TECHNICAL SPECIFICATIONS

PS 20 Pumps, Check Valves, & Services
RFP No. 25-43

City of Mercer Island

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Division 11
Equipment

11.00 GENERAL

Sections in these specifications titled "*Common Work for . . .*" apply to all following subsections whether directly referenced or not.

11.05 Common Work for Equipment

[CSI 11 05 00]

Part 1 - General

Submittals

Provide submittal information to the Owner for the following items:

- Pumps and Motors

11.10 PUMPS

[CSI 43 20 00]

11.10.05 Common Work for Pumps

[CSI 43 20 05]

Part 1 - General

Summary

This section covers work necessary to provide the pumps, complete with motors and accessories, described herein and as shown on the Plans.

This section covers work necessary to provide the pumps, complete with motors and accessories, described herein. The installation of the complete pump assemblies, provided under this contract, will be completed as part of separate contract. References to installation requirements listed elsewhere within this division are generally pertaining to the work that will be completed by an Installation Contractor, not yet selected, under a separate contract.

References

- HI - Hydraulic Institute.
- ASTM - American Society for Testing and Materials.
- AISI - American Iron and Steel Institute.
- ANSI - American National Standards Institute.

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Responsibilities

Performance Requirements

The design and performance requirements listed for each pump must be met, with no exceptions. Pumps that do not meet all of the conditions will be rejected.

Performance range shall adhere to the HI 11.6 (submersible sewer pumps) or HI 14.6 (centrifugal and vertical pumps) tolerances stated herein are referenced at the specified design point(s). Flow tolerance is measured at the design point head. Head tolerance is measured at the design point flow. Efficiency is evaluated where a straight line drawn from zero flow, zero head, passes through the design point and crosses the actual pump curve.

All tolerance requirements listed must be met. They are not independently exclusive.

Grade 2B (±8% Flow, ±5% Head, no less than -5% Efficiency).

Submittals

Submittal information shall be provided for each individual pump and shall be included as part of the bid proposal.

Source Quality Control

- A minimum of 5 installations with similarly sized and configured pumps in equivalent fluid applications installed by the Contractor or installer subcontractor. Include location, contact name, and number.
- Company name, address, and phone of the closest manufacturer's authorized service company and a qualified service company. Qualified service may be a company that is not a manufacturer's authorized service center but can perform competent service and order repair and replacement parts. Authorized service must within the 48 contiguous US states. Qualified service must be within 200 miles of the project site.

Product Data:

- Specifications and data describing all pump parts, pieces, and components. Include information on materials of construction and proposed coating systems.
- Performance curves showing total dynamic head (TDH) in feet, efficiency, and net-positive-suction head required (NPSHR) versus output in gallons per minute (gpm). All losses from the drive shaft, seal, coupling, and other mechanical losses shall be included in the data presented. Catalog or software generated curves may be submitted for preliminary approval and ordering.
- Additional VFD pump curves for speeds at 50 percent, 70 percent, and 90 percent of full speed.
- Documentation on assembled pump and motor unit natural frequency. Natural frequency shall not occur within 20 percent of speed above or below the pump's nameplate speed, or the operating range of 900 rpm to 1,765 rpm for variable speed. A statement from the manufacturer regarding the natural frequency is acceptable.

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No custom or detailed analysis of the natural frequency in this specific pump station is required.

- Complete list of all pump system components and accessories.
- Bearing life (L10) for ball and roller bearings. Calculations supporting L10 of no less than 40,000 hours.

Shop Drawings:

- Detailed dimensional drawings showing outline dimensions, lengths, overall sizes, materials, and weights for each pump unit and associated accessories.

Closeout Submittals: Provide the following submittals prior to project closeout:

- Operations and Maintenance manual.
- Manufacturer signed warranties with pump serial numbers.

Schedule

Provide delivery time in time from approval of shop drawings/submittal. All equipment shall be delivered within 20 weeks or less from approval of complete submittal information.

See Instructions to Bidders for specific equipment delivery requirements.

Quality Assurance

The pump manufacturer is responsible for the motor and pump assembly.

