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2021 IECC Commercial

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Housekeeping

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What's New in the Commercial Provisions of the 2021 IECC?

National Energy Codes Conference Seminar Series, Fall 2020

<https://www.energycodes.gov/technical-assistance/training/courses/whats-new-commercial-provisions-2021-iecc>

Presentation Today:

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Outline/Agenda

- Envelope
- Mechanical
- Lighting and Power
- Energy Credits



2021 IECC Development Process

2019 PROPOSED CHANGES TO THE INTERNATIONAL ENERGY CONSERVATION CODE - COMMERCIAL

CE1-19 Part I	CE29-19 Part I	CE66-19	CE102-19	CE138-19	CE193-19	CE249-19	CE174-19	CE230-19
CE2-19	CE30-19 Part I	CE67-19	CE103-19 Part I	CE139-19	CE194-19	CE250-19	CE175-19	CE231-19
CE3-19 Part I	CE31-19 Part I	CE68-19	CE104-19	CE140-19	CE195-19	CE251-19	CE176-19	CE232-19
CE4-19 Part I	CE28-19 Part I	CE69-19	CE105-19	CE141-19	CE196-19	CE252-19	CE177-19	CE233-19
CE5-19 Part I	CE32-19 Part I	CE70-19	CE106-19	CE142-19	CE197-19	CE253-19 Part I	CE178-19	CE234-19
CE6-19 Part I	CE33-19	CE71-19	CE107-19	CE143-19	CE198-19	CE254-19	CE179-19	CE235-19
CE7-19 Part I	CE34-19 Part I	CE72-19	CE108-19	CE144-19	CE199-19	CE255-19 Part I	CE180-19	CE236-19
ADM9-19 Part II	CE35-19	CE73-19	CE109-19	CE145-19	CE200-19	CE256-19	CE181-19	CE237-19
ADM10-19 Part III	CE36-19 Part I	CE74-19	CE110-19	CE146-19	CE201-19	CE257-19	CE182-19	CE238-19
CE8-19 Part I	CE37-19 Part I	CE75-19	CE111-19	CE147-19	CE202-19	CE258-19	CE183-19	CE239-19
CE9-19 Part I	CE38-19	CE76-19	CE112-19	CE148-19	CE203-19	CE259-19	CE184-19	CE240-19
CE10-19 Part I	CE40-19 part I	CE77-19	CE113-19	CE149-19	CE204-19	CE260-19	CE185-19	CE241-19
CE11-19 Part I	CE41-19	CE78-19 Part I	CE114-19	CE150-19 Part I	CE205-19	CE261-19	CE186-19	CE242-19
ADM46-19 Part III	CE42-19 Part I	CE79-19	CE115-19 Part I	CE151-19 Part I	CE206-19	ADM43-19 Part I	CE187-19	CE243-19
CE12-19 Part I	CE43-19	CE80-19	CE116-19 Part I	CE152-19	CE207-19	CE263-19 Part I	CE188-19	CE244-19
CE13-19 Part I	CE44-19	CE81-19	CE117-19	P1-19	CE208-19	CE264-19	CE189-19	CE245-19
CE14-19	CE45-19	CE82-19	CE118-19	CE153-19	CE209-19	CE262-19	CE190-19	CE246-19
CE15-19 Part I	CE46-19	CE83-19	CE119-19 Part I	CE154-19	CE210-19	CE265	CE191-19	CE247-19
ADM33-19 Part II	CE47-19	CE84-19	CE119-19	CE155-19	CE211-19	CE266	CE192-19	CE248-19 Part I
CE16-19 Part I	CE48-19	CE85-19	CE120-19	CE156-19	CE212-19	CE267		
ADM31-19 Part II	CE49-19	CE86-19	CE121-19	CE157-19	CE213-19			
CE17-19 Part I	CE50-19	CE87-19	CE122-19	CE158-19	CE214-19			
ADM41-19 Part III	CE51-19 Part I	CE88-19	CE123-19	CE159-19 Part I	CE215-19			
ADM40-19 Part III	CE52-19	CE89-19	CE124-19	CE160-19	CE216-19			
CE18-19 Part I	CE53-19	CE90-19	CE125-19	CE161-19	CE217-19 Part I			
CE20-19 Part I	CE54-19 Part I	CE91-19	CE126-19	CE162-19	CE218-19			
CE19-19 Part I	CE55-19	CE92-19	CE127-19	CE163-19	CE219-19			
CE21-19	CE56-19	CE93-19 Part I	CE128-19	CE164-19	CE220-19			
ADM1-19 Part II	CE57-19	CE94-19	CE129-19	CE165-19	CE221-19			
ADM2-19 Part II	CE58-19	CE95-19	CE130-19	CE166-19	CE222-19			
ADM3-19 Part II	CE59-19	CE96-19	CE131-19	CE167-19	CE223-19			
CE23-19 Part I	CE60-19 Part I	CE97-19	CE132-19	CE168-19	CE224-19			
CE24-19	CE61-19	CE98-19	CE133-19	CE169-19	CE225-19			
CE25-19	CE62-19 Part I	CE99-19	CE134-19	CE170-19	CE226-19			
CE22-19 Part I	CE63-19	CE100-19	CE135-19	CE171-19	CE227-19			
CE26-19	CE64-19	CE101-19	CE136-19	CE172-19	CE228-19			
CE27-19	CE65-19		CE137-19	CE173-19	CE229-19			

[IECC Group B Code Development Website](https://www.iccsafe.org/products-and-services/i-codes/code-development-process/2019-group-b/)

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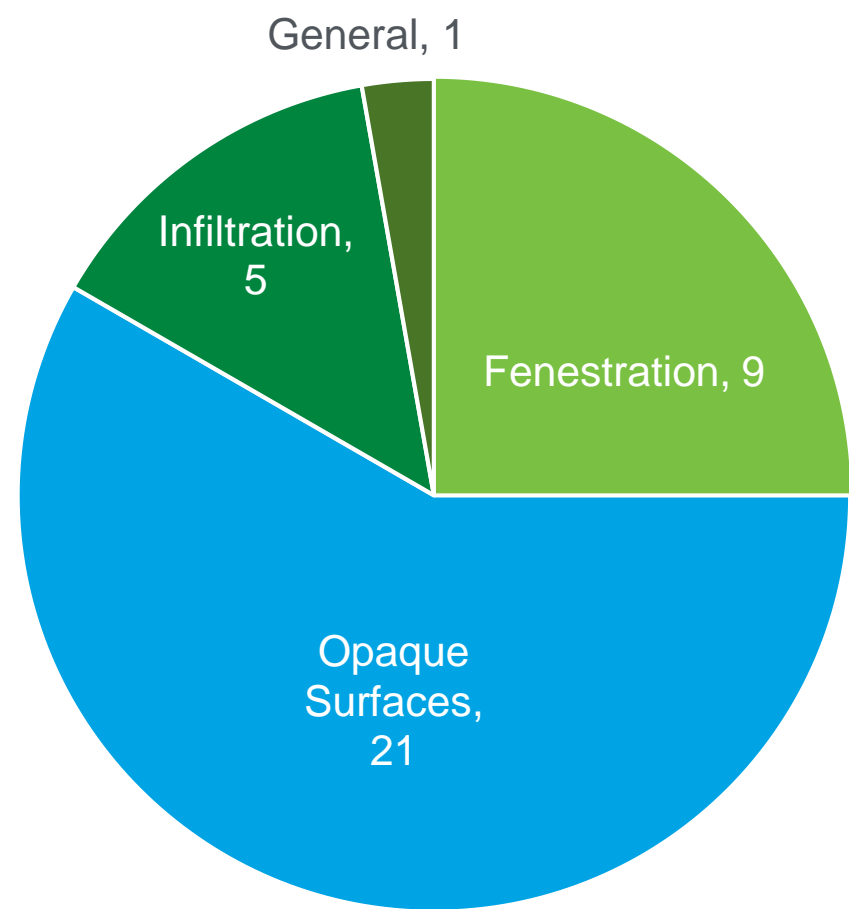
- 2019 Group B Final Action & Report
- 2019 Consolidated Monograph Updates
- 2019 Group B Proposed Changes.

