

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

1st PRINTING (November 19, 2014)

CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

C403.3 Economizers (Prescriptive). Each cooling system ~~that has a fan~~ shall include either an air or water economizer complying with Sections C403.3.1 through C403.3.4

Exceptions: Economizers are not required for the systems listed below.

1. In cooling systems for buildings located in Climate Zones 1A and 1B.
2. In climate zones other than 1A and 1B, where individual fan cooling units have a capacity of less than 54,000 Btu/h (15.8 kW) and meet one of the following:
 - 2.1. Have direct expansion cooling coils.
 - 2.2. The total chilled water system capacity less the capacity of fan units with air economizers is less than the minimum specified in Table C403.3(1).

The total supply capacity of all fan-cooling units not provided with economizers shall not exceed 20 percent of the total supply capacity of all fan-cooling units in the building or 300,000 Btu/h (88 kW), whichever is greater.

C405.4.2.2.1 Additional interior lighting power. Where using the Space-by-Space Method, an increase in the interior lighting power allowance is permitted for specific lighting functions. Additional power shall be permitted only where the specified lighting is installed and automatically controlled separately from the general lighting, to be turned off during nonbusiness hours. This additional power shall be used only for the specified luminaires and shall not be used for any other purpose. An increase in the interior lighting power allowance is permitted in the following cases:

2. For spaces in which lighting is specified to be installed in addition to the general lighting for the purpose of decorative appearance or for highlighting art or exhibits, provided that the additional lighting power shall be not more than ~~40.7~~ 1.7 w/ft² (10.7 w/m²) of such spaces.

R406.2 Mandatory requirements. Compliance with this section requires that the ~~mandatory~~ provisions identified in Sections ~~R401-2~~ R401 through R404 labeled as "mandatory" and Section R403.5.3 be met. The building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.2 or 402.1.4 of the 2009 *International Energy Conservation Code*.

Exception: Supply and return ducts not completely inside the building thermal envelope shall be insulated to a minimum of R-6.

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

1st PRINTING (November 10, 2014)

CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

C402.1 General (Prescriptive). Building thermal envelope assemblies for buildings that are intended to comply with the code on a prescriptive basis, in accordance with the compliance path described in Item 2 of Section C401.2, shall comply with the following:

1. The opaque portions of the building thermal envelope shall comply with the specific insulation requirements of Section C402.2 and the thermal requirements of either the *R*-value-based method of Section C402.1.3; the *U*-, *C*- and *F*-factor-based method of Section C402.1.4; or the component performance alternative of Section ~~402.1.5-~~
C402.1.5

C402.1.3 Insulation component R-value-based method. *Building thermal envelope* opaque assemblies shall meet the requirements of Sections C402.2 and C402.4 based on the *climate zone* specified in Chapter 3. For opaque portions of the *building thermal envelope* intended to comply on an insulation component *R*-value basis, the *R*-values for insulation in framing cavities, where required, and for continuous insulation, where required, shall be not less than that specified in Table C402.1.3, based on the *climate zone* specified in Chapter 3. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *R*-values from the “Group R” column of Table C402.1.3. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *R*-values from the “All other” column of Table C402.1.3. The thermal resistance or *R*-value of the insulating material installed continuously within or on the below-grade exterior walls of the building envelope required in accordance with Table C402.1.3 shall extend to a depth of not less than 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor of the conditioned space enclosed by the below grade wall, whichever is less. Opaque swinging doors shall comply with Table C402.1.4 and opaque ~~roll-up or sliding~~ nonswinging doors shall comply with Table C402.1.3.

