


The Albuquerque
Energy Conservation
Code



ALBUQUERQUEGREEN

Mayor Martin J. Chávez

VOLUME II

ONE - AND TWO - FAMILY
DETACHED DWELLINGS
AND TOWNHOUSES

SECOND EDITION

PREFACE

The City of Albuquerque, the Mayor's Office and the City Council are pleased to have developed the first comprehensive **Energy Conservation Code** in the State of New Mexico. **The 2007 Albuquerque Energy Conservation Code** reflects a concerted, combined effort between local government and those in the building, and building-related, industries to develop a code acceptable to all. An effective Energy Conservation Code is essential to reduce the amount of greenhouse gases generated by buildings. It is estimated that the building industry generates 39% of carbon dioxide (CO₂) emissions and 48% of all greenhouse gas (GHG) emissions in the United States.

The **2007 Albuquerque Energy Conservation Code** is one element of the Mayor's effort to achieve the goals of the 2030 Challenge ensuring new buildings are carbon neutral by the year 2030. Green building standards reduce greenhouse gas emissions by advancing energy efficiency and renewable green energy. Green buildings are cost-effective, provide healthy places for people to live, learn and work while supporting municipal conservation and environmental goals.

The City will be developing incentives through its Green Building Program to encourage building designs that will exceed the level set by the **2007 Albuquerque Energy Conservation Code**. And, with guidance from the Green Ribbon Task Force, the **2007 Albuquerque Energy Conservation Code** will be amended, at regular intervals, to keep pace with new energy conservation technologies.

The Mayor and the City Council would like to thank the Green Ribbon Task Force which includes leaders from the design and building industries, as well as others, for working together to craft such a comprehensive energy code. The assistance provided by the Task Force was invaluable.

HOW TO USE VOLUME II OF THE ALBUQUERQUE ENERGY CONSERVATION CODE

- I. THE 2007 ALBUQUERQUE ENERGY CONSERVATION CODE – VOLUME II ADOPTS AND AMENDS THE 2006 INTERNATIONAL ENERGY CONSERVATION CODE.**
- II. SECTION AND TABLE NUMBERS THAT ARE IDENTIFIED IN THE 2007 ALBUQUERQUE ENERGY CONSERVATION CODE AMEND THE CORRESPONDING SECTIONS AND TABLES IN THE 2006 INTERNATIONAL ENERGY CONSERVATION CODE.**
- III. THE AMENDED PROVISIONS OF THE 2007 ALBUQUERQUE ENERGY CONSERVATION CODE SUPERSEDE THE CORRESPONDING PROVISIONS OF THE 2006 INTERNATIONAL ENERGY CONSERVATION CODE.**
- IV. THE 2007 ALBUQUERQUE ENERGY CONSERVATION CODE MUST BE USED IN CONJUNCTION WITH THE 2006 INTERNATIONAL ENERGY CONSERVATION CODE.**
- V. THE NEW MEXICO ENERGY CONSERVATION CODE IS NOT ADOPTED BY THE CITY OF ALBUQUERQUE.**

CHAPTER 1

ADMINISTRATION

SECTION 101

SCOPE AND GENERAL REQUIREMENTS

101.1 Title. This code shall be known as the Albuquerque Energy Conservation Code – Volume II and shall be cited as such. It is referred to herein as “this code”.

101.2 Scope. This code applies to one- and two-family detached dwellings and townhouses.

101.3 Intent. This code shall regulate the design and construction of buildings for the effective use of energy. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the effective use of energy and to reduce greenhouse gas emissions in Albuquerque. This code is not intended to abridge safety, health, or environmental requirements contained in other applicable codes or ordinances.

101.4 Maintenance. Through an open code development process, administered by the Green Building Program Manager, this code shall be reviewed, and the energy efficiency requirements increased, twice before January 1, 2012. After that date, it shall be reviewed, and amended, every three years.

101.5 Adopted Code, Referenced Standards, and Referenced Sections of the International Residential Code.

101.5.1 Code. This code adopts, by reference, and amends the 2006 International Energy Conservation Code.

101.5.2 Standards. The standards listed in Chapter 6 of this code shall be considered part of the requirements of this code to the extent that they are referenced.

101.5.3 International Residential Code. The sections of the 2006 International Residential Code included in Chapter 7 of this code shall be considered part of the requirements of this code to the extent that they are referenced.

101.5.4 Conflicting requirements. Where the provisions of this code and the 2006 International Energy Conservation Code or the standards referenced herein conflict, the provisions of this code shall take precedence.

101.6 Validity. If a portion of this code is held to be illegal or void, such a decision shall not affect the validity of the remainder of this code.

101.7 Applicability.

101.7.1 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, alteration, or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

101.7.2 Historic buildings. Exempt from this code are buildings: (1) listed in the State or National Register of Historic Places; (2) designated as a historic property under local or state designation law or survey; (3) certified as a contributing resource within a national register listed, or locally designated, historic district; (4) that, in the written opinion of the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, are eligible to be listed in the National or State Registers of Historic Places either individually or as a contributing building within a historic district.

