Major Changes to the 2012 IECC Commercial Requirements

Eric Makela, Britt/Makela Group

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Commercial Compliance Options

2012 IECC OR **2012 IECC** OR **90.1-2010**

C402 - Envelope
C403 - Mechanical
C404 - SWH
C405 – Lighting

AND

Pick One:

C406.2 – Eff. HVAC Performance
C406.3 – Eff. Lighting Systems
C406.4 – On-site Renewable Energy

C407 – Total Building Performance
C402.4 – Air Leakage
C403.2 – Provisions applicable to all mechanical systems
C404 - SWH
Lighting Mandatory Sections
C405.2
C405.3
C405.4
C405.6
C405.7
Building energy cost to be ≤ 85% of standard reference design building

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Chapter 4 Prescriptive Approach Compliance

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2012 IECC Commercial Envelope Major Changes

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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 Deck	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal Buildings (with R-5 thermal blocks)	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
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49	R-49
Walls, Above Grade																
Mass	R-5.7ci	R-5.7ci	R-5.7ci	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal Building	R-13+ R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-19.5ci	R-13 + R-13ci	R-13 + R-19.5ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13 + R-17.5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-15.6ci or R-20 + R-10ci	R-13 + R-15.6ci or R-20 + R-10ci
Below Grade Walls																
Below-grade wall	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-7.5ci	R-10ci	R-10ci	R-10ci	R-12.5ci
Floors																
Mass	NR	NR	R-6.3ci	R-8.3ci	R-10ci	R-10ci	R-10ci	R-10.4ci	R-10ci	R-12.5ci	R-12.5ci	R-12.5ci	R-15ci	R-16.7ci	R-15ci	R-16.7ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30
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	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
Opaque Doors																
Swinging	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.61	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37
Roll-up or sliding	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75	R-4.75

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 Deck	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal Buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, Above Grade																
Mass	U-0.142	U-0.142	U-0.142	U-0.123	U-0.110	U-0.104	U-0.104	U-0.090	U-0.078	U-0.078	U-0.078	U-0.071	U-0.061	U-0.061	U-0.061	U-0.061
Metal Building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.039	U-0.052	U-0.039
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.057	U-0.064	U-0.052	U-0.045	U-0.045
Wood framed and other	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036	U-0.036
Below Grade Walls																
Below-grade wall	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-1.140	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.119	C-0.092	C-0.092	C-0.092	C-0.092
Floors																
Mass	U-0.322	U-0.322	U-0.107	U-0.087	U-0.076	U-0.076	U-0.076	U-0.074	U-0.074	U-0.064	U-0.064	U-0.057	U-0.055	U-0.051	U-0.055	U-0.051
Joist/framing	U-0.066	U-0.322	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033	U-0.033
Slab on Grade Floors																
Unheated slabs	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.73	F-0.54	F-0.54	F-0.54	F-0.54	F-0.54	F-0.52	F-0.40	F-0.40	F-0.40	F-0.40
Heated slabs	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.70	F-0.65	F-0.65	F-0.58	F-0.58	F-0.58	F-0.58	F-0.55	F-0.55	F-0.55	F-0.55

Roof R-Value (C402.2.1)

U-Factor (C402.1.2)

Roof R-values and U-factor requirements are based on assembly type / insulation placement

- ✓ Insulation entirely above deck
- ✓ Metal buildings
- ✓ Attic and other

Skylight curbs to be insulated to the level of roofs with insulation entirely above deck or R-5, whichever is less

- ✓ **Exception**: unit skylight curbs included as a component of an NFRC 100 rated assembly

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Building Envelope

- Cool Roofs
- Required in CZ 1-3 for roofs ≤ 2:12
- Roofs can qualify using one of four minimum roof reflectance and emittance options
- Several exceptions

Three-year aged solar reflectance[b] of 0.55 and three-year aged thermal emittance[c] of 0.75
Initial solar reflectance[b] of 0.70 and initial thermal emittance[c] of 0.75
Three-year-aged solar reflectance index[d] of 64
Initial solar reflectance index[d] of 82

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High Albedo Roofs – Exceptions

C402.2.1.1 (cont'd)

- Portions of roofs that include or are covered by:
  - PV systems or components
  - Solar air or water heating systems or components
  - Roof gardens or landscaped roofs
  - Above-roof decks or walkways
  - Skylights
  - HVAC systems, components, and other opaque objects mounted above the roof
- Portions of roofs shaded during peak sun angle on June 21 by permanent features of the building or adjacent buildings
- Ballasted roofs with minimum stone ballast of 17 lbs/ft2 or 23 lbs/ft2 pavers
- Roofs, where a minimum of 75% of the roof area meets one of the above exceptions

