

PUMP
(2) NP-3153 3Q/276 SH IMPELLER/23 HP

REQUIREMENTS

Furnish and install 2 submersible non-dog wastewater pumps. Each pump shall be equipped with an 23 HP submersible electric motor connected for operation on 480 volts, 3 phase, 60 hertz, 7 wire service, with 40 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and have F-MSHA Approval. The pump shall be supplied with a mating cast iron 6 inch discharge connection and be capable of delivering 150 GPM at 123 TDH. Shut off head shall be 25 feet (minimum). Each pump shall be fitted with 25 feet of stainless steel lifting chain as specified by the manufacturer. The working load of the lifting system shall be 50% greater than the pump unit weight.

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. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor.

PUMP CONSTRUCTION

Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be A315 type 304 stainless steel construction. All metal surfaces coming into contact with pumped media, 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.

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. Filings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

COOLING SYSTEM

Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

CABLE ENTRY SEAL

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

MOTOR

The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (326°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°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 (260°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 junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced 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%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request 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 of oil resistant chloroprene rubber. The motor and cable shall be capable 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.

BEARINGS

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

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 hydrodynamically 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 ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide seal ring. 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. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with an 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 plug, with positive anti-leak seal 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, nontoxic.

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 A315 type 431 stainless steel.

If a shaft material of lower quality than 431 stainless steel is used, a shaft sleeve of 431 stainless steel is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided for in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

IMPELLER (for C - pumps)

The impeller(s) shall be of grey cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long throatlet without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. When ever possible, a full vane, not vortex, impeller shall be used for maximum hydraulic efficiency; thus, reducing operating costs. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be, retained with an Allen head bolt and shall be capable of passing a minimum 3 inch diameter solid. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

WEAR RINGS (for C - pumps)

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass, or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet.

VOLUTE (for C - pumps)

Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

IMPELLER (for N - pumps)

The impeller(s) shall be of grey cast iron, Class 35B, dynamically balanced, semi-open, multi-vane, back-swept, non-dog design. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across a spiral groove located on the volute suction which shall keep them clear of debris, maintaining an unobstructed leading edge. The impeller(s) vanes shall have screw-shaped leading edges that are hardened to Rc 45 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. Impellers shall be locked to the shaft and shall be coated with oily resin primer.

VOLUTE BOTTOM/INSERT RING (for N pumps)

The pump volute shall be of A48 Class 35B grey cast iron and shall have (an) integral spiral shaped cast groove(s) at the suction of the volute. The internal volute bottom or insert ring shall provide effective sealing between the pump volute and the multi-vane, semi-open impeller. The sharp spiral groove(s) shall provide the shearing edge(s) across which each impeller vane leading edge shall cross during its rotation in order to remain unobstructed. The clearance between the internal volute bottom and the impeller leading edges shall be adjustable.

PROTECTION

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.

A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote. USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.

The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS shall be designed to be mounted in any control panel.

Note: FLS not available in CZ/NZ configuration.

MODIFICATIONS

1. Explosion-proof Pumps (X).
2. Warm Liquid Applications (WL).
3. Dry Pit Installations (OT).

Refer to the General Guide Specifications for additional information.

MIX-FLUSH VALVE SPEC.

At least one pump in each sump shall be equipped with an automatically operating valve that will provide a mixing action within the sump at the start-up of the pumping cycle.


This valve shall be mounted directly on the pump volute and shall direct a portion of the pumpage into the sump to flush and re-suspend solids and grease by the turbulent action of its discharge. The turbulent action caused by the flow shall also provide some sump aeration benefits. The valve shall be mounted on the pump volute so that it can be removed from the sump along with the pump during normal and routine maintenance checks and shall be positioned on the volute to provide for non-clogging operation. The valve shall be equipped with an adjustable, wear-resistant discharge nozzle which shall be used to direct flow from the valve to optimize mixing action within the sump.

The valve shall not require any external power source or control to operate, neither electric nor pneumatic. The use of the external power source is not acceptable. The valve shall be suitable for use in Class I, Division 1 hazardous locations.

The valve shall open at the beginning of each pumping cycle and shall automatically close during pump operation after a pre-selected time of operation. The valve shall operate automatically by differential pressure across the valve and shall be actuated through a self-contained hydraulic system which uses an environmentally safe fluid. A method of adjusting the valve operating time shall be provided.

APPROVAL	REVISION	DATE

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THESE CONSTRUCTION PLANS WERE PREPARED BY ME OR UNDER MY CLOSE PERSONAL SUPERVISION AND I AM A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS.
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**THE PRESERVE LIFT STATION
PUMP SPECIFICATIONS**

**APPROVED FOR
CONSTRUCTION**
MAR 2 0 2006

City of Rockwall Engineering Dept.
City Engineer

REVISION
MAY 3 0 2007
CITY OF ROCKWALL ENGINEERING DEPT.

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Date: 03/21/06
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