SECTION 23 21 23
HYDRONIC PUMPS

PART 1 – GENERAL

1.01 WORK INCLUDED

A. The work of this Section shall include, but is not limited to, the following:

1. End suction base mounted pumps.
2. In-line circulating pumps.
3. Cooling coil condensate pumps.
4. Manufacturer's factory representative's supervision of installation, alignment and start-up.

1.02 RELATED DOCUMENTS

A. Section 23 05 01 – HVAC General Provisions

B. Section 23 05 13 – Electric Motors for HVAC Equipment

C. Section 23 05 14 – Variable Frequency Drives for HVAC

D. Section 23 05 48 – Vibration and Seismic Controls for HVAC

E. Section 23 21 13 – Hydronic Piping

1.03 REFERENCE STANDARDS

Published specifications standards, tests or recommended methods of trade, industry or governmental organizations apply to work in this Section where cited below:

A. ASME – American Society of Mechanical Engineers

1.	ASME B16.5	Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24 Metric/Inch Standard

B. ASTM – American Society for Testing and Materials

1.	ASTM A105/A105M-14	Standard Specification for Carbon Steel Forgings for Piping Applications
2.	ASTM A108-13	Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
3.	ASTM A159-83(2015)	Standard Specification for Automotive Gray Iron Castings
4.	ASTM B36/B36M-13	Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar
5.	ASTM B584-14	Standard Specification for Copper Alloy Sand Castings for General Applications

C. AABC – Associated Air Balance Council

D. ISO – International Organization for Standardization

1. ISO 9001 Quality Management Systems

E. UL – Underwriters Laboratories Inc.

1. UL 778 Standard for Motor-Operated Water Pumps

1.04 QUALITY ASSURANCE

A. Alternates to scheduled pumps shall operate at or near their point of peak efficiency, allowing for operation at capacities of approximately 25 percent beyond design capacity. Maximum impeller size shall not exceed 85 percent of the difference between the maximum and minimum impeller diameter.

B. In order to insure stable operation and prevent any possibility of hunting, the pump curve shall be continuously rising from maximum capacity up to the shut-off point. Pumps shall be non-overloading over the full range of the pump curve.

C. Furnish each pump and motor with a metal engraved 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.

D. All pumps shall operate without excessive noise or vibration.

E. Furnish one spare seal and casing gasket for each pump to Owner.

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

G. LEED Credit EQ4.2: Low Emitting Materials, Paints and Coating.

1.05 SUBMITTALS

A. Shop drawing submittals shall include pump curves, net positive suction head requirements, and pump performance characteristics with pump and system operating points plotted.

B. Submit construction details, materials of construction, type of seals, pump base, and mounting details.

C. Submit motor construction, winding type and efficiencies as specified in Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

D. Submit certification of alignment for each pump and obtain approval prior to start-up of pumps.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. End Suction: Armstrong, Paco, B&G, Aurora, Taco.

B. In-Line Circulators: Armstrong, Paco, B&G, Aurora, Grundfos, Taco.

C. Cooling Coil Condensate: Little Giant VCMA-20 Series, March, Beckett CB, Hartell KTP20.

2.02 END SUCTION BASE MOUNTED PUMPS

A. Pump shall be of the end suction, vertically split case centrifugal type.

B. The casing shall be close-grained case iron free from blowholes, sand pockets and other detrimental defects. Liquid passageways shall be smooth and contoured to permit maximum efficiency. Casing shall be designed for working pressure as scheduled and shall be hydrostatically tested at 150 percent of the maximum working pressure. Suction and discharge flanges shall be drilled to ANSI standards.

C. A steel base capable of supporting the pump and motor without additional support shall be furnished for each pump unit. Pump and drive unit shall be carefully aligned and bolted in place prior to factory shipment.

D. The impeller supplied for the specified conditions shall be a one-piece bronze casting and balanced statically, hydraulically and dynamically. The impeller shall be keyed to the shaft and securely retained in an axial position by positive mechanical means.

E. Pump shaft shall be carbon steel with stainless steel or bronze shaft sleeve, sized, and designed to limit shaft deflection at the seal to no more than 0.002 inches.

F. Provide mechanically sealed suction pumps with John Crane Type 1B, elastomer, non-pusher type balanced mechanical seals on pump serving system above 150 pounds per square inch gauge. Provide unbalanced mechanical seals on pumps serving system with 150 pounds per square inch gauge rating.

G. Pump bearings shall be heavy-duty conrad-type suitable for grease lubrication and contained in moisture- and dust-proof bearing housings with a minimum B_{10} life of 20,000 hours.

H. Provide flanged connections on suction and discharge sizes 2.5 inches and larger, drilled to ANSI standards complete with pressure gauge taps.

I. Provide pumps suitable for maximum system working pressure with pump seals rated to operate continuously at fluid temperature up to 250 degrees F.

J. Provide bronze replaceable case wear ring. Ring shall be pinned to lock the ring in place.

K. Pump shall have EPDM flexible coupling suitable for variable speed drive operation. Motor and pump shall be factory-aligned and -mounted on a steel or cast iron drip rim base. An OSHA-approved coupling guard shall be provided.

2.03 IN-LINE CIRCULATING PUMPS

A. Furnish centrifugal close coupled single stage circulating pumps with capacities as scheduled in the Pump Schedule on the Drawings.

1. Centrifugal circulating pumps shall be of the in-line type suitable for vertical or horizontal installation and be serviceable without dismantling the circulator piping

connections.