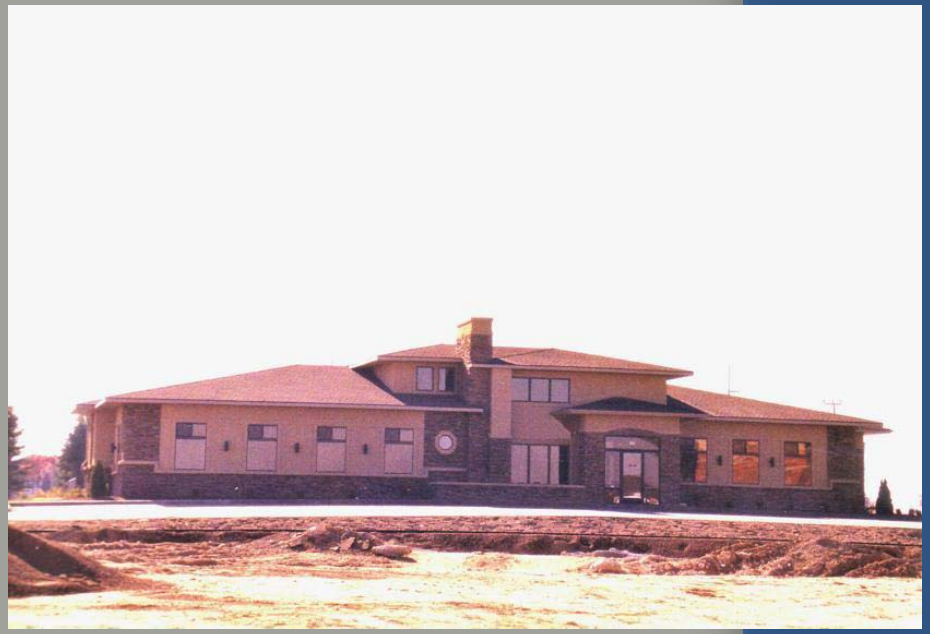
Compliance
Chapter 5 Prescriptive Approach

Table C402.3 BUILDING ENVELOPE REQUIREMENTS: FENESTRATION								
CLIMATE ZONE	1	2	3	4	5	6	7	8
Vertical fenestration								
***U*-factor**								
Fixed fenestration	0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29
Operable fenestration	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37
Entrance doors	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77
SHGC								
SHGC	0.25	0.25	0.25	0.40	0.40	0.40	0.45	0.45
Skylights								
U-factor	0.75	0.65	0.55	0.50	0.50	0.50	0.50	0.50
SHGC	0.35	0.35	0.35	0.40	0.40	0.40	NR	NR

Vertical Fenestration Requirement

C402.3.1 – Prescriptive (Max area)

- Percentage of Vertical Fenestration Area to Gross Wall Area
  - Allowed up to 30% maximum of above grade wall
    - In Climate Zones 1-6, up to 40% maximum of above grade wall with daylighting controls



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Increased Vertical Fenestration with Daylighting Controls *C402.3.1.1*

Up to 40% vertical fenestration area allowed in Climate zones 1-6, provided

- No less than 50% of the conditioned floor area is within a daylight zone
- Automatic daylighting controls are installed in daylight zones; and
- VT of vertical fenestration is ≥ 1.1 times SHGC

Exception:

Fenestration that is outside the scope of NFRC 200 isn't required to comply with VT

Increased Vertical Fenestration SHGC

C402.3.3.2

- ✓ In Climate Zones 1-3, vertical fenestration entirely located not less than 6 ft above the finished floor is permitted a maximum SHGC of 0.40

Skylight Minimum Fenestration Area

C402.3.1 Prescriptive

- ✓ Limited to ≤ 3% of Roof Area
- ✓ Up to 5% allowed if automatic daylighting controls installed in daylight zones under skylights

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Increased Skylight U-Factor

C402.3.3.4

- ✓ Skylights above daylight zones with automated daylight controls are permitted a maximum U-factor of
  - –0.9 in Climate Zones 1-3
  - –0.75 in Climate Zones 4-8

Increased Skylight SHGC

C402.3.3.3

- ✓ In Climate Zones 1-6, skylights above daylight zones with automated daylight controls are permitted a maximum SHGC of 0.60

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Minimum Skylight Fenestration Area

C402.3.2

- In certain types of enclosed spaces > 10,000 ft_2 directly under a roof with ceiling heights > 15 ft
  - total daylight zone under skylights to not be < ½ the floor area and to provide a minimum skylight area to daylight zone of either
    - Minimum of 3% of roof area with a skylight VLT at least 0.40 **OR**
    - Provide a minimum skylight effective aperture of at least 1%

Exceptions

- Climate zones 6-8
- Spaces with LPDs < 0.5 W/ft_2
- Documented shaded spaces
- Daylight area under rooftop monitors is > 50% of floor area

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SHGC Adjustment

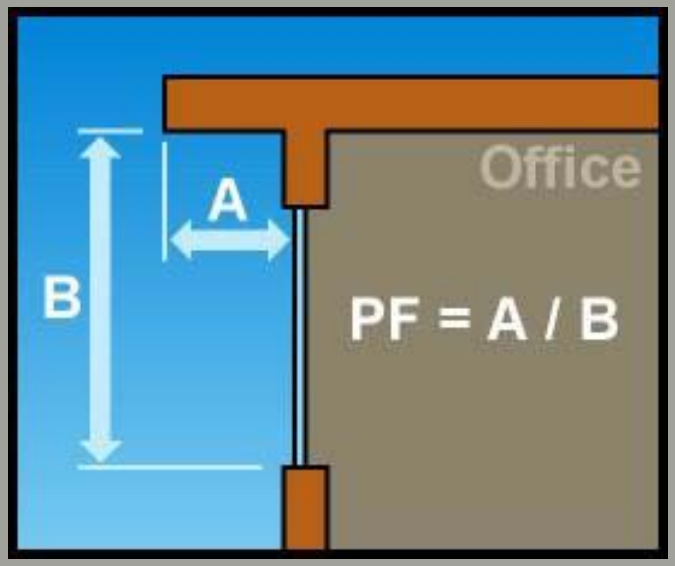
C402.3.3.1

When PF ≥ 0.2, the required maximum SHGC in Table C402.3 must be adjusted by multiplying the required maximum SHGC by the multiplier in Table C402.3.3.1

