Efficient and Safe Heating Boiler Operation Practices for Healthcare Facilities

It's important to assess whether heating boilers are operating safely and efficiently. Many people overlook this consideration, as heating boilers often remain "out of sight, out of mind" until they stop functioning and temperatures inside the building drop significantly. Regular checks can help prevent unexpected breakdowns and ensure safety.

Causes of Heating Boiler Failures and Safety Risks

Hot water and steam heating boilers account for the vast majority of boiler failures each year, costing owners millions of dollars in repair and replacement costs. In the vast majority of instances, these failures were preventable. Our industry experience reveals the following to be prominent causes of boiler failures:

- Operating the boiler with inadequate water level, causing overheating and cracking of heating surfaces
- Lack of proper water treatment leading to overheating and cracking of heating surfaces or leakage due to corrosion or wasting away of metal surfaces

A common misconception is that heating boilers and hot water heaters pose little or no danger to the public because they operate at relatively low operating pressures. This could not be further from the truth. Although infrequent, heating boiler explosions still do occur. Heating boilers and water heaters contain tremendous energy and can be deadly if improperly maintained and operated. A 30-gallon domestic hot water heater typically found in a single-family residence has the equivalent explosive potential of approximately one pound of TNT. Many healthcare facilities have heating boilers and water heaters that are much larger than residential units and thus contain even more explosive potential.

To determine if a heating boiler is efficient and safe, follow these best practices to ensure optimal performance.

Regular Inspections by an Authorized Agency

An Authorized Inspection Agency (AIA) is an entity that employs trained and commissioned boiler inspectors. The AIA may be the jurisdictional authority, an insurance carrier that provides equipment breakdown insurance, or a properly credentialed third-party inspection agency in a limited number of jurisdictions. The local jurisdiction will mandate the frequency of the inspections.

Two key benefits to having a boiler inspected by an authorized inspection agency are:

- The inspector provides a fresh perspective on the facility and brings unique skills and broad industry experience to help eliminate unsafe conditions.
- The inspection ensures compliance with state, province, or local jurisdictional requirements.

The boiler inspection will include external or internal examinations based on jurisdictional requirements.

The inspector will evaluate the condition of the heating boiler concerning construction, installation, maintenance, and operation. A vital aspect of the inspection is ensuring the boiler is equipped with fully functional controls and safety devices.

Most jurisdictions in the United States and Canada have established laws that require boilers to be constructed, installed, and inspected to codes and standards established by the American Society of Mechanical Engineers (ASME), National Board of Boiler and Pressure Vessel Inspectors or other standards adopted by the jurisdiction. Boiler inspection laws can vary from jurisdiction to jurisdiction and can be challenging to interpret.

Assign Proper Boiler Operation and Maintenance Responsibilities to Qualified Personnel

Assigning the responsibility of boiler operation and maintenance to individuals who have not received proper training is a recipe for potential disaster. Operator error and improper maintenance are frequently found to be the root cause of a boiler failure.

Very few jurisdictions require licensed operators to operate heating boilers. Since most jurisdictions do not, those responsible for boiler operation and maintenance must receive adequate training. Some facilities may not be able to maintain dedicated operating and maintenance personnel. In those cases, service contracts with reputable firms are a viable alternative as long as boiler operations are checked at least weekly during the heating season.

Test and Maintain Controls and Safety Devices

Properly testing boiler controls and safety devices in accordance with industry standards is the most essential activity for a boiler. Immediately repair or replace any defective safety device. Combustion controls, water level controls, pressure operating controls, and pressure relief devices must be examined and tested in accordance with recommended industry practices.

The frequency and complexity of testing vary depending on the boiler control or safety device type. In some cases, the use of a qualified contractor is recommended. However, many critical controls and safety devices, such as low water fuel cutouts, pressure relief devices, and combustion system flame sensors, can be routinely tested without needing a contractor, assuming the person performing the test has received proper training.

