


State of Connecticut
Department of Administrative Services
Division of Construction Services
Office of Education and Data Management

*Office of Education and Data Management
Fall 2016 Career Development Series*

Significant Changes to the IECC

Presented by
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Connecticut Energy Codes

**SIGNIFICANT CHANGES
TO THE 2012 ICC ENERGY CODES**

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Today's Presentation




An overview of the significant code change proposals adopted as the 2012 Edition of the ICC and IRC Energy Codes; published Errata; CT proposed Amendments and deletions; plus the commercial ASHRAE 90.1 Option

Detailed information is available at:
<http://www.iccsafe.org/cs/codes/Pages/09-10cycle.aspx>

Original proposals, Committee recommendations, public comments and final approved changes can be found at the website for every specific proposal brought before the ICC and considered for inclusion in the 2012 I-Codes.

Errata Central


<http://www.iccsafe.org/errata-central>



- IECC 2012 had 18 changes between the first printing and third printing
- 6 changes are in Residential
- 12 changes in Commercial

Adopted Base Codes

IECC Key Changes and CT Amendments




Key IECC Changes and CT amendments will be separately identified herein by color-coded bullets:

- ICC changes
- CT Amendments

This format should help assist you in markups of reference documents



The IECC is NOT part of this package deal for code books and must be ordered separately



International Energy Conservation Code

History; Background

- The 2009 IECC was effective October 6, 2011
- The 2012 IECC was published in July 2011. Codes & Standards has voted to adopt 2012 IECC October 12, 2016 with a "modification window ending January 1, 2017"
- The Connecticut Energy Code Chapter 4 scoping for commercial buildings allows use of ASHRAE 90.1-2010 for energy conservation compliance
- "CT Building Standard Guidelines Compliance Manual for High Performance Buildings" **CT DEEP 16a-38k** provides energy conservation rules for large building projects that utilize state funding: ≥\$5million (\$2million CT schools); renovations ≥\$2million (21% reduction rule)

Chapter 1 Administration (both codes)

Commercial [CE] and Residential [RE] First Chapters

- Scope; General Requirements (101)
- Alternate Materials, Method of Construction, Design or Insulating Systems (102)
- Construction Documents (103)
- Inspections (104)
- Validity (105)
- Referenced Standards (106)
- Fees (107)
- Stop Work Order (108)
- Board of Appeals (109)



IECC Energy Efficiency

Re-Organized Requirements in Effect: 2012

- | | |
|--|--|
| <p>[CE] Commercial Energy</p> <ul style="list-style-type: none"> ■ 1. Administration ■ 2. Definitions ■ 3. General Requirements ■ 4. Commercial Efficiency ■ 5. Reference Standards | <p>[RE] Residential Energy</p> <ul style="list-style-type: none"> ■ 1. Administration ■ 2. Definitions ■ 3. General Requirements ■ 4. Residential Efficiency ■ 5. Reference Standards |
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Chapter 1 Administration (both codes)

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- Board of Appeals (109*)



General Requirements

C101.4.7 / R101.4.7 Temporary structures - CT Adds

- Comply with IBC 108.3 for temporary light, heat, power
- Exempt from Energy Code envelope requirements



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Compliance

C101/R101 General

- Same rules as IECC [RE] Chapter 1:
 - Changes in Occupancy or Use
 - Change to Conditioned Space
 - Mixed Occupancies – both Chapters 4
- C101.4.2 Full Historic* exemption
- C101.5.2 Thermal envelope exempted:
 - ✓ Low Energy < 1 W/sf (3.4 Btuh/sf)
 - ✓ Without conditioned space
 - ✓ Heat/cooling from renewables: wind, solar, biomass - as primary source
 - ✓ C202 Greenhouses (by definition)