Table C402.3.3.1 SHGC ADJUSTMENT MULTIPLIERS		
PROJECTION FACTOR	ORIENTED WITHIN 45 DEGREES OF TRUE NORTH	ALL OTHER ORIENTATION
0.2 ≤ PF < 0.5	1.1	1.2
PF ≤ 0.5	1.2	1.6

Fenestration SHGC Requirements

The Effect of Overhangs on Fenestration SHGC



- ✓Overhangs allow a higher SHGC product to be installed
- ✓Projection factor must be calculated
- ✓When different windows or glass doors have different PFs
  - ✓Evaluate separately

Mandatory Requirements

- ✓ Air barriers
- ✓ Fenestration air leakage
- ✓ Air intakes, exhaust openings, stairways and shafts
- ✓ Loading dock weatherseals
- ✓ Vestibules
- ✓ Recessed lighting

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Air Barriers and Construction

C402.4.1 and C402.4.1.1

Continuous air barrier required except in:

- Climate zones 1-3

Air barrier requirements:

- Placement allowed
  - Inside of building envelope
  - Outside of building envelope
  - Located within assemblies composing envelope OR
  - Any combination thereof
- Continuous for all assemblies part of the thermal envelope and across joints and assemblies
- Joints and seams to be sealed per C402.4.2
- Recessed lighting to comply with C404.2.8.
- Where similar objects are installed that penetrate the air barrier, make provisions to maintain the air barrier's integrity

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Air Barrier Compliance Options

C402.4.1.2

Three ways to comply with air barrier requirements

- ✓ Materials
- ✓ Assemblies
- ✓ Building

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Air Barrier Materials (Compliance)

C402.4.1.2.1

Materials with air permeance ≤ 0.004 cfm/ft_2 under pressure differential of 0.3 in. w.g. tested in accordance with ASTM E 2178

These materials meet this requirement:

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Materials	Thickness (Minimum)
Plywood	3/8 in.
Oriented strand board .	3/8 in
Extruded polystyrene insulation board	½ in.
Foil-faced urethane insulation board.	½ in
Closed cell spray foam minimum density of 1.5 pcf	1-1/2 in
Open cell spray foam density between 0.4 and 1.5 pcf	4.5 in.
Exterior gypsum sheathing or interior gypsum board	½ in
Cement board	½ in.
Built up roofing membrane	
Modified bituminous roof membrane	
Fully adhered single-ply roof membrane	
A Portland cement/sand parge, stucco, or gypsum plaster	5/8 in.
Cast-in-place and precast concrete	
Sheet metal or aluminum	

Air Barrier Assemblies (Compliance)

C402.4.1.2.2

OR

Assemblies of materials and components (sealants, tapes, etc.) with average air leakage ≤ 0.04 cfm/ft$_2$ under pressure differential of 0.3 in. w.g. tested in accordance with ASTM E 2357, 1677 or 283

These assemblies meet this requirement:

- Concrete masonry walls coated with one application either of block filler and two applications of a paint or sealer coating OR
- Portland cement/sand parge, stucco or plaster minimum ½ thick

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Air Barrier Building Test (Compliance)

C402.4.1.2.3

OR

Air leakage rate of completed building tested and confirmed to not exceed 0.40 cfm/ft^2 at a pressure differential of 0.3 inches water gauge per ASTM E779 or equivalent method approved by code official

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Air Leakage of Fenestration

C402.4.3

Fenestration Assembly	cfm/ft2	Test Procedure
Windows, sliding glass doors, and swinging doors	**0.20**	AAMA/WDMA/CSA 101/I.S.2/A440 or NFRC 400
Skylights - with condensation weepage openings	0.30	
Skylights – all other	0.20	
Curtain walls and storefront glazing	0.06	NFRC 400 or ASTM E283 at 1.57 psf
Commercial glazed swinging entrance doors	1.00	
Revolving doors	1.00	
Garage doors	0.4	ANSI/DASMA 105, NFRC 400, or ASTM E283 at 1.57 psf
Rolling doors	1.00	

- ✓ **Exceptions**
  - Field-fabricated fenestration assemblies
  - Fenestration in buildings that meet the building test for air barrier compliance option

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2012 IECC Commercial Mechanical Major Changes

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HVAC Load Calculations

C403.2.1 Mandatory

Heating and cooling load sizing calculations required

- ✓ ASHRAE/ACCA Standard 183
- ✓ Other approved computation procedures – using design parameters specified in Chapter 3
  - Exterior design conditions
    - Specified by ASHRAE
  - Interior design conditions
    - Specified by Section 302 of the IECC
  - ≤ 72°F for heating load
  - ≥ 75°F for cooling load