2. Casings shall be cast iron, ASTM A159.

3. Pump working pressure shall be 175 psi.
4. Impeller shall be cast bronze, closed type, ASTM B584 or brass, closed type, ASTM B36/B36M; 304 stainless steel impeller key, keyed to the shaft, brass impeller washer, 304 stainless steel impeller lock washer and a 304 stainless steel impeller cap screw.
5. Pump shall be ASTM A108 grade 1045 carbon steel. Shaft sleeve shall be copper alloy 110 or aluminum bronze, ASTM B584.
6. Shaft seal assembly shall be an internally flushed single seal of the stuffing box design with EPR O-Rings, Carbon-Tungsten Carbide faces, all metal parts and spring shall be stainless steel. Seal shall be rated for continuous operation at 225 degrees Fahrenheit. The wetted area under the seal shall be completely covered by a bronze shaft sleeve.
7. Pump casing shall have gauge ports and vent and drain tapings at the suction and discharge nozzles.
8. Pump motor shall be as specified on the Drawings for horsepower, voltage and phase, and in Section 22 05 13 – Common Motor Requirements for Plumbing Equipment. Motor shall be non-overloading throughout the entire range of the pump curve.
9. Impeller shall be hydraulically and dynamically balanced to ANSI-Hydraulic Institute Pump Standards, Grade G6.3.
10. Each pump shall be factory-tested per the ANSI-Hydraulic Institute Pump Standards.
11. Pump manufacturer shall be ISO 9001 certified.
12. Pump shall be a Bell & Gossett, bronze fitted pump, Series 90 or approved equivalent.

B. Furnish centrifugal long (flexible) coupled single stage circulating pumps with capacities as scheduled in the Pump Schedule on the Drawings.

1. Centrifugal circulating pumps shall be of the in-line type suitable for horizontal installation and be serviceable without dismantling the circulator piping connections.
2. Casings shall be cast iron, ASTM A159.

3. Pump working pressure shall be 175 psi.
4. Impeller shall be cast bronze, closed type, ASTM B584; carbon steel impeller key, keyed to the shaft, carbon steel impeller washer, carbon steel impeller lock washer and a plated steel impeller cap screw.
5. Pump shaft shall be steel, grade SAE 1144, and connected to the motor with a flexible type coupling. Shaft sleeve shall be copper alloy 110.
6. Shaft seal assembly shall be an internally flushed single seal of the stuffing box design, consisting of a housing of brass, ASTM B36/B36M; EPT bellow; carbon steel rotating ring; 304 stainless steel spring; ceramic seat and EPT seat gasket. Seal assembly shall be rated for continuous operation at 225 degrees Fahrenheit. The wetted area under the seal shall be completely covered by a bronze shaft sleeve.
7. Pump casing shall have gauge ports and vent and drain tapings at the suction and discharge nozzles.
8. Pump motor shall be as specified on the drawings for horsepower, voltage and phase, and in Section 22 05 13 – Common Motor Requirements for Plumbing

Equipment. Motor shall be non-overloading throughout the entire range of the pump curve.

9. Impeller shall be hydraulically and dynamically balanced to ANSI-Hydraulic Institute Pump Standards, Grade G6.3.
10. Each pump shall be factory-tested per the ANSI-Hydraulic Institute Pump Standards.
11. Pump manufacturer shall be ISO 9001 certified.
12. Pump shall be a Bell & Gossett, bronze fitted pump, Series 60 or approved equivalent.

2.04 COOLING COIL CONDENSATE PUMPS

A. Provide a fully automatic condensate removal pump with ½ gallon capacity integral leakproof tank. Pump capacity shall be 20 gallons per hour with a 15 foot lift.

B. The pump shall be a vertical-type with stainless steel motor shaft, rust proof, high-impact ABS tank and motor cover, 3 drain inlet connections.

C. Provide a removable ⅜-inch barbed check valve.

D. Provide a safety switch and relay rated at 5 amperes/48 volts to shut down the associated HVAC unit or wired to a tank high level alarm.

E. Pump shall be rated for high-efficiency gas furnace applications that produce an acidic condensate.

F. The 120 volt single phase motor shall be thermally protected motor and UL Listed for hardwire connection.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The mechanical contractor shall be responsible for aligning in the field prior to start-up of all flexibly coupled pumps. Alignment accuracy of plus or minus 0.002 inches shall be verified with a dial indicator. Prior to start-up, the manufacturer shall submit a written report certifying that the alignment work has been performed and that the pumps are ready for operation.

B. Base-mounted pumps shall be leveled up on tapered steel wedges in such manner to permit a minimum of ¾ inches of grout between the pump base and the top of the concrete base.

C. Pump motor, suction and discharge openings shall be covered during construction period. If the motor is started, the Contractor shall be responsible to ensure that the environment in which the motor is running is clean.

D. Install condensate pumps with tank level and allow access for tank removal.

E. 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.

3.02 PIPING

A. Support piping adjacent to pump such that weight is not carried on pump casings.

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

C. At all pump suctions, install a straight pipe length of 4 times the suction diameter.

D. Seals for all pumps serving condenser water or open cooling towers shall be supplied with a flushing water line piped with Crane Kynar Series 100 abrasive separator and Akron ball type sight flow indicator.

E. Provide needle valves and drain connection on pump casings, or at pump inlets to allow for complete drainage of pump casing.

F. Connect pump discharge to copper condensate drain piping with a 8 inch long maximum length of clear plastic tubing.

END OF SECTION 23 21 23