Administration – Both Codes

C101/R101 List scope of work required for existing buildings





- 101.4.2 Historic buildings are exempt from the energy code
- 101.4.3 Additions, alterations, renovations and repairs
- 101.4.4 Change in use
- 101.4.5 Change in space conditioning
- 101.4.6 Mixed occupancy
- 101.5.1 Allows COM/RESCheck
- 101.5.3 Energy Standards / New products CGS 16a-48



General Requirements

C101.5.1 / R101.5.1 Compliance Materials - DOE


- C101.5.1 allows for COMCheck program compliance 
- R101.5.1 allows for RESCheck program compliance 

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General Requirements

C101.5.2 Low energy buildings – CT ADDS Exception 3

- Exempt from thermal envelope
 - ✓ Peak usage < 3.4Btu/1.0W/sf
 - ✓ No conditioned space
 - ✓ Utilizes renewable energy from non-purchase sources




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General Requirements

C102.1.1 / R102.1.1 Above code programs – CT mod names programs

- OSBI, and CT State Codes and Standards approve programs
 - ✓ LEED
 - ✓ Green Globes USA
 - ✓ Green Building Standard NAHB
 - ✓ Equivalent system per 20-256a C.G.S.



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Construction Documents

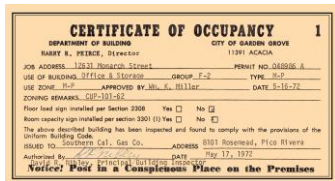
C103.1/R103.1 C.G.S. Amendments

- The building official may waive the submission of construction documents and other supporting data:
 - ✓ *Not required to be prepared by a registered design professional if the work proposed is not required by the provisions of this code, or*
 - ✓ *The building official determines that the nature of the work applied for is such that review of the construction documents is not necessary to obtain compliance with this code*

Schedule of Permit Fees

C107.2 / R107.2 C.G.S. Amendments

- *“Each municipality shall establish a schedule of fees for each construction document review, building permit, certificate of approval and certificate of occupancy. A schedule of adopted fees shall be posted in the building department for public view.”*



Unlawful Continuance

C108.4 / R108.4 C.G.S. Amendments



- *“Any person who shall continue any work in or about the structure after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be liable for penalties in accordance with section 29-254a of the Connecticut General Statutes”*

Means of Appeal

C109.1 / R109.1 C.G.S. Amendments

- (DEL) Board of Appeals Delete 109.1 /.2 /.3 entirely and replace with the following:
- "Means of appeal shall be in accordance with Section 113 of the 2012 International Building Code portion of the State Building Code"



Words/Terms Are Problems

We are not the only game in town creating definitions

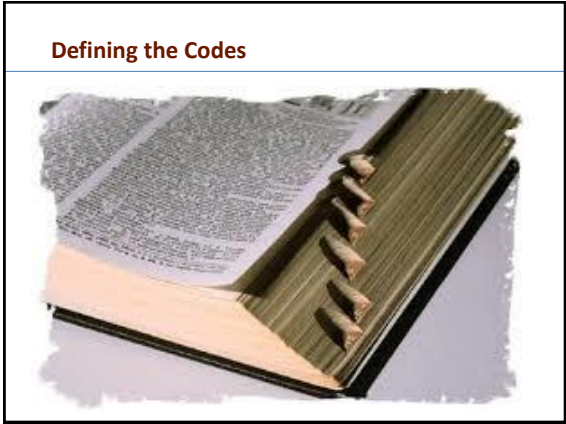
- Legal
 - ✓ Federal Law (FEMA / ADA)
 - ✓ Legislative
 - ✓ Courts: BLACK'S Law
- Medical (hazards)
- Scientific (Equations/symbols)
- OTHER CODES
- Construction STANDARDS
- Education, marketing, etc.
- Local Zoning