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HVAC Performance

C403.2.3 Mandatory Minimum Efficiency Requirements

Water-cooled centrifugal chilling packages

- ✓ Adjustment calculation for systems not operating at AHRI Standard 550/590 test conditions
  - ✓ 44 degree F leaving chilled water temperature
  - ✓ 85 degree F entering water temperature
  - ✓ 3 gpm/ton condenser water flow

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Table 503.2.3(2) Mandatory

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY	TEST PROCEDURE
Air cooled, (Cooling mode)	< 65,000 Btu/h	Split system	13.0 SEER	AHRI 210/240
		Single package	13.0 SEER	
	≥ 65,000 Btu/h and < 135,000 Btu/h	Split system and single package	10.1 EER (before Jan. 1, 2010) 11.0 EER (as of Jan. 1, 2010)	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Split system and single package	9.3 EER (before Jan. 1, 2010) 10.6 EER (as of Jan. 1, 2010)	AHRI 340/360
	≥ 240,000 Btu/h	Split system and single package	9.0 EER 9.2 IPLV (before Jan. 1, 2010) 9.5 EER 9.2 IPLV (as of Jan. 1, 2010)	

Automatic Start Capabilities

C403.2.4.3.3

Automatic start controls for each HVAC system

- ✓ Capable of automatically adjusting daily start time to bring each space to desired occupied temperature immediately prior to scheduled occupancy

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Demand Controlled Ventilation

C403.2.5.1 Mandatory

DCV must be provided for each zone with spaces > 500 ft² and the average occupant load > 25 people/1000 ft² of floor area where the HVAC system has:

- ✓An air-side economizer,
- ✓Automatic modulating control of the outdoor air damper, or
- ✓A design outdoor airflow > 3,000 cfm

Demand control ventilation (DCV): a ventilation system capability that provides for the automatic reduction of outdoor air intake below design rates when the actual occupancy of spaces served by the system is less than design occupancy.

Energy Recovery Ventilation Systems

C403.2.6 Mandatory

- ✓ Applies to fan systems with supply airflow rates > values in Table C403.2.6
- ✓ Exhaust air recovery efficiency must be ≥ 50%
- ✓ When an air economizer is required
  - –include a bypass or controls that permit operation of economizer per C403.4

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Energy Recovery Ventilation Systems

C403.2.6 Mandatory

Exceptions:

- ✓ Where energy recovery ventilation systems prohibited by the IMC
- ✓ Lab fume hood system with at least one of the following:
  - ✓ –VAV hood exhaust and room supply systems capable of reducing exhaust and makeup air volume to ≤ 50% of design values
  - ✓ –Direct makeup (auxiliary) air supply equal to at least 75% of exhaust rate, heated no warmer than 2ºF below room setpoint, cooled to no cooler than 3ºF above room setpoint, no humidification added, and no simultaneous heating and cooling use for dehumidification control
- ✓ Systems serving uncooled spaces and heated to < 60ºF
- ✓ Where > 60% of outdoor heating energy is from site-recovered or site solar energy

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Energy Recovery Ventilation Systems

C403.2.6 Mandatory (Continued)

Exceptions:

- ✓ Heating energy recovery in Climate Zones 1-2
- ✓ Cooling energy recovery in Climate Zones 3C, 4C, 5B, 5C, 6B, 7, and 8
- ✓ Systems requiring dehumidification that employ energy recovery in series with the cooling coil
- ✓ Where largest source of air exhausted at a single location at building exterior is < 75% of design outside air flow rate
- ✓ Systems operating at < 20 hours per week

Energy Recovery Ventilation Systems

C403.2.6 Mandatory

TABLE C403.2.6
ENERGY RECOVERY REQUIREMENT

CLIMATE ZONE	PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE					
	≥ 30% and <40%	≥ 40% and <50%	≥ 50% and 60%	≥ 60% and < 70%	≥ 70% and 80%	≥ 80%
	DESIGN SUPPLY FAN AIRFLOW RATE (cfm)					
3B, 3C, 4B, 4C, 5B	NR	NR	NR	NR	≥ 5000	≥ 5000
1B, 2B, 5C	NR	NR	≥ 26000	≥ 12000	≥ 5000	≥ 4000
6B	≥ 11000	≥ 5500	≥ 4500	≥ 3500	≥ 2500	≥ 1500
1A, 2A, 3A, 4A, 5A, 6A	≥ 5500	≥ 4500	≥ 3500	≥ 2000	≥ 1000	➢ 0
7, 8	≥ 2500	≥ 1000	> 0	> 0	> 0	> 0

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Air System Design and Control
(503.2.10)

- HVAC systems with total fan system power
  > 5 hp to meet 503.2.10.1 and 503.2.10.2
  - Allowable Fan Floor Horsepower
  - Motor Nameplate Horsepower

Allowable Fan Floor Horsepower

- Each HVAC system at fan design conditions to not exceed allowable fan system motor nameplate hp (Option 1) or fan system bhp (Options 2) in Table 503.2.10.1(1)
- Exceptions
  - Hospital and laboratory systems using flow control devices on exhaust and/or return for health and safety or environmental control permitted to use variable fan power limitation
  - Individual exhaust fans ≤ 1 hp
  - Fans exhausting air from fume hoods