TABLE C402.1.3
OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD^a

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs																
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal building ^{a,b}	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS
Slab-on-grade floors																
Unheated slabs	NR	NR	NR	NR	NR	NR	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below
Heated slabs ^f	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for 12" below	R-7.5 for 12" below	R-10 for 24" below	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 36" below	R-15 for 36" below	R-15 for 36" below	R-20 for 48" below	R-20 for 24" below	R-20 for 48" below	R-20 for 48" below	R-20 for 48" below

C402.1.4 Assembly U-factor, C-factor or F-factor-based method. Building thermal envelope opaque assemblies intended to comply on an assembly *U*-, *C*- or *F*-factor basis shall have a *U*-, *C*- or *F*-factor not greater than that specified in Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing Group R occupancies shall use the *U*-, *C*- or *F*-factor from the “Group R” column of Table C402.1.4. Commercial buildings or portions of commercial buildings enclosing occupancies other than Group R shall use the *U*-, *C*- or *F*-factor from the “All other” column of Table C402.1.4. The *C*-factor for the below-grade exterior walls of the building envelope, as required in accordance with Table C402.1.4, shall extend to a depth of 10 feet (3048 mm) below the outside finished ground level, or to the level of the lowest floor, whichever is less.

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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 specified in Table ~~C401.3~~ C402.1.3, based on framing type and construction materials used in the wall assembly. The *R*-value of integral insulation installed in concrete masonry units shall not be used in determining compliance with Table C402.1.3.

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 ~~cage/m²~~ 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).

- a. The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for either solar reflectance or thermal emittance shall be assigned both a 3-year-aged solar reflectance in accordance with Section ~~C402.2.1.1.4~~ **C402.3.1** and a 3-year-aged thermal emittance of 0.90.
- b. Aged solar reflectance tested in accordance with ASTM C 1549, ASTM E 903 or ASTM E 1918 or CRRC-1 **Standard**.
- c. Aged thermal emittance tested in accordance with ASTM C 1371 or ASTM E 408 or CRRC-1 **Standard**.

$$R_{aged} = [0.2 + 0.7(R_{initial} - 0.2)] \quad \text{(Equation 4-3)}$$

R_{aged} = The aged solar reflectance.

$R_{initial}$ = The initial solar reflectance determined in accordance with CRRC-1 [Standard](#).

BUILDING ENVELOPE PERFORMANCE INFORMATION REPORT AND CHECK REQUIREMENTS																	
CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		<u>8</u>		
Vertical fenestration																	
<i>U-factor</i>																	
Fixed fenestration	0.50		0.50		0.46		0.38		0.38		0.36		0.29		<u>0.29</u>		
Operable fenestration	0.65		0.65		0.60		0.45		0.45		0.43		0.37		<u>0.37</u>		
Entrance doors	1.10		0.83		0.77		0.77		0.77		0.77		0.77		<u>0.77</u>		
SHGC																	
Orientation ^a	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	SEW	N	<u>SEW</u>	<u>N</u>	

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
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	<u>0.45</u>	<u>NR</u>
0.2 ≤ 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	<u>NR</u>	<u>NR</u>
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	<u>NR</u>	<u>NR</u>
Skylights																
U-factor	0.75		0.65		0.55		0.50		0.50		0.50		0.50		<u>0.50</u>	
SHGC	0.35		0.35		0.35		0.40		0.40		0.40		NR		<u>NR</u>	

NR = No requirement, PF = Projection factor.

- a. "N" indicates vertical fenestration oriented within 45 degrees of true north. "SEW" indicates orientations other than "N." For buildings in the southern hemisphere, reverse south and north. Buildings located at less than 23.5 degrees latitude shall use SEW for all orientations.

C402.4.3.3 Dynamic glazing. Where *dynamic glazing* is intended to satisfy the SHGC and VT requirements of Table C402.4, the ratio of the higher to lower labeled SHGC shall be greater than or equal to 2.4, and the *dynamic glazing* shall be automatically controlled to modulate the amount of solar gain into the space in multiple steps. Dynamic glazing shall be considered separately from other fenestration, and area-weighted averaging with other fenestration that is not dynamic glazing shall not be permitted.

