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Construction Concerns: Heating Appliance and System Maintenance

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For www.fireengineering.com

Photos by author

Every year, the condition and serviceability of central heating equipment and systems becomes a concern to building occupants and managers in late fall. This article will discuss heating equipment for residences and small commercial occupancies. (Fireplaces, roof-top units, large industrial heating units, and power boilers are topics for another time.)

At the time of the installation of the equipment or a system, the installing contractor will install the equipment or system according to the manufacturer's recommendations, including a complete inspection of the heating appliance and a check for proper functioning (even if this was done before it left the factory). However, this is not the last time that this equipment will need attention.

The National Fire Protection Association (NFPA), equipment manufacturers, and insurance companies recommend that this kind of equipment receive a thorough inspection and functional test every year at the beginning of the heating season. This is an inexpensive way to ensure that the equipment is operating reliably and efficiently, and that minor adjustments and corrections can be made before a failure or perhaps even a fire. Although there is some cost in this kind of preventive maintenance and inspection, it is less expensive than letting the heating equipment break down and needing emergency repairs as well as the inconvenience of having no heat in a building during cold weather.

The homeowner or maintenance personnel can perform some of the inspection and maintenance, although the remainder of the work requires more technical expertise and formal training. These inspection and maintenance procedures include cleanliness, housekeeping, and condition of storage in the furnace or boiler room. Keeping floors and equipment clean not only makes the space more pleasant in which to work but also can prolong the life of moving parts by reducing the possibility of abrasive

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dust entering the space between moving parts and the flow of air required for combustion or to cool the machinery.

Building and fire codes and manufacturer recommendations establish the minimum clearance between the heating equipment and stored combustibles. A “best practice” is to keep three feet (91.4 cm) clear of any storage around the heating equipment, electrical switches, and control panels for easy access by service and maintenance technicians (photo 1).



(1)

Even if the building or fire codes prohibit any storage in mechanical equipment spaces or furnace rooms, the authority having jurisdiction (AHJ) will often permit the storage of small amounts of supplies and equipment for maintenance of the heating equipment. This may include a supply of replacement air filters; lubricants for the machines in the space; replacement parts; and the brooms, mops, and buckets needed for housekeeping in the area.

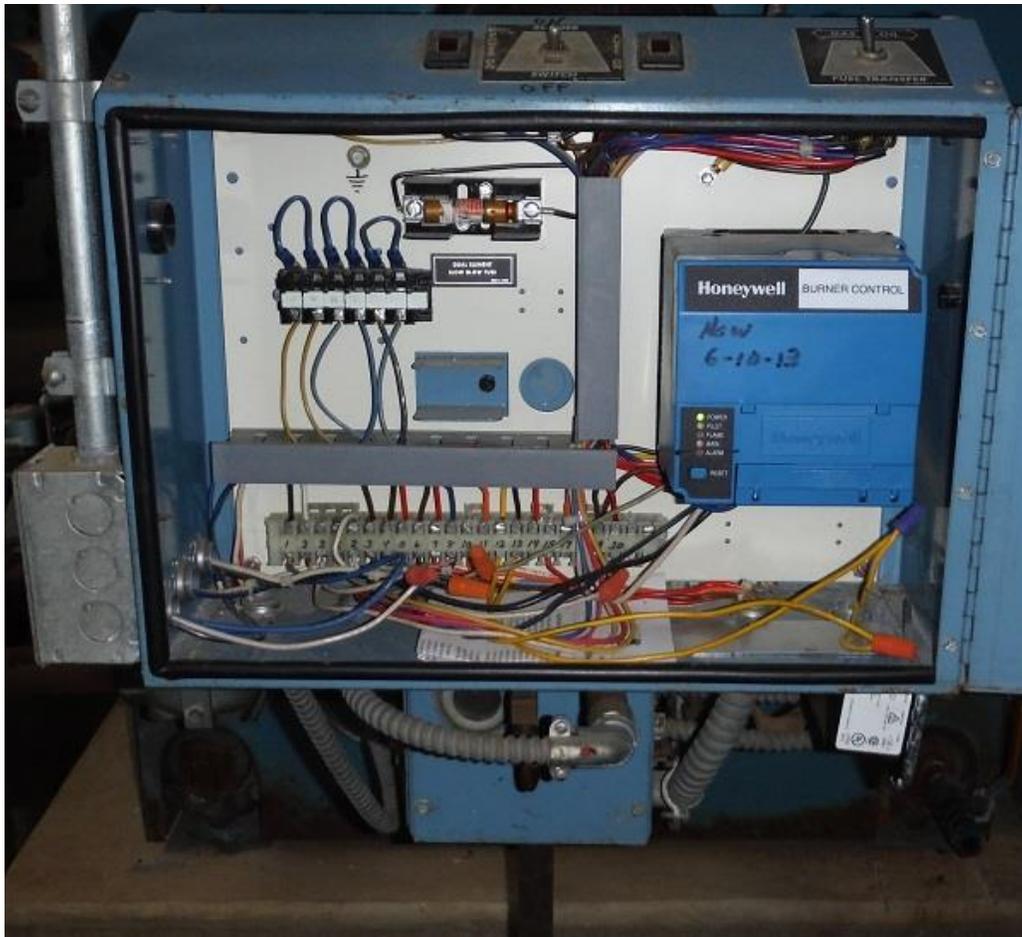
Other tasks that the homeowner or maintenance person may perform include periodic changing of air filters, the periodic inspection and cleaning of fire extinguishers and fire and carbon monoxide (CO) alarm equipment in the area, and the interior cleanliness of the ducts.

