CENTER FOR ENERGY AND ENVIRONMENT

Technical Fact Sheet

Multifamily Facility Management Services

BOILER MAINTENANCE FOR A HOT WATER SYSTEM

Description:

Hot Water systems are the norm in multifamily (and some small commercial) buildings constructed since 1945 when the availability of reliable electric pumps enabled forced circulation systems to come into widespread use. Before 1945 only a few small multifamily or commercial buildings used hot water for heating and these were gravity distribution systems. Hot water systems are generally more comfortable and economical than steam systems since the forced circulation provided by the pump causes radiators throughout the buildings to receive heat nearly simultaneously. There are three aspects to hot water boiler maintenance. First is regular maintenance to the burner of the boiler (fire-side maintenance), second is water treatment (water-side maintenance) and third is addressing air in the system.

Fire-side maintenance is critical in order to achieve safe, efficient operation of a heating boiler. It also assures long-life. Water-side maintenance of a hot water boiler is also important. However, since hot water systems are sealed, they do not continually pick up oxygen from the atmosphere, nor do they require the continual addition of make-up water. As a result, water-side maintenance for hot water boilers does not take on the critical role it plays for steam boilers. Nevertheless, the water in the hot water boiler should be tested periodically and treated as required.

The primary ongoing maintenance required with hot water systems has to do with the third aspect of hot water boiler maintenance, or addressing air in the system. Specifically, at the beginning of the heating season, the expansion tank must be recharged with air, and the radiator must be bled of air that may have become trapped there. The hot water systems found in multifamily buildings are closed-loop systems (i.e. not open to the atmosphere). As a result, these systems must have some means to provide for expansion and contraction of the water as it heats up and cools. An expansion tank partly filled with air and partly filled with water serves this purpose. The expansion tank is usually located just above the boiler in the boiler room. When the boiler water is cool, it tends to absorb air from the expansion tank. When the water is heated, it tends to release this air in the radiators or fin tube baseboards located at the highest point in the piping circuit. Air will accumulate at this point in the radiator and needs to be bled off periodically.

Over time, the expansion tank can lose much of its air and become waterlogged. A waterlogged expansion tank can lead to large pressure swings, which are hard on the system, and can be

211 North 1st Street, Suite 455, Minneapolis, MN 55401
Phone: (612) 335-5863

diagnosed by reading the pressure gauge. The pressure gauge on a hot water boiler should only increase one or two pounds as the system heats from a cold condition to full on. If the pressure increases more than this, the expansion tank is probably waterlogged.

The problem of a waterlogged expansion tank can be eliminated by replacing the standard expansion tank with a diaphragm-type air cushion tank that has a sealed bladder separating the air from the water. This type of tank is permanently charged since the bladder prevents air from dissolving in the system water. This type of tank also greatly reduces the need to bleed the radiators since air is not continually released into the system.

How to Implement:

Regular maintenance of the burner itself should only be completed by a qualified, licensed contractor. For a gas-fired atmospheric burner this should be done every two to three years; for a gas-fired power burner or oil-fired burner it should be done annually. The contractor should clean, tune and adjust the burner for safety and maximum combustion efficiency. At the same time, the contractor should clean the fire side of the heat exchanger, if accessible, and check all controls (thermostat, resets, cutouts) and safety mechanisms (e.g. low water cutoff, high limit controls, safety valve) for proper operation. Any device that is not functioning properly should be repaired or replaced. The contractor should also inspect flues and vents as well as check and lubricate the circulating pump, if applicable.

Once a year, a sample of boiler water should be tested for water quality and, if required, treated with an antioxidant and lubricant to prevent rust and valve freeze-up. Chemical suppliers can provide details on testing and treatment of boiler water and are noted under *Boiler Parts and Supplies* in the Yellow Pages. The testing and treatment procedure is fairly simple; on-site staff or the owner can be trained to complete the annual testing and treatment.

At the beginning of the heating season, all air should be bled from the top radiators (or the highest fin tube baseboard unit) and the expansion tank should be recharged. These tasks can be performed by trained, competent on-site staff or by the building owner. A contractor can also be hired to perform the tasks as outlined below:

To bleed the radiators, a small manual valve on each one (or on the highest bank of fin tube baseboard radiation) is opened with a special key until water flows from it, at which point the valve should be re-closed. The special key is typically available at most hardware or plumbing supply stores. (Note: it is best to perform this task with the heating system on, since the higher pressure will tend to force the air out of the radiator more quickly.)

To recharge the expansion tank, close the valve between the expansion tank and the boiler to isolate the expansion tank from the system. (In some older systems, this isolation valve is not present. If this is the case, a certified contractor should be hired to drain the entire system, install the valve and refill the system. Thereafter, the expansion tank can be drained independently of the entire system.) After the isolation valve is closed, the drain valve on the tank itself should be opened to allow the water to run out. This process will take approximately 15 to 30 minutes to complete. Once the tank is empty of water, the drain valve is re-closed and the isolation valve between the expansion tank and the boiler is re-opened. Water from the system will flow into the expansion tank until the air pressure in the tank matches the hydrostatic pressure on the

system. If necessary, makeup water can be added to the system at this point to bring the hydrostatic pressure up to that for which the system was originally designed. (The contractor will know what the design pressure for a particular boiler system is.)