Envelope

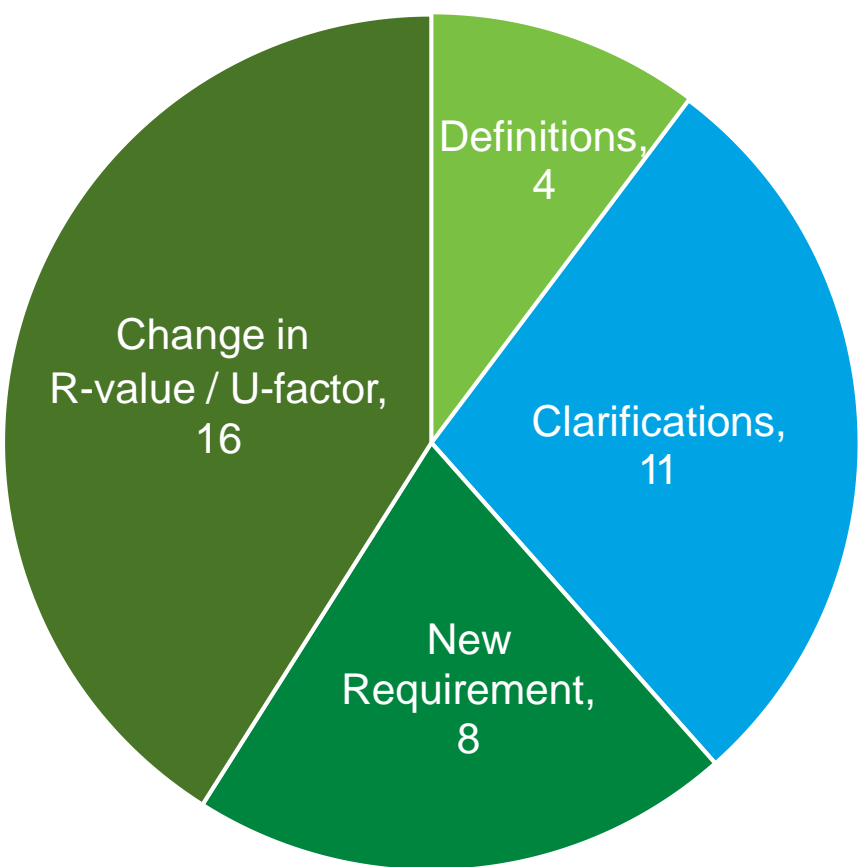
2021 IECC Building Envelope Proposals

36 Building Envelope Proposals approved for IECC 2021.

Proposals by Envelope Component



Proposals by Change Type -



Some proposals fall into more than 1 category so total > 36

Thermal Envelope Certificates (new)

C401.3

CE 55 - Adds requirement for thermal envelope certificate (similar to residential certificate) that must include:

- 1. R-values of insulation installed in opaque envelope assemblies
- 2. U-factors and solar heat gain coefficients (SHGC) of fenestration;
- 3. Results from any building envelope air leakage testing performed on the building

Where a component has more than one value the certificate shall indicate the area-weighted average.



2015 IECC Energy Efficiency Certificate

Insulation Rating		R-Value	
Above-Grade Wall		26.00	
Below-Grade Wall		15.00	
Floor		35.00	
Ceiling / Roof		41.00	
Ductwork (unconditioned spaces):		_____	
Glass & Door Rating		U-Factor	SHGC
Window		0.25	
Door		0.70	
Skylight		0.50	

Roofs

Tables C402.1.3, Table C402.1.4, C402.2.1 and C402.5.1.2.1

CE 61/71/73/102.

- Updates roof assembly performance to align with ASHRAE 90.1-2106 & 90.1-2109
- Modifies roof U-factor requirements for "all other" metal buildings. Lowers U-factor to 0.035
- Remove requirement that single ply-roof membranes be "fully adhered" to align with the requirement in ASHRAE Standard 90.1-2016.
- Adds clarification of the handling of a variety of ceiling and roof issues for both the R-value and U-value compliance approaches, including:
 1. How R-value of tapered roof insulation should be determined
 2. That insulation on suspended ceilings does not count towards roof insulation requirements
 3. Continuous insulation must be installed in two layers with staggered joints.

CLIMATE ZONE	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
Metal buildings ^b	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 R-25 + R-11 + R-11 LS	R-30 + R-11 LS R-25 + R-11 + R-11 LS
Attic and other	R-38 R-49	R-38 R-49	R-38 R-49	R-49	R-49	R-49	R-49 R-60	R-49 R-60	R-49 R-60	R-49 R-60

Vegetated and Landscaped Roofs

C202 and C402.3

CE 82 & 83

- Strikes “Roof Gardens” from and adds “vegetative roof” to exception 3 of C402.3. Aligns the IECC with the IBC, the IFC and Solar Ready Appendix CA.
- Adds new definition of "vegetative roof“.

An assembly of interacting components designed to waterproof a building’s top surface that includes, by design, vegetation and related landscape elements.



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Above Grade Walls

C202, Table C402.1.3 and Table C402.1.4

CE 63/35/74/75

- Changes requirements for above-grade wall assemblies to match ASHRAE Standard 90.1-2016 requirements.
- Modifies definition of "wall, above-grade" to include:
 - between-floor spandrels,
 - peripheral edges of floors,
 - roof and basement knee walls,
 - dormer walls,
 - gable end walls,
 - walls enclosing a mansard roofs, and
 - skylight shafts
- Lowers U-factor to 0.037 for “all other” mass walls in CZ8 to match stated R-value
- Lowers U-factor for Group-R metal framed walls in CZ 7 to U-0.042 and Lowers U-factor of Group-R wood framed walls in CZ5 to 0.051

CLIMATE ZONE	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
Walls, above grade										
Mass ^g	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- 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	<u>R-13</u> <u>+ R-</u> <u>14ci</u>	<u>R-13</u> <u>+ R-</u> <u>14ci</u>	<u>R-13</u> <u>+ R-</u> <u>14ci</u>	<u>R-13</u> <u>+ R-</u> <u>14ci</u>	<u>R-13</u> <u>+ R-</u> <u>14ci</u>	<u>R-13</u> <u>+ R-</u> <u>17ci</u>	R-13+ R- 19.5ci	<u>R-13</u> <u>+ R-</u> <u>19.5ci</u>	R-13+ R- 19.5ci
Metal framed			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	<u>R-13</u> <u>+ R-</u> <u>10ci</u>	<u>R-13</u> <u>+ R-</u> <u>10ci</u>	<u>R-13</u> <u>+ R-</u> <u>12.5ci</u>	<u>R-13</u> <u>+ R-</u> <u>12.5ci</u>	<u>R-13</u> <u>+ R-</u> <u>12.5ci</u>	R-13 + R- 15.6ci	<u>R-13</u> <u>+ R-</u> <u>18.8ci</u>	<u>R-13</u> <u>+ R-</u> <u>18.8ci</u>
Wood framed and other			R-13 +R- 3.8ci or R- 20						R-13 +R- 15.6ci or R- 20	R-13 +R- 15.6ci or R- 20
	R-13 + R- 3.8ci or R- 20	R-13 + R- 3.8ci or R- 20	<u>R-13</u> <u>+ R-</u> <u>7.5ci</u> or R- 20 <u>+ R-</u> <u>3.8ci</u>	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	<u>R-13</u> <u>+ R-</u> <u>10ci</u> or R- 20 <u>+ R-</u> <u>18.8ci</u>	<u>R-13</u> <u>+ R-</u> <u>10ci</u> or R- 20 <u>+ R-</u> <u>18.8ci</u>

Below Grade Walls

Table C402.1.3 and Table C402.1.4

CE 64.

- Changes requirements for below-grade wall assemblies in CZ 4-8 to match ASHRAE Standard 90.1-2016 requirements.

TABLE C402.1.3 OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD ^{a, i}																
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
Walls, below grade																
Below-grade wall ^d	NR	NR	NR	NR	NR	NR	R-7.5ci	R-7.5ei R-10ci	R-7.5ci	R-7.5ei R-10ci	R-7.5ei	R-7.5ei	R-10ci R-15ci	R-10ei R-15ci	R-12.5ei R-15ci	R-12.5ei R-15ci



Photo courtesy of Dow Building Solutions

Exterior Floors

Table C402.1.3 and Table C402.1.4

CE 65 & CE66.

- Changes insulation requirements of floor assemblies to match ASHRAE Standard 90.1 - 2016 requirements.



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

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
Floors																
Mass ^e	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
							R-14.6ci	R-16.7ci	R-14.6ci	R-16.7ci	R-16.7ci	R-16.7ci	R-20.9ci	R-20.9ci	R-23ci	R-23ci
Joist/framing	NR	NR	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30	R-30 ^f	R-30 ^f	R-30 ^f	R-30 ^f	R-30 ^f
	R-13	R-13										R-38	R-38	R-38	R-38	R-38

Slabs and Floors

Table C402.1.3, Table C402.1.4 and C402.2.4

CE 68/69/76/79

- Modifies the F-factors for unheated slabs in CZ-3 - CZ8 to align with ASHRAE Standard 90.1-2016 requirements.

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
Unheated Slab-on-grade floors											
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
	R-10 for 24" below	R-15 for 24" below	R-15 for 24" below	R-15 for 24" below	R-20 for 24" below	R-20 for 24" below	R-20 for 48" below	R-20 for 48" below	R-20 for 48" below	R-20 for 48" below	R-25 for 48" below

- Modifies F-factors for heated slabs; corrects error in IECC 2018, new F-factors match ASHRAE 90.1 Appendix A tables for R-values in Table C402.1.3.

- ✓ CZ-1-2: R7.5@12"/R5 under: F-0.69
- ✓ CZ-4-6C: R15@24"/R5 under: F-0.62
- ✓ CZ-3: R10@24"/R5 under: F-0.66
- ✓ CZ-6R-8: R20/R5 under: F-0.602

- Moves slab installation requirements to C402.2.4 and makes them mandatory. Adds new language describing how to install full under slab insulation

“Where installed, full slab insulation shall be continuous under the entire area of the slab-on-grade floor, except at structural column locations and service penetrations. Insulation required at the heated slab perimeter shall not be required to extend below the bottom of the heated slab and shall be continuous with the full slab insulation.”

