

C103.2 Information on construction documents.

1. Energy compliance path.
2. Insulation materials and their R-values.
3. Fenestration U-factors and solar heat gain coefficients (SHGCs).
4. Area-weighted U-factor and solar heat gain coefficient (SHGC) calculations.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.
7. Economizer description.
8. Equipment and system controls.
9. Fan motor horsepower (hp) and controls.
10. Duct sealing, duct and pipe insulation and location.
11. Lighting fixture schedule with wattage and control narrative.
12. Location of daylight zones on floor plans.
13. Air barrier and air sealing details, including the location of the air barrier.



Prescriptive Path

COMMERCIAL

- Insulation component Rvalue-based method
- · Assembly U-factor, Cfactor, or F-factor method
- · Component performance alternative

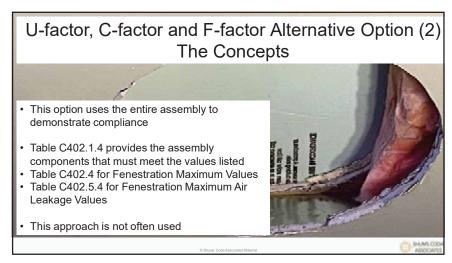


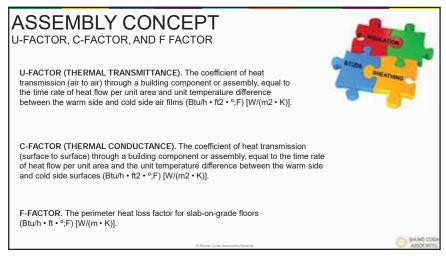
Insulation and Fenestration Criteria Option The Concepts • The project follows the book for requirements It's the concept of tell me what to do Table C402.1.3 for Opaque Assembly Minimum R-Values Table C402.4 for Fenestration Maximum Values Table C402.5.4 for Fenestration Maximum Air Leakage Values Most straightforward approach for prescriptive

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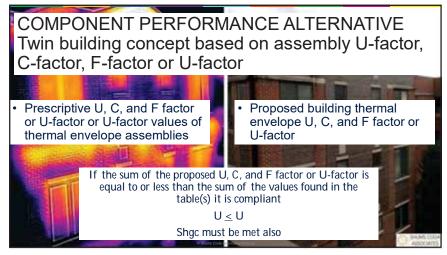
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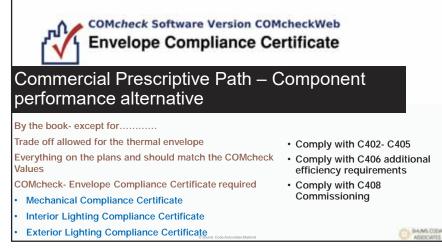
Commercial Prescriptive Path - Insulation component R-value-based method No trade- off Comply with C402- C405 By the book Comply with C406 additional Everything on the plans efficiency requirements No specific required reports, but Comply with C408 Commissioning • Mechanical Compliance Certificate · Interior Lighting Compliance Certificate • Exterior Lighting Compliance Certificate











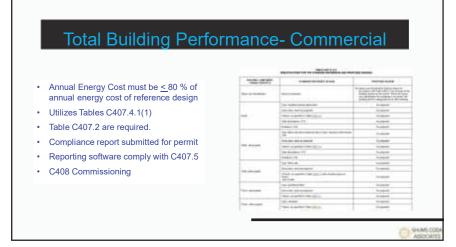


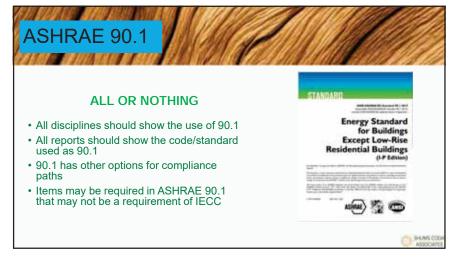
CONCEPTS

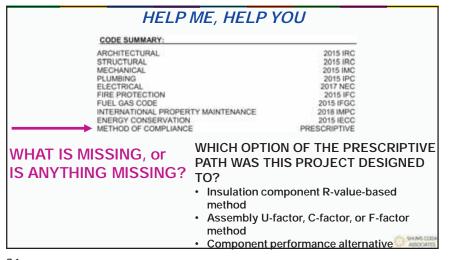
ONCEPTS

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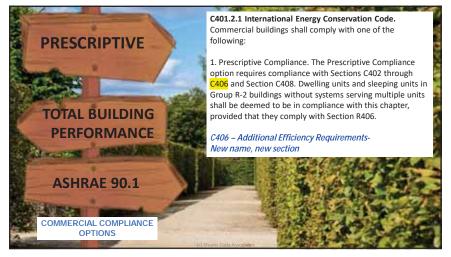


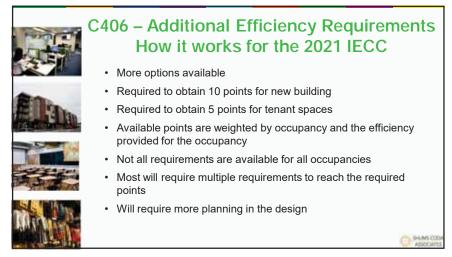


• Code analysis
• List
Compliance
Path

WHAT IS MISSING?

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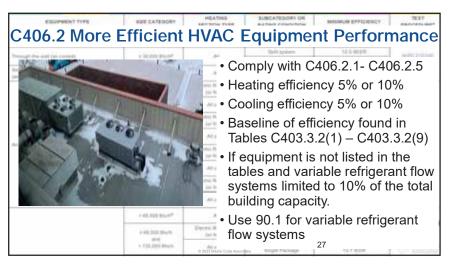


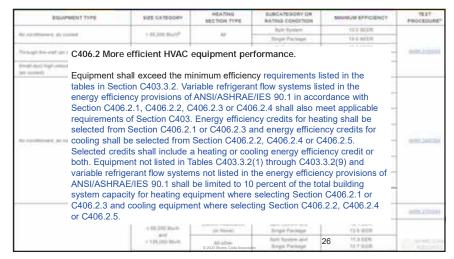
C406.1 Additional Energy Efficiency Credit Requirements

- 1. More efficient HVAC performance in accordance with Section C406.2.
- 2. Reduced lighting power in accordance with Section C406.3.
- 3. Enhanced lighting controls in accordance with Section C406.4.
- 4. On-site supply of renewable energy in accordance with Section C406.5.
- 5. Provision of a dedicated outdoor air system for certain HVAC equipment in accordance with Section C406.6.
- 6. High-efficiency service water heating in accordance with Section C406.7.
- 7. Enhanced envelope performance in accordance with Section C406.8.
- 8. Reduced air infiltration in accordance with Section C406.9
- 9. Where not required by Section C405.12, include an energy monitoring system in accordance with Section C406.10.
- 10. Where not required by Section C403.2.3, include a fault detection and diagnostics (FDD) system in accordance with Section C406.11.
- 11. Efficient kitchen equipment in accordance with Section C406.12.



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C406.3 Reduced Lighting Power.

Buildings shall comply with Section C406.3.1 or C406.3.2, and dwelling units and sleeping units within the building shall comply with Section C406.3.3.

C406.3.1 Reduced lighting power by more than 10 percent.

The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be less than 90 percent of the total lighting power allowance calculated in accordance with Section C405.3.2.

C406.3.2 Reduced lighting power by more than 15 percent.

Where the total connected interior lighting power calculated in accordance with Section C405.3.1 is less than 85 percent of the total lighting power allowance calculated in accordance with Section C405.3.2, additional energy efficiency credits shall be determined based on Equation 4-13, rounded to the nearest whole number.

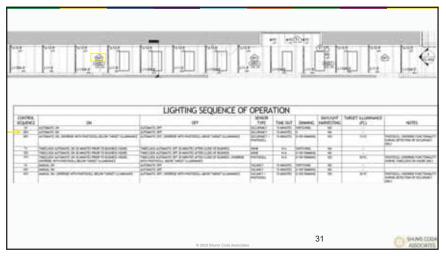
THIS ONE MAY BE ALL YOU NEED

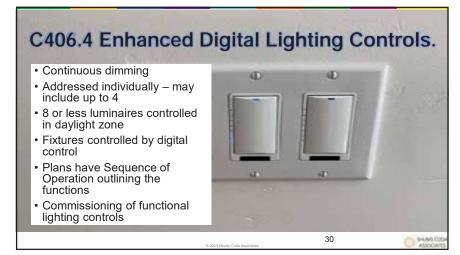
C406.4 Enhanced digital lighting controls.

Interior lighting in the building shall have the following enhanced lighting controls that shall be located, scheduled and operated in accordance with Section C405.2.1 through C405.2.3.

- 1. Luminaires shall be configured for continuous dimming.
- Luminaires shall be addressed individually. Where individual addressability is not available for the luminaire class type, a controlled group of not more than four luminaries shall be allowed.
- 3. Not more than eight luminaires shall be controlled together in a daylight zone.
- Fixtures shall be controlled through a digital control system that includes the following function:
 - 1. Control reconfiguration based on digital addressability.
 - 2. Load shedding.
 - 3. Individual user control of overhead general illumination in open offices.
 - 4. Occupancy sensors shall be capable of being reconfigured through the digital control system.
- Construction documents shall include submittal of a Sequence of Operations, including a specification outlining each of the functions in Item 4.
- 6. Functional testing of lighting controls shall comply with Section C4089

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LIGHTING SEQUENCE OF OPERATION



C406.5 On-site Renewable Energy.
Buildings shall comply with Section C406.5.1 or C406.5.2

C406.5.1 Basic renewable credit.

The total minimum ratings of on-site renewable energy systems, not including systems used for credits under Sections C406.7.2, shall be one of the following:

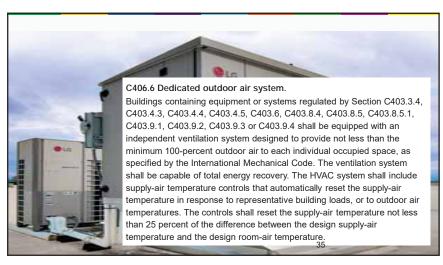
- Not less than 0.86 Btu/h per square foot (2.7 W/m2) or 0.25 watts per square foot (2.7 W/m2) of conditioned floor area.
- Not less than 2 percent of the annual energy used within the building for building mechanical and service water-heating equipment and lighting regulated in Section C405.

C406.5.2 Enhanced renewable credit. Where the total minimum ratings of onsite renewable energy systems exceeds the rating in Section C406.5.1, additional energy efficiency credits shall be determined based on Equation 4-14, rounded to the nearest whole number.

AEEC ... - AEEC .. - ARAGR.

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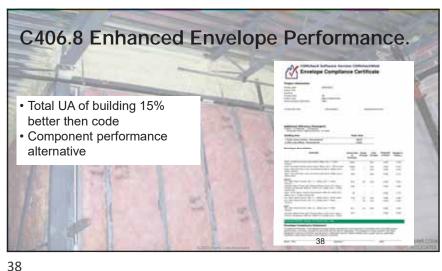
C406.7.1 Reduced Energy Use. In Service Water Heating.

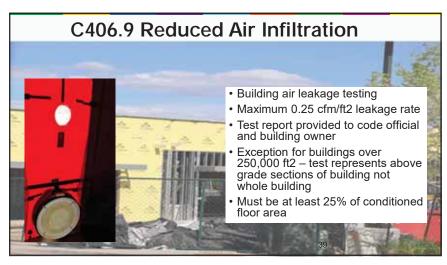
Buildings shall be of the following types to use this compliance method:

- Group R-1: Boarding houses, hotels or motels.
- Group I-2: Hospitals, psychiatric hospitals and nursing homes
- Group A-2: Restaurants and banquet halls or buildings containing food preparation areas.
- · Group F: Laundries.
- Group R-2.
- · Group A-3: Health clubs and spas.
- Group E: Schools with full-service kitchens or locker rooms with showers.
- Buildings showing a service hot water load of 10 percent or more of total building energy loads, as shown with an energy analysis as described in Section C407.









C406.10 Energy monitoring. Buildings shall be equipped to measure, monitor, record and report energy consumption data in compliance with Sections C406.10.1 through C406.10.5. LOAD CATEGORY DESCRIPTION OF ENERGY USE leating, cooling and ventilation, including but not limited to C406.10.1 Electrical energy fans, pumps, boilers, chillers and water heating. Energy used metering by 120-volt equipment, or by 208/120-volt equipment that is Total HVAC system located in a building where the main service is 480/277-volt C406.10.2 End-use metering nower is permitted to be excluded from total HVAC system categories Lighting systems located within the building. • Table C406.10.2 ighting systems located on the building site but not within the xterior lighting • C406.10.3 Meters Devices, appliances and equipment connected to convenience lug loads eceptacle outlets. C406.10.4 Data acquisition Any single load that is not included in an HVAC, lighting or plug load category and that exceeds 5 percent of the peak system connected load of the whole building, including but not limited C406.10.5 Graphical energy o data centers, manufacturing equipment and commercial report The remaining loads not included elsewhere in this table, and other ncluding but not limited to vertical transportation systems

C406.11 Fault detection and diagnostics system.

A fault detection and diagnostics system shall be installed to monitor the HVAC system's performance and automatically identify faults. The system shall do all of the following: 1. Include permanently installed sensors and devices to



monitor the HVAC system's performance. Sample the HVAC system's performance at least once

- every 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 the HVAC system
- Be capable of transmitting the prioritized fault repair recommendations to remotely located authorized personnel.

