



N 3085

PERFORMANCE SPECIFICATIONS

REQUIREMENTS

Furnish _____ submersible non-clog wastewater pump(s). Each pump shall be equipped with a _____ kW (_____ hp), submersible electric motor connected for operation to _____ Volts, _____ phase, 60 hertz, with _____ metres of submersible, SOW or SUBCAB cable. The neoprene or CPE jacketed cable shall be sized according to CSA standards and carry a CSA approval. The pump shall be supplied with a mating cast iron _____ inch discharge connection and be capable of delivering _____ L/s at _____ m TDH. Shut off head shall be _____ metres minimum. Each pump shall be supplied with _____ metres of steel lifting chain, shipped separately and installed by others. The safe working load of the lifting chain shall incorporate a 4:1 safety factor.

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.

APPROVALS

The pump/motor assembly shall have CSA approval as one unit, per CSA standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. **An approval of the motor unit only will not be acceptable.**

The pump/motor unit is also approved by CSA for service in Class I, Division II, Groups A, B, C or D hazardous locations.

PUMP CONSTRUCTION

Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blowholes or other irregularities. All exposed nuts or bolts shall be of AISI type 304 stainless steel. An approved, sewage resistant coating shall protect all metal surfaces coming into contact with the pumpage, other than stainless steel or brass.

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 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.

MOTOR

The pump motor shall be a NEMA-B design induction type with a squirrel cage rotor, shell type design and be housed in an air filled, watertight chamber. The stator windings and leads shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be trickle impregnated with Class H resin and shall be heat-shrink fitted into the stator housing providing for superior heat transfer. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 40°C (104°F). The motor shall be capable of withstanding at least 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminium. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator

temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C (104°F) ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C (176°F). A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

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 necessities using the same entry seal.

COOLING SYSTEM

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

VOLUTE

Pump volute 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.

N-IMPELLER

The impeller shall be of semi-open, multi-vane, backswept, non-clog design. The impeller vanes shall be self-cleaned upon each rotation as they pass across a relief groove(s) located in the pump housing (or in an insert ring in the pump housing) and shall keep the vane clear of debris, maintaining an unobstructed pumping. The impeller(s) shall have heavily back swept leading edges with a specific angle distribution enabling the capability of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Impellers shall be locked to the shaft. The clearance between the pump housing/insert ring and the impeller shall be adjustable. The impeller shall be of grey cast iron (ASTM A48 Class 35B) with hardened edges.

PAINT STANDARD

The exterior of the pump, including all metal surfaces coming into contact with the pumpage shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer and finished with a polyester, epoxidized resin paint. Prior to the final paint finish being applied, the pump components shall be primed and washed. The components shall then be assembled and washed a second time before the final topcoat is applied. The finish paint or top-coat shall be Flygt Duasolid™, applied externally to a minimum dry film thickness of not less than 100µm(microns). The film thickness shall be consistent with ISO 2808, method no.6.

PUMP SHAFT

Pump and motor shaft shall be the same unit and shall be made of AISI type 431 stainless steel throughout. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable.

The use of stainless steel sleeves to protect a lesser grade of shaft material will not be considered equal.

MECHANICAL SEALS

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 pumped liquid and the lubricant chamber, shall contain one stationary and one positively driven rotating **tungsten-carbide** ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary **tungsten-carbide** seal ring and one positively driven rotating **carbon** 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. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

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 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. The seal lubricant shall be non-toxic and FDA approved for potable water applications.**

SPIN-OUT™

In order to reduce wear of the lubricant chamber, open surfaces of the seal, seal surfaces, and increase reliability of the seal itself, the lubricant chamber shall incorporate a specially designed seal chamber. The seal chamber houses the outer seal and consists of a spiral track in the wall of the seal chamber. This spiral track catches particles and transports them out towards the impeller, into the main rotational flow, where they are discharged back into the pump medium.

PROTECTION

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

A leakage sensor shall be included 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 Flygt MiniCAS II (Control & Status) monitoring unit mounted in the control panel.

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, or sleeve lower bearings are not acceptable.**

PERFORMANCE GUARANTEE & STANDARD TESTS

The pump performance shall conform to ISO 9906 :1999. The tests are intended to ascertain the performance of the pump and to compare this with the manufacturer's guarantee. The performance test of the pump(s) shall be carried out to determine the performance of the pump with respect to the discharge rate of flow, total head, power absorbed, etc. For a combined motor-pump unit (for example, submersible

pump; or separate pump and motor with overall efficiency guaranteed), the guarantee covers the efficiency of the **entire** unit.

The pump shall be tested for proper operation at rated power supply values and for electrical and mechanical integrity prior to shipment according to ISO 9906.

On demand, the pump supplier will supply the following test results:

- Hydraulic test curve, proving that the pump meets the operating conditions in accordance with ISO 9906 :1999, Annex A;
- Current and power consumed during the test.
- Megger Test - verification of the electrical resistance to ground
- Wet Test - Submerged functional test and electrical verification of the rated current
- Dry Test - Test for 15 secs. Minimum in a dry condition with verification that current or power consumption draw does not exceed the normal dry rating
- Water Infiltration & Oil Check
- Monitoring Device Check - includes, but is not limited to, motor temperature sensors and leakage detectors

Hydrostatic Test of the pump volute or the complete pump unit and Vibration Test shall be conducted when specifically requested by the Purchaser.

EXPERIENCE

The pump manufacturer shall have several units of similar type pumps installed and operating for no less than five years in Canada.

Preference will be given to the supplier who can offer temporary pump replacement on short notice from an existing rental fleet, containing an adequate inventory of pumps and accessories.

Preference will also be given to the supplier who can offer local parts and labor service by factory trained technicians.

MIX FLUSH VALVE

A mix flush valve shall be supplied separately. It shall be mounted by others, on the volute of one of the pumps in the pump station. The function of this valve is to divert a part of the pumped liquid back into the sump during the first 30 seconds of pumping. This creates a powerful jet, which stirs up the sump and thus prevents settling and the accumulation of hazardous gases.

The valve shall be non-electric and operated by the pressure produced by the pump. Valves mounted on the discharge connections, discharge or riser pipes are not acceptable. Neither additional control systems nor modifications to control panels or equipment shall be necessary.

CONTROL

A control system specifically designed for pumping stations, such as supplied by Flygt , i.e., LOGIMAC, must be used in order to provide monitoring and transfer to a back-up pump when required, to ensure a maximum degree of protection and assurance of continuity of service.

The following control features can be provided:

- registration and alarming of pump protection features;
- alternation to back-up pump;
- surveillance of the power supply quality (low/high voltage, phase unbalance and failure);
- registration of power consumption;
- storage of operating data, including power consumption, duration and frequency of operation of each pump;
- analysis of the stored data to detect long term trends and provide maintenance recommendations;
- telemetry.