**SCOPE**

Furnish Qty. \_\_\_ HOMA Model \_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_ inch discharge, electric submersible wastewater pump(s), each consisting of a single stage, non-clog, centrifugal pump, close-coupled to a squirrel cage induction type electric motor assembled in a single-body, watertight aggregate, capable of maintaining its watertight integrity submerged under 65 feet of water. The pumps(s) shall be designed to handle raw, unscreened sewage, storm water, sludge, or similarly contaminated liquid at an operating point of \_\_\_\_ GPM at \_\_\_\_\_ ft. TDH with a hydraulic efficiency of at least \_\_\_\_\_ %.Shut-off head shall be \_\_\_\_\_\_ ft. minimum. As this pump is utilized for solids handling, it must be capable of repeatedly passing non-compressible, spherical solids up to \_\_\_\_\_ inch in diameter. The motor shall be \_\_\_\_\_\_ HP designed for operation with a \_\_\_\_ phase, 60 HZ, \_\_\_\_\_\_ volt electrical supply. Each motor shall be connected for operation with \_\_\_\_\_ feet of power and control cable.

When the application requires, the motor shall be approved for operation in Class 1 Division 1, Groups C & D Areas by Factory Mutual (FM).

**PUMP CONSTRUCTION**

All major castings shall be of ASTM A-48, Class 40B gray, cast iron with smooth surfaces devoid of porosity, irregularities, or other defects. All exposed fasteners shall be of AISI 304 stainless steel. All exterior surfaces not constructed of stainless steel shall be protected by a factory-applied, two-part, high solids epoxy paint.

Sealing design between castings shall incorporate Nitrile (Buna-N) O-rings in controlled compression in two planes of the sealing interface. The interfaces shall be machined, metal-to-metal contacts and shall not require a specific torque on the securing fasteners to ensure sealing. Rectangular cross sectioned gaskets which require specific torque limits to achieve compression are susceptible to uneven compression and may be compressed beyond the point of permanent deformation; therefore they shall not be acceptable.

**WET WELL INSTALLATION**

For automatic operation in a wet well, an auto-coupling assembly shall be supplied for the retrieval of pumps, to eliminate the need for entering the wet well for service. This system shall consist of a permanently installed base elbow in the wet well and a removable guiding flange to be attached to the pump discharge. The auto-coupling discharge flange shall be ANSI Class 125 lb. cast iron in \_\_\_ inch size. Both the base elbow and the guiding flange shall be made of ASTM A-48, Class 40B cast iron. The guiding flange shall utilize a dual rail system with two rigid guide pipes connected to the base elbow to reliably provide a self-engaging, firm, leak-proof coupling between the pump discharge and the elbow. In order to maximize reliability of this sealing, systems that utilize a single rail, or non-rigid guiding systems such as cable or line shall not be considered acceptable.

Sealing shall be accomplished through the use of a field-replaceable, Nitrile (Buna-N) profile gasket that is axially and evenly compressed upon contact to positively seal the pump discharge against the base elbow. Sealing systems that rely on metal-to-metal contact faces are subject to leaking and blow-by and shall not be considered acceptable.

For ground or portable installation, a ring stand shall be supplied to attach to the bottom of the pump in order to prevent any part of the pump from bearing directly on the basin floor.

**DRY INSTALLATION**

For operation in a dry environment, adequate anchoring and foundation shall be required. The foundation shall consist of a structure heavy enough to provide permanent, rigid support for the pump and inlet elbow stand. Anchor bolts shall be used to secure the pump stand to the foundation.

The suction piping diameter shall be equal to or greater than the suction inlet diameter of the pump. If reducers are utilized in the suction piping, they shall be eccentric and installed with the level side up. All pipe flange joints shall be gasketed to prevent air from entering the pipe. Isolation valves such as gate valves shall be installed in order to facilitate the removal of the pump for maintenance. Any valve installed in the suction line shall be installed with the stems horizontal.

A check valve and isolation valve shall be installed in the discharge line. The check valve shall be installed between the pump discharge flange and the isolation valve. If pipe increasers are used on the discharge line, they shall be placed between the check valve and the pump.

**IMPELLER**

The impeller shall be cast as one piece of ASTM A-48, Class 40B Cast Iron, statically and dynamically balanced. The impeller shall be of the single-vane closed (double-shrouded), multi-vane closed (double-shrouded), or multi-vane open (single-shrouded) non-clog design, and shall meet the Ten State Standards requirement for minimum solids passage of 3 inches. Upon request, the manufacturer must certify a test of a static solids passing test to confirm the supplied pump is capable of passing 3” non-compressible solids in a static configuration. Impellers that are not capable of passing a 3 inch, non-compressible solid in a static state, or which require axial movement in order to pass shall not be considered acceptable. Impellers that require adjustment over time in order to maintain proper tolerance to the volute shall not be acceptable.

**VOLUTE**

The volute shall be cast in one piece of ASTM A-48, Class 40B Cast Iron with smooth contours and surfaces to provide obstruction-free passageways with low friction losses. The discharge flange of the volute shall have a standard ANSI or DIN bolt pattern. Proprietary bolt patterns shall not be acceptable.

**WEAR RING**

On single-vane closed (double-shrouded) and multi-vane closed (double-shrouded) impellers, tolerance between the nose of the impeller and the suction flange of the volute shall be controlled by a pair of replaceable wear rings. A stationary wear ring cast from ASTM B505 Bronze shall be press fit into the volute suction, and an integral wear ring shall be cast into the nose of the impeller in ASTM A-48, Class 40B Cast Iron. Wear systems that require routine adjustment in order to maintain tolerances shall not be acceptable.

