

# SteamTeam®

Bell & Gossett®  
McDonnell & Miller™

VOLUME 2 / ISSUE 5 / SEPTEMBER 2015

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## Adding chemical treatment to boilers

An engineer planning to specify a Domestic 75CBM22-85 BFU recently asked us if it's feasible to have a chemical feed pump come on at the same time as the make-up to the BFU. The chemicals wouldn't be pumped into the receiver, but instead added to the make-up water.

We advised the customer that adding chemicals to the boiler feed receiver or through the make-up water will void warranties. This is noted in every Domestic Pump Series operations manual:

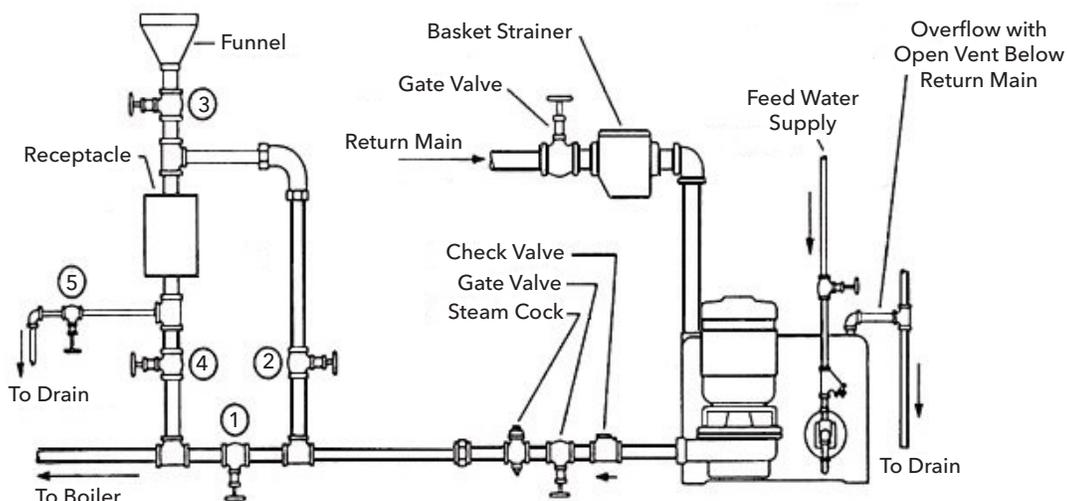
**CAUTION: NOT A CHEMICAL PUMP**  
Inject boiler feed compounds from chemical feed tank into boiler feed piping – never into condensate tank. Failure to follow these instructions could result in injury or property damage.

But let's talk about when and how to add treatment chemicals.

The drawing below shows the standard industry practice which has remained consistent for many years: by means of the funnel and receptacle between the pumps and boiler. That way you can periodically check treatment chemicals and add what's needed to the boiler.

Some people have tried to automate this process (in other words, skipping service and maintenance contracts, leaving everything to the magic black box, and not knowing what's really going on). They replace isolation valves on the discharge piping with a series of solenoid or similar control valves that open every time the pump comes on. The goal is to use the pump to mix and inject the chemicals.

This setup is often linked to a building management system via an auxiliary contact on the pump starter. Each and every time the pump comes on, the BMS is notified and performs a specified action. I'm sure the M&M guys can tell you more about the effects of this action on probes and other components. But our experience with pumps is that this approach simply doesn't work.



**Preferred way to add chemicals**

So let's cut to the chase. Please don't let your customers inject chemicals in any form into the boiler feed receiver. At the very least they'll create the following issues:

1. Solid or powdered chemicals injected into the boiler feed receiver won't fully dissolve. There's just not enough mixing. The result is rapid seal failure, a consequence of pumping high concentrations of abrasive solids—which also skew the pH beyond the seal's rating (typically a pH of 7-9). Less-abrasive liquid compounds still raise the pH issue and can be equally dangerous.
2. The skewing of the pH also accelerates corrosion in the pumps / floats switches and other areas, increasing failures. Add the air from the vented receiver, plus a steam system's high temperatures, and the potential for failure is doubled.
3. Using the make-up water as the mixing agent, then piping into the solenoid make up piping, is likely to compound the dissolving issues. The typical make-up water temperature is too low. Using liquid agents still leaves the other issues in the receiver.

We continue to recommend a slightly more hands-on approach that includes regular checks and periodic reviews of the system as a whole. It's like changing the oil in your car and doing other scheduled maintenance, rather than waiting for the engine to seize up and self-destruct.

If you rely on the chemical guy for answers, you may hear "if a little is good, a lot is better" (mainly for the chemical guy's sales numbers). Have the customer look at what the boiler guy recommends for treating the boiler and how to handle its introduction. Then talk to the trap people and controls guys to make sure what you're doing won't contradict their products. Now factor in what I've said, and you should reach a happy medium that gets the best results for everybody.

