

PART 1 GENERAL

1.1 Administrative

- .1 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with Section B7 of the Tender.
- .2 Submit to Contract Administrator submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .3 Do not proceed with Work affected by submittal until review is complete.
- .4 Present Shop Drawings, product data, samples and mock-ups in SI Metric units.
- .5 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator review of submittals.
- .7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator review.

1.2 Shop Drawings and Product Data

- .1 The term "Shop Drawings" means Drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate Materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of the section under which adjacent items will be supplied and installed. Indicate cross references to design Drawings and Specifications.
- .3 Submit Shop Drawings for all Goods to be supplied and receive a release for construction from the Contract Administrator before Goods are produced for this Contract.
- .4 At the time of submission inform the Contract Administrator in writing of any deviation in the Shop Drawings from the requirements of the Contract documents.
- .5 Submit electronic copies of Shop Drawings as a searchable PDF format.
- .6 Accompany submissions with transmittal letter, containing:
 - .1 Date and revision dates;
 - .2 Project title and number;
 - .3 Name and address of:
 - .1 Subcontractor;
 - .2 Supplier; and

- .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents; and
- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication;
 - .2 Layout, showing dimensions, including identified field dimensions and clearances;
 - .3 Setting or erection details;
 - .4 Capacities;
 - .5 Performance characteristics;
 - .6 Standards;
 - .7 Operating weight;
 - .8 Wiring diagrams;
 - .9 Single line and schematic diagrams;
 - .10 Relationship to adjacent Work; and
 - .11 Recommended alarm and trip conditions for vibration and bearing temperature monitoring.
- .7 Shop Drawings should include, at minimum, but not be limited to, the following:
 - .1 Detailed information of the proposed equipment in the capacity, size and arrangement as indicated and specified;
 - .2 Data for accessory items;
 - .3 Certified (if required) setting plans with tolerances for anchor bolts and/or mounting details;
 - .4 Certified results of shop testing;
 - .5 List of recommended spare parts other than those specified;
 - .6 Special tools required for the installation, setup or maintenance of the equipment; and
 - .7 Table indicating spare parts to be provided, quantity, description and part number for each.
- .8 Show following information in the lower right hand corner of each Shop Drawing:
 - .1 Name of pumping station;
 - .2 City's Bid Opportunity number;
 - .3 Manufacturer's name and description or model number of the item;
 - .4 Serial number(s) of Goods; and
 - .5 Date (to be revised per resubmission).
- .9 With the Shop Drawings, the vendor shall submit calculations regarding the thermal expansion of the shaft and coupling connecting the pump and the motor, as well as the calculations regarding the harmonic frequency of the system. These calculations shall be sealed by a Professional Engineer.
- .10 Allow seven (7) days for Contract Administrator review of each submission. The review is only for conformance with the design concept of the project and with the information given in the Specifications. The Contract Administrator's review of a separate item shall not indicate approval of an assembly in which the item functions.

- .11 Make any corrections required by the Contract Administrator and resubmit the Shop Drawing in an electronic format. Direct specific attention in writing or on resubmitted Shop Drawings for revisions other than the corrections requested by the Contract Administrator on previous submissions.
- .12 By approving and submitting Shop Drawings, the Contractor hereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data, or will do so, and that he has checked and coordinated each Shop Drawing and sample with the requirements of the Work and of the Specifications.
- .13 Provision of Shop Drawings will be considered incidental to the price for supply and delivery of Goods and Materials.
- .14 Adjustments made on Shop Drawings: Contract Administrator is not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Contract Administrator prior to proceeding with Work.
- .15 Make changes in Shop Drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.
- .16 Submit electronic copy of Shop Drawings for each requirement requested in Specification sections and as Contract Administrator may reasonably request.
- .17 Submit electronic copies of product data sheets or brochures for requirements requested in Specification sections and as requested by Contract Administrator where Shop Drawings will not be prepared due to standardized manufacture of product.
- .18 Submit electronic copies of test reports for requirements requested in Specification sections and as requested by Contract Administrator.
- .19 Submit electronic copies of manufacturer's instructions for requirements requested in Specification sections and as requested by Contract Administrator.
 - .1 Electronic material describing installation of product, system or Material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .20 Submit electronic copies of Manufacturer's Field Reports for requirements requested in Specification sections and as requested by Contract Administrator. Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .21 Submit five (5) hard copies and one (1) electronic copy of Operation and Maintenance Data for requirements requested in Specification 43 21 13 – Centrifugal Pumps, and as requested by Contract Administrator.
- .22 Delete information not applicable to the Project.
- .23 Supplement standard information to provide details applicable to Project.
- .24 If upon review by Contract Administrator, no errors or omissions are discovered or if only minor corrections are made electronic copy will be returned and fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and resubmission of corrected Shop Drawings, through same procedure

indicated above, must be performed before fabrication and installation of Work may proceed.

