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| **Docket Number:** | 24-BSTD-01 |
| **Project Title:** | 2025 Energy Code Rulemaking |
| **TN #:** | 258651 |
| **Document Title:** | Revisions to 2025 Energy Code, Section 1410(b)2Cii for Nonresidential HVAC Alterations |
| **Description:** | This is a staff memo to justify the proposed revision to Table 141.0-C, for nonresidential HVAC alterations. |
| **Filer:** | Javier Perez |
| **Organization:** | California Energy Commission |
| **Submitter Role:** | Commission Staff |
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CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

# MEMORANDUM

**TO**: 2025 BUILDING ENERGY EFFICIENCY STANDARDS DOCKET (24-BTSD-01)

**FROM**: CALIFORNIA ENERGY COMMISSION

**SUBJECT**: Explanation of CEC-proposed Revisions to 2nd 15-day Language of the 2025 Energy Code, Section 141.0(b)2Cii for Nonresidential Building Alterations of New or Replacement Single Zone Packaged Rooftop Space-Conditioning Systems or Components

**DATE**: AUGUST 22, 2024

## INTRODUCTION

The first proposed 15-day language for the 2025 Building Energy Efficiency Standards (2025 Energy Code) released on June 13, 2024, included prescriptive requirements and compliance options for alterations of single zone packaged rooftop systems with direct expansion (DX) cooling capacity <65,000 Btu/hr[1] in nonresidential building types: retail and grocery, school, office, financial institution, and library. This proposal was documented in a staff report developed by the California Energy Commission (CEC), Nonresidential HVAC Heat Pump Baseline Measures[2]. NORESCO provided technical support for that report.

In the first 15-day language proposal, Sections 141.0(b)2Cii and Table 141.0-E-1 specify economizer requirements for the single zone air conditioner compliance options (SZAC1 and SZAC2). The economizer requirement was not explicitly specified for the heat pump baseline, single zone heat pump (SZHP). Additionally, the first proposed 15-day language does not explicitly refer to the 2025 Energy Code section that specifies the cooling capacity where economizers are required for single zone packaged equipment. In both the 2022 Energy Code and the proposed 2025 Energy Code, Section 140.4(e) specifies economizer requirements for air conditioners and heat pumps with a design total mechanical cooling capacity over 33,000 Btu/hr.

The first proposed 15-day language introduces ambiguity regarding whether an economizer is required for the heat pump baseline, and for what cooling capacity an economizer is required. There should be no ambiguity that economizers are required for the heat pump baseline in compliance with the 2022 Energy Code and proposed 2025 Energy Code Section 140.4(e). The compliance option for single zone air conditioners with only the already required economizer is insufficient to comply with the single zone heat pump baseline for cooling capacities where

[1] See Appendix A of this memo for regulatory language.

[2] https://efiling.energy.ca.gov/GetDocument.aspx?tn=255318-3&DocumentContentId=91006

economizers are required. This option needs to be revised to account for this insufficiency. This memo clarifies that single zone air conditioners must be installed with a variable speed fan to match the heat pump baseline, which includes an economizer.

The proposed revisions in the second 15-day language clarify that the economizer requirements specified in Section 140.4(e) apply to alterations of single zone packaged rooftop systems. This revision replaces SZAC1, the air conditioner with economizer only measure, with the measures that were proposed in the first 15-day language for SZAC2. The new SZAC1 option also incorporates a variable speed fan. The proposed revisions in the second 15-day language also remove the SZAC3 compliance option, which is redundant to SZAC1.

# DISCUSSION

## Economizers

Section 141.0(b)2C prescriptively requires alterations for new or replacement space-conditioning systems to meet the requirements of Section 140.4 (including subsection 140.4(e)). Section 140.4(e) of the 2022 Energy Code and proposed first 15-day language of the 2025 Energy Code specifies the economizer requirement for cooling air handlers with a design total mechanical cooling capacity over 33,000 Btu/hr. This economizer requirement is applicable to alterations for single zone packaged AC and heat pump rooftop systems.[1]

The first 15-day language included prescriptive requirements for alterations of single zone packaged rooftop systems with a heat pump baseline and a compliance option for single zone air conditioners, which did not accurately and clearly reflect the 2022 and proposed 2025 Energy Code economizer requirements. As proposed, the first 15-day language proposal could appear to disregard the Energy Code requirements for economizers and as a result the energy savings associated with the Energy Code economizer requirements would be lost. The second proposed 15-day language requirements are intended to accurately and clearly reflect the 2022 and proposed 2025 Energy Code economizer requirements and clarify requirements for both the single zone heat pump baseline and the single zone air conditioner compliance option.

## Dual Fuel Heat Pumps

Note that in the first 15-day language proposal, dual fuel heat pump (DFHP) is included in the footnotes for SZAC1 and SZAC2 as an alternative prescriptive option to the single zone air conditioner with furnace. This dual fuel heat pump was included based on comments received in the docket from industry stakeholders (Docket 24-BSTD-01, comment TN# 256111).

# ORIGINAL AND SECOND 15-DAY LANGUAGE

Appendix A of this memo provides 1) the original proposed 15-Day Language for Section 141.0(b)2Cii, and 2) the proposed Second 15-Day Language for Section 141.0(b)2Cii.

# APPENDIX A

## First 15-Day Language for Section 141.0(b)2Cii

**(b) Alterations**

**2. Prescriptive approach.**

**C. New or Replacement Space-Conditioning Systems or Components**

ii. New or replacement single zone packaged direct expansion (DX) rooftop systems with rated cooling capacity less than 65,000 Btu/hr shall meet the applicable requirements in Table 141.0-E-1 or shall meet the performance compliance requirements of Section 141.0(b)3.

