

150.2 Res Additions and Alterations

SUBCHAPTER 9

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

SECTION 150.2 – 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 110.1 through 110.810, ~~Section 119,~~ and Section 150.0, and either Section 150.2(a)1 or 2.

EXCEPTION 1 to Section 150.2(a): Additions 1,000 square feet or less are exempt from the ASHRAE Standard 62.2 section 4 requirement for whole-building ventilation as referenced by Section 150.0(o), however, all other applicable requirements of ASHRAE Standard 62.2 shall be met by the addition. For additions larger than 1,000 ft², application of the ASHRAE Standard 62.2 Section 4 requirement to provide whole-building ventilation shall be based on the conditioned floor area of the entire dwelling unit comprised of the existing dwelling conditioned floor area plus the addition conditioned floor area.

EXCEPTION 2 to Section 150.2(a): Where the space in the attic or rafter area is not large enough to accommodate the required R-value, the entire space shall be filled with insulation provided such installation does not violate Section 1203.s of Title 23, Part 2.

EXCEPTION 3 to Section 150.2(a): When the existing residential building does not have a solar zone, the requirements of Section 110.10 and Section 150.0(r) need not be met.

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)3A, 151(f)4 and TABLE 151-C).~~

~~BA. Additions greater than 1000 square feet shall meet the prescriptive requirements of Section 150.1(c).~~

~~B. Additions of up to 1000 square feet or less shall meet all the requirements of Package D-A (Section 150.1(f) and TABLE 151-C TABLE 150.1-C), except that the addition's total glazing area limit is the maximum allowed in Package D-A plus the glazing area that was removed as a result of the construction of the addition, and the wall insulation value need not exceed R-1315.~~

EXCEPTION TO SECTION 150.2(a)1B: In climate zones 2, 4, 7-15 the total allowed west-facing glazing-fenestration area shall be 5 percent of the conditioned floor area of the addition plus the amount of west-facing glazing-fenestration removed from the existing building as a result of the construction of the addition.

~~C. Additions of more than 1000 square feet shall meet the prescriptive requirements of Section 151(f).~~

~~C. Additions of 100 square feet or less shall not have fenestration more than 50 square feet of fenestration area, and shall meet the U-factor and Solar Heat Gain Coefficient requirements of Package A (Sections 150.1(c)3A, 150.1(c)4 and TABLE 150.1-C).~~

2. ~~_____~~ **Performance approach.** Performance calculations shall meet the requirements of Section 150.1(a) through (ce), pursuant to either Item A or B, below.

A. For additions alone, ~~the~~ addition complies if the addition alone meets the combined water-heating and space-conditioning energy budgets as specified in Section 150.1(b).

- B. ~~For additions with an alteration to the existing building. For existing plus addition plus alteration compliance. The existing plus the addition plus the altered building's energy use is of~~ the combination of the altered existing building plus the proposed addition's energy use. This energy shall be equal to or less than the energy use of the existing building with all alterations meeting the requirements of Section 150.2(b)2, plus the standard energy budget of an addition that complies with Sections 150.1(a) through (ec). When determining the standard design, the fenestration area shall be the smaller of the sum of the installed fenestration area up to 20 percent of the conditioned floor area of the addition plus glass removed from the existing building as a result of the construction of the addition or the proposed glass area in the addition.

EXCEPTION 1 to Section 150.2(a)2B; WALL INSULATION: Existing structures with a minimum R-11 insulation in framed walls ~~showing compliance with Section 152(a)2 (Performance Approach)~~ are exempt from ~~showing compliance with~~ Section 150(c).

EXCEPTION 2 to Section 150.2(a)2B; WATER HEATING: 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 150.2(a)1 or Section 150.2(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 ~~equal to or greater than required under the Appliance Regulations~~ ~~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 150.2(a)1, the water heating systems requirement in Section 150.1(f)8 shall not apply. For performance compliance for the addition alone, only the space-conditioning budgets of Section 150.1(b)2 shall be used; the water-heating budgets of Section 150.1(b)1 shall not apply.

