SECTION 15130 – HVAC HYDRONIC PUMPS AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

A. Furnish and install all pumps for all systems which are part of the building HVAC systems. This shall include all accessories specified in this Division and as shown on the drawings.

B. All pumps shall be new and manufactured for the specific purpose of circulating chemically treated water to the building HVAC systems.

C. All pumps, circulators and system components shall be installed in accordance with state and local codes.

D. Secure all permits and local/state approval for the components as specified and included under this Section.

1.3 RELATED SECTIONS

A. Examine all drawings and criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

1.4 REFERENCES

A. Applicable provisions of the following Codes and Trade Standard Publications shall apply to the work of this Section, and are hereby incorporated into, and made a part of the Contract Documents.

B. Material standards shall be as specified or detailed hereinafter and as follows:

1. NEMA MG1 – Motors and Generators; National Electrical Manufacturers Association.
2. NEMA OS1 – Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 1989.
3. NFPA 70 – National Electrical Code.

4. UL 778 – Standard for Motor-Operated Water Pumps.
5. ASME – Section VIII, Unfired Pressure Vessels.

C. Reference Standards

1. AFBMA: Anti-Friction Bearing Manufacturers Association.

   a. 1-84 - Terminology for Anti-Friction Ball and Roller Bearings and Parts.
   b. 9-84 - Load Ratings and Fatigue Life for Ball Bearings.
   c. 11-78 -Load Ratings and Fatigue Life for Roller Bearings.
   d. 20-77 -Metric Ball and Roller Bearings Conforming to Basic Boundary Plans.

2. ASTM: American Society for Testing and Materials.

   a. A 48-Gray Iron Castings.
   b. B 62-Standard Specification for Composition Bronze or Ounce Metal Castings.
   c. B 584-Standard Specification for Copper Alloy Sand Castings for General Applications.

3. HI: Hydraulics Institute.

   a. Hydraulic Institute Standards.

4. ANSI B15.1
5. OSHA: Occupational Safety and Health Administration, U.S. Department of Labor.

1.5 SYSTEM DESCRIPTION

A. Provide base mounted, horizontal axial split-case, or vertical mounted split-case, double-suction, single-stage centrifugal pumps, or base mounted, single-stage end suction radial pumps, as shown on the drawings. Capacity, RPM, head and electrical motor characteristics shall be as scheduled on the drawings.

1.6 SUBMITTALS

A. See Section 15050 and General Conditions for additional information.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics, connection requirements and all dimensional data including operating weights.

C. Manufacturer's Installation Instructions: Indicate hanging and/or support requirements and recommendations.

D. Millwright's Certificate: Certify that base mounted pumps have been aligned.

E. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions and replacement parts list.

F. In addition to items specified elsewhere provide:

1. Large scale certified pump curves indicating operating points.
2. Detailed motor data.
3. Detailed coupling data
4. Detailed seal data.
5. All pump construction data.
6. Detailed bearing data.
7. Base details
8. Dimensioned pump and motor drawing.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing, assembly and field performance of pumps, with minimum three (3) years of documented experience.

B. Alignment: Base mounted pumps shall be aligned by qualified millwright.

1.8 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL 778 testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

B. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

1.9 DELIVERY, STORAGE AND HANDLING

A. All pumps shall be delivered in containers and shall be kept in a dry and protected area.

B. All pumps shall be given 2 coats of rust resistant paint at the factory prior to installation.

1.10 ENVIRONMENTAL

A. Do not paint or install pumps when environmental conditions are outside the specific limitations of the referenced codes and manufacturer’s recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS ACCEPTABLE FOR PRODUCT TYPES INDICATED CONTINGENT UPON PRODUCTS' COMPLIANCE WITH THE SPECIFICATIONS

A. Base mounted pumps:

1. Bell and Gossett.
2. Aurora Pump Division.
3. Peerless Pump.
4. Weinman.
5. PACO

B. In-line circulators:

1. Bell and Gossett.
2. Aurora Pump Division.
3. Thrush Products, Inc.
4. Weinman
5. Armstrong

C. Expansion Tanks

1. Bell and Gossett
2. Amtrol
3. Wessel
4. Armstrong

D. Air Separators

1. Bell and Gossett
2. Amtrol
3. Spirotherm
4. Wessel

2.2 PUMPS GENERAL

A. Statically and dynamically balance rotating parts.

B. Construction shall permit complete servicing without breaking pipe or motor connections.

C. Pumps to operate at 1750 rpm unless scheduled or specified otherwise.

D. Pumps of the same type shall be from one pump manufacturer.

E. Motors shall be in accordance with Section Motors, unless otherwise specified.

F. Provide guards around shafts and couplings in accordance with OSHA and ANSI recommendations.

G. All parts shall be suitable for Variable frequency drives; including but not limited to Motor, Pump, all pump components, coupling, and base.