101.7.3 Additions, alterations, renovations, or repairs. Additions, alterations, renovations, or repairs to an existing building, building system, or portion thereof, shall conform to the prescriptive or the performance-based provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building, or building system, to comply with this code. Additions, alterations, renovations, or repairs shall not create an unsafe or hazardous condition or overload existing building systems.

Exception: The following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
3. Existing single-rafter roof, wall, or floor cavities exposed during construction provided that these cavities are filled with insulation having a minimum nominal value of R-3.5 per inch of thickness.
4. Construction where the existing roof, wall, or floor cavity is not exposed.
5. Replacement only of furnaces and air conditioners before July 1, 2009.

101.7.4 Substantial alterations. Substantial alterations of existing buildings shall comply with Section 101.7.3 of this code and with the following:

1. HVAC equipment shall comply with Section 403.2 of this code.
2. HVAC controls shall comply with Section 403.4 of this code.
3. Service water heating equipment shall comply with Section 403.9.2 of this code.
4. Electrical lighting shall comply with Section 403.10.1 of this code.
6. Appliances, when installed by the builder, shall comply with Section 403.11 of this code.

Exception: Substantial alterations that comply with Section 103.2, Section 404, or Section 405 of this code.

101.7.5 Roof replacement. Where the roof of an existing building is being replaced and the roof is a component of the thermal envelope of a building regulated by this code, and the R-value of the existing roof insulation is less than 30, insulation shall be added to achieve R-30.

Exceptions:

1. Roof replacements where either the roof sheathing or the roof insulation is not exposed.
2. Where the insulation is continuous and is applied entirely above the roof sheathing, R-20 shall be allowed.
3. Insulation may be tapered to drain to existing scuppers provided the average R-value of the roof insulation complies with this section and that the minimum added R-value is not less than 3.
4. Where the overall U-value of the entire roof assembly is 0.034 or less.

101.7.6 Change in occupancy. Buildings undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

101.8 Compliance.

101.8.1 Compliance materials. The code official shall be permitted to approve specific computer software, worksheets, compliance manuals, and other similar materials that meet the intent of this code.

101.8.2 Low energy buildings. The following buildings, or portions thereof, separated from the remainder of the building by building thermal envelope assemblies complying with this code shall be exempt from the building thermal envelope provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4 Btu/h ft. or 1.0 watt/ft. of floor area for space conditioning purposes.
2. Those that do not use fossil fuels or electricity that is produced from fossil fuels.
3. Those that do not contain conditioned space.

SECTION 102
MATERIALS, SYSTEMS, AND EQUIPMENT

Section 102 of the 2006 International Energy Conservation Code is adopted as written.

SECTION 103
ALTERNATE MATERIALS, METHOD OF CONSTRUCTION, DESIGN, OR
INSULATING SYSTEMS

103.1 General. This code is not intended to prevent the use of any material, method of construction, design, or insulating system not specifically prescribed herein, provided that such construction, design, or insulating system has been approved by the code official as meeting the intent of this code.

103.2 High-performance building programs. LEED H Silver certification or Build Green New Mexico Silver certification are deemed to meet, or exceed, the energy efficiency required by this code. Buildings approved in writing by these programs shall be considered in compliance with this code provided that such buildings also comply with the mandatory provisions of this code. High-performance buildings shall be subject to the inspections listed in Table 105.1 of this code.

SECTION 104
CONSTRUCTION DOCUMENTS

Section 104 of the 2006 International Energy Conservation Code is adopted as written.