- .25 Contractor will be charged for Contract Administrator subsequent reviews of submittal packages exceeding two (2) submissions.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used

END OF SECTION

PART 1 GENERAL

1.1 Submittals

- .1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final inspection, with Contract Administrator comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Within two (2) weeks after equipment delivery provide one (1) hard copy and one (1) electronic copy of operating and maintenance manuals in English. The electronic copy shall be a searchable PDF format. The Contractor shall modify and supplement the manual as required by the Contract Administrator. When accepted, five (5) final copies, including one (1) electronic version, shall be provided by the Contractor for distribution purposes within two (2) weeks of receiving the Contract Administrator's review comments. The City's staff shall be in receipt of these manuals prior to the date set out for installation and commissioning of the Goods.
- .6 Furnish evidence, if requested, for type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at their own expense.

1.2 Format

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, three (3) 'D' ring, loose leaf two hundred nineteen (219) by two hundred seventy-nine (279) millimetres (8.5 by eleven (11) inch) with spine and face pockets.
- .3 When multiple binders are used correlate data consistently in related groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of Project and identify subject matter of contents.
- .5 Arrange content by systems under section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger Drawings to size of text pages.

1.3 Contents – Each Volume

- .1 Table of Contents: provide title of Project, date of submission, names:

- .1 Addresses and telephone numbers of Contract Administrator and Contractor with name of responsible parties; and
- .2 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.4 Operating and Maintenance Manuals

- .1 Provide the Contract Administrator with five (5) copies of the manufacturer's technical literature for each component supplied detailing correct installation procedure and recommended operating and maintenance schedule, grades of lubricants required and assembly/disassembly instructions.
- .2 Provide all required data in electronic format. Text documents shall be Microsoft Word or Adobe format. Drawings, scanned documents, parts lists, test forms shall be in Adobe format. If possible, documents should be an original electronic format. Documents that require scanning shall be high quality scans and fully legible. Documents shall be submitted on a high quality compact disk. Compact disk and case shall be labelled in type, with the following:
 - .1 Bid Opportunity number;
 - .2 Job title; and
 - .3 Description of Goods.
- .3 In addition to information called for in the Specifications, the following shall be included:
 - .1 Title sheet, labelled "Operation and Maintenance Instructions", containing Project name and date;
 - .2 List of contents;
 - .3 As-Constructed Shop Drawings of all Goods;
 - .4 Certified factory test results;
 - .5 Full description of entire mechanical system, operation and control;
 - .6 Names, addresses and telephone numbers of all major Subcontractors and suppliers;
 - .7 Detailed Specification and operating and maintenance instructions for all Goods provided including a preventative maintenance program;
 - .8 An itemized list of provided parts as part of the Contract;
 - .9 An itemized list of spare parts recommended for five (5) years of service, particularly those components where failure of which will render the Goods supplied inoperative. Recommended quantities to be maintained in storage shall be provided. Any special tools or other ancillary items necessary for commissioning and/or proper operation and maintenance shall also be listed.

These prices shall be available to the City at any time prior to the issuance of the Certificate of Acceptance;

- .10 Part books that illustrate and list all assemblies, sub-assemblies and components;
- .11 Routine test procedures for all electronic and electrical circuits; and
- .12 Troubleshooting chart covering the complete controls/electrical power systems, showing description of trouble, probable cause and suggested remedy.

1.5 Warranties

- .1 Assemble approved information in binder and submit upon acceptance of Work. Organize binder as follows:
 - .1 Separate each warranty with index tab sheets keyed to Table of Contents listing;
 - .2 List Subcontractor, supplier and manufacturer, with name, address and telephone number of responsible principal;
 - .3 Obtain warranties, executed in duplicate by Subcontractors, suppliers and manufacturers, within ten (10) days after completion of applicable item of Work;
 - .4 Verify that documents are in proper form, contain full information and are notarized;
 - .5 Co-execute submittals when required; and
 - .6 Retain warranties and bonds until time specified for submittal.
- .2 Except for items put into use with City's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .3 Conduct joint eleven (11) month warranty inspection on-site, measured from Date of Substantial Performance, by Contract Administrator.
- .4 Respond in a timely manner to oral or written notification of required construction warranty repair Work.
- .5 Written verification will follow oral instructions. Failure to respond will be cause for the Contract Administrator to proceed with action against Contractor.
- .6 The Contract Administrator will prepare a deficiency log for any deficiencies found during the warranty Site investigation with any warranty issues that City personnel bring up. The Contractor will be required to address any warranty deficiencies at no additional cost to the Contract.

PART 2 PRODUCTS

2.1 Not Used

- .1 Not Used

PART 3 EXECUTION

3.1 Not Used

- .1 Not Used

END OF SECTION

PART 1 GENERAL

1.1 Scope

- .1 This section refers to the supply, delivery and testing of the following valves:
 - .1 Resilient Seated Rising Stem Gate Valves:
 1. Two (2) three hundred (300) millimetre gate valves – manually actuated [SLG-L01B, SLG-L02B];
 2. One (1) three hundred fifty (350) millimetre gate valve – manually actuated [SLG-L03C]; and
 3. Two (2) two hundred fifty (250) millimetre gate valves – manually actuated [SLG-L01C, SLG-L02C].
 - .2 Resilient Seated Non-Rising Stem Gate Valves:
 1. One (1) two hundred fifty (250) millimetre gate valves – manually actuated [SLG-L04C].
 - .3 Check Valves:
 1. Two (2) two hundred fifty (250) millimetre check valves with “hold-open” device [CV-L01A, CV-L02A].
- .2 Have valves for all systems supplied by the same supplier.
- .3 Supply all other Materials, products and services described in this Specification.