- ENCARTA dictionary
- OXFORD "
- Roget's Thesaurus
 - ✓ Synonyms / antonyms





Commercial Changes




Defining the Codes

Commercial Definitions

C202 Amended, Revised, Deleted



- Building
 - ✓ Above-Grade Wall (C402.2.2.1)
 - ✓ Commissioning
 - ✓ Basement Wall (C402.2.2.2)
 - ✓ Entrance
 - ✓ Site
 - ✓ Thermal Envelope
 - ✓ Greenhouse
- Fenestration
 - ✓ Field fabricated
 - ✓ Site-built
 - ✓ Dynamic glazing
 - ✓ Skylight (15°→30°)
 - ✓ VT (visible transmittance)
- HVAC
 - ✓ COP Heating/cooling
 - ✓ Furnace Electric Ratio
 - ✓ Demand recirculation
 - ✓ On-site renewable energy* C406
 - ✓ IPLV / NPLV
 - ✓ Thermal Envelope
- General lighting
 - ✓ Full cutoff luminaire



Commercial Compliance

C401.2 Application: OPTIONS

1. ASHRAE 90.1-2010
 - ✓ No Appendix G modeling energy option
2. C402, C403, C404 & C405 Prescriptive
 - ✓ Must comply w/C406 Add Options
3. C407 TBPM + Mandatory sections
 - ✓ Comply w/ standard reference design

Commercial Energy Efficiency

Compliance Paths C401

- **Prescriptive-based Design**
 - ✓ 2012 IECC C402 - 406
- **Performance-based Design**
 - ✓ 2012 IECC C407 Total Building Performance
 - ✓ ASHRAE 90.1 – 2007 (Chapter 4 only)



Commercial Buildings:

C402 Envelope Changes

- C402.2.1 Roof assembly. Exception 2 allows skylights that are part of an NFRC 100 rated assembly to not be insulated
- C402.2.6 Slabs on grade. Eliminates exception for slab insulation that may be subject to termite infestation.
- C402.2.8 Radiant heating systems in slabs must have a minimum of R-3.5 continuous insulation underneath



Envelope Changes


Table C402.2 Prescriptive Requirements

Envelope Component	2009 'Other'	2012 'Other'
ROOF - above deck	20	R25
- Metal Buildings	R13+R13	R19+R11 LS
- Attic & Other	R38	R49
Metal Building WALLS	R13+5.6 ci	R13+13 ci
Wood Frame Walls	R13+3.8 ci	R13+7.5 ci*
Floor slabs/heated (C402.2.8)	N/A	R3.5
- Slab Perimeter - unheated	R10/24"	R15/36"
Swinging Doors	U-0.70	U-0.37
Roll-up Doors	U-0.50 (R2)	R4.75




Commercial Buildings:

C402 Envelope Changes




- Table C402.3 Fenestration. Eliminates differences between framing materials, thermal breaks, and curtain walls/storefronts.
- C402.3.1 Skylight U-factors reduced
- Allowable skylight area increases 3% to 5% of total roof area
 - ✓ Use of automatic daylighting control zones under skylights.
- C402.3.2 ≥ 50% of the floor area in certain building types must be in a "daylight" zone under skylights



Fenestration Changes

Table C402.3 Prescriptive Requirements Zone 5



Fenestration Component	2009	2012
U-Factor - all non-metal	0.35	-
Fixed fenestration	0.45	0.38
Operable fenestration	0.55	0.45
Entrance doors	0.80	0.77
SHGC (<0.25 PF 2009 – 0.40)	0.00-0.40	0.40 (all)
Skylights		
U-factor	0.60	0.50
SHGC	0.40	0.40



Commercial Buildings

C402 Fenestration - Significant Changes

- C402.3.1 Maximum fenestration area decreases from 40% to 30%; skylight area remains at 3%
- C402.3.2 Fenestration area increases back to 40%; skylights to 5%: IF
 - ✓ ≥ 50% of conditioned floor area within daylight zone,
 - ✓ Automatic daylight-responsive controls are installed
 - ✓ Vertical fenestration VT is ≥1.1 (SHGC)
 - ✓ Space is not otherwise exempted
- C402.3.3 Skylight factors using DRC
 - ✓ C402.3.3.3 SHGC 0.60
 - ✓ C402.3.3.4 U-factor 0.75