The performance approach for the existing building and the addition in Section 150.2(a)2B may be used to show compliance, regardless of the type of water heater installed.

EXCEPTION 3 to Section 150.2(a)2B; SPACE CONDITIONING: 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 1204.1.

EXCEPTION 4 to Section 150.2(a)2B; DUCTS: When ducts will be extended from an existing duct system to serve the addition, the ducts shall meet the requirements of Section 150.2(b)1D.

~~**EXCEPTION 5 to Section 152(a):** Additions 1,000 square feet or less are exempt from the requirements of Section 150(e). For additions larger than 1,000 ft², application of Section 150(e) shall be based on the conditioned floor area of the entire dwelling unit, not just the addition.~~

- (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 110.0 through 110.108, ~~Section 119~~, and all applicable requirements of Section 150.0(a) through (p); and

EXCEPTION to Section 152.0(b)1: When the existing residential building does not have a solar zone, the requirements of Section 110.10 and Section 150.0(r) need not be met.

- A. **Fenestration:** Alterations that add fenestration area shall meet the U-factor requirements of Package ~~D-A~~ (Section 150.1(c)3A and ~~TABLE 151-C~~ TABLE 150.1-C), the total fenestration area and west-facing fenestration area requirements of Package ~~D-A~~ (Sections 150.14(f)3B and C and ~~TABLE 151-C~~ TABLE 150.1-C), and the Solar Heat Gain coefficient requirements of Package ~~D-A~~ (Section 150.1(f)4 and ~~TABLE 151-C~~ TABLE 150.1-C).

EXCEPTION to Section 150.2(b)1A; Fenestration Area: Alterations that add fenestration area of up to 50 square feet shall not be required to meet the total fenestration area and west-facing fenestration area requirements of Sections 150.1(c)3B and C. ~~The existing west-facing fenestration area shall not be increased by more than 50 square feet.~~

- B **Fenestration:** Replacement fenestration, where existing glazing is replaced with a new manufactured fenestration product in the same orientation and tilt, shall meet the U-factor and Solar Heat Gain Coefficient requirements of Package ~~D-A~~ (Sections 150.1(c)3A and 150.1(c)4 and ~~TABLE 151-C~~ TABLE 150.1-C).

EXCEPTION to Section 150.2(b)1B; Glazing Properties Replacement fenestration up to a total area of no more than 50 square feet with a U-factor no greater than 0.40 and in climate zones 2, 4, and 6-16, a SHGC value no greater than 0.40.

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 or replacement space-conditioning systems shall:

- i. Meet the requirements of Sections 150.0(h), 150.0(i), 150.0(j)2, 150.1(f)6, 150.1(c)7, ~~150.1(f)9,~~ and 150.1(f)11; 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. **Duct Replacement:** When more than 40 feet of new or replacement space-conditioning ducts are installed in unconditioned space or indirectly conditioned space, the new ducts shall meet ~~the all applicable~~ requirements of Section 150.0(m), ~~and~~ the duct insulation requirements of TABLE 150.1-C, Package D Section 151(f)10. ~~If ducts are installed in climate zones 2, 9, 10, 11, 12, 13, 14, 15, or 16, and~~ the altered existing duct system shall be sealed, as confirmed through field verification and diagnostic testing in accordance with all applicable procedures for duct sealing of altered existing duct systems ~~as specified in the~~ Reference Residential Appendix RA3.1, and the leakage compliance criteria specified in Reference Residential Appendix Table RA3.1-2, conforming to either 150.2(b)1Di or 150.2(b)1Dii ~~to meet one of the following requirements:~~