Doors

Tables C402.1.3 and Table C402.1.4

- CE 70/77
 - Deletes "non-swinging doors" R-value requirements and adds the requirements as U-factors
 - Updates swinging door U-factors and requires compliance with NFRC 100
 - Adds requirement for horizontally hinged doors with a single row of glazing (garage doors) with glazing area between 14% and 25% shall have an assembly U-factor less than or equal to 0.44 in Climate Zones 1 through 6 and less than or equal to 0.36 in Climate Zones 7 and 8

TABLE C402.1.4
OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7	
	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
Opaque doors														
NonSwinging door	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>	<u>U-0.31</u>
Swinging door	U-0.61 <u>U-0.37</u>	U-0.61 <u>U-0.37</u>	U-0.61 <u>U-0.37</u>	U-0.61 <u>U-0.37</u>	U-0.61 <u>U-0.37</u>	U-0.61 <u>U-0.37</u>	U-0.61 <u>U-0.37</u>	U-0.61 <u>U-0.37</u>	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37	U-0.37
Garage door <14% glazing	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31	U-0.31

Building Envelope Clarifications & Definitions

C402.1.3, C401.2, C402.2.7, C407.2, C402.4.2

- **CE 60/80**

- Specifies proper use of cavity and continuous insulation in R-value computation in Section C402.1.3
- Makes section C402.2.7 Airspaces mandatory and adds to list of mandatory requirements for use with the total building performance method.



Vertical Fenestration – U-Factors

Table C402.4

CE 84/85

- Lowers vertical fenestration U-factor and SHGC requirements to align with Standard 90.1-2019.



CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8
Vertical fenestration								
U-factor								
Fixed fenestration	0.50	0.50 0.45	0.46 0.42	0.38 0.36	0.38 0.36	0.36 0.34	0.29	0.29 0.26
Operable fenestration	0.65 0.62	0.65 0.60	0.60 0.54	0.45	0.45	0.43 0.42	0.37 0.36	0.37 0.32
Entrance doors	1.10 0.83	0.83 0.77	0.77 0.68	0.77 0.63	0.77 0.63	0.77 0.63	0.77 0.63	0.77 0.63

Fenestration – SHGC

Table C402.4

CE 84/87.

- Lowers vertical fenestration SHGC requirements for most climate zones to align with Standard 90.1-2019 requirements. Results in reduced solar load on the building by requiring more stringent a solar heat gain coefficient (SHGC) values in all climate zones. SHGC must be based on window type (fixed or operable).

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		8	
Vertical fenestration																
SHGC																
Orientation ^a	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable	SEW Fixed	N Operable
PF < 0.2	0.25 0.23	0.33 0.21	0.25	0.33 0.23	0.25	0.33 0.23	0.36	0.48 0.33	0.38	0.51 0.33	0.40 0.38	0.53 0.34	0.45 0.40	NR 0.36	0.45 0.40	NR 0.36
0.2 ≤ PF < 0.5	0.30 0.28	0.37 0.25	0.30	0.37 0.28	0.30	0.37 0.28	0.43	0.53 0.40	0.46	0.56 0.40	0.48 0.46	0.58 0.41	NR 0.48	NR 0.43	NR 0.48	NR 0.43
PF ≥ 0.5	0.40 0.37	0.40 0.34	0.40	0.40 0.37	0.40	0.40 0.37	0.58	0.58 0.53	0.61	0.61 0.53	0.64 0.61	0.64 0.54	NR 0.64	NR 0.58	NR 0.64	NR 0.58

Fenestration – Skylights

Table C402.4

CE 84&86

- Lowers skylight U-factor and SHGC requirements to align with Standard 90.1-2019.

CLIMATE ZONE	1	2	3	4 EXCEPT MARINE	5 AND MARINE 4	6	7	8
Skylights								
U-factor	0.75 0.70	0.65	0.55	0.50	0.50	0.50	0.50 0.44	0.50 0.41
SHGC	0.35 0.30	0.35 0.30	0.35 0.30	0.40	0.40	0.40	NR	NR



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Fenestration Clarifications & Definitions

C202, C303.1.3 C402.1.2, C402.4, C402.4.2, C405.2

CE 89/90/91/92/39

- Editorial change to add the word daylight to the terms sidelit zones and toplit zones
- Removes redundant text and changes section reference for daylight responsive controls in Section C405.2.3 to clarify that the entire list of exceptions apply.
- Uses more clear and direct language to describe requirements for skylights in Section C402.1.2 and C402.4.2
- Adds new definition of "visible transmittance, annual (VT_{annual})", and adds NFRC203 test procedure and minimum requirements for Tubular Daylighting Devices(TDD
- Adds a new exception to C402.4.2 regarding skylights for storm shelters complying with ICC 500.



Air Leakage Testing

C405.2

CE 96 – Testing requirements for Class R and Class I occupancies

- Required in all CZ except 2B, 3C and 5C.
- Adds new definition of "testing unit enclosure area".
- Air leakage target 0.3cfm/sq.ft. of testing unit enclosure area at 50PA.
- Allows sampling in larger buildings. If a dwelling unit test fails, requires testing of additional units

CE 97 - Testing requirements for buildings that are not Class R or Class I.

- Air leakage target aligns with ASHRAE 90.1-2019. Testing target is 0.4cfm/ft² at 75PA, if tested value is between 0.4 and 0.6 cfm/ft² additional air sealing is required.
- Testing becomes the sole compliance path for non-residential buildings as follows:
 - All buildings in CZ 4A, 5A, 6A, 7 and 8
 - Buildings < 5,000 sq.ft. in CZ 0B, 1, 2A, 4B, 4C
 - Buildings < 5,000 sq.ft or >50,000 sq.ft in CZ 0A, 3A and 5B
- Buildings not required to test must follow the material and assembly requirements.



Other Air-leakage Requirements

C402.5, C103.2, C402.5.1.3 C405.5.1.2.2

CE 98/99/101

- Adds ASTM E3158, covering multi-zone buildings, as an approved test method.
- Adds new requirements for air barrier verification/commissioning by a registered design professional or approved agency when not testing.
- Updates requirements for listing of air barrier and air sealing details including the location of the air barrier on project drawings.
- Adds ASTM D8052 for sloped roofs, clarifies that ASTM E1677 applies to walls and ASTM E283 applies to fenestration.



Air Leakage Testing

Air Leakage Proposals add new testing requirements that make current organization of C405.2 a challenge. Draft language for IECC 2021 Section 405.2 makes requirements easy to follow.

C402.5 – Air leakage – thermal envelope (Mandatory)

- Updated charging language for air leakage requirements.

C402.5.1 – Air barrier compliance

- Three compliance options- testing for Class R and Class I occupancies, testing for buildings that are not Class R or Class I and requirements for buildings not required to do testing.

C402.5.2 – Air barriers(current Sections 402.5.1,1, 402.5.1.2.1, 402.5.1.2.2 and CE99 requirements)

- Air barrier construction, materials, assemblies and performance verification (CE99) requirements included as sub-sections.

C402.5.3 – Dwelling and Sleeping Unit Enclosure Testing (CE96 requirements)

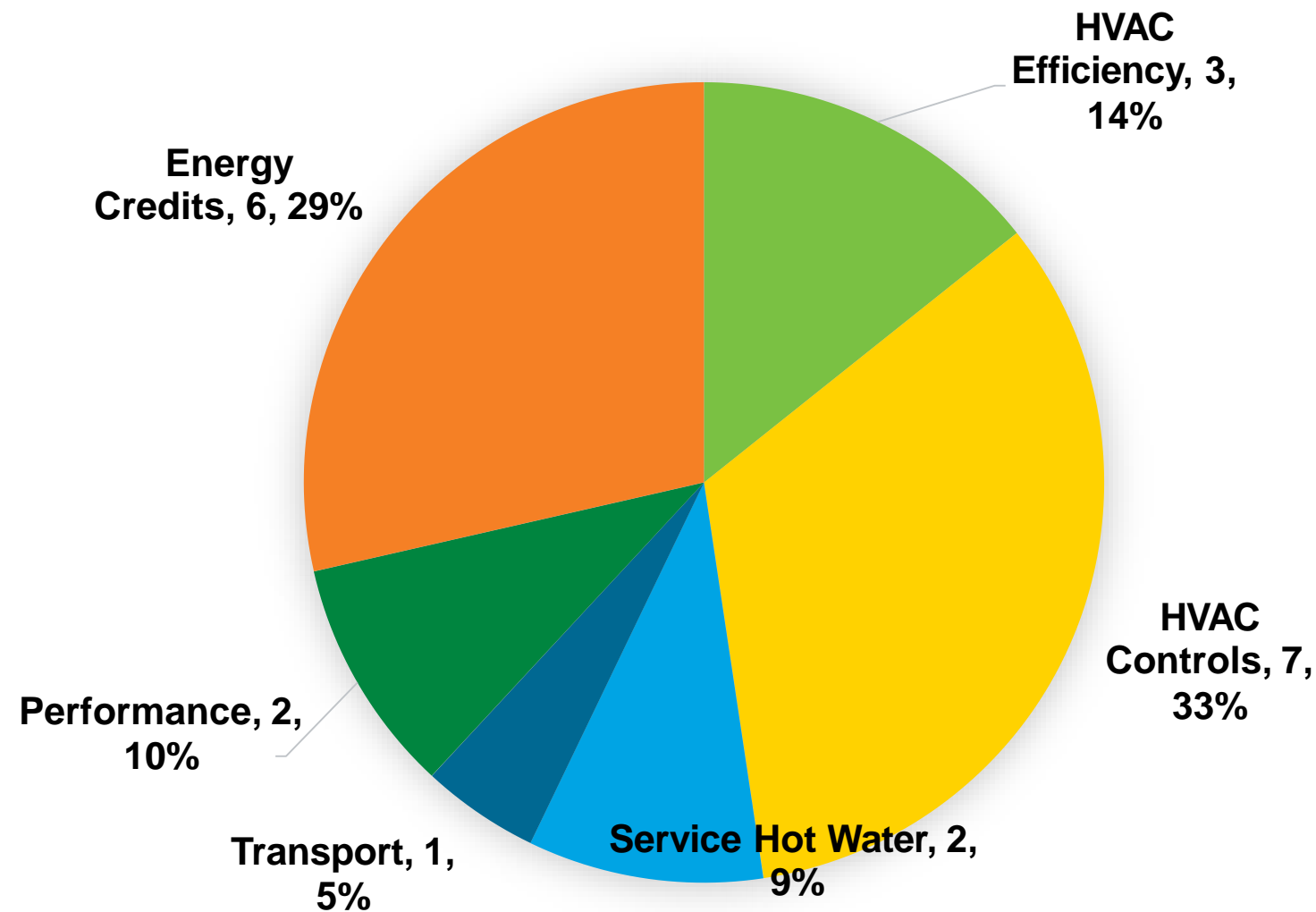
- Testing requirements for dwelling and sleeping units.