Exception: Dynamic glazing is not required to comply with this section where both the lower and higher labeled SHGC already comply with the requirements of Table C402.3-C402.4.

C402.5.1.1 Air barrier construction. The *continuous air barrier* shall be constructed to comply with the following:

- Recessed lighting fixtures shall comply with Section C402.5.7 C402.5.8. Where similar objects are installed that penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

C402.5.4 Doors and access openings to shafts, chutes, stairways and elevator lobbies. Doors and access openings from conditioned space to shafts, chutes stairways and elevator lobbies not within the scope of the fenestration assemblies covered by Section C402.5.2 shall be gasketed, weatherstripped or sealed.

Exceptions:

- Door openings required to comply with Section 716 or 716.4 of the *International Building Code*.
- Doors and door openings required by to comply with UL 1784 by the *International Building Code*.

TABLE C403.2.3(3)
MINIMUM EFFICIENCY REQUIREMENTS:
ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS,
PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS,
SINGLE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS AND ROOM AIR-CONDITIONER HEAT PUMPS

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE ^a
Room air conditioners, with louvered sides	< 6,000 Btu/h	—	9.7 SEER	ANSI/ AHAM RAC-1
	≥ 6,000 Btu/h and < 8,000 Btu/h	—	9.7 EER	
	≥ 8,000 Btu/h and < 14,000 Btu/h	—	9.8 EER	
	≥ 14,000 Btu/h and < 20,000 Btu/h	—	9.7 SEER	
	≥ 20,000 Btu/h	—	8.5 EER	

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE ^a
Room air conditioners, with <u>without</u> louvered sides	< 8,000 Btu/h	—	9.0 EER	
	≥ 8,000 Btu/h and < 20,000 Btu/h	—	8.5 EER	
	≥ 20,000 Btu/h	—	8.5 EER	
Room air-conditioner heat pumps with louvered sides	< 20,000 Btu/h	—	9.0 EER	
	≥ 20,000 Btu/h	—	8.5 EER	
Room air-conditioner heat pumps without louvered sides	< 14,000 Btu/h	—	8.5 EER	
	≥ 14,000 Btu/h	—	8.0 EER	

This whole table is new – and the margin mark only covers part of it. That would make this a no-list. HOWEVER – I am adding the < (less than) symbol as shown. The original submittal from Ferguson/ASHRAE didn't have the symbols – but the ASHRAE 90.1 table he was copying does. Without the symbols, the table makes no sense.

TABLE C403.2.3(9)
MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS

EQUIPMENT TYPE	NET SENSIBLE COOLING CAPACITY ^a	MINIMUM SCOP-127 ^b EFFICIENCY DOWNFLOW UNITS / UPFLOW UNITS	TEST PROCEDURE
Air conditioners, air cooled	< 65,000 Btu/h	2.20 / 2.09	ANSI/ASHRAE 127
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥ 240,000 Btu/h	1.90 / 1.79	
Air conditioners, water cooled	< 65,000 Btu/h	2.60 / 2.49	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.50 / 2.39	
	≥ 240,000 Btu/h	2.40 / 2.29	
Air conditioners, water cooled with fluid economizer	< 65,000 Btu/h	2.55 / 2.44	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.45 / 2.34	
	≥ 240,000 Btu/h	2.35 / 2.24	
Air conditioners, glycol cooled (rated at 40% propylene glycol)	< 65,000 Btu/h	2.50 / 2.39	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.15 / 2.04	
	≥ 240,000 Btu/h	2.10 / 1.99	
Air conditioners, glycol cooled (rated at 40% propylene glycol) with fluid economizer	< 65,000 Btu/h	2.45 / 2.34	
	≥ 65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥ 240,000 Btu/h	2.05 / 1.94	

For SI: 1 British thermal unit per hour = 0.2931 W.

a. Net sensible cooling capacity: the total gross cooling capacity less the latent cooling less the energy to the air movement system. (Total Gross – latent – Fan Power).

