BOILER FACTS

TOOLS AND TECHNIQUES FOR TECHNICIANS

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Two Pipe Steam System and NO traps?

How can that be?

I am not sure how or why it happens, but every now and then I go through a period of time where I keep getting calls or emails from several different people telling me about an obscure heating system that is experiencing some problem. Mind you, each call is for a completely separate system…they just happen to be experiencing similar problems or symptoms. This has been the case over the last month or so where I have been talking to different contractors and service technicians about a particularly nasty type of steam system. At first blush, it looks innocent enough; but as they start looking at all the details, the nastiness starts to reveal itself.

For example, a two-pipe steam system with dry returns HAS to have traps on the outlet side of every radiator. It has to! Why? Well, to explain, we first want a good understanding of what a dry return is. When they say dry, it doesn't mean it is always dry. It will, in fact, get wet any time condensate is flowing from the radiator and back to the boiler room. The dry part refers to when the steam system is off. Is the piping above or below the water line of the boiler? If it is above, then it is filled with air whenever the system is off and that constitutes a dry return.

Dry returns are also connected to each other above the boiler's water line. As the individual radiator returns work their way back to the boiler room, they connect into a common return line which brings back all the radiation's condensate to the boiler room. Once in the room, a main vent is normally located near the end of the return before it drops down towards the floor. There, it then becomes known as a wet return. Why? This section of piping is ALWAYS below the boiler's water line.

Back to the reason why two-pipe systems with dry returns HAVE to have traps located on the outlet of each radiator…if they didn't, the steam would travel past the radiator and get into the dry return piping. And that's where the problems begin! When a steam system is working properly, there is a difference in pressure between the supply and the return side of the system. If that difference "goes away," the steam will stop dead in its tracks. Without pressure differential there is no motive force…no reason to flow out into the system.

When the guys call me and tell they are working on a two-pipe steam system that has dry returns but NO traps, I have to tell them to go back and really check! When they get back to me, the answer is the same: "…there are NO steam traps connected to the radiators, only union elbows or little P-trap elbows!" "Congratulations," I tell them. "You are now working on a VERY old vapor or vapor/vacuum steam system."

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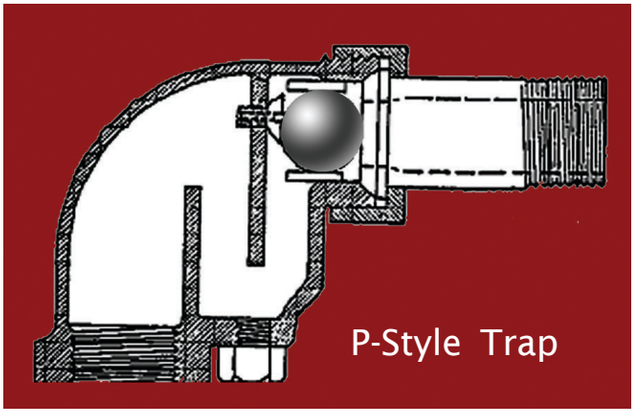
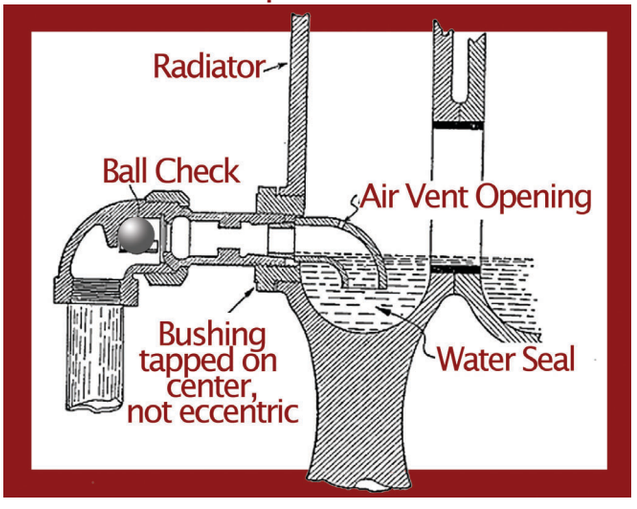


Richardson Trap



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Back in the day, before thermostatic radiator traps were developed, the heating engineers were forced to experiment with various methods to stop steam from passing through a radiator into the return portion of the system. They knew if the steam passed into the return, the system would not work effectively. So these union-elbows actually had a dip-tube like structure on the inside of the radiator that "dipped" down below the water seal which sits at the bottom of every radiator. These dip-tubes also had a very small hole located above the level of the water seal to allow air to vent out of the radiator. A small amount of steam would pass through the hole but would quickly condense as it left the radiator.

Most of the questions I receive are centered on the failure of the existing boiler plant, which now needs to be replaced. In addition to the normal concerns of replacing a steam boiler—because of the "weird" steam traps—the contractors ask if there is anything else they should be concerned with. The answer can be tricky...one option is to leave everything as it is and "kind of hope for the best." If the new boiler doesn't need a feed tank to support the lack of water in the replacement boiler, and the dry returns are in good shape, pitched in the right direction, you can probably survive the replacement. I would suggest changing from the pressuretrol that comes with the new boiler to a vapor-stat. These systems, by their very name—Vapor or Vapor/Vacuum—indicate they were designed to run at very low pressures—ounces, in fact.

A vapor-stat, though more expensive, is much more accurate in controlling the pressure in the system. Because the vapor-stat will operate the system in ounces of pressure instead of pounds, it becomes critical to have the largest capacity main vents installed at the end of the dry return(s). The new boilers are physically smaller and hold less water; therefore, they are more apt to build pressure quickly, especially if the air in the system can't get out quickly and effortlessly. By replacing the old vent with a large capacity vent, you can prevent the new boiler from short-cycling.

If the replacement boiler does require a feed tank, then the stakes are raised. I would strongly suggest replacing all of the old "dip-tube" style traps with thermostatic radiator traps. With a vented feed tank that's open to the atmosphere, you have to ensure that the steam can't get past the outlet of each radiator or it will eventually blow out the vent pipe, filling the boiler room with steam. This obviously makes the job more expensive, but if you try to use a feed tank with the old style "dip-tube" traps, you are creating more trouble for yourself! You will also have to install an F&T trap at the end of the steam main to keep it in the supply-side only of the system. The vapor-stat isn't quite as important if new radiator traps and a feed tank are installed.

The important thing to remember is when you come across a two-pipe steam system and it has dry returns, there has to be some type of "trapping" device on the outlet of each radiator and it has been there from the very beginning.

If you have any comments or questions please call me at 1-800-423-7187 or email me at gcarey@fiainc.com