Proposal Summary

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Process Steam #1 Flash Steam Recovery or Reduction

Updated October 23, 2025

Prepared by: Ryan Swanson, Shafi Amoni, Lily Baldewicz, Eva Hidalgo, Amy Droitcour, Emma Conroy

Measure Description

This measure would require newly constructed process steam systems and new, non-replacement process steam loads at existing facilities that meet a set of criteria to recover or reduce at least 35% of their flash steam using one or more methods such as the following:

1. Recovery and reuse of flash steam from high-pressure condensate, via:
    a. direct reuse,
    b. thermal vapor recompression (TVR), or
    c. mechanical vapor recompression (MVR)
2. Recovery and reuse of flash steam from boiler blowdown
3. Implementation of a pressurized condensate return system.

Newly constructed process steam systems would qualify for the requirement if they:

- have one or more connected boilers with an input rating (capacity) of 10 MMBtu/h or greater,
- have a pressurized deaerator, and
- have a boiler design condition pressures of 100 psig or greater.

New, non-replacement process steam loads at existing facilities would qualify for the requirement if they:

1. have one or more connected boilers with an input rating (capacity) of 10 MMBtu/h or greater,
2. are connected to system with a pressurized deaerator,
3. are served by a header that has a design condition pressure of 100 psig or greater, and
4. meet the conditions in Table 1.

Table 1: Steam Load Addition Code Trigger Criteria for Existing Facilities

Steam Flow (lb/h)	Linear Length[1] (ft) less than
<5,000	Exempt
>5,000, <7,500	150
>7,500, <10,000	350
>10,000, <15,000	500
>15,000	1,000

Applications for flash steam reuse may include:

- Low-pressure steam loads
- Steam-to-hot-water heat exchangers
- Deaerator heating
- Intermediate-pressure steam loads.

Table 2 summarizes the scope of the proposed code change.

Table 2: 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	X	no changes to third party verification			
		update existing verification requirements			
		add new verification requirements			

Justification for Proposed Change

When steam condensate is dropped to a pressure lower than its saturation (boiling-point) pressure, a fraction of it vaporizes, or flashes, into what is known as "flash

[1] Linear distance from the load to the nearest boiler plant deaerator, measured across both horizontal and vertical dimensions. Calculation of linear length will be described in Reference Appendix.

steam." Most sites vent flash steam to the atmosphere, resulting in significant fuel, water, and chemical losses. Many steam system design options are available to recover and repurpose flash steam for useful heating to serve low-pressure loads instead of using high-pressure live boiler steam for the same purpose. Flash vessels capture flash steam and allow it to be piped to various applications, and TVR and MVR can boost the flash steam pressure if needed. Alternatively, a pressurized condensate return system can minimize flashing of condensate as it is returned to the deaerator.

Flash steam recovery has been listed in Department of Energy (DOE) literature as a best practice since at least the early 2000s, and the DOE has five steam tip-sheets for different flash steam recovery methods. This proposed code change originated from discussions with California-based consulting engineers from strategic energy management programs and the DOE Industrial Assessment Center program.

To the Statewide CASE Team's knowledge, flash steam recovery requirements have not been proposed in previous code cycles. In 2013, Title 24 first adopted requirements for process boilers. In 2022, Title 24 adopted requirements for strainers and fault detection and diagnostics in steam trap assemblies.

Requiring flash steam recovery would save fuel, water, and chemicals. When applied throughout typical steam systems, this measure is expected to save approximately 1% to 5% of baseline boiler system fuel use. In addition, the requirement would reduce water and sewer use and the associated chemicals used for water treatment, as the flash steam is no longer vented to the atmosphere and its condensate can be returned to the boiler plant. Ancillary benefits include improved plant safety and improved public perception through reduction of steam plumes.

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 emmaconroy@2050partners.com directly and copy info@title24stakeholders.com.

- Major limitations or barriers to flash steam recovery
- Factors that impact flash steam recovery cost-effectiveness
- Flash steam applications, system sizes, and operating pressures for California facilities
- Prevalence of flash steam recovery projects in new construction, addition of new steam capacity, or steam system retrofits

- Typical per-unit makeup water costs, boiler water treatment costs, and wastewater costs in California
- California market growth rate for new construction of process steam systems.
- California rate for retrofit of process steam systems

Draft Code Language

1.1 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).