SECTION 105
ENERGY PERFORMANCE INSPECTIONS

105.1 General. Work that is regulated by this code shall be subject to the inspections listed in Table 105.1.

**TABLE 105.1
ENERGY PERFORMANCE INSPECTIONS**

	COMPONENT	CODE REFERENCES	WHEN INSPECTED
Thermal Envelope	1. Slab Insulation	Section 402.2 of the 2006 IECC and Table 402.1.1 of this code	Foundation Insulation Inspection
	2. Thermal Bypass	<i>(Intentionally left blank)</i>	Thermal Bypass Inspection
	3. Frame Insulation	Section 402.2 of the 2006 IECC and Table 402.1.1 of this code	Frame Insulation
	4. Roof Ventilation	Section R806 of the 2006 IRC ^a and Section 402.7 of this code	Building Final
	5. Roof Reflectance (after 1/1/2009)	Section 402.8 of this code	Building Final
Air Leakage	1. Building Thermal Envelope	Section 402.4.1 of the 2006 IECC	Thermal Bypass Inspection
	2. Fenestration	Section 402.4.2 of the 2006 IECC	Building Final
	3. Recessed Lighting	Section 402.4.3 of the 2006 IECC	Thermal Bypass Inspection/ Electrical Rough-In
Heating, Ventilating, and Air-Conditioning System	1. Duct Sealing and Support	Sections M1601.3.1 and M1601.3.2 of the 2006 IRC ² and Section 403.4.2 of this code	Below Slab: Duct Groundwork Inspection Above Slab: Heating/Cooling Top-Out
	2. Duct Insulation	Section 403.4.1 of this code	Below Slab: Duct Groundwork Inspection Above Slab: Heating/Cooling Top-Out
	3. Pipe Insulation	Section 403.9.5 of this code	Below Slab: Plumbing Groundwork Inspection Above: Plumbing Top-out
	4. Equipment Efficiency	Section 403.2 and Table 403.2 of this code	Appliance Final
	5. Controls	Sections 403.3, 403.3.1, and 403.7 of this code	Heating/Cooling Final
Service Water Heating System	1. Pipe Insulation	Section 403.8.5 of this code	Below Slab: Plumbing Groundwork Inspection Above Slab: Plumbing Top-out
	2. Equipment Efficiency	Section 403.8.2 and Table 403.8.2 of this code	Appliance Final
	3. Controls	Section 403.8.4 of this code	Plumbing Final
	4. Conservation of Hot Water	Section 403.8.6 of this code	Plumbing Final
	5. Heat Trap	Section 403.8.7 of this code	Plumbing Top-out
Heated Swimming Pools	1. Pipe Insulation	Section 403.8.5 of this code	Pool/solar Heating Rough-In
	2. Energy Source	Section 403.8.3.1 of this code	Pool/Solar Heating Rough-In
	3. Insulating Cover	Section 403.8.3.3 of this code	Pool Final
	4. Controls	Section 403.8.3.2 and 403.8.3.4 of this code	Pool Final
Electrical Lighting	1. Lighting Efficiency	Section 403.9 of this code	Recessed Fixtures: Electrical Rough-In Surface – Mounted Fixtures and Luminaires: Electrical Final

IECC = International Energy Conservation Code
IRC = International Residential Code

a. IRC references are reprinted in Chapter 7 of this code.

CHAPTER 2

DEFINITIONS

Chapter 2 of the 2006 International Energy Conservation Code is adopted as written with the following additions:

BASELINE RESIDENCE. A computer representation of a proposed residence that meets the minimum requirements of the 2003 International Energy Conservation Code and is used to determine compliance with Section 405 of this code.

ENERGY STAR. A joint program of the United States Environmental Protection Agency and the United States Department of Energy to identify and label energy-efficient products that will reduce greenhouse gas emissions.

SUBSTANTIAL ALTERATION. Any alteration where the work area exceeds 50 percent of the aggregate area of the building.

TOWNHOUSE. A single-family dwelling unit constructed in a group of three or more attached units in which each unit extends from foundation to roof, has open space on at least two sides, is not more than three stories in height, and does not share means of egress with any other units.

WORK AREA. That portion or portions of a building consisting of all reconfigured spaces as indicated on the construction documents. Work area excludes other portions of the building where incidental work entailed by the intended work must be performed and portions of the building where work not initially intended by the owner is specifically required by this code.

CHAPTER 3

CLIMATE ZONES

SECTION 301

CLIMATE ZONES

301.1 Climate Zone. Albuquerque is in Climate Zone 4 and it is in a Dry (B) location.

301.2 Warm humid counties. Albuquerque is not in a warm humid county.

The balance of Chapter 3 of the 2006 International Energy Conservation Code is deleted in its entirety.

CHAPTER 4

ENERGY EFFICIENCY

SECTION 401

GENERAL

401.1 Compliance. Projects shall comply with the Mandatory provisions of this code and either:

1. The Prescriptive provisions of this code; or
2. Section 404 (performance); or
3. Section 405 (performance).

401.2 Certificate. A permanent certificate shall be posted in a conspicuous place within the dwelling or attached garage. The certificate shall be completed by the builder or registered design professional. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawlspace wall, and/or floor) and ducts outside conditioned spaces; *U*-factors for fenestration; and the solar heat gain coefficient (SHGC) of fenestration. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the type and efficiency of heating, cooling, and service water heating equipment.

SECTION 402

BUILDING THERMAL ENVELOPE

Section 402 of the 2006 International Energy Conservation Code is adopted as written with the following modifications and additions:

Table 402.1.1. *Table 402.1.1 of the 2006 International Energy Conservation Code is replaced by Table 402.1.1 of this code.*

Table 402.1.3. *Table 402.1.3 of the 2006 International Energy Conservation Code is replaced by Table 402.1.3 of this code.*

402.7 Roof Ventilation. (Mandatory). Roofs shall be ventilated in accordance with Section R806 of the *2006 International Residential Code*.

402.8 Roof Reflectance. (Prescriptive After January 1, 2009). Roof coverings that meet one of the following standards shall be installed on new roofs and on existing roofs that are being re-roofed:

1. Reflective roof coverings that are Energy Star qualified.

2. Low slope (2 inches in 12, or less) roof coverings that have an initial solar reflectance of 0.65 or greater as determined by the Cool Roof Rating Council.
3. Steep slope (greater than 2 inches in 12) roof coverings that have an initial solar reflectance of 0.25 or greater as determined by the Cool Roof Rating Council.

Exception: Vegetated “green roofs” when approved by the Green Building Program Manager.