- i. If the new ducts form an entirely new or replacement duct system directly connected to the air handler, the measured duct leakage shall be less than 6 percent of fan flow as determined utilizing the procedures in Reference Residential Appendix Section Error! Reference source not found.RA3.1.4.3.1, or Error! Reference source not found.RA3.1.4.3.4. The duct system shall also conform to the requirements of Section 150(m)12 and 150(m)13 ~~and meet the airflow requirements of Reference Residential Appendix RA3;~~ 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 percent of system fan flow as determined utilizing the procedures in Reference Residential Appendix Section Error! Reference source not found.RA3.1.4.3.1; or
 - b. The measured duct leakage to outside shall be less than 10 percent of system fan flow as determined utilizing the procedures in Reference Residential Appendix Section 4; or
 - ~~c. The duct leakage shall be reduced by more than 60 percent 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~~
 - ~~dc.~~ If it is not possible to meet the duct sealing requirements of either subsection Section 150.2(b)1Diia, or Section 150.2(b)1Diiib, ~~or e,~~ then all accessible leaks shall be sealed and verified through a visual inspection and a smoke test by a certified HERS rater utilizing the methods specified in Reference Residential Appendix RA3.1.4.3.6.

EXCEPTION to Section 150.2(b)1Dii; DUCT REPLACEMENT: Existing duct systems that are extended, which are constructed, insulated or sealed with asbestos.

- E. **Altered Space Conditioning System - Duct Sealing:** In all 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~~altered space-conditioning system equipment shall be sealed, as confirmed through field verification and diagnostic testing in accordance with all applicable procedures for duct sealing of altered existing duct systems as specified in ~~the~~ Reference Residential Appendix RA3.1, and the leakage compliance criteria specified in Reference Residential Appendix Table RA3.1-2, conforming to one of the following requirements.
- i. The measured duct leakage shall be less than 15 percent of system fan flow as determined utilizing the procedures in Reference Residential Appendix Section Error! Reference source not found.RA3.1.4.3.1; or
 - ii. The measured duct leakage to outside shall be less than 10 percent of system fan flow as determined utilizing the procedures in Reference Residential Appendix Section 4; or
 - ~~iii. The measured duct leakage shall be reduced by more than 60 percent 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~~
 - ~~iiiv.~~ If it is not possible to meet the ~~duct~~ duct sealing requirements of either Section 150.2(b)1Ei, or Section 150.2(b)1Eii, then or iii, all accessible leaks shall be sealed and verified through a visual inspection and a smoke test by a certified HERS rater utilizing the methods specified in Residential Appendix RA3.1.4.3.6..

EXCEPTION 1 to Section 150.2(b)1E; DUCT SYSTEM SEALING: 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 RA3.

EXCEPTION 2 to Section 150.2(b)1E; DUCT SYSTEM SEALING: Duct systems with less than 40 linear feet in unconditioned spaces.

EXCEPTION 3 to Section 150.2(b)1E; DUCT SYSTEM SEALING: Existing duct systems constructed, insulated or sealed with asbestos.

- F. **Altered Space-Conditioning System - Mechanical:** When a space-conditioning system is altered by the installation or replacement of the ~~air handler,~~ outdoor condensing unit of a split system air conditioner or heat pump, or the indoor cooling or heating coil, ~~or the furnace heat exchanger,~~ the following requirements shall be met: non-setback thermostats shall be replaced with thermostats meeting the requirements of Section 110.2(c).
- ~~i. Non setback thermostats shall be replaced with setback thermostats meeting the requirements of Section 110.2(c); and~~
 - ~~ii. Meet the refrigerant charge and airflow requirements of Reference Residential Appendix RA3~~
 - i. In climate zones 2, 8, 9, 10, 11, 12, 13, 14, and 15, ducted split system central air conditioners and ducted split system heat pumps shall have proper refrigerant charge confirmed through field verification and diagnostic testing in accordance with applicable procedures set forth in Reference Residential Appendix RA3.2, or RA1.
 - ii. For systems other than ducted split system central air conditioners and ducted split system heat pumps, when a space conditioning system is an air conditioner or heat pump that cannot meet the requirements of 150.2(b)1Fi, the space conditioning system shall submit Installation Certificate documentation that certifies the system has correct refrigerant charge as determined in accordance with the weigh-in charging method specified in Reference Residential Appendix RA3.2.3. HERS field verification and diagnostic testing of the refrigerant charge for these systems is not required.
- Additionally, these systems shall conform to one of the following alternatives:

- a. The system shall have a SEER of 14 and an EER of 11; or
- b. The space conditioning system shall be a non-ducted system.

