SECTION 23 21 23

HYDRONIC PUMPS

**BASED ON DFD MASTER SPECIFICATION DATED 11/15/2019**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

# P A R T 1 - G E N E R A L

## SCOPE

This section includes specifications for water pumps used for HVAC applications. Included are the following topics:

PART 1 - GENERAL

Scope

Related Work

Reference

Quality Assurance

Shop Drawings

Operation and Maintenance Data

Design Criteria

PART 2 - PRODUCTS

Base Mounted Centrifugal Pumps

In-Line Centrifugal Pumps

Horizontal Turbine Pumps

Vertical Turbine Pumps

Glycol Fill Pump

PART 3 - EXECUTION

Installation

Base Mounted Pumps

Glycol Fill Pump

Construction Verification Items

Functional Performance Testing

Agency Training

## RELATED WORK

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 23 05 13 - Common Motor Requirements for HVAC Equipment

Section 23 08 00 – Commissioning of HVAC

## REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

## QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

## SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include data concerning dimensions, capacities, materials of construction, ratings, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

Pump curves shall identify design point of operation.

## OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

Delete the following if there are no additional requirements.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

 [A/E and commissioning provider to define detailed operation and maintenance data requirements for equipment specifications added to this section.]

## DESIGN CRITERIA

Pump sizes, capacities, pressures and operating characteristics shall be as scheduled.

As of January 27th, 2020, the DOE will mandate the minimum pump efficiency on base mounted, end suction frame mounted pumps and inline close coupled pumps. DFDM will only be accepting pumps that have a PEIcl rating. Any pumps with only a PEIvl rating will need to be approved by DFDM before specifying.

All base mounted, end suction frame mounted pumps and inline close coupled pumps shall meet DOE’s 2020 pump energy standards and have a constant load PEIcl rating of less than 1.0.

All other pumps shall meet or exceed operating efficiencies scheduled.

Provide all pumps with motors, impellers, drive assemblies, bearings, coupling guard, and other accessories specified. Statically and dynamically balance all rotating parts. Provide flanged connections on all pumps unless specified otherwise. Service or repair of base mounted pumps shall not require breaking piping connections or removal of motor.

Where a pump is specified for parallel operation, the scheduled conditions are for that pump with both pumps operating; i.e., total system flow rate is twice that scheduled for a single pump. When only one of the parallel pumps is operating, the operating point of that pump must fall within the manufacturer's recommended operating range.

Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 1750 rpm unless specified otherwise.

Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.

Test all pumps, clean and paint before shipment. The manufacturer shall certify all pump ratings.

All pumps to operate without excessive noise or vibration.

After completion of balancing, provide replacement of impellers, or trim impellers to provide specified flow at actual pumping head, as installed.

Furnish one spare seal and casing gasket for each pump to user agency.

# P A R T 2 - P R O D U C T S

## BASE MOUNTED CENTRIFUGAL PUMPS

MANUFACTURERS:

Allis Chalmers, Aurora, Bell and Gossett, Taco, Peerless, Pacific, Armstrong, Grundfos, or approved equal.

TYPE:

Horizontal shaft, single stage, single or double suction, split casing, 175 psig working pressure at operating temperature of 225°F continuous, 250°F intermittent.

Specify that pumps connected to any central chilled water system be designed for a working pressure not less than 200 psig.

CASING:

Cast iron with suction and discharge gauge ports, renewable bronze wear rings, vent and drain plugs, flanged suction and discharge connections.

IMPELLER:

Bronze, hydraulically and dynamically balanced, keyed and locked to pump shaft, and protected by a replaceable bronze shaft sleeve.

BEARINGS:

Oil or grease lubricated ball or roller bearings.

SHAFT:

Alloy steel with copper, bronze, or stainless steel shaft sleeve.

SEAL:

Carbon rotating against a stationary ceramic seat, 225°F maximum continuous operating temperature.

DRIVE:

Flexible spacer type coupling or coupling with extended hub to allow for pump service. Provide guard for shaft/coupling assembly.

BASEPLATE:

Cast iron or fabricated steel with integral drain rim.

## IN-LINE CENTRIFUGAL PUMPS

MANUFACTURERS:

Bell and Gossett, Armstrong, Thrush, Taco, Grundfos, Aurora, or approved equal.

TYPE:

 Single stage, direct connected, resiliently mounted motor for in-line mounting, oil lubricated, 175 psig maximum working pressure at operating temperature of 225 ° F. continuous, 250 ° F. intermittent.