Piping Insulation

C403.2.8 Mandatory

All piping serving heating or cooling system must be insulated in accordance with Table C403.2.8

Minimum Pipe Insulation

(thickness in inches)

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (inches)				
	Conductivity Btu · in./(h · ft² · °F)[b]	Mean Rating Temperature, °F	< 1	1 to < 1 1/2	1 1/2 to < 4	4 to < 8	≥ 8
> 350	0.32 – 0.34	250	4.5	5.0	5.0	5.0	5.0
251 – 350	0.29 – 0.32	200	3.0	4.0	4.5	4.5	4.5
201 – 250	0.27 – 0.30	150	2.5	2.5	2.5	3.0	3.0

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Piping Insulation

C403.2.8

Exceptions:

- ✓ Piping internal to HVAC equipment *(including fan coil units)* factory installed and tested
- ✓ Piping for fluid in temperature range

  60 F < temp < 105 F
- ✓ Piping for fluid not heated or cooled by electricity or fossil fuels
- ✓ Strainers, control valves, and balancing valves associated with piping ≤ 1” in diameter
- ✓ Direct buried piping for fluids ≤ 60 F

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Mechanical Systems Commissioning and Completion *C403.2.9* Mandatory

- HVAC Commissioning
- Applies to buildings with a total building equipment capacity ≥:
  - 480,000 Btu/h cooling capacity, or
  - 600,000 Btu/h heating capacity
- Requires:
  - Commissioning plan
  - Systems adjusting and balancing
  - Functional performance testing
    - Equipment
    - Controls
    - Economizers
  - Preliminary commissioning report
  - Construction documents and O&M Manuals
  - Final commissioning report and air balancing report

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Economizers

C403.3

Table C403.3.1(1)

CLIMATE ZONES	ECONOMIZER REQUIREMENT
1A, 1B	No requirement
2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	Economizers on cooling systems ≥ 33,000 Btu/h[a]

[a] The total capacity of all systems without economizers shall not exceed 300,000 Btu/h per building, or 20 percent of its air economizer capacity, whichever is greater

Economizers

C403.3.1

Trade-off high cooling efficiency for economizer

CLIMATE ZONES	COOLING EQUIPMENT PERFORMANCE IMPROVEMENT (EER OR IPLV)
2B	10% Efficiency Improvement
3B	15% Efficiency Improvement
4B	20% Efficiency Improvement

Table C403.3.1(2)

Economizers

C403.3.1.1.3 High Limit Shut-off

TABLE C403.3.1.1.3(1)
HIGH-LIMIT SHUTOFF CONTROL OPTIONS FOR AIR ECONOMIZERS

CLIMATE ZONES	ALLOWED CONTROL TYPES	PROHIBITED CONTROL TYPES
1B, 2B, 3B, 4B, 4C, 5B, 5C, 6B, 7, 8	Fixed dry bulb Differential dry bulb Electronic enthalpy Differential enthalpy Dew-point and dry-bulb temperatures	Fixed enthalpy
1A, 2A, 3A, 4A	Fixed dry bulb Fixed enthalpy Electronic enthalpy Differential enthalpy Dew-point and dry-bulb temperatures	Differential dry bulb
All other climates	Fixed dry bulb Differential dry bulb Fixed enthalpy Electronic enthalpy Differential enthalpy Dew-point and dry-bulb temperatures	—

Economizers

C403.3.1.1.3 High Limit Shut-off (Continued)

TABLE C403.3.1.1.3(2)
HIGH-LIMIT SHUTOFF CONTROL SETTING FOR AIR ECONOMIZERS

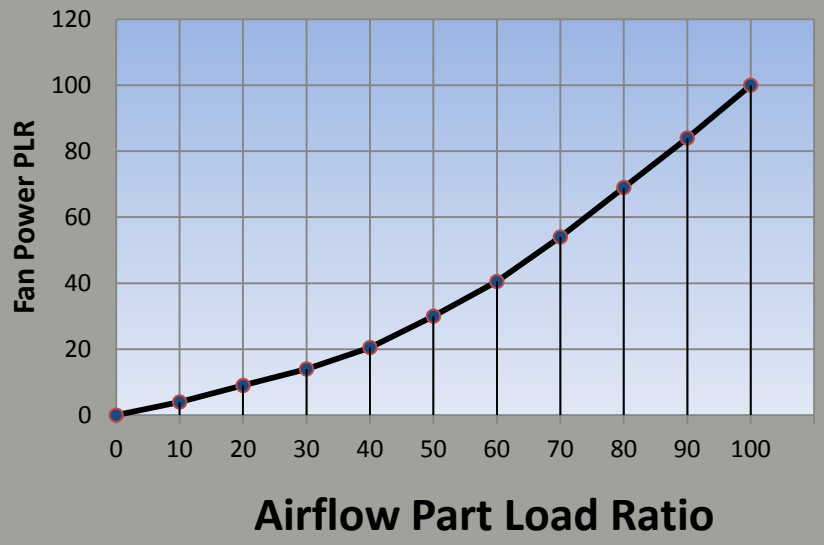
DEVICE TYPE	CLIMATE ZONE	REQUIRED HIGH LIMIT (ECONOMIZER OFF WHEN):	
Fixed dry bulb	1B, 2B, 3B, 3C, 4B, 4C, 5B, 5C, 6B, 7, 8	EQUATION	DESCRIPTION
		TOA > 75°F	Outdoor air temperature exceeds 75°F
	5A, 6A, 7A	TOA > 70°F	Outdoor air temperature exceeds 70°F
	All other zones	TOA > 65°F	Outdoor air temperature exceeds 65°F
Differential dry bulb	1B, 2B, 3B, 3C, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 78	TOA > TRA	Out door air temperature exceeds return air temperature
Fixed enthalpy	All	*h*OA> 28 Btu/lb	Outdoor air enthalpy exceeds 28 Btu/lb of dry air
Electronic Enthalpy	All	(TOA, RHOA)>A	Outdoor air temperature/RH exceeds the “A” setpoint curve
Differential enthalpy	All	*h*OA>*h*RA	Outdoor air enthalpy exceeds return air enthalpy
Dew-point and dry bulb temperatures	All	DPOA>55°F or TOA>75°F	Outdoor air dry bulb exceeds 75°F or outside dew point exceeds 55°F (65 gr/lb)