**TABLE 402.1.1
BUILDING THERMAL ENVELOPE**

Fenestration U-factor	Skylight ^b U-Factor	North-, East-, West-Facing Glazed Fenestration	Ceiling R-Value	Wood Frame Wall R-Value	Wood Frame Wall R-Value after 1-1-2009	Mass Wall R-Value	Floor R-Value	Basement ^c Wall R-Value	Slab R-Value & Depth	Crawl Space ^c Wall R-Value
0.40	0.60	Low-E Glass Required	38	13	19 or 13+5 ^e	5	21	10/13	R-5/2ft, unheated slabs R-10/2ft, heated slabs ^d	10/13

- a. R-values are minimums. U-factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2 x 6 cavity.
- b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
- c. The first R-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.
- d. In addition, continuous insulation with a minimum R-value of 10 shall be installed under heated slabs.
- e. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing.

NR = No Requirement

**TABLE 402.1.3
EQUIVALENT U-FACTORS^a**

Fenestration U-factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Frame Wall U-Factor after 1-1-2009	Mass Wall U-Factor	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall R-Factor
0.40	0.60	0.030	0.082	0.060	0.141	0.046	0.059	0.065

- a. Nonfenestration U-factors shall be obtained from measurement, calculation.

SECTION 403

BUILDING SYSTEMS AND EQUIPMENT

403.1 General. This section covers mechanical, plumbing, and electrical systems and equipment used to provide heating, ventilating, air-conditioning and lighting functions.

403.2 Mechanical equipment efficiency. (Prescriptive). Equipment shown in Table 403.2 shall meet the specified minimum performance. Data furnished by the equipment supplier, or certified under a nationally-recognized certification procedure, shall be used to satisfy these requirements. All such equipment shall be installed in accordance with the manufacturer's instructions.

Exception: Where, in the opinion of the building official, replacement of an existing furnace would require extensive revisions to other systems, equipment, or elements of a building, it may be replaced by a new unit of the same type provided that such unit complies with all other laws and ordinances adopted by this jurisdiction.

**TABLE 403.2
MINIMUM EQUIPMENT PERFORMANCE**

Equipment Category	Subcategory	Energy Star Label Required	Minimum Performance
Gas-fired furnaces<225,000 Btu/h	----	Yes	90%AFUE
Oil-fired furnaces<225,000 Btu/h	----	Yes	83% AFUE
Central air conditioners	Split systems	Yes	14 SEER
	Single package	Yes	14 SEER
Air-source heat pumps	Split systems	Yes	8.2 HSPF
	Single package	Yes	8.0 HSPF
Boilers<300,000 Btu/h	----	Yes	85% AFUE
Ventilating fans ^a	Range hood (up to 500 cfm)	Yes	2.8 cfm/watt
	Bathroom and utility fans (10-80 cfm)	Yes	1.4cfm/watt ^b
	Bathroom and utility fans (90-130 cfm)	Yes	2.8 cfm/watt ^c
	Bathroom and utility fans (140-500 cfm)	Yes	2.8 cfm/watt ^c
	In-line fans (single-port and multi-port)	Yes	2.8 cfm/watt

- a. Light sources must use pin-based fluorescent technology.
- b. Minimum rated airflow at 0.25 static w.g. 60% of 0.1.
- c. Minimum rated airflow at 0.25 w.g. 70% of 0.1 static w.g. airflow

AFUE = Annual Fuel Utilization Efficiency Ratio
 SEER = Seasonal Energy Efficiency Ratio
 HSPF = Heating Seasonal Performance Factor

403.3 Heating Equipment. (Mandatory). The primary source of space heating shall not be electric-resistance.

Exceptions:

1. Buildings that do not use fossil fuels or electricity produced by fossil fuels.
2. Where approved by the Green Building Program Manager, electric-resistance heaters may be used as a source of backup heat in buildings with passive-solar collection and storage systems capable of supplying 100 percent of the buildings space heating requirements.
3. Where approved by the Green Building Program Manager, electric-resistance heaters may be used as a source of backup heat in portions of buildings with passive-solar collection and storage systems capable of providing 100 percent of the space heating requirements for the space, provided that such spaces are separated from the remainder of the building by a thermal envelope that complies with this code.
4. Where installed in accordance with Section 403.3.3 of this code.

403.4 Controls. (Mandatory).

- 403.4.1 Programmable thermostats.** At least one programmable thermostat shall be provided for each separate heating and cooling system.
- 403.4.2 Bathroom and laundry room fans.** Ventilating fans installed in bathrooms or laundry rooms shall be controlled by an occupancy sensor or an automatic-timer switch.
- 403.4.3 Heat pump supplementary heat.** Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.

403.5 Ducts. (Mandatory).

- 403.5.1 Insulation.** Supply and return ducts shall be insulated to a minimum of R-8. Ducts in floor trusses shall be insulated to a minimum of R-6.

Exception: Ducts, or portions thereof, located completely inside the building thermal envelope.

