

Instructions for Completion of Report on Maintenance of Heating Equipment (HM-38)

I Individual Gas-Fired Hot Air Furnaces

(usually found in one and two story buildings)

- 1 Furnace filters, usually disposable type, are designed to trap lint and dust before reaching the heat exchanger.
- 2 Clean burner tubes and check color of flame. If flame is yellow, check for cracks or improper setting of tubes or of air adjustment.
- 3 Check flue for tight fit. While burner is on, check for leaks around joints with a lit match or candle. If flame on match or candle goes out, it is an indication that combustion gases are being released which requires *immediate action*.
- 4-7 Recommended maintenance: lubricate bearings of blowers, change filters, clean heat exchangers, etc .

II Burners

- 1a Flame of oil burners should be red and free of smoke.
- 1b Flame of gas burners should be blueish with no yellow spots.
- 2 Resetting air-fuel ratios and negative drafts on dampers of burners and of breaching should be done by certified personnel. A good draft for burners should be around .2 inches of water and around .5 inches of water for flues (breaching) .
- 3 Oil filter canister(s) located on suction side of pump for #2 oil has replaceable filter(s), while #6 oil uses strainers that must be cleaned periodically. Note that #6 oil must also be preheated to 140°F or 150°F before burning.
- 4 Boiler control panel should be in good working order showing:
green - when boiler is on
red - when boiler is off
yellow - when boiler is on stand-by
Draft gauges should indicate proper readings of drafts on burners and on breaching, boilers' lead-lag, etc.
- 5-6 Check working condition of gauges for: oil pressure including temperature of #6 oil, primary combustion air, negative pressure on vacuum systems and air pressure on supply or exhaust systems.
- 7 Check high fire modulation on large boilers.
- 8 Check reading on gauges (described on 5 and 6 above) that would indicate proper operation of fuel pump. Also, check for abnormal noise from pump bearings.

- 9 Good carbon dioxide (CO₂) readings for non-condensing type boilers are 11.5-13% for oil and 9-11% for gas. Higher concentrations of CO₂ are indicative of higher boiler efficiencies.

Gas boilers require a mandatory carbon monoxide (CO) test when installed. This test should be performed if CO is suspected in boiler room. It is recommended that CO detectors be installed in all boiler rooms with gas boilers.

The flame of a gas boiler should be blueish with no yellow tips.

Stack temperature for non-condensing boilers should be above 270°F. Normally, stack temperatures are around 350°F- 450°F. A high stack temperature equates to a higher heat loss through the chimney. High chimney temperature may indicate that cleaning or replacing tubes on steel boilers or cleaning flue passages on cast iron boilers is in order. Some boilers are inherently inefficient which results in a stack temperature higher than normal. High efficiency boilers (i.e. condensing type boilers) have flue temperatures of less than 150°F.

III Boilers

- 1-3 Inspection reports from insurance company.
- 4 Cleaning refers to soot removal by scraping and vacuuming tubes of either steel boilers or cast iron sections of boilers. The effect of soot built up on fuel consumption is as follows:
- | | | | |
|-------------------------|-------|-------|------|
| Thickness of Soot | 1/32" | 1/16" | 1/8" |
| Approx. Efficiency Loss | 2.3% | 4.5% | 8.3% |
- 5 Plugged tubes reduce the efficiency of a boiler while increasing the temperature of its flue.
- 6 One or more pressure relief valves for each boiler are located on top or side of each boiler. Domestic hot water (DHW) boilers and DHW tanks must have relief valves for both pressure and temperature.
- 7 Refractory materials on fire boxes, baffles, etc. are designed to prevent combustion flames from impinging and damaging unprotected elements in the interior of boilers. Damaged or improperly installed refractory materials will shorten the life expectancy of boilers. Also, check refractory wall for soot deposits. If soot is visible check for proper setting of burner linkages or for proper spray pattern of nozzle.
- 8 Abnormal pressure and/or temperature changes should prompt the operator to look for possible malfunctions and take corrective action.
- 9 The temperature switch (one for each large boiler) is designed to shut off the fuel supply when temperature exceeds 165°F. The switch should be installed 6-12 inches above the burner.
- 10 If, after the boiler is switched on (predetermined time measured in seconds), the flame is not on, the boiler will shut down on safety.

