

## Pump and Pipe Size Decision-making

The following decision-making discussion will help you get experience with the uniform pressure loss method for pump and pipe size selection.

Let's estimate (or get from manufacturers' literature—the more accurate method) the pressure drop of equipment in the circulating system other than pipe and fittings. For pipe and fittings, we will use equivalent pipe length (adding 30 percent, although some designers use more). Assume the ¾-inch pipe didn't work out, so let's go to 1 inch.

- Water heater (estimated or from manufacturer catalog, often omitted) = 1 ft
- 1-inch balancing valves:
  - 3 gpm, 16% closed = 2.2 ft
  - 4 gpm, 10% closed = 2.2 ft
  - 5 gpm, 4% closed (I like to use 10% minimum) = 2.2 ft
- Check valve (1.5 psi to open, approximately) = 3.45 ft
- Total = 11 ft

Let's assume that the pump should have at least twice this head. Let's try a Bell and Gossett PD 35 flexible coupled all-bronze pump rated at 6 gpm at 23 feet of head.

$23 \text{ ft} - 11 \text{ ft} = 12 \text{ ft}$  of head available for piping

$(12/532 \times 1.3) \times 100 = 1.74 \text{ ft}/100 \text{ ft}$  or  $0.75 \text{ psi}/100 \text{ ft}$  (Let's use 0.8 on the pipe size chart.)

Make the B-A section 1¼ inch. I can accept this solution, or I could omit two of the balancing valves (at C and B) and save 4.4 feet. I could then drop down one pump size to an HD3, which has a ⅓-hp motor as compared to the PD35, which has a ½-hp motor. This would save pump cost, energy use, and balancing valve cost (about \$35 each).

I discussed with the designer of the hot water supply piping making the ¾-inch at G a 1-inch pipe. He decided to leave it ¾-inch. The contractor put in a 1-inch.

Hot water circulating pumps can have steep curves (as do the wet rotor pumps). For HVAC, we like relatively flat curves.

Many designers who do this type of work regularly go through these decisions quickly. Others not so experienced hopefully may learn from my decision-making discussion and calculations and gain speed in selecting a hot water circulating system. Some of you may have circular calculators that help you make the decisions needed quickly.