

## SECTION 15500 HVAC

### A. GENERAL

1. System designs shall be effective and serviceable. The implementation of the overall system design must meet the needs and be appropriate for the requirements of the individual spaces. Equipment and controls should not be experimental in nature but proven and accepted in the industry.

### B. HVAC PUMPS

1. In-Line Circulators  
Specify direct drive, unitary style in-line circulators, supported directly from the system piping. Install with shafts horizontal.
2. Close Coupled Pumps  
Specify cast iron construction; bronze fitted, end suction pumps.
3. Base Mounted, Flexible Coupled, End-Suction Pumps  
Specify cast iron construction, bronze fitted, flexible couplings, end suction pumps mounted on a cast iron or steel base. Align base mounted pumps after installation and provide alignment check report. All new pumps shall be laser aligned prior to startup. Provide a written report to the design engineer upon completion of alignment.
4. Net Positive Suction Head  
Design inlet pipe and select pump(s) to ensure Net Positive Suction Head adequate to prevent cavitation at design water temperatures and flow rates.
5. Vibration Isolation - Noise  
Specify stainless steel flexible connections at pump inlet and outlet to prevent noise transmission from the pump to the hydronic pipe work.
6. Maintenance - Isolation Valves  
Install full line size isolation valves upstream and downstream of the pump to enable service of the pump. Provide check valve and strainer. Do not use multiple-duty valves for piping larger than 2 inches diameter. Provide pump/piping design so that bearings and seals can be serviced without disconnecting pipe work. Triple duty valves are acceptable for all pipe sizes.
7. Bearings  
Specify oil and sleeve type for fractional horsepower circulators, otherwise use

grease lubricated, heavy duty, deep groove ball bearings with a certified rating design of 200,000 hours of average bearing life.

8. Couplings  
Specify flexible couplings between motor and pump.
9. Seals, packings  
Mechanical seals are preferred.
10. Pressure Gage Tappings  
Specify pressure gage tappings on the suction and discharge of the pump, and a pressure gage piped and valved to read both suction and discharge pressures.
11. Motor  
Refer to Section 15170.
12. Mounting Pad  
Install pumping units on 4" high concrete pad. Properly grout the pump base.
13. Balancing Valves  
Provide manual balancing valves on the discharge piping at each pump. Balancing valve assembly shall include a venturi for reading flowrate and a manual throttling valve with memory stop.
14. Provide variable frequency drives for all pump motors exceeding 7.5 HP.

### **C. PUMPING PACKAGES**

1. Do not provide pumping packages for chilled water and heating water systems.

### **D. VIBRATION ISOLATION**

1. General
  - a. Vibration isolation is required on all equipment with motors 2 h.p. and above.
2. Equipment Base Isolators
  - a. All equipment base isolators shall have a vibration transmissibility of less than 20%.
  - b. Utility sets and air handling units with wheel diameter less than 27 inches and all equipment in basement or on grade, except high pressure apparatus, may be mounted on rubber-in-shear units.

- c. Fans and air handling units except those with wheel diameter less than 27 inches and in basement or on grade units, shall be isolated with spring type isolators to meet the following requirements:

<u>Fan Speed</u>	<u>Allowable Transmission</u>
0 to 450 rpm	20%
450 to 850 rpm	10%
850 rpm and over	5%

3. Concrete Inertia-Block Bases

- a. Use concrete inertia block bases on the following equipment:

1. Fans and air handling units (up to 5" static pressure) driven by 75 hp or larger motors. If internal isolation is provided, inertia bases are not required.
2. High pressure fans and air handling units (over 5" static pressure) driven by 30 hp and larger motors.
3. All pumps of 20 hp and over.

**E. BALANCING**

1. The HVAC system design must incorporate means for balancing air and water systems. Such means include dampers, temperature and pressure test connections, and balancing valves. The specifications shall require a contractor independent of the installing contractor be procured for testing and balancing air and hydronic systems. The balancing subcontractor should be AABC or NEBB certified.

**F. HUMIDIFICATION**

1. Steam to steam generator utilizing clean city water and campus steam shall be used when campus steam is available. Provide water softener to pretreat city water to prevent scaling. Provide automatic drain down based on total dissolved solids.
2. Provide steam boiler or gas fired humidifier where campus steam is not available. Utilize city water to generate humidification steam. Water softener shall be used to pretreat the city water.