

FROM THE FIELD

Commercial Steam – Part II

BY DAN FOLEY CONTRIBUTING WRITER



Around the turn of the last century, Washington, D.C. was a growing metropolis. In an effort to house the burgeoning population, a building boom ensued. Residential communities, like Columbia Heights, Capitol Hill, Cleveland Park, Glover Park and Mt. Pleasant, sprang up around this time. Grand apartment buildings, with majestic names like the Cairo, the Wyoming, the Altamont, the Ontario, the Northumberland, and the Mendota, were built during this golden age of D.C. apartment houses.

The Mendota, built in 1901, is D.C.'s oldest intact luxury apartment building (See Photo 1). It was the first of 25 apartment houses to be built in Kalorama Triangle, near the Connecticut Avenue trolley line. This area was considered the far north suburbs of D.C. at the time of construction. The 49 apartments featured 10-foot ceilings, transom windows, built-in corner cabinets, corner marble sinks, and claw-foot enamel bathtubs. The apartment building was converted to a co-op in the 1950s.

The seven-story building is heated by a one-pipe steam system connected to column-style cast iron radiators. The original coal fired boiler is still in place, as the building was built around the boiler (See Photo 2). It has long been disconnected. When we started working on the system, a 40-year-old Weil-McLain MGB steam boiler provided heat. When service calls started to be a weekly occurrence and we had replaced most of the operational parts on the boiler, the building committee decided it was time to consider replacing the boiler.

On a cold, windy January morning, about five years ago, I met with Jim Wood, chairman of the Mendota Building and Grounds committee. As we walked around the building, I knew I could save them money and lots of it. On this blustery winter day, the burner on the boiler fired non-stop with about 1/3 of the apartment windows wide open, many more cracked open, and the remainder of the tenants crying for more heat.

The main venting system was inadequate for the two 6-inch steel mains that circled the basement. The boiler would flood on a regular basis, and the condensate would lag as it percolated through the clogged wet returns. When the water level would drop, the #51 feeder would add

water to maintain the water line. When the condensate would finally return, the boiler would flood necessitating a service call. Water was continuously drained from the boiler as fresh water was added. This caused the boiler to rot from the inside out. Fist-sized holes were found in the cast iron section when the old boiler was demolished.

The building budgeted approximately \$75,000 annually for natural gas when we first starting working on the system. I knew we had plenty of room for improvement. Starting about five years ago, we started making improvements in steps. Wood was instrumental in making the changes, as he understood the system. The next thing I had him do was change the bullet vents on the one-pipe radiators. This was easy to do, and he handled this without our assistance. The first thing we did



Photo 2

was get the boiler in working order. We replaced multiple ribbon burners that had rusted out, and replaced the boiler relief valve and safety controls. The next thing we did was re-build the main venting system. The vents were under-sized and the two mains were not balanced. We had a welder cut in two 1-inch thread-o-lets into the end of steam mains, and then we built vent headers on each main (See Photo 4). We used multiple Gorton #2 main vents, and through trial and error Lead Tech Brian Golden got the mains to balance.

The next step was to remove an old Heat-Timer electro-mechanical control that had not functioned properly in years. We installed a tekmar 269 steam control that adjusts the firing rate of the boiler based on outdoor temperature. We added an indoor sensor in the core of the building to provide feedback to the steam control. We switched the steam sensor to the end of the long main and dialed in the parameters.

These changes, alone, had a fairly dramatic effect on comfort and fuel usage. We had steam to the ends of both mains at approximately the same time. While not entirely



Photo 1

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Photo 3

eliminated, the tenant complaints dropped dramatically. The budget for natural gas dropped to \$55,000 to \$60,000 annually. The easy fixes were done. Now, it was time to bite the bullet and make some hard decisions.

The boiler was approximately 40 years old, and it was getting harder to find the parts we needed

to keep it operational. The wet returns were clogged and rotted out. Several risers were slow to heat leading to comfort issues. There was still room for improvement. My recommendation to the board was to replace the boiler, re-pipe the header, and replace the rotted, clogged wet returns.

I submitted a six-figure proposal, and at first the board balked at the price. When I suggested they review what they paid in fuel over the past five years as well as tally up the service calls and tenant complaints, they came around. It is important to recognize that fuel costs will always dwarf the installed cost of a mechanical system over the life of the equipment.

I shy away from simple payback when discussing replacement cost, as it is meaningless when it comes to a heating system. Heating is a necessity, not an option. A heating system is always going to “cost,” never “save.” The idea is to minimize the costs while providing a reliable, comfortable heating system.

As this was a two-week project, we would only attempt a job like this over the summer. The board accepted my proposal, and Brian and his crew installed a new Weil-McLain LGB-20 steam boiler (2.47M BTU/hr.). (See Photo 3.) The boiler was sized to the connected radiation using a 1.5 pick-up factor. The header was re-piped to manufacturer specifications.

Next, we cut out the old rotted steel wet returns. As expected, they were almost completely clogged with 100 years of sediment, rust and corrosion. There was no flushing this out. They needed to be replaced. We used 4-inch L-Copper and Pro-Press XL brass fittings. I do not recommend using copper anywhere on a steam system except on wet returns below the water line. If we were to do this job today, most likely we would use schedule 40 black steel with Viega Mega-Press fittings. This was not available when we did this project. We added purge and isolation valves to facilitate future flushing of the wet returns. Keep in mind that steam systems are open to the atmosphere. Rust and corrosion are a given. All this corrosion, sediment and crap end up in the wet returns. It is imperative that provisions are made to flush out wet returns on a regular basis.

After the new boiler was installed, we cleaned the system with Rhomar steam cleaner. We let

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the system run for several weeks and flushed out all the sediment and total dissolved solids (TDS) that returned back to the boiler. After flushing the boiler and wet returns, Brian skimmed the water line until it ran clear. This step is critical and takes time; there is no short-cut. Skip this step and you will be back doing it for free. I prefer to build it into my price and get paid for it.

After firing the new boiler, adjusting the combustion and draft, and checking out the system, there were still issues. Several risers would not heat and others were very slow to heat. After walking the basement and tracing out the mains and risers, Brian quickly found the cause. Keep in mind that this building was built in 1901; long before reliable steam traps or F&T traps were commercially available. Steam was kept out of the dry returns through loop seals.

After breaking the unions loose, Brian found the loop seals were also clogged with sediment. Condensate would back up into the main blocking the flow of steam to

the risers. Brian meticulously flushed out each loop seal with water, which allowed the condensate to drain and the steam to flow freely. This helped to balance out the system.

After the changes and upgrades, the new system was put into service. Radiators that had not heated in years were hot. Steam circled the mains quickly and the risers received steam at the approximately the same time. Windows previously opened in January were closed. Tenant complaints were minimized. Most importantly, the fuel budget dropped to \$37,000 to \$38,000 annually. It is easy to close deals like this when you can cut five-figure fuel budgets in half, while at the same time resolving reliability and comfort issues.

I am often asked about converting steam systems to hot water. This is rarely a good option. More often, a better choice is to repair the deficiencies of the steam system and reap the rewards. In this case, we were able to cut fuel usage by over half, while improving client comfort and reliability. ●

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