Proposal Summary

Process Boiler #2 Conductivity-Based Blowdown & Deaerator Settings

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Measure Description

This proposal would add the following requirements for all newly installed process steam boiler systems with capacities at or above 5 MMBtu/h:

1) The boilers have an automatic blowdown controller that is programmed to be controlled by conductivity, and
2) For systems that use the boiler steam header to pressurize the deaerator, the deaerator regulator pressure must be set to under 5 pounds per square inch of gauge pressure (psig) and between 2 and 5 psig for boilers with tubes not rated for oxidizing conditions.

The requirement would apply to all sites with new process steam boilers, including replacement boilers and boilers in additions to existing facilities. The Statewide CASE Team currently anticipates an exception to the proposed blowdown requirement for systems with condensate return above 90%. This proposal would require updates to compliance documents and a verification of controls and deaerator control settings by a field technician.

Boilers used in oilfield production and utility and municipal power generation are not expected to be within the scope of Title 24, Part 6.

Table 1~~Table 1~~ summarizes the scope of the proposed code change.

Table 1: Scope of Proposed Code Change

An "X" indicates the proposed code change is relevant.

Building Type(s)		single family	**Construction Type(s)**	X	new construction
		multifamily		X	additions
	X	nonresidential		X	alterations

Type of Change	X	mandatory	**Updates to Compliance Software**	X	no updates
		prescriptive			update existing feature
		performance			add new feature
Third Party Verification		no changes to third party verification			
		update existing verification requirements			
	X	add new verification requirements			

Justification for Proposed Change

High conductivity in boiler water indicates high mineral content, which leads to fouling of the boiler heat exchanger tubes, increased thermal stress, and lower boiler efficiency. In addition, high dissolved solids concentrations can lead to foaming and carryover of boiler water into the steam, which can foul downstream components, trigger water hammer, and accelerate system wear and tear. To limit the levels of suspended and dissolved solids in steam boilers, water is periodically or continuously discharged or "blown down." This surface blowdown removes dissolved solids that accumulate near the surface of the boiler water.

Given that blowdown discharges hot water, it also results in fuel, water, and chemical losses. Manual boiler blowdown is typically excessive, resulting in unnecessary losses. Automatic blowdown systems avoid excessive blowdown by monitoring and maintaining water conductivity within manufacturer-specified setpoints. This eliminates the need for operators to make manual valve adjustments and offers the following benefits:

a. Fuel, water, and chemical savings
b. Improved conductivity control which can extend boiler useful life and slow efficiency degradation

Deaerators remove dissolved air from steam boiler feedwater to protect the system from corrosion. They are present in nearly all large boiler systems and are commonly operated at pressures that are higher than necessary. Overpressurization leads to excess venting, and underpressurization can lead to insufficient air removal, which can lead to oxygen pitting and corrosion on contact surfaces. Ensuring proper deaerator pressurization saves energy and has no additional cost for end users.

Preliminary statewide natural gas savings from an automatic blowdown requirement are estimated at 0.47 million therms per year. In addition to the energy benefits, these

practices would reduce local photochemical smog and improve air quality. The value of improved air quality is amplified by the consideration that many industrial facilities are located near Low- and Moderate-Income (LMI) housing, which is disproportionately exposed to lower air quality.

Data Needs / Information Requests

The Statewide CASE Team is seeking the following information to inform the code change proposal. Data may be provided anonymously. To participate or provide information, please email Emma Conroy at emmaconroy@2050partners.com directly and copy info@title24stakeholders.com.

- Typical annual operating hours and load factors for boilers in various industries
- Typical boiler lifetimes across different boiler sizes
- Typical boiler conductivity
- Typical boiler blowdown temperatures and flowrates
- Typical boiler makeup water flowrates and temperatures
- Typically used boiler blowdown methods/schedules
- Prevalence of sites with poor or very poor water quality programs and/or maintenance programs
- Fouling rates and/or rates of boiler efficiency drop for boiler systems with poor and very poor water quality management
- Labor and material costs, ongoing maintenance costs, and lifetimes of blowdown valves, valve controllers, and conductivity probes
- Implementation of methods for measuring or calculating system steam flow and conducting automatic leak detection for blowoff valves at existing sites
- The costs of chemical conditioning for feedwater and wastewater
- Labor and material costs of boiler retubing

Draft Code Language

Guide to Marked Up Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2025 documents are marked with blue underlining (new language) and ~~strikethroughs~~ (deletions).

Title 24, Part 1

There are no proposed changes to Title 24, Part 1.

Title 24, Part 6

120.6 (d) Mandatory requirements for process boilers.

1. Combustion air positive shut-off shall be provided on all newly installed process boilers as follows:

A. All process boilers with an input capacity of 2.5 MMBtu/h (2,500,000 Btu/h) and above, in which the boiler is designed to operate with a nonpositive vent static pressure.

B. All process boilers where one stack serves two or more boilers with a total combined input capacity per stack of 2.5 MMBtu/h (2,500,000 Btu/h).

2. Process boiler combustion air fans with motors 10 horsepower or larger shall meet one of the following for newly installed boilers:

A. The fan motor shall be driven by a variable speed drive; or.

B. The fan motor shall include controls that limit the fan motor demand to no more than 30 percent of the total design wattage at 50 percent of design air volume.

3. Newly installed process boilers with an input capacity greater than 5 MMBtu/h (5,000,000 Btu/h) shall maintain stack-gas oxygen concentrations at less than or equal to 3.0 percent by volume on a dry basis over firing rates of 20 to 100 percent. Combustion air volume shall be controlled with respect to measured flue gas oxygen concentration. Use of a common gas and combustion air control linkage or jack shaft is prohibited.

Exception to Section 120.6(d)3: Boilers with steady state full-load combustion efficiency 90 percent or higher.

4. Automatic Blowdown. Newly installed process boilers with an input capacity greater than or equal to 5 MMBtu/h (5,000,000 Btu/h) shall have an automatic boiler blowdown controller that is programmed to be controlled by conductivity.

5. Deaerator Pressure Control. Deaerator pressure shall be under 5 psig for all newly installed process boilers with an input capacity greater than or equal to 5 MMBtu/h (5,000,000 Btu/h). For boilers with tubes that are not rated for oxidizing conditions, the deaerator pressure shall be within 2 to 5 psig.

Added Definitions:

BOILER BLOWDOWN VALVE is a valve used for discharging water from a boiler to maintain the desired concentration of solids and chemicals to deter scale buildup, corrosion and carryover of impurities in the boiler water.

AUTOMATIC BOILER BLOWDOWN CONTROLLER is an automated system that optimizes surface-blowdown rates by regulating the volume of water discharged from the boiler in relation to the concentration of dissolved solids present.

BOILER DEAERATOR is a system that is used for the removal of oxygen and other dissolved gases from the feedwater to steam generating boilers. Dissolved gases in boiler feedwater cause corrosion damage in steam systems by attaching to metallic components and forming oxides, or rust.

STEAM BLOWOFF VALVE is a valve that vents boiler steam to the atmosphere for system capacity control. A steam blowoff valve is not a boiler blowdown valve.

Reference Appendices

Appendix NA7 – Installation and Acceptance Requirements for Nonresidential Buildings and Covered Processes.

Acceptance testing, performed by a field technician, shall be added for all newly installed process steam boilers with capacities at or above 5 MMBtu/h to:

a. ensure that automatic blowdown is programmed to be controlled by conductivity, and
b. ensure that deaerator pressure is under 5 psig and within 2 to 5 psig for boilers with tubes that are not rated for oxidizing conditions.