1.2 Shop Drawings

- .1 Submit Shop Drawings in accordance with Section 01 30 00 – Submittal Procedures.

1.3 References

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

1.4 Product Data

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit data for all valves specified in this section.

1.5 Closeout Submittals

- .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.6 Spare Parts

- .1 Provide list of recommended spare parts for City's follow-up.

PART 2 PRODUCTS

2.1 Valve Operators

- .1 Supply valve operators or actuators for all types of valves specified as follows:
 - .1 Supply removable manually operated hand wheels for all valves;
 - .2 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;
 - .3 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 gear actuators;
 - .4 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
 - .5 Supply steel pipe Tee wrenches with socket to suit nut dimensions.

2.2 General Valve Requirements

- .1 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.
- .2 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.
- .3 The Contractor shall ensure that the valve end connections are compatible with pipe material in which the valve is installed.
- .4 Do not install valves dissimilar with piping to avoid galvanic corrosion.
- .5 All packing, gaskets, seats, diaphragms, lubricants, etc., shall be suitable for the intended operating conditions.
- .6 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.
- .7 Equip the valve with a disc position indicator and a direction of flow indicator where applicable.

2.3 Resilient Seated Iron Gate Valve Specification

- .1 This Specification covers Ductile Iron Gate Valves in sizes seventy-five (75) millimetres to seven hundred fifty (750) millimetres (three (3) inches to thirty (30) inches) for above ground installation.
- .2 The valves shall confirm to AWWA 515.
- .3 Pressure-temperature ratings:
 - .1 Seventy-five (75) millimetres to three hundred (300) millimetres: one thousand four hundred (1,400) kilopascals at sixty-five (65) degrees Celsius.
 - .2 Three hundred fifty (350) millimetres to seven hundred fifty (750) millimetres: one thousand fifty (1,050) kilopascals at sixty-five (65) degrees Celsius.
- .4 Body material: Ductile Iron to ASTM-525 or 526.
- .5 Stem: Non-Rising stem and Rising stem as specified in Clause 1.1, one (1) piece bronze or stainless steel.
- .6 Disc: Resilient wedge tapered on both sides.
- .7 End connections: flanged to ANSI B16.1, Class 150.
- .8 Packing and gaskets: non-asbestos.
- .9 Fusion bonded epoxy coating to AWWA C-550 shall be applied to the ferrous surfaces in contact with water.
- .10 All fasteners, nuts and bolts shall be stainless steel.
- .11 Acceptable manufacturers – one (1) of the following:
 - .1 American Valve Company;
 - .2 Pratt;
 - .3 Clow Canada;
 - .4 Dezurik;
 - .5 Mueller Canada; or
 - .6 Approved equal in accordance with Section B7 of the Tender.

2.4 Process Check Valves

- .1 The valves shall be designed, manufactured, tested and certified to American Water Works Association Standard ANSI/AWWA C508.
- .2 The valves shall have flanges with drilling to ANSI B16.1, Class 125 with holes straddling centreline.
- .3 Check valve to be rapid closure rubber flapper (RF) type with a forty-five (45) degree seating face suitable for horizontal installation.
- .4 The valves will be specified with the “hold open” device.
- .5 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.
- .6 The disc shall be of one-piece construction, precision molded with an integral O-ring type sealing surface and reinforced with alloy steel.
 - .7 The valve body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron.
 - .8 The disc shall be precision molded Buna-N (NBR), ASTM D2000-BG. Optional disc material includes Viton, EPDM, Hypalon.
 - .9 Hinge pin to be stainless steel (303/316).
 - .10 The exterior and interior of the valve shall be coated with an AWWA C-550 approved fusion bonded epoxy coating.
 - .11 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.
 - .12 Submit Shop Drawings of check valves in accordance with Section 01 33 00 – Submittal Procedures.
 - .13 Approved check valve manufacturers:
 - .1 American Valve Company;
 - .2 Clow Canada;
 - .3 Dezurik;
 - .4 ValMatic
 - .5 Mueller Canada; or
 - .6 Approved equal in accordance with Section B7 of the Tender.

PART 3 EXECUTION

3.1 Shop Testing

- .1 Test AWWA valves in the shop in accordance with American Water Works Association requirements. A certified test report shall be submitted.

3.2 Certificates

- .1 On completion of installation and testing, submit the manufacturer's certification of the correctness of the installation to the Contract Administrator.