- 403.5.2 Sealing and support.** All ducts, air handlers, filter boxes, and building cavities used as ducts shall be sealed. Joints and seams shall comply with Section M1601.3.1 of the *2006 International Residential Code*. Ducts shall be supported in accordance with Section M1601.3.2 of the *2006 International Residential Code*.

- 403.5.3 Building cavities.** Building framing cavities shall not be used as supply ducts.

Exception: Under-floor plenums constructed in accordance with nationally-recognized standards.

- 403.6 Mechanical system piping insulation. (Mandatory).** Mechanical system piping capable of carrying fluids above 105° F (41° C) or below 55° F (13° C) shall be insulated to a minimum of R-4 for piping two inches, or less, in diameter and to a minimum of R-6 for piping greater than two inches in diameter.

- 403.7 Mechanical ventilation. (Mandatory).** Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

- 403.8 System sizing. (Mandatory).** Heating and cooling systems shall be sized in accordance with 403.8.1 through 403.8.3.

- 403.8.1 Equipment sizing.** Heating and cooling equipment shall be sized based on building loads calculated in accordance with the most current version of ACCA Manual J.

- 403.8.2 Duct sizing.** Ducts shall be sized in accordance with the most current version of ACCA Manual D.

- 403.8.3 Equipment selection.** Heating and cooling equipment selection shall be in accordance with the most current version of ACCA Manual S.

Exception: Other heating and cooling system sizing methodologies approved by the Green Building Program Manager.

403.8.4 Documentation of system sizing. Documentation verifying the accuracy of heating and cooling equipment and duct sizing shall be submitted with each application for a building permit and shall include the following information:

1. The address of the proposed work and an indication of the model type if the plan will be re-issued.
2. Heating and cooling load calculations.
3. The indoor and outdoor temperatures used to perform the heating load calculations.
4. The indoor and outdoor temperatures used to perform the cooling load calculations.
5. Equipment and duct sizing calculations.
6. The name of the person that performed the calculations.
7. The name and version of software used to perform the calculations.

403.9 Service water heating.

403.9.1 Scope. The purpose of this section is to provide criteria for design and equipment selection that will produce energy savings when applied to service water heating. Water supplies to ice-making machines and refrigerators shall be taken from a cold-water line of the water distribution system.

403.9.2 Performance efficiency. (Prescriptive). Until January 1, 2009, water heaters shall comply with Table 403.9.2(a). After January 1, 2009, water heaters shall comply with Table 403.9.2(b).

403.9.3 Service water heating equipment. (Mandatory). After January 1, 2009, the primary source of water heating shall not be electric-resistance.

Exceptions:

1. Where the electricity is provided by an on-site solar photovoltaic system.
2. When approved by the Green Building Program Manager, tankless electric water heaters may be used as backup for an on-site solar water heating system.
3. The building official may approve electric-resistance water heaters that comply with Table 403.9.2(a) where it is shown that natural gas is not available.

TABLE 403.9.2(a)
MINIMUM PERFORMANCE OF SERVICE WATER HEATING EQUIPMENT
UNTIL JANUARY 1, 2009^a

Equipment Type	Size (gallons)	Energy Factor (EF)
Gas	30 or less	0.62
	40	0.62
	50	0.60
	65	0.55
	75	0.53
Electric	30 or less	0.95
	40	0.94
	50	0.92
	65	0.90
	80 and above	Not allowed

TABLE 403.9.2(b)
MINIMUM PERFORMANCE OF SERVICE WATER HEATING EQUIPMENT
AFTER JANUARY 1, 2009^a

Equipment Type	<i>Energy Star</i> Label Required	Minimum Performance
Gas tankless water heaters	Yes	Energy factor of 0.80 3.5 gallons-per-minute at a 77° F rise
Advanced non-condensing gas storage water heaters	Yes	Energy factor of 0.70 First-hour rating of 50 gallons-per-hour
Gas condensing water heaters	Yes	Energy factor of 0.80 First-hour rating of 50 gallons-per-hour
Solar water heaters	Yes	Solar fraction of 0.50 OG-300 certification from the SRCC
Heat pump water heaters	Yes	Energy factor of 2.0 First-hour rating of 50 gallons-per-hour

a. Conventional gas storage water heaters, electric-resistance water heaters, and electric tankless water heaters not permitted in new construction after January 1, 2009.

SRCC = Solar Rating and Certification Corporation

403.9.4 Swimming pools. (Mandatory). Swimming pools shall be provided with energy-conserving measures in accordance with Sections 403.8.3.1 through 403.8.3.4 of this code.

403.9.4.1 Energy source. After January 1, 2009, the primary source of energy for heating swimming pools shall come from solar collectors.

403.9.4.2 On-off switch. All pool heaters shall be equipped with an ON-OFF switch mounted for easy access to allow shutting off the operation of the heater without adjusting the thermostat setting and to allow restarting without relighting the pilot light.

403.9.4.3 Pool covers. Heated swimming pools shall be equipped with a pool cover that has a minimum insulation value of R-12.

