SUGGESTED SPECIFICATIONS

PART 1 GENERAL

1.1 DESCRIPTION

Work Included: Under this section, the contractor shall provide all labor, equipment and material necessary to furnish, install, test and place in operation Dry-Pit Submersible Pumping Systems including, but not necessarily limited to, Dry-Pit Submersible Pumps and Pump System Controls as shown in the plans and as specified herein.

Other Project Specific Work

1.2 Related Work Described Elsewhere: Project Specific

1.3 GENERAL

Furnish and install _______ Dry Pit Submersible Pumping Units complete with all accessories, controls and appurtenances as shown in the plans and specified herein or as required for a complete operating system. Each Pumping Unit shall be rated for continuous duty in accordance with the operating conditions defined in Table 1 of these specifications.

1.4 QUALITY ASSURANCE

Qualifications of Manufacturers: The pumps shown and specified are based on the products manufactured by Chicago Pump Company, Aurora, Illinois. Catalog numbers and references are given only as an indication of the quality of materials and workmanship to be used. Equal products by other manufacturers, approved by the Engineer and Owner, will be acceptable in accordance with the Substitute Equipment requirements contained in the General Conditions Section of these Specifications.

1.5 COORDINATION (Optional)

The pump manufacturer shall be responsible for furnishing and coordinating the Dry-Pit Submersible Pumps and Controls to ensure compatibility of the equipment to perform the specified requirements of the pumping system.

1.6 QUALITY CONTROL

The Dry Pit Submersible Pumping Units shall conform to all applicable requirements of NEMA, NEC, SWPA and Hydraulic Institute. For purposes of this specification, the revision and/or version of the referenced standards in effect on the date bid opening shall apply.

The Dry Pit Submersible Pumping Units specified shall be the products of reputable manufacturers who have been regularly engaged in the design, manufacture and furnishing of Submersible Waste Water Pumps and Motors for at least ten (10) years. The manufacturer of the pump shall assume full responsibility for the compatibility of the supplied components with the application. The motor and pump shall be manufactured by one company providing sole source responsibility for the warranty of the unit. Manufacturers who do not manufacture the submersible motor and who limit their warranty to that of the motor manufacturer shall not be acceptable. Additionally, the products of third party packagers, assemblers or distributors shall neither be considered equal, nor shall they be acceptable.
PART 2 PRODUCTS

2.1 PUMPS

The Dry Pit Submersible Pumping Units shall be self contained, close coupled pump/motor units designed to operate at continuous full load either submerged or non-submerged without the need for any external cooling devices or water jackets. Separate bolted on cooling jackets or externally mounted cooling fluid piping are specifically prohibited. Motor ratings shall conform to the latest applicable requirements of NEMA, IEEE, ANSI and NEC standards. Designs which incorporate external cooling jackets and in particular, designs which rely on circulation of the pumped sewage for cooling, are not considered equal to the equipment described in this specification and shall not be acceptable.

Frames 140 & 180: The motor shall be of the air-filled type and shall be cooled by an adequately sized motor frame. Heat transfer shall be accomplished by convection through the stator-housing wall to the surrounding media.

Frames 210CLC – 360CLC: The motor shall be of the air-filled type and shall be cooled by an internal closed loop cooling system. Motor heat dissipation shall be accomplished by circulating a heat transfer fluid from an integral reservoir through channels that are internally cast into the motor stator housing. The bottom of the reservoir shall be designed to provide adequate retention time of the heat transfer fluid to ensure positive heat transfer. The heat transfer fluid shall be environmentally safe and shall not require hazardous material disposal. Primary heat transfer shall be accomplished by convection through the reservoir wall to the pumped fluid.

The nameplate ratings of the motor shall be based on 40° C ambient temperature environment and have a 1.15 service factor. The pump motors shall be designed to withstand 150 feet of static pressure. All motors shall be furnished and certified per IEEE 117 with Class H rated insulation materials (Class F on 140 frame). All motors not having IEEE 117 certified insulation systems shall be considered not acceptable. Insulation materials rated lower than Class F (i.e. Class B or A) are specifically prohibited.

Pumps shall be Series 2235, Model ________, as manufactured by Chicago Pump Company, Aurora, Illinois or approved equal.