EXCEPTION to Section 150.2(b)1Fii: SPACE-CONDITIONING SYSTEM: Heating only systems need not comply with this requirement.

G. Water-Heating System: New service water-heating systems or components shall:

- i. Meet the requirements of Section 150.0(j); 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.

H. Roofs: Replacements of the exterior surface of existing roofs shall meet the requirements of Section 110.8 and the applicable requirements of subsections i ~~through and~~ iii where more than 50 percent of the roof ~~or more than 1,000 square feet of roof, whichever is less,~~ is being replaced:

- i. ~~Low-rise residential buildings with steep-sloped roofs, For Steep-sloped roofs, roofing products with a density of less than 5 pounds per square foot asphalt shingle products in climate zones 10 through 15, and steep-sloped roofs with all other roofing products in climate zones 1 through 16 shall~~ shall have a ~~meet the following requirements: a~~ minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75~~85~~, or a minimum SRI of 16.

~~1. A minimum aged solar reflectance of 0.24 and a minimum thermal emittance of 0.85, or a minimum SRI of 22, and~~

~~2. R-4 continuous insulation with radiant barrier meeting the requirements of Section 151f(2), or R-6 continuous insulation, or R-13 batt insulation~~

- ii. ~~For steep-sloped roofs, roofing products with a density of 5 pounds per square foot or more in climate zones 1 through 16 shall have a minimum aged solar reflectance of 0.15 and a minimum thermal emittance of 0.75, or a minimum SRI of 10.~~

ALTERNATIVE TO SECTION 150.2(b)1Hi-and-ii: The following shall be considered equivalent to Subsection i and ii:

~~**EXCEPTION 1 TO SECTION 152(b)1Hi:** A minimum aged solar reflectance of 0.20, existing ducts in the attic are insulated and sealed according to Section 151(f)10, and with at least R-38 ceiling insulation.~~

~~**EXCEPTION 2 TO SECTION 152(b)1Hi:** A minimum aged solar reflectance of 0.20 in buildings that have no ducts in the attic.~~

~~a. Insulation with a thermal resistance of at least 0.85 hr·ft²·°F/Btu or at least a 3/4 inch air space is added to the roof deck over an attic; or~~

~~ba. Existing ducts in the attic are insulated and sealed according to Section 150.1(fc)10; or~~

~~c. In climate zones 10, 12 and 13, with 1 ft² of free ventilation area of attic ventilation for every 150 ft² of attic floor area, and where at least 30 percent of the free ventilation area is within 2 feet vertical distance of the roof ridge; or~~

~~db. Buildings with at least R-30-38 ceiling insulation; or~~

~~ec. Buildings with a radiant barrier in the attic meeting the requirements of Section 150.1(fc)2; or~~

~~df. Buildings that have no ducts in the attic; or~~

~~ge. In climate zones 10, 11, 13 and 14-15, R-43 or greater roof deck insulation above the roof deck, vented attic.~~

- iii. Low-sloped roofs in climate zones 13 and 15 shall have a 3-year aged solar reflectance equal or greater than 0.55-63 and a thermal emittance equal or greater than 0.7585, or a minimum SRI of 6475.

EXCEPTION 1 to Section 150.2(b)1Hiii: Buildings with no ducts in the attic.

EXCEPTION 2 to Section 150.2(b)1Hiii: The aged solar reflectance can be met by using insulation at the roof deck specified in Table 150.2

Table 150.2 Aged Solar Reflectance Insulation Trade off Table

<u>Aged Solar Reflectance</u>	<u>Insulation R-value</u>	<u>Aged Solar Reflectance</u>	<u>Insulation R-value</u>
<u>0.62-0.60</u>	<u>2</u>	<u>0.44-0.40</u>	<u>12</u>
<u>0.59-0.55</u>	<u>4</u>	<u>0.39-0.35</u>	<u>16</u>
<u>0.54-0.50</u>	<u>6</u>	<u>0.34-0.30</u>	<u>20</u>
<u>0.49-0.45</u>	<u>8</u>	<u>0.29-0.25</u>	<u>24</u>

2. **Performance approach.** Performance calculations shall meet the requirements of Section 150.1(a) through (e), pursuant to Items A through C below.
- A. The altered components shall meet the applicable requirements of Sections 110.0 through 110.108, ~~Section 119,~~ and Sections 150.0(a) through (p); and
- EXCEPTION to Section 150.2(b)2A: When the existing residential building does not have a solar zone, the requirements of Section 110.10 and Section 150.0(r) need not be met.
- B. When the altered components do not meet the requirements specified ~~in the sections that are stated in subsections i through viii, the standard~~ Section 150.1, Table 150.1-C, standard design energy budget (energy budget) shall be based on the requirements stated in ~~those sub~~ subsections as follows:
- Ceiling Insulation. The ~~standard design energy budget~~ shall be based on the requirements of Section 110.8(d).
 - Wall Insulation. The ~~standard design energy budget~~ shall be based on the requirements of Section 150.0(c).
 - Raised-floor Insulation. The ~~standard design energy budget~~ shall be based on the requirements of Section 150.0(d).
 - Fenestration. The ~~standard design energy budget~~ shall be based on the U-factor of 0.40 and SHGC value of 0.40 in climate zones 2, 4, and 6-16 ~~requirements of TABLE 151-C~~. The allowed glass area shall be the glass area of the existing building.
 - Space-Heating and Space-Cooling Equipment. The ~~standard design energy budget~~ shall be based on the requirements of ~~TABLE 151-C~~ TABLE 150.1-C.
 - Ducts. The ~~standard design energy budget~~ shall be based on the requirements of Section 150.2(b)1D.
 - Water Heating Systems. The ~~standard design energy budget~~ shall be based on requirements of Section 151(b)1.
 - Roofing Products. The ~~standard design energy budget~~ shall be based on Section 150.2(b)1H.
- C. When the altered components meet the requirements specified in ~~Section 152(b)2B, subsections i through viii~~ Section 150.1, Table 150.1-C, the ~~design energy budget~~ standard design energy budget shall be based on ~~existing conditions that existed prior to alternations (existing conditions)~~.
- D. When the altered component's existing conditions exceed the requirements specified in subsection i through viii above, the standard design shall be based on existing conditions.
- E. The proposed design shall be based on the actual values of the altered components.

NOTES TO SECTION 150.2(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 standard design energy budget and must meet the requirements of Section 150.2(b)2B.

~~B. The proposed design shall be based on the actual values of the altered components.~~

~~CB.~~ The standard design shall assume the same geometry and orientation as the proposed design.

EXCEPTION to Section 150.2(b): Any dual-glazed greenhouse/garden window installed as part of an alteration complies with the U-factor requirements in Section 150.1(c)3.

(c) **Whole Building.** Any addition or alteration may comply with the requirements of Title 24, Part 6 by meeting the requirements for the entire building.

2007 CALIFORNIA MECHANICAL CODE, CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 4 CHAPTER 6, DUCT SYSTEMS

TABLE P4-A ADOPTION TABLE

CODE SECTION	CEC
Entire 2007 CMC as noted in this table ¹	
601	X
602	X
604	X
605	X
Standard 6-5	X

¹ Adopted by reference for Occupancies A, B, E, F, H, M, R, and S; see Sections 110.8 (d)3, 120.4, and 150.0 (m).

APPENDIX 1-A STANDARDS AND DOCUMENTS REFERENCED IN THE ENERGY EFFICIENCY

AIR-CONDITIONING AND REFRIGERATION INSTITUTE

ARI 210/240-2003 Unitary Air Conditioning and Air-Source Heat Pump Equipment (2003)
ARI 310/380-93 Packaged Terminal Air-Conditioners and Heat Pumps (1993)
ARI 320-98 Water-Source Heat Pumps
ARI 325-98 Ground Water-Source Heat Pumps (1998)
ARI 340/360-2000 Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment (2000)
ARI 365-2002 Commercial and Industrial Unitary Air-Conditioning Condensing Units (2002)
ARI 460-2000 Remote Mechanical-Draft Air-Cooled Refrigerant Condensers (2000)
ARI 550/590-98 Standard for Water-Chilling Packages Using the Vapor Compression Cycle (1998)
ARI 560-2000 Absorption Water Chilling and Water Heating Packages (2000)
Available from: Air-Conditioning and Refrigeration Institute
4301 North Fairfax Drive, Suite 425
Arlington, Virginia 22203
(703) 524-8800

AIR CONDITIONING CONTRACTORS OF AMERICA

Manual J – Residential Load Calculation, Eighth Edition (2003)
Available from: Air Conditioning Contractors of America, Inc.
2800 Shirlington Road, Suite 300
Arlington, VA 22206
www.acca.org
(703) 575-4477

AMERICAN NATIONAL STANDARDS INSTITUTE

ANSI Z21.10.3-2001 Gas Water Heaters, Volume 1, Storage Water Heaters with Input Ratings above 75,000 Btu/h (2001)
ANSI Z21.13-2000 Gas-Fired Low Pressure Steam and Hot Water Boilers (2000)
ANSI Z21.40.4-1996 Performance Testing and Rating of Gas-Fired, Air-Conditioning and Heat Pump Appliances (1996)
ANSI Z21.47-2001 Gas-Fired Central Furnaces (2001)
ANSI Z83.8-2002 Gas Unit Heaters and Gas-Fired Duct Furnaces (2002)
Available from: American National Standards Institute
25 West 43rd Street, 4th Floor
New York, NY 10036
(212) 642-4900
ANSI/NSPI-5 2003 Residential Inground Swimming Pools (2003)ANSI C82.6-2005 Ballasts for High-Intensity Discharge Lamps - Methods of Measurement
Available from: Association of Pool & Spas Professionals
2111 Eisenhower Ave.
Alexandria, VA 22314
(703) 838-0083

**AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS
(NATIONAL PUBLICATIONS)**

ASHRAE Standard 55-2004 Thermal Environment Conditions for Human Occupancy

ASHRAE Standard 62.2-2007 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings

ASHRAE Handbook

Applications Volume, Heating, Ventilating and Air-Conditioning Applications (2003)

Equipment Volume, Heating, Ventilating and Air-Conditioning Systems and Equipment (2000)

Fundamentals Volume, Fundamentals (2005)

Available from:

ASHRAE

1791 Tullie Circle N.E.

Atlanta, Georgia 30329-2305

www.ashrae.org

AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS (REGIONAL PUBLICATION)

ASHRAE Climatic Data for Region X Arizona, California, Hawaii, Nevada, Publication SPCDX, 1982, ISBN #20002196 and Supplement, 1994, ISBN #20002596

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Building News
10801 National Boulevard
Los Angeles, CA 90064
(800) 873-6397 or (310) 474-7771
<http://www.bnibooks.com/>

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM C55-01	Standard Specification for Concrete Brick (2001)
ASTM C177-97	Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus (1997)
ASTM C272-01	Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions (2001)
ASTM C335-95	Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation (1995)
ASTM C518-02	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus (2002)
ASTM C731-00	Standard Test Method for Extrudability, After Package Aging, of Latex Sealants (2000)
ASTM C 732-01	Standard Test Method for Aging Effects of Artificial Weathering on Latex Sealants (2001)
ASTM C 1167-96	Standard Specification for Clay Roof Tiles
ASTM C1371-98	Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers (1998)
ASTM D822-01	Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings (2001)
ASTM D1003-00	Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics (2000)
ASTM D2824-02	Standard Specification for Aluminum-Pigmented Asphalt Roof Coatings, Nonfibered, Asbestos Fibered, and Fibered without Asbestos, 2002
ASTM D3805-97	Standard Guide for Application of Aluminum-Pigmented Asphalt Roof Coatings, 1997 (reapproved 200 9 ³)
ASTM D4798-01	Standard Test Method Accelerated Weathering Test Conditions and Procedures for Bituminous Materials (Xenon-Arc Method) (2001)
ASTM D6848-02	Standard Specification for Aluminum-Pigmented Emulsified Asphalt Used as a Protective Coating for Roofing Asphalt Roof Coatings, 2002.
ASTM E96-00	Standard Test Methods for Water Vapor Transmission of Materials
ASTM E 283-91 (1999)	Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E408-71(200 8 ²)	Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques (200 8 ²)
<u>ASTM E972 - 96(2007)</u>	<u>Standard Test Method for Solar Photometric Transmittance of Sheet Materials Using Sunlight.</u>

ASTM E1980 – 01	Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped opaque Surfaces
<u>ASTM E2178-03</u>	<u>Standard Test Method for Air Permeance of Building Materials</u>
<u>ASTM E2357-05</u>	<u>Standard Test Method for Determining Air Leakage of Air Barrier Assemblies</u>
<u>ASTM E779-03</u>	<u>Standard Test Method for Determining Air Leakage Rate by Fan Pressurization</u>
<u>ASTM E1677-95 (2000)</u>	<u>Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls</u>
ASTM C836-05	Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course (2005)
ASTM C1583-04	Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method) (2004)
ASTM D522-93a (2001)	Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings (2001)
ASTM D1653-03	Standard Test Methods for Water Vapor Transmission of Organic Coating Films (2003)
ASTM D2370-98 (2002)	Standard Test Method for Tensile Properties of Organic Coatings (2002)
ASTM D3468-99	Standard Specification for Liquid-Applied Neoprene and Chlorosulfonated Polyethylene Used in Roofing and Waterproofing (1999)
ASTM D5870-95 (2003)	Standard Practice for Calculating Property Retention Index of Plastics (2003)
ASTM D6083-05e1	Standard Specification for Liquid Applied Acrylic Coating Used in Roofing (2005)
ASTM D6694-01	Standard Specification for Liquid-Applied Silicone Coating Used in Spray Polyurethane Foam Roofing (2001)
Available from:	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken, Pennsylvania 19428-2959 (800) 262-1373 or (610) 832-9585

CALIFORNIA BUILDING STANDARDS COMMISSION

2007 California Electrical Code
2007 California Plumbing Code
2007 California Mechanical Code
2007 California Building Code

Available from: California Building Standards Commission
2525 Natomas Park Drive, Suite 130
Sacramento, CA 95833-2936
(916) 263-0916
www.bsc.ca.gov

CALIFORNIA ENERGY COMMISSION

Appliance Efficiency Regulations
Building Energy Efficiency Standards for Residential and Nonresidential Buildings
Reference Appendices for the Building Energy Efficiency Standards for Residential and Nonresidential Buildings
Nonresidential Alternative Calculation Method (ACM) Manual
Nonresidential Compliance Manual
Residential Alternative Calculation Method (ACM) Manual
Residential Compliance Manual

Available from: California Energy Commission/Publications
1516 Ninth Street
Sacramento, CA 95814
(916) 654-5200
www.energy.ca.gov/title24.

CALIFORNIA DEPARTMENT OF CONSUMER AFFAIRS

Standards for Insulating Material

Available from: California Department of Consumer Affairs
Bureau of Home Furnishings and Thermal Insulation
3485 Orange Grove Ave
North Highlands, CA 95660
(916) 574-2041

COOLING TECHNOLOGY INSTITUTE

CTI ATC-105-00 Acceptance Test Code for Water Cooling Towers (2000)
CTI STD-201-04 Standard for the Certification of Water-Cooling Tower Thermal Performance (2004)

Available from: Cooling Technology Institute
2611 FM 1960 West, Suite A-101
Houston, Texas 77068-3730

PO Box 73383
Houston, Texas 77273-3383
(281) 583-4087

COOL ROOF RATING COUNCIL

CRRC-1 Product Rating Program Manual (2007)

Available from: Cool Roof Rating Council
1610 Harrison Street
Oakland, CA 94612
(866) 465-2523
www.coolroofs.org

HYDRONICS INSTITUTE

HI Heating Boiler Standard 86, 6th Edition, (1989)

Available from: Hydronics Institute
35 Russo Place, P.O. Box 218
Berkeley Heights, New Jersey 07922
(908) 464-8200

ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA

The IESNA Lighting Handbook, Ninth Edition (2000)

Available from: IESNA
120 Wall Street, 17th Floor
New York, New York 10005-4001
(212) 248-5000
Email: iesna@iesna.org

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS

2007 California Mechanical Code

Available from: International Association of Plumbing and Mechanical Officials
2001 E. Walnut Drive South
Walnut, California 91789-2825
800 85-IAPMO (854-2766)
www.iapmo.org

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS

2007 California Building Code

Available from: International Conference of Building Officials
International Code Council Los Angeles District Office
5360 South Workman Mill Road
Whittier, California 90601-2298
(800) 284-4406
www.icbo.org

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO-13256-1 Water-Source Heat Pumps - Testing and Rating for Performance - Part 1: Water-to-Air and Brine-to-Air Heat Pumps (1998)

Available from: ISO
1, rue de Varembe
Case postale 56
CH-1211
Geneve 20, Switzerland

NATIONAL FENESTRATION RATING COUNCIL

NFRC 100 Procedures for Determining Fenestration Product U-factors (20~~1007~~)
NFRC 200 Procedures for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence (20~~1007~~)

[NFRC 202](#) [Procedure for Determining Translucent Fenestration Product Visible Transmittance at Normal Incidence \(2011\)](#)

[Note: This Technical document has yet not been approved by NFRC. If this document is not approved before the Building Energy Standards effective date it will be removed.](#)

NFRC 400 Procedures for Determining Fenestration Product Air Leakage (20~~1007~~)

Available from: National Fenestration Rating Council
[6305 Ivy Lane, Suite 1408484 Georgia Ave.](#)
[Greenbelt Silver Spring, MD 20~~910770~~](#)
(301) 589-1776
Email: info@nffc.org

NSF INTERNATIONAL (formerly National Sanitation Foundation)

NSF/ANSI 50 2005 Circulation System Components and Related Materials for Swimming Pools, Spas/Hot Tubs (2005)

Available from: NSF International
PO Box 130140
Ann Arbor, MI 48113
(734) 769-8010

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION

Residential Comfort System Installation Standards Manual (1998)

Available from: Sheet Metal And Air Conditioning Contractors National Association (SMACNA)
4201 Lafayette Center Drive
Chantilly, VA 20151-1209
(703) 803-2980
www.smacna.org

UNDERWRITERS LABORATORIES

UL 181	Standard for Safety for Factory-made Air Ducts and Connectors (1996)
UL 181A	Standard for Safety for Closure Systems for Use with Rigid Air Ducts and Air Connectors (1994)
UL 181B	Standard for Safety for Closure Systems for Use with Flexible Air Ducts and Air Connectors (1995)
UL 723	Standard for Test for Surface Burning Characteristics of Building Materials (1996)
UL 727	Standard for Oil-Fired Central Furnaces (1994)
UL 731	Standard for Oil-Fired Unit Heaters (1995)
UL 1574	Track Lighting Systems (2000)
UL 1598	Standard for Luminaires (2000)
UL 2108	Low Voltage Lighting Systems (2008)

Available from: Underwriters Laboratories
333 Pfingsten Road
Northbrook, Illinois 60062-2096
(847) 272-8800