Exception: Outdoor pools deriving more than 50 percent of the energy for heating from solar collectors are exempt from this requirement.

403.9.4.4 Time clocks. Time clocks shall be installed so that the pump can be set to run in the off-peak electric demand period and can be set for the minimum time necessary to maintain the water in a clear and sanitary condition in keeping with applicable health standards.

403.9.5 Hot water system controls. (Mandatory). Automatic-circulating hot water system pumps or heat trace shall be arranged to be conveniently turned off, automatically or manually, when the hot water system is not in operation.

403.9.6 Pipe insulation. (Mandatory). In circulating systems, all circulating service hot water piping shall be insulated to a minimum R-4 for piping two inches, or less, in diameter and to a minimum of R-6 for piping greater than two inches in diameter. In non-circulating systems, the first 8 feet of outlet piping and the piping between the tank inlet and the inlet heat trap shall be insulated to a minimum of R-4 for piping two inches, or less, in diameter and to a minimum of R-6 for piping greater than two inches in diameter.

403.9.7 Conservation of hot water. Hot water shall be conserved in accordance with Sections 403.9.7.1 and 403.9.7.2 of this code.

403.9.7.1 Showers. Shower heads shall have a maximum flow rate of 2.5 gallons per minute (gpm) at a pressure of 80 pounds per square inch (psi).

403.9.7.2 Faucets. Sink and lavatory faucets shall have a maximum flow rate of 2.2 gallons per minute (gpm) at a pressure of 60 pounds per square inch (psi).

403.9.8 Heat traps. Water heaters with vertical pipe risers shall have a heat trap on both the inlet and outlet of the water heater unless the water heater has an integral heat trap or is part of a circulating system.

403.10 Electrical Lighting.

403.10.1 Lighting efficiency. (Prescriptive). At least 70% of all interior lighting shall be one of the following:

1. *Energy Star* labeled fixtures.
2. *Energy Star* labeled luminaires installed in conventional fixtures.

403.11 Appliances. (Mandatory). The following appliances, when installed by the builder, shall be *Energy Star* labeled:

1. Clothes washers.
2. Dishwashers.

SECTION 404
SIMULATED PERFORMANCE ALTERNATIVE I
(Performance)

Section 404 of the 2006 International Energy Conservation Code is adopted as written with the following modifications:

404.2 Mandatory requirements. Compliance with this Section requires that all of the Mandatory provisions of this code be met.

Table 404.5.2(1). *Table 404.5.2(1) of the 2006 International Energy Conservation Code is replaced by Table 404.5.2(1) of this code.*

TABLE 404.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

Building Component	Standard Reference Design	Proposed Design
Above-grade walls	Type: Mass wall if proposed wall is mass; otherwise wood frame Gross area: same as proposed U-Factor: from Table 402.1.3 Solar absorptance= 0.75 Emittance = 0.90	As proposed As proposed As proposed As proposed As proposed
Basement & crawl space walls	Type: same as proposed Gross area: same as proposed U-Factor: from Table 402.1.3 w/insulation layer on interior side of walls	As proposed As proposed As proposed
Above-grade floors	Type: wood frame Gross area: same as proposed U-Factor: from Table 402.1.3	As proposed As proposed As proposed
Ceilings	Type: wood frame Gross area: same as proposed U-Factor: from Table 402.1.3	As proposed As proposed As proposed
Roofs	Type: composition shingle on wood sheathing Gross area: same as proposed Solar absorptance=0.75 Emittance = 0.90	As proposed As proposed As proposed As proposed
Attics	Type: vented with aperture =1 ft ² per 300 ft ² ceiling area	As proposed
Foundations	Type: same as proposed	As proposed
Doors	Area: 40 ft ² Orientation: North U-factor: Same as fenestration from Table 402.1.3	As proposed As proposed As proposed
Glazing ^a	Total area ^b = (a) The proposed glazing area; where the proposed glazing area is less than 18% of the conditioned floor area (b) 18% of the conditioned floor area; where the proposed glazing area is 18% or more of the conditioned floor area Orientation: equally distributed to four cardinal compass orientations (N,E,S & W) U-factor: from Table 402.1.1 SHGC: from Table 402.1.1 except that for climates with no requirement (NR) SHGC=0.40 shall be used Interior shade fraction: Summer (all hours when cooling is required) = 0.70 Winter (all hours when heating is required) =0.85 External shading: none	As proposed As proposed As proposed As proposed Same as standard reference design ^c
Skylights	U-factor: from table 402.1.1	As proposed
Thermally isolated sunrooms	None	As proposed