H. Design and performance requirements:

1. Scheduled design flow, design head, pump efficiency, and motor horsepower are minimum acceptable.
2. Scheduled design brake horsepower and speed are maximum acceptable.
3. Pump curve shall rise continuously from maximum flow to cut off.
4. Shut-off head shall be approximately 20 percent greater than design head, unless otherwise indicated in pump schedules.
5. Pump brake horsepower not to exceed motor horsepower rating over entire operating range (from shut-off to run-out). Motor shall not operate in service factor
6. Suitable for parallel operation.
7. Pumps shall operate within the preferred operation region as defined by the Hydraulics Institute.
8. Select pump for operation at or near peak efficiency.
9. Cavitation-free at all points on curve.
10. Impeller diameter shall not exceed 90 percent of the maximum cutwater diameter.
11. Vibration levels of pump shall be within the vibration limits established by hydraulic institute.

2.3 BASE MOUNTED PUMPS

A. Type: Centrifugal, single or multi-stage where noted, base mounted flexible coupled, single or double suction as noted.

1. Casing:

a. Casing shall be constructed of cast iron ASTM A 48 Class 30A or better.
b. Casing shall be rated for 1.25 times the scheduled working pressure with a minimum rating of 150 psig.
c. Cast iron castings shall be sound and free of shrink holes, blow holes, cracks, scale, blisters and other defects.
d. Casing shall have flanged suction and discharge per ANSI B16.1 for sizes 2-1/2 inch and larger. Smaller sizes shall be threaded connections.
e. Casing shall have a tapped and threaded plug for an air vent.
f. Casing shall be provided with a threaded drain plug at the lowest point.
g. Casing shall be provided with a seal flush connection.
h. Casing wearing rings shall be replaceable and constructed of bronze ASTM B 584 or ASTM B 62.
i. Casing shall be base supported.
j. Casing shall be vertically or horizontally split as indicated.

2. Impeller:

   a. Impeller shall be constructed of one piece bronze ASTM B 584 or ASTM B 62.
   b. Fully enclosed design.
   c. Impeller shall be keyed to the shaft and secured with a stainless steel, 300 series washer and bolt. Bolt to tighten in direction opposite rotation of impeller.
   d. Dynamically balanced for smooth, low vibration operation over the operating range from shut-off to run out.
   e. Impeller shall be provided with replaceable wear rings.

3. Shaft:

   a. Shaft shall be solid stainless steel AISI 316 turned, ground and polished and ring gauged for accuracy.
   b. Shafts shall be polished to a minimum 16 microinch finish.
   c. Shaft deflection shall not exceed 0.002 inches in the round.

4. Shaft sleeve:

   a. Design such that there is no contact between the pump shaft and the pumped liquid.
   b. Shaft sleeve shall be stainless steel, AISI 316.
   c. Provide O-ring or gasket to prevent leakage of pumped liquid.

5. Shaft seals:

   a. Mechanical type.

      1) Stainless steel hardware and spring.
      2) EPT rings, carbon rotating face against a tungsten carbide nickel binder seat.
      3) Seals shall be balanced type for all pumps with 100 psig or greater suction pressure.
      4) API 610 seal number: USTFM. Similar to John Crane Type 1 or 2 material code $\mathbf{0_{(28)}\text{-}P_{(66)}\text{-}1\text{-}0_{(15)}\text{-}1}$.
      5) Provide a bypass line from the discharge side of the pump casing to the seal faces. Design to ensure adequate flushing and proper lubrication.

   b. Provide Doxie or equal cyclone separator on seal flushing lines on all pumps with a head of 25 PSIG or greater.

6. Bearings:

   a. Grease lubricated ball bearings.
   b. L-10 life minimum 100,000 hours.

7. Motor:

   a. Refer to Section 15170 “Motors and Controllers” for requirements.

8. Drive coupling:

   a. Flexible coupling with OSHA and ANSI type coupling guard.
   b. Suitable for variable speed drive.
   c. Suitable for system duty, fluid, and service temperature.
   d. Similar to T.B. Woods (the coupling service factor shall not be less then 2).

9. Base:

   a. Cast iron or fabricated steel base with drip rim and tapped NPT connection for drain.
   b. Common base for pump and motor.