Delivery, Storage, and Handling

Pump Local Supplier will store the pumps on the City's behalf until the City's contractor is ready to install the pumps in the proposed wetwell. It is anticipated that the pumps will be installed approximately during Summer 2026.

Warranty

Warrant all pumping equipment described in this section and provided under this contract against defects in materials and workmanship for a period of two years after date of acceptable field testing or three years after time of delivery, whichever comes first.

Following pump and motor installation, furnish the services of a qualified manufacturer's representative to inspect pump units and inform Owner, prior to field testing, of any defects or concerns regarding condition of each unit and its installation at the job site. Upon resolution of any defects or concerns (if any) and work performed by the Contractor at their expense, to the satisfaction of the Owner, manufacturer's warranty shall then be in full effect with no reservation or qualifications other than those stated in the manufacturer's warranty. Upon completion of pump installation, manufacturer's representative shall provide written certification that equipment is fully warranted as installed.

Extra Materials

Provide any special tools required for pump or motor maintenance.

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Part 2 - Products

Manufacturers

Flygt is the only manufacturer approved on this project.

Components

For pumps in domestic water applications, all wetted pump components, coatings, and lubricants shall be approved for use in potable drinking water in accordance with U.S. Food and Drug Administration (FDA) or National Sanitation Federation (NSF 61) rules and regulations.

Neither 201 nor alloy-20 stainless steels are approved for any pump components unless specifically mentioned otherwise in these specifications.

All pump system components are to come from the pump manufacturer and include:

- 3 - Flygt NP3153 pumps and motor with 2 of the 3 the pumps with mix flush valves
- 3 – Flygt discharge elbow
- 3 – Upper guide bar bracket
- 3 – Lifting assemblies and 1 grip eye
- 1 – Spare Impeller

Accessories

All pumps are to include an engraved non-corrodible metal nameplate on the exterior of the pump head or body (duplicate attached to pump support flange or shipped loose if submersible), readily accessible without requiring any disassembly. The nameplate shall include, at a minimum, the following information (as applicable for the type of pump):

- Pump Manufacturer
- Pump Model Number
- Pump Serial Number
- Impeller Number
- Impeller Trim
- Design TDH (feet)
- Design Flow (gpm)
- Supplier Name and Phone Number
- Date of Manufacture

Source Quality Control

Factory Pump Performance Testing and Certification

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Factory testing curves and data on each pump must be provided prior to pump delivery. Variations between factory tests and previously submitted catalog curves may be cause for rejection. Factory testing of the pump may use a dynamometer or calibrated shop motor.

Perform a performance test as described in the latest edition of Hydraulic Institute's (HI) Pump Tests (ANSI/HI 14.6 Centrifugal and Vertical, ANSI/HI 11.6 Submersible), with results submitted to the Engineer and approved for each pump prior to shipment to the construction site. Test pumps at the factory to HI standards, except as modified below.

- Test speed must be within 20 percent of the rated speed unless prior written approval is given by the Owner. Approval is not guaranteed.
- HI 14.6.5.7.1: No less than three additional test points beyond the five points listed in the HI standard are required. Two of these points between shutoff head and design point, and one point to the right of the design point.
- HI 14.6 Appendix K, 11.6.10: Model tests are not allowed unless prior approval is given by Owner. Supplier shall submit a written request to perform a model test with procedures outlined for Owner's review.
- Provide a certified data sheet and performance curve for each pump similar to HI 14.6 Appendix H pump test summary of information. At a minimum provide:
    - Information per HI standards.
    - TDH (ft) vs. Flow (gpm)
    - Power (hp) vs. Flow (gpm)
    - NPSHR (ft) vs. Flow (gpm) (catalog data is acceptable)
    - Motor Input Power
    - Hydraulic Efficiency (%) vs. Flow (gpm) (where applicable)

Graphs must be submitted and approved prior to shipment of pumps. Factory tests for vertical pumps shall adhere to all of the following tolerances. If results are excessive, pump shall be corrected and retested until the performance criteria are met.

