

Questions and Answers About

ENDURANCE

Q: How does the combustion system work in the Endurance, compared to standard boilers?

A: Standard atmospheric boilers have combustion systems that require both primary air and secondary air for operation. The primary air is introduced through the air shutters and mixed with the gas from the gas orifices. The rich gas/air mixture is then introduced into the combustion chamber through the burners and is ignited by an ignitor of some type (standing pilot, interrupted pilot or hot surface ignitor, HSI). Upon ignition, the flame has an insufficient supply of air (primary air) provided with the gas and obtains the additional air (secondary air) required for proper combustion from the area immediately adjacent to the flame. The primary and secondary air are draft induced by a chimney or in the case of side wall vented boilers by a draft inducer or power venter.

The Endurance boiler differs from that type of system and has a premixed combustion system that injects all of the air required for proper combustion with the gas and requires no secondary air. A combustion air blower forces the air for combustion into the combustion chamber with the gas. The speed of this blower, which is automatically adjusted by the heating requirements, determines the firing rate.

The gas/air mixture at any time is properly proportioned by a ratio gas valve, which senses airflow and adjusts gas flow accordingly. A hot surface ignitor (HSI) ignites the gas/air mixture that is forced into the combustion chamber through a cylindrical burner.

This type of system is insensitive to atmospheric conditions and site-related variables.

Q: How can a boiler with 87% AFUE be approved for chimney (Category I) venting without condensing?

A: A gas boiler with 87% AFUE can not be approved as a Category I boiler or be chimney vented. Chimney spaces may be used as "chases", but too much condensation would occur if a regular chimney were used.

Q: How does the modulation system in Endurance work?

A: The Endurance modulation system senses the boiler

return water temperature indirectly and adjusts the input by varying the combustion air blower speed. Proper combustion is maintained by the ratio gas valve, which senses blower suction pressure and adjusts gas flow accordingly. The full output is provided when the return water temperature is low. As the return water temperature increases, the firing rate modulates downward and is a minimum just prior to limit operation. This type of modulating system is ideal for low mass boilers.

Q: What is the pressure drop through the brazed plate heat exchanger (both for the DHW side and for the boiler side)?

A: The design pressure drop through the brazed plate heat exchanger is the same for both the boiler side and the DHW side for any given flow rate. The DHW side flow rate is a maximum of 5 GPM and the pressure drop at that flow rate is 1.82 PSI (4.2 FT. W.C.). The boiler side flow rate and pressure drop are approximately the same.

Q: How much pressure drop does the tempering valve add to the DHW system?

A: The fitting size and design of tempering valves determines their pressure drop and there are so many different manufacturers and valve designs available that it is difficult to test all of them and provide pressure drop information. However, the passages in most tempering valves are large enough that they do not contribute significantly to the overall DHW system pressure drop.

Q: What rate flow restrictors are used, and how much do they alter pressure drop?

A: The EBP 110 is shipped with a 4 GPM flow restrictor. It has a pressure drop of 15 PSI. The EBP 175 is shipped with a 5 GPM flow restrictor. It has a pressure drop of 13 PSI.

Q: How does the DHW system in Endurance protect against differential pressures between hot & cold supplies to valves such as T/S valves?

A: The flow restrictors shipped with the Endurance EBP boilers are to be installed upstream of the cold water



pipng to the tempering valve. This location for the flow restrictor balances the pressure on the tempering valve (except for the small pressure drop added by the plate heat exchanger) and permits the valve to operate properly.

It should be noted, however, that a pressure difference will exist between the hot and cold water pressures throughout the balance of the DHW system. Most shower valves are pressure balanced and are capable of performing properly with this pressure difference.

Q: Can the heat exchanger become fouled? If so, how can it be cleaned?

A: The DHW heat exchanger is designed to operate with turbulent flow. Because of its design, it is less susceptible to fouling than other types of heat exchangers.

In the unlikely event that the heat exchanger did become fouled, it can be removed for cleaning by relieving the system pressure and loosening the unions that attach it to the system piping. The cleaning is accomplished by flushing the heat exchanger with a commercially available cleaning agent.

Q: With a 20 gallon boiler water storage tank, what is the recovery rate after the first 5 minutes?

A: The recovery rate of the Endurance EBP, after all of the stored energy in the 20 gallon (76 litre) tank has been depleted, is 4.0 GPM @ 77°F (15.1 LPM @ 43°K) rise for the EBP 175 and 2.5 GPM @ 77°F (9.5 LPM @ 43°K) rise for the EBP 110. With the flow restrictors provided the energy in the storage tank will not be depleted in 5 minutes unless the incoming domestic water is extremely cold (less than 40°F [4°C]).

To extend the DHW performance of the EDP units, a hot water storage tank may be added to the system. This is especially important if several bathrooms or a large whirlpool tub will be included in the system. An inexpensive storage device is a 50-gallon electric water heater, where the elements are not used. The lower thermostat can be used to control a bronze circulator. A T+P valve must be installed on the tank, as well as a potable water expansion tank, where required.

Q: How does the PC controller work to detect a drop in the temperature of the water in the buffer tank and then respond to make sure hot water temperatures don't fall?

A: The boiler control senses a DHW draw immediately and dedicates all of the boiler output to DHW generation by closing the internal anticondensing valve which stops space heating flow until after the DHW demand has been satisfied.

Q: When do I need to install a condensate tee in the vent?

A: A condensate tee is required in the vent when the boiler is vented as a Category IV boiler. No condensate tee is required in Direct Vent applications because the vent slopes downward from the boiler to the outside and the condensate drains from the vent to the outside.

Q: Is there any regular maintenance required on the boiler?

A: Regular Endurance boiler maintenance is limited to inspecting the vent system to detect signs of a blockage or corrosion.

Q: Is there any regular maintenance required on the DHW heat exchanger?

A: There is no regular maintenance required on the DHW heat exchanger.

Q: How does the unit prove flame?

A: The Endurance burner control proves flame by the principle of flame rectification. A flame rod (located on the ignitor bracket beside the ignitor) in the combustion chamber is energized by the burner control with an AC voltage. If a flame is present in the combustion chamber, the flame conducts that voltage to ground and rectifies (converts) it from AC to DC. The burner control senses the flow of electricity (DC) and permits the gas valve to remain open. If at any time the control does not sense the DC current flowing to ground (no flame), it closes the gas valve. This type of control is inherently safe because it will only allow the gas valve to remain open when it senses DC current flow to ground. If the flame rod is shorted out for any reason, the control will flow AC current to ground, sense that it is AC and will not allow the gas valve to be energized and open or remain open.

Q: How does the Endurance handle low return water temperatures (such as may be found in radiant floor systems) to protect the boiler from condensation?

A: The Endurance EBP boiler is equipped with an anticondensing valve which protects the heat exchanger and ensures adequate DHW supply by closing off the space heating flow when the transfer tank temperature drops below 140°F (60°C).

The Endurance EDP boiler is equipped with a thermostatic union that restricts system flow so that the return water temperature is always high enough to prevent condensation on the surface of the boiler heat exchanger.