END OF SECTION

PART 1 GENERAL

1.1 Description

- .1 This Specification shall cover the supply and commissioning of pumping equipment at the Riverbend Wastewater Lift Station.
 - .1 Wastewater Sewage Pumps – Supply and delivery of two (2) one hundred fifty-four (154) litres per second (two thousand four hundred forty-one (2,441) US gallons per minute) pumps complete with motors, drive shafts, drive shaft guards, pump suction elbows, supports and spare parts.
 - .2 Pumps will be used to pump raw sewage having a temperature range of zero (0) degrees Celsius to thirty (30) degrees Celsius and will operate under conditions of flooded suction.
 - .3 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. The pumps shall be installed in a dry well and the motor shall be installed higher up in a motor room. A pump that is submersible style pump where the motor is connected directly to the pump will not be acceptable.
 - .4 Durable metal nameplates shall be securely attached to each pumping unit supplied. Pump nameplates shall indicate the serial number, capacity, head, revolutions per minute and other pertinent data. Motor nameplates shall indicate the serial number, voltage, phase, hertz, revolutions per minute, horsepower, service factor, NEMA Design, insulation class and any other pertinent data.

1.2 Guarantees

- .1 The equipment shall be guaranteed to perform to the specified operating conditions.

1.3 Reference Standards

- .1 Pumping units shall generally comply with the requirements of the Hydraulic Institute Standards.
- .2 Pumping unit shall be CSA approved.

1.4 Shop Painting

- .1 All equipment is to be painted with manufacturer's standard coatings.

1.5 Standards

- .1 Have equipment comply with the latest edition of the applicable codes and regulations including, but not limited to, the following:
 - .1 American Society of Mechanical Engineers (ASME);
 - .2 Canadian Standards Association (CSA);
 - .3 Canadian Electrical Manufacturers Association (CEMA);
 - .4 National Electrical Manufacturer's Association (NEMA);
 - .5 American Society for Testing and Materials (ASTM);
 - .6 American National Standard Institute (ANSI);

- .7 Electrical Electronics Manufacturing Association of Canada (EEMAC); and
- .8 Electrical Safety Association (ESA).
- .2 Have all electrical equipment comply in every respect with the rules and regulations of Manitoba Hydro and be acceptable to their local inspector.
- .3 In cases of any conflict between these Specifications and any of the above standards, the most stringent standard will have precedence.

1.6 Submittals

- .1 Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings shall include details of the equipment stand, complete with instructions for attachment of the stand to the concrete base.
- .3 Performance curves shall be submitted with the Shop Drawings. Performance curves shall include capacity, head, pump efficiency, BkW and NPSH from shut-off through the rated point to run-out.
- .4 Submit operation and maintenance manuals in accordance with Section 01 78 00 – Closeout Submittals.
- .5 Attached Data Sheets must be completed and submitted as part of the Shop Drawings.
- .6 Submit Manufacturer recommended alarm and lockout conditions for both vibration and bearing temperature monitoring.

PART 2 PRODUCTS

2.1 Centrifugal Pumps

- .1 General
 - .1 Supply two (2) centrifugal vertical shaft pumps (wastewater sewage pumps) as detailed in this Specification.
 - .2 The wastewater sewage pumps shall be supplied complete with:
 - .1 Motor;
 - .2 Base (four (4) legged);
 - .3 Flanged suction and discharge piping connections;
 - .4 Extended drive shafts and guards;
 - .5 Couplings; and
 - .6 Vibration and temperature monitoring instruments.
- .2 Operating Requirements
 - .1 Pump head/capacity curves shall be continuously rising toward shut-off.
 - .2 The required net positive suction head (NPSHR) shall not exceed the available NPSHa as provided in Clauses below with a factor of safety of twenty-five (25) percent and cavitation-free performance shall be guaranteed.
 - .3 Motor shall be sized so that the pump is non-overloading throughout the pump performance curve from shut-off to run-out conditions.
 - .4 Wastewater Sewage Pumps:
 - .1 Duty Point:

- | | | |
|----|--|--|
| .1 | Single Pump | one hundred fifty-four (154) litres per second at 10.7 metres TDH
(two thousand four hundred forty-one (2,441) USgpm at 35.1 feet TDH) |
| | TDH Range | 9.6 to 10.7 metres
(31.5 to 35.1 feet) |
| | NPSHa | 8.8 metres at one hundred fifty-four (154) litres per second
(28.9 feet at two thousand four hundred forty-one (2,441) US gallons per minute) |
| .2 | Nominal Speed: | one thousand two hundred (1,200) revolutions per minute |
| .3 | Rotation (viewed from above): | CW |
| .4 | Type of Impeller: | Non-clog |
| .5 | Size of Sphere Impeller Shall Pass: | seventy-six (76) millimetres
(three (3.0) inches) |
| .6 | Diameter of Pump Suction: | three hundred (300) millimetres
(twelve (12) inches) |
| .7 | Diameter of Pump Discharge: | two hundred fifty (250) millimetres
(ten (10) inches) |
| .8 | Minimum Pump Efficiency at Duty Point: | eighty (80) percent |
- .3 Pump Suction Elbow
- .1 Provide three hundred (300) millimetres by two hundred (200) millimetres (twelve (12) inches by eight (8) inches) pump suction elbow.
- .4 Clean Out Port
- .1 Clean out port to be located at center of pump.
- .2 One hundred fifty (150) millimetres (six (6) inches) diameter, two (2) bolt pattern.
- .5 Unspecified Materials
- .1 All unspecified materials shall be selected specifically for their suitability considering their duty.
- .6 Casing
- .1 Pump casing: 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.
- .7 Backhead
- .1 Backhead: 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.
- .8 Bearing Frame
- .1 Bearing Frame: cast iron conforming to ASTM Specification A48 or A278, for Gray Iron Castings, Class 30.
- .9 Non Clog Impeller
- .1 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. The cast iron shall contain not less than three (3) percent nickel.