C402.5.2 – Building Thermal Envelope Testing (CE97 requirements)

- Testing requirements for buildings other than Class R and Class I occupancies.

Mechanical

21 Mechanical, Performance & Energy Credits Proposals approved for IECC 2021



- HVAC Equipment and Controls
- General Mechanical Systems
 - Refrigeration
 - Pools
 - Escalator / Walkway
 - Computer Room
- Performance Path
- Net zero renewable appendix
- Service Hot Water
- Energy Credits

HVAC Equipment Efficiency Tables

C403.3.2

CE113

- HVAC equipment efficiency updated to match ASHRAE Tables directly
- Replaces Tables C403.3.2(1) through C403.3.2(10)
- Adding new tables for:
 - DOAS units
 - Water source heat pumps
 - Variable refrigerant flow cooling and heat pumps
 - Heat pump and heat reclaim chiller packages
 - Ceiling mounted computer room air conditioners
 - Commercial refrigerators and freezers
- Many table efficiencies are based on Federal appliance manufacturing requirements

Table 6.8.1-4 Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air-Conditioner Heat Pumps—Minimum Efficiency Requirements

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency ^d	Test Procedure ^a
Room air conditioners without reverse cycle with louvered slides for applications outside U.S. ^d	<6000 Btu/h		11.0 CEER	ANSI/AHAM RAC-1
	≥6000 Btu/h and <8000 Btu/h		11.0 CEER	
	≥8000 Btu/h and <14,000 Btu/h		10.9 CEER	

Table 6.8.1-9 Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum Efficiency Requirements

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure
VRF air cooled (cooling mode)	<65,000 Btu/h	All	VRF multisplit system	13.0 SEER	AHRI 1230
	≥65,000 Btu/h and <135,000 Btu/h	Electric resistance (or none)		11.0 EER 12.9 IEER14.6 IEER	
			VRF multisplit system with heat recovery	10.8 EER 12.7 IEER 14.4 IEER	
	≥135,000 Btu/h and <240,000 Btu/h		VRF multisplit system	10.6 EER 12.3 IEER 13.9 IEER	

INSI/AHAM IAC-1

Table 6.8.1-10 Floor-Mounted Air Conditioners and Condensing Units Serving Computer Rooms—Minimum Efficiency Requirements (Continued)

Equipment Type	Standard Model	Net Sensible Cooling Capacity	Minimum Net Sensible COP	Rating Conditions Return air (dry bulb/dew point)	Test Procedure	
Glycol cooled	Downflow	<80,000 Btu/h	2.56	85°F/52°F (Class 1)	AHRI 1360	
		≥80,000 Btu/h and <295,000 Btu/h	2.24			
		≥295,000 Btu/h	2.21			
	Upflow, ducted	<80,000 Btu/h	2.53			75°F/52°F (Class 1)
		≥80,000 Btu/h and <295,000 Btu/h	2.21			
		≥295,000 Btu/h	2.18			
	Upflow, nonducted	<65,000 Btu/h	2.08	75°F/52°F (Class 1)		
		≥65,000 Btu/h and <240,000 Btu/h	1.90			
		≥240,000 Btu/h	1.81			
	Horizontal	<65,000 Btu/h	2.48	95°F/52°F (Class 3)		
		≥65,000 Btu/h and <240,000 Btu/h	2.18			

Equipment Efficiency – Small Fans

C403.8.5

CE140

- New efficiency requirements for small fans
 - Less than 1/12 horsepower
 - Except when part of a listed HVAC appliance
 - Except dryer exhaust, range hood main or booster fans

TABLE C403.8.5
LOW-CAPACITY VENTILATION FAN EFFICACY

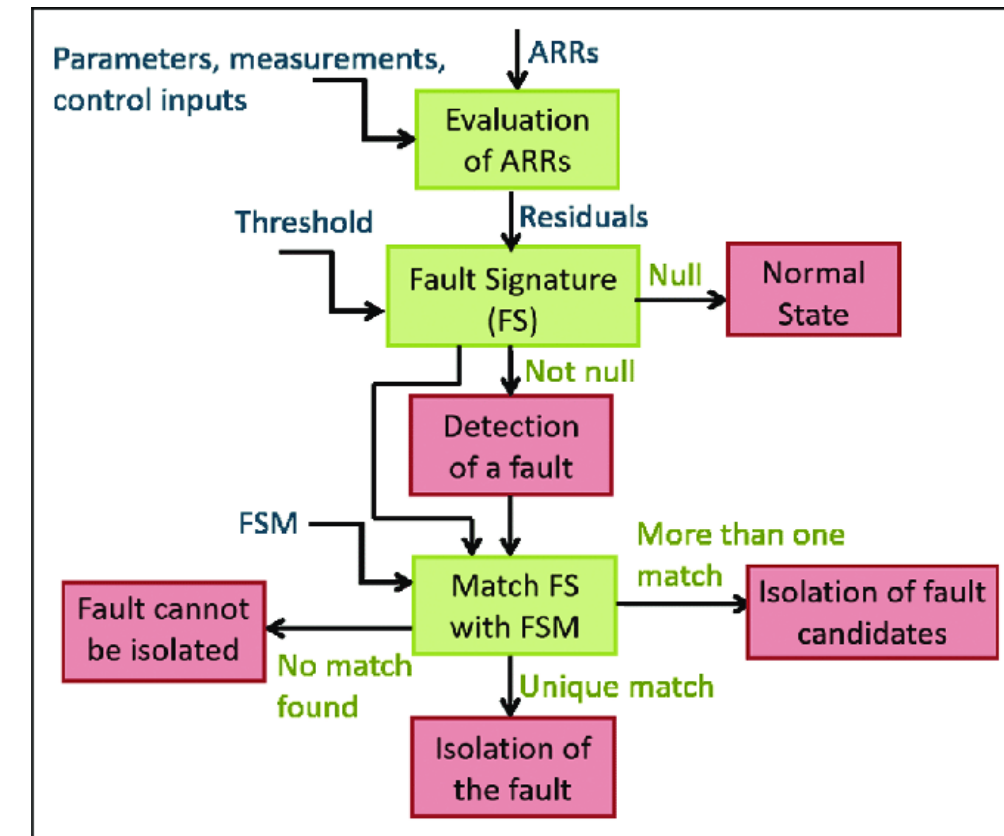
<u>FAN LOCATION</u>	<u>AIR FLOW RATE MINIMUM</u>	<u>MINIMUM EFFICACY</u>	<u>AIR FLOW RATE MAXIMUM</u>
	<u>(CFM)</u>	<u>(CFM/WATT)</u>	<u>(CFM)</u>
<u>HRV or ERV</u>	<u>Any</u>	<u>1.2 cfm/watt</u>	<u>Any</u>
<u>In-line fan</u>	<u>Any</u>	<u>3.8 cfm/watt</u>	<u>Any</u>
<u>Bathroom, utility room</u>	<u>10</u>	<u>2.8 cfm/watt</u>	<u>< 90</u>
<u>Bathroom, utility room</u>	<u>90</u>	<u>3.5 cfm/watt</u>	<u>Any</u>

Fault Detection and Diagnostics (FDD)

C403.2.3

CE111

- HVAC controls fault detection & diagnostic (FDD)
- Required on buildings 100,000 square feet and larger
 1. Include permanently installed sensors and devices to monitor the HVAC system's performance;
 2. Sample the HVAC system's performance at least once per 15 minutes;
 3. Automatically identify and report HVAC system faults;
 4. Automatically notify authorized personnel of identified HVAC system faults;
 5. Automatically provide prioritized recommendations for repair of identified faults based on analysis of data collected from the sampling of HVAC system performance; and
 6. Be capable of transmitting the prioritized fault repair recommendations to remotely located authorized personnel.