2.1.1 BEARINGS AND LUBRICATION

Bearings shall be specifically selected to carry all radial and axial loads imposed by the pump and motor.

Bearings shall be rated to provide a minimum L₁₀ Bearing Life of 50,000 hours at any design operating point within plus or minus 40% of best efficiency flow point (BEP) of the pump performance curve. Bearing selection shall limit the bearing temperature rise to a maximum of 60° C under full load operation.

All bearings shall be permanently lubricated with a premium moisture resistant grease containing rust inhibitors and shall be suitable for operation over a temperature range of -25° C to +120° C. The bearings shall not require any additional or periodic lubrication. All bearings shall be commercially available from third party sources other than the pump/motor manufacturer.

2.1.2 SHAFT SEALS

Two independent, tandem mounted, mechanical seals shall be provided in the heat transfer fluid reservoir to isolate and protect the air-filled motor from the pumped media. The reservoir shall act as a barrier to trap moisture and provide sufficient time for a planned shutdown in the event of an outer seal failure.
The inner mechanical seal shall be constructed with a solid block carbon rotating seal face and a solid block silicon carbide stationary seal face. The outer mechanical seal shall be constructed with a solid block silicon carbide rotating seal face and a solid block silicon carbide stationary seal face. All other metal seal components of both inner and outer seals shall be AISI 316 stainless steel. All elastomers of both inner and outer seals shall be of Viton® material. The outer mechanical seal shall be located in a recessed housing outside the main flow path of the pump to avoid damage. Mechanical seals that employ sprayed or laminated seal faces shall neither be considered equal, nor shall they be acceptable.

Mechanical seals shall be readily and commercially available from third party sources other than the pump and motor manufacturer, their agents, dealers and/or distributors. Mechanical Seals shall be Type 21 or approved equivalent.

2.1.3 MOISTURE DETECTION SYSTEM

A dual (2) probe moisture sensing system shall be provided to detect the entrance of moisture and provide an alarm. The moisture detection system shall be designed to detect the entrance of moisture in both the heat transfer fluid reservoir and the air-filled motor stator housing. The use of single probe or float switch type sensor systems shall not be acceptable. The moisture sensing probe leads shall terminate in a sensing device located in the control panel, which shall provide an alarm in the event of moisture intrusion. The sensing device, if not specifically ordered from the pump manufacturer, shall be approved by the pump/motor manufacturer.

2.1.4 CAP/CABLE ASSEMBLY

The power and control cable entry system shall be designed to provide a positive, leak-free seal to prevent liquid from entering the air filled motor housing. The design shall incorporate provisions that prevent moisture from wicking through the cable assembly even in the event the cable jacket has been punctured. All cable shall be type SEOW-A or better and U.L. Listed for the intended submersible service.

The power and control cable entry into the lead connection chamber shall be epoxy encapsulated for positive moisture sealing. For frame size 180 and above, the power and control cables shall be unitized modular assemblies permitting individual repair or replacement. Each modular cable unit shall include a cast iron connector body with flared inlet to protect against cable damage due to bending or flexing at the entry point. Each cable unit shall include both epoxy seal and a Neoprene sealing grommet. A sleeve/spacer shall be provided to isolate the epoxy from the connector body and facilitate easy removal and replacement of the sealing compound. Assembly of cable components and grommet tensioning shall be accomplished by a precision snap-ring connection to prevent cable damage or leakage due to under or over compression. The system shall permit the use of factory supplied epoxy or other commercial sealants for field repair without voiding the rating of explosion proof units. Cable strain relief shall be independent of the epoxy seal. Individual cable units shall be designed to permit repair or rebuilding independent of the motor.

Each cap & cable assembly shall include a modular design rail-mounted terminal block system with individual terminal units for connection of each power and control lead. The terminal block system shall utilize standard non-proprietary commercial components.

