

# FROM THE FIELD

## Steam Heating Systems

BY DAN FOLEY CONTRIBUTING WRITER

**B**ack in the early 1990's, I worked for a mid-size HVAC company. We dabbled in hot water boiler replacements but were primarily an HVAC company. I had been in the trade for only a few short years and was still learning my way.

One day my boss sent me to do a boiler replacement estimate. I had only done a few of these so I was very cautious. I greeted the client and proceeded down to the basement. I was unsure of what I was looking at so I took an unusual amount of time with my survey. I had never seen a steam boiler before. Where was the pump? What was the glass tube on the side of the boiler? What was the skinny squiggly pipe with the control perched on top? What was the cast iron ball on the other side of the boiler?

After about 30 minutes of scratching my head, I called in reinforcements. I called the office and talked to one of



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the old-timers who had been there for more than 20 years. When I described the system, he immediately knew it was a steam system and advised me to get out of there ASAP and refer the job to a plumber.

I followed orders as instructed, but this did not sit well with me. Why would we turn away good work? How hard could it be to learn these types of systems? I soon found out that it was plenty hard indeed. But I have never shied away from hard work and took it upon myself to learn as much as I could about these systems.

I started by attending a two-day steam seminar taught by my friend and mentor Dan Holohan. I also purchased, read and studied his book, "The Lost Art of Steam Heating." This book is the bible when it comes to steam heat and I advise anyone involved with steam systems to start with this book.

Since that day over 20 years ago, I have been in hundreds of boiler rooms repairing, replacing and renovating steam systems. Back in 2002, we even installed a complete steam system from scratch, including a new boiler, piping, mains, valves and radiators. Steam systems are unique and can be a challenge to work on. That is why I like them so much. It requires thinking and planning, and mistakes are not an option.

I have found steam systems to be both enjoyable and profitable. There are still hundreds of thousands of steam systems out there, especially in older metropolitan areas such as my market of Washington, D.C. Houses and buildings that were built from the 1890's to the mid-1930's were likely to have steam heat.

We do about 12-15 steam boiler replacements per year and many more repairs, re-pipes and service calls. There aren't many companies that are versed on steam heat and this niche is less price-sensitive than other market segments. Most of our clients are just happy to have found someone who understands their system and can fix or restore it. My good friend Frank "Steamhead" Wilsey, who is based in Baltimore, has built his entire business around fixing and restoring old steam systems.

This column can barely scratch the surface on steam heat. Entire tomes have been written about these systems by those with far greater knowledge than me. What I would like to do is share some of my field experience with these old systems and some pitfalls I have run into and learned the hard way.

### 1. Pipe steam boilers with black steel

Steam boilers require schedule 40 black steel piping. I cringe when I see boilers piped in copper. It does not matter if you use L copper and 15 percent silver brazing rod. The copper expands much more than threaded steel, the joints cannot handle the torsional stress and they leak. That's why you always see rags wrapped around the leaking joints or buckets underneath. The threaded joints can handle the stress much better. Copper does not belong on a steam boiler. I recommend taking this shortcut or you will be back fixing leaks.

### 2. Beware wet returns

This one has snagged me a few times. Understand that most steam systems you will work on will be close to 100 years old and these systems are open to the atmosphere. Rust, dirt and corrosion occur in the open piping and settle out in the bottom of the system, in the wet returns.



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At best, these returns are clogged with mud and sediment. At worst, they are completely rotted out waiting for the next fool to grab ahold of it with their 3' Ridgid pipe wrench.

If the piping is in good shape, we will cut in a ball valve and boiler drain and flush out with water under house pressure. You would be amazed at what comes out the other end. If the piping is corroded, leaking or buried under concrete, we will advise replacement and figure it into our bid. Do it now and get paid or do it later for free – it's your choice.

Understand that old boilers can mask these problems, which will be exposed by the new boiler. Old boilers had massive sections and had large water contents. If it took 30-45 minutes for the returning condensate to filter back through the clogged returns, there was not a problem. Replace that old boiler with a new boiler that holds only a couple gallons of water and the boiler will be cycling on low water or flooded if you have an automatic feeder. "The old boiler never had this problem" is what your client will say. I know, I have heard it before and paid dearly for my "education."