- .2 The impeller to be of the non-clog enclosed channel type.
- .3 Impeller to be mid-range in diameter.
- .10 Wear Rings
 - .1 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 Section B7 of the Tender.
 - .2 Impeller ring hardness to be at least 300 Brinell (RC 32.1).
 - .3 Casing wear ring to exceed impeller wear ring by at least 50 Brinell.
- .11 Impeller Shaft Assembly
 - .1 Shaft Assembly: fabricated from steel conforming to ASTM A108, Grade 1045 or approved equal in accordance with Section B7 of the Tender.
- .12 Shaft Sleeve
 - .1 Shaft sleeve where shaft passes through stuffing box: fabricated from 316L stainless steel conforming to ASTM A240 or approved equal in accordance with Section B7 of the Tender.
- .13 Bearings
 - .1 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.
 - .2 Design bearings for a B-10 life of not less than one hundred thousand (100,000) hours in accordance with AFBMA.
- .14 Mechanical Seals
 - .1 Mechanical Seals: Double mechanical seals, cartridge type.
 - .2 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.
 - .3 As manufactured by John Crane, Flowserve, Burgmann or approved equal in accordance with Section B7 of the Tender.
 - .4 Witness testing of mechanical seals by the Contract Administrator in Winnipeg prior to delivery of pumps to Site.
- .15 Mechanical Seal Water Solenoid Valves
 - .1 Where mechanical seals require external seal water, supply one (1) solenoid valve per pump for the purpose of controlling seal water flow.
 - .2 Seal water solenoid valves are not required to be provided if the pumps utilize an internal sealed oil reservoir.
 - .3 Solenoid valves to operate off one hundred twenty (120) VAC, sixty (60) hertz supply.
 - .4 Provide and supply one (1) flow switch, with contacts rated at twenty-four (24) VDC, for each pump seal water system.
- .16 Vibration Monitoring
 - .1 Provide pump vibration monitoring on pump bearing housing.
 - .2 Vibration sensor to be XY type.
 - .3 4-20mA loop powered.
 - .4 Frequency range three (3) hertz to one thousand (1,000) hertz.

- .5 Sensor one hundred (100) mV/g.
- .6 Cast aluminum NEMA 4 conduit elbow termination housing.
- .7 Terminal blocks for connection to field wiring.
- .8 Threaded bolted connection to machined flat spot on bearing housing.
- .9 Manufacturer: IMI Sensors (PCM Piezotronics).
- .17 Temperature Monitoring
 - .1 Provide RTD temperature sensor on pump bearings.
 - .2 One hundred (100) ohm 3-wire RTD.
 - .3 Spring loaded.
 - .4 Cast aluminum NEMA 4 connection head.
 - .5 Terminal blocks for connection to field wiring.
- .18 Paint
 - .1 One (1) prime coat of a rust inhibitive primer, a second adhesive prime coat and one (1) finish coat of manufacturer's standard enamel.

2.2 Mechanical requirements:

- .1 General
 - .1 Casing shall be rated for 1.5 times working pressure.
- .2 Drive Shaft Assembly
 - .1 Vertical hollow steel drive shaft with flexible coupling(s) to transmit power from the motor to the pump.
 - .2 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 three (3) 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.
- .3 Drive Shaft
 - .1 Drive Shaft Guard
 - .1 Removable (with tools), minimum 1.6 millimetres (0.06 inches) thick galvanized expanded metal steel mesh constructed to OSHA standards.
 - .2 Fasteners: ASTM A276 Type 316 stainless steel.
 - .3 The drive shaft guard shall extend through the pump room ceiling to the motor room floor.
 - .2 Shaft and Sleeve:
 - .1 Shaft and shaft sleeve shall be designed for minimum deflection at maximum load. Shaft assembly shall be one (1) piece, ground and polished. Shaft sleeve shall be renewable, positively driven by impeller key.
 - .2 The shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of forty-eight (48) millimetres (1 7/8 inches). The dimension from the lowest bearing to the top of the impeller shall not exceed one hundred fifty (150) millimetres (six (6) inches).
 - .3 Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified minimum diameter. O-ring shall be provided to prevent leakage under shaft sleeve.

.4 Shaft runout limited to 0.08 millimetres (0.003 inches).

.4 Pump Support

.1 Provide one (1) rigid fabricated steel four (4) legged stand or a cast suction elbow/cast stand combination for each pump. Pump support shall firmly support the entire weight of the pump and withstand the full motor torque.

.1 The pump support shall provide clear access to the cleanout ports on the suction elbow and the pump volute.

.2 The pump support should be suitable for mounting onto a concrete base using anchor bolts.

.1 The installation contractor will have the capability to modify the existing concrete base to suite the pump and pump support.