*Table 141.0-E-1 – NEW OR REPLACEMENT SINGLE ZONE AIR CONDITIONER OR HEAT PUMP REQUIREMENT*

| Building Area Type | CZ1 | CZ2 | CZ3 | CZ4 | CZ5 | CZ6 | CZ7 | CZ8 | CZ9 | CZ10 | CZ11 | CZ12 | CZ13 | CZ14 | CZ15 | CZ16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Retail and grocery** | NR | NR | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | NR | SZHP or SZAC3 | NR |
| **School** | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC2 | SZHP or SZAC1 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | NR |
| **Office, financial institution** | NR | NR | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC2 | SZHP or SZAC1 | SZHP or SZAC1 | NR | SZHP or SZAC2 | NR |
| **Library** | SZHP or SZAC1 | NR | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | SZHP or SZAC2 | NR |

Footnotes to Table 141.0-E-1

- SZHP – Single Zone Heat Pump
- SZAC – Single Zone Air Conditioner with Furnace, or Dual Fuel Heat Pump
- SZAC1 – Single Zone Air Conditioner with Furnace + Economizer, or Dual Fuel Heat Pump + Economizer
- SZAC2 - Single Zone Air Conditioner with Furnace + Economizer + Variable Speed Fan, or Dual Fuel Heat Pump + Economizer + Variable Speed Fan
- SZAC3 – Single Zone Air Conditioner with furnace + Economizer + Variable Frequency Drive
- NR – No Requirement

Air conditioners with furnaces or dual fuel heat pumps complying with Table 141.0-E-1 using variable speed fan and controls shall be designed to vary the indoor fan air flow rate as a function of the load and shall have a minimum of two stages of fan control. The minimum speed at stage 1 shall be set for ventilation only mode and shall be the greater of 50% or the minimum fan speed required to meet the minimum ventilation airflow rate. The indoor fan shall draw no more than 30% of the fan power at full fan speed when operating at 50% speed.

**Exception 1 to Section 141.0(b)2Cii:** Section 141.0(b)2Cii is not applicable if the alteration exceeds the existing main service panel or service transformer capacity. An electrical load calculation shall be submitted by a registered professional engineer in accordance with Article 220 of California Electrical Code.

**Exception 2 to Section 141.0(b)2C:** Subsection (b)2C does not apply to replacement of electric reheat of equivalent or lower capacity electric resistance space heaters, when natural gas is not available.

**Exception 3 to Section 141.0(b)2C:** Section 140.4(n) is not applicable to newly installed or replacement space conditioning systems. with existing operable wall or roof openings without interlock controls.

**Exception 4 to Section 141.0(b)2C:** A new or replacement gas hot water boiler system with a total system input of at least 1 MMBtu/h but no more than 10 MMBtu/h need not comply with the requirements of 140.4(k)8.

**Exception 5 to Section 141.0(b)2C:** Requirements for the use of ASHRAE Guideline 36 in Sections 140.4(c)2Bii, 140.4(d)2Av, 140.4(e)2D, and 140.4(f)3, and 140.4(r) shall not apply to new or replacement components unless the space conditioning-systems are also new or replacements.

**Exception 6 to Section 141.0(b)2C:** Section 140.4(e) is not applicable to systems that meet both of the following:

1. The system is not a single package air-cooled commercial unitary air conditioner or heat pump; and
2. The cooling capacity of the system is less than 54,000 Btu/h.

## Proposed Second 15-Day Language for Section 141.0(b)2Cii

**(b) Alterations**

**2. Prescriptive approach.**

**C. New or Replacement Space-Conditioning Systems or Components**

ii. New or replacement single zone packaged direct expansion (DX) rooftop systems with rated cooling capacity less than 65,000 Btu/hr shall meet the applicable requirements in Table 141.0-E-1 or shall meet the performance compliance requirements of Section 141.0(b)3.

*Table 141.0-E-1 – NEW OR REPLACEMENT SINGLE ZONE AIR CONDITIONER OR HEAT PUMP REQUIREMENT*

| Building Area Type | CZ1 | CZ2 | CZ3 | CZ4 | CZ5 | CZ6 | CZ7 | CZ8 | CZ9 | CZ10 | CZ11 | CZ12 | CZ13 | CZ14 | CZ15 | CZ16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Retail and grocery** | NR | NR | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | NR | SZHP or SZAC13 | NR |
| **School** | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC12 | SZHP or SZAC1 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | NR |
| **Office, financial institution** | NR | NR | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC12 | SZHP or SZAC1 | SZHP or SZAC1 | NR | SZHP or SZAC12 | NR |
| **Library** | SZHP or SZAC1 | NR | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC1 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | SZHP or SZAC12 | NR |

Footnotes to Table 141.0-E-1

- SZHP – Single Zone Heat Pump + Economizer in accordance with Section 140.4(e)
- ~~SZAC – Single Zone Air Conditioner with Furnace, or Dual Fuel Heat Pump~~
- ~~SZAC1 – Single Zone Air Conditioner with Furnace + Economizer, or Dual Fuel Heat Pump + Economizer~~
- SZAC12 - Single Zone Air Conditioner with Furnace + ~~Economizer +~~ Variable Speed Fan + Economizer in accordance with Section 140.4(e), or Dual Fuel Heat Pump + ~~Economizer +~~ Variable Speed Fan + Economizer in accordance with Section 140.4(e)
- ~~SZAC3 – Single Zone Air Conditioner with furnace + Economizer + Variable Frequency Drive~~
- NR – No Requirement