Ultimately, as with any system, it's not about what's right for one part. It's about what's right for the system as a whole to keep it in proper balance, providing many years of efficient service.

Jarek Berezowski  
McDonnell & Miller Product Specialist

## How to run a condensate zone off a steam boiler

### 1. Can I run a hot water zone off an existing steam boiler without a heat exchanger?

Yes, but there is a limit to how much radiation your steam boiler can support.

Manufacturers list two capacity outputs on every steam boiler: the Department of Energy (DOE) capacity, aka the boiler's gross output, and the boiler's net capacity. Gross output is about 20% higher than net capacity and includes capacity to pick up the system when you turn it on as well as the load of keeping the piping network warm. Net capacity is the energy available to beat radiation and keep the house warm.

Once the system has warmed up, the boiler has this extra 20% capacity. Its availability determines how much radiation can be supported for the hot water



**Model 750-HW-MT-120 can protect you and your customer from a flooded boiler**

zone. You could run the zone in a priority condition if the load is greater than the pick-up factor, but this means no heat in the steam system while the hot water zone operates.

### 2. What keeps the water "up" in the piping and radiation?

The air around us has weight and presses down on everything it touches. This atmospheric pressure pushes down on the water in the steam boiler, forcing it up into the radiation.

The atmospheric pressure at sea level is 14.7 pounds per square inch, decreasing as you travel higher. One pound of pressure per square inch can lift water

2.31 feet. So, in theory, the atmosphere can support water to about 34 feet (14.7 x 2.31), but the practical limit is closer to 30 feet.

Because atmospheric pressure forces the water in a steam system up, you should never use vents in the condensate zones off the boiler. If you do, as soon as a vent opens, the condensate will fall into the boiler and flood it.

### 3. What happens if I add the hot water zone loads to the size of my replacement steam boiler?

Oversizing your steam boiler will “shove” too much steam into a system designed for a lesser load. That leads to all kinds of problems—water hammer, surging water lines and uneven heating. Don’t do it!

### 4. How should I pipe the hot water zone off the steam boiler?

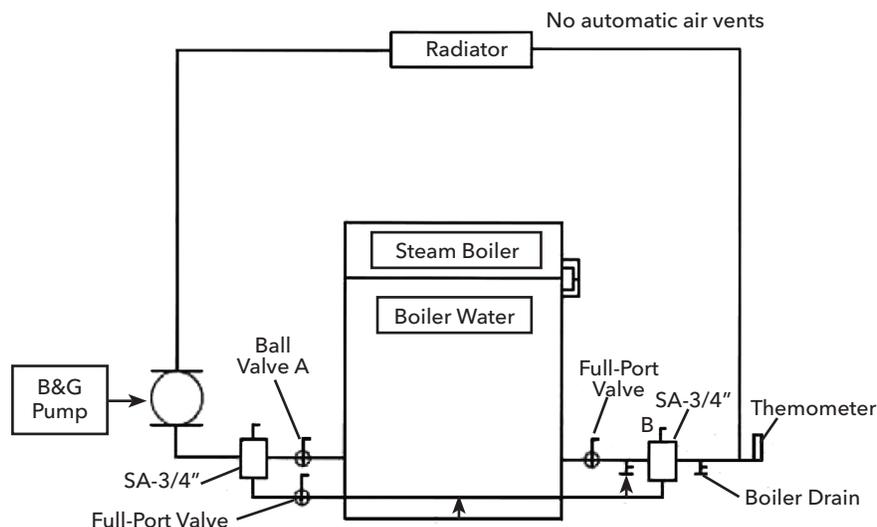
Locate the supply and return connections below the boiler’s water line (see illustration). Ideally, you should have a good cross-sectional flow through the boiler, so that the water doesn’t “short-circuit” through the boiler and not pick up enough BTUs.

Locate the circulator on the supply side (below the water line), pumping away from the boiler and out

to the radiation so that its pressure differential is added to the system, not subtracted. This helps prevent the water from flashing into steam and causing water hammer.

### 5. What else should I consider when piping the hot water zone off the boiler?

Be sure to pipe a bypass around the boiler to limit the temperature of the water that will circulate out to the radiation. When the boiler is producing steam, the water temperature is the same as the steam. At one psi of steam pressure, the water temperature is 216°F; at two psi, the temperature is 218°F, and so on. The problem with water being this hot is that, when the circulator shuts off because the zone is satisfied, it’s likely that some of the water up in the zone will “flash” into steam. Remember, these systems don’t have pressure reducing valves, so the water at the top of the system is under no pressure. Since water can flash into steam at 212°F at zero psi, whenever the circulator turns off, you can get “banging” in the hot water zone and a flooded steam boiler in the basement!



**Piping a hot water zone off a steam boiler**