1.2 Title 24, Part 1

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

1.3 Title 24, Part 6

SECTION 100.1 RULES OF CONSTRUCTION AND DEFINITIONS

…

(b) **Definitions.** Terms, phrases, words and their derivatives in Part 6 shall be defined as specified in Section 100.1. Terms, phrases, words and their derivatives not found in Section 100.1 shall be defined as specified in the "Definitions" chapters of Title 24, Parts 1 through 5 of the California Code of Regulations. Where terms, phrases, words and their derivatives are not defined in any of the references above, they shall be defined as specified in *Webster's Third New International Dictionary of the English Language, Unabridged* (1961 edition, through the 2002 addenda), unless the context requires otherwise.

…

FLASH STEAM is water vapor that is generated when condensate is dropped to a pressure lower than its saturation pressure, which then vaporizes a fraction of the liquid in a process called flashing.

…

PRESSURIZED CONDENSATE RETURN is a steam condensate return system that continuously operates at a pressure above 15 psig during normal operation and is not vented to atmosphere. The system contains liquid condensate and any associated steam vapor that may be present in the piping.

…

SECTION 120.6 – MANDATORY REQUIREMENTS FOR COVERED PROCESSES

…

(I) Mandatory requirements for process steam systems. The following requirements apply to process steam systems that meet the below conditions:

1. A newly constructed process steam system that:
    a. has one or more connected boilers with an input rating (capacity) of 10 MMBtu/h or greater
    b. has a pressurized deaerator
    c. has design boiler operating pressures of 100 psig or greater
2. A new, non-replacement process steam load at an existing facility that:
    a. has one or more connected boilers with an input rating (capacity) of 10 MMBtu/h or greater
    b. connected to system with a pressurized deaerator and
    c. is served by a header that has a design condition pressure of 100 psig or greater
    d. meets the criteria for load size and piping lengths in Table 120.6-F

Table 120.6-F: Steam Load Addition Code Trigger Criteria for Existing Facilities

Steam Flow (lb/h)	Linear Length[2] (ft) less than
<5,000	Exempt
>5,000, <7,500	150
>7,500, <10,000	350
>10,000, <15,000	500
>15,000	1,000

Qualifying process steam systems shall recover or reduce at least 35% of flash steam as calculated using Reference Non-Residential Appendix 9 (NA9) and include the calculations for recovered or reduced flash steam in the steam system construction documents.

Flash steam may be recovered or reduced using methods such as:

A. Recovery and reuse of flash steam from high-pressure condensate, via
    a. direct reuse,
    b. thermal vapor recompression (TVR), or
    c. mechanical vapor recompression (MVR)

---

[2] Linear distance from the load to the nearest boiler plant deaerator, measured across both horizontal and vertical dimensions. Calculation of linear length will be described in Reference Appendix.

B. Recovery and reuse of flash steam from boiler blowdown
C. Implementation of a pressurized condensate return system.

SECTION 141.1 – REQUIREMENTS FOR COVERED PROCESSES IN ADDITIONS, ALTERATIONS TO EXISTING NONRESIDENTIAL, AND HOTEL/MOTEL BUILDINGS

…

[leaving space for subsection (d) to cover process boilers]

…

(e) Process steam systems.

All new, non-replacement process steam loads at existing facilities shall meet the requirements of Section 120.6(l).

1.4 Reference Appendices

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

NA7.XX Process Steam Installation Requirements

NA7.XX.1 Flash Steam Recovery

NA7.XX.1.1 Construction Inspection

Verify and document the planned installation of a flash steam recovery tank and flash steam recovery piping.

NA9 – Process Steam System Qualification Requirements

NA9.1 Purpose and Scope

Non-residential appendix NA9 provides the qualification requirements for a process steam system to meet the requirements for flash steam and condensate return in Title 24, Part 6, Sections 120.6(l).

NA9.2 Flash Steam Calculations

The amount of flash steam generated by a process, and the amount of flash steam reduced by measures in Title 24, Part 6, Sections 120.6(l)(1) shall be calculated as follows:

[TBD]

NA9.2.1 Flash Steam Documentation

[TBD]