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

- b. Sensible coefficient of performance (SCOP-127): a ratio calculated by dividing the net sensible cooling capacity in watts by the total power input in watts (excluding reheaters and humidifiers) at conditions defined in ASHRAE Standard 127. The net sensible cooling capacity is the gross sensible capacity minus the energy dissipated into the cooled space by the fan system.

C403.2.9.1.3 High-pressure duct systems. Ducts and plenums designed to operate at static pressures greater than 3 inches water gauge (747 Pa) shall be insulated and sealed in accordance with Section ~~C403.2.8~~. C403.2.9. In addition, ducts and plenums shall be leak tested in accordance with the SMACNA HVAC Air Duct Leakage Test Manual and shown to have a rate of air leakage (CL) less than or equal to 4.0 as determined in accordance with Equation 4-8.

$$CL = F/P^{0.65} \quad \text{(Equation 4-8)}$$

where:

- F = The measured leakage rate in cfm per 100 square feet of duct surface.
H = The static pressure of the test.

Documentation shall be furnished by the designer demonstrating that representative sections totaling at least 25 percent of the duct area have been tested and that all tested sections comply with the requirements of this section.

TABLE ~~C403.2.1~~ C403.2.10
MINIMUM PIPE INSULATION THICKNESS (in inches)^{a, c}

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (inches)				
	Conductivity Btu · in./(h · ft ² · °F) ^b	Mean Rating Temperature, °F	< 1	1 to < 1 ½	1 ½ to < 4	4 to < 8	≤ 8 ≥ 8

C403.2.12.1 Allowable fan ~~floor~~ motor horsepower. Each HVAC system at fan system design conditions shall not exceed the allowable *fan system motor nameplate hp* (Option 1) or *fan system bhp* (Option 2) as shown in Table C403.2.12.1(1). This includes supply fans, exhaust fans, return/relief fans, and fan-powered terminal units associated with systems providing heating or cooling capability. Single-zone variable air volume systems shall comply with the constant volume fan power limitation.

TABLE C403.3.1
DX COOLING ~~STATE~~STAGE REQUIREMENTS FOR MODULATING AIRFLOW UNITS

C403.4.1.3 Set points for direct digital control. For systems with direct digital control of individual zones reporting to the central control panel, the static pressure set point shall be reset based on the *zone* requiring the most pressure. In such case, the set point is reset lower until one zone damper is nearly wide open. The direct digital controls shall be capable of monitoring *zone* damper positions or shall have an alternative method of indicating the need for static pressure that is capable of all of the following:

1. Automatically detecting any zone that excessively drives the reset logic.
2. Generating an alarm to the system operational location.
3. Allowing an operator to readily remove one or more zones from the reset algorithm.

TABLE C407.5.1(3)
SPECIFICATIONS FOR THE STANDARD REFERENCE DESIGN HVAC SYSTEM DESCRIPTIONS

- a. **VAV with parallel boxes:** Fans in parallel VAV fan-powered boxes shall be sized for 50 percent of the peak design flow rate and shall be modeled with 0.35 W/cfm fan power. Minimum volume setpoints for fan-powered boxes shall be equal to the minimum rate for the space required for ventilation consistent with Section ~~C403.4.5~~, C403.4.4 Exception 4.—Supply air temperature setpoint shall be constant at the design condition.
- e. **Chilled water:** For systems using purchased chilled water, the chillers are not explicitly modeled and chilled water costs shall be based as determined in Sections C407.3 and C407.5.2. Otherwise, the standard reference design's chiller plant shall be modeled with chillers having the number as indicated in Table C407.5.1(4) as a function of standard reference building chiller plant load and type as indicated in Table C407.5.1(5) as a function of individual chiller load. Where chiller fuel source is mixed, the system in the standard reference design shall have chillers with the same fuel types and with capacities having the same proportional capacity as the proposed design's chillers for each fuel type. Chilled water supply temperature shall be modeled at 44°F design supply temperature and 56°F return temperature. Piping losses shall not be modeled in either building model. Chilled water supply water temperature shall be reset in accordance with Section C403.4.3.3. Pump system power for each pumping system shall be the same as the proposed design; where the proposed design has no chilled water pumps, the standard reference design pump power shall be 22 W/gpm (equal to

