

Date: May 4, 2009**Bulletin Number: HP606****Subject: Choosing Steam Boiler Water Level Controls****Background**

Proper water level control selection is essential to the operation and safety of commercial steam heating boilers. Many installations use more than one Low Water Cut-off (LWCO). Choosing the right combination of low water cut-off's depends on many factors, including boiler design, system operating conditions and boiler room equipment selection.

Steam heating boiler water level controls are categorized into three main functions: low water cutoff's, feeders and pump controllers. A low water cutoff is a safety device that shuts the burner off if the water level in the boiler gets too low. Feeders are also safety devices that feed water into the boiler if the water level gets too low. Sometimes these devices are installed more as an aid to fill the boiler automatically rather than having to add water manually. Pump controllers, although they have a low water cutoff function, are unique because they are the only control intended to maintain a boiler's normal water line (NWL).

When using more than one LWCO, we refer to them as primary and secondary LWCO's. Care must be taken so that the installed heights of each control do not interfere with each other. The purpose of the primary LWCO is for safety or maintaining the NWL and is mounted higher than the secondary LWCO. The purpose of the secondary LWCO is primarily for safety, or possibly for feeding and is typically a manual reset device that requires someone present to restart the burner after experiencing a low water condition.

Understanding how the condensate returns to the boiler is key in what controls are provided. Gravity systems rely on atmospheric and static pressure to return water to the boiler. If the condensate does not return to the boiler within a certain time period, the water in the boiler can be depleted and the boiler will go into a low water condition. In order to alleviate this problem, the installer might add a feeder. However, care must be taken in what type of feeder is used and its installed height since overfilling (flooding) can occur. Pumped return systems are typically found on larger steam systems and use a pump to force condensate back into the boiler through the use of a boiler feed system.

Discussion/Applications

How do we know what level controls to furnish on any particular job? There are several factors to consider:

- Do you know how long it takes for the condensate to return? Knowing this, you could compare it to the steaming rate of the new boiler and decide if a boiler feed system would be needed. Sometimes, we don't have this luxury since the old boiler isn't working anymore.
- Did the old boiler have a large water content and what controls were on it? Older, less efficient boilers held more water than today's modern boilers. Since they had more water to steam off, more time was available for condensate to return, sometimes avoiding a low water condition. Maybe the old boiler had a primary LWCO and a secondary LWCO/feeder. More than likely, this feeder didn't feed often. When the boiler is replaced, the same control scheme may be followed and it's possible the new feeder will feed more often. This could shorten the life of the boiler because of constant fresh water being added.

Date: May 4, 2009**Bulletin Number: HP606****Subject: Choosing Steam Boiler Water Level Controls**

- Does the installation have a boiler feed system? If it does, we know a McDonnell & Miller (M&M)150 or a 42 pump controller as our primary LWCO and the secondary can be a M&M 63M.
- Do you have any history from the owner about how the old boiler operated? Speak to the owner, superintendent or maintenance person for the building. Ask them if they ever noticed if the old boiler was taking on a lot of fresh water or if the feeder ran a lot. Maybe there was a boiler feed system and it was removed for some reason – ask why. Maybe the buried return lines were never replaced – ask. Maybe the boiler flooded a lot – ask. Any of these questions can give you an idea of how the old boiler was running and how it used water and will help you decide on what controls to use.

Boiler Feed System or Condensate Tank

These two tanks perform different functions and should not be confused with one another. A boiler feed system has a large storage tank with a sight glass and make-up assembly on it along with a simplex or duplex pump set. Its purpose is to store returning condensate to be used by the boiler when the pump controller calls for it. The water make-up assembly is there to provide fresh water into the tank in the event the tank water level ever drops to a low point. Typically, the make-up assembly on a boiler feed system rarely comes on, so the boiler is always receiving stored returned condensate that is oxygen free instead of fresh water.

The condensate tank is meant to move condensate from one area of a building back to the boiler feed tank. Condensate tanks have a much smaller water storage capacity and do not have a water make up assembly to add fresh water. These tanks have a float switch assembly that makes and breaks as the water rises and falls within the tank. When the switch is made, the condensate pump energizes and sends the condensate back to the boiler feed unit. Sometimes condensate tanks are used in place of boiler feed tanks. Condensate tanks are not substitutes for boiler feed tanks and should not be used as such.