- TDH at design flow shall be +5 percent, -5 percent of design TDH
- Flow at design TDH shall be +8 percent, -8 percent of design flow.

Part 3 - Execution

Installation/Construction

Installation of pump units will be completed as part of a separate contract and will be performed by Installation Contractor. This section is provided so that the Pump Supplier can anticipate their roles, responsibilities, and deliverables in working with the Installation Contractor.

Field Quality Control

A qualified and authorized representative of the Pump Manufacturer/Supplier shall conduct and/or supervise the field testing. Prior to acceptance of installed pumps, manufacturer's

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representative shall demonstrate proper operation of pumps at capacities stated. Upon completion of pump installation and testing, Pump Supplier/manufacturer's representative shall provide written certification that equipment is installed correctly and fully warranted.

Pump Supplier shall be responsible for calibration, startup, and initial performance to meet specifications herein. A field test shall be made to give an indication of the performance of the new pump when it is operating under actual field conditions and to establish the acceptance of the pump furnished and installed. The field test shall be performed in the presence of the Engineer after the piping and controls have been installed.

A performance test similar to those described in the latest edition of Hydraulic Institute's (HI) Pump Tests (ANSI/HI 14.6 centrifugal and vertical, ANSI/HI 11.6 Submersible) shall be performed, submitted to the Engineer and approved for each pump.

The field test shall be performed to the accuracy obtainable with the testing equipment installed as a part of the piping and instrumentation. If sufficient field devices are not available, the Contractor shall provide testing gauges and meters as needed.

Results shall be within plus or minus 1 percent of the tolerances listed above under Source Quality Control.

Testing shall be completed under the observation of the Owner and Engineer. At that time, the following data shall be collected for each pump:

- TDH vs. Flow at a minimum of three points which include: Shutoff head, Open to system, and approx. 50% design flow with throttled discharge valve. Additional points may be required by Engineer.
- Overall Efficiency

Maximum allowable completed unit vibration amplitude (pump and motor installed) shall be as shown below. (Velocity measurements are in/sec RMS)

Upon completion of pump installation and testing, Pump Supplier shall provide written certification that equipment is fully warranted installed. Certification shall be provided that pumps meet all requirements set forth in these specifications and submittal literature. The Pump Supplier shall also provide a written report of all test conditions and results.

Repair

Repair and retest units failing any field test. If unit fails second field test, unit will be rejected, and supplier shall furnish a unit that will perform as specified.

11.12 Wastewater Pumps

11.12.2 Centrifugal Solids Handling Pump

[CSI 43 25 13]

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Part 1 - General

Summary

Summary

This section covers work necessary to provide the submersible non-clog pumps and motors with rail system, complete at the sewer pump station.

Each pump unit provided for this project shall be Flygt, no substitutions. See lower sections for specific pump model number and operational requirements.

Extra Materials

Provide (1) spare pump impeller.

Related Sections

- Division 11.10.05 Common Work for Pumps
- Division 1.81.40 Pressure Ratings

Part 2 - Products

Operational Requirements

	Pump Nos. 01, 02 and 03
Design Head (TDH) (feet)	15.7
Design Flow (gpm)	1,783
Minimum Shutoff Head (feet)	47
Flygt Model Number/Impeller No.	NP 3153 LT 3~ Adaptive 415
Maximum Motor Horsepower	12

Pump Design

The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet well. A machined metal to metal watertight contact shall accomplish sealing of the pumping unit to the discharge connection. Each pump shall be fitted with sufficient length of stainless-steel chain with spectra cord to reach from bottom to top of wet well plus five feet of slack. The working load of the lifting system shall be 50 percent greater than the pump unit weight.

Pump Construction

Major pump components shall be of gray cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow-holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the sewage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

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Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Impeller

The impeller(s) shall be cast of A532 Alloy III A (25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back-swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across a spiral groove located on a replaceable insert ring.

The impeller shall have vanes hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in waste water. The screw shape of the impeller inlet shall provide an inducing effect for the handling of sludge and rag-laden wastewater.