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

a pump operating against a 75-foot head, 65-percent combined impeller and motor efficiency). The chilled water system shall be modeled as primary-only variable flow with flow maintained at the design rate through each chiller using a bypass. Chilled water pumps shall be modeled as riding the pump curve or with variable-speed drives when required in Section C403.4.3.3. The heat rejection device shall be an axial fan cooling tower with two-speed fans where required in Section ~~C403.4.4~~, ~~C403.4.3~~. Condenser water design supply temperature shall be 85°F or 10°F approach to design wet-bulb temperature, whichever is lower, with a design temperature rise of 10°F. The tower shall be controlled to maintain a 70°F leaving water temperature where weather permits, floating up to leaving water temperature at design conditions. Pump system power for each pumping system shall be the same as the proposed design; where the proposed design has no condenser water pumps, the standard reference design pump power shall be 19 W/gpm (equal to a pump operating against a 60-foot head, 60-percent combined impeller and motor efficiency). Each chiller shall be modeled with separate condenser water and chilled water pumps interlocked to operate with the associated chiller.

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

CHAPTER 4 [RE] RESIDENTIAL ENERGY EFFICIENCY

R401.2.1 Tropical zone. *Residential buildings* in the tropical zone at elevations below 2,400 feet (731.5 m) above sea level shall be deemed to comply with this chapter where the following conditions are met:

- Bedrooms with exterior walls facing two different directions have operable fenestration ~~or exterior walls facing two directions.~~

R403.10 Pools and permanent spa energy consumption (Mandatory). The energy consumption of pools and permanent spas shall be in accordance with Sections R403.10.1 through ~~R403.10.4.~~ R403.10.3.

~~**R403.10.1 Residential pools and permanent residential spas.** Swimming pools and permanent spas that are accessory to detached one- and two-family dwellings and townhouses three stories or less in height above grade plane and that are available only to the household and its guests shall be in accordance with APSP-145.~~

R403.10.2 R403.10.1 Heaters. The electric power to heaters shall be controlled by a readily *accessible* on-off switch that is an integral part of the heater mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

~~**R403.10.3 R403.10.2 Time switches.**~~ Time switches or other control methods that can automatically turn off and on according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

- Where public health standards require 24-hour pump operation.
- Pumps that operate solar- and waste-heat-recovery pool heating systems.

~~**R403.10.4 R403.10.3 Covers.**~~ Outdoor heated pools and outdoor permanent spas shall be provided with a vapor-retardant cover or other *approved* vapor-retardant means.

Exception: Where more than 70 percent of the energy for heating, computed over an operation season, is from site-recovered energy, such as from a heat pump or solar energy source, covers or other vapor-retardant means shall not be required.

TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE DESIGN AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass wall if proposed wall is mass; otherwise wood frame.	As proposed
	Gross area: same as proposed	As proposed
	U-factor: as specified in Table R402.1.4	As proposed
	Solar absorptance = 0.75	As proposed
	Remittance <u>Emittance</u> = 0.90	As proposed

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

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CHAPTER 4[CE] COMMERCIAL ENERGY EFFICIENCY

TABLE C402.3
MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS^a

- a. The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for either solar reflectance or thermal emittance shall be assigned both a 3-year-aged solar reflectance in accordance with Section C402.2.1.1.1 and a 3-year-aged thermal emittance of 0.90.
- b. Aged solar reflectance tested in accordance with ASTM C 1549, ASTM E 903 or ASTM E 1918 or CRRC-1 [Standard](#).
- c. Aged thermal emittance tested in accordance with ASTM C 1371 or ASTM E 408 or CRRC-1 [Standard](#).
- d. Solar reflectance index (SRI) shall be determined in accordance with ASTM E 1980 using a convection coefficient of $2.1 \text{ Btu/h} \cdot \text{ft}^2 \cdot ^\circ\text{F}$ ($12 \text{ W/m}^2 \cdot \text{K}$).
Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance.

