

## SUBCHAPTER 9

# LOW-RISE RESIDENTIAL BUILDINGS—ADDITIONS AND ALTERATIONS IN EXISTING LOW-RISE RESIDENTIAL BUILDINGS

### SECTION 152 – ENERGY EFFICIENCY STANDARDS FOR ADDITIONS AND ALTERATIONS IN EXISTING BUILDINGS THAT WILL BE LOW-RISE RESIDENTIAL OCCUPANCIES

- (a) **Additions.** Additions to existing residential buildings shall meet the requirements of Sections 111 through 118, Section 119 (d), and Section 150, and either Section 152(a)1 or 2.
1. **Prescriptive approach.** Additions to existing buildings shall meet the following additional requirements:
    - A. Fenestration in additions up to 100 square feet shall not have more than 50 square feet of fenestration area, and shall meet the U-factor and Solar Heat Gain Coefficient requirements of Package D (Sections 151-(f)-3 A, 151 (f) 4 and TABLE 151 C); or
    - B. Additions up to 1000 square feet shall meet all the requirements of Package D (Section 151 (f) and TABLE 151-C), except that the addition's total glazing area limit is the maximum allowed in Package D plus the glazing area that was removed by the addition, and the wall insulation value need not exceed R-13.
    - C. Additions of more than 1000 square feet shall meet all the requirements of Package D (Section 151(f) and Package D (Section 151 (f) and TABLE 151 C).
    - D. In climate zones 2, 4, 7-15 the total allowed west-facing glazing area shall be five percent of the conditioned floor area of the addition plus the amount of west-facing glazing removed from the existing building.<sup>1</sup>
  2. **Performance approach.** Performance calculations shall meet the requirements of Section 151(a) through (e), pursuant to either Item A or B, below.
    - A. For additions alone. ~~T~~he addition complies if the addition alone meets the combined water-heating and space-conditioning energy budgets as specified in Section 151(b).
    - B. For existing plus addition plus alteration compliance. ~~T~~he addition complies if the energy efficiency of the existing building is improved such that the TDV energy consumption of the improved existing building and the addition is equal to or less than that of the unimproved existing building plus an addition that complies with the applicable energy budget. When an improvement is proposed to the existing building to comply with this subsection, the improvement shall meet the requirements of section 152(b)2 for that component.

**EXCEPTION 1 to Section 152 (a):** Existing structures with R-11 framed walls showing compliance with Section 152 (a) 2 (Performance Approach) are exempt from Section 150(c).

**EXCEPTION 2 to Section 152 (a):** Any dual-glazed greenhouse window and dual-glazed skylight installed in an addition complies with the U-factor requirements in Section 151(f)3A.

**EXCEPTION 3 to Section 152 (a):** If the addition will increase the total number of water heaters in the building, one of the following types of water heaters may be installed to comply with Section 152(a)1 or Section 152(a)2A:

1. A gas storage non-recirculating water heating system that does not exceed 50 gallons capacity; or
2. If no natural gas is connected to the building, an electric storage water heater that does not exceed 50 gallons capacity, has an energy factor not less than 0.90; or
3. A water heating system determined by the executive director to use no more energy than the one specified in Item 1 above; or if no natural gas is connected to the building, a water heating system determined by the executive director to use no more energy than the one specified in Item 2 above.

For prescriptive compliance with Section 152 (a) 1, the water heating systems requirement in Section 151 (f) 8 shall not apply. For performance compliance for the addition alone, only the space-conditioning budgets of Section 151 (b) 2 shall be used; the water-heating budgets of Section 151-(b)-1 shall not apply.

The performance approach for the existing building and the addition in Section 152 (a) 2 B may be used to show compliance, regardless of the type of water heater installed.

**EXCEPTION 4 to Section 152 (a):** When heating and/or cooling will be extended to an addition from the existing system(s), the existing heating and cooling equipment need not comply with Title 24, Part 6. The heating system capacity must be adequate to meet the minimum requirements of CBC Section 310.11.

**EXCEPTION 5 to Section 152 (a):** When ducts will be extended from an existing duct system to serve the addition, the ducts shall meet the requirements of Section 152 (b) 1 D.

(b) **Alterations.** Alterations to existing residential buildings or alterations in conjunction with a change in building occupancy to a low-rise residential occupancy shall meet either Item 1 or 2 below.