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C406.12 Efficient kitchen equipment. For buildings and spaces designated as Group A-2 or

facilities that include a commercial kitchen with at least one gas or electric fryer, all fryers, dishwashers, steam cookers and ovens shall comply with all of the following:

- 1. Achieve performance levels in accordance with the equipment specifications listed in Tables C406.12(1) through C406.12(4) when rated in accordance with the applicable test procedure.
- 2. Be installed prior to the issuance of the Certificate of Occupancy.
- 3. Have associated performance levels listed on the construction documents submitted for permitting. Energy efficiency credits for efficient kitchen equipment shall be independent of climate zone and determined based on Equation 4-15, rounded to the nearest whole $AEEC_x = 20 = Area_x/Area_x$



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AD	DITIONAL EN	NERGY EFFIC		CRED		R GRO	UP B 0	CCUP	ANCIES	3							
SECTION							CLIN	MATE	ZONI	E							_
SECTION	0A & 1A	0B & 1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% heating efficiency improvement	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1	1	NA	1
C406.2.2: 5% cooling efficiency improvement	6	6	5	5	4	4	3	3	3	2	2	2	1	2	2	2	1
C406.2.3: 10% heating efficiency improvement	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1	1	2	2	NA	1
C406.2.4: 10% cooling efficiency improvement	11	12	10	9	7	7	6	5	6	4	4	5	3	4	3	3	3
C406.3: Reduced lighting power	9	8	9	9	9	9	10	8	9	9	7	8	8	6	7	7	6
C406.4: Enhanced digital lighting controls	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1
C406.5: On-site renewable energy	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
C406.6: Dedicated outdoor air	4	4	4	4	4	3	2	5	3	2	5	3	2	7	4	5	3
C406.7.2: Recovered or renewable water heating	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C406.7.3: Efficient fossil fuel water heater	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C406.7.4: Heat pump water heater	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C406.8: Enhanced envelope performance	1	4	2	4	4	3	NA	7	4	5	10	7	6	11	10	14	16
C406.9: Reduced air infiltration	2	1	1	2	4	1	NA	8	2	3	11	4	1	15	8	11	6
C406.10: Energy monitoring	4	4	4	4	3	3	3	3	3	3	2	3	2	2	2	2	2
C406.11: Fault detection and diagnostics system	2	2 0:	2 8023 Shui	2 ns Coda	1 ssociates	1	1	1	1	43	1	1	1	1	1	1	1

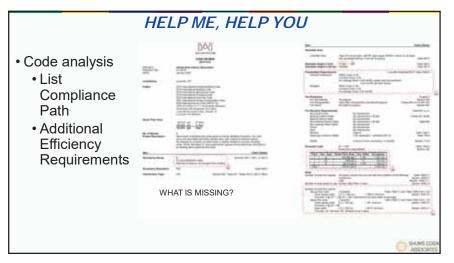
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C406.2.1: 5% heating efficiency improvement	NA	NA	NA	NA	1	NA	NA	1	NA	1	1	1	1	2	1	2	2
C406.2.2: 5% cooling efficiency improvement	3	3	2	2	1	1	1	1	1	NA	1	1	NA	1	1	1	NA
C406.2.3: 10% heating efficiency improvement	NA	NA	NA	NA	1	NA	NA	1	1	1	2	2	1	3	2	3	4
C406.2.4: 10% cooling efficiency improvement	5	5	4	3	2	3	1	2	2	1	1	1	1	1	1	1	1
C406.3: Reduced lighting power	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
C406.4: Enhanced digital lighting controls	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C406.5: On-site renewable energy	8	8	8	8	7	8	8	7	7	7	7	7	7	7	7	7	7
C406.6: Dedicated outdoor air system	3	4	3	3	4	2	NA	6	3	4	8	5	5	10	7	11	12
C406.7.2; Recovered or renewable water heating	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406.7.3: Efficient fossil fuel water heater	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406.7.4: Heat pump water heater	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406.8: Enhanced envelope performance	3	6	3	5	4	4	1	4	3	3	4	5	3	5	4	6	6
C406.9: Reduced air infiltration	6	5	3	11	6	4	NA	7	3	3	9	5	1	13	6	8	3
C406.10: Energy monitoring	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406.11: Fault detection and diagnostics	1	1 。	1 1023 Shur	s clas	ssoclates	1	NA	1	1	₩4	1	1	NA	1	1	1	1

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C406.2.1: 5% heating efficiency improvement	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	4
C406.2.2: 5% cooling efficiency improvement	4	4	3	3	2	2	2	2	1	1	1	1	NA	1	1	1	NA
C406.2.3: 10% heating efficiency improvement	NA	NA	NA	1	1	1	1	2	3	4	3	4	3	4	3	5	7
C406.2.4: 10% cooling efficiency improvement	7	8	7	6	5	4	3	4	3	1	2	2	1	2	2	2	1
C406.3: Reduced lighting power	8	8	8	9	8	9	9	8	9	9	8	9	8	7	8	7	7
C406.4: Enhanced digital lighting controls	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
C406.5: On-site renewable energy	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5
C406.6: Dedicated outdoor air system	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C406.7.2: Recovered or renewable water heating ^a	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C406.7.3: Efficient fossil fuel water heater ^a	NA	1	1	1	1	1	1	2	2	3	2	3	2	3	3	3	5
C406.7.4: Heat pump water heater ^a	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	1	1	NA	1	1	1	1
C406.8: Enhanced envelope performance	3	7	3	4	2	4	1	1	3	1	2	3	NA	4	3	6	9
C406.9: Reduced air infiltration	1	1	1	2	NA	NA	NA	NA	NA	NA	1	NA	NA	4	1	4	3
C406.10: Energy monitoring	3	3	3	3	3	3	3	3	3	2	2	3	2	2	2	2	2
C406.11: Fault detection and diagnostics system	1	2 02	1 023 Shuri	1 s Coda A	1 ssociates	1	1	1	1	45	1	1	1	1	1	1	2

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C406.2.1: 5% heating efficiency improvement	NA	NA	NA	NA	1	1	NA	1	1	2	2	2	2	3	2	3	Г
C406.2.2: 5% cooling efficiency improvement	5	6	4	4	3	3	1	2	2	1	1	2	NA	1	1	1	Ī
C406.2.3: 10% heating efficiency improvement	NA	NA	NA	1	1	1	1	2	2	4	3	4	5	5	3	6	Γ
C406.2.4: 10% cooling efficiency improvement	9	12	9	8	6	6	3	4	4	1	2	3	NA	2	2	2	Г
C406.3: Reduced lighting power	13	13	15	14	16	14	17	15	15	14	12	14	14	16	16	14	Γ
C406.4: Enhanced digital lighting controls	3	3	4	3	4	3	4	4	4	3	3	3	3	4	4	3	Г
C406.5: On-site renewable energy	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	Γ
C406.6: Dedicated outdoor air system	3	4	3	3	3	3	1	3	2	2	2	3	2	4	3	4	Γ
C406.7.2: Recovered or renewable water neating	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
C406.7.3: Efficient fossil fuel water heater	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
C406.7.4: Heat pump water heater	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Ī
C406.8: Enhanced envelope performance	4	6	3	4	3	3	1	6	4	4	4	5	4	6	5	8	Γ
C406.9: Reduced air infiltration	1	1	1	2	1	1	NA	3	1	1	3	2	1	7	3	6	Γ
C406.10: Energy monitoring	4	5	5	5	5	4	4	4	4	3	3	4	3	4	4	4	
C406.11: Fault detection and diagnostics	2	2	2 1023 Shur	2 ns Coda A	1 issociates	1	1	1	1	416	1	1	1	1	1	2	1

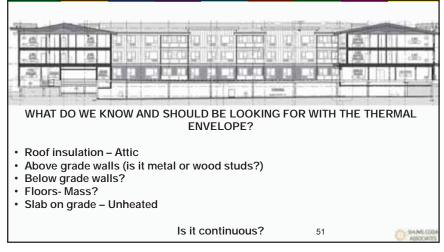
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SECTION	0A & 1A	0B & 1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
C406.2.1: 5% heating efficiency improvement	NA	NA	NA	NA	1	1	1	1	1	2	1	2	1	2	2	3	3
C406.2.2: 5% cooling efficiency improvement	5	5	4	4	3	3	2	2	2	1	1	2	1	1	1	1	1
C406.2.3: 10% heating efficiency improvement	NA	NA	NA	1	1	1	1	2	2	3	3	3	3	4	3	5	5
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C406.3: Reduced lighting power	8	8	9	9	9	9	10	8	9	9	7	8	8	8	8	8	7
C406.4: Enhanced digital lighting controls	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1
C406.5: On-site renewable energy	8	8	8	8	8	8	8	8	8	7	7	7	7	7	7	7	7
C406.6: Dedicated outdoor air system	3	4	3	3	4	3	2	5	3	3	5	4	3	7	5	7	6
C406.7.2: Recovered or renewable water heating ^b	10	9	11	10	13	12	15	14	14	15	14	14	16	14	15	15	15
C406.7.3: Efficient fossil fuel water heater ^b	5	5	6	6	8	7	8	8	8	9	9	9	10	10	9	10	11
C406.7.4: Heat pump water heater ^b	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
C406.8: Enhanced envelope performance	3	6	3	4	3	4	1	5	4	3	5	5	4	7	6	9	10
C406.9: Reduced air infiltration	3	2	2	4	4	2	NA	6	2	2	6	4	1	10	5	7	4
C406.10: Energy monitoring	3	3	3	3	3	3	3	3	3	3	2	3	2	2	2	3	2
C406.11: Fault detection and diagnostics system	2	2 © 202	2 3 Shums	2 Coda Asse	1 ciates	1	1	1	1 4	47 ₁	1	1	1	1	1	HANG MISOC	4

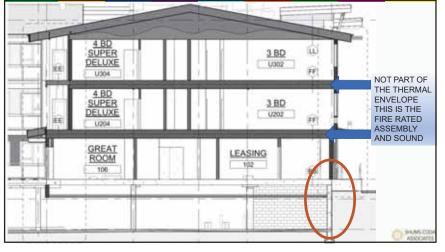




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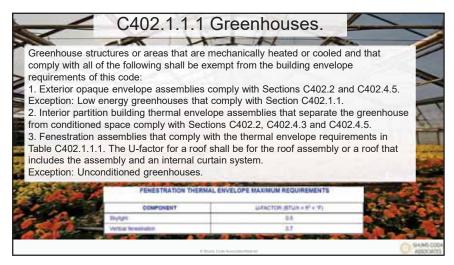




INSULATION ISN'T JUST FOR THERMAL RESISTANCE

• Thermal envelope- thermal resistance
• Fire resistance rated construction
• Sound attenuation
• Vapor retarder assembly

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ZONE	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
								Roo	fs							
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

C402.1.4.1 Roof/ceiling assembly.

The maximum roof/ceiling assembly U-factor shall not exceed that specified in Table C402.1.4 based on construction materials used in the roof/ceiling assembly.

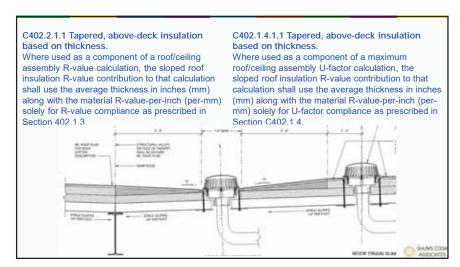
C402.2.1 Roof assembly.

The minimum thermal resistance (R-value) of the insulating material installed either between the roof framing or continuously on the roof assembly shall be as specified in Table C402.1.3, based on construction materials used in the roof assembly.

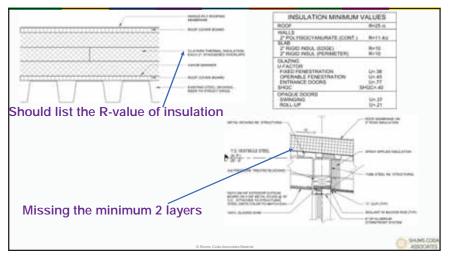
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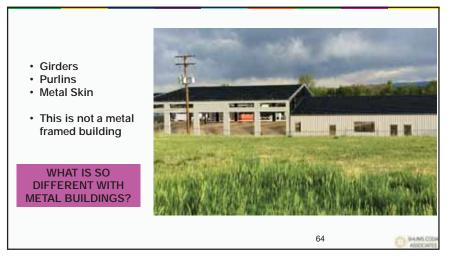


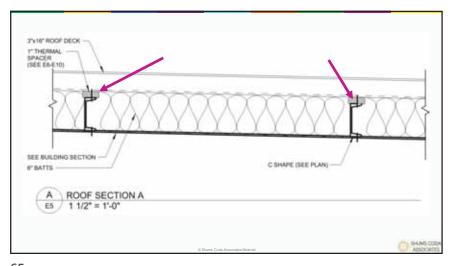
C402.1.4.1.3 Joints staggered. C402.2.1.4 Joints staggered. Continuous insulation board shall be installed Continuous insulation board shall be installed in not less in not less than two layers, and the edge than two layers and the edge joints between each layer of ioints between each laver of insulation shall insulation shall be staggered, except where insulation be staggered, except where insulation tapers tapers to the roof deck at a gutter edge, roof drain or to the roof deck at a gutter edge, roof drain or scupper. FULLY ADHERED EPOM MEMBRANE, RE-SPEC # 175323 COVER BOARD, RE: SPEC # 092116 CLAYERS 2.5' RIGID INSULATION: VAPOR RETARDER, RE: SPEC # 572500 ALS YOUR SWARFSHIP SUBSTRATE BOARD, RE-SPEC # 0501 M 3" METAL ROOF DECK, RE: SPEC #151101 SPRAY ON FIREPROOFING, 1 ROOF ASSEMBLIES HR RATED, RE: SPEC # 078/00