Variable Air Volume Fan Control

C403.4.2

Individual VAV fans with motors ≥ 7.5hp must be:

- ✓ Driven by a mechanical or electrical variable speed drive **OR**
- ✓ Driven by a vane-axial fan with variable-pitch blades **OR**
- ✓ Have controls or devices to result in fan motor demand ≤ 30% of their design wattage at 50% of design airflow



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Snow Melt Controls

c503.2.4.5

Topic	2006 IECC	2012 IECC
Snow melt controls	None	Requires snow melt controls on all snow melt equipment installed as part of a commercial project.

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2012 IECC Commercial Lighting Requirements Major Changes

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What's Covered Under Electrical Power and Lighting Systems Requirements?

Mandatory Interior Lighting requirements

- ✓ Required Controls
- ✓ Wattage/Efficiency Limits

Interior Lighting Power Allowances (watts/ft_2)

Exterior Lighting Controls

- ✓ Required Controls
- ✓ Lamp Efficiency

Exterior Lighting Power Allowances (watts/ft2)

Electric Metering

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Interior Lighting Power Allowance

Two methods to determine allowance:

- ✓ Building Area Method
  - Floor area for each building area type x value for the area
  - "area" defined as all contiguous spaces that accommodate or are associated with a single building area type as per the table
  - When used for an entire building, each building area type to be treated as a separate area
- ✓ Space-by-Space Method
  - Floor area of each space x value for the area
  - Then sum the allowances for all the spaces
  - Tradeoffs among spaces are allowed

Building Area Method Table (Partial)

Table 405.5.2(1) Interior Lighting Power allowances: Building Area Method	
Building Area Type	LPD (w/ft2)
Automotive facility	0.9
Convention Center	1.2
Courthouse	1.2
Ding: Bar lounge/leisure	1.3
Dining: Cafeteria/fast food	1.4
Dining: Family	1.6
Dormitory	1.0
Fire Station	0.8
Gymnasium	1.1
Health Care Clinic	1.0
Hospital	1.2
Hotel	1.0
Library	1.3
Manufacturing Facility	1.3
Motel	1.0
Motion Picture Theatre	1.2
Museum	1.1
Office	0.9
Parking Garage	0.3
Penitentiary	1.0
Performing Arts Theatre	1.6
Post Office	1.1
Religious Building	1.3
Retail	1.4

Space-By-Space Method Table (Partial)

Common Space-By-Space Types	LPD (w/ft2)
Atrium Above 40ft in height	0.02 per ft. Height
Audience/seating area-permanent	
For Auditorium	0.9
For Performing Arts Theatre	2.6
Class Room/Lecture/Training	1.30
Conference/Meeting/Multipurpose	1.2
Corridor/Transition	0.7
Dining Area	
Bar/Lounge/Leisure Dining	1.40
Family Dining Area	1.40
Electrical/Mechanical	1.10
Food Preparation	1.20
Laboratory for Class Rooms	1.3
Laboratory for medical/industrial/research	1.8
Lobby	1.10
Lobby for motion picture theatre	1.0
Lounge recreation	0.8
Office – Enclosed	1.1
Office-Open Plan	1.0
Restroom	1.0
Sales Area	1.6
Storage	0.8

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Additional Retail Lighting Power Allowance

