

**Date: January 3, 2008****Bulletin Number: HP601****Subject: Sequence of Operation for Two Low-High-Low Steam Boilers, Using Pressuretrols.**

Many steam boiler installations use two boilers connected to a common steam header to meet the building load demand. There are advantages of using two steam boilers over one larger boiler:

- Redundancy: Provides built in back up in the event one boiler is down.
- Efficiency: Typically, each boiler is sized for 60% of the load. One boiler will run longer to meet part load conditions rather than a single larger boiler cycling between low and high fire.
- Staging: By using low high low burners, four stages of operation can be obtained from two burners to meet the steam load.

There are many methods to control the staging of low high low steam boilers. Some installations use sophisticated control panels to automatically stage and rotate boilers according to demand. A common control application is accomplished through the use of pressuretrols. Using the example of two boilers with low high low firing sequences, the pressuretrol settings can be arranged to obtain four different set points to meet the load demand. Assuming most commercial systems are two pipe steam systems that can sustain pressures anywhere from 2 psi to 14 psi, we can sequence the boilers on as follows:

**First Stage:** If the system is using a system starter thermostat (typically a Honeywell T675A set for 65°F), both boilers are energized upon a temperature drop below 65°F, go through their low fire start and begin to ramp up to high fire.

**Second Stage:** One L404F (LHL controller) set at 2½ psi will drop the second boiler to low fire.

**Third Stage:** One L404F (LHL controller) set for 3 psi will drop the first boiler to low fire.

**Forth Stage:** One L404F (operator) set for 3½ psi will turn off the second boiler.

**All Off:** One L404F (operator) set at 4 psi will turn off the first boiler.

The pressuretrols will be set at a ½ psi differential to turn the boilers back on, as steam pressure drops off:

3½ psi - first boiler comes on at low fire through its operating controller.

3 psi, - second boiler comes on at low fire through its operating controller.

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2½ psi - first boiler goes to high fire through its LHL controller.

2 psi - second boiler goes to high fire through its LHL controller.

This process will repeat itself throughout the heating season. Manual rotation of the boilers can be obtained by switching the settings of boilers one and two. Typically, all pressuretrols are all header mounted unless there are intervening stop valves, in which case these controls would remain on the boiler. Since most codes call for manual reset pressuretrols (L4079B), they should be set out of the operating range of the L404F controls. Manual reset controls should always be mounted on the boiler. In this example, the L4079B could be set for approximately 6 psi.

Proper control settings are a must in any steam heating system and will ensure maximum efficiency. The settings provided above are used as an example. Each installation should be fine tuned to the specific job requirements. When on-off burners are used, only two pressuretrols would be required and set for the lowest possible operating range for the connected load using the above logic.