2.3 Pump Motors

.1 General Requirements

- | | | |
|----|------------------------------------|--|
| .1 | Power Supply: | Five hundred seventy-five (575) V/
three (3) phase/sixty (60) hertz |
| .2 | Power Rating: | Provide minimum power to meet power
rating of maximum impeller diameter of
pump. |
| .3 | Motor Service Factor: | 1.15 with sine wave |
| .4 | Motor Efficiency: | NEMA premium efficiency motor |
| .5 | Full Load Amps at Operating Point: | Ninety (90) percent of max |
| .6 | Motor Speed Torque Characteristics | NEMA Design B |
| .7 | Starts per Hour Capability: | Ten (10) |
| .8 | CSA Specification Conformance: | C22.2 No. 100 |
| .9 | Winding Material | Copper |

.2 Motor

.1 Vertical shaft, squirrel cage, totally enclosed fan cooled, NEMA premium efficiency inverter duty motor for use with Variable Frequency Drive (VFD) conforming to CSA Specification C22.2 No. 100 and all other CSA Specifications referenced therein.

.2 Motors will be subject to a maximum of ten (10) start/stop cycles per hour and the stator winding insulation suitable for such operation. In no case shall stator winding insulation be less than Class F. Motor lead cables to be one thousand (1,000) V rated.

.3 Equipped with heavy duty grease-lubricated and anti-friction bearings with an AFBMA B10 rating of one hundred thousand (100,000) hours.

.4 Maximum noise level of eighty-five (85) dBa at 1.2 metres (3.9 feet) distance.

.5 Motors to be suitable for vertical mounting either to the concrete floor or base stand.

.3 Bearings

.1 The upper bearing shall be free to move linearly with the thermal expansion of the shaft and shall carry only radial loads.

.2 Lower bearing (nearest to impeller) shall be adequate to carry all radial and axial thrusts developed by largest impeller that bowl can accommodate.

.3 Shaft bearing nearest the pump impeller shall be locked in place so that shaft end play is limited to the clearance within the bearing.

- .4 Motor non drive end bearing shall be insulated.
- .5 Provide Aegis shaft grounding ring.
- .4 Vibration Monitoring
 - .1 Provide motor vibration monitoring on drive end and non-drive end (upper and lower) bearings.
 - .2 Vibration sensors to be XY type.
 - .3 4-20mA loop powered.
 - .4 Frequency range three (3) hertz to one thousand (1,000) hertz.
 - .5 Sensor one hundred (100) mV/g.
 - .6 Cast aluminum NEMA 4 conduit elbow termination housing.
 - .7 Terminal blocks for connection to field wiring.
 - .8 Threaded bolted connection to machined flat spot on motor bearing housing.
 - .9 Manufacturer: IMI Sensors (PCM Piezotronics).
- .5 Temperature Monitoring
 - .1 Provide RTD temperature sensor on drive end and non-drive end (upper and lower) bearings.
 - .2 Provide six (6) RTD winding temperature sensors
 - .3 Cast aluminum NEMA 4 connection head.
 - .4 Terminal blocks for connection to field wiring.
- .6 A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant.
- .7 Instrument wiring field cables shall terminate in a separate enclosure (junction box) from where power field cables terminate at.

2.4 Construction

- .1 General
 - .1 Castings to be free from flaws and imperfections and machined surfaces finished true.
 - .2 Round off inside and outside corners and edges of all castings.
 - .3 Provide means to prevent nuts and bolts from becoming loose (pins, spring or friction washered fasteners).
 - .4 Statically and dynamically balance all rotating components as an assembled unit in accordance with ISO 1940 G6.3.
- .2 Casing
 - .1 Centrifugal volute type design of ample thickness and rigidity to withstand stresses due to hydraulic forces, weight of piping, erection loads, operating and testing.
 - .2 Inside water passages shall be smooth and free from any significant projections that would hinder the flow of any solid waste.
 - .3 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.
 - .4 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.

- .5 Design to permit the removal of the rotating assembly without disturbing the suction and discharge piping.
 - .6 Provide a hand hole with bolted cover on the volute to permit access to the inside for cleaning and unclogging of the volute.
 - .7 Provide a tapped ten (10) millimetres (3/8 inches) 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.
 - .8 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.
- .3 Suction and Discharge
- .1 Suction and discharge shall be flanged, faced and drilled to conform to ASME Specification B 16.1 Class 125.
 - .2 Provide a cast or fabricated ninety (90) degree 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.
 - .3 Provide gauge connections tapped for ten (10) millimetres (3/8 inches) NPT threaded pipe on each suction and discharge nozzle. Locate tapped connection close to flange ends. Provide pipe plugs in tapped holes.
 - .4 Orient the suction and discharge horizontally opposite each other on the centreline of the pump.
- .4 Backhead and Stuffing Box
- .1 Backhead shall be a separate piece from the volute casing.
 - .2 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.
 - .3 Provide a minimum of two (2) large openings opposite each other adjacent to the stuffing box to allow access for maintenance.
 - .4 Provide for external axial adjustment of the rotating element to maintain proper clearance between the impeller and front head wearing rings.
 - .5 Stuffing box shall be integral with the backhead and suitable for the use of a double mechanical seal.
 - .6 Provide tapped ten (10) millimetres (3/8 inches) NPT inlet and vent holes complete with suitable lengths of brass pipe and shut-off ball valves on opposite sides of the stuffing box for seal water inlet and outlet.
 - .7 Provide a tapped drain hole on the stuffing box complete with pipe plug.
- .5 Bearing Frame
- .1 Machine bearing frame for accurate and permanent bearing alignment.
 - .2 Completely enclose the shaft between the bearings.
 - .3 Provide lip type seals in contact with the shaft.
 - .4 Include grease fittings in the bearing frame for bearing lubrication.
 - .5 Drilled and tapped for bearing vibration and temperature monitoring
- .6 Impeller
- .1 Design impeller to ensure smooth operation without cavitation in the operating range and with minimum vibration.
 - .2 Cast impeller in one piece and balance both statically and dynamically to ISO 1940 G6.3.