Table C405.5.2(2) – Footnotes

Additional Interior Lighting Power Allowance =

500 watts +

(Retail Area 1 x 0.6 W/ft2) +

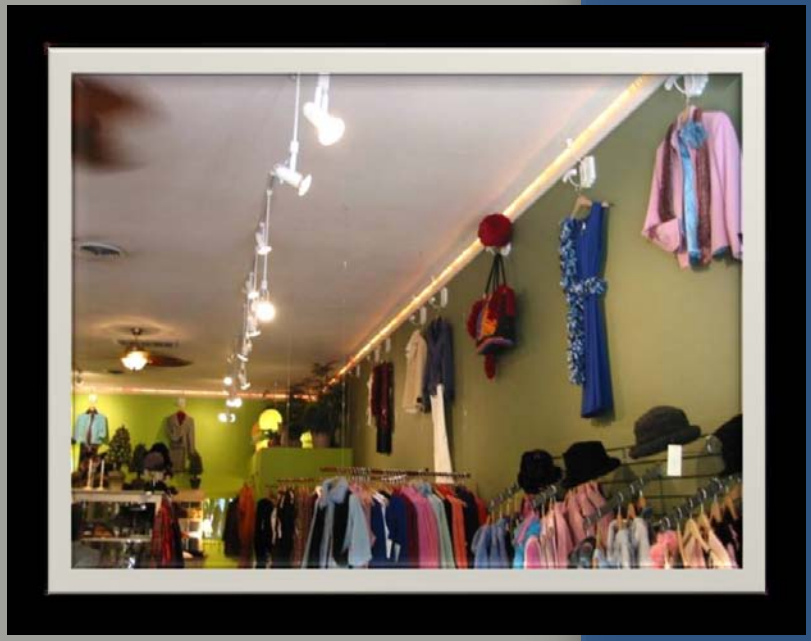
(Retail Area 2 x 0.6 W/ft2) +

(Retail Area 3 x 1.4 W/ft2) +

(Retail Area 4 x 2.5 W/ft2),

Where:

- ✓ **Retail Area 1 = the floor area for all products not listed in Retail Area 2, 3 or 4.**
- ✓ **Retail Area 2 = the floor area used for the sale of vehicles, sporting goods and small electronics.**
- ✓ **Retail Area 3 = the floor area used for the sale of furniture, clothing, cosmetics and artwork.**
- ✓ **Retail Area 4 = the floor area used for the sale of jewelry, crystal, and china.**



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Interior Lighting

c505.5.1

Topic	2006 IECC	2009 IECC
Total connected interior lighting power.	505.5.1 Provides five exemptions for lighting used for specialized lighting and associated with life/ safety including: Specialized lighting for medical and dental Professional sports arena playing field lighting. Display lighting for exhibits in galleries, museums and monuments. Sleeping unit lighting in hotels, motels, boarding houses or similar buildings. Emergency lighting automatically off during normal building operation.	Adds exempted lighting that does not need to be considered when calculating the Total Connected Interior Lighting Power including: Lighting in spaces specifically designated for use by occupants with special lighting needs including the visually impaired visual impairment and other medical and age related issues. Lighting in interior spaces that have been specifically designated as a registered interior historic landmark. Casino gaming areas. Task lighting for plant growth or maintenance. Advertising signage or directional signage. In restaurant buildings and areas, lighting for food warming or integral to food preparation equipment. Lighting equipment that is for sale. Lighting demonstration equipment in lighting education facilities. Lighting approved because of safety or emergency considerations, inclusive of exit lights. Lighting integral to both open and glass-enclosed refrigerator and freezer cases. Lighting in retail display windows, provided the display area is enclosed by ceiling height partitions. Furniture mounted supplemental task lighting that is controlled by automatic shutoff.

Interior Lighting Control

C405.2 Basic Control

Independent Lighting Control required for each space surrounded by floor-to-ceiling partitions

- ✓ Must be located in the space served, **- OR -**
- ✓ Switched from a remote location
  - Must have indicator that identifies the lights served and their status (off or on)
- ✓ **Exemptions**
  - Security or emergency areas that must be continuously lighted
  - Lighting in stairways or corridors that are elements of the means of egress

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Interior Lighting Control

C405.2.1.2 Light Reduction

Light Reduction Controls must allow the occupant to reduce connected lighting

- ✓ By at least 50%
- ✓ In a reasonably uniform illumination pattern

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Interior Lighting Control

Light Reduction Exemptions

Light Reduction Control Not required for the following:

- ✓ Areas with only one luminaire with rated power < 100 W
- ✓ Areas controlled by occupancy sensor
- ✓ Corridors, equipment rooms, storerooms, restrooms, public lobbies, electrical or mechanical rooms
- ✓ Sleeping units
- ✓ Spaces with <0.6 w/ft2
- ✓ Daylight spaces complying with Section C405.2.2.3.2

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Interior Lighting Control

C405.2.2 Automatic Shutoff

Each area required to have a manual control to also have controls meeting:

C405.2.2.1 – Automatic time switch control devices, or

C405.2.2.2 – Occupancy sensors, or

C405.2.2.3 – Daylight zone control

Exempted spaces

- ✓ Sleeping units
- ✓ Lighting for patient care
- ✓ When an automatic shutoff would endanger occupant safety or security
- ✓ Lighting intended for continuous operation

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Daylight Zone Control Requirements

C405.2.2.3

Daylight Zones

- ✓ Must have individual control of the lights independent of general area lighting and
- ✓ Controlled per C405.2.2.3.1 manual daylighting controls or C405.2.2.3.2 automatic daylighting controls
- ✓ Each daylight control zone to be ≤ 2500 ft2

Contiguous daylight zones adjacent to vertical fenestration

- ✓ Can be controlled by a single controlling device if the zone doesn't include areas facing more than two adjacent orientations *(i.e., north, east, south, west)*

Daylight zones under skylights > 15 ft from the perimeter

- ✓ Must be controlled separately from daylight zones adjacent to vertical fenestration

Exception

- ✓ Daylight spaces 1) enclosed by walls or ceiling height partitions and 2) containing two or fewer light fixtures
  - not required to have a separate switch for general area lighting

Note: required controls may be manual or automatic

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Specific Application Controls

C405.2.3

- ✓ These types be controlled by dedicated, independent control
  - Display and accent lighting
  - Display case lighting
  - Nonvisual applications (i.e., plant growth and food warming)
  - Lighting equipment for sale or demonstration in lighting education
- ✓ Hotel and motel sleeping units and guest suites
  - Master control device at main room entry
    - Controls all permanently installed luminaires and switched receptacles
- ✓ Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting
  - Have control device integral to luminaires OR
  - Be controlled by readily accessibly, wall-mounted control device

Exterior Lighting Power Limits

C405.6.2

What areas are covered under exterior lighting allowances?