Daylighting

C402.3.2 Daylighting is a Prescriptive Option - Except



- Enclosed spaces > 10,000 s.f. directly under a roof with ceiling heights ≥ 15'

Assembly Uses:
 Gym; convention & transportation centers
Business & Mercantile Uses**
 Offices; Retail stores; Automotive services
Associated spaces
 Lobby; Atrium; Concourse; Corridor
Factory Uses:
 Manufacturing**; Workshop;
Storage Uses:**
 Warehouses (non-refrigerated);
 Distribution / Sorting, Storage

** 90% haze factor



Daylighting

C402.3.2 Daylighting Required - Mandatory



- **Skylighting (toplighting)**
 ≥ 50% of floor area (FA) has **daylight-responsive** controls
 - ✓ A ≥ 3% min. skylight area to daylight zone with VT ≥ 0.40; or ≥ 1% effective aperture
 - ✓ Not required where lighting power densities are < 0.5W/s.f.
 - ✓ Not required in areas where daylight obstructed



Skylight Haze Factor

C402.3.2.2 Obscured Glazing**

- Glazing material OR diffuser
 - ✓ > 90% obscuration
 - ✓ ASTM D 1003
- **Exception.** Achieve diffusion:
 - ✓ Geometry of skylight well
 - ✓ Fixed or automatic baffles



Glazing: What Counts? As What?

Basic Daylighting to Illuminate Interiors

Windows? Skylights?

Sidelighting

C202 Daylight Zone Adjacent to Vertical Fenestration – C402 .3.1.1

- Single zone with DR controls
- **Zone is 15 feet, without regard to window head height**
- Side margins of 2'
- Zone width/depth extends over partitions less than ceiling height

(a) Section view
(b) Plan view of daylight zone under a rooftop monitor

Sidelighting

C402.3.1.1 Prescriptive Definition Changes

Daylight Zone =

- Full-height opaque wall cutoffs
- **Outside shading is a further limitation**
 - ✓ A light shelf will not change the IECC area measurement
 - ✓ No allowances for technical strategies
 - ✓ No penalties for non-uniformity of lighting

Partition is < Ceiling height

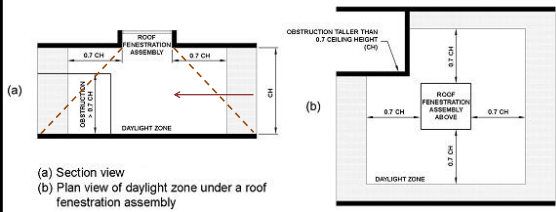
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DAYLIT ZONE—SIDELIGHTING

Skylights

C202 Daylight Zone Under Skylights –

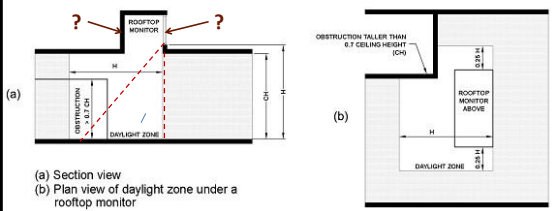
- Floor area dimension equals twice the height of the ceiling plus skylight width
- Only full-height partitions block the light to other portions of the illuminated area
- C405.2.3.3 specifies light control



Toplighting

C402.3.2.1 Exception 4 (does not define rooftop monitors)

- Monitor Floor Area Allowance: from sill of glazing to plumb line and out an equal distance with side allowances
- Side illumination allowance: two feet beyond opening plumb line



Using Projection Factors

C402.3.3.1 Vertical Fenestration SHGC Adjustment

- SHGC factor by orientation to north
- PF must be ≥ 0.2
- $PF < 0.2$; no adjustment

Table C402.3.3.1
SHGC Adjustment Multipliers

Projection Factor	Orientation $\leq 45^\circ$ N	All others
$0.2 \leq PF < 0.5$	x1.1	x1.2
$PF \geq 0.5$	x1.2	x1.6