**BEARINGS**

The shaft shall be supported by pre-lubricated, anti-friction bearings. These bearings shall be non-proprietary and shall be produced and branded by a major manufacturer of bearings. The bearings shall have an L-10 life of 100,000 hours at the pump’s Best Efficiency Point (BEP). The lower, impeller-side bearing shall be a double-row, deep groove, angular contact ball bearing, axially-retained, to sustain both axial and radial loads. The upper, motor-end bearing shall be a single-row, deep groove ball bearing, axially floating, to sustain radial loads only.

**SEALS**

The motor shall be protected from water intrusion by a tandem mechanical seal arrangement. The mechanical seals shall be of a non-proprietary design and shall be produced and branded by a major manufacturer of mechanical seals. The seals shall operate in an isolated oil chamber, which shall provide lubrication and cooling. One seal shall prevent intrusion from the pumped medium into the oil chamber, and the second seal shall prevent intrusion from the oil chamber into the motor. Each seal shall utilize one stationary silicon-carbide seal face, and one rotating silicon carbide seal face positively driven by its own spring and utilize Nitrile (Buna-N) elastomers. The springs shall be protected from the pumped medium, and under no circumstances shall solid particles accumulate on the external spring and hamper its effectiveness. Seals shall not require routine maintenance except periodic inspection of the oil chamber.

In order to prevent damaging particles in the pumped media from interfering with the seal, the top shroud of the impeller shall maintain a close tolerance to a matching surface in the wall of the volute. This tolerance shall be small enough that potentially damaging particles in the pumped media are unable to pass. Arrangements that rely on cutting systems to reduce the size of particles or those that rely on directing particles away from the seal shall not be acceptable

Seal systems that utilize a common single or double spring acting between the upper and lower seal, any system that utilizes pressure differential to ensure proper sealing, seals utilizing mechanical locking devices such as set screws or pins to hold the seal in place, and any proprietary seal not produced and branded by a major mechanical seal manufacturer shall not be allowed.

**SEAL FAILURE EARLY WARNING SYSTEM**

In order to warn of seal failure and allow the pump to be shut down before moisture reaches the motor, the pump shall be supplied with an early warning system, consisting of a conductive seal probe to be installed in the seal oil chamber. This probe shall monitor for leakage and shall provide early warning of potential seal failure before moisture reaches the motor. Systems which utilize less reliable mechanical leakage detectors shall not be acceptable. Systems which rely upon detectors in the motor housing shall not be considered an early warning system and shall not be acceptable.

**MOTOR**

The motor shall be an air-filled, submersible, squirrel cage, induction-type motor of the NEMA type B design. The motor shall be housed in a watertight enclosure capable of continuous operation at a submergence of 65 feet, and made of ASTM A-48, Class 40B Cast Iron. Fitting the stator into the enclosure with the use of bolts, pins, or other fastening devices which would require penetration of the housing shall not be acceptable.

The stator windings shall be insulated with moisture-resistant Class-H insulation. In each phase winding, there shall be embedded a bi-metallic temperature sensor, wired in series and interlocked with the motor overload protection in the control panel. Any of these thermal switches shall cut out electric power if the temperature in its winding exceeds 140°C (284°F), and shall automatically reset when the winding temperature returns to normal conditions.

The motor shall be non-overloading through the selected performance curve and shall perform in accordance with NEMA MG1, Part 30. The motor shall be rated for continuous operation in environments up to 104°F or intermittently up to 140°F, and shall be capable of sustaining 15 starts per hour. Motors shall be available to meet NEMA MG1, Part 31 and VFD-rated if required.

When the application requires, the motor shall be approved for operation in Class 1 Division 1, Group C & D Areas by Factory Mutual (FM).

**SHAFT**

The pump and motor shaft shall be an integral, one-piece unit composed of AISI 430 Stainless Steel. Shafts that utilize carbon steel, two-piece or sleeved construction shall not be considered acceptable. The maximum allowable shaft deflection at the shaft seal shall not be more than 0.002 inches while within operating range.

**CABLE ENTRY**

Each cable entry assembly shall contain a cylindrical elastomer grommet, flanked by two washers, closely fitted to the cable O.D. A watertight seal shall be maintained by screwing a threaded cable entry gland into a cable inlet flange which bolts into the motor cap. The cable entry shall not require a specific torque to ensure watertight integrity. The gland shall incorporate a strain-relief and anti-kink feature that shall function independently from the separate sealing action. For pumps over 10.5 horsepower, an isolated junction chamber containing the terminal board shall be sealed from the motor by means of a watertight isolation plate.

When the application requires, the cable entry shall be drilled and potted to completely prevent gas intrusion. The assembly shall be non-removable to ensure the integrity is preserved, and shall be approved for operation in Class 1 Division 1, Group C & D Areas by Factory Mutual (FM).

**COOLING**

Motor cooling shall be accomplished through a cooling jacket encircling the motor housing. The jacket is filled during operation with the pumped liquid to provide sufficient cooling of the motor at any operating point on the selected performance curve. Directly utilizing the pumped liquid for cooling ensures the best possible transfer of heat. Impeller back vanes shall force circulation throughout the cooling jacket, and an air vent shall ensure air is not entrapped within the jacket. Cooling shall not require the use of external heat exchangers, fans, or an external supply of cooling liquid.