HVAC Control Changes

C403.4.2.3, C403.5, C403.7.1

CE120

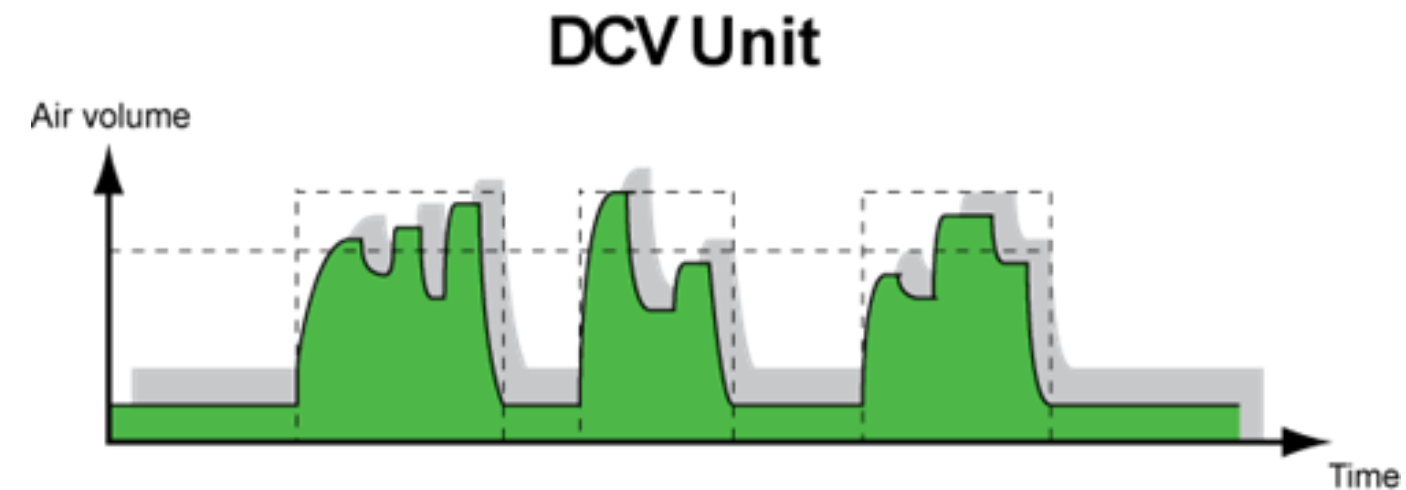
- Adds optimized stop schedule adjustment
 - End of day system turns off and “coasts” up to temperature shift of +/- 2°F

CE124

- Variable Refrigerant Flow (VRF) systems no longer require outside air economizers

CE127

- Expands Demand Control Ventilation (DCV) requirements from occupant density of 25 down to 15 people/1000 ft²;
 - Now includes retail sales areas



HVAC Control Changes

C403.4.3.3.2, C403.7.2, C403.7.6

CE121

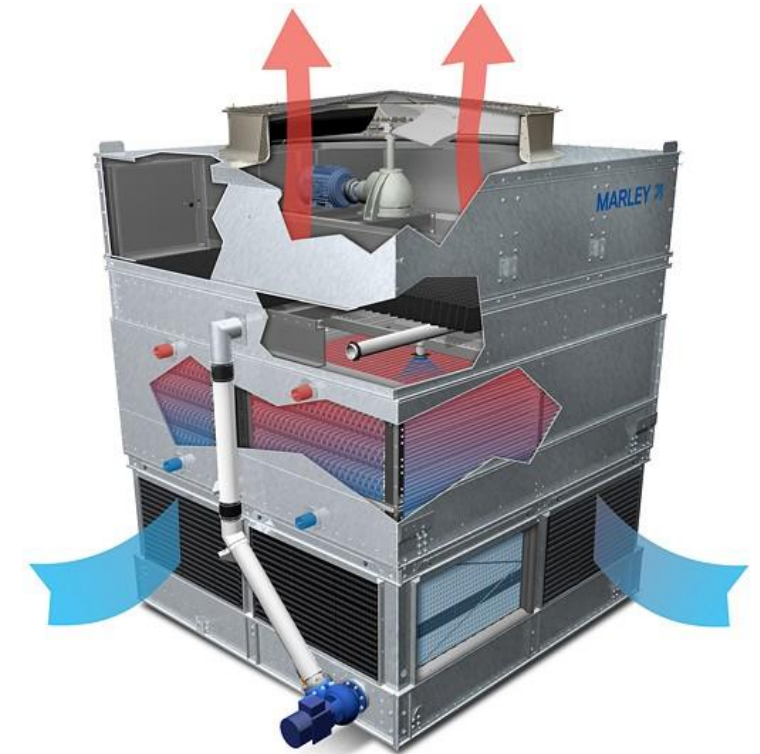
- Water loop heat pump heat rejection circulation pump shutdown now required on closed-circuit cooling towers

CE129

- Parking garage exhaust reduction controls
 - Threshold reduced to 8000 cfm
 - Controls sensor specifications match IMC

CE135

- Hotel guest room temperature and ventilation controls
 - Clarification of operating modes
 - Reduce occupant sensor shutoff from 30 min to 20 min



HVAC Controls: Supply Air Temperature Reset with Dehumidification C403.6.5

CE125

- Adjusts requirements for multiple zone supply air temperature reset.
- In warm moist climate zones (0A to 3A)
 - Exception for
 - Small systems <3000 cfm (CZ 2A <10,000 cfm)
 - 80% or more outside air and ERV (50% ERR)
 - Requires supply air temperature reset while dehumidifying; usually requires
 - separate outdoor air cooling coil or
 - return air bypass
 - Lock out economizer during dehumidification

