

Chapter 32

BUILDING ENERGY CONSERVATION CODE

Articles:

1. Purpose
2. General Provisions
3. Adoption of the International Energy Conservation Code
4. Amendments to the 2006 ICC International Energy Conservation Code

Article 1. Purpose

Sections:

- 32-1.1 Purpose and intent.

Sec. 32-1.1 Purpose and intent.

- (a) The purpose of this chapter is to set minimum requirements for the energy-efficient design of buildings so that they may be constructed, operated, and maintained in a manner that minimizes the use of energy without constraining the building function or the comfort or productivity of the occupants.
- (b) The intent of this chapter is to provide criteria for the energy-efficient design and construction of buildings and this chapter is intended to provide flexibility to allow the use of innovative approaches and techniques to achieve the effective use of energy. This chapter will recognize the need for a modern, up-to-date energy conservation code addressing the design of energy-efficient building envelopes and installation of energy-efficient mechanical, lighting and power systems through requirements emphasizing performance. There may be instances in which the requirements of this code may conflict with requirements in health, safety or environmental codes, including the building code. In that case, the health, safety or environmental codes shall prevail.

(Added by Ord. 09-30)

Article 2. General Provisions

Sections:

- 32-2.1 Definitions.

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In this chapter, unless the context otherwise requires:

"Chapter" means Chapter 32 of this ROH.

"ICC" means the International Code Council.

"IECC" means the ICC, International Energy Conservation Code, 2006 Edition, as copyrighted by the International Code Council.

"Section" means a section of a chapter of the International Energy Conservation Code.
(Added by Ord. 09-30)

Article 3. Adoption of the International Energy Conservation Code

Sections:

Sec. 32-3.1 Adoption of the International Energy Conservation Code.

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The "International Energy Conservation Code, 2006 Edition," as copyrighted and published in 2006 by the International Code Council, Incorporated, 500 New Jersey Avenue, 6th Floor, Washington, DC 20001, is adopted by reference and made a part of this chapter. This incorporation by reference includes all parts of the International Energy Conservation Code, subject to the amendments hereinafter set forth. The appendices of the ICC, IECC are not adopted except as provided in this chapter. (Added by Ord. 09-30)

Article 4. Amendments to the 2006 ICC International Energy Conservation Code

(1) Amending Section 101.1. Section 101.1 is amended to read as follows:

101.1 Title. This code shall be known as the Building Energy Conservation Code of the City and County of Honolulu, and shall be cited as such. It is referred to herein as "this code."

(2) Amending Section 101.5.2. Section 101.5.2 is amended to read as follows:

101.5.2 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. Conditioned spaces with a peak design rate of energy usage less than 3.4 Btu/h-ft² (10.7 W/m²) or 1.0 watt/ft² (10.7 W/m²) of floor area for space conditioning purposes.
2. Unconditioned spaces that are non-habitable spaces.

(3) Amending Section 104.1. Section 104.1 is amended to read as follows:

104.1 General. When the requirements in this code apply to a building as specified in Section 101.4, plans, specifications or other construction documents submitted for a building, electrical, or plumbing permit required by this jurisdiction shall comply with this code and shall be prepared, designed, approved, and observed by a design professional. The responsible design professional shall provide on the plans a signed statement certifying that the project is in compliance with this code.

Exception: Any building, electrical, or plumbing work that is not required to be prepared, designed, approved, or observed by a licensed professional architect or engineer pursuant to Chapter 464 of the Hawaii Revised Statutes.

- (4) Adding Section 104.3. Section 104.3 is added to read as follows:

104.3 Conformance Statement. The plan shall include the following conformance statement by the responsible engineer or architect that the design conforms to this code.

CITY AND COUNTY OF HONOLULU
 REVISED ORDINANCE CHAPTER 32,
 HONOLULU COUNTY CODE 1990, AS AMENDED

To the best of my knowledge, this project's design substantially conforms to the Building Energy Conservation Code for:

- _____ Building Component Systems
- _____ Electrical Component Systems
- _____ Mechanical Component Systems

Signature: _____ Date: _____
 Name: _____
 Title: _____
 License No.: _____

Include only those items that the signator is responsible for. This block shall be on the first sheet of the pertinent plan, e.g. architectural, electrical, and mechanical. The above may be submitted separately to the Building Official in a letter including the identification of the building.