- 11 Ideally, hydronic systems require little or no make-up water and therefore require little or no water treatment.

Steam systems require make-up water to replace water discharged during blow downs. Also, steam systems are prone to lose water, in the form of vapor, through defective steam traps or as condensate through corroded return condensate pipes. The soundness of a heating system can be determined from the amount of water that must be replaced within the system.

- 12 Pressure relief valves discharge either because they are defective or because the system they are designed to protect has reached its design pressure. When expansion tanks become water logged, the pressure relief valves of hydronic systems will discharge water. Usually, boiler operators do not take this seriously; however, over time this spillage will have an adverse affect on the life expectancy of boilers, as well as that of the rest of the heating distribution system.

III A Steam Only

- 1 Automatic chemical feed should be part of any central steam heating system.
- 2 Boiler operators should make sure that chemicals are always present inside the dispensing drum and that the chemical feed pump is working. Also, they should check water consumption on the make up water meter to confirm that the proper amount of chemical is injected into the system.
- 3-5 The reason for blowing down equipment (float chambers in boilers and on piping connected to automatic water feeder, low water cut off, site glass, etc.) is to keep it free of sediment while maintaining the boiler safe and at optimum efficiency.
- 6 If heat exchangers provide heat or DHW as per design and do not leak, they should not be tampered with. Leaks in heat exchangers can be detected as follows:
- A On steam systems look for excess condensate.
 - B On hydronic systems look for abnormal pressure differences.
 - C Over time, exchangers for DHW may become partially blocked with mineral deposits and must be either cleaned or replaced.

III B Small Modular Boilers

- 1-5 Self explanatory.
- 6 Indicate whether coil (heat exchanger) is inside the tank or external.
- 7 Boiler capacity in BTU/HR or SQ. FT. of radiation can be read from the name plate on each boiler.
- 8 Burners should be opened annually, their nozzles should be renewed and, if necessary, other parts should also be renewed and/or adjusted.

9-11 Self explanatory.

12-13 Depending on the system (DHW and/or heating, and the time of year) the temperature range (160°F - 180°F) may be readjusted. It must be noted that the lower the range the less energy is required to provide the same heat and/or DHW. Also, the high number on the range should always be 10°F less than the high limit setting. Under no circumstances should hydronic and DHW systems have the high limit set at more than 210°F.

This is a DHCR requirement. (See III. 9 above)

14 Tests and maintenance work on all boilers should be *recorded in the boiler room log.*

IV Heat Distribution System

1 Maintenance staff should periodically check the settings of thermostats, valves, aquastats, pressure controllers, etc. Also, they should check and clean contactor relays including those of thermostats, clean air vents, louvers, etc.

2 When work cannot be done in-house (e.g. resetting valves on pressure reducing station, replacing components and/or re-balancing vacuum systems, etc.), contractors or consultants should be hired.

3-6 Self explanatory.

7-8 Life expectancy of steam traps varies greatly (5-10 years) depending on the type, and wear and tear, due to the amount of condensate going through them. Most of DHCR's low pressure steam systems have F&T (float & thermostatic) traps on steam mains and thermostatic traps on the return side of radiators. Normally, F&T traps are located at the end of steam mains and risers in basements or in boiler rooms. Steam escaping from the condensate vents indicates that some traps are malfunctioning. Malfunctioning radiator valves will cause rooms/apartments along that riser to be either cold or overheated.

Starting with malfunctioning steam mains and risers, maintenance staff should inspect, repair and/or replace all steam valves. This required cyclical work should be scheduled over several summers. All repairs and/or replacements should be *entered in the boiler log.*

9 Automatic zone valves respond on signal from the controller. Several other sensors within the system must work properly in order to supply the right information to the controller.

10-11 Self explanatory.

V Miscellaneous

Self explanatory.