Specify that pumps connected to central chilled water systems be designed for a working pressure not less than 200 psig.

CASING:

Cast iron or stainless steel; flanged suction and discharge connection; with plugged taps for vent, drain, suction and discharge gauges.

IMPELLER:

Brass or bronze, keyed to the shaft, single suction enclosed type, hydraulically and dynamically balanced.

BEARINGS:

Two, oil lubricated bronze sleeves or ball bearings capable of being greased.

SHAFT:

Stainless steel or carbon steel with stainless steel or bronze sleeve, integral thrust collar.

SEAL:

Mechanical type, carbon rotating against a stationary ceramic seat, 225°F maximum continuous operating temperature.

DRIVE:

close coupled.

## HORIZONTAL TURBINE PUMPS

MANUFACTURER:

Aurora, Pacific (Paco), Roth, Grundfos, or approved equal.

TYPE:

Pumps to be base mounted, split case, double suction, single stage type with cast iron casing and bronze trim. Casing shall be suitable for 300 psig working pressure, with vent and drain taps.

Pump shall be flexible connected to the motor and shall have a minimum of two grease lubricated ball or roller bearings. Flexible coupling shall have bushings keyed to the shaft. Pump and motor shall have a common base.

SHAFT:

Construct pump shaft of stainless steel.

SEALS:

Furnish mechanical seals with carbon steel rings and ceramic seats.

## VERTICAL TURBINE PUMPS

MANUFACTURERS:

Bell & Gossett, Fairbanks Morse, Peerless, Aurora, Simmons, Layne & Bowler, Peabody Floway, Grundfos, or approved equal.

TYPE:

Pumps shall be vertical mount with cast iron discharge base, threaded or flanged column construction, cast iron bowl units, bronze impeller and replaceable bronze wearing rings on both the impeller and the bowl. Pump motor shall have weather-proof enclosure suitable for outdoor installation.

SHAFT:

Construct pump shaft and pump column shaft of stainless steel.

SEALS:

Furnish mechanical type shaft seals with carbon steel rings and ceramic seats.

## GLYCOL FILL PUMP

Provide one portable mixing tank and electric fill pump assembly. The mixing tank shall be constructed of corrosion resistant material, with 25 gallon capacity. Pump shall have a capacity of 3 to 5 gpm at 20 psig fill pressure. Provide threaded hose adapter for pump discharge, and electrical cord for standard 120 volt outlet.

Verify the fill pressure required for the system actually designed.

# P A R T 3 - E X E C U T I O N

## INSTALLATION

Install all pumps in strict accordance with manufacturer's instructions. Access/service space around pumps shall not be less than minimum space recommended by pump manufacturer.

Support piping adjacent to pump such that no weight is carried on pump casings.

Decrease from line size at pump connections with suction diffusers where specified, long radius reducing elbows or concentric reducers/increasers in the vertical piping, and eccentric reducers/increasers for horizontal piping. Install eccentric reducers/increasers with the top of the pipe level

All valves and piping specialties must be full line size as indicated on the drawings

Lubricate pumps before startup.

Install a full line size spring loaded check valve and balancing valve in the pump discharge piping. At contractor’s option, combination shut-off, check, balancing valve may be substituted instead of separate valves. Reference section 23 05 23.

## BASE MOUNTED PUMPS

Set base mounted pumps on concrete bases, or concrete inertia base, level and bolt down prior to grouting. Fill the entire base with non-shrinking grout when required by the manufacturer's installation instructions.

Coordinate the preceding paragraph with section 23 05 48. Provide inertia bases for base mounted pumps only where pump motors are large and/or vibration is a concern. For example, specify concrete bases, not inertia bases, for pumps located in mechanical rooms on grade (unless unusual conditions exist where inertia bases may be warranted).

Align all flexible coupled base-mounted pumps in accordance with the manufacturer's instructions.

provide supports for elbows on pump suction and discharge piping 4" and over.

Provide air vent and drain valve on horizontal pump casings.

Provide drains for bases and seals, piped to and discharging into floor drains.

## GLYCOL FILL PUMP

After initial system fill, turn pump over to owner

## CONSTRUCTION VERIFICATION ITEMS

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 23 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02.

## FUNCTIONAL PERFORMANCE TESTING

Contractor is responsible for utilizing the functional performance test forms supplied under specification Section 23 08 00 in accordance with the procedures defined for functional performance testing in Section 01 91 01 or 01 91 02.

## AGENCY TRAINING

All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01 or 01 91 02.

END OF SECTION