Other aspects of the annual inspection and maintenance will require a trained technician and include the following:

- Verify that combustion air is provided, with all ducts, dampers, and controls in good and clean operating condition.

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- Verify that fuel storage (solid fuels or fuel oil) are stored as required by the NFPA standards with good housekeeping, and that gaseous fuels (fuel oil, natural gas, and liquefied propane gas) are brought to the heating equipment in pipes without leaks.
- Verify that combustibles are not stored on or too close to heating equipment, and that adequate clearance is provided for access by service technicians.
- Verify that heating equipment and radiators are free of dust and debris.
- Verify that the vent pipe and chimney are properly connected, in good condition, and unobstructed.
- Verify that electrical power connections are tight and not corroded, that wiring is in good condition, and that the voltage and current draw at each motor or heating element are as specified by the manufacturer.
- Clean the interior of heating equipment; control cabinets (photo 2); and motor ventilation openings to remove dust, mold, debris, and fuel or lubricant residue.



(2)

- Measure and adjust fuel gas pressure within manufacturer's specification.
- Clean or replace air and fuel filters.
- Inspect and adjust any drive belts or couplings.

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- Clean and inspect heat exchangers for cracks, pits, and leaks. Some manufacturers may require a heat exchanger pressure test every three to five years.
- Lubricate all bearings and moving parts as recommended by the manufacturer.
- Check the thermostats (photo 3) for proper operation, calibration, and sensitivity.



(3)

- Check the ignition system and sequence for proper and safe operation.
- Test the exhaust gases during combustion, the air in the duct system, and the air around the furnace or boiler for the presence of CO.
- Check the supply/return air or water temperature differential and adjust it to the factory specification.
- Test the safety and control systems (photo 4) for proper operation. These include burner controls, automatic fuel shut-off, air supply-fuel interlocks, and manual and/or automatic restart after a failure. Also test to see if the control circuit is no

- more than 120 volts with all control device switches wired in series; the high-temperature thermostat functions properly; and the high-pressure or low-water shutoffs, safety relief valves, and water pump controls function properly on boilers. Also check that the flame-sensing device (infrared scanner, thermocouple, or other) is clean and working properly.
- In photo 4, warm-air furnaces and smaller residential boilers have similar controls, most of which are contained inside the furnace or boiler cabinet:
 1. Manual gas pilot burner valve (automatic gas pilot valve is on the other side of the burner).
 2. Manual gas burner valve.
 3. Gas regulator.
 4. Two-position automatic gas control valve.
 5. Modulating automatic gas control valve.
 6. Burner ignition transformer.
 7. Burner flame viewing ports.
 8. Boiler and burner control cabinet.
 9. High-temperature limit thermostat.
 10. High-high-temperature limit thermostat.
 11. Combination boiler pressure gauge and thermometer.
 12. Low-water cut-off, low-voltage probe type.



(4)

Attention to these details at the beginning of the heating season can ensure that the heating equipment and the system will operate reliably and reduce the possibility of a malfunction that could shut down the system or cause a fire.

Reviewing documentation of these inspections may be required by the AHJ or insurance agent in commercial buildings. The presence of these inspection documents may result in reduced premiums from property insurance companies.



Gregory Havel is a member of the Town of Burlington (WI) Fire Department; a retired deputy chief and training officer; and a 40-year veteran of the fire service. He is a Wisconsin-certified fire instructor II, fire officer II, and fire inspector; an adjunct instructor in fire service programs at Gateway Technical College; and safety director for Scherrer Construction Co., Inc. Havel has a bachelor's degree from St. Norbert College, has more than 40 years of experience in facilities management and building construction, and presents classes at FDIC and other venues.

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