

Residential HVAC Measures

Draft Code Language

Last Updated: March 2017

1. INTRODUCTION

The California Statewide Utility Codes and Standards Team actively supports the California Energy Commission in developing revisions to the 2019 California Building Energy Efficiency Standards (Title 24, Part 6). Our joint intent is to achieve significant energy savings through the development of reasonable, responsible, and cost-effective code change proposals for the 2019 Title 24 code change cycle.

The Statewide Utility Team is proposing code changes that change the mandatory requirement for fan efficacy to 0.40 W/cfm as well as add compliance option alternatives for refrigerant charge verification and fault detection.

The Statewide Utility Team is requesting feedback on the draft code language presented in this document. Input we receive will inform the code change proposal that the Statewide Utility Team will be proposing to the California Energy Commission in April 2017.

To provide feedback, please email us at info@title24stakeholders.com or contact the measure lead at:

David Springer, dspringer@davisenergy.com

For more information about the California Statewide Utility Codes and Standards Team's 2019 Title 24, Part 6 advocacy efforts, and the latest information on this code change proposal please visit: www.title24stakeholders.com.

2. DRAFT CODE LANGUAGE

The proposed changes to the Standards, Reference Appendices, and the ACM Reference Manuals are provided below. Changes to the 2016 documents are marked with underlining (new language) and ~~strikethroughs~~ (deletions).

2.1 Standards

SECTION 150.0 – MANDATORY FEATURES AND DEVICES

Subsection 150.0(m)13:

- B. **Single Zone Central Forced Air Systems.** Demonstrate, in every control mode, airflow greater than or equal to 350 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy less than or equal to ~~0.58~~0.45 W/CFM as confirmed by field verification and diagnostic testing in accordance with the procedures given in Reference Residential Appendix RA3.3
- 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 ~~0.580.45~~ W/CFM as confirmed by field verification and diagnostic testing in accordance with the applicable procedures specified in Reference Residential Appendix RA3.3.

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

Subsection 150.1(c)7:

- A. **Refrigerant Charge.** When refrigerant charge verification or ~~fault indicator display equivalent~~ is shown as required by TABLE 150.1-A, the system shall comply with either 150.1(c)7Ai or 150.1(c)7Aii:
- i. Air-cooled air conditioners and air-source heat pumps, including but not limited to ducted split systems, ducted packaged systems, and mini-split systems, shall comply with subsections a, b and c, unless the system is of a type that cannot be verified using the specified procedures:
 - a. Have measurement access holes (MAH) installed according to the specifications in the Reference Residential Appendix Section RA3.2.2.3; and
 - b. System airflow rate greater than or equal to 350 cfm per ton shall be demonstrated by the installer and be verified by the HERS rater as specified by Reference Residential Appendix Section RA3.3 or an approved alternative procedure as specified by RA1; and
 - c. The installer shall charge the system according to manufacturer’s specifications. Refrigerant charge shall be verified according to one of the following options, as applicable:
 1. The installer and rater shall perform the standard charge procedure as specified by Reference Residential Appendix Section RA3.2.2 or an approved alternative procedure as specified by RA1; or
 2. The installer shall perform the standard charge procedure as specified by Reference Residential Appendix Section RA3.2.2. The rater shall perform the standard charge procedure, or the temperature split procedure as specified by RA3.2.4; or
 3. The system shall be equipped with a fault indicator display (FID) device that meets the specifications of Reference Joint Appendix JA6. The installer shall verify the refrigerant charge and FID device in accordance with the procedures in Reference Residential Appendix Section RA3.4.2. The HERS Rater shall verify FID device in accordance with the procedures in Section RA3.4.2; or
 4. The installer shall perform the weigh-in charging procedure as specified by Reference Residential Appendix Section RA3.2.3.1 provided the system is of a type that can be verified using the RA3.2.2 standard charge verification procedure and RA3.3 airflow rate verification procedure or approved alternatives in RA1. The HERS Rater shall verify the charge using RA3.2.2 and the airflow rate using RA3.3 or approved alternatives in RA1.