- .3 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.
 - .4 Balance trimmed impeller after trimming.
 - .5 Cast impeller surface to be free from casting blemishes and finished to 250 RMS or better.
 - .6 Securely key the impeller to the tapered shaft and hold in place with an impeller nut.
 - .7 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.
 - .8 Design the impeller and retaining nut so that the impeller cannot loosen on the shaft due to torque resulting from rotation.
- .7 Wear Rings
- .1 Provide removable wear rings of the axial or radial type for the front head and impeller.
 - .2 Machine the rings for a close fit to minimize the leakage of sewage from the discharge to the suction.
 - .3 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.
- .8 Impeller Shaft Assembly
- .1 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.
 - .2 Accurately machine the shaft along its entire length and provide keyways at both ends.
- .9 Shaft Sleeve
- .1 Fit and securely fasten the shaft sleeve in place after shaft grinding.
 - .2 Seal shaft sleeve to prevent leakage between the sleeve and shaft.
 - .3 Extend shaft sleeve at least two (2) millimetres (0.08 inches) above the top of the gland cover.
- .10 Bearings
- .1 Rigidly support bearings to counteract any possible tendency towards vibration.
 - .2 Grind and match duplex bearings, if used.
 - .3 Adapt lubrication of the bearings to the operation of the units without full-time attendance.
- .11 Mechanical Seals
- .1 Seals to be water lubricated.
 - .1 Seals will be continually flushed and lubricated by filtered domestic water while the pump is operating. Provide solenoids on seal flush lines to stop seal flush water flow to pumps while pumps are off. Solenoids to operate off of a one hundred twenty (120) Vac, sixty (60) hertz supply and connect by a schedule eighty (80) fifteen (15) millimetres diameter PVC pipe line to the pump seal. Supplier to supply seal water solenoid switches.
- .12 Drive Shaft Assembly

- .1 The drive shaft assembly coupling arrangement shall permit easy removal of either the pump or motor without disturbing the other. More than one (1) length of shaft shall be permitted to be used between the pump and motor.
- .2 Statically and dynamically balance the drive shaft to obtain vibration free operation. Design shaft to ensure a separation of fifty (50) percent between the operating speed and the first harmonic frequency of the system (motor, couplings, shaft and pump).
- .3 The approximate elevations of the pump room floor and motor room floor for the pumping station are shown in Table 1. The approximate distances between the floors are shown in Table 2. The Bidder shall use this to approximate the drive shaft length for bidding purposes. Bidder shall confirm dimensions prior to submittal of Shop Drawings.

.1 Approximate Elevations:

DETAIL	ELEVATION (m)
Pump Room Floor	223.659
Motor Room Floor	226.605

- .4 After award of this Contract, the Supplier shall be responsible to take exact measurements for final sizing of the drive shaft lengths.
- .13 Drive Shaft Guard
 - .1 Drive shaft guards, as supplied, shall be meet OSHA standards upon installation without requiring any modification. Installation by others. Provide installation instructions.
- .14 Paint
 - .1 Apply one (1) prime coat of a rust inhibitive primer to all exterior metal surfaces, except machined surfaces.
 - .2 Do not paint over nameplates.

2.5 Equipment Mounting

- .1 Pump and motor shall be supported by a heavy cast-iron or fabricated steel base with four (4) legs. The height of the base shall be sufficient to permit the use of decreasing suction and increasing discharge elbows, which shall be provided when the nominal pump size is smaller than the suction line. The suction and discharge openings shall be flanged faced and drilled one hundred and twenty-five (125) pound American Standard.
- .2 The pump must be secured to base at the factory or in the field, with bolts and/or dowels such that the motor-pump shaft shall be centered, in relation to the motor base within 0.1 millimetres (0.005 inches).

2.6 Spare Parts

- .1 Provide two (2) sets of pump rebuild kits. The following shall be provided as part of the each rebuild kit:
 - .1 One (1) set of wear rings;
 - .2 One (1) set of mechanical seals and accessories;
 - .3 One (1) set of lower bearings (pump side) and accessories;
 - .4 One (1) set of upper bearings (motor side) and accessories;
 - .5 One (1) drive shaft;
 - .6 One (1) impeller (trimmed to size);

- .7 One (1) set of mechanical seals;
- .8 One (1) set of gaskets/o-rings;
- .9 One (1) AEGIS ground ring; and
- .10 Hardware to install spare parts.