Float and Probe Low Water Cutoff's

Probe type LWCO's must be mounted in a tapping that is typically higher on a cast iron boiler in order for it to shut off the burner at a safe level. Pay attention to the height of the probe tapping compared to where you are mounting a pump controller or other float type LWCO. It's possible the levels of the two controls can interfere with each other. If this is the case, stick to float types for both primary and secondary LWCO's.

Feeders

Some commercial installations are installed without a boiler feed system and use a float type automatic water feeder. There is a misconception about combination LWCO/feeders in that they maintain the normal water line, like a pump controller. This is not true. A feeder does not have the same kind of switch that a pump controller has. The float will make and break its switch according to the level of where it is installed. Most float type feeders have unrestricted flow rates unless a throttling valve installed to limit the flow. Only the M&M 47-2 has a modulating type feed valve. If the water level drops slowly, the feeder feeds slowly. If it drops fast, it feeds fast. Sometimes the feeder is installed right at the boiler's normal water line (NWL) and will feed fresh water every time the float drops. This will lead to premature failure of the boiler sections. When fresh water is introduced to the boiler on a regular basis, sediment will buildup in the sections and result in a crack.

If a feeder (like a M&M 247-2 or a M&M 51) is used, pipe it closer to the lowest permissible water line. Piped in this manner, the boiler has more of an opportunity to receive condensate back before the feeder feeds. The secondary LWCO could be a M&M 63M in this type of application

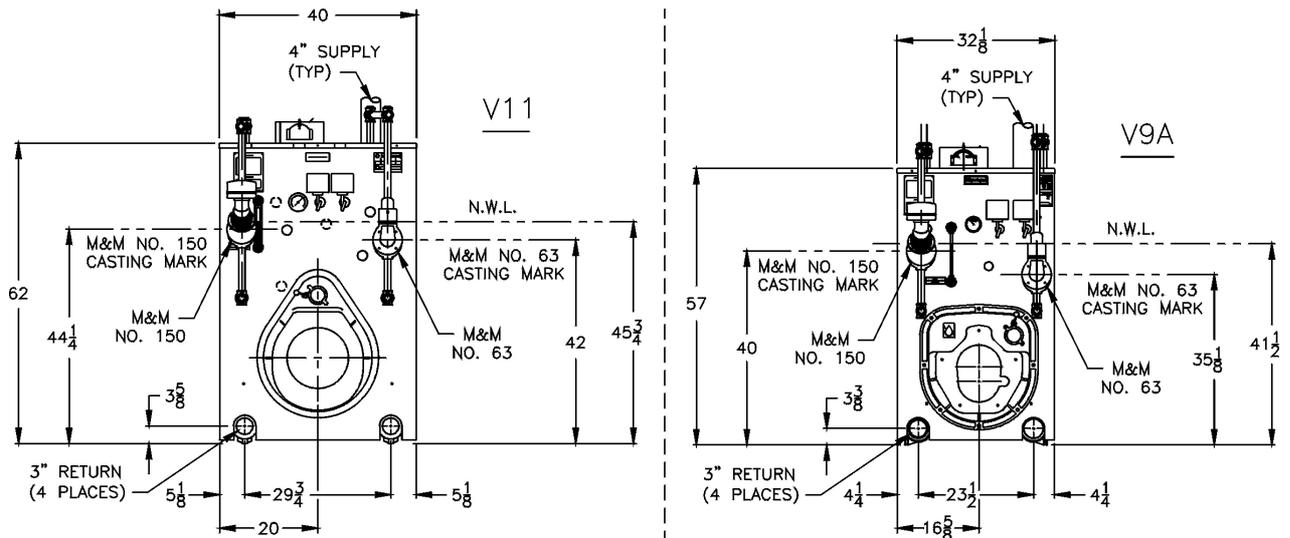
Date: May 4, 2009

Bulletin Number: HP606

Subject: Choosing Steam Boiler Water Level Controls

Application Drawings

Below is the recommended low water cutoff piping combinations on a V9 and V11 with a MM 150 and a 63M:



Below is an example of boiler connected to a boiler feed system:

