SUBMERSIBLE TURBINE PUMPS

PART1 - GENERAL

1. SCOPE

1.1 This section covers the furnishing of submersible turbine pumping unit(s) with above ground discharge and furnished with suitable driver and accessories as required and to the expectations of the ENGINEER with regards to the manufacture of the equipment.

1.2 The Vertical Turbine pump(s) specified in this section shall be furnished by and be the product of one manufacturer. All components of the pumping unit must be supplied by and warranted by the pump OEM (original equipment manufacturer) including bowls, impellers, column, shafting, discharge heads, couplings, seals, suction barrels (if applicable) and motors. Well drillers, distributors, or other fabrication shops will not be allowed to furnish equipment built or modified in their local fabrication shop. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by ENGINEER.

1.3 Except as modified or supplemented herein, all submersible turbine pumps shall conform to the most recent edition of ANSI/AWWA E103 and Hydraulic Institute Standards.

2. SUBMITTALS

2.1 Complete fabrication and assembly drawings together with detailed specifications and data covering materials, parts, devices and accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. The data and specifications for each pumping unit shall not be limited to the following:

- Name of manufacturer.
- Type and model.
- Design rotative speed.
- Number of stages.
- Type of bowl bearings.
- Size of pump column.
- Size of discharge outlet.
- Data on shop painting.
- Overall dimensions.
- Total Weight.
- Complete performance curves showing capacity versus head, calculated NPSH required, efficiency, and BHP plotted scales consistent with performance requirements.

2.2 Adequate operation and maintenance information shall be supplied. Operation and maintenance manuals shall include the following:

- Equipment function, normal operating characteristics, and limiting conditions.
- Assembly, installation, adjustment, and checking instructions.
- Operating instructions for startup, routine, and normal operation, regulation and control, shutdown, and emergency conditions.
- Guide to troubleshooting.
- Parts lists and predicted life of parts subject to wear.
- Outline, cross-section, and assembly drawings; engineering data; and wiring diagrams for motors if applicable.
- Test data and performance curves, where applicable.

3. QUALITY ASSURANCE

3.1. The pump manufacturer shall be certified to the ISO 9001 standard for design and manufacture of vertical turbine pumps.

4. WARRANTY

4.1 The manufacturer shall warrant their pumps to be free of defects in material and workmanship for a period of one (1) year after the product is first put into operation or eighteen (18) months after date of shipment, whichever occurs first.

5. DELIVERY,STORAGE, AND HANDLING

5.1 The pumps shall be adequately supported during transit to ensure the pumping unit is not subjected to undue stress.

5.2 Spare parts shall be furnished as specified. Spare parts shall be suitably packaged with labels indicating the contents of each package. Spare parts shall be delivered to owner as directed.

5.3 Final documentation shall be delivered electronically.

PART 2 – PRODUCTS

6. MANUFACTURERS

6.1 SIMFLO, LLC

6.2 Or Pre-Approved Equal

Note: This specification was developed using design criteria from SIMFLO, LLC. Other manufacturers will be considered as long as they meet the performance and quality requirements specified within. Any "or equal" substitution must be submitted to the design engineer two weeks before the bid date for pre-approval. If approved, the manufacturer will be listed by addendum.

7. PERFORMANCE AND DESIGN REQUIREMENTS

7.1 Pumping units shall be designed for the performance and design requirements as required, at maximum speed unless otherwise noted

7.2 For design and rating purposes, the water to be pumped shall be assumed to have a temperature of 70°F.

7.3 Pump performance shall be stable and free from damaging cavitation, vibration, and noise within the operating head range and shall conform to the requirements and recommendations of the latest Hydraulic Institute Standards.

7.4 The pumping application required for this project demands equipment that will operate reliably for many years. Unscheduled downtime is unacceptable to the client, and it is the objective of this specification to deliver the highest quality equipment that is fit for this purpose.