- (5) Deleting Section 105. Section 105 is deleted.
- (6) Amending Table 402.1.1. Table 402.1.1 is amended to read as follows:

**TABLE 402.1.1
 INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

Climate Zone	Fenestration U-Factor	Skylight ^b U-Factor	Glazed Fenestration SHGC	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement ^c Wall R-Value	Slab ^d R-Value & Depth	Crawl Space Wall R-Value
1	1.20	0.75	0.40	See Section 402.1.1.1	13	3	NR	NR	NR	NR
2	0.75	0.75	0.40	30	13	4	13	0	0	0
3	0.65	0.65	0.40 ^e	30	13	5	19	0	0	5 / 13
4 except Marine	0.40	0.60	NR	38	13	5	19	10 / 13	10, 2 ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	19 or 13+5 ^g	13	30 ^f	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	19 or 13+5 ^g	15	30 ^f	10 / 13	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19	30 ^f	10 / 13	10, 4 ft	10 / 13

For SI: 1 foot = 304.8 mm.
 NR = No requirement.

- a. R-values are minimums. U-factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2 × 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. R-5 shall be added to the required slab edge R-values for heated slabs.

- e. There are no SHGC requirements in the Marine zone.
- f. Or insulation sufficient to fill the framing cavity, R-19 minimum.
- g. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.

(7) Amending Section 402.1.1. Section 402.1.1 is amended by adding Sections 402.1.1.1, 402.1.1.2, 402.1.1.3, 402.1.1.4, 402.1.1.5, 402.1.1.6, 402.1.1.7, 402.1.1.8, and 402.1.1.8.1 to read as follows:

402.1.1.1 Ceiling Insulation Alternative. Insulation requirements for ceilings in buildings constructed in climate zone 1 shall meet one of the design options in Table 402.1.1.1.

**Table 402.1.1.1
Ceiling Insulation for Buildings in Climate Zone 1**

Design Option	Design and Construction Components				
	Roof Insulation (Section 402.1.1.4)	Attic Ventilation (Section 402.1.1.5)	Radiant Barrier (Section 402.1.1.6)	Cool Roof (Section 402.1.1.7)	Roof Heat Gain Factor below 0.05 (Section 402.1.1.8)
1	R				
2 ^a		R	R		
3 ^a			R	R	
4 ^a					R

R = Required.

a. Design Option is not allowed at building sites above a 2,400-foot elevation.

402.1.1.2 Definitions. For the purpose of this section, the following terms shall be defined as follows:

Gross Area of Opaque Roof Surfaces. Gross area of opaque roof surfaces means the total surface of the roof assembly exposed to outside air or unconditioned spaces. The opaque roof assembly shall exclude skylight surfaces, service openings, and overhangs.

Net Free Vent Area. Net free vent area means the total area through which air can pass in a screen, grille face or register.

Roof Area. Roof area means attic floor area; or, if there is no attic, "roof area" means the horizontal projection of roof area measured from the outside surface of the exterior walls.

402.1.1.3 Construction Documents. Plans shall be submitted which indicate insulation type, thickness, and location; ventilation opening types, sizes and locations; radiant barrier location; and, roof surface type as appropriate, depending on the option selected from Table 402.1.1.1.

402.1.1.4 Roof Insulation. Roof insulation shall be provided as follows:

1. In buildings with an attic space provide either:
 - 1.1. R-30 insulation installed above the ceiling level, or
 - 1.2. R-19 insulation installed at the roof level between the roof framing members.
2. In buildings without an attic space provide either:
 - 2.1. R-19 insulation installed at the roof level between the roof framing members.
 - 2.2. R-15 insulation entirely above the roof deck.

402.1.1.5 Ventilation. Ventilation shall be provided by at least one of the following:

1. A baffled ridge vent installed in accordance with the manufacturer's instructions in addition to lower inlet openings to provide a total of no less than one square foot of net free vent area for each 300 square feet of roof area. No less than 30 percent of the total vent area shall be in either the ridge vent or the lower half of the ventilated space.
2. A solar-powered exhaust fan that provides at least one cubic foot per minute of airflow for each square foot of roof area.
3. Upper and lower vents with total net free vent area of at least one square foot for each 150 square feet of roof area. At least 30 percent of the total vent area shall be in the upper half of the ventilated space and at least 30 percent of the total vent area shall be in the lower half of the ventilated space.