- ✓ **Tradable surfaces**

  Common exterior lighted needs that can be traded for other needs.

  - For example, wattage allowed for parking lot lighting can be “traded” and used for canopy lighting.

- ✓ **Nontradable surfaces**

  Less common exterior lighted needs that cannot be traded for other needs.

  - These applications have more specific security or task illuminance needs.

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Exterior Lighting Zones

Table C405.6.2(1)

Lighting Zone	Description
1	Developed areas of national parks, state parks, forest land, and rural areas
2	Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed use areas
3	All other areas
4	High-activity commercial districts in major metropolitan areas as designated by the local land use planning authority

Exterior Lighting Zones

Table C405.6.2(1)

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Exterior Lighting Zones con't

		Zone 1	Zone 2	Zone 3	Zone 4
Base Site Allowance		500 W	600 W	750 W	1300 W
Tradable Surfaces	**Uncovered Parking Areas**				
	Parking areas and drives	0.04 W/ft^2	0.06 W/ft^2	0.10 W/ft^2	0.13 W/ft^2
	Building Grounds				
	Walkways less than 10 feet wide	0.7 W/linear foot	0.7 W/linear foot	0.8 W/linear foot	1.0 W/linear foot
	Walkways 10 feet wide or greater Plaza areas Special Feature Areas	0.14 W/ft^2	0.14 W/ft^2	0.16 W/ft^2	0.2 W/ft^2
	Stairways	0.75 W/ft^2	1.0 W/ft^2	1.0 W/ft^2	1.0 W/ft^2
	Pedestrian Tunnels	0.15 W/ft^2	0.15 W/ft^2	0.2 W/ft^2	0.3 W/ft^2

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Exterior Lighting Zones con't

		Zone 1	Zone 2	Zone 3	Zone 4
Tradable Surfaces	**Building Entrances and Exits**				
	Main entries	20 W/linear foot of door width	20 W/linear foot of door width	30 W/linear foot of door width	30 W/linear foot of door width
	Other doors	20 W/linear foot of door width	20 W/linear foot of door width	20 W/linear foot of door width	20 W/linear foot of door width
	Entry Canopies	0.25 W/ft^2	0.25 W/ft^2	0.4 W/ft^2	0.4 W/ft^2
	Sales Canopies				
	Free-standing and attached	0.6 W/ft^2	0.6 W/ft^2	0.8 W/ft^2	1.0 W/ft^2
	Outdoor Sales				
	Open areas (including vehicle sales lots)	0.25 W/ft^2	0.25 W/ft^2	0.5 W/ft^2	0.7 W/ft^2
	Street frontage for vehicle sales lots in addition to "open area" allowance	No allowance	10 W/linear foot	10 W/linear foot	30 W/linear foot

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2012 IECC Commercial Additional EFFICIENCY PACKAGE Requirements

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Additional Efficiency Requirements

- One Additional Efficiency Feature Must Be Selected to Comply with the IECC
  - More efficient lighting system (consistent with 90.1-2010), or
  - More efficient HVAC system
  - Installation of onsite renewables
    - 3% of the regulated energy

High Efficiency HVAC

Onsite Renewables

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Additional Efficiency Requirements

- HVAC
  - Efficiencies based on Consortium for Energy Efficiency (CEE)
  - Option not available to all HVAC system types

High Efficiency HVAC

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Additional Efficiency Requirements

- Lighting
  - Whole building LPD's consistent with ASHRAE 90.1-2010
  - No additional lighting allowed for retail lighting
  - Daylighting controls option for retail and office lighting
  - 70% daylit floor area for warehouse occupancies

Table 405.5.2(1) Interior Lighting Power allowances: Building Area Method (*Partial*)	
Building Area Type	LPD (w/ft2)
Automotive facility	0..82
Convention Center	1.08
Courthouse	1.05
Ding: Bar lounge/leisure	0.99
Dining: Cafeteria/fast food	0.90
Dormitory	1.0
Gymnasium	1.0
Health Care Clinic	0.87
Hospital	1.10
Library	1.3
Manufacturing Facility	1.11
Motion Picture Theatre	0.83
Museum	1.06
Office	0.90/0.85
Performing Arts Theatre	1.6
Post Office	0.87
Religious Building	1.05
Retail	1.4/1.3

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Additional Efficiency Requirements

- Installation of onsite renewables compliance options:
- Option 1: Provide ≥ 1.75 btu's, or 0.50 watts, per square foot of conditioned floor area.
- Option 2: Provide ≥ 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 5.

Onsite Renewables

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