7.5 The complete pumping unit shall conform to the vibration requirements set forth in section 9.6.4 of the 2022 edition of Hydraulic Institute Standards.8. SERVICE CONDITIONS

8. SERVICE CONDITIONS

Service	XXX
Tag Numbers	XXX
Quantity	X
Design Flow (GPM)	XXX
Design TDH (ft)	XX
Minimum Bowl Efficiency at Design Point (%)	XXX
Maximum Speed at Design Point (RPM)	XXXX
Secondary Point A Flow (GPM)*	XXXX
Secondary Point A TDH (ft)*	XXX
Minimum Bowl Eff at Secondary Point A (%)*	XX
Secondary Point B Flow (GPM)*	XXXX
Secondary Point B TDH (ft)*	XXX
Minimum Bowl Eff at Secondary Point B (%)*	XX
Minimum Shutoff TDH (ft)	XXX
Maximum Motor HP	XXX
Minimum Column Diameter (in)	XX
Minimum Discharge Diameter (in)	XX

*Secondary design point to be within HI 3B Tolerance

9. PUMP CONSTRUCTION

9.1 NSF61 CERTIFICATION **(OPTIONAL)**

9.1.1 The complete pump assembly shall be certified to NSF/ANSI standard 61. This certification shall cover all wetted components of the pump, including but not limited to the bowl assembly, column assembly, discharge head assembly & suction barrel (when applicable). Manufacturers without NSF61 certification will not be considered. Written documentation demonstrating full compliance to NSF61 shall be provided as part of the

submittal package. The pump discharge elbow shall be fitted with a separate nameplate displaying the NSF61 logo. No exceptions.

9.2 BOWL ASSEMBLY

9.2.1 The pump bowl assembly shall be SIMFLO Pump model **XXXX** or pre-approved equal. The pump (intermediate bowls, discharge case, submersible suction case and motor bracket) shall be constructed of the material as listed under the subsection "materials of construction." The bowls shall be accurately machined and flanged with machined, rabbit-fit connections. The water passages pump bowls size 6" through 14" shall have vitreous porcelain enamel lining and 16" and larger shall have ScotchKote™ Fusion Bonded Epoxy 134 both to reduce friction losses. The waterways and diffusion vanes shall be smooth and free from nodules, bumps and dips, and shall be cast of high quality, free of blow holes, sand holes and other detrimental defects. The bowl assembly shall be fitted with a submersible suction case including integral cast ribs supporting the suction bearing. The suction bearing shall have a length not less than two times the shaft diameter. The bowl bearings are to be lubricated by the product being pumped and located above and below each impeller. All bearings shall be sleeve type of the material listed in the subsection "materials of construction" as required to support the bowl-shaft. When applicable, the bowl bolting material shall be as listed in the subsection "materials of construction."

9.2.2 **(Optional)**: The bowls shall have VTR-9193 Viton "O" rings fitted to custom machined grooves. There shall be zero leakage between flanged joints.

(Optional) *[Fit all bowls and/or impellers with renewable wear ring(s). The wear rings shall be constructed of material as outlined in the subsection "materials of construction".*

9.2.3 The impellers shall be cast in one piece of the enclosed type and constructed of the material listed in the subsection "materials of construction. The impellers shall be statically or dynamically balanced. The impeller shall be securely fastened to the shaft with taper split bushings (collets) of the material listed in the subsection "materials of construction" for bowl-shafts 2-3/16" nominal diameter and smaller or with keyed connections for bowl-shafts larger than 2-3/16" nominal diameter. The bowl shafting shall conform to the material listed in the subsection "materials of construction". The bowl-shaft shall be of sufficient diameter to transmit the pump horsepower with a safety factor consistent with AWWA pump-shaft standards. Impellers shall be set vertically by the motor-shaft and shall have sufficient axial clearance for reliable service in accordance with the specified operating conditions.

9.2.4 The inlet motor adapter shall contain an extra-long bronze bearing. The inlet area shall have a net open area of at least four times the eye of the

impeller and shall be protected with a screen. The openings on the screen shall not be more than 75% of the minimum opening of the water passage through the bowl or the impeller.

9.3 DISCHARGE HEAD

9.3.1 The discharge head shall be of material per subsection "Materials of construction". The discharge head shall consist of a radius elbow for above ground discharge with sufficient strength and rigidity to carry the suspended wight of the attached pipe and pump/motor assembly. The discharge flange shall be a **(150#, 300#, 600#)** Class ANSI **(raised, flat)** face flange with bolt holes straddling the vertical centerline. The discharge size shall be the same as the pump discharge. The discharge head shall have an integral base and lifting lugs of sufficient strength to lift the entire head, discharge pipe and pump/motor assembly safely for installation and servicing operations. The base of the discharge head shall be circular and finished on bottom for proper mounting. A threaded connection shall be provided in the head base for a terminal box. The base shall also be provided with threaded openings for a well vent and a water level indicator. If the discharge head is to be mounted on a booster can, the base diameter and bolt pattern shall match a 150# Class ANSI flange.