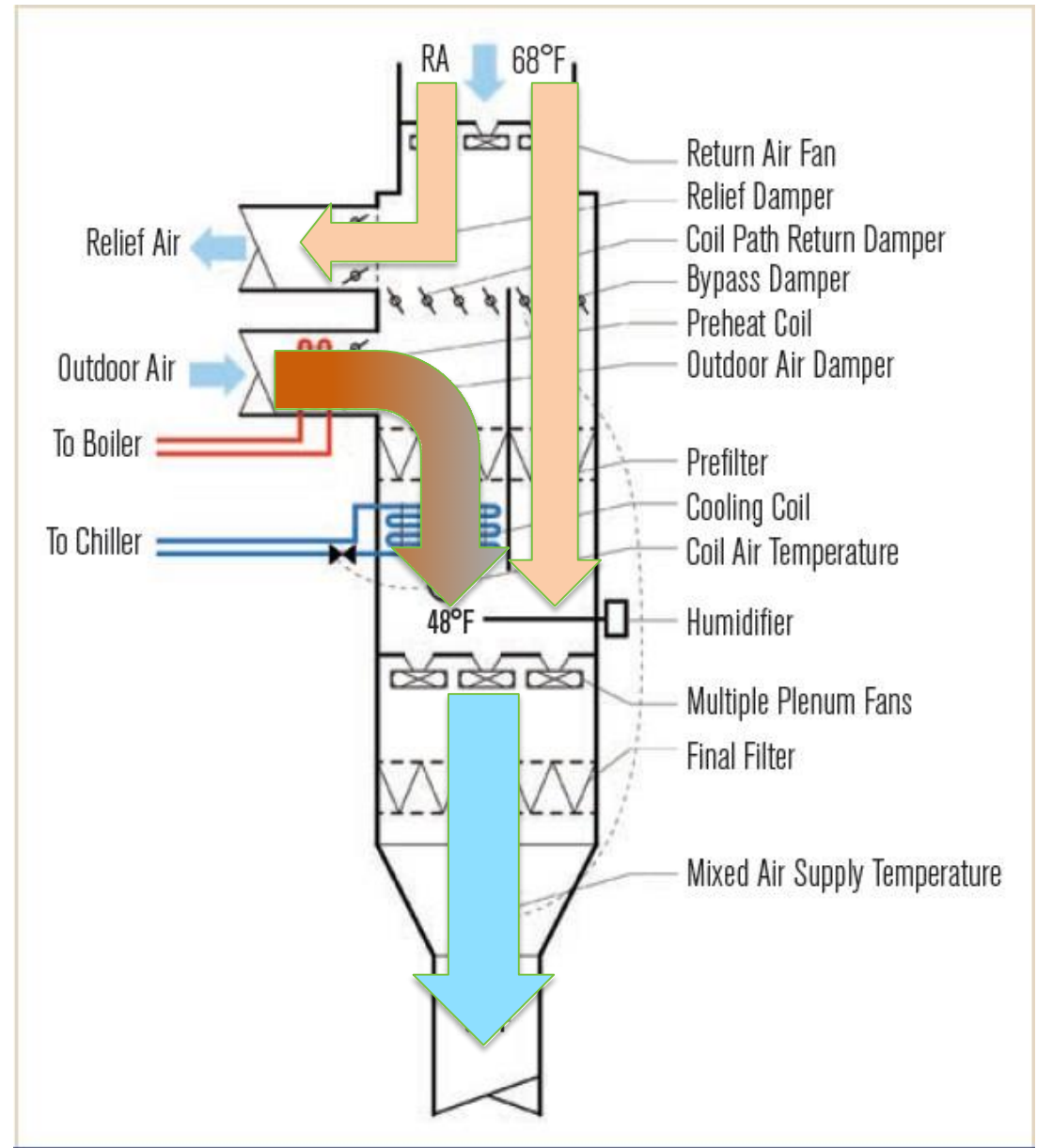


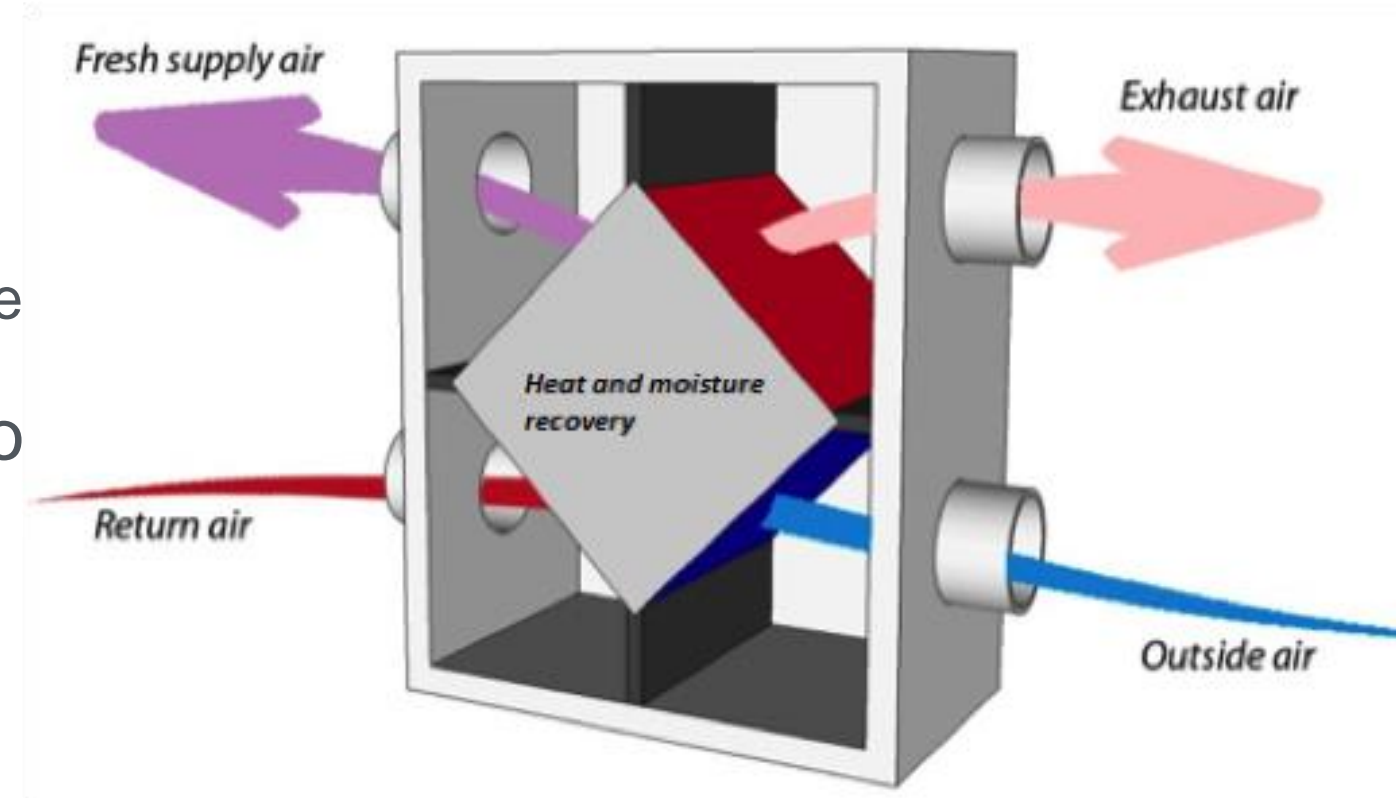
FIGURE 1 Coil bypass air-handling unit, basic configuration.

Energy Recovery Changes

C403.7.4, C403.9.6

CE133

- Adds residential (apartment) exhaust energy recovery requirements
 - Climate zone 3C exempt
 - Smaller (<500 ft²) apartments exempt in Climate Zones 0, 1, 2, 3, 4C, 5C
- Defines Enthalpy Recovery Ratio (ERR) to match ASHRAE (not AHRI effectiveness)
- Requires 50% cooling / 60% heating ERR



CE143

- Requires chiller heat recovery for reheat in hospitals
 - 300 or more tons of chiller capacity with simultaneous heating and cooling
 - Except in Climate Zones 5C, 6B, 7, and 8
 - Except where $\geq 60\%$ of reheat is renewable or otherwise recovered

General system modifications

C403.10, C404.9, C404.10, C405.8.2

CE146

- Refrigeration efficiency
 - Section duplication eliminated
 - Updated to match federal requirements

CE160

- Pool & Spa cover exception for solar or heat pump pool heating reduced from 75% to 70% annual pool heating energy

CE213

- Escalator or moving walk speed controls based on traffic analysis
- Power recovery language clarified and tied to traffic analysis



Data Centers, Performance Path, Net Zero Energy

C202, C401.2, C401.3, C403.1, C403.1.2, C407.5.1, New Appendix

CE108

- Computer room definition changed to < 20 watts per ft^2 or < 10 kW equipment; larger are “Data Centers”
- Data centers referred to ASHRAE Standard 90.4 with updated design mechanical load component (MLC) values
- Changes to performance path (C407):
 - Proposed performance must be 80% rather than 85% of baseline building (CE49)
 - Standard reference design walls to be the same as proposed (CE247)

CE264

- New Appendix for *zero code renewable energy standard*
 - *Alternative approach jurisdictions may adopt using renewable offsets to achieve zero net building energy use*



Large Service Hot Water System Efficiency

C404.2.1

CE 156

- Large ($\geq 1,000,000$ Btu/h) service hot water system efficiency increases from 90% to 92%
- capacity weighted average