2.1.5 MATERIALS OF CONSTRUCTION - MOTOR

The dry-pit submersible motor enclosure including frame, end brackets, flanges and cap assembly shall be constructed of close-grained cast iron, ASTM A-48, Class 30 or better.
All mating fits on the motor frame shall have rabbet joints with large overlap as well as o-ring seals to provide for a watertight seal. O-rings shall be Buna-N. The motor/pump shaft shall be constructed of AISI 416 stainless steel and shall be precision machined to ensure proper tolerances at all contact points. The entire rotating assembly shall be designed with sufficient rigidity and be balanced as a shaft and rotor assembly.

The motor rotor shall be constructed of die cast aluminum, fabricated copper or their respective alloys. The rotor shall have an interference fit to the shaft and the rotating assembly shall be dynamically balanced to ISO 1940, G.6.3. Balance weights, if required, shall be secured to the rotor resistance ring or rotor fins. Machine screws or nuts and bolts used to attach balance weights are specifically prohibited.

2.1.6 ELECTRICAL

The dry-pit submersible motors shall successfully operate under power supply variations per NEMA MG1-14.30. Motors shall be NEMA Design B with torque and starting current in accordance with NEMA MG-12. Motors shall be of an air-filled design and shall be suitable for continuous operation. The motors shall have a minimum 1.15 Service Factor at 40°C ambient temperature.

Stators shall be solid copper wound and shall be press fitted into the stator housing for true positive alignment and efficient heat transfer. The motor insulation system shall be Class H minimum, utilizing materials and insulation systems evaluated and certified with IEEE 117 classification tests. The entire wound stator assembly shall receive a minimum of two (2) coats of insulating varnish utilizing a dip and bake process.

Three (3) normally-closed, automatic-reset thermostats connected in series shall be embedded in adjoining phases of the stator windings. The thermostats shall be connected to safely shut down the motor upon opening.

2.1.7 MATERIALS OF CONSTRUCTION - PUMP

The pump casing shall be constructed of close-grained cast iron, ASTM A48, Class 30, and shall be of sufficient thickness to withstand all operating pressures and mechanical stresses. The casing shall be suitably ribbed, have tangential discharge, and be reinforced to support the weight of the motor assembly. Centerline discharge pump casings are not acceptable. The pump casing shall have an integrally cast hand hole supplied with a hand hole cover. The hand hole cover shall be constructed of the same material as the pump casing and shall have surfaces which match the internal casing contours to minimize turbulence and localized wear. The casing shall also be provided with a ___” NPT tapped pressure gauge connection on the discharge nozzle.

A support pedestal for mounting of the complete pump/motor assembly shall be provided and shall be constructed of fabricated steel. The support pedestal shall be designed for anchor bolting to a concrete foundation and shall be of adequate strength and mass to support the combined weight of the pump/motor assembly and all forces imposed by the pump unit during operation.

The impeller shall be of a multi-vaned, enclosed design and shall have large passages to provide smooth flow transition and unimpeded passage of large spherical solids. All impellers shall be statically and dynamically balanced to ISO 1940, G.6.3. The impeller shall be constructed of close-grained cast iron, ASTM A48, Class 30. The pump shall be provided with a separate, removable suction plate constructed of the same material as the casing.

Wearing Rings- Optional for all models : A replaceable 400 Series stainless steel wear ring shall be provided on the impeller inlet to reduce the effects of abrasive wear and provide the ability to renew the running clearance. The suction plate shall contain a replaceable 400 Series stainless steel wear ring to match the impeller wear ring.
A suction elbow with integral clean-out and hand hole cover shall be mounted to the pump suction cover. The suction elbow and hand hole cover shall be constructed of close-grained cast iron, ASTM A48, Class 30. The hand hole cover shall have surfaces that match the internal contours of the elbow to minimize turbulence and localized wear. The suction elbow shall also be provided with a ___” NPT tapped connection for a high pressure clean out and a ___” NPT tapped pressure gauge connection.

All external casting surfaces shall have a surface cleanliness equal to that of a SSPC-SP3 process prior to being factory protected by one (1) coat, of an environmentally safe machinery enamel coating with high solids content.

All external hardware including nameplates on the Pump/Motor shall be 300 Series stainless steel.