Subsection 150.1(c)10:

Central Fan Integrated Ventilation Systems. Central forced air system fans used to provide outside air, shall have an air-handling unit fan efficacy less than or equal to ~~0.580.40~~ W/CFM as confirmed through field verification and diagnostic testing in accordance with all applicable procedures specified in Reference Residential Appendix RA3.3. Central Fan Integrated Ventilation Systems shall be certified to the Energy Commission as Intermittent Ventilation Systems as specified in Reference Residential Appendix RA3.7.4.2.

Table 150.1-A:

Table 1: Proposed updates to Table 150.1-A Component Package-A

			Climate Zone															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HVAC SYSTEM	Space Cooling	Refrigerant Charge Verification or Equivalent Fault Indicator-Display	NR	REQ	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR

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

Subsection 150.2(b)1F:

- ii. 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, and mini-split 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.
 - a. Minimum system airflow rate greater than or equal to 300 cfm per ton shall be demonstrated by the installer and be verified by the HERS Rater according to the procedures specified in Reference Residential Appendix Section RA3.3 or an approved alternative procedure as specified in Section RA1; and
 - b. ~~The system shall comply with the requirements of 150.1(c)7Aic. The installer shall charge the system according to manufacturer’s specifications. Refrigerant charge shall be verified according to one of the following options, as applicable.~~
 - 1. ~~The installer and rater shall perform the standard charge verification procedure as specified in Reference Residential Appendix Section RA3.2.2, or an approved alternative procedure as specified in Section RA1; or~~
 - 2. ~~The system shall be equipped with a fault indicator display (FID) device that meets the specifications of Reference Joint Appendix JA6. The installer shall verify the refrigerant charge and FID device in accordance with the procedures in Reference Residential Appendix Section RA3.4.2. The HERS Rater shall verify FID device in accordance with the procedures in Section RA3.4.2; or~~
 - 3. ~~The installer shall perform the weigh in charging procedure as specified by Reference Residential Appendix Section RA3.2.3.1 provided the system is of a type that can be verified using the RA3.2.2 standard charge verification procedure and RA3.3 airflow rate verification procedure or approved alternatives in RA1. The HERS Rater shall verify the charge using RA3.2.2 and RA3.3 or approved alternatives in RA1.~~

EXCEPTION 1 to Section 150.2(b)1Fia: Systems unable to comply with the minimum 300 cfm per ton airflow rate requirement shall demonstrate compliance using the procedures in Section RA3.3.1.5; and the system’s thermostat shall conform to the specifications in Reference Joint Appendix JA5.

EXCEPTION 2 to Section 150.2(b)1Fia: The Executive Director may approve alternate airflow and fan efficacy requirements for small duct high velocity systems.

EXCEPTION 3 to Section 150.2(b)1Fia: Entirely new or complete replacement space conditioning systems, as specified by section 150.2(b)1C, without zoning dampers may comply with the minimum airflow rate by meeting the applicable requirements in TABLE150.0-B or 150.0-C as confirmed by field verification and diagnostic testing in accordance with the procedures in Reference Residential Appendix Section RA3.1.4.4 and RA3.1.4.5. The design clean-filter pressure drop requirements of Section 150.0(m)12C for the system air filter device(s) shall conform to the requirements given in TABLES 150.0-B and 150.0-C.

EXCEPTION 1 to Section 150.2(b)1Fiib: When the outdoor temperature is less than 55 degrees F and the installer utilizes the weigh-in charging procedure in Reference Residential Appendix Section RA3.2.3.1 to verify the refrigerant charge demonstrate compliance, the installer may elect to utilize the HERS Rater verification procedure in Reference Residential Appendix Section RA3.2.3.2. If the HERS Rater verification procedure in Section RA3.2.3.2 is used for compliance, the system's thermostat shall conform to the specifications in Reference Joint Appendix JA5. Ducted systems shall comply with the minimum system airflow rate requirements in Section 150.2(b)1Fiia.

