

# SteamTeam®

Bell & Gossett®  
McDonnell & Miller™

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## Do's and don'ts for one-pipe steam systems

Over the years we've heard numerous questions on steam systems, from what causes water hammer to how to size traps to selecting boiler feed tanks and condensate pumps. We've compiled our answers in the following do's and don'ts for a one-pipe steam system.

**1. DON'T** size a replacement boiler by using the heat loss calculation method, the label method, the "looks a lot like" method or any other rule-of-thumb method.

**DO** size a replacement boiler by counting all the radiation in the house. The total becomes the net EDR (equivalent direct radiation) rating of your replacement boiler. Steam doesn't care about heat loss or anything else--only the amount of the length of piping. If the boiler is too small, part of the building will never heat; if it's too big, the new boiler will short cycle, consume more energy and require more service calls.

**2. DON'T** assume that you can pipe the new boiler exactly the same way as the old boiler.

**DO** pipe the boiler according to the manufacturer's instructions. New boilers are very different from older boilers. The sections are narrower, the exit holes are smaller and less numerous, and the steam chest is almost non-existent. Pipe according to the directions, and save yourself a lot of headaches.

**3. DON'T** just throw in a couple of bottles of cleaning chemicals when you are finished piping a new boiler.

**DO** skim the boiler according to the manufacturer's instructions. Oil from the foundry, as well as the cutting oils used in the field, creates surface tension on the top of the water in the boiler. This sets up a foaming/priming condition that creates wet steam, leading to water hammer, lack of heat, and unhappy customers.



Hoffman Specialty Air Vent Series 75

**4. DON'T** use small radiator vents as end of main vents! Worse, don't use a pipe plug.

**DO** use the largest main vents you can get. Venting the air from the main separately, and quickly, significantly improves the system's balance: with a large vent, the steam heads toward the end of the main before it starts filling the risers. Hoffman Specialty Vents Number 4A, 75 or 76 are the right choice.

**5. DON'T** size the horizontal run-out to a one-pipe riser based on the inventory method.

**DO** use a steam pipe-sizing chart that tells you the exact size needed to support the radiation connected to that riser. The pipe that connects the steam main to an up feed riser is called a horizontal run-out. Its job is to simultaneously supply steam to the riser and let condensate returning from the radiators drain back into the steam main. If the steam is moving too fast, the condensate can't drain back into the main; instead, the steam will drive it toward the radiator vents.

**6. DON'T** use adjustable vents based on the radiator's location.

**DO** use adjustable vents based on the radiator's size. When coal-fired systems were converted to oil or gas, the system operated differently. Adjusting to this new

“on-and-off” system required balancing the air venting of the larger radiators against that of the smaller radiators. It had nothing to do with radiator location. With at least one large-capacity main vent installed at the end of each main, the adjustable vents simply control the venting rate of the larger radiators compared to the smaller radiators.



**Hoffman Specialty®  
Adjustable Radiator  
Vent Series A1**

**7. DON'T** raise the setting of the pressuretrol, thinking it will solve a heating problem!

**DO** keep the Pressuretrol® or Vaporstat® set as low as possible, because:

- Low-pressure steam moves faster than high-pressure steam. If you want steam to reach the end of the main quickly, lower the pressure and make sure you install a large-capacity main air vent.

- All radiator vents have a “drop-away” pressure rating. This is the maximum pressure at which the float inside the vent can fall down without stopping the vent from re-opening. If the pressuretrol setting is too high, the vent closes and stays closed, and any air remaining in the radiator can't vent.
- One-pipe steam radiators were sized to heat the house on the coldest day of the year with less than 1 psi of steam. For every square foot of EDR, the radiator will emit 240 BTU/H when the room temperature is 70°F and the steam temperature is 215°F.

**Remember:**

Your Hoffman Specialty representative is always willing to help you solve your steam heating problems. Call them next time you need help.

Pressuretrol and VaporStat are registered trademarks of Honeywell International Inc.

