FocusOnFACILITIES

Water Heater Maintenance

By Howard McKew, P.E., C.P.E.

We continue our discussion on maintaining equipment in our buildings with our topic this month being hot water heaters that serve various facilities in the Diocese. Domestic hot water heaters serve a wide variety of applications, but they all start out with the same requirement: hot water at a maximum temperature in 140F setting allowed by the State Plumbing code with 120F suggested in the water storage tank section, e.g., 40 gallons of the heater. This criteria is applicable for tankless hot water heaters also.

With either hot water heater type, a mixing valve is required by Code to serve occupants. This mixing valve regulates the amount of 120F-140F from the heater and blends it with city water (that will be approximately 50F-60F), to provide 110F to 120F hot water at the tap. Water coming out of a faucet above 120F can be considered hazardous to the user.

The energy source to produce domestic hot water may be one of the following:

- Electric heat exchanger (electric element or heat pump)
- Gas heat exchanger (condensing type or burner type)
- Solar assisted with any one of the types listed above

Hot water heater applications begin with the 110F-120F water source to kitchens, bathrooms, and utility sinks, e.g., housekeeping sinks, to mention the three most common applications. When water temperatures are required to be higher for sanitizing needs, such as residential and commercial dishwashers, the specific appliance will have an electric resistance heating element in the unit to boost the clean water heating source to 180F. In some commercial kitchen applications, this booster heating coil may be served by

a steam or hot water (180F) heating source.

The preventive maintenance (PM) procedures for hot water heaters are similar to most other mechanical equipment: “walk-around” PM and via a PM work order. The walk-around observations should be made once a month, if not more frequently. A quick look would include:

- Check for water leak from pipe connected to the heaters, as well as from the storage tank itself.
- The same inspection for valves to ensure valve stems are not leaking water.

As a rule, hot water heater tanks are usually installed in a 24” by 24” by 1” high aluminum or stainless steel drain pan, and this pan may or may not have a water leak sensor located in the pan to set off an alarm in the room or to one’s cellphone.

The useful service life of a gas-fired hot water heater with its storage tank can be anytime between 8 years and 12 years but some of these units can last up to 15 years. The useful service life of an electric hot water heater and tank can be 10 to 15 years before replacing. Tankless heaters have a useful service life of 15 to 20 years.

Although not a monthly requirement when walking around, the maintenance person should make sure that there is an adequate combustion air source for gas-fire water heaters. For the gas-fired heater, the Plumbing Code requires an air intake near the floor and a relief vent high on the wall or in the ceiling. Intakes and relief vents are not required to go directly to outdoors, but it is a good practice to do so. The size of these vents is described in the Code based on the burner heating capacity. Condensing water heaters will have an air intake and an air exhaust, both piped to outdoors and these two vents should be checked after each snowstorm to make sure the vents are not blocked by snow or snow drift.

Commercial domestic hot water heaters may have a hot water return pipe with an in-line circulator that should be checked for maintenance. Often these small pumps are out-of-sight and out-of-mind, but they should not be forgotten. For more on preventive maintenance of pumps, read last month's FOCUS on FACILITIES.

The purpose of these recirculating pumps is to conserve water because, based on the distance from the hot water heater to the furthest plumbing fixture at the end of an extra-long pipe main and/or branch line, is the concern for the time it takes the hot water to reach the fixture due to a "low flow" rate or from a "no flow" condition within an idle pipeline where the water loses temperature over time. Many readers have probably experienced the need to run water in their sink at home for a minute or two before hot water comes out of the faucet. This is the result of an extra-long hot water pipe run.

In commercial applications, where hot water is used more frequently, the water-to-waste of lukewarm water that goes down the drain while one waits for hot water to come out of the faucet can be costly each month because the owner will pay what the water meter bill states and then pay a sewer charge for this same water volume that the water department considers to have gone down the drain.

City water that flows into a hot water heater storage tank is considered an "open" (open to atmospheric pressure) system at the water source, usually a pond, lake, or reservoir. Between there and the individual water heater tanks in buildings, sediment can occur in the city water pipe distribution system. As a result, this open water system source will usually result in sediment getting into the hot water heater tank requiring the tank, which is under city water pressure, to have this sediment removed. A PM work order for a hot water heater should include the following tasks:

- Shut off electrical power at local disconnect to heater
- Open water drain valve, at bottom of storage tank, to blow-out sediment.
- Inspect equipment, pipe, fittings, and valves (assembly) for damaged insulation
- Inspect assembly for rust
- Inspect assembly for water leakage
- Inspect wiring for damage or loose connections
- Inspect tank safety relief valve function
- Exercise automatic control functions

Additional PM tasks for gas-fired hot water heater:

- Keep air intake, and exhaust connections clear of debris
- Clean burner chamber
- Flush the heat exchanger

Additional PM tasks for electric hot water heater:

- Drain tank and check anode rod and replace if needed (anode rods may need to be replaced every 3-5 years)

Annually scheduled maintenance should be performed by a trained service technician and, when a hot water heater fails, a service technician should be called.

Electricity and gas can each be dangerous if the equipment is serviced by an untrained, certified technician.

If the building does not have a PM work order system, whether manual or automated work order system, a PM work order should be created and used each time a hot water heater is serviced in the future. Refer to our August 2019, "*What a Preventive Maintenance Work Order Includes"* column to guide one in creating a PM work order template. When creating the required PM work order, the following reference guide web site for preventive maintenance is:

https://www.gsa.gov/system/files/GSA%20PBS%20Preventive%20Maintenance%20Guide%202022-01302023_0.pdf

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Howard McKew is a registered engineer and president of Building Smart Software. Howie has a ton of experience to draw from the various industry jobs he's held and often writes about that experience in his columns in Engineered Systems Magazine. He is the author of 3-books, contributor to other author's books, lectures, and is an active member and Fellow in ASHRAE.

www.buildingsmartsoftware.com
hmckew@bss-consultant.com

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For more information:
facilities@dioceseofcleveland.org

Facilities Services
Catholic Diocese of Cleveland