Staying Out of Hot Water

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In an earlier column we discussed the oversizing of various pieces of equipment. I want to explore one of them—thermostatic mixing valves—in more depth. I have been contacted many times by building owners complaining of fluctuations in water temperature in their domestic hot water systems. Invariably, the cause is the thermostatic mixing valve.

It's imperative to understand the basis for sizing thermostatic mixing valves if your end product is going to be a properly operating domestic hot water distribution system. Too many times in the field, I have come across valves that had been sized based on the number of fixtures connected to the system, without regard for how the facility operated. The result is a system that cannot be controlled properly.

Case in point: Recently I had the opportunity to review a system that was not working. Because the system was in a healthcare facility, hot water temperature control was extremely important. Three valves had been installed. They had equal capacities and were piped in parallel. The total capacity of the valves was based on hot water distribution pipe sizing using the fixture-unit method of pipe sizing. While this method is a great way to size piping, it does not work well for sizing thermostatic mixing valves. The result of having the three valves both piped in parallel and oversized was a lack of temperature control.

Thermostatic mixing valves sometimes have a difficult time dealing with low-flow conditions. If the valve is oversized, low flow occurs on a regular basis. When a valve is oversized and the thermostatic element does not sense the hot water creeping by, water that is hotter than it should be can get into the hot water distribution system. The problem is made worse in a hot water recirculation system, which will move the hotter-than-desired water through the distribution system. The next thing you know, you have a severe problem that could be very dangerous.

To prevent the oversizing of thermostatic mixing valves, you have to know anticipated domestic hot water usage, as well as the way the facility is going to operate. For instance, if you are working with a nursing home or hospital, you need to take into consideration how many of the fixtures will be used at any given time. Using Hunter's curve for determining the size of a thermostatic mixing valve could have dangerous consequences. The number of fixtures in a nursing home has nothing at all to do with the amount of water that may be used at any given time. In a nursing home, there usually are some residents who cannot bathe without assistance. If this is the case, and if only a few staff members are available to assist these residents, then only two or three showers or tubs may be in operation at any given time, instead of 40 showers that may be connected to the thermostatic mixing valve. Looking at how the system is going to be used is imperative if the system is to function the way you, the designer, intend it to.

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If you are dealing with a large system, consideration should be given to placing multiple thermostatic mixing valves in the system rather than a single system at the water heater. If you do choose to use a single master mixing device, you need to take into consideration the potential for low flows in the system. The one person who takes a shower or washes his or her hands at 4 am needs to be able to do so without worrying about whether the water coming out of the shower head or faucet will be too hot. One way to resolve the problem may be to use a high-low valve arrangement that will allow for both low-flow and higher flow conditions when multiple fixtures are in use. You should contact the thermostatic mixing valve manufacturers to thoroughly understand their products and how they should be properly applied. The thermostatic mixing valves on the market control water in different ways, and you need to understand how each valve can be applied to function in your system. Each system or building is different, and you need to look at it on an individual basis.

You also need to pay attention to how the thermostatic mixing valve piping configuration can affect the system. Consult the manufacturers and get their recommendation on the proper piping schematic for their valves. The piping arrangement will change depending on which valve is being used. If you can avoid the pitfalls of sizing thermostatic mixing valves, you won't have to learn a lesson the hard way. ■

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