Steve Almgreen  
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Steam Products

## Factory tested as complete pumping packages

These six words, in the specs for every Bell & Gossett Domestic® Pump Series, add up to one word: confidence. Our production team assembles each unit and conducts multiple performance tests, linking the results to the unit's factory serial number file.

Units ordered with control panels are tested through that control panel. We inspect appearance, check float switches and test seals and gaskets for leaks. Pump performance is typically tested at four condition points along the pump curve. For condensate return and boiler feed units, those points are:

1. Dead head or no flow, which measures the maximum discharge pressure for the unit.
2. The actual gpm at the RATED discharge pressure.
3. The actual discharge pressure at the RATED flow.
4. Maximum flow.

In a perfect world, points 2 and 3 would be the same, but in reality, they seldom are. Impellers in our pumps are trimmed to the nearest 1/16th inch increment for



**Domestic Pump CBE Unit**

your specified capacity. The real flow when generating the rated discharge pressure may actually be a gallon or two higher per minute. Similarly, the real discharge pressure at the rated flow may be one or two psi higher. So while those points are very close on the pump curve, they are different.

Maximum flow is subjective. We fully open the fixture's valves and let the pump run out the end of the curve, to just before the starting point for cavitation. Or we run the pump motor into the service factor area, to the point where the pump is drawing almost full load SFA (service factor amps), typically around 110 percent. That keeps us inside the overload protection range so we don't pop fuses or circuit breakers or thermal overload relays. All ODP and TEFC motors in our Domestic Pump Series have a minimum 1.15 service factor. At each point of testing, we record amps draws for the motor.

Vacuum heating units go through similar tests to insure that discharges are correct when the pump is pumping

from a vacuum, that air can be removed and that the vacuum can be maintained at appropriate levels. Testing also lets us set those levels on the diaphragm vacuum switch that controls the vacuum pumps.

For the customer, this all adds up to confidence. It means products leaving our factory have gone through extensive testing and are proven to work as advertised. Testing can also provide comparative information for troubleshooting units and isolating problems on troublesome installations.

Here's what the factory recently gave to a customer who asked to see our test data.

Part QEB033		<b>Test Detail</b>						Thursday, June 04, 2015			
Impeller PN DP3363		Sales Order Number SA9108408		Line# 001	Unit# 1	MFG Order		FAS773451			
Tested by: 1899		Test Date: 8/28/2014						Override User:			
Brand: DOMESTIC		GPM: 45		Water Pump(s)		HP:		Control Voltage: 115 / 1 / 60			
Product Group: CONDU		PSI: 40		HP: 2		RPM:					
Model Number: 454CC		CFM:		RPM: 3500		Voltage:					
Series: CC.C		InHg:		Voltage: 460 / 3 / 60		SFA:					
				SFA: 3.36							
Unit	Pump	Step Number / Description	Pump Type	GPM	PSI	CFM	InHg/Corrected	Amperage	Voltage	Results	Remarks
1	1	1 Shut off Pressure	Water Pump #1	0.0	49.9		/	2.3	474.6	N/A	
1	1	2 Pump Cap @ Rated Pressure	Water Pump #1	50.0	40.8		/	3.1	473.7	P	
1	1	3 Pump Pressure @ Rated Capacity	Water Pump #1	45.5	42.7		/	3.0	475.2	P	
1	1	4 Maximum Water Capacity	Water Pump #1	79.1	24.7		/	3.5	474.0	N/A	
<b>Final Test Results:</b>											
1	2	1 Shut off Pressure	Water Pump #2	0.0	48.7		/	2.2	474.1	N/A	
1	2	2 Pump Cap @ Rated Pressure	Water Pump #2	51.0	40.7		/	3.2	474.8	P	
1	2	3 Pump Pressure @ Rated Capacity	Water Pump #2	46.4	42.2		/	3.1	474.5	P	
1	2	4 Maximum Water Capacity	Water Pump #2	80.7	24.8		/	3.6	473.8	N/A	
<b>Final Test Results:</b>											

### Test Summary



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