Building Component	Standard Reference Design	Proposed Design
Air-exchange rate	Specific Leakage Area (SLA) ^d =0.00036 assuming no energy recovery	For residences that are not tested, the same as the standard reference design For residences without mechanical ventilation that are tested in accordance with ASHRAE 119, Section 5.1, the measured air exchange rate ^e but not less than 0.35 ACH For residences with mechanical ventilation that are tested in accordance with ASHRAE 119, Section 5.1, the measured air exchange rate ^e combined with the mechanical ventilation rate, ^f which shall not be less than $0.01 \times \text{CFA} + 7.5 \times (\text{N}_{\text{br}} + 1)$ where: CFA = conditioned floor area N _{br} = number of bedrooms
Mechanical ventilation	Electric ventilation fans efficiencies: In accordance with table 403.2 of this code	As proposed
Internal gains	$\text{IGain} = 17,900 + 23.8 \times \text{CFA} + 4104 \times \text{N}_{\text{br}}$ (Btu/day per dwelling unit)	Same as standard reference design
Internal mass	An Internal mass for furniture and contents of 8 pounds per square foot of floor area	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element ^g but not integral to the building envelope or structure
Structural mass	For masonry floor slabs, 80% of floor area covered by R-2 carpet and pad, and 20% of floor directly exposed to room air For masonry basement walls, as proposed, but with insulation required by Table 402.1.3 located on the interior side of the walls For other walls, for ceilings, floors and interior walls, wood frame construction	As proposed As proposed As proposed
Heating systems ^h	Fuel type: same as proposed design Efficiencies: Electric: air-source heat pump, in accordance with Table 403.2 of this code Nonelectric furnaces: natural gas furnace in accordance with Table 403.2 of this code. Nonelectric boilers: natural gas boiler in accordance with Table 403.2 of this code Capacity: sized in accordance with Section M1401.3 of the <i>International Residential Code</i>	As proposed As proposed As proposed As proposed As proposed
Cooling systems ^h	Fuel type: Electric Efficiency: in accordance with Table 403.2 of this code Capacity: sized in accordance with Section M1401.3 of the <i>International Residential Code</i>	As proposed As proposed As proposed
Service Water Heating ^{h,i}	Fuel type: same as proposed design Efficiency: in accordance with Table 403.9.2 of this code Use: gal/day=30 + 10 x N _{br} Tank temperature: 120°F	As proposed As proposed Same as standard reference Same as standard reference
Thermal distribution systems	A thermal distribution system efficiency (DSE) of 0.80 shall be applied to both the heating and cooling system efficiencies	Same as standard reference design, except as specified by Table 404.5.2(2)
Thermostat	Type: manual, cooling temperature set point =78°F; Heating temperature set point =68°F	Same as standard reference design

For SI: square foot = 0.93m²; 1 British thermal unit = 1055 J; 1 pound per square foot = 4.88kg/m²; 1 gallon (US) = 3.785L; °C = (°F-32)/1.8.

- a. Glazing shall be defined as sunlight-transmitting fenestration, including the area of sash, curbing or other framing elements, what enclose conditioned space. Glazing includes the area of sunlight-transmitting fenestration assemblies in walls bounding conditioned basements. For doors where the sunlight-transmitting opening is less than 50% of the door area, the glazing area is the sunlight transmitting opening area. For all other doors, the glazing area is the rough frame opening area for the door including the door and the frame.

- b. For residences with conditioned basements, R-2 and R-4 residences and townhouses, the following formula shall be used to determine glazing area:
 $AF = A_s \times FA \times F$ where:
 AF = Total glazing area.
 A_s = Standard reference design total glazing area.
 $FA = (\text{Above-grade thermal boundary gross wall area}) / (\text{above-grade boundary wall area} + 0.5 \times \text{below-grade boundary wall area})$.
 $F = (\text{Above-grade thermal boundary wall area}) / (\text{above-grade thermal boundary wall area} + \text{common wall area})$ or 0.56, whichever is greater.
 and where:
 Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions. Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil. Below-grade boundary wall is any thermal wall in soil contact. Common wall area is the area of walls shared with an adjoining dwelling unit.
- c. For fenestrations facing within 15 degrees (0.26 rad) of true south that are directly coupled to thermal storage mass, the winter interior shade fraction shall be permitted to be increased to 0.95 in the proposed design.
- d. Where Leakage Area (L) is defined in accordance with Section 5.1 of ASHRAE 119 and where:
 $SLA = L/CFA$
 where L and CFA are in the same units.
- e. Tested envelope leakage shall be determined and documented by an independent party approved by the code official. Hourly calculations as specified in the 2001 ASHRAE Handbook of Fundamentals, Chapter 26, page 26.21, Equation 40 (Sherman-Gimsrud model) or the equivalent shall be used to determine the energy loads resulting from infiltration.
- f. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE Handbook of Fundamentals, Chapter 26.24 and the "Whole-house Ventilation" provision of 2001 ASHRAE Handbook of Fundamentals, page 26.19 for intermittent mechanical ventilation.
- g. Thermal Storage element shall mean a component not part of the floors, walls or ceilings that is part of a passive solar system, and that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element must be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or must be connect to such a room with pipes or ducts that allow the element to be actively charged.
- h. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- i. For a proposed design with a nonstorage-type water heater, a 40-gallong storage-type gas water heater that complies with Table 403.9.2 of this code shall be assumed.

SECTION 405 SIMULATED ENERGY PERFORMANCE ALTERNATIVE II (Performance)

405.1 Scope. This section establishes criteria for compliance using simulated energy performance analysis. Such analysis shall include heating, cooling, and service water heating energy only.

