Proposal Summary

2022 California Energy Code (Title 24, Part 6)

Single Family Variable Capacity HVAC Compliance Software Revisions

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Prepared by: David Springer, Frontier Energy Inc.

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during Round 2 of the utility-sponsored stakeholder meeting on March 12, 2020. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com.

Measure Description

Variable capacity HVAC systems typically have higher performance ratings than single speed systems, but when their ducts are located in a vented attic, reduced airflow can result in increased thermal losses, producing an overall loss of efficiency. This measure proposes to utilize results from laboratory testing of a variable capacity system completed by the UC Davis Western Cooling Efficiency Center (WCEC) to improve compliance software so that it more closely reflects the overall performance of variable capacity systems with attic ducts. This measure applies to central split system air conditioners, heat pumps, and furnaces. This measure does not apply to variable capacity heat pumps commonly referred to as "mini-splits", which are dealt with separately under Title 24, Part 6 code.

With proposed improvements to compliance software, compliance results for systems that integrate zonal control with variable capacity air conditioners and heat pumps, and systems that have ducts in conditioned space will be substantially the same as they are under the 2019 Title 24 Standards. A process for verifying systems with integrated controls is also proposed and will utilize a new category under the Energy Commission's Manufacturer Certification for Equipment, Products, and Devices listings.

In addition to these performance path changes, a prescriptive requirement that applies to alterations is also proposed that would limit the replacement of existing equipment with variable capacity systems unless they are equipped with integrated zonal control or ducts are fully buried. These requirements would be limited to Climate Zones 2 and 8 through 15.

Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions). Changes to

Section 150.0 are only proposed to remove obsolete language and to relocate an exception to the subsection in which it belongs.

Standards

SECTION 100.1 – DEFINITIONS AND RULES OF CONSTRUCTION

Section 100.1(b) – Definitions: Recommend new definitions for the following terms:

"Integrated Zonal Control System" is a variable speed or multi speed space conditioning system that combines control of outdoor unit compressor speed, and indoor unit forced air distribution fan speed and zone dampers to prevent low air velocity or over-pressurization of ducts.

SECTION 150.0 – MANDATORY FEATURES AND DEVICES

150.0(m)13. Space Conditioning System Airflow Rate and Fan Efficacy. Space conditioning systems that utilize forced air ducts to supply cooling to an occupiable space shall:

C. **Zonally Controlled Central Forced Air Systems.** Zonally controlled central forced air cooling systems shall be capable of simultaneously delivering, in every zonal control mode, an airflow from the dwelling, through the air handler fan and delivered to the dwelling, of greater than or equal to 350 CFM per ton of nominal cooling capacity, and operating at an air-handling unit fan efficacy of less than or equal to the maximum W/CFM specified in subsections i or ii below. The airflow rate and fan efficacy requirements in this section shall be confirmed by field verification and diagnostic testing in accordance with the applicable procedures specified in Reference Residential Appendix RA3.3.

i. 0.45 W/CFM for gas furnace air-handling units.

ii. 0.58 W/CFM for air-handling units that are not gas furnaces.

EXCEPTION to Section 150.0(m)13C: Multispeed or variable speed compressor systems, or single speed compressor systems that utilize the performance compliance approach, shall demonstrate compliance with the airflow (cfm/ton) and fan efficacy (Watt/cfm) requirements by operating the system at maximum compressor capacity and system fan speed with all zones calling for conditioning, rather than in every zonal control mode.

D. **Small Duct High Velocity Forced Air Systems.** Demonstrate, in every control mode, airflow greater than or equal to 250 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy less than or equal to 0.62 W/CFM as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3

EXCEPTION 1 to Section 150.0(m)13B and D: Standard ducted systems without zoning dampers may comply by meeting the applicable requirements in TABLE 150.0-B or 150.0-C as confirmed by field verification and diagnostic testing in accordance with the procedures in Reference Residential Appendix Sections RA3.1.4.4 and RA3.1.4.5. The design clean-filter pressure drop requirements specified by Section 150.0(m)12Div for the system air filter(s) shall conform to the requirements given in TABLES 150.0-B and 150.0-C.

EXCEPTION 2 to Section 150.0(m)13B and D: Multispeed compressor systems or variable speed compressor systems shall verify airflow (cfm/ton) and fan efficacy (Watt/cfm) for system operation at the maximum compressor speed and the maximum air handler fan speed.

