Bigger Is Not Always Better

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It usually starts as a simple design. Then someone mentions the date the project is to be completed by. Somehow there is never enough time to do the job right, and in the electronic age everyone wants to have information immediately.

How do you deal with this situation? Well, one way is to take a short cut on the actual calculations to size major equipment by using either rule of thumb or an educated guess. Or sometimes we perform the calculations but do it so quickly we may not take into account all of the criteria necessary to provide an informed calculation. Often the result is that we specify equipment that is oversized for the job.

So, you may ask, what is the problem with that? Nothing is wrong with oversizing equipment just a little, but I have seen equipment that is more than just a little oversized. Why? I think it may be because the people sizing the equipment didn’t understand the type of building they were designing for. If I had a nickel for every time I have heard “Oh, it’s only plumbing,” I would not need to be in this profession any longer.

Plumbing systems are getting more complex, and demands are being made by equipment manufacturers to stay within closer and closer design tolerances. Some good examples are gas pressure regulators, water pressure regulators, water softeners, water heaters, and, of course, the dreaded thermostatic mixing valve. Oversized piping tends not to be a big problem—except for drainage piping. Drainage piping is supposed to be designed so that the velocity of the flow is at a minimum of 2 ft per second. If the piping is oversized, the minimum velocity drops below 2 ft per second. The next thing you know, you have clogging problems. Then the owner of the building calls to say that the system keeps clogging up.

Of the equipment likely to be oversized, water softeners and water heaters are the least likely to cause great problems, but they can really be a nuisance. Water heaters waste energy when they are oversized. When a water softener is too large and the velocity through the softener cannot be maintained above the minimum rate, the media tends to channel, so the water takes a short cut through the softener and does not get fully softened. You should check with the softener manufacturer to verify the minimum velocity necessary to prevent channeling of the softening media.

Gas pressure regulators and water pressure regulators tend to perform the same way when they are oversized. If the minimum flow through a gas or water pressure regulating valve is less than 15% of the regulator’s rated flow, the regulator tends to search for an equilibrium point that satisfies the pressure requirements. This searching creates pressure fluctuations that can cause equipment malfunctions or failures.

Again, you should check with the manufacturer to verify the minimum necessary flow through the regulating valves.

My personal favorite is the thermostatic mixing valve. Oversizing a thermostatic mixing valve can be not only frustrating but also dangerous. Thermostatic mixing valves are probably the most critical piece of the plumbing system that I see miss-sized. As you can imagine, from time to time I receive calls from building owners and other designers about those dreaded temperature fluctuations in the hot water system. The thermostatic mixing valve usually is the culprit. Too many times when I ask the size of the thermostatic mixing valve, the answer is “more than an inch and a half” or, sometimes, “more than 2 inches.” Those valve sizes work great in processes that use a lot of water on a consistent basis, but they really create problems when the flow rates through the valves vary greatly. Like pressure regulating valves, thermostatic mixing valves have a minimum flow rate that needs to be considered. I have observed systems that do a great job at providing the flow rate needed for every fixture in a building to operate at the same time but fail miserably in the middle of the night when only one lavatory is operating.

Please take the time to understand these devices. The application and use of thermostatic mixing valves have become part of almost every project I am involved in. Probably it is the most critical system I deal with on a daily basis. We will spend more time in future columns dealing with these systems and what to watch for.

Needless to say, the oversizing of systems can present some interesting situations to those of us involved in the trade. With careful forethought, problems can be minimized. You will have fewer problems if you take into account the system’s minimum flow requirements rather than its maximum capacity.

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