



CADMUS

2015 IECC Residential: Overview of the Tropical Zone Requirements

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Section I

INTRODUCTION



Structure of the 2015 IECC

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Residential Provisions

Chapter 1 – Scope and Administration

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Energy Savings Potential for Adoption of the 2015 IECC



Cumulative Residential energy savings compared to the 2006 IECC
<ul style="list-style-type: none">• 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
<ul style="list-style-type: none">• 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
<ul style="list-style-type: none">• 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 II

RESIDENTIAL PROVISIONS: AN OVERVIEW





Section R401

General



Compliance Options

Tropical Zone

Section R401.2.1

- Residential buildings in tropical zone at elevations below 2,400ft
- Best suited for sites with large yards of dense landscaping

Prescriptive

Sections R401-R404

- No trade-offs permitted
- No tools needed
- Historically the preferred compliance option of designers in Hawaii

Total UA Alternative

Section R402.1.5

- U-factor and assembly area used to determine trade off
- Calculation performed using approved method
- U.S. DOE REScheck

Performance

Section R405

- Mandatory provisions must be met
- Simulated energy performance analysis for heating, cooling and SHW
- Proposed design must have annual energy cost less than or equal to energy cost of reference design

Energy Rating Index

Section R406

- Mandatory provisions must be met
- Building envelope requirements of 2009 IECC



Option One - Tropical Zone

R401.2.1

Applies to residential buildings in the tropical zone at elevations below 2,400ft above sea level. Includes provisions for:

- No air-conditioning
- 50% Air-conditioned space
- Renewable energy
- Fenestration
- Lighting
- Roofs
- Ceiling fans
- Overhangs
- Smaller homes



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Tropical Zone as Amended (1)

- Terms “occupied space” and “conditioned space” replaced with dwelling unit.
- Air-conditioning permitted in no more than one-half of dwelling unit.
- Rewards no air-conditioning.
- Dwelling units are not heated.



- Solar, wind or other renewable energy source must supply at least 90 percent of SWH energy.



Solar Water Heating

R403.5.4 Hawaii Specific

- **Solar water heating.** Solar water heating systems are required for new single-family residential construction pursuant to HRS 196-6.5.



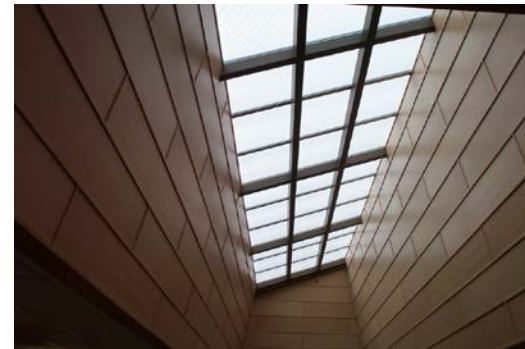
Tropical Zone as Amended (2)

- Glazing must have a maximum SHGC as specified in Table R402.2.1.
- Skylights in dwelling units shall have a maximum U-factor as specified in Table R402.1.2.

Table R402.2.1. Window SHGC Requirements

Projection Factor of overhang from base of average window sill	SHGC
< .30	.25
.30 - .50	.40
≥.50	N/A

Exception: North-facing windows with $pf > .20$ are exempt from the SHGC requirement. Overhangs shall extend 2 feet on each side of window or to nearest wall, whichever is less.



Lighting Equipment

R404.1

- A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps.



Lamp Wattage	Efficacy
> 40 watts	60 lumens/watt
15-40 watts	50 lumens/watt
< 15 watts	40 lumens/watt



Tropical Zone: Roofs

- The roof/ceiling complies with one of the following options:
 1. Comply with one of the roof surface options in Table C402.3 and install R-13 insulation or greater.
 2. Install R-19 insulation or greater.
- Attics above insulation are vented and unvented if below insulation.

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

Exception: The roof/ceiling assembly is permitted to comply with R407.

- Roof surfaces have a minimum slope of $\frac{1}{4}$ inch per foot of run to avoid ponding.



Points Option

R407 NEW!

SECTION R407

POINTS OPTION

- **R407.1 General (Prescriptive).** Above-grade walls and roofs are permitted to comply with the points option as an alternative to complying with Section R401.2.1 and R402.2.
- **R407.2 Requirements.** One or more efficiency measures shall be selected for roof and *above-grade* wall systems from Table R407.1 that cumulatively equal or exceed 0 (zero) points.
- As an alternative, *above-grade walls* and roofs are permitted to comply separately by scoring 0 (zero) or greater.



Table R407 Tropical Zone

Points Option - Wood Framed Walls

Walls		Standard Home Points	Tropical Home Points
Wood Framed			
	R-13 Cavity Wall Insulation	0	1
	R-19 Roof Insulation	-1	0
	R-19 Roof Insulation + Cool roof membrane ¹ or Radiant Barrier ³	0	1
	R-19 Roof Insulation + Attic Venting ²	0	1
	R-30 Roof Insulation	0	1
	R-13 Wall Insulation + high reflectance walls ⁴	1	2
	R-13 Wall insulation + 90% high efficacy lighting and Energy Star Appliances ⁵	1	2
	R-13 Wall Insulation + exterior shading wpf=0.3 ⁶	1	2
	Ductless Air Conditioner ⁷	1	1
	1.071 X Federal Minimum SEER for Air Conditioner	1	1
	1.142 X Federal Minimum SEER for Air Conditioner	2	2
	No air conditioning installed	Not Applicable	2
	House floor area $\leq 1,000$ ft ²	1	1
	House floor area $\geq 2,500$ ft ²	-1	-1
	Energy Star Fans ⁸	1	1
	Install 1 kW or greater of solar electric	1	1