~~**EXCEPTION to Section 150.2(b)1Fii:** Entirely new or complete replacement packaged systems for which the manufacturer has verified correct system refrigerant charge prior to shipment from the factory are not required to have refrigerant charge confirmed through field verification and diagnostic testing. The installer of these packaged systems shall certify on the Certificate of Installation that the packaged system was pre-charged at the factory and has not been altered in a way that would affect the charge. Ducted systems shall comply with minimum system airflow rate requirement in Section 150.2(b)1Fiia, provided that the system is of a type that can be verified using the procedure specified in RA3.3 or an approved alternative in RA1.~~

2.2 Reference Appendices

JOINT APPENDICES

Appendix JA1 - Glossary

Fault Detection and Diagnosis is a ...

Fault Indicator Display is a ...

Temperature Split is a ...

Appendix JA6 – HVAC System Fault Detection and Diagnostic Technology

JA6.1 Fault Indicator Display (FID)

JA6.6.1 Purpose and Scope

Fault indicator display technologies other than what is described in Section JA6.1 are possible, and when vapor compression air conditioner and heat pump system ~~faults refrigerant charge, metering device and airflow operating performance~~ can be reliably determined and displayed by methods and instrumentation other than those specifically defined in section JA6.1 such alternative fault indicator display technologies may be allowed for Fault Indicator Display compliance credit if the manufacturer of the product requests approval from the Energy Commission.

JA6.3 Fault Detection & Diagnosis (FDD)

[New language will be developed that provides the general specifications for devices meeting requirements for FDD devices.]

RESIDENTIAL APPENDICES

Appendix RA2 – Residential HERS Verification, Testing, and Documentation Procedures

RA2.2 – Measures That Require Field Verification and Diagnostic Testing

Table RA2-1: *Summary of Measures Requiring Field Verification and Diagnostic Testing*

Measure Title	Description	Procedure(s)
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Air Conditioning Measures		
Improved Refrigerant Charge <u>or performance verification, and Fault Detection</u>	Component Packages require in some climate zones that air-cooled air conditioners and air-source heat pumps be diagnostically tested in the field to verify that the system has the correct refrigerant charge <u>or meets capacity criteria as determined using a temperature split test</u> . For the performance method, the Proposed Design is modeled with less efficiency if diagnostic testing and field verification is not performed. The system must also meet the prerequisite minimum System Airflow requirement.	RA3.3 RA3.2 RA1.2
Installation of Fault Indicator Display	Component Packages specify that a Fault Indicator Display can be installed as an alternative to refrigerant charge testing. <u>When using the performance approach to compliance</u> (The existence of a Fault Indicator Display has <u>a higher</u> the same calculated benefit <u>than</u> as refrigerant charge testing. Field verification is required.	RA3.4.2
<u>Installation of Fault Detection & Diagnosis</u>	<u>Compliance credit can be taken for installation of a Fault Detection and Diagnosis device. Field verification is required.</u>	<u>RA3.4.5</u>

Appendix RA3 – Residential Field Verification and Diagnostic Test Protocols

RA3.2 – Field Verification and Diagnostic Testing of Refrigerant Charge for Air Conditioners and Heat Pumps

RA3.2.4 Temperature Split Verification Procedure

[Language to be added after procedure is adopted and finalized]

RA3.4 – Field Verification of Installed HVAC System Components and Devices

RA3.4.2 Fault Indicator Display (FID) Verification Procedure

The FID verification procedure shall consist of visual inspection to confirm that the FID is installed on the system, and that the manufacturer has certified to the Energy Commission that the FID model meets the applicable requirements of Reference Joint Appendix JA6. In addition, the space conditioning system shall comply with the procedures specified in Sections RA3.4.2.1, or RA3.4.2.2, or RA3.4.2.3, or other verification procedure submitted to the Energy Commission for devices that are approved but that do not meet the specifications provided in JA6.

RA3.4.5 Fault Detection and Diagnosis (FDD) Device Verification Procedure

[Language to be added following the development of the FDD specification.]