1. **Prescriptive approach.** The altered component and any newly installed equipment serving the alteration shall meet the applicable requirements of Sections 110 through 118, Section 119(d), and Section 150; and

A. Alterations that add fenestration area shall meet the U-factor requirements of Package D (Section 151(f)3A and Table 151-C), the total fenestration area and west-facing fenestration area requirements of Package D (Section 151(f)3B and Table 151-C), and the Solar Heat Gain coefficient requirements of Package D (Section 151(f)4 and TABLE 151-C)

**EXCEPTION 1 to Section 152(b)1A.:** ~~West-facing fenestration area shall be limited to not exceed the~~ higher of five percent of the conditioned floor area or the area of the existing west-facing fenestration area.

**EXCEPTION 2 to Section 152(b) 1 A.:** Alterations that add fenestration area of up to 50 square feet shall ~~not~~ be required to meet the total fenestration area requirements of Section 151(f)3B.

B Replacement fenestration, where all the glazing in an existing fenestration opening is replaced with a new manufactured fenestration product, shall not exceed the U-factor and Solar Heat Gain Coefficient requirements of Package D (Sections 151(f)3A and 151(f)4 and Table 151-C).

**NOTE:** Glass replaced in an existing sash and frame, or replacement of a single sash in a multi-sash fenestration product are considered repairs.

C. New space-conditioning systems or components other than new or replacement space conditioning ducts shall:

- i. Meet the requirements of Sections 150(h), 150(i), 150(j)2, 151(f)6, 151(f)7A, and 151(f)9; and
- ii. Be limited to natural gas, liquefied petroleum gas, or the existing fuel type unless it can be demonstrated that the TDV energy use of the new system is more efficient than the existing system.

D. When more than 40 feet of new or replacement space-conditioning ducts are installed in unconditioned space, the new ducts shall meet the requirements of Section 150 (m) and the duct insulation requirements of Package D Section 151-(f)-10. ~~and if ducts are installed~~ in climate zones 2, 9, 10, 11, 12, 13, 14, 15, or 16, ~~and~~ the duct system shall be sealed as confirmed through field verification and diagnostic testing in accordance with procedures for duct sealing of existing duct systems as specified in the Reference Residential Appendix RA4CM manual, to meet one of the following requirements:

- i. If the new ducts form an entirely new duct system directly connected to the air handler, the measured duct leakage shall be less than 6% of fan flow; or
- ii. If the new ducts are an extension of an existing duct system, the combined new and existing duct system shall meet one of the following requirements:
  - a. The measured duct leakage shall be less than 15% of fan flow; or
  - b. The measured duct leakage to outside shall be less than 10% of fan flow; or
  - c. The duct leakage shall be reduced by more than 60% relative to the leakage prior to the installation of the new ducts and a visual inspection including a smoke test shall demonstrate that all accessible leaks have been sealed or
  - d. If it is not possible to meet the duct sealing requirements of Subsection a, b, or c, all accessible leaks shall be sealed and verified through a visual inspection and a smoke test by a certified HERS rater.

**EXCEPTION to Section 152 (b) 1 D ii:** Existing duct systems that are extended, which are constructed, insulated or sealed with asbestos.

- E. In climate zones 2, 9, 10, 11, 12, 13, 14, 15, and 16, when a space-conditioning system is altered by the installation or replacement of space-conditioning equipment (including replacement of the air handler, outdoor condensing unit of a split system air conditioner or heat pump, cooling or heating coil, or the furnace heat exchanger) the duct system that is connected to the new or replacement space-conditioning equipment shall be sealed, as confirmed through field verification and diagnostic testing in accordance with procedures for duct sealing of existing duct systems as specified in the Reference Residential Appendix RA4ACM manual, to one of the following requirements.
- i. The measured duct leakage shall be less than 15% of fan flow; or
  - ii. The measured duct leakage to outside shall be less than 10% of fan flow; or
  - iii. The measured duct leakage shall be reduced by more than 60% relative to the measured leakage prior to the installation or replacement of the space conditioning equipment and a visual inspection including a smoke test shall demonstrate that all accessible leaks have been sealed; or
  - iv. If it is not possible to meet the duct requirements of i, ii, or iii, all accessible leaks shall be sealed and verified through a visual inspection and a smoke test by a certified HERS rater.

**EXCEPTION 1 to Section 152 (b) 1 E:** Duct systems that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in the Reference Residential Appendix RA4CM manual.

**EXCEPTION 2 to Section 152 (b) 1 E:** Duct systems with less than 40 linear feet in unconditioned spaces.

**EXCEPTION 3 to Section 152 (b) 1 E:** Existing duct systems constructed, insulated or sealed with asbestos.

- F. New service water-heating systems or components shall:
- i. Meet the requirements of Section 150; and
  - ii. Be limited to natural gas, liquefied petroleum gas, or the existing fuel type unless it can be demonstrated that the TDV energy use of the new system is more efficient than the existing system.