~~**EXCEPTION 3 to Section 150.0(m)13B:** Gas furnace air-handling units manufactured prior to July 3, 2019 shall comply with a fan efficacy value less than or equal to 0.58 w/cfm as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.~~

~~**EXCEPTION 1 to Section 150.0(m)13C:** Multispeed or variable speed compressor systems, or single speed compressor systems that utilize the performance compliance approach, shall demonstrate compliance with the airflow (cfm/ton) and fan efficacy (Watt/cfm) requirements of Section 150.0(m)13C by operating the system at maximum compressor capacity and system fan speed with all zones calling for conditioning, rather than in every zonal control mode.~~

~~**EXCEPTION 2 to Section 150.0(m)13C:** Gas furnace air-handling units manufactured prior to July 3, 2019 shall comply with a fan efficacy value less than or equal to 0.58 w/cfm as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3.~~

SECTION 150.1 – PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR LOW-RISE RESIDENTIAL BUILDINGS

150.1(b)3. Compliance Demonstration Requirements for Performance Standards.

B. **Field Verification**. When performance of installed features, materials, components, manufactured devices or systems above the minimum specified in Section 150.1(c) is necessary for the building to comply with Section 150.1(b), or is necessary to achieve a more stringent local ordinance, field verification shall be performed in accordance with the applicable requirements in the following subsections, and the results of the verification(s) shall be documented on applicable Certificates of Installation pursuant to Section 10-103(a)3 and applicable Certificates of Verification pursuant to Section 10-103(a)5.

x. **Multispeed and Variable Speed Space Conditioning Systems**. When performance compliance includes zonally controlled multispeed or variable speed systems with ducts in non-conditioned space, the space conditioning system shall be verified to meet the requirements for Integrated Zonal Control Systems in accordance with the procedures specified in Residential Appendix RA3.4.4.4.

SECTION 150.2 – ENERGY EFFICIENCY STANDARDS FOR ADDITIONS AND ALTERATIONS TO EXISTING LOW-RISE RESIDENTIAL BUILDINGS

150.2(b)1. Prescriptive approach.

F. **Altered Space-Conditioning System - Mechanical Cooling:** When a space-conditioning system is an air conditioner or heat pump that is altered by the installation or replacement of refrigerant-containing system components such as the compressor, condensing coil, evaporator coil, refrigerant metering device or refrigerant piping, the altered system shall comply with the following requirements:

i. All thermostats associated with the system shall be replaced with setback thermostats meeting the requirements of Section 110.2(c).

ii. In Climate Zones 2, 8, 9, 10, 11, 12, 13, 14, and 15, multi-speed and variable speed central split system air-cooled air conditioners and air source heat pumps with ducts located in an unconditioned attic shall include a certified zoning system consisting of a minimum of two zones confirmed through field verification in accordance with the procedures specified in Reference Residential Appendix Section RA3.4.4.4.

Exception to 150.2(b)1Fii: Zoning is not required if ducts are located in conditioned space or if they are verified to be deeply buried in accordance with RA3.1.4.1.

iii. In Climate Zones 2, 8, 9, 10, 11, 12, 13, 14, and 15, air-cooled air conditioners and air-source heat pumps, including but not limited to ducted split systems, ducted package systems, small duct high velocity air systems, and minisplit systems, shall comply with subsections a and b, unless the system is of a type that cannot be verified using the specified procedures. Systems that cannot comply with the requirements of 150.2(b)1Fii shall comply with 150.2(b)1Fiii.

Reference Appendices

RA3.3.4 HVAC System Verification Procedures

RA3.4.4.4 ***Verification Procedure for Variable Capacity Systems with Zonal Controls***

When performance compliance includes a multiple speed or variable speed split system with zonal controls, or when an existing space conditioning system is altered to include a multiple speed or variable speed split system air conditioner or heat pump, the controls for the system shall be verified according to the procedure specified in this section. The verification procedure shall consist of visual inspection to confirm that the furnace or heat pump air handler, outdoor unit, and zone controls are listed in the Energy Commission Manufacturer Certification for Equipment, Products and Devices, and the following tests shall be performed and documented in compliance documents:

(a) Verify that no bypass damper is installed (per RA3.1.4.6).

(b) Set thermostats so that all zones are calling for cooling.

(c) After the system has been operating for at least five minutes, measure and record the airflow using methods described in RA3.3.

(d) Set all thermostats but one to the off position.

(e) Measure and record airflow again.

(f) For the HERS Rater inspecting the system, if the second airflow measurement is not greater than 60% of the first measurement, then there is sufficient evidence that controls link zonal operation to equipment capacity and the system passes.

(g) For the Installer, if the system fails to meet the maximum airflow criteria with one zone calling, then necessary control adjustments or equipment substitutions must be made, and the measurement procedure repeated.