### 3. Replace vents and traps

If you address the boiler but do not address the system, you have only done half the job. If the air can't get out, steam can't get in. We include replacing the main vents, radiator vents in one-pipe systems, and steam traps in two-pipe systems. Many times we find the original vents still on the job. The average life of a vent or trap is approximately 5 years, with 10 being the maximum. I realize why these are not changed regularly. Many times they are behind covers or built-in enclosures. Yes, they can be difficult to change, but the vents and traps must be in working order or the system will not operate properly.

### 4. Insulation

Steam is a gas that wants to change back to a liquid. Hopefully this occurs in the radiator or heat emitter where it can give up its latent heat. Often, we find systems with mains that were originally insulated with asbestos insulation. Somewhere along the way, this asbestos insulation was removed and never replaced. Now, the steam begins to condense in the mains before it reaches the radiators. It is always a good idea to insulate exposed steam mains, especially if they run across unconditioned spaces or cold spaces.

### 5. Watch the water lines

This is truer in two-pipe systems but can also get you in one-pipe systems. We once re-piped a commercial boiler in a large apartment house in Washington, D.C. The previous contractor had installed a new boiler and re-piped the wet returns. His mistake was to install a boiler feed pump to make up for the reduced water content of the new boiler. This alone was not a problem as we use boiler feed pumps on many of our projects. The unanticipated problem was that the boiler feed pump opened up the wet returns to the atmosphere. Live steam was blowing out the receiver vent pipe so they installed a 2-inch "master" trap at the receiver inlet. If only it were this easy. The master trap is never a solution.

The solution was to remove the master trap and cut in F&T (float & thermostatic) traps at the ends of the steam mains where the wet returns previously stopped the steam. As the returns were now open to the atmosphere,

live steam was blowing through. The F&T traps cut in at the end of all of the steam mains resolved this issue.

I recently looked at a job in Alexandria, Va. The client was finishing the basement and had a well-intentioned heating contractor raise a wet return in order to have some built-in cabinets installed. This work was done over the summer. Unfortunately, the return was raised above the water line making it a dry return without enough "A" dimension to return condensate by gravity. The result was horrendous water hammer when the boiler fired for the first time that fall. The solution was to drop the return back below the water line, which required the built-ins to be removed and reworked.

### 6. Low water cutoffs

We install dual low water cutoffs on all of our steam boilers. It is cheap insurance. I have seen the results of a dry fired boiler. It is not pretty and it is extremely dangerous. We once had a combination low water cutoff/water feeder fail to function properly causing a commercial boiler to dry fire. When my technician arrived, the sections were glowing cherry red and the plastic trim and plastic gauge covers had melted. This was about as scared as I have ever been on a job site. We got lucky that time but I no longer leave it to chance. Two low water cutoffs go on all of our steam boilers and all safety controls are tested and documented before we leave the site.

### 7. Clean the new boiler

Whenever a new steam boiler is installed it must be properly cleaned and skimmed. The boiler sections contain oils from the manufacturing process and machining. New piping contains cutting oil. Dirt and sediment from the system work their way back to the boiler. All of these contaminants interfere with dry steam releasing from the surface. The oils and dirt need to be cleaned from the system and unfortunately there is no shortcut. We figure the better part of a day to do this and build it into our quote. Again, if you do not factor this into your bid, you will be back doing it for free.

I like to install a ball valve into the return line and waste the returning condensate rather than let it return back to the boiler. I will gradually fill the boiler manually to maintain a normal water line. Once the returning condensate runs clear, I will skim the boiler using a full size tapping. I will install a ball valve in the skim line to make this easier and plug it when we are done to prevent it from being opened accidentally.

We use chemicals sparingly. They are not a substitute for proper cleaning. A little bit of Rhomar steam cleaner usually does the trick but don't go overboard or you will spend days getting the system to run clear.

For a more in depth study of steam heating systems, read Dan Holohan's "The Lost Art of Steam Heating." A more concise overview is contained in his book, "We Got Steam Heat." Both are available at his website ([www.heatinghelp.com](http://www.heatinghelp.com)) along with a wealth of information about old heating systems. ●

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