Provide the material in PDF format to the Contract Administrator for review at least two (2) weeks prior to the sessions. Binders/material to include training materials provided in all training sessions by all parties including the contractor:
- (a) As listed by Contractor in E41.1
 - (b) As listed by standardized equipment vendors in E41.3.
- E41.6 Measurement and Payment
- (a) Training will be measured on a fixed fee basis at the Contract Unit Price for "Training" as shown in Form B: Prices, for supplying all Documents and for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.
 - (b) fifty percent (50%) upon submission and approval of draft training plan materials;
 - (c) fifty percent (50%) upon completion of all training activities.
- E41.6.1 The price provided for "Training" shall cover all costs associated with this item of Work including travel expenses, accommodations, meals and wages.

E42. CASH ALLOWANCE FOR ADDITIONAL WORK

- E42.1 Additional Work may be necessitated due to unforeseen circumstances that may arise during the course of the project due to:
- (a) Additions to the scope of Work by the Contract Administrator, beyond that defined herein.
- E42.2 A cash allowance has been included on Form B: Prices in the amount of \$125,000.
- E42.3 The City reserves the right to delete any or all of the Cash Allowance from the Contract if the Work intended to be covered by the Cash Allowance is not required, or if the Works intended are found to be more extensive than the provisional Cash Allowance.
- E42.4 Cost of additional work shall be evaluated by the methods outlined in C7.4, and a Change Order prepared by the Contract Administrator. Cost of the Change Order will be paid on the Progress Estimate and deducted from the Cash Allowance. If the valuation of the authorized work exceeds the Value of the Cash Allowance, the Contract Value will be adjusted by the shortfall.
- E42.5 Additional services and/or Work will not be initiated for:
- (a) Reasons of lack of performance or errors in execution.
 - (b) Scheduling changes initiated by the City, where at least 24 hours' notice is given prior to the Contractors schedule time to be on Site.
- E42.6 Should it be determined that additional material or services are required, the Contract Administrator shall approve the Work, prior to commencement of the additional Work.
- E42.7 Material Mark-Up Factors in accordance with C7:
- (a) The base cost is to be the wholesale cost of the material, regardless of the Contractor or Subcontractor supplying the material.
 - (b) In general, the party (Contractor or Subcontractor) supplying the material is the party that purchases the material from a supplier who does not perform any work on Site, unless otherwise determined by the Contract Administrator.
 - (c) Where the Contractor is supplying the material, the mark-up on the material is limited to fifteen percent (15%).
 - (d) Where the Contractor's immediate Subcontractor is supplying the material the total mark-up on the material including all Subcontractors and the Contractor is limited to twenty-five percent (25%)
 - (i) The Subcontractor's mark-up on the material is limited to fifteen percent (15%);
 - (ii) The Contractor's mark-up on the material is limited to ten percent (10%).
 - (e) A Third-Level Subcontractor is a Subcontractor of a Subcontractor of the Contractor.
 - (i) No Third-Level Subcontractors on this project are approved for additional mark-up.
- E42.8 In the event that a Third-Level Subcontractor is utilized, that is not approved for additional mark-up, the Contractor is responsible for coordinating the split of the maximum approved mark-up between the Contractor and Subcontractors.

E43. TEMPORARY SURFACE RESTORATION AND MAINTENANCE

- E43.1 Further to CW 1130, where permanent surface restorations cannot be made due to cold weather, the Contractor shall temporarily restore surfaces as follows:
- (a) backfill and level boulevards and grassed areas to match existing surface elevations,
 - (b) cap excavations in concrete pavement with a 100-millimetre-thick layer of concrete for "Temporary Restoration of Utility Pavement Cuts" as specified in CW 3310,
 - (c) cap excavations in sidewalk pavement with a 50-millimetre-thick layer of concrete for "Temporary Restoration of Utility Pavement Cuts" as specified in CW 3310,
 - (d) insulate temporary concrete where required during 48hr curing period,

- (e) where curb has been removed as part of the pavement cut pour temporary curb using "Concrete for Temporary Restoration of Utility Pavement Cuts" as specified in CW 3310.
- (f) remove all temporary pavements prior to permanent restorations.

E43.2 The Contractor shall monitor and maintain temporarily restored surfaces as required until permanent restoration is complete.

E43.3 If, in the opinion of the Contract Administrator, temporarily restored surfaces are not being adequately maintained or were not properly constructed and pose a danger to the public, maintenance or reconstruction will be done by the City forces with no advance notification to the Contractor.

E43.4 Backfill Under Temporary Surface Restorations

- (a) Use class 2 backfill in excavation under temporary street pavement and sidewalk where Class 3 backfill cannot be jetted and flooded due to cold weather.
- (b) Class 2 backfill may be compacted in 600mm lifts where backhoe operated pneumatic plate compactors are used.
- (c) Jet and flood Class 2, Class 3 and Class 5 backfilled excavations in spring when ground is not frozen prior to permanent restoration.

E43.5 All costs associated with the maintenance or reconstruction of temporary pavement incurred by the City shall be deducted from future payments to the Contractor.

E43.6 Temporary Surface Restorations shall be considered incidental to the Works of this Contract, and no separate payment will be made for this item.