G. Replacements of the exterior surface of existing roofs shall meet the requirements of Section 118 and the applicable requirements of Subsection i or ii where more than fifty percent of the roof or more than 1,000 square feet of roof, whichever is less, is being replaced:<sup>2</sup>

- i. High-sloped roofs in climate zones 10, 11, 12, 13, 14, and 15 shall have a minimum 3-year aged reflectance 0.20 and a minimum emittance of 0.75, or a minimum SRI of 19.

**ALTERNATIVE TO SECTION 151 (b) 1 G i:** The following shall be considered equivalent to Subsection i:

- a. Insulation with a thermal resistance of at least 0.85 hr·ft<sup>2</sup>·°F/Btu or at least a ¾ inch air-space is added to the roof deck over an attic.
- b. Existing ducts in the attic are insulated and sealed according to §151(f)10
- c. In climate zones 10, 12 and 13, with 1 ft<sup>2</sup> of free ventilation area of attic ventilation for every 150 ft<sup>2</sup> of attic floor area, where at least 30% of the free ventilation area is within two foot vertical distance of the roof ridge.

**EXCEPTION to Section 152 (b) 1 G i:** Buildings that have no ducts in the attic, buildings that have at least R-30 ceiling insulation, or buildings that have a radiant barrier in the attic meeting the requirements of §151(f)2.. 

- ii. Low-sloped roofs in climate zones 13 and 15 shall have a 3-year aged reflectance equal or greater than 0.55 and an emittance equal or greater than 0.75.

**EXCEPTION to Section 152 (b) 1 G ii: Buildings with ducts in attic, or in climate zones 10, 11, 13 and 14, R-3 or greater roof deck insulation above vented attic.**

**2. Performance approach.**

- A. The altered components shall meet the applicable requirements of Sections 110 through 118, Section 119 (d), and Section 150; and
- ~~B. The energy efficiency of the existing building shall be improved so that the building meets the energy budget in Section 151 that would apply if the existing building was unchanged except those altered components that do not meet the requirements of Section 152 (b) 1 (including improvements proposed to comply with this section) are assumed to be upgraded to comply with Section 152 (b) 1 as specified in the Residential ACM Manual.~~
- B. When the altered components do not meet the requirements specified in subsections i through viii, the existing plus alteration, the standard energy budget (energy budget) shall be based on the following:
- i. Ceiling Insulation. The energy budget shall be based on the requirements of Section 118(d).
  - ii. Wall Insulation. The energy budget shall be based on the requirements of Section 150(c).
  - iii. Raised-floor Insulation. The energy budget shall be based on the requirements of Section 150(d).
  - iv. Fenestration. The energy budget shall be based on the U-factor and SHGC value requirements of Table 151-C. The allowed glass area shall be the smaller of the sum of 20% of the conditioned floor area plus glass removed from the existing building or the proposed glass area in the addition.
  - v. Space-Heating and Space-Cooling Equipment. The energy budget shall be based on the requirements of Table 151-C.
  - vi. Ducts. The energy budget shall be based on the requirements of Section 152(b)1D.
- C. Water Heating Systems. The energy budget shall be based on requirements of Section 151(b)1.
- D. Roofing Products. The energy budget shall be based on Section 152(b)1G.
- E. When the altered components meet the requirements specified in 152(b)2B, subsections i through viii, the standard energy budget shall be based on existing conditions.

**NOTES TO SECTION 152 (b) 2:**

- A. If an existing component must be replaced with a new component, that component is considered an altered component for the purpose of determining the energy budget and must meet the requirements of Section 152 (b) 2 B.
- B. The proposed design shall be based on the actual values of the altered components.
- C. The standard design shall assume the same geometry and orientation as the proposed design.

~~**EXCEPTION 1 to Section 152 (b):** The EXCEPTION to Section 150 (k) 2 applies only for alterations to kitchen lighting where all permanently installed kitchen luminaires are replaced.~~

**EXCEPTION 2 to Section 152 (b):** Any dual-glazed greenhouse window ~~and dual-glazed skylight~~ installed as part of an alteration complies with the U-factor requirements in Section 151 (f) 3 ~~A~~

- (c) Any addition or alteration may comply with the requirements of Title 24, Part 6 by meeting the requirements for the entire building.
- (d) Repairs. Repairs shall not increase the preexisting energy consumption of the repaired component, system, or equipment.

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## **End Notes**

The following notes are an explanation of the changes that have been made. These notes are not part of the Standard.

<sup>1</sup> Clarification of existing standards.

<sup>2</sup> Changes based on new requirements for roof solar reflectance and thermal emittance, by LBNL, B. Wilcox and CEC staff.