

## Multifamily Facility Management Services

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### OUTDOOR RESET AND CUTOUT CONTROL

#### Description:

In newer multizone hot water heated buildings, the thermostats typically do not control the firing of the boiler. Instead, an aquastat controls the boiler, keeping the water in the distribution system at a constant temperature so that it is always available whenever the thermostat in any of the zones or apartments calls for heat. Therefore, the individual thermostats simply regulate the flow of hot water into the apartment's baseboard loop.

The amount of heat given off by the baseboard radiators depends on the temperature of the water circulating through them. A multifamily building is usually designed so that a water temperature of 180 to 200°F will balance the apartments' heat loss at the coldest winter temperature. But this water temperature is much hotter than is needed for most of the winter.

An outdoor reset varies the temperature of the water in the distribution system in response to outdoor temperature. When the weather is mild, this water is kept at a lower temperature than in the middle of winter. Supplying water that is just hot enough reduces energy in three ways:

1. Overheating of hallways and basements is reduced since the water that circulates through the main distribution loop is cooler.
2. Overheating of apartments is less likely. Even when closed, a zone valve will allow some water to pass into the apartment subloop. If this water is too hot, it could overheat the apartment in spring and fall. Or the tenant may keep the thermostat at a high setting, and may even open the window for comfort rather than turning the thermostat down. With an outdoor reset the water in the system is just warm enough to heat the apartment, not hot enough to overheat it.
3. With a cast iron boiler, seasonal efficiency may be improved because the water in the boiler is cooler.

A companion to the reset control is the outdoor cutout. In many multizone buildings, the boiler is started manually in the fall and turned off manually in the spring. Between the first and last dates that heat is needed, there are many mild periods when it is not; ranging from mild days with cold nights to mild stretches of several days interspersed with colder days. It is not practical for the owner or maintenance person to go to the building to turn the boiler on and off for each of these times, so it continues to cycle to satisfy the aquastat or reset. This can be very wasteful. An outdoor cutout is a device that automatically turns off the burners and the circulating pump(s)

when the outdoor temperature is warm enough so that no heat is needed in the building. Because lighting, people, stoves, and the sun supply some heat, this cutoff temperature is usually between 50 and 60°F.

### **How to Implement:**

Boiler controls should be installed by a licensed heating contractor. Different types of boilers require different methods of reset control. On *cast iron boilers*, it is customary to use a reset that replaces the aquastat and controls the boiler water temperature directly, by controlling the firing rate of the boiler. *Steel fire-tube boilers* are generally considered to be more susceptible to corrosion and thermal shock, and not suited to operate below 140°F. For them, reset control can be achieved by installing a mixing valve that mixes hot water with cooler return water to provide the desired temperature in the distribution loop. A more sophisticated and expensive reset control must be used to adjust the position of the mixing valve in response to outside temperature. Another option for steel-fire tube boilers is to install a reset control with a low limit setting on it which will not allow the boiler temperatures to go below a set temperature. This second option is cheaper, but sacrifices much of the resetting capability as well as the corresponding savings potential.

Some outdoor resets have a fixed “reset ratio” such as 1:1 (one degree rise in supply temperature for every degree decrease in outdoor temperature), 1-1/2 to 1, or 1 to 1-1/2. Others have a ratio that is adjustable. The adjustable ratio is more flexible since the ideal reset ratio may vary slightly from building to building depending on the exact heating characteristics. An adjustable ratio also allows the ratio to be varied if major improvements are made to the building that change its heating characteristics (e.g. adding insulation).

Some resets also include a night setback feature. This feature usually adds expense to the control and no data are available on how much can actually be saved by night setback of the water boiler temperature in buildings that have individual thermostats in each apartment.

Outdoor cutouts are available from some manufacturers as part of a combined reset and cutout control. This is often the most economical way of purchasing both controls. An outdoor cutout can also be purchased as a separate control. In either case, the cutout should be wired to control both the burners and the pump(s).

The proper location of the outdoor sensors is an important consideration for both reset and cutout controls. In order to protect them from direct sun, sensors should be protected by a shield and located in a shaded area, preferably on the north side of the building. Shielding of the sensor is especially important if a north side location is not possible. Otherwise outdoor temperatures may be measured inaccurately and the building will not be well controlled.

Electro-mechanical or electronic reset and cutout controls are also available. Electro-mechanical controls are mechanically actuated and since they use a sensing bulb and capillary tube to measure temperatures, there is a limit to the distance from the control box the sensing bulbs can be located. Electronic controls use electronic sensors attached to common thermostat wire, which eliminates restrictions on the distance between the sensor and the control.