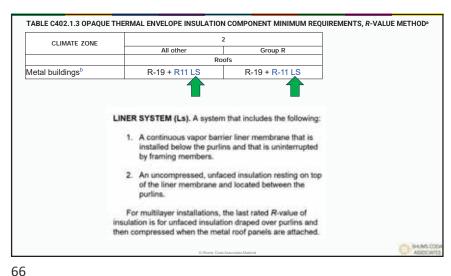


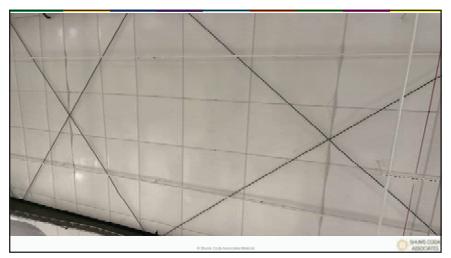


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								Roc	fs							
Metal buildingsb	R-19 +R-11 LS	R-19+R- 11 LS	R-19 +R11 LS	R-19 +R- 11 LS	R-25 +R- 11 LS	R-30 +R- 11 LS	R-30 +R- 11 LS	R-30 +R- 11 LS	R-25 +R-11+ R-11 LS	R-2 +R-1 R-11						
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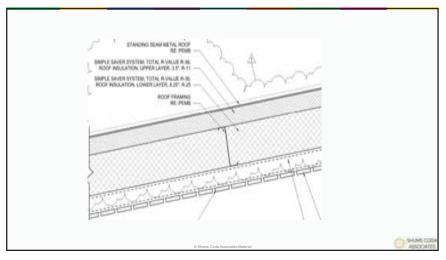










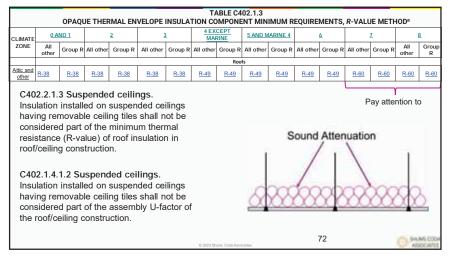


Simple Sever Roof Performance Values

The Emple Dane Roof System is a particular fully from the resultant against that is considered by a positive for make considered as 70% by year of factor than years and a support and a sup

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CLIMATE	0 A	ND 1		2		3	4 EXCEP	T MARINE	5 AND N	ARINE 4		6		7		8
	All other	Group R	All other	Group R	All other	Group R	AII other	Group R	AII other	Group R	All other	Group R	All other	Group R	All other	Group R
							Wall	ls, above gr	ade							
Massf	R 5.7cic	R- 5.7cic	R- 5.7cic	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	R13 + R-6.5ci	R-13 ± R-13ci	R-13 ± R-6.5ci	R-13 ± R-13ci	R-13 ± R-13ci	R-13 + R-14ci	R-13 + R-14ci	R-13 ± R-14ci	R-13 + R-14ci	R-13 ± R-14ci	R-13 ± R-17ci	R-13 + R- 19.5ci	R-13 +R- 19.5c i	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-10ci	R-13 ± R-10ci	R-13 + R- 12.5ci	R-13 + R- 12.5ci	R-13 + R- 12.5ci	R-13 + R- 15.6ci	R-13 ±R- 18.8c i	R-13 +R- 18.8ci
Wood framed and other	R-13 +R- 3.8ci orR-20	R-13 +R- 7.5ci orR20 +R3.8c	R-13 +R- 7.5ci orR-20 +R- 3.8ci	R-13 +R- 7.5ci orR-20 +R- 3.8ci	R-13 +R- 7.5ci orR-20 +R- 3.8ci	R-13 +R- 7.5ci orR-20 +R- 3.8ci	R-13 +R- 7.5ci orR-20 +R- 3.8ci	R-13 +R- 18.8c i	R-13 +R- 18.8ci							

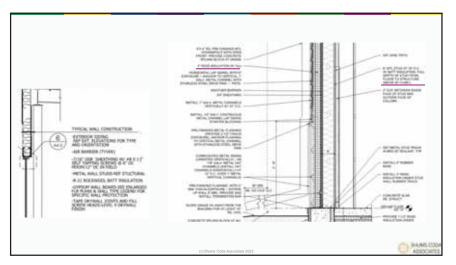
C402.2.2 Above-grade walls

Comply Table C402.1.3

The R-value of integral insulation installed in concrete masonry units shall not be used in determining compliance with Table C402.1.3 except as otherwise noted in the table. "Mass walls" where used as a component in the thermal envelope of a building shall comply with one of the following: Weigh not less than 35 pounds per square foot of wall surface area. Weigh not less than 25 pounds per square foot of wall surface area where the material weight is not more than 120 pcf. Have a heat capacity exceeding 7 Btu/ft2 • °;F
Have a heat capacity exceeding 5 Btu/ft2 • °;F
where the material weight is not more than 120

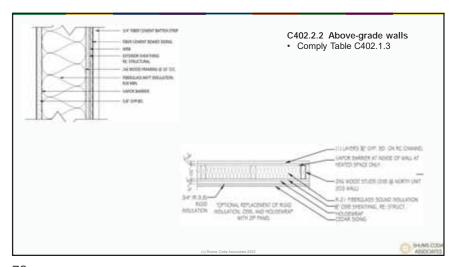
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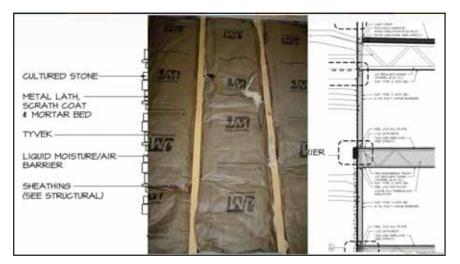


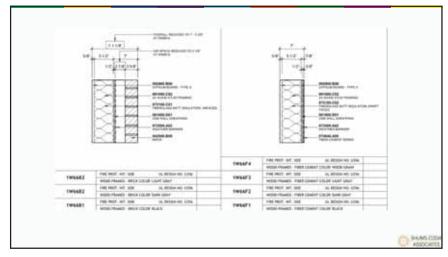


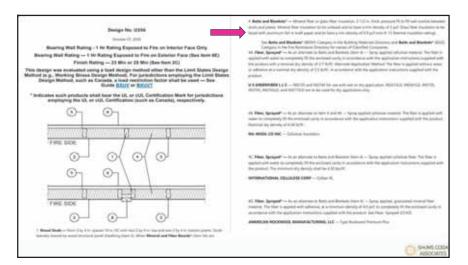
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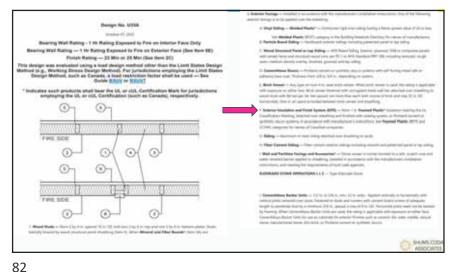


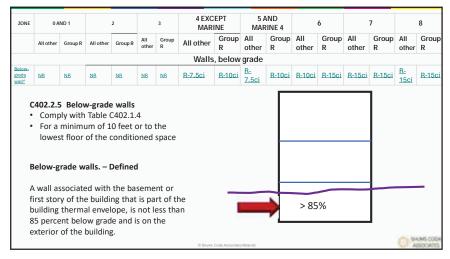




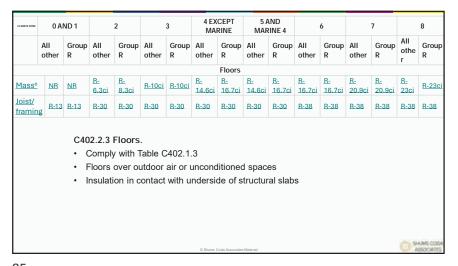


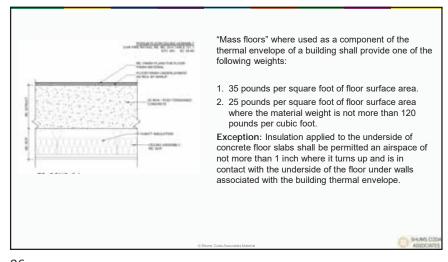


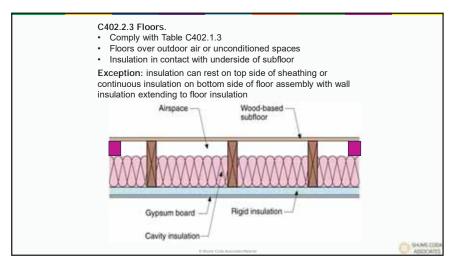




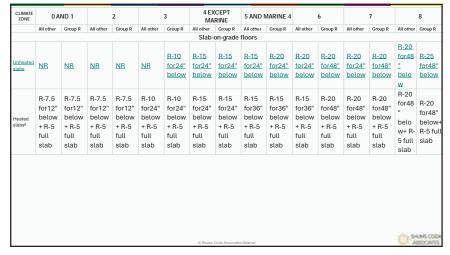








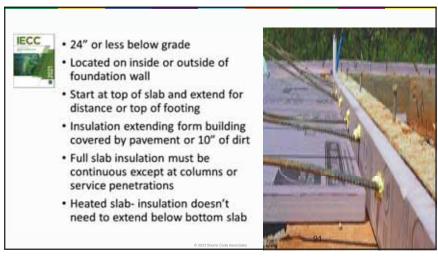


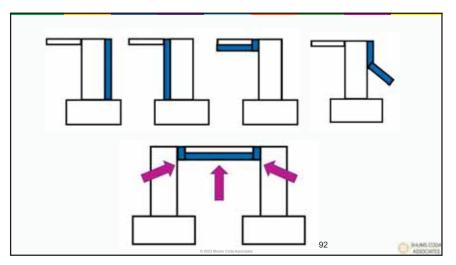


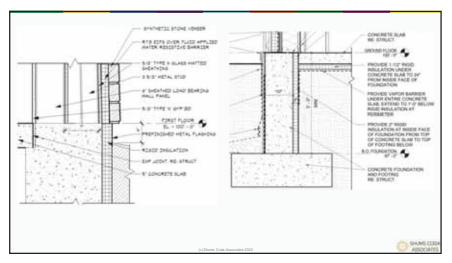
C402.2.4 Slabs-on-grade. The minimum thermal resistance (R-value) of the insulation for unheated or heated slab-on-grade floors designed in accordance with the R-value method of Section C402.1.3 shall be as specified in Table C402.1.3. C402.2.4.1 Insulation installation. Where installed, the perimeter insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The perimeter insulation shall extend downward from the top of the slab for the minimum distance shown in the table or to the top of the footing, whichever is less, or downward to not less than the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by not less than 10 inches (254 mm) of soil. 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. Exception: Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade, perimeter insulation is not required.

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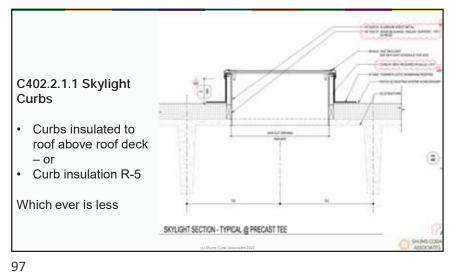




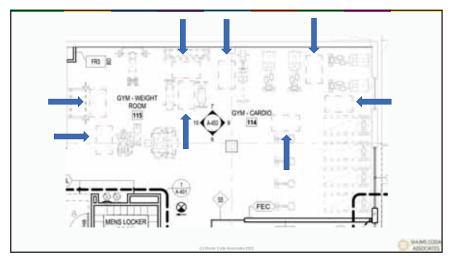






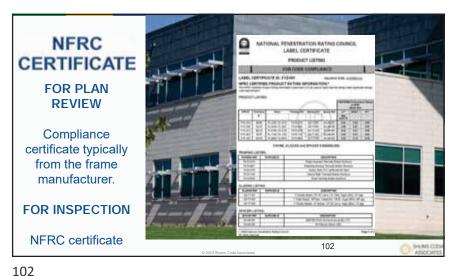






Т	ABLI	E C402.4	BUIL	DING EN	IVELO	PE FEN	ESTR	ATION N	1AXIN	ИИМ <i>U</i> -F	ACTO	R AND	SHGC	REQUIR	EMEN	NTS
CLIMATE ZONE	0	AND 1		2		3		XCEPT ARINE		AND RINE 4		6		7		8
						1		al fenestr	ation							
								<i>U</i> -factor								
Fixed fenestratior	ו	0.50	(0.45	(0.42	(0.36	(0.36	(0.34	(0.29	(0.26
Operable fenestratior	ו	0.62	(0.60	().54	(0.45	().45	(0.42	(0.36	(0.32
Entrance doors		0.83	().77	().68	(0.63	(0.63	(0.63	(0.63	(0.63
								SHGC								
	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable	Fixed	Operable
PF < 0.2	0.23	0.21	0.25	0.23	0.25	0.23	0.36	0.33	0.38	0.33	0.38	0.34	0.40	0.36	0.40	0.36
0.2 ≤ PF < 0.5	0.28	0.25	0.30	0.28	0.30	0.28	0.43	0.40	0.46	0.40	0.46	0.41	0.48	0.43	0.48	0.43
PF ≥ 0.5	0.37	0.34	0.40	0.37	0.40	0.37	0.58	0.53	0.61	0.53	0.61	0.54	0.64	0.58	0.64	0.58
							5	kylights								
U-factor	().70	().65	().55	(0.50	(0.50	(0.50	().44	(0.41
SHGC	(0.30	(0.30	(0.30	© 2023	40coda Asso	iates (0.40	(0.40		NR		NR

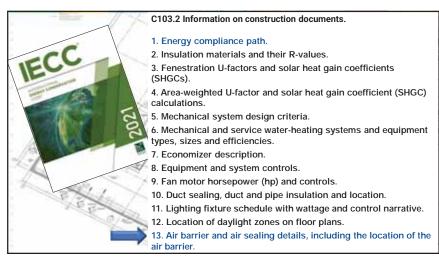


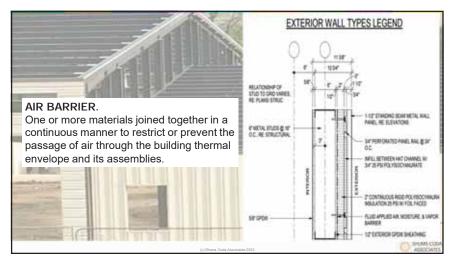


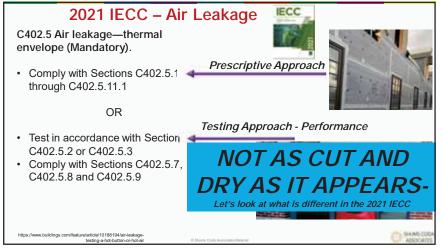
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Commercial Energy Reports	146	1.00	1	
Commercial Energy Reports	3.44	119		
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	\$4650 Street Street 4.75 4.75 4.95 4.95 4.95 4.95	Mairie Secret Militi - 200 - 201 - 200	Visible for them VI ' 0.75 0.75 0.80 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Overall (1)
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© 2023 Sharer Code Associate	\$4400 (State Detail)	Metric	Vicible for Stan VI	

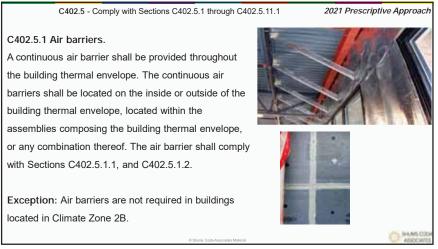
Thermal Trans pittance 1 (BTUhr • ft Overall U-Factor Glass U-Factor 0.48 0.61 0.46 0.59 0.44 0.58 0.42 0.56 NOTE: For glass values that are not listed, linear 0.40 0.55 interpolation is permitted. 0.38 0.53 1. U-Factors are determined in accordance with NFRC 100. 0.36 0.51 2. SHGC and VT values are determined in accordance with NFRC 200. 0.34 0.50 3. Glass properties are based on center of glass values and 0.32 0.48 are obtained from your glass supplier.

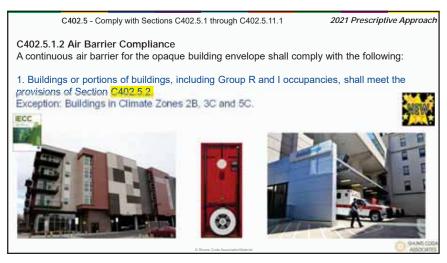
4. Overall U-Factor, SHGC, and VT Matricies are based on 0.30 the standard NFRC specimen size of 2,000 mm wide by 2,000 mm high (78-3/4" by 78-3/4"). 0.28 0.45 0.26 0.24 0.42 0.22 0.40 104 0.20 0.38











C402.5 - Comply with Sections C402.5.1 through C402.5.11.1

C402.5.2 Dwelling and sleeping unit enclosure testing.

The building thermal envelope shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.30 cfm/ft² (1.5 L/s m²) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa). Where multiple dwelling units or sleeping units or other occupiable conditioned spaces are contained within one building thermal envelope, each unit shall be considered an individual testing unit, and the building air leakage shall be the weighted average of all testing unit results, weighted by each testing unit's enclosure area. Units shall be tested separately with an unquarded blower door test as follows:

- 1. Where buildings have fewer than eight testing units, each testing unit shall be tested.
- 2. For buildings with eight or more testing units, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a ground floor unit and a unit with the largest testing unit enclosure area. For each tested unit that exceeds the maximum air leakage rate, an additional two units shall be tested, including a mixture of testing unit types and locations.

109 110

C402.5 - Comply with Sections C402.5.1 through C402.5.11.1

C402.5.2 Dwelling and sleeping unit enclosure testing.

The building thermal envelope shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.30 cfm/ft² (1.5 L/s m²) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa).

R402.4.1.2 Testing (RESIDENTIAL AIR TESTING REQUIREMENTS- not the full sections)

Exception: When testing individual dwelling units, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot [0.008 m3/(s × m2)] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pa), shall be permitted in all climate zones for:

- 1.Attached single and multiple-family building dwelling units.
- 2.Buildings or dwelling units that are 1,500 square feet (139.4 m²) or smaller.

.30 cfm/ft2 is equal to about 5 ach

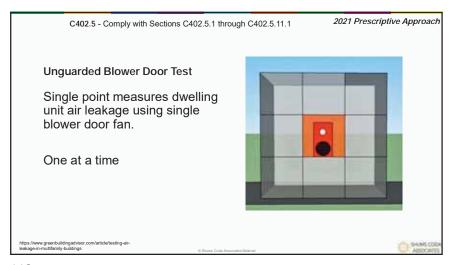


C402.5 - Comply with Sections C402.5.1 through C402.5.11.1

C402.5.2 Dwelling and sleeping unit enclosure testing.

The building thermal envelope shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.30 cfm/ft² (1.5 L/s m²) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa). Where multiple dwelling units or sleeping units or other occupiable conditioned spaces are contained within one building thermal envelope, each unit shall be considered an individual testing unit, and the building air leakage shall be the weighted average of all testing unit results, weighted by each testing unit's enclosure area. Units shall be tested separately with an unquarded blower door test as follows:





C402.5 - Comply with Sections C402.5.1 through C402.5.11.1

C402.5.2 Dwelling and sleeping unit enclosure testing.

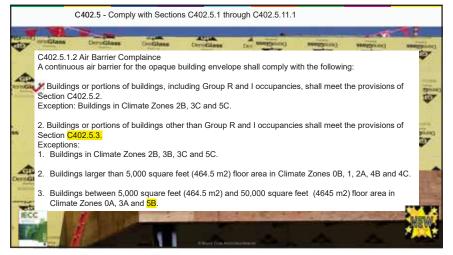
Units shall be tested separately with an unguarded blower door test as follows:

1. Where buildings have fewer than eight testing units, each testing unit shall be tested.

2. For buildings with eight or more testing units, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a ground floor unit and a unit with the largest testing unit enclosure area. For each tested unit that exceeds the maximum air leakage rate, an additional two units shall be tested, including a mixture of testing unit types and locations.

7 units - or
20%

113



C402.5 - Comply with Sections C402.5.1 through C402.5.11.1 2021 Prescriptive Approach

C402.5.3 Building thermal envelope testing.

116

The building thermal envelope shall be tested in accordance with ASTM E779, ANSI/RESNETI/CC 380, ASTM E3158 or ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.40 cfm/ft² (2.0 L/s × m²) of the building thermal envelope area at a pressure differential of 0.3 inch water gauge (75 Pa). Alternatively, portions of the building shall be tested and the measured air leakages shall be area weighted by the surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:

- 1. The entire envelope area of all stories that have any spaces directly under a roof.
- 2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are below grade.
- Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space.

Exception:Where the measured air leakage rate exceeds $0.40 \text{ cfm/ft}^2 (2.0 \text{ L/s} \times \text{m}^2)$ but does not exceed $0.60 \text{ cfm/ft}^2 (3.0 \text{ L/s} \times \text{m}^2)$, a diagnostic evaluation using smoke tracer or infrared imaging shall be conducted while the building is pressurized along with a visual inspection of the air barrier. Any leaks noted shall be sealed where such sealing can be made without destruction of existing building components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner, and shall be deemed to comply with the requirements of this section.

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C402.5 - Comply with Sections C402.5.1 through C402.5.11.1

2021 Prescriptive Approach

C402.5.3 Building thermal envelope testing.

The building thermal envelope shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E3158 or ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.40 cfm/ft2 (2.0 L/s × m2) of the building thermal envelope area at a pressure differential of 0.3 inch water gauge (75 Pa).



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C402.5 - Comply with Sections C402.5.1 through C402.5.11.1

2021 Prescriptive Approach

C402.5.3 Building thermal envelope testing.

Alternatively, portions of the building shall be tested and the measured air leakages shall be area weighted by the surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:

- 1. The entire envelope area of all stories that have any spaces directly under a roof.
- 2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are
 - 3. Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space



C402.5 - Comply with Sections C402.5.1 through C402.5.11.1 2021 Prescriptive Approach C402.5.3 Building thermal envelope testing.

Alternatively, portions of the building shall be tested and the measured air leakages shall be area weighted by the surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:

1. The entire envelope area of all stories that have any spaces directly under a roof.

C402.5 - Comply with Sections C402.5.1 through C402.5.11.1

1. The entire envelope area of all stories that have any spaces directly under a roof.

building leakage limit. In the alternative approach, the following portions of the building shall be tested:

Alternatively, portions of the building shall be tested and the measured air leakages shall be area weighted by the

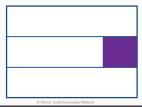
surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole

2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are 3. Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing

C402.5.3 Building thermal envelope testing.

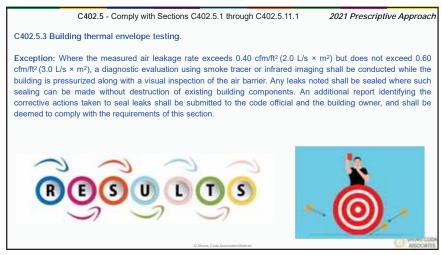
the remaining conditioned space.

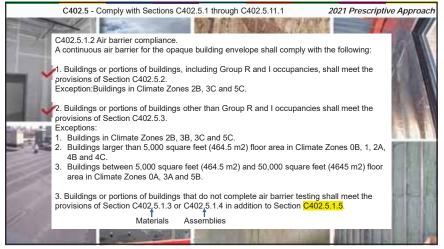
- 2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are
- 3. Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space.



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2021 Prescriptive Approach





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C402.5 - Comply with Sections C402.5.1 through C402.5.11.1 2021 Prescriptive Approach

C402.5.3 Building thermal envelope testing.

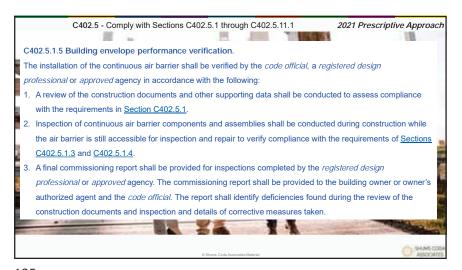
The building thermal envelope shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E3158 or ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.40 cfm/ft² ($2.0 \text{ L/s} \times \text{m}^2$) of the building thermal envelope area at a pressure differential of 0.3 inch water gauge (75 Pa). Alternatively, portions of the building shall be tested and the measured air leakages shall be area weighted by the surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:

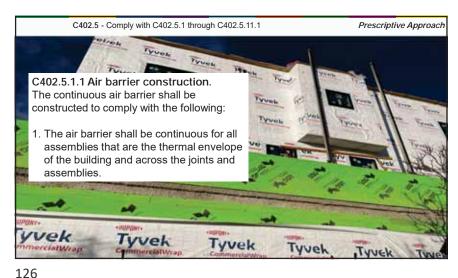
- 1. The entire envelope area of all stories that have any spaces directly under a roof.
- 2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are below grade.
- Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space.

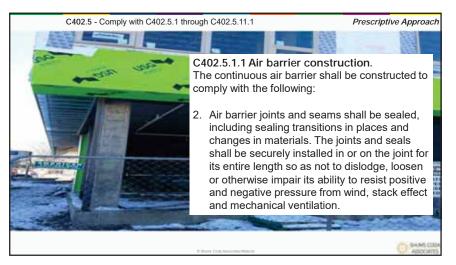
Exception:Where the measured air leakage rate exceeds 0.40 cfm/ft^2 ($2.0 \text{ L/s} \times \text{m}^2$) but does not exceed 0.60 cfm/ft^2 ($3.0 \text{ L/s} \times \text{m}^2$), a diagnostic evaluation using smoke tracer or infrared imaging shall be conducted while the building is pressurized along with a visual inspection of the air barrier. Any leaks noted shall be sealed where such sealing can be made without destruction of existing building components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner, and shall be deemed to comply with the requirements of this section.

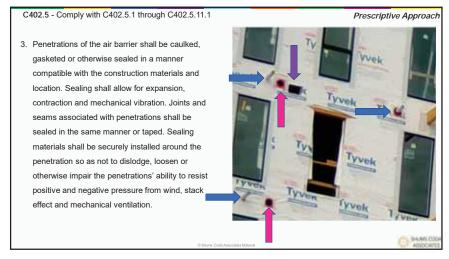
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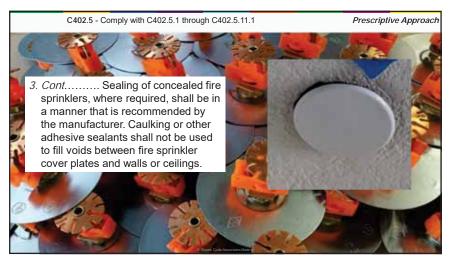


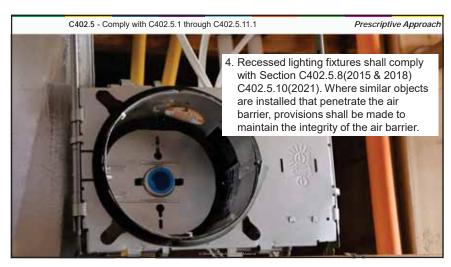


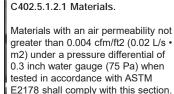












m2) under a pressure differential of 0.3 inch water gauge (75 Pa) when E2178 shall comply with this section. Materials in Items 1 through 16 shall be deemed to comply with this section, provided that joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.



- Plywood with a thickness of not less than 3/8"
- 2. Oriented strand board having a thickness of not less than 3/8"
- 3. Extruded polystyrene insulation board having a thickness of not less than 1/3"
- 4. Foil-back polyisocyanurate insulation board having a thickness of not less than 1/2"
- 5. Closed-cell spray foam having a minimum density of 1.5 pcf and having a thickness of not less than 1 1/2"
- 6. Open-cell spray foam with a density between 0.4 and 1.5 pcf and having a thickness of not less than 4.5 inches
- 7. Exterior or interior gypsum board having a thickness of not less
- 8. Cement board having a thickness of not less than 1/2"
- 9. Built-up roofing membrane
- 10. Modified bituminous roof membrane
- 11. Fully adhered single-ply roof membrane
- 12. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than 5/8"
- 13. Cast-in-place and precast concrete
- 14. Fully grouted concrete block masonry
- 15. Sheet steel or aluminum
- 16. Solid or hollow masonry constructed of clay or shale masonry

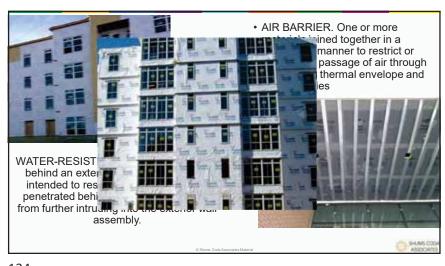
C402.5.1.2.2 Assemblies.

