



CADMUS



2015 IECC Commercial: Overview of the Envelope Requirements

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Section I

INTRODUCTION



Structure of the 2015 IECC

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Residential Provisions

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Energy Savings Potential for Adoption of the 2015 IECC



Cumulative Residential energy savings compared to the 2006 IECC

- **2 GWh/yr in 2016**
- 369 GWh/yr in 2026
- 687 GWh/yr in 2030
- 1,317 GWh/yr in 2036

Cumulative Commercial energy savings compared to ASHRAE Standard 90.1-2004

- **11 GWh/yr in 2016**
- 715 GWh/yr in 2026
- 1,304 GWh/yr in 2030
- 3,386 GWh/yr in 2036

Cumulative Net Savings

- **13 GWh/yr in 2016**
- 1,084 GWh/yr in 2026
- 1,991 GWh/yr 2030
- 4,703 GWh/yr in 2036

How Much is a Gigawatt:

Power for approximately 200,000 homes for one year





Section R401

General



Section III

COMMERCIAL PROVISIONS: AN OVERVIEW





Section C401

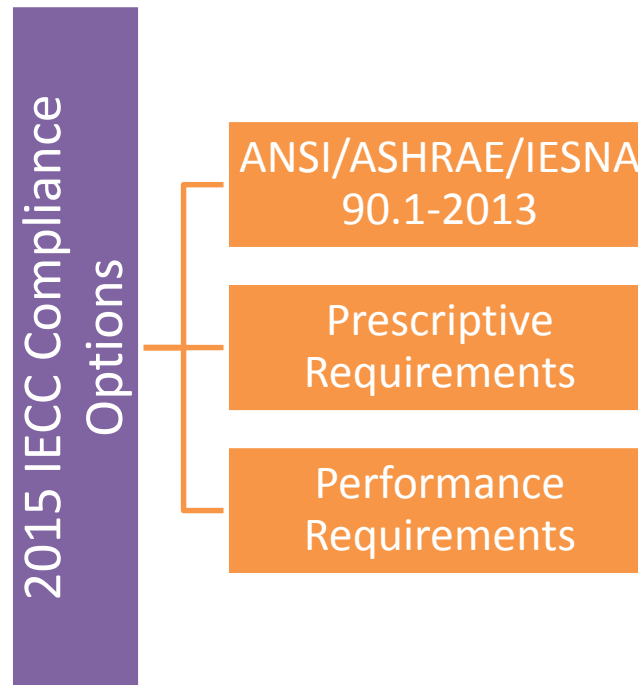
General



Scope and Application

C401.1 and C401.2

C401.1 Scope. The provisions of this chapter are applicable to *commercial buildings* and their *build sites*.





Section C402

Building Envelope



Table C402.1.3 Opaque Thermal Envelope Insulation Minimum Requirements, R-Value Method

Climate Zone	1	
	All Other	Group R
Roofs		
Insulation entirely above roof deck	R-20ci	R-25ci
Metal buildings	R-19 + R-11 LS	R-19 + R-11 LS
Attic and other	R-38	R-38
Walls, above grade		
Mass	R-5.7ci	R-5.7ci
Metal building	R-13 + R-6.5ci	R-13 + R-6.5ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20
Walls, below grade		
Below-grade wall	NR	NR
Floors		
Mass	NR	NR
Joist-framing	NR	NR
Slab-on-grade floors		
Unheated slabs	NR	NR
Heated slabs	R-7.5 for 12" below	R-7.5 for 12" below
Opaque doors		
Nonswinging	R-4.75	R-4.75



Thermal Resistance of Above-Grade Walls

C402.2.3 Hawaii Specific

C402.2.3 Thermal resistance of above-grade walls. The minimum thermal resistance (R-value) of materials installed in the wall cavity between framing members and continuously on the walls shall be as specific in Table C401.3, based on framing type and construction materials used in the wall assembly.

Exceptions:

Continuous insulation for wood and metal framed walls are not required when one of the following conditions are met:

- Walls have a covering with a reflectance of ≥ 0.64
- Walls have overhangs with a projection factor equal to or greater than 0.3. The projection factor is the horizontal distance from the surface of the wall to the farthest most point of the overhang divided by the vertical distance from the first floor level to the bottom most point of the overhang.

The R-value of integral insulation installed in concrete masonry units shall not be used in determining compliance with Table C402.1.3. Mass walls shall include walls:

1. Weighing not less than 35 psf (170 kg/m²) of wall surface area.
2. Weighing not less than 25 psf (120 kg/m²) of wall surface area where the material weight is not more than 120 pcf (1900 kg/m³).
3. Having a heat capacity exceeding 7 Btu/ft²·°F (144 kJ/m²·K).
4. Having a heat capacity exceeding 5 Btu/ft²·°F (103 kJ/m²·K), where the material weight is not more than 120 pcf (1900 kg/m³).



Roof Solar Reflectance and Thermal Emittance

C402.3

- Low-sloped roofs in CZ 1-3 must comply with one or more options in Table C402.3.