9.5 MATERIALS OF CONSTRUCTION

Component	**Material**
Pump Bowls	Cast Iron (ASTM A48 c130 - Enamel Lined or Scotchkote lined)*
Impellers	CF8m 316SS* or C95500 NAB*
Bowlshaft	416 HT Stainless Steel - (ASTM A582)*
Bowl Bearings	Bronze (ASTM 505 C89835)*
Collets	316 SS*
Bowl Bolting	18-8 SS*
Bowl Wear Rings	**(Optional)**
Impeller Wear Rings	**(Optional)**
Inlet Motor Adapter	Ductile Iron (ASTM A536 Gr. 65-45-12)
Discharge Pipe Thickness	Standard
Discharge Head	Fabricated Steel - (A36 HR-Gr 70 plate, A53 Gr. B pipe)
Name Plate	SS

9.6 ELECTRIC SUBMERSIBLE MOTORS

9.6.1 Manufacturers:

9.6.1.a Sunstar/Hitachi

9.6.1.b Or Pre-Approved Equal

9.6.2 The motor shall be of the vertical, submersible, alternating current induction type, designed for continuous duty, underwater operation. The motor shall be oil or water filled and shall incorporate a suitable seal to restrict foreign matter from entering the motor. The thrust bearing shall be of ample capacity to carry the weight of all rotating parts plus the hydraulic thrust and shall be an integral part of the driver.

HP	**XXX**
Shaft Type	**Submersible**
RPM	**XXXX**
Voltage	**XXX**
Enclosure	**WPI**
Efficiency Rating	**XXX**
Motor Operation	**Fixed Speed**
Service Factor	**1.15**

9.6.3 The submersible motor cable shall be comprised of separate conductor within a single neoprene exterior jacket. Motor cable shall be sized to provide for no more than a 5 percent voltage drop under in-rush loading with across-the- line starting. Each conductor shall be insulated by synthetic rubber or plastic specifically designed for continuous immersion in water. The minimum size of cable shall be per NEC ampacity requirements. The insulation shall be water and oil resistant, and suitable for continuous immersion. The cable should be the length of the discharge pipe plus 20 feet to extend from the surface plate to the electrical controller. The cable should be adequately secured to the discharge pipe.

9.7 FACTORY TESTING

9.8.1 Each bowl assembly shall be tested at the factory for capacity, power requirement, and efficiency at minimum head, rated head, shutoff head or point of discontinuity, and at as many other points as necessary for accurate performance curve plotting. All tests and test reports shall conform to the requirements and recommendations of the Hydraulic Institute Standards. If the pump fails to operate properly or fails to meet the specified conditions, the pump manufacturer shall modify the pumping unit and perform additional tests. The pump manufacturer shall submit complete pump test reports, including test arrangement, test procedures, & test data in curve format.

9.7.2 **(Optional)** Each pump shall be tested with the actual motor or drive unit to be installed in the field.

9.7.3 **(Optional)** The test results are to be certified correct by a licensed Professional Engineer, whom may be an employee of the pump manufacturer.

9.7.4 All test data shall be submitted to the engineer at least 5 days prior to shipment.

9.7.5 The bowl assembly and discharge head shall be non-witness factory pressure tested in accordance with the latest edition of Hydraulic Institute Standards.

9.8 FACTORY COATING

9.9.1 **(Optional)** The bowl assembly OD and discharge head ID shall be factory painted with a NSF 61 approved two-part epoxy coating, such as Tnemec 21. The coating shall be applied per the manufacturer's recommendations.

9.9 SPARE PARTS

9.10.1 If required, to be specified by the engineer and/or owner.

PART 3-EXECUTION

10. FIELD QUALITY CONTROL

10.1 A representative of the manufacturer shall visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are signed off by all parties.

10.2 Manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

10.3 **(Optional)** *[The equipment manufacturer shall furnish a qualified field installation supervisor during the equipment installation. Such services shall be included in the contract price for the number of days and round trips to the site as required. Manufacturer's' installation supervisor shall observe, instruct, guide, and direct the installing contractor's erection or installation procedures. The equipment manufacturer will be provided with written notification 10 days prior to the need for such services.]*