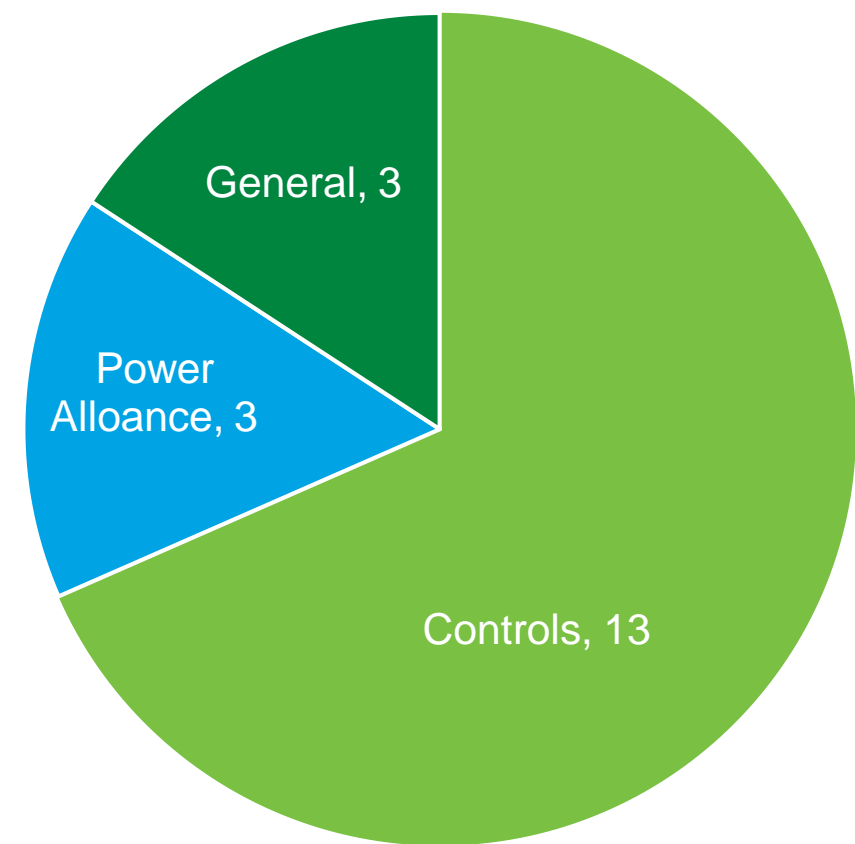


Lighting and Power

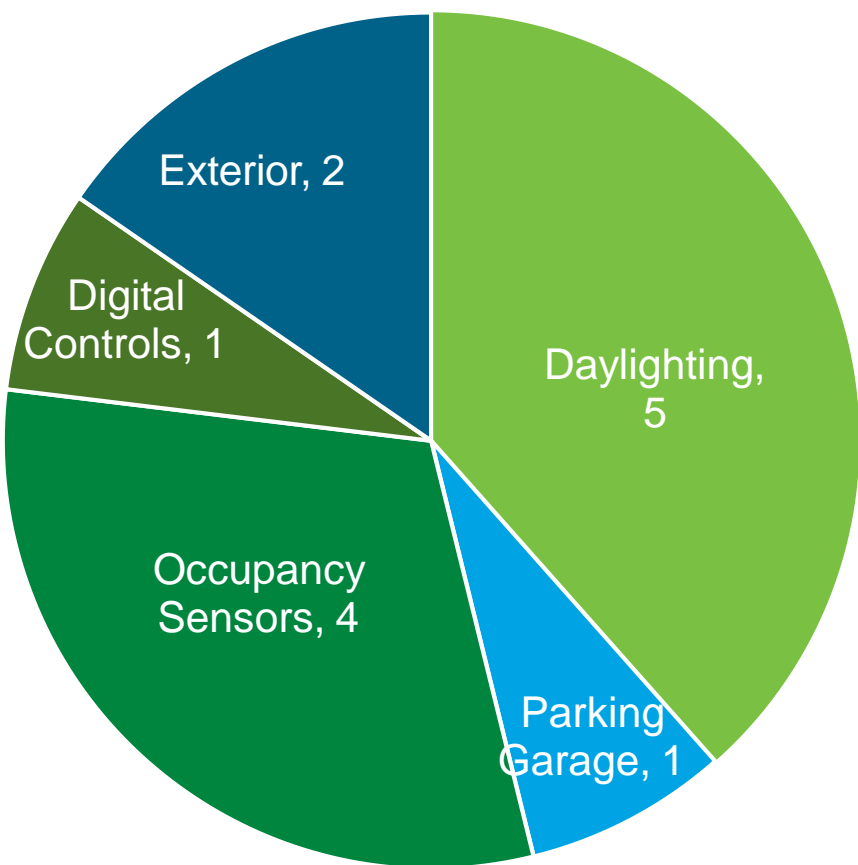
2021 IECC Building Lighting Proposals

19 Building Lighting Proposals approved for IECC 2021

Proposals by Lighting Component



Lighting Controls Proposals



Lighting for Plant Growth and Maintenance

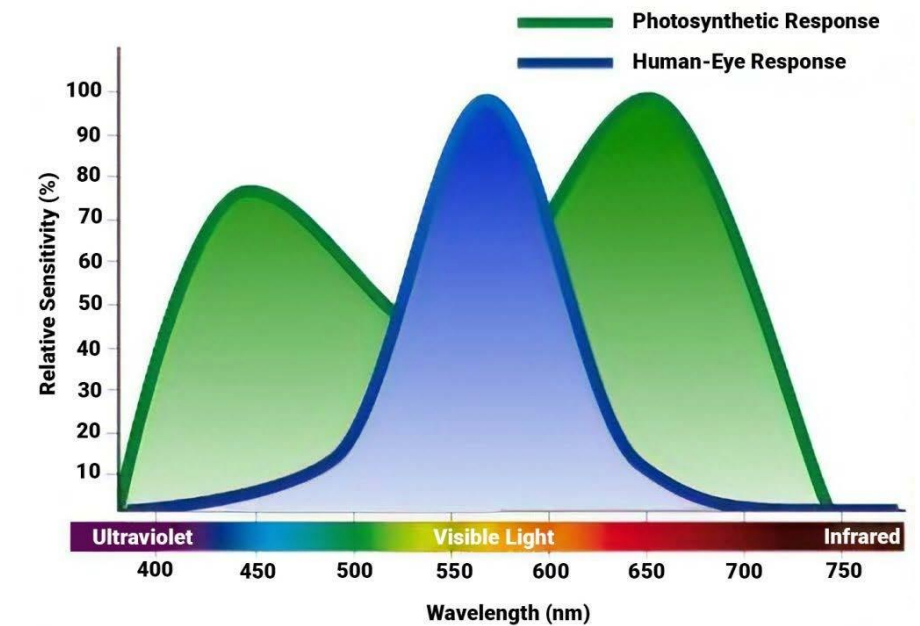
C405.4

CE 209

- At least 95% of the permanently installed luminaires used for plant growth and maintenance shall have a photon efficiency of not less than 1.6 mmol/J rated in accordance with ANSI/ASABE S640

Background:

- Controlled-Environmental Horticulture (CEH) expected to increase in the future
- Requirement is the same as photosynthetic photon efficacy (PPE) – industry standard metric related to horticulture
- Typical lighting metrics use lumens, but lumens are for humans
- PPE is for plants



Antimicrobial Lighting

C405.3.1

CE 201

- Modifies C405.3.1 related to the total connected interior lighting power
- Adds 1 more to the existing 19 items of connected power from lighting equipment and applications NOT included in the total connected lighting power

Background:

- Light on low end of visual spectrum ($\approx 405 - 420$ nm) or UV-C
- This lighting can inhibit the growth of microbes
- Typical spaces include medical facilities, gyms, locker rooms, kitchens, restrooms, and places where general health may be a concern



General Lighting

C403.10.2, C405.1, C405.2.3

CE 161

- Modifies the definition to “Interior lighting that provides a substantially uniform level of illumination through a space.”
- C403.10.2 states that general lighting shall consist of all lighting when calculating the total connected interior lighting power

Interior Lighting Power Allowances: Building Area Method C405.3.2(1)

CE 206

- Many of the building area method values decreased
- A few building type LPD values increased

Building Area Type	LPD (w/ft²)
Automotive facility	0.71 0.75
Convention center	0.76 0.64
Courthouse	0.90 0.79
Dining: bar lounge/leisure	0.90 0.80
Dining: cafeteria/fast food	0.79 0.76
Dining: family	0.78 0.71
Dormitory	0.61 0.53
Exercise center	0.65 0.72
Fire station	0.53 0.56
Gymnasium	0.68 0.76
Health care clinic	0.82 0.81
Hospital	1.05 0.96

(partial
table)

Interior Lighting Power Allowances: Space-by-Space Area Method C405.3.2(2)

CE 208

- Many of the building area method values decreased
- A few building type LPD values increased

Space Type	LPD (w/ft²)
Food Preparation Area	1.06 1.09
Guestroom	0.77 0.41
Laboratory	
In or as a classroom	1.20 1.11
Otherwise	1.45 1.33
Laundry / washing area	0.43 0.53
Loading dock, interior	0.58 0.88
Lobby	
For an elevator	0.68 0.65
Visually impaired facility	2.03 1.69
In a hotel	1.06 0.51
In a motion picture theater	0.45 0.23

(partial
table)

Interior Lighting Power Allowances: Space-by-Space Area Method C405.3.2.2

CE 202

- C405.3.2 – Interior lighting power allowance | Buildings with unfinished spaces shall use the Space-by-Space Method
- C405.3.2.2 Space-by-Space Method | If a building has unfinished spaces, the lighting power allowance for the unfinished spaces shall be the total connected power for those spaces, or 0.2 watts per square foot, which is less
- Addresses core and shell buildings



Daylighting Changes

C405.2.2.2, C405.2.3, C405.2.3.1, C405.2.3.2

CE 182/185/187/190/191

- C405.2.2.2
 - Removes exception “Light reduction controls are not required *daylight zones* with *daylight responsive controls* complying with Section C405.2.3.
- Expands to all spaces with daylight-responsive controls that full range is required
 - “Daylight responsive controls shall dim lights continuously from full light output to 15% of full light output or lower”
- Clarifies additional language related to daylight responsive controls
- Adds a secondary sidelit zone
- Revises sidelit zone

Parking Garage Lighting Control

C405.2.7

CE 199

- Adds multiple control requirements for parking garage lighting
- Automatic time-switch
- Automatically reduce lighting by 30% when no activity in a lighting zone for 20 minutes, zone must be less than 3600 ft²
- In the daylight transition zone at entrances and exits, the lighting shall be separately controlled that reduces lighting at night
- Lighting w/in 30' of perimeter opening or fenestration shall reduce in response to daylight by at least 50%.



Occupancy Sensors

C405.2.1.2, 405.2.1, C405.2.1.1, C405.2.1.3

CE 166/167/169/172

- Adds corridors to the list of spaces where occupancy sensors are required
 - Must reduce by 50% full power w/in 20 minutes of occupants leaving the space
- Modifies occupancy sensors in warehouses – lighting in each aisleway must be independent, sets 20 minutes as the timeout
- Incorporates a requirement that for manual control to allow occupants to turn off lights
- Adds an exception to occupancy sensors in open plan offices which states, where general lighting is turned off by time-switch control complying with Section C405.2.2.1



Enhanced Digital Lighting Controls

C406.4

CE 231

- Adds general to lighting in the building that is required to have enhanced lighting controls
- Removed a provision for individual user control of overhead general illumination in open offices

Background:

- Previously written applied to **ALL** lighting in a required space, but many decorative fixtures would have a challenge or not be able to meet the previous requirement
- Previous individual control – was that of the fixture over a given workstation or the entire open plan?
- Previous individual control added wiring / design complexity

Exterior Lighting

C405.2.6.3, C405.4.1

CE 198/210

- Luminaires serving outdoor parking with a wattage > 78 W and a mounting height $\leq 24'$ shall be controlled so that the lighting is reduced by at least 50% after 15 minutes of inactivity
- Removes the requirement for exterior lighting power that “powered through the energy service for the building”