Control or safety devices that perform poorly during the test should be replaced promptly. Boilers should be shut down immediately when low water control testing fails to shut a boiler down properly, when flame failure tests do not shut down the boiler, or when pressure relief devices fail to operate properly. The boiler should only be restored to operation once a qualified technician repairs or replaces the devices. Only test a boiler control or safety device with proper training and supervision.

Monitor Boiler Operations and Piping Leaks

Heating boilers require consistent monitoring rather than just periodic checks. It's essential to record the results of each monitoring round in a log and regularly review them for signs of adverse trends. Effective record-keeping and trend analysis can significantly lower the risk of boiler failure.

Heating boiler operating logs do not have to be sophisticated. Logs should include checks for leakage from the boiler and associated piping systems, burner control system checks, water level indication, temperature and pressure indication, and the testing of critical boiler controls and safety devices.

This document provides a generic heating boiler operating log suitable for the typical heating boiler application.

Implement a Boiler Water Treatment Program

Excessive mineral content and dissolved oxygen in the water supply can severely damage a boiler. Over time, mineral deposits can solidify inside the boiler, impeding heat transfer and significantly increasing fuel costs by as much as 25% for every ¼ inch of buildup. Additionally, oxygen exposure can cause corrosion and leaks in tubes and heating surfaces.

The lack of or misapplication of a boiler water treatment program is the leading cause of boilers' reduced useful life.

Boilers that are correctly operated and have established water treatment programs have been known to last more than 30 years. In contrast, newly installed boilers operating without proper water treatment have required extensive repairs or complete replacement in very short periods.

A proper water treatment program should be established using a qualified water treatment consulting firm. Solutions to minimize the adverse effects of poor water quality are site-specific and require appropriate testing and analysis. Additional measures, such as water softening systems and idle boiler lay-up procedures, may be necessary. In some cases, chemical treatment of boilers may not be appropriate for the boiler's design, and alternative solutions may be necessary. These decisions require a proper understanding of water chemistry and industry experience and should not be administered by a novice. With that said, boiler operators should have a basic knowledge of how to test and chemically treat boiler feed water under the strict supervision of a consulting firm.

Utilize Certified Services for Welded Repairs

If a boiler requires a weld repair, the welding company must be certified by the ASME or National Board or authorized by the jurisdiction. In most cases, the welded repair will require an examination by an authorized inspector under contract with the repair firm before the boiler can be placed back into operation.

Improper weld repairs completed by an unqualified welder can lead to catastrophic results. Weld repairs not conducted to jurisdictional requirements will result in the decertification of the boiler until proper repairs are made.

Maintain a Clean Boiler Room

Boiler rooms are not storage rooms. Unfortunately, all too often, they become common places to store custodial supplies, surplus office equipment, and flammables such as paint and gas cans, all of which present potential fire hazards. In addition, poorly lit, dirty, and cluttered boiler rooms pose slip-and-fall hazards and can hinder rapid response during emergencies. Boiler rooms should be adequately lighted. Combustibles and flammables should be stored elsewhere. There should be clear access to all areas in and around the boiler and auxiliary equipment in the boiler room. The emergency boiler shut-off switch should be identified and accessible. Finally, the boiler room should be kept as clean as possible. Excessive soot, dirt, and debris will mask fuel or water piping leaks, leading to future problems.

Emergency Response Planning

Boilers are critical equipment that keeps a Healthcare facility operational. Emergency plans for the facility should contemplate the loss or damage to a boiler. Staff should be trained for emergencies, including boiler incidents, through drills and exercises.

Resources

ASME Code Section VI Recommended Rules for the Care and Operation of Heating Boilers

National Board Inspection Code (NBIC) Part 2 Inspection

Canadian Standards Association (CSA) B51

Learn More & Connect

For more information on protecting your business, contact your local risk engineer, visit the Chubb Risk Consulting Library, or check out www.chubb.com/riskconsulting.