2.1.8 PUMP BASE

The contractor shall provide a concrete pump-mounting base for each pump as shown in the plans. The base shall be designed to support the entire weight of the assembled pump and motor. The base shall be of adequate height to provide suitable clearance between the pump suction elbow and the mounting floor and of sufficient strength to accept all forces imposed by the pump unit. Rebar and anchor bolts used in the pump base shall be sufficiently tied to the mounting floor to ensure a rigid, stable mounting surface for the pump unit.

The height of the base shall be sufficient so that the centerline of the suction elbow lines up with the centerline of the suction piping and shall include an allowance for grouting between the concrete base and the pump mounting pedestal in accordance with the pump manufacturer’s recommendations.

2.1.9 TESTING

The pumps shall be hydrostatically tested at the manufacturer’s plant prior to shipment. The test pressure shall be within the limits set forth by the Hydraulic Institute. Certified copies of the test results shall be submitted to the design engineer upon request.

Each completed and assembled motor shall receive a routine factory test.

Optional:

The pumps shall be performance tested at the manufacturer’s plant prior to shipment. The performance shall be within the limits set forth by the Hydraulic Institute. Certified curves shall be submitted to the design engineer upon request.

As a minimum, each finished pump shall be performance tested for total dynamic head, capacity, efficiency and power requirements at six (6) operating points plus shut-off head for the selected impeller diameter, of which, the design capacity operating point shall be included.
After installation, a Field Test shall be performed by the installer on each completed Dry-Pit Submersible Pump System. The pump manufacturer’s authorized representative shall be present for the Field Test. The test shall demonstrate to the satisfaction of the Owner that the equipment meets all specified performance criteria, is properly installed and anchored, and operates smoothly throughout the specified speed range without exceeding the full load amperage rating of the motor or excessive motor heating. Additionally, the Dry-Pit Submersible Pumps shall operate within the acceptable field vibration limits as established by the Hydraulic Institute for this class of equipment at all speeds and loads within the operating range specified herein.

2.1.10 WARRANTY

The Pump Manufacturer shall Warrant to the Owner the Dry pit Submersible Pump Units against defects in material and workmanship for a period of 1 year from date of acceptance or 15 months from date of shipment, whichever is sooner. This warranty shall cover the cost of labor and materials, excluding removal and reinstallation costs, required to correct any warrantable defect, FOB, Manufacturer’s Authorized Service Center.

Additionally, the Pump Manufacturer shall provide and administer a 5 year, prorated materials warranty on the Dry Pit Submersible Motor against defects in materials and workmanship. The motor warranty shall provide for the replacement of any part of the motor (excluding mechanical seals) found to be defective in accordance with the following schedule:

19 to 31 Months Payment of 75% of the Current Replacement Parts Cost.
32 to 45 Months Payment of 50% of the Current Replacement Parts Cost.
46 to 60 Months Payment of 25% of the Current Replacement Parts Cost.

2.1.11 FIELD SERVICE

___ Days of Field Service shall be provided by an authorized, factory trained representative of the Pump Manufacturer. Services shall include, but not necessarily be limited to, inspection of the completed installation to ensure that it has been performed in accordance with the manufacturer’s instructions and recommendations, supervision of all field-testing and activation of the Manufacturer’s Prescribed Warranties.

The Contractor shall be responsible for coordinating the required field services with the Pump Manufacturer.

END OF SECTION
## TABLE 1 PERFORMANCE DATA

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Rate of Flow at Duty Point (USGPM)</td>
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<tr>
<td>Total Dynamic Head at Duty Point (Ft)</td>
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<tr>
<td>Maximum Rotating Speed at Duty Point (RPM)</td>
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<tr>
<td>Maximum Net Positive Suction Head Required at Duty Point (Ft)</td>
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<tr>
<td>Minimum Pump Efficiency at Duty Point (Percent)</td>
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<tr>
<td>Minimum Impeller Diameter (In)</td>
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<tr>
<td>Minimum Shut-Off Head (Ft)</td>
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<tr>
<td>Rate of Flow at Secondary Point (USGPM)</td>
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<td>Total Dynamic Head at Secondary Point (Ft)</td>
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<td>Minimum Motor HP</td>
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<td>Electrical Power (Voltage, Phase, Cycles)</td>
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<td>Operation (Constant or Variable Speed)</td>
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<tr>
<td>Type of Speed Control</td>
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