

Modify subsection .03 in Section 23 21 23 HVAC Pumps per the following (deletions are shown struck through and additions are double underlined). Remainder of section is unchanged.

23 21 23 HVAC Pumps

.03 Execution

A. Installation and Start-up/Commissioning

1. Install pumps and accessories in strict accordance with the manufacturer's requirements for maintaining optimum hydraulic performance and lowest accessory pressure drop.
2. Base mounted pumps installed on slab-on grade shall typically be mounted on a concrete housekeeping pad with anchor bolts. Base mounted pumps installed above grade shall be provided with concrete inertia bases with spring vibration isolators.
 - a. Exception: For sensitive applications, such as experimental research that could be affected by mechanical system vibrations, provide inertia bases and spring vibration isolation regardless of floor construction.
 - b. In general, the housekeeping pad shall be at least 4 in. thick and 6 in. wider than the pump base plate on each side. Vibration type bases shall also include a minimum 2" pad underneath to prevent water from reaching and corroding vibration spring mountings.
 - c. Steel pump frame bases shall be leveled on housekeeping pad or inertia sub-base, rigidly anchored, and **completely filled with non-shrink grout** formulated for equipment bases in accordance with pump manufacturer's installation instructions. Grout prevents the base from shifting, fills in irregularities, and further stiffens the base to maintain long-term alignment.
 - d. Sound and Vibration Control Requirements: Comply with the following:
 - i. Standard 23 05 01.05 Sound and Vibration Control. Which also references the ASHRAE Handbook—HVAC Applications; Vibration Isolation and Control.
3. All piping connections to pumps shall be independently supported so that no strain is imposed on the pump casing flanges.
 - a. Support suction diffusers and piping directly in contact with pump from housekeeping pad (for slab on grade) or inertia base (above grade).
4. Install line-sized, ~~low pressure drop~~ shutoff valves (~~typically butterfly~~) in the suction and discharge piping of each pump to permit servicing the pump and strainer without draining the system.
 - a. Refer to application guidelines for Shutoff Valves in .02 Valves.^[SR1]

b. In multiple pump arrangements, install a globe style, center-guided, silent (a.k.a. "non-slam") check valve in each pump discharge to prevent reverse flow in a non-running pump.

4.c. Check valve shall be located between the pump and its associated shutoff so the check valve can be serviced or replaced easily without draining the rest of the system.

5. ~~Provide low pressure drop, flow measuring station (venturi flowmeter per 23-05-19 Measuring Instruments for HVAC) located in the pump discharge. Allow adequate length of straight pipe between the pump discharge and the flow station for measurement accuracy. Install flow measuring devices in strict accordance with manufacturer requirements to ensure proper performance. Dedicated flow measuring devices in each pump discharge are NOT to be installed. The goal is to avoid unnecessary system pressure drop, added complexity and installation space requirements to achieve the required straight pipe before and after, and associated installed and operating costs. Flows shall be determined when necessary by portable ultrasonic flow meters or other means and methods. If specific applications have some other overriding reason to include, review those exceptions with Engineering Services.~~

a. **In general, do not use manual balance valves on pump discharge. See Hydronic System Balancing requirements below.**

b. **Multi-purpose (triple duty) valves are not permitted** because:

- i. Their pressure drop is usually greater than separate check and butterfly shutoff;
- ii. they are often inaccurate and particularly at lower pressure drops,
- iii. the check valve portion cannot be repaired without draining the system unless an additional shut off valve downstream

6. Provide flexible pipe connectors on suction and discharge sides of base-mounted pumps between pump casing/suction diffuser and isolation valves for effective vibration isolation.

a. Exception: Flexible connectors are typically not required on in-line pumps (allowing pumps to be supported from adjacent piping). However, special noise or vibration requirements in sensitive applications may overrule and still require the isolators.

b. Systems with operating temperatures less than 105°F: Rubber Spherical Elastomer Type: ~~shall be peroxide cured EPDM throughout with Kevlar® tire cord reinforcement.~~

1. Shall be peroxide cured EPDM throughout with Kevlar® tire cord reinforcement.

1.2. End connections shall be threaded or flanged. The assembly shall encase solid steel rings molded within the rubber to prevent pull out. Flexible cable wire is not acceptable.

- ~~2.3.~~ Minimum tempature rating shall be 250°F.
- ~~3.4.~~ Sizes 3/4" through 2" may have one sphere with bolted threaded flange assemblies.
- ~~4.5.~~ Sizes 2-1/2" through 14" shall have a ductile iron external ring between the two spheres.
- ~~5.6.~~ Sizes 16" through 24" may be single sphere.
- ~~6.7.~~ Include control rods or cables as recommended by manufacturer for the application. The piping gap shall be equal to the length of the expansion joint under pressure. Control rods passing through 1/2" thick neoprene washer bushings large enough to take the thrust at 1000psi of surface area may be used on unanchored piping where the manufacturer determines the condition exceeds the expansion joint rating without them.
- ~~7.8.~~ Strictly follow all of the manufacturer's installation instructions.
- ~~8.9.~~ Documented performance: Submittals shall include test reports by independent consultants showing minimum reductions of 20 DB in vibration acceleration and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer.
- ~~9.10.~~ Shall be SAFEFLEX series as manufactured by Mason Industries, Inc.
- ~~10.11.~~ Substitutions must have certifiable equal or superior characteristics.

c. Systems with operating temperatures 105°F and greater: Do not use flexible corrugated and braided metal pipe connectors. They do not provide adequate vibration isolation.

- 1. Length shall be per manufacturer's guidelines to achieve adequate vibration isolation.
- 2. Strictly follow all of the manufacturer's installation instructions.

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d. All flexible connectors shall be installed on the equipment side of the shut off valves so they can be easily isolated from main system for future inspection and replacement.

END of revision

Update Commentary:

Section was updated primarily for the following reasons:

- 1) *Edit Shutoff Valve requirements to cross reference where defined elsewhere in the OPP Standards to avoid duplication/conflicting guidance*
- 2) *Clarify pump discharge check valve requirements*
- 3) *Eliminate requirement for flow measurement station at each pump*
- 4) *Revise requirements for flexible pipe connectors to use flexible metal type on systems with operating temperatures 105°F and greater*