C402.3.1 Aged roof solar reflectance. Where an aged solar reflectance required by Section C402.3 is not available, it shall be determined in accordance with Equation 4-3.

$$R_{\text{aged}} = [0.2 + 0.7(R_{\text{initial}} - 0.2)] \text{ (Equation 4-3)}$$

where:

R_{aged} = The aged solar reflectance.

R_{initial} = The initial solar reflectance determined in accordance with CRRC-1 [Standard](#).

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

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CHAPTER 4[CE] COMMERCIAL ENERGY EFFICIENCY

C402.5.1.1 Air barrier construction. The *continuous air barrier* shall be constructed to comply with the following:

4. Recessed lighting fixtures shall comply with Section ~~C402.5.7~~ C402.5.8. Where similar objects are installed that penetrate the air barrier, provisions shall be made to maintain the integrity of the air barrier.

TABLE C403.2.8^e
MINIMUM PIPE INSULATION THICKNESS (thickness in inches)^{a, c}

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (inches)				
	Conductivity Btu · in./ (h · ft ² · °F) ^b	Mean Rating Temperature, °F	< 1	1 to < 1½	1½ to < 4	4 to < 8	<u>d. 8</u> <input type="checkbox"/>

C406.5 On-site renewable energy. Total minimum ratings of on-site renewable energy systems shall comply with one of the following:

1. Provide not less than 0.50 watts per square foot (5.4 W/m²) of conditioned floor area.

2015 International Energy Conservation Code Errata

(Portions of text and tables not shown are unaffected by the errata)

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CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

TABLE C403.2.3 (9)
MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS

Equipment Type	Net Sensible Cooling Capacity ^a	Minimum SCOP-127 ^b Efficiency Downflow units / Upflow units	Test Procedure
Air conditioners, air cooled	65,000 Btu/h	2.20 / 2.09	ANSI/ASHRAE 127
	≥65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥240,000 Btu/h	1.90 / 1.79	
Air conditioners, water cooled	65,000 Btu/h	2.60 / 2.49	
	≥65,000 Btu/h and < 240,000 Btu/h	2.50 / 2.39	
	≥240,000 Btu/h	2.40 / 2.29	
Air conditioners, water cooled with fluid economizer	65,000 Btu/h	2.55 / 2.44	
	≥65,000 Btu/h and < 240,000 Btu/h	2.45 / 2.34	
	≥240,000 Btu/h	2.35 / 2.24	
Air conditioners, glycol cooled (rated at 40% propylene glycol)	65,000 Btu/h	2.50 / 2.39	
	≥65,000 Btu/h and < 240,000 Btu/h	2.15 / 2.04	
	≥240,000 Btu/h	2.10 / 1.99	
Air conditioners, glycol cooled (rated at 40% propylene glycol) with fluid economizer	65,000 Btu/h	2.45 / 2.34	
	≥65,000 Btu/h and < 240,000 Btu/h	2.10 / 1.99	
	≥240,000 Btu/h	2.05 / 1.94	

For SI: 1 British thermal unit per hour = 0.2931 W.

a. Net sensible cooling capacity: The total gross cooling capacity less the latent cooling less the energy to the air movement system. (Total Gross – latent – Fan Power)

b. Sensible coefficient of performance (SCOP-127): a ratio calculated by dividing the net sensible cooling capacity in watts by the total power input in watts (excluding re-heaters and humidifiers) at conditions defined in ASHRAE Standard 127. The net sensible cooling capacity is the gross sensible capacity minus the energy dissipated into the cooled space by the fan system.