Table C402.3

Minimum Roof Reflectance and Emittance Options

Three-year aged solar reflectance of 0.55 and 3-year aged thermal emittance of 0.75

Three-year-aged solar reflectance index of 64



Table C402.4 Building Envelope Fenestration Maximum U-factor and SHGC Requirements

Climate Zone	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7
Vertical Fenestration							
U-factor							
Fixed fenestration	0.50	0.50	0.46	0.38	0.38	0.36	0.29
Operable fenestration	0.65	0.65	0.60	0.45	0.45	0.43	0.37
Entrance doors	1.10	0.83	0.77	0.77	0.77	0.77	0.77
SHGC							
Orientation	SEW/N	SEW/N	SEW/N	SEW/N	SEW/N	SEW/N	SEW/N
PF < 0.2	0.25/0.33	0.25/0.33	0.25/0.33	0.40/0.53	0.40/0.53	0.40/0.53	0.45/NR
$0.2 \leq \text{PF} < 0.5$	0.30/0.37	0.30/0.37	0.30/0.37	0.48/0.58	0.48/0.58	0.48/0.58	NR/NR
PF ≥ 0.5	0.40/0.40	0.40/0.40	0.40/0.40	0.64/0.64	0.64/0.64	0.64/0.64	NR/NR
Skylights							
U-factor	0.75	0.65	0.55	0.50	0.50	0.50	0.50
SHGC	0.35	0.35	0.35	0.40	0.40	0.40	NR

Maximum Area C402.4.1

Percentage of Vertical
Fenestration Area to Gross
Wall Area

- Allowed up to 30% maximum of above-grade wall area
- In Climate Zones 1-6, up to 40% maximum of above-grade wall area permitted with daylight controls



Increased Vertical Fenestration Area with Daylight Responsive Controls C402.4.1.1

**Up to 40% vertical fenestration area
allowed in Climate Zones 1-6 if:**

No less than 50%
of the net floor
area is within a
daylight zone in
buildings 2 stories
or less

No less than 25%
of the net floor
area is within a
daylight zone in
buildings with 3
or more stories

Daylight
responsive
controls are
installed in
daylight zones

VT of vertical
fenestration is \geq
1.1 times SHGC



Minimum Skylight Fenestration Area

C402.4.2

- Limited to $\leq 3\%$ of Roof Area (C402.4.1)
- Up to 5% allowed if automatic daylighting controls installed in daylight zones under skylights (C402.4.1.2)

In certain types of enclosed spaces $> 2,500 \text{ ft}^2$ directly under a roof with not less than 75% of the ceiling area with a ceiling height $> 15 \text{ ft}$

- total daylight zone under skylights to not be $<$ half the floor area and must provide either
 - A minimum skylight area to daylight zone under skylights of not less than 3% where all skylights have a VT of at least 0.40 **OR**
 - A minimum skylight effective aperture of at least 1%

Exceptions

- Climate zones 6-8
- Spaces with LPDs $< 0.5 \text{ W/ft}^2$
- Documented shaded spaces
- Daylight area under rooftop monitors is $> 50\%$ of floor area
- Spaces where total area minus area of daylight zones adjacent to vertical fenestration is less than $2,500 \text{ ft}^2$ and where lighting is controlled per C405.2.5



Area-Weighted SHGC

C402.4.3.5 Hawaii Specific

C402.4.3.5 Area-weighted SHGC. In commercial buildings, an area-weighted average of fenestration products shall be permitted to satisfy SHGC requirements.



Air Barriers and Construction

C402.5.1 and C402.5.1.1

Air Barrier Requirements

- Continuous for all assemblies part of the thermal envelope and across joints and assemblies
- Joints and seams to be sealed and securely installed
- Penetrations and joints and seals associated with penetrations must be sealed in a manner compatible with construction material and location
- Recessed lighting to comply with C402.5.7. Where similar objects are installed that penetrate the air barrier, make provisions to maintain integrity of air barrier

Placement
Allowed

Inside of building envelope

Outside of building envelope

Located within assemblies composing envelope

Any combination thereof



Air Barrier Compliance Options

C402.5.1.2

Compliance Options

Materials

Assemblies

Testing



C402.5.1.2.1 Materials

Materials with air permeability ≤ 0.004 cfm/ft² under pressure differential of 0.3 in. w.g. when tested in accordance with ASTM E 2178 comply with materials provision.

Materials	Thickness (Minimum)
Plywood	3/8 in.
Oriented strand board	3/8 in
Extruded polystyrene insulation board	½ in
Foil-back polyisocyanurate insulation board.	½ in
Closed-cell spray foam with minimum density of 1.5 pcf	1-1/2 in
Open-cell spray foam with density between 0.4 and 1.5 pcf	4.5 in
Exterior or interior gypsum board	½ in
Cement board	½ in
Built up roofing membrane	
Modified bituminous roof membrane	
Fully adhered single-ply roof membrane	
Portland cement/sand parge or gypsum plaster	5/8 in
Cast-in-place and precast concrete	
Fully grouted concrete block masonry	
Sheet metal or aluminum	
Solid or hollow masonry constructed of clay or shale masonry units	



C402.5.1.2.2 Assemblies

Assemblies of materials and components (sealants, tapes, etc.) with average air leakage ≤ 0.04 cfm/ft² under pressure differential of 0.3 in. w.g. tested in accordance with ASTM E 2357, 1677 or 283 comply with assemblies provision.

Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating

Masonry walls constructed of clay or shale masonry units with a nominal width of 4 inches or more

Portland cement/sand parge, stucco or plaster minimum ½ thick



C402.5 Air Barrier Testing Alternative

Thermal envelope of buildings must comply with either the materials or assemblies provision **OR** be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge or equivalent method approved by code official.

Building thermal envelope with a tested air leakage rate of ≤ 0.40 cfm/ft² complies with air leakage requirements





Section C406

Additional Efficiency Package Options



Requirements

C406.1

Buildings must comply with at least one additional efficiency feature:

1. More efficient HVAC
2. Reduced lighting power density
3. Enhanced lighting controls
4. On-site renewable energy
5. Dedicated outdoor air system
6. High-efficiency SWH





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