

Maintenance guidelines for controls and safety devices on boilers and pressure vessels

Introduction

Boilers and pressure vessels are found in almost every building. Boilers are used to provide comfort heat, hot water, and heating mediums for process. Pressure vessels can be an integral part of a manufacturing process or be important components of pneumatic tools, process equipment, or instrumentation systems. This equipment is usually hidden in machine rooms and as long as they are working and providing their intended service, they are usually forgotten and taken for granted. Boilers and pressure vessels contain a large amount of potential energy that can cause bodily injury and property damage when an uncontrolled release occurs. Controls and safety devices are required on boilers and pressure vessels to ensure they operate within their design parameters.

Uses for most common controls and safety devices

- Protect against overpressure
- Protect against overtemperature
- Protect against low water level
- Protect against no flow
- Control pressure
- Control temperature
- Control water level and/or flow

Maintenance, inspection and testing

The best way to ensure that this equipment is safe and reliable is through regular maintenance, inspection, and testing. Depending on the geographical location in which the equipment is installed and operated, regular inspections by jurisdictional inspectors or an authorized inspector from a Boiler and Machinery insurance company may be required by law. The protective devices listed on the following page are required by most jurisdictions. The authority that has jurisdiction or the Boiler and Machinery insurance company are sources for details on the requirements for controls and safety devices in that area. The jurisdiction is usually the state but it can be a city, county or parish.

Maintenance, inspection and testing should only be done by trained and qualified technicians following manufacturer's recommended procedures and good engineering practice.

Through many years of inspecting equipment, Travelers Risk Control has developed maintenance guidelines for controls and safety devices on boilers and pressure vessels.

More detailed information regarding mandatory and recommended maintenance and testing practices can be obtained from:

- The authority having jurisdiction
- The American Society of Mechanical Engineers (ASME)
- The National Board of Boiler and Pressure Vessel Inspectors (NB)
- The National Fire Protection Association (NFPA)
- Your Boiler and Machinery insurance company

While it is difficult to address all types of equipment and take into account the wide variety of applications and operating conditions, these guidelines provide information that can be used in conjunction with a comprehensive maintenance

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program. Severe operating conditions may demand more frequent and thorough testing and inspections than these guidelines recommend. Longer intervals between inspections should only be considered after reviewing the equipment's breakdowns, maintenance, inspections and consultation with the jurisdictional or the Boiler and Machinery insurance inspector.

Maintenance guidelines

The boiler maintenance information on the following page only addresses the waterside controls and protective devices. The unfired pressure vessel information only addresses safety or relief valves for overpressure protection.

Fuel train controls, protective devices, inspection and maintenance are not addressed. For information regarding the fuel train, the jurisdiction having authority or the fire insurance carrier should be consulted with.

Boilers and water heaters

Type of boiler	Control or safety device	Testing frequency	Testing mode*
Low pressure hot water heating	One low water fuel cutoff (LWCO) with manual reset	Monthly	Rapid drain
	High temperature limit cutoff with manual reset	Annual	Inspect
	Relief valve	Annual	Operational
		Every 3 Months	Manual
Hot water supply (forced circulation)	Flow switch	Monthly	Operational
	High temperature limit cutoff with manual reset	Annual	Operational
	Combination pressure/temperature relief valve	Every 2 months	Manual
		Every 3 years	Replace
Low pressure steam (pumped and gravity condensate return)	Two LWCOs , the lower equipped with a manual reset	Daily	Rapid drain
	High pressure limit cutoff with manual reset	Annual	Slow drain
	Safety valve	Annual	Inspect
		Annual	Operational
		Every 3 Months	Manual
High pressure steam (automatically fired and unattended)	Two LWCOs , the lower equipped with a manual reset	Daily	Rapid drain
	High pressure limit cutoff with manual reset	Annual	Slow drain
	Safety valve	Annual	Inspect
		Annual	Operational
		Every 6 months	Manual
		Annual	Pressure
High pressure steam (operator attended)	One LWCO	Each shift	Rapid drain
		Annual	Slow drain
		Annual	Inspect
	High and low water level alarms	Each shift	Manual
	Safety valve (400 psi or less)	Every 6 months	Manual
		Annual	Pressure
	Safety valve (over 400 psi)	Every 3 years	Pressure
Storage water heaters	Combination P/T relief valve	Every 2 months	Manual
		Every 3 years	Replace

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*Notes:

- Manual test of safety and safety/relief valves should not be made unless the valve is subjected to a pressure of at least 75% of the set pressure.
- All LWCOs must be dismantled for a complete inspection and overhaul by a competent service technician annually. The internal and external mechanisms including linkage, contacts, floats, mercury bulbs and wiring must be checked for defects. Probe type LWCOs must be removed, inspected and cleaned.

Unfired pressure vessels

Service	Protective device	Testing frequency	Testing mode
Air and clean dry gases	Safety/relief valve	Every 3 years	Manual or bench
	Rupture disk	Every 3 years	Inspect
Propane and refrigerants	Safety/relief valve	Every 5 years	Bench
	Rupture disk	Every 5 years	Inspect
All others	Safety/relief valve	Per inspection history	Bench
	Rupture disk	Per inspection history	Inspect

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