2.7 Acceptable Products

- .1 The pump shall be:
 - .1 Flowserve;
 - .2 Sulzer;
 - .3 Cornell;
 - .4 Flygt; and
 - .5 Or approved equal in accordance with Section B7 of the Tender.

PART 3 EXECUTION

3.1 Tools and Accessories

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

3.2 Testing

- .1 General
 - .1 Each manufacturer shall guarantee their pump(s) for the rated capacity and overall efficiency when installed and operating under the specified conditions of head and discharge.
 - .2 Submit results of factory performance tests to the Contract Administrator as Certified Pump Test Curves including capacity, head, pump efficiency, BkW and NPSH from shut-off through the rated point to run-out.
- .2 Pump and Motor Testing
 - .1 Conduct pump tests in accordance with Hydraulic Institute Standards – Centrifugal Pumps Test Code. All definitions for the purpose of testing shall be as set forth by Hydraulic Institute Standards – Centrifugal Pumps Ratings.
 - .2 Pump test to be non-witnessed performance tested as per Hydraulic Institute Standards 14.6 Grade 1B. Each pump shall be tested for:
 - .1 Simulating flow and head conditions at flow rates of one hundred twenty (120) L/s, one hundred twenty-eight (128) L/s, one hundred thirty-six (136) L/s, one hundred forty-four (144) L/s and one hundred fifty-four (154) L/s. Record motor efficiency and absorbed power usage at each flow rate listed. Absorbed power shall be obtained when power factor has been corrected to 0.95.
 - .2 Develop a Certified Test Curve (per Hydraulic Institute Class A Standards) showing pump performance.
 - .3 Vibration while pump is under load.
 - .4 Measure Bearing Temperature while under load.
 - .3 Conduct motor tests in accordance with CSA C22.2 No. 100, EEMAC, MG-2. Each motor shall be tested for:
 - .1 Running current;
 - .2 Locked rotor current;

- .3 Hi-pot test;
- .4 Winding resistance;
- .5 Power Factor test;
- .6 Surge test;
- .7 Partial discharge test; and
- .8 Insulation resistance test.
- .4 Conduct instrument tests to verify operation and monitoring. Each instrument shall be tested in the energized and de-energized states.
 - .1 Operation and documenting Analog Signal Readings; and
 - .2 Measuring resistance on bearing temperature RTD circuits.
- .3 Shop Tests
 - .1 Test each pump in the manufacturer's shops over the range of operation from shut-off to run-out.
 - .2 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.
 - .3 Test curves to be signed by the pump manufacturer's official responsible for the test.
 - .4 Final payment for the Goods will be made only after the Contract Administrator has received the certified test curve for each pump supplied.

3.3 Lubrication, Grease, Oil and Fuel

- .1 Perform the complete initial lubrication of all equipment in accordance with the manufacturer's instructions. Provide all grease, oil, lubricants, etc., as required for the initial operation of the equipment.

3.4 Commissioning

- .1 The Manufacturer's Technical Representative, installation Contractor and Contract Administrator shall jointly commission the pumps 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 put the pumps into continuous operation.
 - .1 Pumps supplied under this Contract will be installed under a separate contract. The pumping equipment supplier will not be responsible for the installation work.
 - .2 The Contract Administrator will provide seven (7) Calendar Days' notice of requirement for commissioning.
 - .3 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.
 - .4 The Manufacturers Technical Representative shall perform the following during commissioning:
 - .1 Inspect the pumping equipment to ensure they have been properly installed in accordance with the manufacturer's instructions. If the installation is not in order, the Manufacturer's Technical Representative

- shall provide instruction for the installation Contractor. The equipment shall be started and run, and adjustments made at this time;
- .2 Conduct and document amp draw, rotation and speed tests;
- .3 Check for unusual vibration or noises;
- .4 Instruct City personnel in the operation and maintenance of the pumps; and
- .5 Inspect and document vibration and bearing temperature reading.
- .5 The Manufacturers Technical Representative shall promptly correct any deficiencies with the pumping equipment at own expense to the Contract Administrator's satisfaction.
- .6 The price provided for "Commissioning" shall cover all costs associated with this item of Work including travel expenses, accommodations, meals and wages.

3.5 Training

- .1 Commissioning and training shall be combined. Training sessions shall be documented and include the following as a minimum:
 - .1 Functional description of equipment operation;
 - .2 Identification of components and their purpose;
 - .3 Confirmation of operating parameters and machine limits;
 - .4 Review of routine maintenance procedures and maintenance supplies;
 - .5 Trouble shooting procedures, limits of operator and maintenance competence;
 - .6 Long-term maintenance procedures, including anticipated overhaul frequencies; and
 - .7 Disconnection and removal of motors, drive shafts and pumps for maintenance Work.
- .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.
- .3 Training shall be provided in one (1) session for operation staff and one (1) session for maintenance staff.
- .4 No additional payment will be made by the City to an equipment supplier for the training. Cost to be included in the lump sum for the specific equipment.
- .5 Provide a total of five (5) hardcopy training manuals in 3-ring binders along with an electronic copy for attendees of each session.

END OF SECTION