

### Suggested Specifications Type NCF, NCP, NCH Frame Mounted, Dry Pit Non-Clog Pumps

{ **ENGINEER'S NOTE:** These specifications are intended to allow you maximum flexibility throughout. Items in bold parentheses ( ) represent choices. Inappropriate choices should be struck. Options should be selected as required.}

**SCOPE:** The contractor shall furnish and install, as shown on the plans and described in these specifications (**one, two, three, four**) single stage, (**vertical, horizontal**) Dry Pit Non-clog, frame mounted, end suction centrifugal pump unit(s) for wastewater pumping service. The pump(s) shall be (**constant, variable**) speed and electric motor driven. The pump(s) shall be PACO model (**NCP, NCF, NCH**) or equal.

The pumping unit shall be complete with:

**(Option A – Type NCP)** pump, electric motor, motor pedestal, intermediate shafting, guide bearings, pump pedestal, subbase, suction elbow with cleanout opening.

**(Option B – Type NCF)** pump, electric motor, coupling, coupling guard, motor pedestal, pump pedestal, suction elbow with cleanout opening.

**(Option C – Type NCH)** pump, electric motor, steel base plate, coupling, coupling guard, and all other appurtenances specified or otherwise required for proper installation.

**General:** Equipment furnished and installed by the contractor under this section shall be fabricated, assembled, erected and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer. Definition of terms and other hydraulic considerations shall be as set forth in the Hydraulic Institute Standards.

**Submittals:** The data and specifications for each unit shall include, but shall not be limited to the following:

#### Pumps:

- Name of manufacturer
- Type and model
- Rotative speed
- Size of suction nozzle
- Size of discharge nozzle
- Net weight of pump
- Complete performance curves showing capacity versus head, NPSH required, pump efficiency and BHP

#### Motors:

- Name of manufacturer
- Type and model
- Type of bearing and lubrication
- Rated size of motor, HP
- Temperature rating
- Full load rotative speed
- Net weight
- Efficiency at full, ¾ and ½ load
- Full current load
- Locked rotor current

**Testing: (Option A)** Each pump shall be given an operational test to check for mechanical integrity and leaks. All irregularities will be corrected prior to shipment from the factory.

**Testing: (Option B)** A (**non-witnessed, witnessed**) Hydraulic Institute performance test shall be performed. The pump shall be tested at the design point as well as at least 4 other points to develop a set of curves. Data shall be collected to plot the head-capacity curve in addition to the efficiency and brake horsepower.

**Performance & Design Requirements:** The pumping unit shall be designed for the following operating conditions at maximum speed, unless otherwise noted:

Unit designation	Pump No (_____)
Number of units	(_____)
<b>Primary Design Point</b>	
Rated total head, feet	(_____)
Capacity at rated head, GPM	(_____)
<b>Secondary Design Point</b>	
Rated total head, feet	(_____)
Capacity at rated head, GPM	(_____)
Operating head range, feet	(_____)
Max (nominal) pump operating speed at rated head, RPM	(_____)
Max BHP required at input shaft of pump for any point in the operating head range	(_____)
Min pump efficiency at rated head, feet	(_____)
Min available net positive suction head at center line of suction elbow, feet absolute	(_____)
Pump rotation as viewed from the driver end	(_____)
Min pump nozzle size, inches	(_____)
Suction	(_____)
Discharge	(_____)
Min sphere diameter, inches	(_____)
Min hydrostatic test 1.5 x shutoff head pressure, PSI plus suction press	(_____)

Pump performance shall be stable and free from cavitation and noise throughout the specified operating head range at design suction submergences. The design performance shall be based on a wear ring axial clearance of not less than one mil per inch of wear ring diameter, or 12 mils total, whichever is greater.

#### Materials:

Casing, Casing Covers, and Frame	Cast iron ASTM A48
Case Wear Rings	<b>(Cast iron, 416 SS, Bronze, 300 SS)</b>
Impeller	<b>(Cast iron, Bronze)</b>
Impeller Wear Rings	<b>(Cast iron, 416 SS, Bronze, 300 SS)</b>
Shaft	<b>(Alloy steel, 316 SS)</b>
Shaft Sleeve	<b>(Bronze, 316 SS, 416 SS)</b>
Bearings	<b>(Grease lubricated deep groove ball, Angular Conact, Spherical Roller) – see Technical data sheet, D2a.6, pg.2 for bearing types)</b>
Pedestal and Subbase	Cast iron or fabricated steel
Stuffing Box	Cast iron ASTM A48

**Packing:** A minimum of 5 rings of graphite impregnated synthetic packing, teflon split lantern ring and adjustable packing gland shall be furnished as standard.