10. Painting:

   a. Pump components shall be thoroughly degreased, deburred and sandblasted as required before the application of any primers or paint.
   b. Prime coat components before assembly; finish coat after assembly.

11. Nameplate:

   a. Provide pump with a nameplate constructed of 18-8 stainless steel securely fastened to pump casing by stainless steel pins.
   b. Locate nameplate for easy visibility.

12. The rating conditions and other data below, as a minimum, shall be clearly stamped on the nameplate.

   a. Manufacturer, address, telephone number.
   b. Pump model number.
   c. Pump serial number.
   d. Size (including impeller diameter scheduled in inches).
   e. Type.
   f. Equipment designation as listed on the pump schedule.
   g. Flow scheduled (gallons per minute).
   h. Dynamic head scheduled (feet of water).
   i. Efficiency (percent).
   j. Shut-off head (feet of water).
   k. Speed (RPM).

2.4 IN-LINE CIRCULATOR

A. Casing: Bronze cast iron rated for 150 psi working pressure.

B. Impeller: Bronze.

C. Shaft: Hardened alloy steel with integral thrust collar and oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Provide additional pipe supports to support weight of pump, motor, fittings and accessories.

2.5 EXPANSION AND COMPRESSIONS TANKS

A. Provide expansion and compression tanks, air separator and other pump hydronic accessories, as shown and as scheduled on the drawings.

B. Tanks shall be the pressurized captive air bladder type.

C. Provide replaceable elastomeric bladder suitable for a maximum operating temperature of 240°F

D. Provide integral steel base ring for vertical mounting.

E. Tanks shall be constructed and certified to ASME Section VIII

1. Pressure rating150 psig
2. Temperature of 240°F

F. Provided with charging valve enclosure, remote air connector coupling, system connection and lifting rings.

G. Tanks shall be provided with factory applied rustproof coat of paint to the exterior of tanks.

2.6 AIR SEPARATORS

A. Provide air separator with flanged inlet and outlet connections.

1. Provided with drain connection with valve.
2. Shall be tangential type.
3. Bottom blow down.
4. Full size removable strainer.

B. Pressure drop shall be 0.5 psi of water and maximum velocity shall be 4 fps.

C. Minimum 95% efficient on air removal.

D. Minimum 90% efficient sediment removal down to 40 microns.

2.7 MAKEUP AND RELIEF VALVES

A. See specification SECTION 15120

PART 3 – EXECUTION

3.1 PUMP INSTALLATION

A. Pumps shall be installed so as to ensure easy accessibility for service or removal and replacement of all components such as, but not limited to, impellers, motors, drive couplings, bearings, strainers, other pump appurtenances and isolators.

B. The Contractor shall receive and inspect all pumps and motors to ensure they are received without defect.

C. All defective or damaged pumps shall be returned to the manufacturer by the Contractor for replacement.

D. The Contractor shall properly protect all equipment to prevent damage from water, dirt, etc. Protection shall include temporary plastic wrap to keep equipment in original factory condition.

E. Set pump on concrete base, anchor, level and grout according to manufacturer's instructions. Where specified or where indicated in the equipment schedule on the mechanical drawings provide vibration isolators under pump base.

F. Provide line sized shutoff valve and strainer on suction and line sized silent check valve and flow control balancing valve on discharge unless otherwise noted on mechanical drawings.

G. Decrease from line size, with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

H. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

I. Refer to pump detail on mechanical drawings for other accessories to be provided.

J. Provide drains for bases and stuffing boxes piped to and discharging over floor drain. Provide air cock and drain connection on horizontal pump casings.

K. Manufacturer representative shall check, laser align, and certify base mounted pumps 25 motor horsepower and over, before start-up. Pump and drive shall be aligned in accordance with Hydraulic Institute Standards.

L. Pumps shall be installed so as to ensure easy accessibility for service or removal and replacement of all components such as, but not limited to, impellers, motors, drive couplings, bearings, strainers, other pump appurtenances, isolators, and flex connections.

M. The Contractor shall receive and inspect all pumps and motors to ensure they are received without defect. All defective or damaged pumps shall be replaced.

N. The Contractor shall properly protect all equipment to prevent damage from water, dirt, etc.

3.2 EXPANSION TANK

A. Provide where indicated in the drawings.

B. Install in accordance with manufacturer's installation instructions.

C. Charge with air to the specified pressure prior to the system fill.

3.3 AIR SEPARATOR

A. Provide where indicated on the drawings.

B. Install in accordance with manufacturer's instructions.

END OF SECTION