



# Overheating taking place? Pay attention to details...

By George R. Carey

I wanted to share with you a couple of problem jobs that I have been asked to visit over this winter. The phone calls all described the same thing...Overheating or unwanted heat in a zone that was off...the thermostat was not calling and the respective zone valve was CLOSED!

The first job was piped like the drawing in figure 1. You can see that the system was set up with zone valves on the supply header down in the boiler room and the system circulator that served all of the zone valves was on the return line pumping back towards the boiler.

The service technician who had called me tried to describe the piping arrangement over the phone and what was happening. A top floor unit was overheating so badly that the tenant had the thermostat turned down as low as it would go, had windows partially opened and the temperature was still 77-78°F in the unit. After a while, we decided to meet at the apartment building to see if we could figure out what was happening.

The boiler room piping was basically as drawn in figure 1. Of course, when we first started, we did not know that the top floor zones were piped with one supply line and two separate returns connected to the main return line in a ceiling somewhere. All of the other units were piped as simple series loops.

When we first began looking, the piping in the mechanical room looked like every other multi-zoned hydronic heating system that used zone valves. The circulator was set-up to run on constant circulation. When the outdoor temperature dropped below a set temperature, the circulator would turn on.

Each individual apartment had a thermostat wired down to its respective zone valve in the basement. Whenever the thermostat called for heat, the zone valve would open, allowing the hot water that was already circulating around the building into the zone of baseboard.

So as we were checking out the boiler room piping, we kept asking ourselves, "How could water be circulating through a zone with its zone valve closed?" The obvious answer is, it can't...but at the same time we had a unit upstairs that was severely overheating.

Fortunately, each zone valve had a service valve that would be used when you had to fix or replace the

zone valve. We decided to close that valve to see if the overheating stopped or continued. By closing this valve, we were taking the integrity of the zone valve right out of the equation.

We waited a while and then checked the supply piping for the overheating zone and sure enough, the line was cold—at ambient temperature! There was definitely no flow going past the zone valve and up into the apartment.

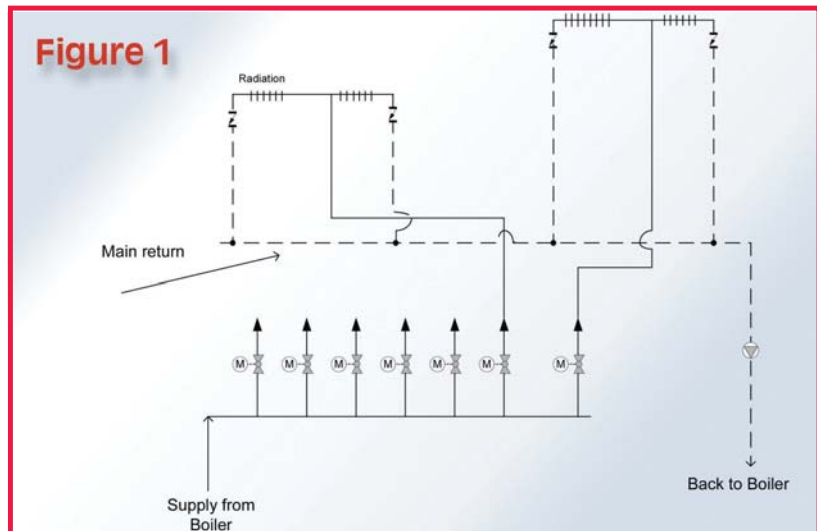
This made us think there had to be a "cross-connected" pipe somewhere that was feeding the other unit. Or somehow, the thermostat wiring to its respective zone valve had to be crossed. Such a situation would allow one thermostat to call for heat but the wrong zone would open, allowing hot water to flow through the wrong apartment. As we were discussing these various scenarios, I kept asking, "How long has this problem existed?"

"About three weeks," came the answer from the property manager who was receiving the phone calls.

"And in that time frame, had ANY work been performed on the system? Thermostats replaced? Piping work?"

The answer was no to all of the above. I said to the service technician, "Let's get upstairs to the overheating apartment; maybe we will see something there which isn't visible from here."

Once inside the apartment, we took the baseboard enclosure off. I wanted to be able to see all of the piping, including the supply and return lines. And when we did, two things "jumped" out at us. First,



was there were three pipes coming into or leaving the apartment. The second was that there were two check valves in the piping at either end of the apartment.

If you look at figure 1 again, you can see that, in fact, there is one supply pipe that splits left and right, feeds both sides of the apartment which then return individually into the main return line. And that explains why they had installed check valves: to prevent the water that was flowing along the return main from any of the other zones from moving backwards up one of the "off" return lines, through the baseboard and back down the other return line.