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**Mechanical Seal: (Option A)** A double opposed inside type mechanical seal with BUNA-N elastomers, stainless steel hardware, ceramic stationary rings and carbon rotating rings shall be provided.

**(Option B)** An abrasive-resistant conical (ARC) type shaft seal shall be provided. The rotating cone shall be of helical groove design, and permit pumping of highly abrasive fluids or run dry conditions without damage or leakage.

**Seal Pressurizer: (Optional)** To provide adequate lubrication and maximum protection from abrasive particle contamination for the mechanical seals, a "Pressure-Miser" seal pressurizer shall be provided. The seal pressurizer shall use light machine oil and maintain a pressure at the sealing surface higher than the pump case pressure.

#### Pump Construction

**Casing assembly:** The casing assembly and drive connection shall permit the removal of the rotating element without disconnecting the piping. The discharge nozzle (and suction elbow) shall have flanged cleanout handholes with interior surfaces flush with the casing water passages. Casing parts shall have registered fits to maintain alignment. The nozzle flanges shall be flat face with ANSI B16.1 Class 125 diameter and drilling. A pipe tapped opening shall be provided for draining the stuffing box leakage.

Pipe tapped openings shall be provided for draining, priming and venting the casing.

**Impeller:** The impeller shall be a one-piece casting statically and dynamically balanced. The interior water passages shall have uniform sections, smooth surfaces, and be free from cracks and porosity. The impeller shall be securely locked to the shaft with an acorn shaped capscrew, impeller washer, and locking washer so it will not be loosened by reverse rotation, but it shall be readily removable.

The impeller shall be enclosed, non-clog type with at least two ports, and capable of passing a \_\_\_\_\_ inch spherical solid.

**Shaft and Shaft Sleeves:** The shaft shall be completely machined. Deflection at the stuffing box shall not exceed .002" at any head in the operating range.

The shaft shall be provided with a replaceable sleeve extending from the impeller through the stuffing box. The sleeve shall be positively secured to the shaft and shall be sealed with an O-ring to prevent leakage between the shaft and sleeve. With sleeve in place, total runout shall not exceed .002".

**Wear Rings:** Renewable, L-shaped wear rings shall be provided in the casing and on the impeller. The rings shall be positively locked in place with set screws.

**Bearing Frame Assembly:** The bearing frame assembly shall rigidly support the rotating element with two bearings. The outboard bearing shall carry both axial and radial pump loads. The assembly design shall permit axial adjustment of the rotor without dismantling the pump. Bearing enclosures shall include lip seals to prevent contamination of the bearings and to retain

the lubricant. Suitable fittings shall be provided for properly adding lubricant.

The frame shall provide ample clearance for stuffing box maintenance.

**Bearings:** Bearings shall be grease lubricated antifriction type. Bearings shall have a minimum AFBMA L10 Life Rating of (\_\_\_\_\_) (Refer to D2a.6) hours at specified operating conditions. The pump shaft speed shall not exceed the bearing manufacturer's limitations.

**Drive Unit:** The pump shall be furnished with a (**vertical solid shaft, horizontal**) squirrel-cage induction type motor rated \_\_\_\_\_ volts, (**3, 1**) phase, (**60, 50**) Hertz, (**ODP, TEFC, Explosion proof**) with (**1.15, 1.0**) service factor. 40°C ambient. Motor shaft bearings shall be grease lubricated, antifriction type and regreaseable. Motor shall be (**Standard, Premium**) efficiency with a minimum efficiency of (\_\_\_\_).

**Installation:** The installation of the pumping equipment shall be in accordance with the drawings and manufacturer's instructions. All equipment shall be supported and securely anchored, making sure all connections are plumb and tight. All construction debris shall be removed from the system and wet well prior to operation of the pumping equipment.

**Exposed Surfaces:** All exposed surfaces shall first be cleaned by high pressure water or steam. Grease and oil shall be removed by suitable solvent cleaner.

Immediately following surface preparation, the clean metal surface shall be given a standard surface finished coat of air-dried alkyd resin type enamel containing zinc chromate rust inhibitive pigment.

The completed coat shall have good adhesion and a high degree of resistance to moisture, alkalis and oils.

**Start-Up and Field Testing:** Start-up and operational field tests shall be conducted by the pump manufacturer's factory trained start-up representative. The start-up and operational test shall be conducted in the presence of the engineer, owner operator personnel and the contractor. Final site specific level control adjustments shall be made to ensure proper functioning of the system.