

Proposal Summary



Circulator Pump Controls

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Measure Description

This measure would prescriptively require circulator pumps serving central service hot water systems in nonresidential buildings to have advanced pump controls. Applicable controls would include controls that are internal or external to the pump that reduce energy use at the pump and/or water heater. The proposed control requirements would vary based on building size, application, water heating plant types, and distribution system designs. Proposed continuous pump control methods include but are not limited to pressure based variable speed control with thermal balancing valve(s), constat return temperature control, demand flow-based control, and digital timeclock. The proposed measure would be applicable to new construction, alterations, and additions.

This measure would include updates to Joint Appendix JA14 to add startup and field verification requirements for contractors based on the application and pump control strategy. Field verification would be via self-attestation on the design (NRCC, LMCC) and installation (NRCI, LMCI) forms.

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

Justification for Proposed Change

Currently, there is a mandatory requirement that circulating pumps are capable of automatically turning off. Projects typically meet this requirement via installation of a timeclock, however this method does not save energy while the building is occupied. Furthermore, the commonly used timeclocks are analog timeclocks that have limited configuration options. For example, they cannot be programmed with different schedules for the weekend versus weekday. These timeclocks also have persistence issues due to clock drift and daylight savings time changes. Some projects also include aquastat control of the pump, however there is no requirement for the aquastat set point and often the aquastat installation does not result in energy savings. There are no prescriptive requirements for advanced pump controls in Title 24, Part 6 for nonresidential buildings with central water heating systems.

The proposed code change would result in the reduction of energy from the water heater and the circulator pump. The water heater energy savings are due to the reduction in recirculation system pipe heat losses in pipes and reduced destratification. Reduced destratification also increases the viability and efficiency of heat pump water heaters. The pump savings is due to the pump operating at a reduced flow rate and reduced head loss in the recirculation system; this savings is partially offset by additional plant heating load since the portion of pump power delivered to the water ultimately ends up as heat, but all plant types will have at least a marginal net pump energy savings. The controls that the proposed code change would require are typically easier to set up and more persistent than analog controls.

Several studies have evaluated the benefits of electronically commutated motors (ECM) pumps and controls. Based on the Northwest Energy Efficiency Alliance (NEEA) study results, circulator pump controls reduced runtime between 55 – 85 percent, and increased water heater energy savings between 1 - 14 percent in nonresidential applications for varying controls (NEEA, 2019). The Statewide CASE Team was able to isolate the savings associated with the proposed controls from this study. The National Renewable Energy Laboratory (NREL) study suggests that ECM pumps with added controls can provide greater than 50 percent electricity savings at the circulator pump (Dean, Honnekeri and Barker 2018). However, this study does not separate out savings

associated with controls and savings associated with the switch from an induction to ECM pump.

In addition to the above studies, TRC and 2050 Partners are working on a field demonstration study for circulator pump controls. The Statewide CASE Team will leverage data from this study to inform the energy savings for the proposed measure.

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 [Richard Fatu, rfatu@trccompanies.com] directly and copy info@title24stakeholders.com.

- Documentation of successful implementations of return temperature control, adaptive flow control, and/or differential pressure control with thermal balancing valves (case studies, adaptive flow control).

Draft Code Language

1.1 Guide to Markup Language

The proposed changes to the standards, Reference Appendices, and the ACM Reference Manuals are provided below. Changes to the 2025 documents should be marked with dark blue [underlining](#) (new language) and [strikethroughs](#) (deletions).

1.2 Administrative Code (Title 24, Part 1)

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

1.3 Energy Code (Title 24, Part 6)

Section 140.5 – PRESCRIPTIVE REQUIREMENTS FOR SERVICE WATER HEATING SYSTEMS

- (a) **Nonresidential occupancies.** [Service hot water heating](#) systems in nonresidential buildings shall meet the requirements of 1 or 2 [and 3](#) below, or meet the performance compliance requirements of Section 140.1.

1. School buildings less than 25,000 square feet and less than 4 stories in CZs 2 through 15. A heat pump water-heating system that meets the applicable requirements of Sections 110.1, 110.3 and 120.3.

Exception to Section 140.5(a)1: A water-heating system serving an individual bathroom space may be an instantaneous electric water heater.

2. All other occupancies. A water heating system that meets the applicable requirements of Sections 110.1, 110.3, 120.3 and 140.5(c)
3. All occupancies. Pump controls for circulator pumps serving recirculation systems must meet the requirements below:
 - A. Circulator pumps serving single loop recirculation systems shall be controlled via one of the following methods:
 - i. Constant return temperature control, or
 - ii. Differential pressure control with use of a thermal balancing valve, installed at the inlet of the circulator pump.
 - B. For multi-riser distribution systems, differential pressure control with thermal balancing valves installed at the end of each riser.
 - C. Where timeclocks are used to turn the system off, they shall be digital timeclocks.
 - D. Installation and startup requirements shall be documented on the plumbing plans. Documentation shall include specification of external sensors necessary for a complete installation.

Section 141.0(b)2.N:

N. Service hot water systems shall meet the requirements of Section 140.5(a)2, ~~and 140.5(b)~~, and 140.5(a)3 except for the solar water heating requirements.

1.4 Reference Appendices

APPENDIX JA14 – Qualification Requirements for Central Heat Pump Water Heater Hot Water Systems

JA14.1 Purpose and Scope

Joint Appendix JA14 provides the qualification requirements to meet the standards for hot water systems set forth in Title 24, Part 6, Section 110.3. Additionally, JA14 provides qualification requirements to meet the standards for central heat pump water heater (Central HPWH) systems set forth in Title 24, Part 6, Section 170.2(d)2 and in performance standards set forth in Section 140.1 and 170.1.