Barometric dampers

Most firebox boilers are equipped with barometric dampers to regulate the flow of hot combustion gases through the boiler. A constant even flow of gases through the boiler is necessary for the boiler to efficiently remove the heat from the combustion gases.

A chimney is necessary to supply the necessary draft to feed air to the burner and it carries undesirable combustion products (smoke etc.) up to the atmosphere. The force for both these things to happen comes from the fact that hot gases rise creating an effect called buoyancy. The flow up the chimney is restricted by the resistance from the boiler tubes, furnace walls, baffles, dampers and the chimney walls. It is the balance of the buoyancy and flow resistance that determines the smoke velocity in a chimney. Without draft, stagnation in the burning process would result and the combustion process would die from lack of air.

Boiler draft can change over time because of changing atmospheric conditions. Cold outdoor temperatures, increased barometric pressure associated with a high pressure weather fronts and windy conditions all can contribute an increased draft on the firebox. To break the draft and restrict the flow of combustion gases a barometric damper is added to the stack. The barometric damper has a weighted flapper that opens and closes in response to pressure differentials that exist in the chimney. During periods where the draft is adequate to eliminate combustion products, the barometric damper remains closed. As the draft increases, the damper swings in. This allows the chimney to draw in cooler boiler room air rather than pull more air through the boiler and its burner. By adding cooler boiler room air to the exhaust stream, the temperature inside the chimney is reduced, reducing the draft.

Draft is a measure of the force making gasses flow. A high draft causes the combustion gasses to flow faster through the boiler. A common unit to measure draft is "inches of water column." Historically small pressure differences were measured using a transparent U-shaped tube partially filled with water. One end of the tube is left open to the atmosphere while the other end would be inserted in an opening to the boiler firebox (often through the sight glass or a tapped hole) in the vicinity of the combustion process. Since the pressure is measured in an area just above where the combustion process is occurring it is often called the furnace pressure or over-fired pressure.The slight negative pressure in the boiler firebox would draw the water level down in the U-shaped tube. The difference in water level in the U-shaped tube is the draft measured in inches.

Barometric dampers are set by adding washer style weights to the damper weight chain. With the boiler operating at a high firing rate measure the over fire furnace pressure. Add or remove weights until the draft is reduced to a negative furnace pressure recommenced by the burner manufacturer, usually 0.02 – 0.04 inches of water column. At a location in the stack between the damper and the boiler use boiler test equipment to sample the flue gas for carbon monoxide (less than 200 parts per million) or smoke (less than 2 on a Baccarach smoke scale.) Be sure not to adjust the weight located on the face of the

damper.

The chimney connector is the section of piping between the boiler and the chimney. The best location for dampers is as close to the boiler as possible and a minimum of 18 inches from a combustible wall or ceiling. In a facility with multiple boilers best results occur when each boiler has its own damper.

Barometric dampers on gas boilers use flappers that can swing in two directions. The flapper swings inward under normal draft conditions and outward in the event of a sudden down draft in the chimney. On oil boilers the damper will be fixed so it only swings inward. There must always be enough draft so the burner does not "puff" back into the room at start up.