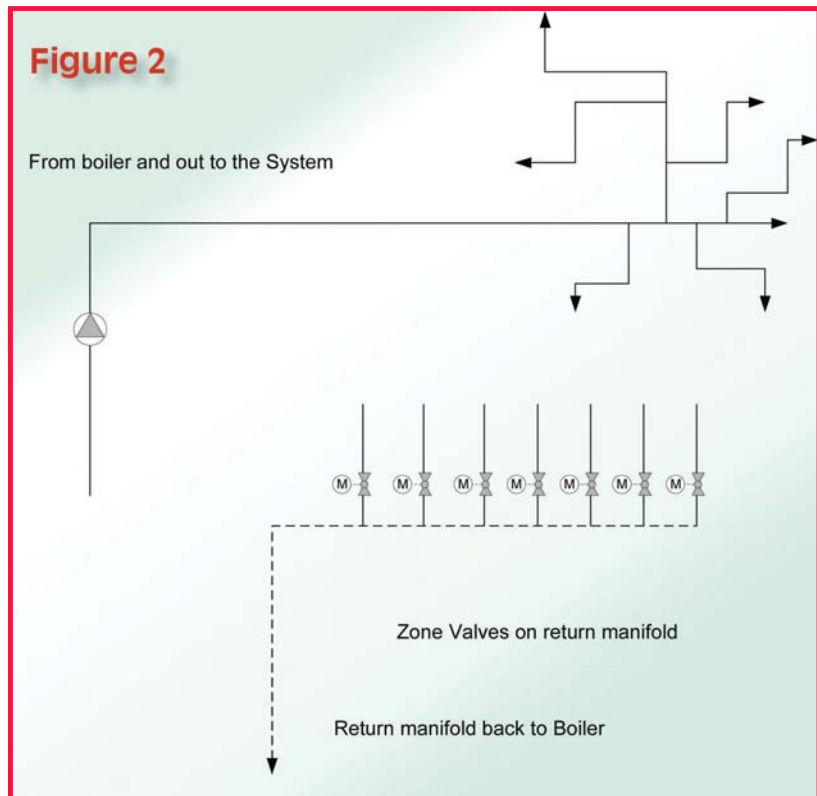
What we speculated to be happening was somehow, the integrity of one or more check valves was compromised. Either something became lodged onto the seat, the flapper was deteriorating or somehow leaking by. Regardless of the cause, we suggested that the both check valves in the overheating apartment be replaced with new ones. And once they were, the overheating complaints stopped!

The other job I was called in on was also one of complaints about overheating and it, too, was zoned with zone valves and one main circulator pumping throughout the building. But the piping in this system was different from the previous problem job, as you can see if you reference figure 2. All of the zone valves were located back in the mechanical room, but this time they were installed on the return manifold. The reason they did this is because the supply main left the boiler as a single pipe and then split off to the various zones in the ceiling and behind the walls.

The only convenient way to zone the system was to locate the zone valves on each return that came back separately to the boiler room. The complaint from the homeowner was that they noticed two zones were overheating even though the thermostat was satisfied and not calling for heat. They described to the service technician that in each of the zones that were too hot, a certain amount of cast-iron baseboard was heating, not all the way across, but enough to throw some heat into the space, making it uncomfortable.

The house had recently gone through a renovation and some changes were made to the heating system. And some of these modifications forced the plumbing contractor to relocate and re-pipe some of the cast-iron baseboard. The service technician went to the customer's house the first time and confirmed that the zone valves were definitely closed, the thermostats in the "trouble" zones were not calling and the return piping of the system side of each zone valve was ambient temperature.

The way this system was piped, there were a lot of take-offs from the supply main out to the heating zones (see figure 2 again). And these take-offs were piped with tees, the run portion continuing along the supply main while the branch portion was feeding up



to the zone take-off. Now when any of the zones calls for heat, hot water is circulated through the main until it reaches the proper take-off for the zone(s) that is calling.

In the meantime, hot water is passing by one or more tees that have their branch portion of the tee facing up towards the zone of piping. The water temperature in the riser connected to an off-zone is certainly cooler than the temperature of the water circulating in the supply main. And Mother Nature hates an imbalance, so she will do everything in her power to re-establish that balance. As the hot water is circulating past these "open" branch runs, heat will go to cold. And when the conditions are just right—the temperature difference, the weight difference (the amount of water which varies depending upon pipe size and type of radiation), the location of the first piece of radiation relative to the supply riser take-off and the stars and the moon are aligned just so—you can have enough HEAT "go to cold" so that the radiation starts to emit BTUs into the zone.

Now remember, this isn't water circulating through the zone, because the zone valves were in fact working as they should. It was simply heat moving to cold. And when a room is already warm enough, any additional BTUs will elevate the space temperature to an uncomfortable level. And that, unfortunately, was happening in this particular home.

To solve it, the service technician located, where he could, spring-loaded check valves that prevented the heat from migrating.

*If you have any questions or comments, e-mail me at [gcarey@fiainc.com](mailto:gcarey@fiainc.com) or call me at FIA. 1-800-423-7187.*