402.1.1.6 Radiant Barrier. A radiant barrier shall have an emissivity of no greater than 0.05 as tested in accordance with ASTM E-408. The radiant barrier shall be installed with the shiny side facing down and with a minimum air gap thickness of three-fourths ($\frac{3}{4}$) inch. The radiant barrier may be securely attached to the roof framing or may be laminated to the bottom of the roof sheathing.

402.1.1.7 Cool Roof. A cool roof shall have an infrared emittance of no more than 0.75 when tested in accordance with ASTM E-408 and a high solar reflectance. The manufacturer's test results shall be acceptable for compliance.

402.1.1.8 Roof Heat Gain Factor. The Roof Heat Gain Factor (RHGF) shall not exceed 0.05 when calculated as described in Equation 402.1.1-1.

Equation 402.1.1-1

$$\text{RHGF} = U_r \times \alpha \times \text{RB}$$

Where:

RHGF = Roof Heat Gain Factor (Btu/ft²-h-°F)

U_r = Overall thermal transmittance value for the gross area of opaque roof surfaces (Btu/ft²-h-°F)

α = Roof surface absorptivity. Between 0.3 and 1.0 (unitless)

RB = Radiant Barrier credit. Equals 0.33 if a radiant barrier is installed and 1.00 otherwise (unitless). Radiant barrier installation shall comply with Section 402.1.1.7.1 to qualify for Radiant Barrier credit.

402.1.1.8.1 Radiant Barrier Credit. To qualify for the Radiant Barrier credit (RB) described in Section 402.1.1.8, the installation of the radiant barrier shall meet the following criteria:

1. The emissivity of the radiant barrier shall be 0.10 or less. The manufacturer shall provide test data or documentation of the emissivity as tested in accordance with ASTM E-408.
2. The radiant barrier shall be securely installed in a permanent manner using one of the following installation methods:
 - 2.1. The radiant barrier shall be draped with the reflective surface facing down over the top cord of the truss before the roof deck is installed. A minimum air gap of three-fourths ($\frac{3}{4}$) inch shall be provided between the radiant barrier and the roof deck above at the center of the span. A minimum three-fourths ($\frac{3}{4}$) inch air gap shall also be provided between the radiant barrier and the ceiling or insulation below.
 - 2.2. The radiant barrier shall be stretched with the shiny side facing down between the top cords of the truss and stapled or otherwise secured at each side. A minimum air space of three-fourths ($\frac{3}{4}$) inch above and below is required.
 - 2.3. For attic installations only, the radiant barrier shall be stapled or otherwise secured to the bottom surface of the top cord of the truss and draped below with the shiny side facing down. A minimum air space of three-fourths ($\frac{3}{4}$) inch above and below is required.
 - 2.4. For open beam ceiling construction only, the radiant barrier shall be laid on top of the roof deck with the shiny side facing up and a

minimum three-fourths (¾) inch air gap between the radiant barrier and the roofing material above. The roof slope shall be greater than or equal to 14° from horizontal.

3. At least one square foot of free area for ventilation shall be provided per 150 square feet of attic floor area, or in the case of vaulted or open-beam ceilings, per 150 square feet of ceiling area. In vaulted or open beam ceilings, the air space shall have an evenly-distributed vent area. In vaulted ceilings, vents shall be provided for each air space between rafters.

- (8) Amending Table 402.1.3. Table 402.1.3 is amended to read as follows:

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

Climate Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling U-Factor	Frame Wall U-Factor	Mass Wall U-Factor	Floor U-Factor	Basement Wall U-Factor	Crawl Space Wall U-Factor
1	1.2	0.75	0.035	0.082	0.197	NR	NR	NR
2	0.75	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.65	0.65	0.035	0.082	0.141	0.047	0.360	0.136
4 except Marine	0.40	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.060	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.060	0.06	0.033	0.059	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033	0.059	0.065

NR = No requirement

- a. Nonfenestration U-Factors shall be obtained from measurement, calculation or an approved source.

- (9) Amending Section 402.3.3. Section 402.3.3 is amended to read as follows:

402.3.3 Glazed Fenestration Exemption. Up to 15 square feet (1.4 m²) of glazed fenestration per dwelling unit shall be permitted to be exempt from U-factor and SHGC requirements in Section 402.1.1. North-facing windows and windows with a projection factor of 1.0 or more shall be permitted to be exempt from SHGC requirements in Section 402.1.1.