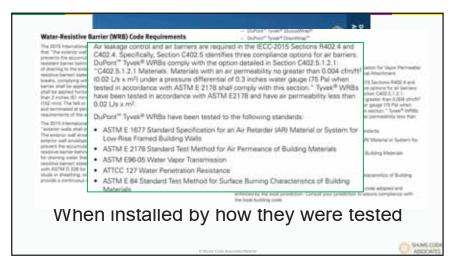
Assemblies of materials and components with an average air leakage not greater than 0.04 cfm/ under a pressure differential of 0.3 inch of water gauge (w.g.)(75 Pa) when tested in accordance with ASTM E2357, ASTM E1677 or ASTM E283 shall comply with this section. Assemblies listed in Items 1 through 3 shall be deemed to comply, provided that joints are sealed and the requirements of Section C402.5.1.1 are met.

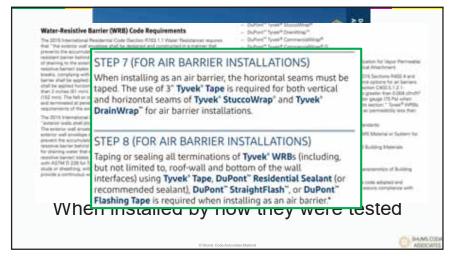
- 1. Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating.
- 2. Masonry walls constructed of clay or shale masonry units with a nominal width of 4 inches or more.
- 3. A Portland cement/sand parge, stucco or plaster not less than 1/2 inch in thickness.



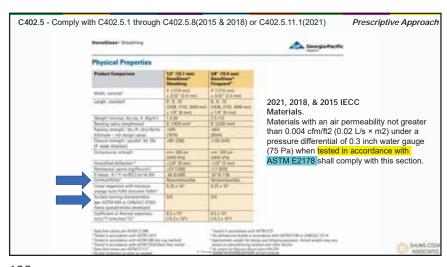


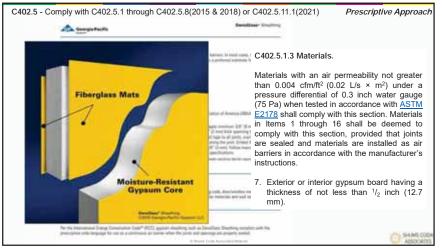


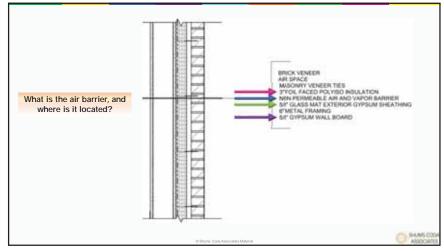




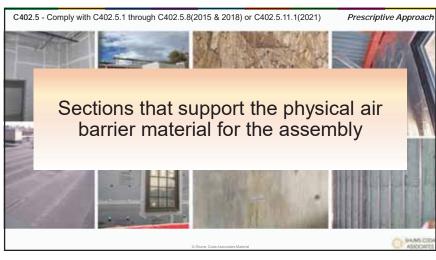












2021 IECC

C402.5.4 Air leakage of fenestration.

The air leakage of fenestration assemblies shall meet the provisions of <u>Table C402.5.4</u>. Testing shall be in accordance with the applicable reference test standard in <u>Table C402.5.4</u> by an accredited, independent testing laboratory and *labeled* by the manufacturer.

Exceptions:

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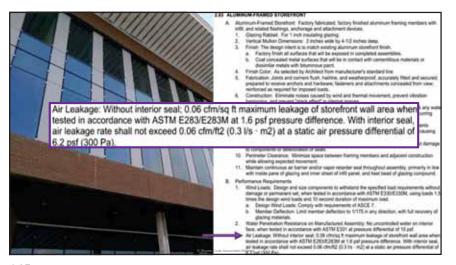
- Field-fabricated fenestration assemblies that are sealed in accordance with <u>Section C402.5.1</u>.
- 2. Fenestration in buildings that comply with the testing alternative of <u>Section C402.5</u> are not required to meet the air leakage requirements in <u>Table C402.5.4</u>.

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FENESTRATION ASSEMBLY	MAXIMUM RATE (CFM/FT²)	TEST PROCEDURE
Windows	0.20 ^a	
Sliding doors	0.20 ^a	
Swinging doors	0.20 ^a	AAMA/WDMA/CSA101/I.S.2/A440 or NF
Skylights—with condensation weepage openings	0.30	RC 400
Skylights—all other	0.20 ^a	
Curtain walls	0.06	
Storefront glazing	0.06	
Commercial glazed swinging entrance doors	1.00	NFRC 400 or ASTM E283 at 1.57 psf (75
Power-operated sliding doors and power operated folding doors	1.00	Pa)
Revolving doors	1.00	
Garage doors	0.40	
Rolling doors	1.00	ANSI/DASMA 105, NFRC 400, or ASTM
High-speed doors	1.30	E283 at 1.57 psf (75 Pa)



C402.5.6(2021 IECC) Doors and access openings to shafts, chutes, stairways and elevator lobbies.

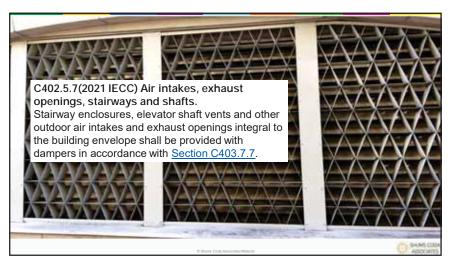
Doors and access openings from conditioned space to shafts, chutes stairways and elevator lobbies not within the scope of the fenestration assemblies covered by Section C402.5.4 shall be gasketed, weather-stripped or sealed.

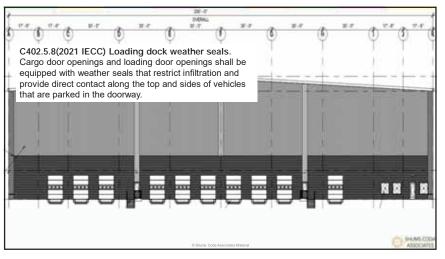
Exceptions:

1. Door openings required to comply with Section 716 of the International Building Code.

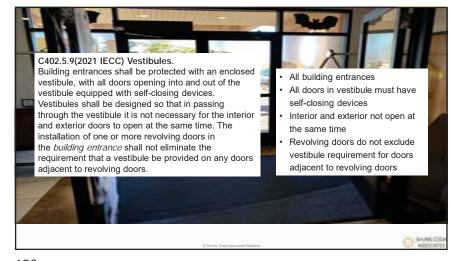
2. Doors and door openings required to comply with UL 1784 by the International Building Code.

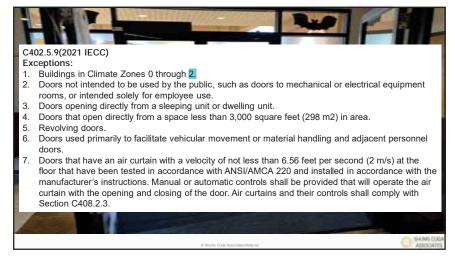
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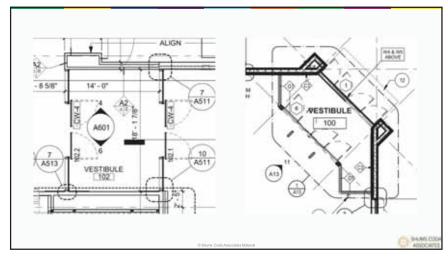














C402.5.10(2021 IECC) Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be all of the following:

1. IC-rated.

- Labeled as having an air leakage rate of not more 2.0 cfm (0.944 L/s) when tested in accordance with <u>ASTM E283 at a 1.57 psf</u> (75 Pa) pressure differential.
- 3. Sealed with a gasket or caulk between the housing and interior wall or ceiling covering.



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C402.5.11 Operable openings interlocking.

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Where occupancies utilize operable openings to the outdoors that are larger than 40 square feet (3.7 m2) in area, such openings shall be interlocked with the heating and cooling system so as to raise the cooling setpoint to 90° F (32° C) and lower the heating setpoint to 55° F (13° C) whenever the operable opening is open. The change in heating and cooling setpoints shall occur within 10 minutes of opening the operable opening.

- 1. Separately zoned areas associated with the preparation of food that contain appliances that contribute to the HVAC loads of a restaurant or similar type of occupancy.
- 2. Warehouses that utilize overhead doors for the function of the occupancy, where approved by the code official.
- The first entrance doors where located in the exterior wall and are part of a vestibule system.

C402.5.11.1 Operable controls.

Controls shall comply with Section C403.14.

C403.14 Operable opening interlocking controls.

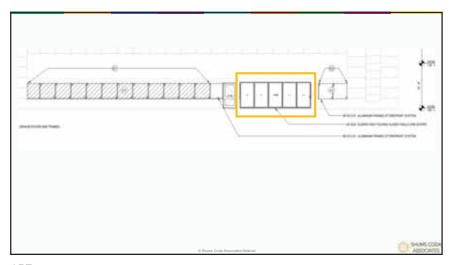
The heating and cooling systems shall have controls that will interlock these mechanical systems to the set temperatures of 90°F (32°C) for cooling and 55°F (12.7°C) for heating when the conditions of Section C402.5.8 exist. The controls shall configure to shut off the systems entirely when the outdoor temperatures are below 90°F (32°C) or above 55°F (12.7°C).

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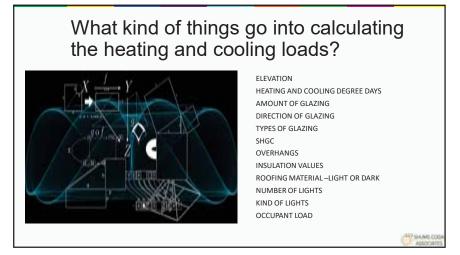


- Openings ≥40 sqft
- Heating systems setpoint to 55°F with opening opened
- Cooling systems setpoint to 90 °F with opening opened
- Setpoint changed within 10 minutes of opening being opened
- Interlocked with controls complaint with C403.14
- Exceptions for separately zoned food prep areas
- Warehouses as approved by code official
- First entrance doors

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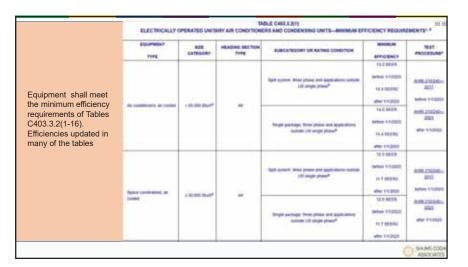


C403.3.1 Equipment sizing

The output capacity of heating and cooling equipment shall be not greater than that of the smallest available equipment size that exceeds the loads calculated in accordance with Section C403.1.1. A single piece of equipment providing both heating and cooling shall satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

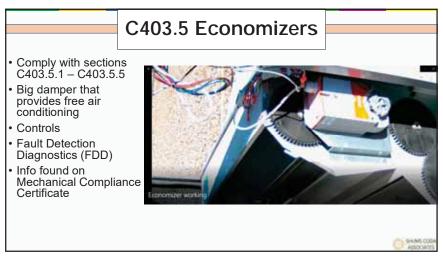
- Exceptions:
- Required standby equipment and systems provided with controls and devices that allow such systems or equipment to operate automatically only when the primary equipment is not operating.
- Multiple units of the same equipment type with combined capacities exceeding the design load and provided with controls that are configured to sequence the operation of each unit based on load.

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HEATING CAPACITY NET COOLING CAPACITY TOTAL MBH SENS MOH EFFICIENCY SEERIEER EAT (F) LAT (F) EFF STG EADB (F) EAWB (F) LADB (F) LAWB (F) REFRIG MIDH (ALT) STONE RATING 14.6 / 11.0 49.4 193 79.3 53.8 43.4 B-410A 14.6 / 11.3 79.3 128 79.3 51.8 49.4 R-410A 14.6711.0 H-410A 14.7 / 12.4 98.56 93.4 49.5 52 49.2 23 R-410A 14.0/11.3 43.5 140/120 TABLE C403.3.2[1] ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS. MINIMUM EFFICIENCY REQUIREM N.T.S. HEADING SECTION TEST SUBCATOOMY OR SATING CONDITION TIPE EFFICENCY 11.0 3019 Spir system, Street phone and oppositions nation ACTULITIES OF US single prices? VLA SCENE 45W 115 THE + 90 HE BUSY 140 0000 AHRICZ10240-DATING TAXABLE Named and Name. Name phase and apply officer after 1110003 suttorier LES single phone 15.4 900/07 after Exempt

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C403.5 through C403.5.5 Economizers

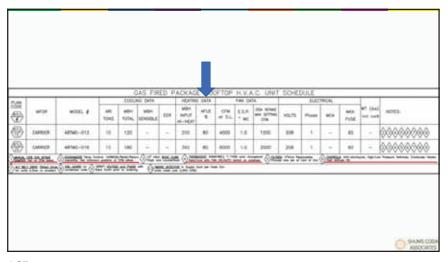
- Integrated economizer controls C403.5.1
- Economizer heating system impact C403.5.2
- Air economizer C403.5.3
 - Design capacity C403.5.3.1
 - Control signal C403.5.3.2
 - High limit shut off C403.5.3.3
 Relief of excess outdoor air C403.5.3.4
 - Economizer dampers C403.5.3.5
- · Water side economizer C403.5.4
- Design capacity C403.5.4.1
- Maximum pressure drop C403.5.4.2
- Economizer fault detection and diagnostics C403.5.5

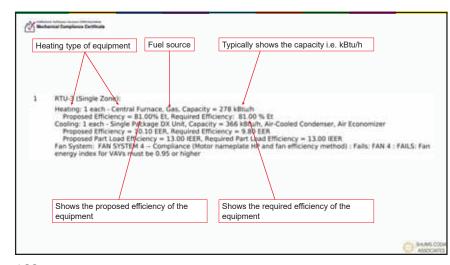


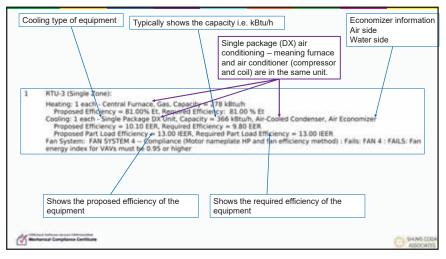
Economizer exceptions:

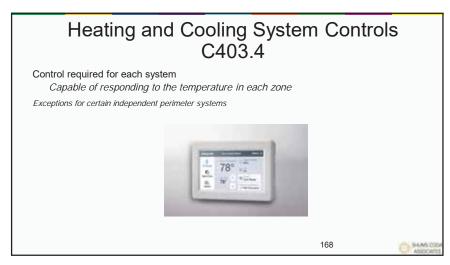
- Individual fan systems not served by chilled water in Climate Zones 0A, 0B, 1A and 1B
- Where more than 25% of the air designed to be supplied by the system is to spaces that are designed to be humidified above 35 degrees dewpoint temperature to satisfy process needs
- Systems expected to operate less than 20 hours per week.
- Systems serving supermarket areas with open refrigerated casework.
- Where the cooling efficiency is greater than or equal to the efficiency in Table C403.5(2) (Climate zones 2-4 only)
- Systems that include a heat recovery system in accordance with Section C403.10.5
- VRF systems installed with a dedicated outdoor air system.

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C403.4.1.1 Heat pump supplementary heat.

Heat pumps having supplementary electric resistance heat shall have controls that limit supplemental heat operation to only those times when one of the following applies:

- 2. The heat pump is operating in defrost mode.
- 3. The vapor compression cycle malfunctions.
- 4. The thermostat malfunctions.

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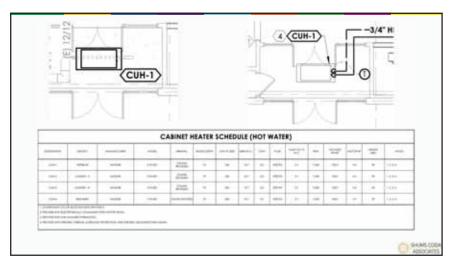
IECC C403.4.1.4

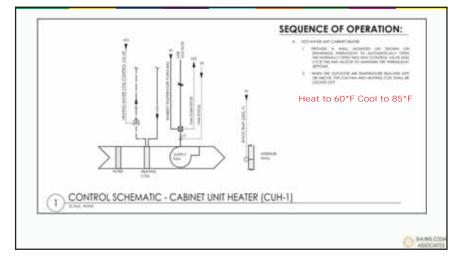
Heated or cooled vestibules

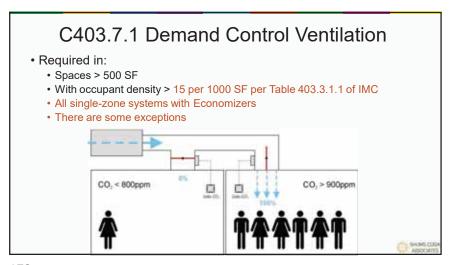
Requires separate thermostat within the vestibule to limit the amount of heating and

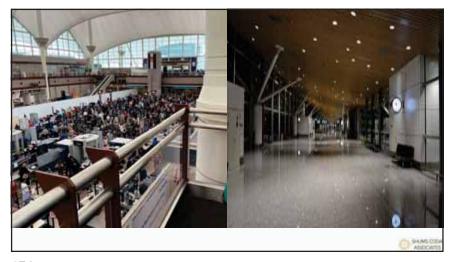
cooling within a vestibule

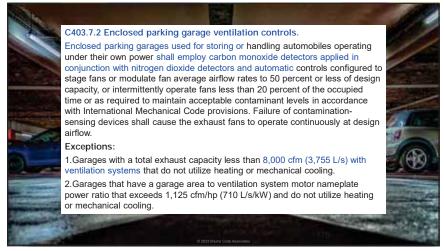
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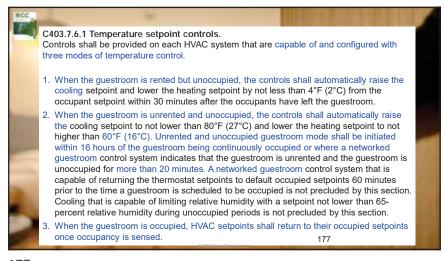






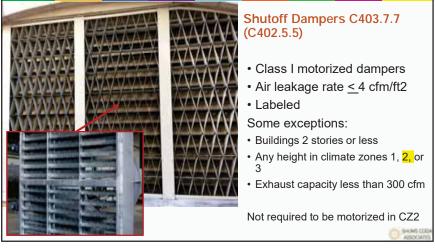


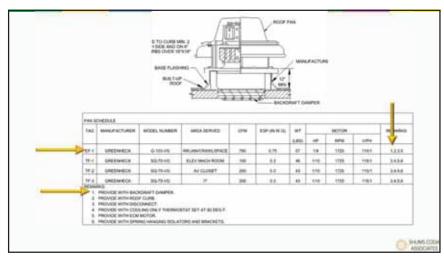




C403.7.6.2 Ventilation controls. Controls shall be provided on each HVAC system that are capable of and configured to automatically turn off the ventilation and exhaust fans within 20 minutes of the occupants leaving the guestroom, or isolation devices shall be provided to each guestroom that are capable of automatically shutting off the supply of outdoor air to and exhaust air from the guestroom. Exception: Guestroom ventilation systems are not precluded from having an automatic daily preoccupancy purge cycle that provides daily outdoor air ventilation during unrented periods at the design ventilation rate for 60 minutes, or at a rate and duration equivalent to one air change. 178 94MS CO

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Each HVAC system having a total fan system motor nameplate horsepower exceeding 5 hp (3.7 kW) at fan system design conditions shall not exceed the allowable fan system motor nameplate hp (Option 1) or fan system bhp (Option 2) shown in Table C403.8.1(1). This includes supply fans, exhaust fans, return/relief fans, and fan-powered terminal units associated with systems providing heating or cooling capability. Singlezone variable air volume systems shall comply with the constant volume fan power limitation.

Exceptions:

- 1. Hospital, vivarium and laboratory systems that utilize flow control devices on exhaust or return to maintain space pressure relationships necessary for occupant health and safety or environmental control shall be permitted to use variable volume fan power limitation.
- 2. Individual exhaust fans with motor nameplate horsepower of 1 hp (0.746 kW) or less are exempt from the allowable fan horsepower requirement.

TABLE C403 8-1(1) FAN POWER LIMITATION CHOT CONSTANT VOLUME VARIABLE VOLUME Cytics Y. Fast system motor nameptate by Resident August Court tp. c CFMs. + 0.0010 Codum 2: Fair suspens that Altocathe fact bystem this 200-Y CFM++ 0.00004 + A 186 c CPM, v 0 0011 v.A.

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C403.8.3 Fan efficiency.

Each fan and fan array shall have a fan energy index (FEI) of not less than 1.00 at the design point of operation, as determined in accordance with AMCA 208 by an approved independent testing laboratory and labeled by the manufacturer. Each fan and fan array used for a variable-air-volume system shall have an FEI of not less than 0.95 at the design point of operation, as determined in accordance with AMCA 208 by an approved independent testing laboratory and labeled by the manufacturer. The FEI for fan arrays shall be calculated in accordance with AMCA 208 Annex C.

Exceptions: The following fans are not required to have a fan energy index:

- 1. Fans that are not embedded fans with motor nameplate horsepower of less than 1.0 hp (0.75 kW) or with a nameplate electrical input power of less than 0.89 kW.
- 2. Embedded fans that have a motor nameplate horsepower of 5 hp (3.7 kW) or less, or with a fan system electrical input power of 4.1 kW or less.
- 3. Multiple fans operated in series or parallel as the functional equivalent of a single fan that have a combined motor nameplate horsepower of 5 hp (3.7 kW) or less or with a fan system electrical input power of 4.1 kW or less.
- 4. Fans that are part of equipment covered in Section C403.3.2.
- 5. Fans included in an equipment package certified by an approved agency for air or energy performance.
- 6. Ceiling fans, which are defined as nonportable devices suspended from a ceiling or overhead structure for circulating air via the rotation of the blades.
- 7. Fans used for moving gases at temperatures above 482°F (250°C).
- 8. Fans used for operation in explosive atmospheres.
- 9. Reversible fans used for tunnel ventilation.
- 10. Fans that are intended to operate only during emergency conditions.
- 11. Fans outside the scope of AMCA 208.

C403.8.2 Motor nameplate horsepower.

For each fan, the fan brake horsepower (bhp) shall be indicated on the construction documents and the selected motor shall be not larger than the first available motor size greater than the following:

- 1.For fans less than 6 bhp (4476 W), 1.5 times the fan brake horsepower.
- 2.For fans 6 bhp (4476 W) and larger, 1.3 times the fan brake horsepower.

Exceptions:

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- 1. Fans equipped with electronic speed control devices to vary the fan airflow as a function of load.
- 2.Fans with a fan nameplate electrical input power of less than 0.89 kW.
- 3.Systems complying with Section C403.8.1 fan system motor nameplate hp (Option 1).
- 4. Fans with motor nameplate horsepower less than 1 hp (746 W).

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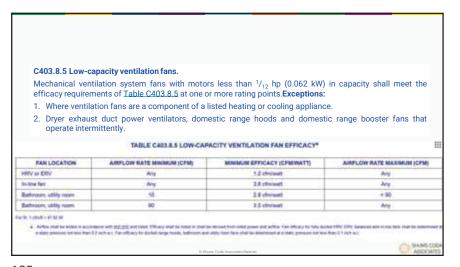
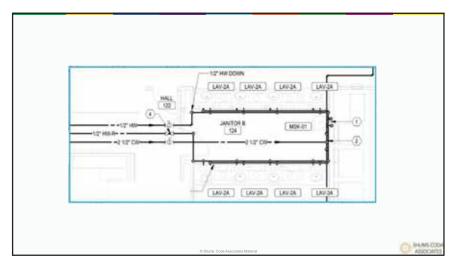


TABLE USED FOR BOTH PIPING FOR MECHANICAL HVAC SYSTEMS AND HOT WATER PIPING TABLE C403.12.3 MINIMUM PIPE INSULATION THICKNESS (in inches)^{a, a} INSULATION CONDUCTIVITY NOMINAL PIPE OR TUBE SIZE (Inches) Conductivity FLUID OPERATING TEMPERATURE RANGE AND Mean Rating 4 to 4 USAGE ("F) Bbu \times in $J/h \times ft^2$ Temperature, 'F 17/2 . "FJ" > 350 0.32-0.34 250 4.5 5.0 8.0 8.0 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 2.0 3.0 2.0 541-200 0.25-0.29 1.5 1.5 2.0 2.0 125 1.5 105-140 0:21-0:26 100 1.0 1.5 1.5 0.21-0.27 0.5 0.5 1.0 1.0 1.0 < 40 0.25-0.26 56 0.5 1.0 1.0 1,0 1.5 Fac St. 1 (each + 25 Amm, 10 + 2/4) - 32(4.8) a. For piping yearlist than 11% inches per located in partition, edition confidenced spaces, reduction of State Statements. Sp. 1 inch stud for partition (Indian Ministrate adjustment required in Note 5). But not be a Wellmann less than I such A. For brokeline subside the statust productivity verge, the minimum tricinous (T) shall be determined as follows:

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NOMINAL PIPE SIZE (Inches)	VOLUME (liquid ounces per foot length)	MAXIMUM PIPING LENGTH (Newl)	
		Public lavatory faccets	Other fixtures and appliances
Ni	9.33	6	60
No.	0.6	4	50
4	6.75	. 1	60
50	1.5	2	/43
No.	7	4	32
1/4	3	- 13	21
7/4	4	0.5	16
1	5	0.5	13
1//0	1	0.5	
t ¹ t _p	**	- 0.5	0
2 or targer	18	0.5	4



C404.6.1 Circulation systems.

Heated-water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is not a demand for hot water. The controls shall limit the temperature of the water entering the cold water piping to not greater than 104°F (40°C).

C404.6.1.1 Demand recirculation controls.

Demand recirculation water systems shall have controls that start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture, or sensing the flow of hot or tempered water to a fixture fitting or appliance.

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Energy consumption of pools and permanent spas

C404.8.1 Heaters

- Controlled by an on-off switch on the exterior of the heater or external to within 3 feet of heater, and with ready access.
- Switch shall not change the setting of heater thermostat.
- Gas-fired heaters shall not have continuously burning ignition pilots.



C404.8.2 Time switches

 Time switch or other controls to automatically turn off and on heaters and pump motors.

Exceptions:

- 1. Public health standards require 24-hour pump operation
- 2. Pumps operate solar-and waste heat recovery pool heating systems



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Energy consumption of pools and permanent spas

 Provide vapor retarder for outdoor pools and spas

Exceptions:

Where more than 75 percent of the energy for heating, computed over an operating season of not fewer than 3 calendar months, is from a heat pump or an site-recovered energy such as from a heat pump or on-site renewable energy system, covers or other vapor-retardant means shall not be required.



C405.1 General.