405.2 Mandatory requirements. Compliance with this Section requires that all of the Mandatory provisions of this code be met.

405.3 Performance-based compliance. Compliance with this Section requires that a proposed residence be 30% more energy efficient than a baseline residence.

405.4 Documentation requirements. Simulated energy performance shall be submitted with each permit application. The information submitted shall include the following:

1. Address of the proposed residence;
2. Model number of the proposed residence (if applicable);

3. Calculated values for the baseline residence performance, the proposed residence performance, and the percentage of improvement;
4. A list of energy-related features that are included in the design and on which the performance rating is based. This list shall document all of the energy-related features that differ between the proposed residence model and the baseline residence model;
5. Name of individual completing the simulated energy performance documentation; and
6. Name and version of the simulation program.

405.5 Calculation procedure. The proposed residence design and the baseline residence design shall be calculated using the following:

1. The same simulation program;
2. The same geographical location;
3. The same weather data; and
4. The same orientation of the building on the site unless otherwise approved by the building official.

405.6 Simulation program.

405.6.1 Minimum capabilities. Calculation procedures used to comply with this section shall be software tools capable of calculating the annual energy consumption of all building elements that differ between the baseline residence design and the proposed residence design and shall include the following capabilities:

1. Computer generation of the baseline residence design using only the input for the proposed residence design. The calculation procedure shall not allow the user to directly modify the building component characteristics of the baseline residence design;
2. Calculation of whole-building (as a single zone) sizing for the heating and cooling equipment in the baseline residence design in accordance with Section 403.8.1 of this code; and
3. Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating, and air conditioning equipment based on climate and equipment sizing.

CHAPTER 5 COMMERCIAL ENERGY EFFICIENCY

Chapter 5 of the International Energy Conservation Code is deleted in its entirety. It is replaced by the 2007 Albuquerque Energy Conservation Code-Volume I, Commercial and Multi-Family Residential Buildings.

**CHAPTER 6
REFERENCED STANDARDS**

Chapter 6 of the 2006 International Energy Conservation Code is adopted as written.

**CHAPTER 7
REFERENCED SECTIONS OF THE
2006 INTERNATIONAL RESIDENTIAL CODE**

SECTION R806 ROOF VENTILATION

R806.1 Ventilation required. Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain or snow. Ventilating openings shall be provided with corrosion-resistant wire mesh, with 1/8 inch minimum to 1/4 inch maximum openings.

R806.2 Minimum area. The total net free ventilating area shall not be less than 1/150 of the area of the space ventilated except that reduction of the total area to 1/300 is permitted, provided that at least 50 percent and not more than 80 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet above the eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents. As an alternative, the net free cross-ventilation area may be reduced to 1/300 when a vapor barrier having a transmission rate not exceeding 1 perm is installed on the warm-in-winter side of the ceiling.

R806.3 Vent and insulation clearance. Where eave or cornice vents are installed, insulation shall not block the free flow of air. A minimum of a 1-inch space shall be provided between the insulation and the roof sheathing and at the location of the vent.

R806.4 Conditioned attic assemblies. Unvented conditioned attic assemblies (spaces between the ceiling joists of the top story and the roof rafters) are permitted under the following conditions:

1. No interior vapor retarders are installed on the ceiling side (attic floor) of the unvented attic assembly.
2. An air-impermeable insulation is applied in direct contact to the underside/interior of the structural roof deck. "Air-impermeable" shall be defined by ASTM E283.
3. Sufficient insulation is installed to maintain the monthly average temperature of the condensing surface above 45°F. The condensing surface is defined as either the structural roof deck or the interior surface of an air-impermeable insulation applied in direct contact with the underside/interior of the structural roof deck. "Air-impermeable" is quantitatively defined by ASTM E283. For calculation purposes, an interior temperature of 68°F is assumed. The exterior temperature is assumed to be the monthly average outside temperature.

SECTION M1601.3.1 JOINTS AND SEAMS

M1601.3.1 Joints and seams. Joints of duct systems shall be made substantially airtight by means of tapes, mastics, gaskets, or other approved closure systems. Closure systems used with rigid fibrous glass ducts shall comply with UL 181A and shall be marked "181A-P" for pressure-sensitive tape, "181A-M" for mastic, or "181A-H" for heat-sensitive tape. Closure systems used with flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked "181B-FX" for pressure-sensitive tape or "181B-M" for mastic. Duct connections to flanges of air distribution system equipment or sheet metal fittings shall be mechanically

fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Crimp joints for round metal ducts shall have a contact lap of at least 1 1/2 inches and shall be mechanically fastened by means of at least three sheet-metal screws or rivets equally spaced around the joint.

M1601.3.2 SUPPORT

M1601.3.2 Support. Metal ducts shall be supported by 1/2-inch wide 18-gage metal straps or 12-gage galvanized wire at intervals not exceeding 10 feet or other approved means. Nonmetallic ducts shall be supported in accordance with the manufacturer's installation instructions.