KH Series
Non-Clog Submersible Pump
Specification

Furnish and install _____ submersible non-clog wastewater pump(s). The KEEN pump(s) shall be equipped with a _____ HP close coupled submersible electric motor, connected for operation on _____ volts, 3 phase, 60 hertz service, with _____ feet of heavy duty submersible electric power cable. Each pump shall be capable of producing _____ GPM at _____ feet TDH. The shut-off head shall be no less than _____ feet.

Design - The KEEN pump(s) shall be capable of handling raw, unscreened sewage and shall be automatically and securely connected to the permanent discharge connection, guided by no less than two guide rails extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge base elbow shall be accomplished by machined metal to metal watertight contact. The pump(s) shall be easily removed for inspection and service without the need for personnel to enter the wet-well. The entire pumping unit, including electric cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 60 feet. No portion of the pump shall bear directly on the sump floor.

Construction – Major pump components shall be of gray cast iron, ASTM A-48, Class 30, with smooth surfaces devoid of blowholes or other irregularities. All exposed nuts or bolts shall be 304 stainless steel. All metal surfaces coming into contact with the pumpage, other than stainless steel, shall be protected by a factory applied spray coating of primer and an air dry enamel paint finish to 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 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. No secondary sealing compounds, elliptical o-rings, grease or other devices shall be used.

Cooling System – Each unit shall be provided with an integral, self-supplying internal cooling system. The cooling system shall encircle the stator housing, providing for dissipation of the motor heat regardless of type of installation. The closed cooling system shall consist of a cooling jacket, circulator impeller, liquid refrigerant snd drain / fill plugs. The circulating impeller shall be attached to the motor shaft, turning at the same speed of the motor. The liquid refrigerant has a high boiling point (195 degree C, 383 degree F) and low freezing point (-40 degree C). The circulating impeller shall provide the necessary circulation of the cooling liquid through the cooling system. The closed cooling system shall provide for continuous submerged or completely non-submerged pump operation in liquid or ambient temperatures up to 40 degree C or 104 degree F, in accordance with NEMA standards.

Cable / **Entry Seal** – The power cable shall be sized in accordance with NEC standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket has a compression grommet compressing the exterior of the cable entry system. The cable wires are individually stranded in epoxy in the cord cap assembly for a second permanent seal.

Motor – The pump motor shall be an induction type, NEMA B design with a squirrel cage rotor, shell type design, housed in an air-filled, watertight chamber. The motor shall be inverter duty rated. The stator windings and stator leads shall be insulated with moisture resistant Class H insulation rated. The stator shall be dipped and baked in Class H varnish and shall be heat-shrink fitted into the motor housing. 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 104°F (40°C) and capable up to 15 evenly spaced starts per hour. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have voltage tolerance of plus or minus 10% and frequency tolerance of plus or minus 5%. The motor horsepower shall be adequate so that the pump is not overloading throughout the entire pump performance curve from shut-off through run-out. 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.

Bearings – The pump shaft shall rotate on two bearings. The motor bearings shall be double shielded and permanently lubricated with high temperature grease. The upper motor bearing shall be a single ball type bearing to handle radial loads. The lower bearing shall be a two row angular contact ball bearing to compensate for axial thrust and radial forces. Single row lower bearings shall not be considered acceptable. The minimum L-10 bearing life shall be 100,000 hours at any useable portion of the pump curve.

Mechanical Seal – Each pump shall be provided with a mechanical shaft seal system consisting of two assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the seal faces at a constant rate. The lower primary seal, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, silicon-carbide ring. The upper, secondary seal, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, silicon-carbide seal ring. The seals shall require neither maintenance nor adjustment and shall be capable of operating in either clockwise or counter clockwise direction of rotation without damage or loss of seal. For special applications, other seal face materials shall be available.

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 to operate dry without damage while pumping under load.

Pump Shaft - The pump shaft 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 410 stainless steel.

Impeller – The enclosed, 2-vane impeller shall be of ductile iron, Class 35B, dynamically balanced, double shrouded non-clogging design having long through-let without acute turns. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other material found in wastewater. The impeller shall be keyed to the shaft, retained with an impeller bolt, capable of passing a 3-inch diameter solid. Mass moment of inertia calculations shall be provided by the pump manufacture upon request.

Volute – The pump volute shall be gray cast iron, ASTM A-48, Class 30, single piece design with smooth passages large enough to pass any solids that may enter the impeller. A replaceable bronze wear ring system shall be utilized to provide efficient sealing between the volute and impeller suction inlet.

Protection – All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 260°F (125°C) the thermal switches shall open to signal the control to stop the motor and activate the alarm. A leakage sensor shall be installed in the lubricant chamber to detect seal leakage prior to entry and contamination of the lower bearing and motor stator housing.