Mechanical Seal

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten carbide WCCR ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating carbon-aluminum oxide (AL203) seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plugs, with positive anti-leak seals, shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

Seal lubricant shall be FDA Approved, non-toxic.

Suction Cover

The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of ASTM A-532 Alloy III A (25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

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Volute

The pump volute shall be of A48 Class 35B gray cast iron and shall have an integral spiral shaped cast groove(s) at the suction of the volute.

Pump Shaft

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be 431 stainless steel ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

Bearings

The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two row angular contact ball bearing. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L_{10} bearing life shall be 50,000 hours at any usable portion of the pump curve.

Electrical Pump Cord

Each pump shall be provided with submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be of sufficient length to reach from the bottom of the wet well to the splice box shown on the Plans plus five feet of slack. The power cable shall be sized according to NEC and OCEA standards and also meet with PMSHA approval.

Electric Motors

The pump motor shall be FM explosion-proof rated for continuous operation in a Class I, Division I, Group D hazardous location when not submerged.

The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator housing shall be of gray cast iron, ASTM A-48, Class 35B. The stator windings and stator leads shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (257°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The motor and pump shall be designed and assembled by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10 percent. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C (176°F). A performance chart shall be provided showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable

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of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

Motor Sensors

The motor stator temperature shall be continuously monitored by three (3) low resistant, bi-metallic, (N.C.) normally closed thermal switches embedded in the stator windings. These thermal sensor switches shall be used as additional supplemental motor protection and shall be wired in series with external third leg overload protection provided by the motor stator in the control panel.

A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50 percent chamber capacity, signaling the need to schedule an inspection.

Upon detection, the sensors shall actuate a panel mounted relay which will provide the operator with a visual indication of impending seal failure.

Seal lubricant shall be FDA Approved, non-toxic.

Pump Removal Rail System

The pump removal rail system shall provide smooth, easy, removal and installation of the specified pumps from the lift station. The system shall include for each pump unit a hydraulic sealing flange, discharge base elbow, guide rails, carrier guide bracket, Flygt Grip-Eye System, nylon line, and lifting chain. The guide rails, carrier guide bracket, and lifting chain shall be constructed of stainless steel materials.

Mix Flush System

Flygt 4901 Flush Valve for flushing the wet well during initial operation of the pump. The flush valve shall depend only on the pump flow and pressure to operate and no electrical components shall be allowed. Install per manufacturer's recommendation.

Part 3 - Execution

Installation

Installation of the pump units shall be in accordance with the manufacturer's specifications and direction. The installation shall be supervised and approved by the manufacturer's representative prior to operating or field testing the units.

Upon completion of the pump installation, the manufacturer shall provide written certification that the equipment is fully warranted as installed.

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15.30 VALVES

15.33 Check Valves

15.33.08 Sewage Ball Check Valves

[CSI 40 05 65.35]

Part 1– General

Summary

Sewage Ball Check Valves are intended to be used on the discharge side of sewage process pumps and elsewhere as specified on the Plans.

Submittals

Submit product literature including information on performance and operation valve, materials of construction, dimensions/weight, headloss data, and pressure ratings.

Upon request, provide shop drawings that clearly identify the valve dimensions.

Performance Requirements

The ball shall be designed to operate properly with the static and operational conditions shown in the Contract Documents.

Part 2 – Products

Manufacturers

The valve shall be Flygt HDL Type 5087 ball check valve, or equal.

Manufactured Units

The valve housing shall be constructed of cast iron material conforming to ASTM A159-72 Class 35, ASTM A126 Class B or ductile iron ASTM A536 Grade 65-45-12. The valve ends shall be ANSI Class 125# flanges. The ball shall be constructed of Rubber NPR/EPDM (material chosen specifically for fluid it will be used in) or hollowed steel with a vulcanized nitrile or buna-n rubber covering which is resistant to grease, petroleum products, animal and vegetable fats, dilute concentrations of acids and alkalies (pH 4 – 10), tearing and abrasion, with a high load bearing capability and low compression set. The ball shall be equipped with a sinking or floating type ball based on the valve orientation and which is suitable for the intended application.

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