Lighting system controls, the maximum lighting power for interior and exterior applications, and electrical energy consumption shall comply with this section. Sleeping units shall comply with Section C405.2.5 and with either Section C405.1.1 or C405.3. General lighting shall consist of all lighting included when calculating the total connected interior lighting power in accordance with Section C405.3.1 and which does not require specific application controls in accordance with Section C405.2.5.

Transformers, uninterruptable power supplies, motors and electrical power processing equipment in data center systems shall comply with Section 8 of ASHRAE 90.4 in addition to this code.

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C405.2 Lighting controls.

Lighting systems shall be provided with controls that comply with one of the following.

- 1. Lighting controls as specified in Sections C405.2.1 through C405.2.8.
- 2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, C405.2.5 and C405.2.6. The LLLC luminaire shall be independently capable of:
 - 2.1. Monitoring occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.
 - 2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.
- 2.3. For each control strategy, configuration and reconfiguration of performance parameters including; bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.

Exceptions: Lighting controls are not required for the following:

- 1. Areas designated as security or emergency areas that are required to be continuously lighted.
- 2. Interior exit stairways, interior exit ramps and exit passageways.
- 3. Emergency egress lighting that is normally off. © Shums Coda Ass

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C405.2.1 Occupant sensor controls.

Occupant sensor controls shall be installed to control lights in the following space types:

- 1. Classrooms/lecture/training rooms.
- 2. Conference/meeting/multipurpose rooms.
- 3. Copy/print rooms.
- 4. Lounges/breakrooms.
- Enclosed offices.
- 6. Open plan office areas.
- 7. Restrooms.
- 8. Storage rooms.
- 9. Locker rooms.
- 10. Corridors.
- 11. Warehouse storage areas.
- 12. Other spaces 300 square feet (28 m2) or less that are enclosed by floor-to-ceiling height partitions.



C405.2.1.1 Occupant sensor control function.

Occupant sensor controls in warehouses shall comply with Section C405.2.1.2. Occupant sensor controls in open plan office areas shall comply with Section C405.2.1.3. Occupant sensor controls in corridors shall comply with Section C405.2.1.4. Occupant sensor controls for all other spaces specified in Section C405.2.1 shall comply with the following:

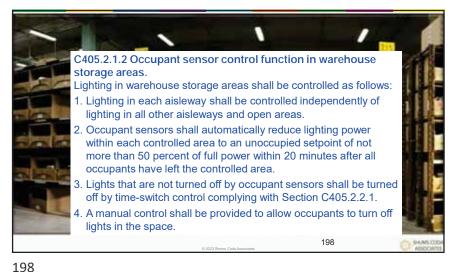
- 1. They shall automatically turn off lights within 20 minutes after all occupants have left the space.
- 2. They shall be manual on or controlled to automatically turn on the lighting to not more than 50-percent power.
- 3. They shall incorporate a manual control to allow occupants to turn off lights.

Exception: Full automatic-on controls with no manual control shall be permitted in corridors, interior parking areas, stairways, restrooms, locker rooms, lobbies, library stacks and areas where manual operation would endanger occupant safety or security.

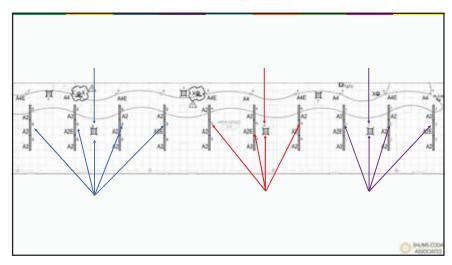
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C405.2.2 Time-switch controls.

Each area of the building that is not provided with occupant sensor controls complying with Section C405.2.1.1 shall be provided with time-switch controls complying with Section C405.2.2.1. Exceptions:

- 1. Luminaires that are required to have specific application controls in accordance with Section C405.2.4.
- 2. Spaces where patient care is directly provided.
- 3. Spaces where an automatic shutoff would endanger occupant safety or security.
- 4. Lighting intended for continuous operation.
- 5. Shop and laboratory classrooms.

C405.2.2.1 Time-switch control function.

Time-switch controls shall comply with all of the following:

- 1. Automatically turn off lights when the space is scheduled to be unoccupied.
- 2. Have a minimum 7-day clock.
- 3. Be capable of being set for seven different day types per week.
- 4. Incorporate an automatic holiday "shutoff" feature, which turns off all controlled lighting loads for not fewer than 24 hours and then resumes normally scheduled operations.
- 5. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.
- 6. Include an override switch that complies with the following:
 - 6.1. The override switch shall be a manual control.
- 6.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.
- 6.3. Any individual override switch shall control the lighting for an area not larger than 5,000 square

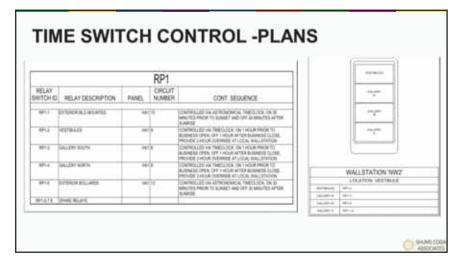
Exception: Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas: The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key

The area controlled by the override switch shall not be limited to 5,000 square feet provided that such area is less than 20,000 square feet.



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C405.2.3 Light-reduction controls.

Where not provided with occupant sensor controls complying with Section C405.2.1.1, general lighting shall be provided with light-reduction controls complying with Section C405.2.3.1.

Exceptions:

- 1. Luminaires controlled by daylight responsive controls complying with Section C405.2.4.
- 2. Luminaires controlled by special application controls complying with Section C405.2.5.
- 3. Where provided with manual control, the following areas are not required to have light-reduction control:
 - 3.1. Spaces that have only one luminaire with a rated power of less than 60 watts.
 - 3.2. Spaces that use less than 0.45 watts per square foot (4.9 W/m²).
 - 3.3. Corridors, lobbies, electrical rooms and/or mechanical rooms.



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C405.2.4 Daylight-responsive controls.

Daylight-responsive controls complying with Section C405.2.4.1 shall be provided to control the general lighting within daylight zones in the following spaces:

- Spaces with a total of more than 150 watts of general lighting within primary sidelit daylight zones complying with Section C405.2.4.2.
- Spaces with a total of more than 300 watts of general lighting within sidelit daylight zones complying with Section C405.2.4.2.
- Spaces with a total of more than 150 watts of general lighting within toplit daylight zones complying with Section C405.2.4.3.

Exceptions: Daylight responsive controls are not required for the following:

- 1. Spaces in health care facilities where patient care is directly provided.
- 2. Sidelit daylight zones on the first floor above grade in Group A-2 and Group M occupancies.
- New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPAadj) calculated in accordance with Equation 4-9.

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C405.2.3.1 Light-reduction control function.

Spaces required to have light-reduction controls shall have a manual control that allows the occupant to reduce the connected lighting load by not less than 50 percent in a reasonably uniform illumination pattern with an intermediate step in addition to full on or off, or with continuous dimming control, using one of the following or another approved method:

- Continuous dimming of all luminaires from full output to less than 20 percent of full power.
- 2. Switching all luminaires to a reduced output of not less than 30 percent and not more than 70 percent of full power.
- Switching alternate luminaires or alternate rows of luminaires to achieve a reduced output of not less than 30 percent and not more than 70 percent of full power.

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C405.2.4.1 Daylight-responsive control function.

Where required, daylight-responsive controls shall be provided within each space for control of lights in that space and shall comply with all of the following:

- Lights in toplit daylight zones in accordance with Section C405.2.4.3 shall be controlled independently of lights in sidelit daylight zones in accordance with Section C405.2.4.2.
- 2. Lights in the primary sidelit daylight zone shall be controlled independently of lights in the secondary sidelit daylight zone.
- Daylight responsive controls within each space shall be configured so that they can be calibrated from within that space by authorized personnel.
- 4. Calibration mechanisms shall be in a location with ready access.
- Daylight responsive controls shall dim lights continuously from full light output to 15 percent of full light output or lower.
- 6. Daylight responsive controls shall be configured to completely shut off all controlled lights.
- 7. When occupant sensor controls have reduced the lighting power to an unoccupied setpoint in accordance with Sections C405.2.1.2 through C405.2.1.4, daylight responsive controls shall continue to adjust electric light levels in response to available daylight, but shall be configured to not increase the lighting power above the specified unoccupied setpoint.
- 8. Lights in sidelit daylight zones in accordance with Section C405.2.4.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other. Exceptions:
- Within each space, up to 150 watts of lighting within the primary sidelit daylight zone is permitted to be controlled together with lighting in a primary sidelit daylight zone facing a different cardinal orientation.
- Within each space, up to 150 watts of lighting within the secondary sidelit daylight zone is permitted to be controlled together with lighting in a secondary sidelit daylight zone facing a different cardinal orientation.

C405.2.4.2 Sidelit daylight zone.

The sidelit daylight zone is the floor area adjacent to vertical fenestration that complies with all of the

- 1. Where the fenestration is located in a wall, the sidelit daylight zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest fullheight wall, or up to 0.5 times the height from the floor to the top of the fenestration, whichever is less. as indicated in Figure C405.2.4.2(1)
- Where the fenestration is located in a rooftop monitor, the sidelit daylight zone shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.4.2(2) and C405.2.4.2(3).
- The secondary sidelit daylight zone is directly adjacent to the primary sidelit daylight zone and shall extend laterally to 2.0 times the height from the floor to the top of the fenestration or to the nearest full height wall, whichever is less, and longitudinally from the edge of the fenestration to the nearest full height wall, or up to 0.5 times the height from the floor to the top of the fenestration, whichever is less, as indicated in Figure C405.2.4.2(1). The area of secondary sidelit zones shall not be considered in the calculation of the daylight zones in Section C402.4.1.1.
- 4. The area of the fenestration is not less than 24 square feet (2.23 m2).
- 5. The distance from the fenestration to any building or geological formation that would block access to daylight is greater than one-half of the height from the bottom of the fenestration to the top of the building or geologicformation
- 6. The visible transmittance of the fenestration is not less than 0.20.
- The projection factor (determined in accordance with Equation 4-5) for any overhanging projection that is shading the fenestration is not greater than 1.0 for fenestration oriented 45 regrees or less from true north

SIDELITE REQUIREMENTS

- >150 watts of primary zone
- > 300 watts total of both zones
- Exempt:
 - · Healthcare patient care provided
 - 1st floor above grade A-2 or M
 - · Total connected lighting power calculated equation 4-10 < the adjusted lighting power allowance with equation 4-9

- 2 zones- primary & secondary Each zone controlled independently
 - · Calibrated from within space at a location ready access
 - Dim continuously from full to 15%
 - Shut off all controlled lights
 - Occ sensors reduce lighting in unoccupied areas per code with additional controls for light levels and power
 - Zone facing different directions independently controlled
 - 2 exceptions for the controls

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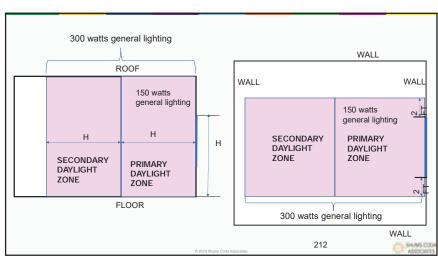
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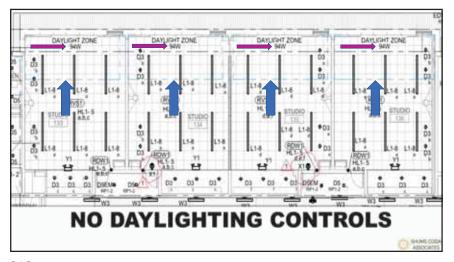
Sidelite zones comply with all of these

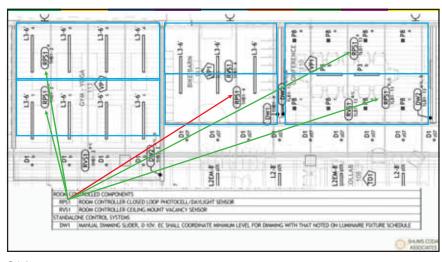
- From floor to top of fenestration distance horizontally or to wall
- Sidelite in rooftop monitor extend to obstruction or .7 of ceiling height or 1 times the height of floor to bottom of fenestration less.....
- · Second zone double the first or to full height wall
- Window must be 24 sq ft for lighting

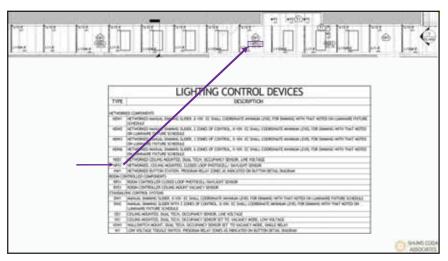
- Takes into account of building or geological items that block light from entering fenestration
- Visible transmittance must be a minimum of 20
- Projection factor of overhangs not greater than 1 for north facing and 1.5 for all others

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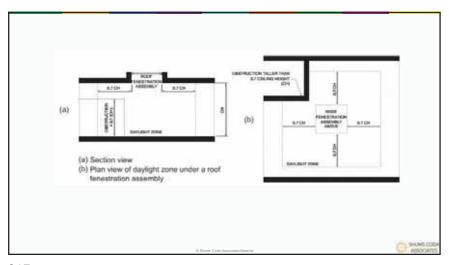
C405.2.4.3 Toplit daylight zone.

The toplit daylight zone is the floor area underneath a roof fenestration assembly that complies with all of the following:

- 1. The toplit daylight zone shall extend laterally and longitudinally beyond the edge of the roof fenestration assembly to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.7 times the ceiling height, whichever is less, as indicated in Figure C405.2.4.3.
- Direct sunlight is not blocked from hitting the roof fenestration assembly at the peak solar angle on the summer solstice by buildings or geological formations.
- 3. The product of the visible transmittance of the roof fenestration assembly and the area of the rough opening of the roof fenestration assembly divided by the area of the toplit zone is not less than 0.008.

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C405.2.4.4 Atriums.
Daylight zones at atrium spaces shall be established at the top floor surrounding the atrium and at the floor of the atrium space, and not on intermediate floors, as indicated in Figure C405.2.4.4.