Lighting and **Power**

2021 IECC Building Power / Electrical Proposals

Building Power / Electrical items approved for IECC 2021

- Voltage drop
- Metering and monitoring
- Automatic receptacle controls

Voltage drop

C405.9

CE 214

- Retitled from “Voltage drop in feeders and branch circuits” → “Voltage drop”
- Text changed from “combination of feeders” to “combination of customer-owned service conductors, feed conductors and branch circuits conductors...”
- Reduces inconsistency and application in compliance

Metering and Monitoring

C405.10, C405.10.1 – C405.10.5

CE 215

- C405.10 Energy Monitoring (Mandatory) – Buildings 25,000 ft² or larger
- C405.10.1 Electrical energy metering
- C405.10.2 End-use metering categories
- C405.10.3 Meters
- C405.10.4 Data acquisition system
- C405.10.5 Graphical energy report

Load Category	Description
Total HVAC System	Heating, cooling and ventilation
Interior Lighting	Lighting w/in the building
Exterior Lighting	Lighting NOT w/in the building
Plug Loads	Devices, appliances, and equipment connected to receptacle outlets
Process Loads	Any load that exceeds 5% of peak connected load
Building Operations & Misc. Loads	Remaining loads NOT already covered

Automatic Receptacle Control

C405.10

CE 216

1. 50% of all 125 V, 15 & 20-amp receptacles installed in enclosed offices, conference rooms, rooms used primarily for copy or print functions, breakrooms, classrooms, and individual workstations, including those installed in modular partitions and module office workstation systems.
2. At least 25% of branch circuit feeders installed for modular furniture not shown on the construction documents.

Functions:

- Scheduled basis using time-of-day, limited to 5,000 ft² or a single floor
 - Occupancy sensor turns off within 20 minutes of all occupants leaving
 - An automated signal from another control or alarm system that turns off within 20 minutes
-
- Plug-in devices shall NOT comply – MUST be hardwired



Energy Credits

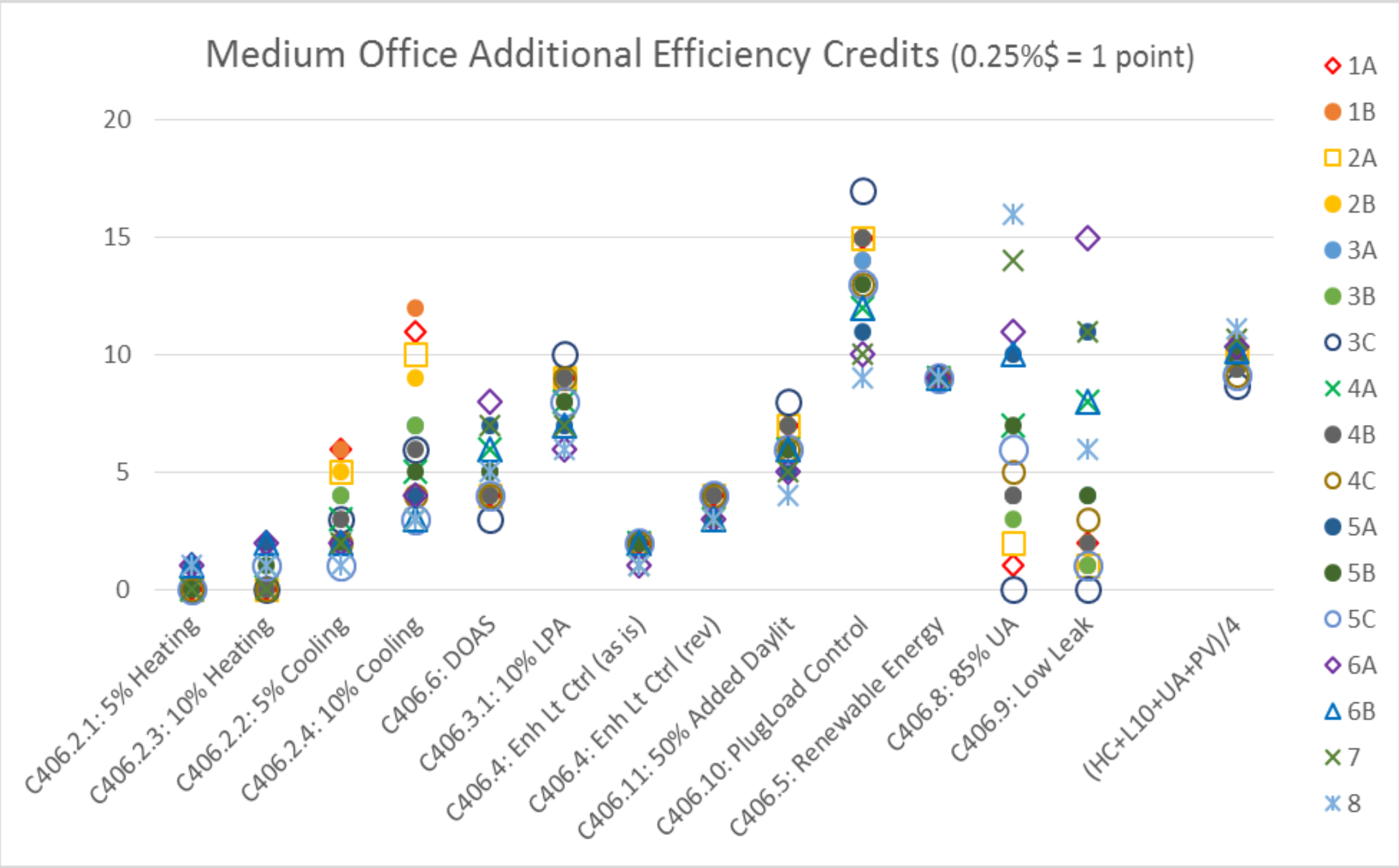
Energy Credits

C406

- Old extra efficiency in C406 based on “pick one” approach
CE218, CE226
- New extra efficiency made several changes
 - Assigned “credits” to each item by climate zone and building type
 - General goal was to equalize savings achieved
 - 10 credit requirement represents about 2.5% total building energy cost savings
- Modifications to existing credits
 - HVAC split to heating and cooling separately with 5% and 10% efficiency improvements
 - Lighting allows added credits above 15% LPD reduction
 - Credits for sleeping/dwelling unit lighting efficacy

Energy Credits are Savings-Based

C406



New Energy Credits C406

CE224

- Extends HVAC cooling savings up to 15%

CE237, CE239

- Energy monitoring and FDD when not otherwise required

CE240

- Kitchen equipment (especially fryers)



Energy Credit Table Example

C406

CE218

- Most credits table based, some are formulas
- Separate tables:
 - Office (Group B)
 - Multifamily (R) & Institutional (I)
 - Schools (E)
 - Retail (M)
 - Other than above
- Uniform Target
 - 10 credits = 2.5% cost savings
- Tenant infill
 - 5 Credits

C406.1

Table C406.1(1) Additional Energy Efficiency Credits for Group B Occupants

<u>Climate Zone:</u>	<u>1A</u>	<u>1B</u>	<u>2A</u>	<u>2B</u>	<u>3A</u>	<u>3B</u>	<u>3C</u>	<u>4A</u>	<u>4B</u>	<u>4C</u>	<u>5A</u>	<u>5B</u>	<u>5C</u>	<u>6A</u>	<u>6B</u>	<u>7</u>	<u>8</u>
<u>C406.2.1: 5% Heating</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>1</u>	<u>NA</u>	<u>NA</u>	<u>1</u>	<u>1</u>	<u>NA</u>	<u>1</u>
<u>C406.2.2: 5% Cooling</u>	<u>6</u>	<u>6</u>	<u>5</u>	<u>5</u>	<u>4</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>
<u>C406.2.3: 10% Heating</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>1</u>	<u>NA</u>	<u>NA</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>NA</u>	<u>1</u>
<u>C406.2.4: 10% Cooling</u>	<u>11</u>	<u>12</u>	<u>10</u>	<u>9</u>	<u>7</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>6</u>	<u>4</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>3</u>
<u>C406.3.1: 10% LPA</u>	<u>9</u>	<u>8</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>10</u>	<u>8</u>	<u>9</u>	<u>9</u>	<u>7</u>	<u>8</u>	<u>8</u>	<u>6</u>	<u>7</u>	<u>7</u>	<u>6</u>
<u>C406.4: Digital Lt Ctrl</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>1</u>
<u>C406.5: Renewable</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>
<u>C406.6: DOAS</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>5</u>	<u>3</u>	<u>2</u>	<u>5</u>	<u>3</u>	<u>2</u>	<u>7</u>	<u>4</u>	<u>5</u>	<u>3</u>
<u>C406.7.1: SWH HR</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<u>C406.7.2: SWH NG eff</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<u>C406.7.3: SWH HP</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<u>C406.8: 85% UA</u>	<u>1</u>	<u>4</u>	<u>2</u>	<u>4</u>	<u>4</u>	<u>3</u>	<u>NA</u>	<u>7</u>	<u>4</u>	<u>5</u>	<u>10</u>	<u>7</u>	<u>6</u>	<u>11</u>	<u>10</u>	<u>14</u>	<u>16</u>

Tables expanded with added credits

Thank You!

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Energy Code Resources:

Building Energy Codes Program

www.energycodes.gov/training

BECP help desk

<https://www.energycodes.gov/HelpDesk>