- (10) Amending Section 402.4.1. Section 402.4.1 is amended by adding Section 402.4.1.1 to read as follows:

402.4.1.1 Unconditioned building exemption. Unconditioned residential buildings are exempt from compliance with Section 402.4. The free-vent fenestration area of unconditioned buildings shall be no less than 14 percent of the floor area. All interior doors shall be capable of being secured in the open position and ceiling fan stub-ins shall be provided to living areas and bedrooms.

- (11) Amending Section 402.4.2. Section 402.4.2 is amended to read as follows:

402.4.2 Fenestration Air Leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m²), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m²), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer.

Exceptions:

1. Site-built windows, skylights and doors.
2. Jalousie windows shall not exceed 1.2 cfm per square foot (6.1 L/s/m²).

(12) Adding Section 403.7 to read as follows:

403.7 Residential Pools. Residential pools shall be provided with energy conserving measures in accordance with Sections 403.7.1 through 403.7.3.

403.7.1 Pool Heaters. All pool heaters shall be equipped with a readily accessible on-off switch to allow shutting off the heater without adjusting the thermostat setting. Pool heaters fired by natural gas shall not have continuously burning pilot lights.

403.7.2 Time Switches. Time switches that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on swimming pool heaters and pumps.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Where pumps are required to operate solar- and waste-heat-recovery pool heating systems.

403.7.3 Pool Covers. Heated pools shall be equipped with a vapor retardant pool cover on or at the water surface. Pools heated to more than 90°F (32°C) shall have a pool cover with a minimum insulation value of R-12.

Exception: Pools deriving over 60 percent of the energy for heating from site-recovered energy or solar energy source.

(13) Deleting Section 503.2.9. Section 503.2.9 is deleted.

(14) Adding a new Section 503.2.9. A new Section 503.2.9 is added to read as follows:

503.2.9 Mechanical Systems Commissioning and Completion Requirements. Prior to the issuance of a certificate of occupancy, the design professional shall provide a written statement of system completion in accordance with Sections 503.2.9.1 through 503.2.9.2.

503.2.9.1 System Commissioning. Commissioning is a process that verifies and documents that the selected building systems have been designed, installed, and function according to the owner's project requirements and construction documents. Drawing notes shall require commissioning and completion requirements in accordance with this section. Drawing notes may refer to specifications for further requirements. Copies of all documentation shall be given to the owner.

503.2.9.1.1 Commissioning Plan. A commissioning plan shall include, as a minimum, the following items:

1. A detailed explanation of the original owner's project requirements;
2. A narrative describing the activities that will be accomplished during each phase of commissioning, including guidance on who accomplishes the activities and how they are completed;
3. Equipment and systems to be tested, including the extent of tests;
4. Functions to be tested (for example, calibration, economizer control, etc.);
5. Conditions under which the test shall be performed (for example, winter and summer design conditions, full outside air, etc.); and
6. Measurable criteria for acceptable performance.

503.2.9.2 Systems Adjusting and Balancing. All HVAC systems shall be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within 10 percent of design rates. Test and balance activities shall include, as a minimum, the following items:

1. Air systems balancing: Each supply air outlet and zone terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the International Mechanical Code. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 10 hp (18.6 kW) and larger. Air systems shall be balanced in a manner to first minimize throttling losses; then, for fans with

a system power greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

Exception: Fan with fan motors of 1 hp or less.

2. Hydronic systems balancing: Individual hydronic heating and cooling coils shall be equipped with means for balancing and pressure test connections. Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Each hydronic system shall have either the ability to measure pressure across the pump, or test ports at each side of each pump.

Exceptions:

1. Pumps with pump motors of 5 hp or less.
2. When throttling results are no greater than 5 percent of the nameplate horsepower draw above that required if the impeller were trimmed.

- (15) Amending Chapter 6. Referenced Standards. The following Standards are added to Chapter 6 - Referenced Standards, to read as follows:

ASTM E 408-2008, Standard Test Methods for Total Normal Emittance of Surfaces
Using Inspection Meter Techniques.....402.1.1.6, 402.1.1.7, 402.1.1.8.1.
(Added by Ord. 09-30)