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C405.2.5 Specific application controls.

Specific application controls shall be provided for the following:

- The following lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time-switch
 control complying with Section C405.2.2.1. In addition, a manual control shall be provided to control such lighting
 separately from the general lighting in the space:
 - 1.1 Luminaires for which additional lighting power is claimed in accordance with Section C405.3.2.2.1.
 - 1.2 Display and accent.
 - 1.3 Lighting in display cases.
 - 1.4 Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting.
 - 1.5 Lighting equipment that is for sale or demonstration in lighting education.
 - 1.6 Display lighting for exhibits in galleries, museums and monuments that is in addition to general lighting.
- Sleeping units shall have control devices or systems that are configured to automatically switch off all permanently installed luminaires and switched receptacles within 20 minutes after all occupants have left the unit.

Exceptions:

- 1. Lighting and switched receptacles controlled by card key controls.
- 2. Spaces where patient care is directly provided.
- 3. Permanently installed luminaires within dwelling units shall be provided with controls complying with Section C405.2.1.1 or C405.2.3.1.
- Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a time switch
 control complying with Section C405.2.2.1 that is independent of the controls for other lighting within the room or
 space.
- 5. Task lighting for medical and dental purposes that is in addition to general lighting shall be provided with a manual control.

SLEGEND

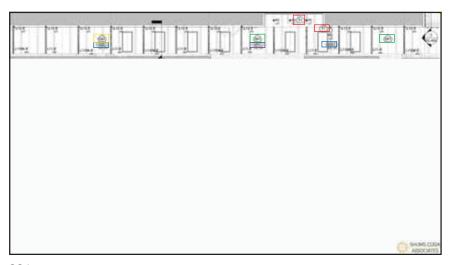
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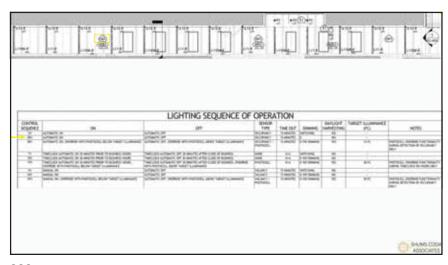
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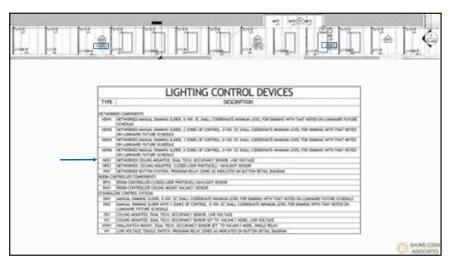
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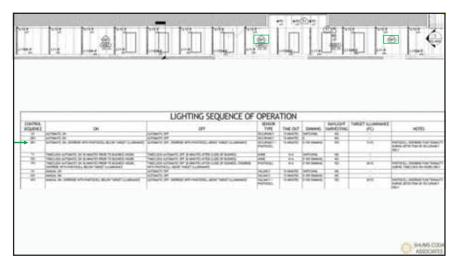
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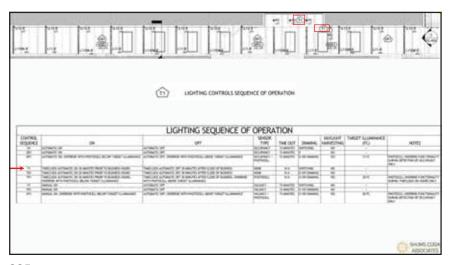
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C405.2.7 Exterior lighting controls.

Exterior lighting systems shall be provided with controls that comply with Sections C405.2.7.1 through C405.2.7.4. Exceptions:

- Lighting for covered vehicle entrances and exits from buildings and parking structures where required for eye adaptation.
- 2. Lighting controlled from within dwelling units.

C405.2.7.1 Daylight shutoff.

Lights shall be automatically turned off when daylight is present and satisfies the lighting needs.

C405.2.7.2 Building facade and landscape lighting.

Building facade and landscape lighting shall automatically shut off from not later than 1 hour after business closing to not earlier than 1 hour before business opening.

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C405.2.7.3 Lighting setback.

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Lighting that is not controlled in accordance with Section C405.2.7.2 shall comply with the following:

- Be controlled so that the total wattage of such lighting is automatically reduced by not less than 50 percent by selectively switching off or dimming luminaires at one of the following times:
 - 1.1.From not later than midnight to not earlier than 6 a.m.
 - 1.2. From not later than one hour after business closing to not earlier than one hour before business opening.
 - 1.3. During any time where activity has not been detected for 15 minutes or more.
- 2. Luminaires serving outdoor parking areas and having a rated input wattage of greater than 78 watts and a mounting height of 24 feet (7315 mm) or less above the ground shall be controlled so that the total wattage of such lighting is automatically reduced by not less than 50 percent during any time where activity has not been detected for 15 minutes or more. Not more than 1,500 watts of lighting power shall be controlled together.

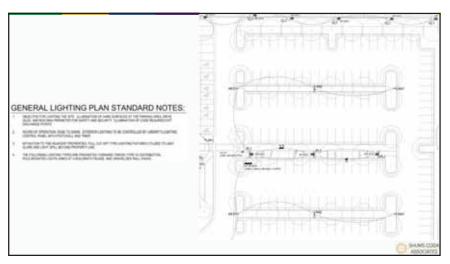
C405.2.7.4 Exterior time-switch control function.

Time-switch controls for exterior lighting shall comply with the following:

- 1. They shall have a clock capable of being programmed for not fewer than 7 days.
- 2. They shall be capable of being set for seven different day types per week.
- 3. They shall incorporate an automatic holiday setback feature.
- They shall have program backup capabilities that prevent the loss of program and time settings for a period of not less than 10 hours in the event that power is interrupted.

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C405.2.8 Parking garage lighting control.

Parking garage lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time-switch control complying with Section C405.2.2.1. Additional lighting controls shall be provided as follows:

1. Lighting power of each luminaire shall be automatically reduced by not less than 30 percent when there is no activity detected within a lighting zone for 20 minutes. Lighting zones for this requirement shall be not larger than 3,600 square feet (334.5 m2).

Exception:Lighting zones provided with less than 1.5 footcandles of illumination on the floor at the darkest point with all lights on are not required to have automatic light-reduction controls.

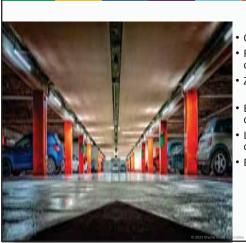
- 2. Where lighting for eye adaptation is provided at covered vehicle entrances and exits from buildings and parking structures, such lighting shall be separately controlled by a device that automatically reduces lighting power by at least 50 percent from sunset to sunrise.
- 3. The power to luminaires within 20 feet (6096 mm) of perimeter wall openings shall automatically reduce in response to daylight by at least 50 percent.

Exceptions:

- 1. Where the opening-to-wall ratio is less than 40 percent as viewed from the interior and encompassing the vertical distance from the driving surface to the lowest structural element.
- 2. Where the distance from the opening to any exterior daylight blocking obstruction is less than one-half the height from the bottom of the opening or fenestration to the top of the obstruction.
- 3. Where openings are obstructed by permanent screens or architectural elements restricting daylight entering the interior space.

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- Occ sensor or time switch
- Reduce >30% after 20 min of no occupancy
- Zones no bigger than 3,600 sq ft • Exception if foot candles are >1.5
- Entrance and exits separate lighting controls for eye adaptation to >50%
- Lighting within 20ft of exterior wall opening reduce >50%
- Exceptions
 - Opening to wall ratio >40% with vertical distance
 - Daylight obstructions requirements
 - Opening obstructed by screens or elements to restrict daylight

Interior Lighting Power Allowance *C405.3.2*

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





| Space-By-| Space | S

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C405.11 Automatic receptacle control.

The following shall have automatic receptacle control complying with Section C405.11.1:

- 1. At least 50 percent of all 125V, 15- and 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 percent of branch circuit feeders installed for modular furniture not shown on the construction documents.

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C405.11

- 50% of 15 or 20 amp receptables in any of these:
 - · Enclosed offices
 - Conference rooms
 - · Rooms for copy/printing functions
 - · Break rooms
 - Classrooms
 - · Individual workstation even module office work systems
- · 25% of branch circuit feeders for module furniture not shown on plans

C405.11.1

- · Split receptacle or one located within 12" of each other
- Controls:
 - · Time of day controls
 - · Occupancy sensors 20 minutes of space vacant
 - · Automatic sensor control to shut off after 20 minutes of vacancy
- Controlled must be marked
- · Uniformly distributed
- · Plug-in decides not permitted





1. Either split controlled receptacles shall be provided with the top receptacle controlled, or a controlled receptacle shall be located within 12 inches (304.8 mm) of each uncontrolled receptacle.

2. One of the following methods shall be used to provide control:

C405.11.1 Automatic receptacle control function. Automatic receptacle controls shall comply with the following:

- 2.1.A scheduled basis using a time-of-day operated control device that turns receptacle power off at specific programmed times and can be programmed separately for each day of the week. The control device shall be configured to provide an independent schedule for each portion of the building of not more than 5,000 square feet (464.5 m2) and not more than one floor. The occupant shall be able to manually override an area for not more than 2 hours. Any individual override switch shall control the receptacles of not more than 5,000 feet (1524 m).
- 2.2.An occupant sensor control that shall turn off receptacles within 20 minutes of all occupants leaving a space. 2.3.An automated signal from another control or alarm system that shall turn off receptacles within 20 minutes after
- determining that the area is unoccupied. 3. All controlled receptacles shall be permanently marked in accordance with NFPA 70 and be uniformly distributed throughout the space.
- 4. Plug-in devices shall not comply.

Exceptions: Automatic receptacle controls are not required for the following:

- 1. Receptacles specifically designated for equipment requiring continuous operation (24 hours per day, 365 days per
- 2. Spaces where an automatic control would endanger the safety or security of the room or building occupants.
- 3. Within a single modular office workstation, noncontrolled receptacles are permitted to be located more than 12 inches (304.8 mm), but not more than 72 inches (1828 mm) from the controlled receptacles serving that

EXCEPTIONS

- Equipment that must run 24 hrs
- If controls endanger safety or security
- Single modular office workstation have noncontrolled to be located up to 72" of workstation



C405.12 Energy monitoring.

New buildings with a gross conditioned floor area of 25,000 square feet (2322 m2) or larger shall be equipped to measure, monitor, record and report energy consumption data in compliance with Sections C405.12.1 through C405.12.5.

Exception: R-2 occupancies and individual tenant spaces are not required to comply with this section provided that the space has its own utility services and meters and has less than 5,000 square feet (464.5 m2) of conditioned floor area.

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TABLE C405.12.2 ENERGY USE CATEGORIES

LOAD CATEGORY	DESCRIPTION OF ENERGY USE	
Total HVAC system	Heating, cooling and ventilation, including but not limited to fans, pumps, boilers, chillers and water heating. Energy used by 120-volt equipment, or by 208/120-volt equipment that is located in a building where the main service is 480/277-volt power, is permitted to be excluded from total HVAC system energy use.	
Interior lighting	Lighting systems located within the building.	
Exterior lighting	Lighting systems located on the building site but not within the building.	
Plug loads	Devices, appliances and equipment connected to convenience receptacle outlets.	
Process load	Any single load that is not included in an HVAC, lighting or plug load category and that exceeds 5 percent of the peak connected load of the whole building, including but not limited to data centers, manufacturing equipment and commercial kitchens.	
Building operations	The remaining loads not included elsewhere in this table, including but	
and other	not limited to vertical transportation systems, automatic doors, motorized	
miscellaneous	shading systems, ornamental fountains, ornamental fireplaces,	
loads	swimming pools, in-ground spas and snow-melt systems.	

C405.12.1 Electrical energy metering.

For all electrical energy supplied to the building and its associated site, including but not limited to site lighting, parking, recreational facilities and other areas that serve the building and its occupants, meters or other measurement devices shall be provided to collect energy consumption data for each end-use category required by Section C405.12.2.

C405.12.2 End-use metering categories.

Meters or other approved measurement devices shall be provided to collect energy use data for each enduse category indicated in Table C405.12.2. Where multiple meters are used to measure any end-use category, the data acquisition system shall total all of the energy used by that category. Not more than 5 percent of the measured load for each of the end-use categories indicated in Table C405.12.2 shall be permitted to be from a load that is not within that category.

Exceptions:

- 1. HVAC and water heating equipment serving only an individual dwelling unit shall not require end-use
- 2. End-use metering shall not be required for fire pumps, stairwell pressurization fans or any system that operates only during testing or emergency.
- 3. End-use metering shall not be required for an individual tenant space having a floor area not greater than 2,500 square feet (232 m2) where a dedicated source meter complying with Section C405.12.3 is provided.

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C405.12.3 Meters.

Meters or other measurement devices required by this section shall be configured to automatically communicate energy consumption data to the data acquisition system required by Section C405.12.4. Source meters shall be allowed to be any digital-type meter. Lighting, HVAC or other building systems that can monitor their energy consumption shall be permitted instead of meters. Current sensors shall be permitted, provided that they have a tested accuracy of ±2 percent. Required metering systems and equipment shall have the capability to provide at least hourly data that is fully integrated into the data acquisition system and graphical energy report in accordance with Sections C405.12.4 and C405.12.5.

C405.12.4 Data acquisition system.

A data acquisition system shall have the capability to store the data from the required meters and other sensing devices for a minimum of 36 months. The data acquisition system shall have the capability to store real-time energy consumption data and provide hourly, daily, monthly and yearly logged data for each enduse category required by Section C405.12.2.

C405.12.5 Graphical energy report.

A permanent and readily accessible reporting mechanism shall be provided in the building that is accessible by building operation and management personnel. The reporting mechanism shall have the capability to graphically provide the energy consumption for each end-use category required by Section C405.12.2 at least every hour, day, month and year for the previous 36 months.