Table R407 Tropical Zone

Points Option - Metal Framed Walls

Walls		Standard Home Points	Tropical Home Points
Metal Framed			
	R-13 +R 3 Wall Insulation	0	1
	R-13 cavity Wall insulation + R-0	-1	0
	R-13 Wall Insulation + high reflectance walls ⁴	0	1
	R-13 wall insulation + 90% high efficacy lighting and Energy Star Appliances ⁵	1	2
	R-13 Wall Insulation + exterior shading wpf=0.3 ⁶	0	1
	R-30 Roof Insulation	0	1
	R-19 Roof Insulation	-1	0
	R-19 + Cool roof membrane ¹ or Radiant Barrier ³	0	1
	R-19 Roof Insulation + Attic Venting ²	<u>0</u>	<u>1</u>
	Ductless Air Conditioner ⁷	<u>1</u>	<u>1</u>
	1.071 X Federal Minimum SEER for Air Conditioner	<u>1</u>	<u>1</u>
	1.142 X Federal Minimum SEER for Air Conditioner	<u>2</u>	<u>2</u>
	No air conditioning installed	Not Applicable	<u>2</u>
	House floor area $\leq 1,000$ ft ²	<u>1</u>	<u>1</u>
	House floor area $\geq 2,500$ ft ²	<u>-1</u>	<u>-1</u>
	Energy Star Fans ⁷	<u>1</u>	<u>1</u>
	Install 1 kW or greater of solar electric	<u>1</u>	<u>1</u>



Table R407

Points Option- Footnotes

- ¹ Cool roof with three-year aged solar reflectance of 0.55 and 3-year aged thermal emittance of 0.75 or 3-year aged solar reflectance index of 64.
- ² One cfm/ft² attic venting.
- ³ 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 in accordance with the manufacturer's installation instructions.
- ⁴ Walls with covering with a reflectance of ≥ 0.64 .
- ⁵ Energy Star rated appliances include refrigerators, dishwashers, and clothes washers and must be installed for the Certificate of Occupancy
- ⁶ The wall projection factor is equal to 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.
- ⁷ All air conditioning systems in the house must be ductless to qualify for this credit.
- ⁸ Install ceiling fans in all bedrooms and the largest space that is not used as a bedroom.



Tropical Zone: Ventilation

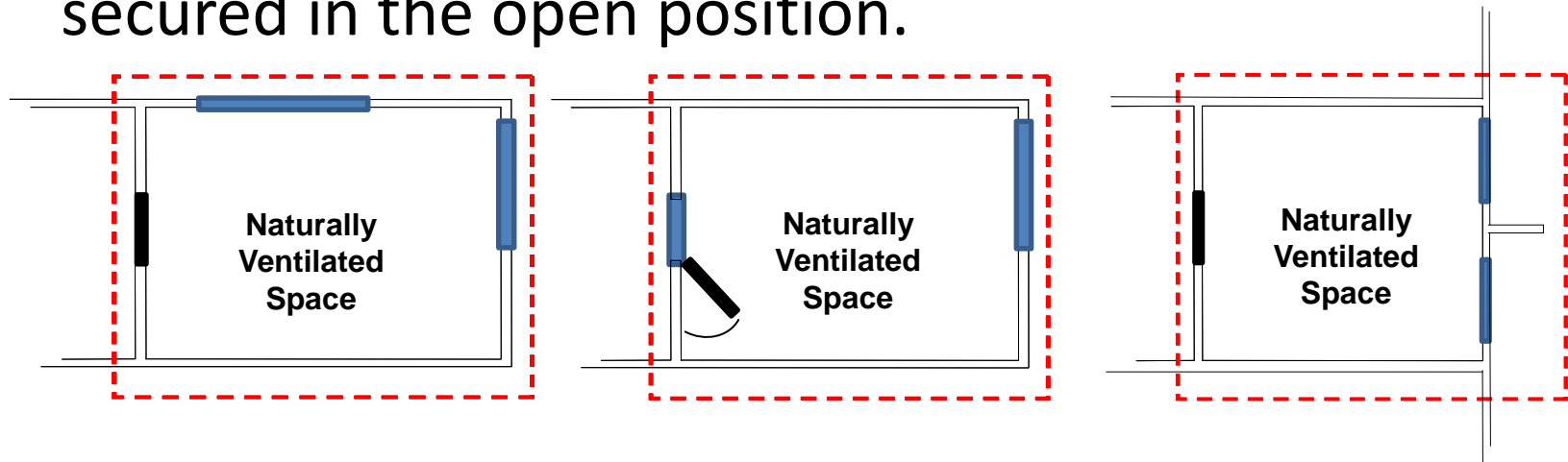


- Ventilation area equal to at least 14% of floor area must be provided by operable fenestration or ventilation fan.
- Jalousie windows shall have an air infiltration rate of no more than 1.2 cfm per square foot (6.1 L/s/m²).



Tropical Zone: Ventilation

- Bedrooms with exterior walls facing two different directions must have operable fenestration or exterior walls facing two different directions.
- Interior doors to bedrooms must be capable of being secured in the open position.



Tropical Zone: Ceiling Fans

- A ceiling fan or ceiling fan rough-in must be provided for bedrooms and the largest space not used as a bedroom.



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Tropical Zone: Air Sealing

- Walls, floors and ceilings separating air conditioned spaces from non-air conditioned spaces shall be constructed to limit air leakage in accordance with the requirements in Table R402.4.1.1.





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