E44. SNOW CLEARING

E44.1 All required snow clearing shall be performed by the Contractor at his own expense.

E44.2 The Contractor will be required to perform snow clearing and sanding operations on City streets and sidewalks within the Site where access to City snow clearing and sanding crews is blocked due to construction activities or where construction activities have created unsafe, icy conditions.

E44.3 Snow built-up on sidewalks and roadway shall be maintained to the condition of the surrounding sidewalks and roadways.

E45. EXPEDITED SHOP DRAWINGS

E45.1 In order to expedite Shop Drawings with critical timelines, the bidder of the Lowest Evaluated Responsive Bid, as outlined in B18.1, after receiving written approval from the Contract Administrator, is to arrange for the preparation of Shop Drawings for the following items with critical timelines.

- (a) Three (3) wastewater lift pumps (P-L01, P-L02 and P-L03)
 - (i) Note the critical date for pump delivery in D19.1(b). In order to permit the expedited manufacturing of the pumps, the shop drawings may be divided into two submissions.
 - ◆ The expedited initial shop drawing submission may contain only the model number, pump curve, impeller diameter, required motor horsepower, and details of the major castings (casing - E27.3.5, backplate - E27.3.7, suction elbow - E27.3.17(b), bearing frame - E27.3.18, impeller - E27.3.6). Approval of this expedited initial shop drawing will permit the immediate entry of these items into the factory queue upon project award. Driveshaft details and torsional frequency analysis results are not required for this submission.
 - ◆ The second submission may occur after project award and will include all information necessary to satisfy the requirements of E27, E28, E29.

- (b) Three (3) wastewater lift motors (MTR-L01, MTR-L02, MTR-L03)
- (c) All Process Gate Valves
- (d) All Process Check Valves
- (e) One (1) standby natural gas generator (GEN-L72)
- (f) One (1) Automatic Transfer Switch (ATS-L72)
- (g) Three (3) Variable Frequency Drive Enclosures (VFD-L01, VFD-L02, VFD-L03)
- (h) and PLC-L81 as part of Standardized PLC Control System and Motor Control Equipment

E45.2 If Award is made to the Lowest Evaluated Responsive Bidder, no payment for the expedited preparation of Shop Drawings will be made.

E45.3 If no contract is awarded, then the City of Winnipeg will pay the requested Bidder up to a maximum of five hundred dollars (\$500.00) for each of the requested submissions noted above, for the preparation and delivery of Shop Drawings. Delivery of Shop Drawings to the City and payment of the above amounts will constitute full and final consideration for each party to the other, and neither party will have any further liability to the other with respect to this Tender.

E46. OPERATIONS AND MAINTENANCE MANUALS

E46.1 An electronic draft copy of the operation and maintenance manuals shall be submitted (word version, if available) two (2) weeks prior to Substantial Performance of the Work for review and comments. Submission of individual data will not be accepted unless directed by the City. Make changes and incorporate the Contract Administrator's review comments as required and re-submit as directed by the Contract Administrator.

E46.2 After review and acceptance by the City, five (5) hard copies and one electronic (PDF) copy of the final operation and maintenance manuals shall be submitted. The final electronic copy shall be provided on a flash memory drive.

E46.3 Manuals are to incorporate the training manuals in E41.

E46.4 The following shall be included as part of the Operations and Maintenance (O&M) Manuals:

- (a) Title Sheet labelled 'Tylehurst Operation & Maintenance Instructions', Containing Project Numbers & Name.
- (b) Tab A – Contactor Information
 - (i) Contractor name and address.
 - (ii) Contractor contact representative with phone number and email.
 - (iii) All Sub-Contractors names, addresses and contact information.
- (c) Tab B – Warranty
 - (i) Letter of Warranty, signed and dated to include warranty start date, warranty end date, Contractor warranty information.
 - (ii) Descriptions of work/parts that are covered under warranty and warranty durations.
- (d) Tab C – Products and Shop Drawings
 - (i) Copy of all approved / as-constructed Shop Drawings.
- (e) Tab D – Spare Parts & Tools
 - (i) Provide instructions for handling and storage of spare parts.
 - (ii) Provide a listing of any special tools required to operate and/or maintain the products.
 - (iii) Provide a listing of all spare parts included with pictures of each part, part numbers, quantities and practical life spans.
- (f) Tab E – Certified Factory Test Results
 - (i) Calibration of equipment used for testing procedures and test procedure arrangements.

- (ii) Copy of all approved tests and documented information test forms completed at the factory, each test shall be signed by the Contractor representative and dated.
- (iii) Factory inspection and verification reports/forms.
- (iv) Any additional performance reports.
- (v) Copy of current edition of factory certification for CSA and/or cUL compliance for Canadian Approval.
- (g) Tab F – Commissioning Forms
 - (i) Type written commissioning forms for all equipment commissioned.
- (h) Tab H – Maintenance Activities
 - (i) Spare Tab
 - (j) Spare Tab

E46.5 Measurement and Payment

- (a) Provision of Operations and Maintenance Manuals will be measured on a fixed fee basis at the Contract Unit Price for “Operations and Maintenance Manuals” as shown in Form B: Prices
- (b) fifty percent (50%) upon submission and approval of draft materials;
- (c) fifty percent (50%) upon completion and provision of final deliverables.