SHGC Daylight Control Exception

C402.3.3 Increased Skylight SHGC

- For daylight zones with automatic daylight-responsive lighting controls
- SHGC increases in Climate Zones 1-6 - 0.40 to ≤ 0.60
- SHGC tradeoffs in CZ 7-8 are not allowed



Envelope Changes

Air Barrier Requirements (Mandatory) C402.4

- C402.4 Air barrier required; Climate Zones 4-8
 - ✓ Construction
 - ✓ Materials
 - ✓ Tested assemblies
 - ✓ Penetrations
 - ✓ Fenestration testing
 - ✓ Other openings
- C402.4.5 Outdoor intakes, exhausts, stairs and shafts
 - ✓ Gravity dampers are OK < 3 stories high



Commercial HVAC

C403.2 Mandatory Provisions



- Load calculations must account for ERV systems
- Equipment: Sizing per loads
 - ✓ New NAECA regional-based minimums
- Chiller NPLV required performance



Commercial Buildings

Significant Changes C403



- C403.2.5.1 Demand Control Ventilation. DCV required in spaces > 500 SF with an occupant load ≥ 25/KSF (Table 403.3 IMC)
 - ✓ Having air side economizer
 - ✓ Automated modulating controls
 - ✓ Design outdoor airflow 3,000cfm

Commercial HVAC

C403.2 Mandatory Provisions

- C403.2.4.3.3 Off-hour controls - automatic start capable
- C403.2.6/Table C403.2.6 Energy recovery required
- C403.2.7 Duct/plenum insulation sealing must be installed values (CT)
 - ✓ R-6 in unconditioned space
 - ✓ R-8 within thermal envelope or outside


Commercial Buildings

Significant Changes C403

Table C403.3.1(1)

CLIMATE ZONES	ECONOMIZER REQUIREMENT
1A, 1B	No requirements
2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8	All systems ≥ 33,000Btu/h; buildings >300,000Btu/h or > 20%

- Table C403.2.8 Pipe insulation set by diameter, temperature operating range of fluid
- C403.3.1 Economizer threshold decreases to 33,000 Btu/h
 - ✓ Exceptions (6)



Service Water Heating Changes

C404.5 Pipe Insulation Confusion

- **C404.5 Pipe insulation. (5th line)**
The first 8 feet...in non-hot-water-supply temperature maintenance systems served by equipment without integral heat traps...shall be insulated



- **C404.4 (2015) Circulation systems**
On both the inlet and outlet piping of a storage HW heater or heated storage tank, the piping to a heat trap, or first 8 feet of piping, shall be insulated



Service Water Heating Changes

C404.7 Insulated Pool Covers

Pool covers no longer required to be insulated



Lighting Changes

C405

- **C405.2.2.2 Occupancy sensors:**
 - ✓ ≥ 300sf, plus
 - ✓ 8 specific areas
- **C405.2.2.3 Daylight zone control**
limitations/exceptions
- **C405.5.2 Space-by-space**
method for Interior Lighting
Power Allowance (ILPA) returns



Exterior Lighting Power Zones*

Table C405.6.2

ZONE 1
Parks, forest, and rural areas.

ZONE 2
Residential and mixed-use, neighborhood business, light industrial with limited night use.

ZONE 3
Retail.

ZONE 4
High-density commercial in major centers as designated by AHJ.

In 2009, Zone O was introduced to represent undeveloped areas within national parks, forest land, and rural areas as defined by AHJ.

AKF

Lighting Changes

C405.6.3 Light Pollution Controls - CT

- Full cutoff luminaires
 - ✓ Powered by building service
- Exceptions:
 - ✓ ≤ 150W equivalent
 - ✓ Building facades/features
 - ✓ Historic site lighting
 - ✓ Outdoor sports playing field
 - ✓ MOE discharge lighting
 - ✓ Low-voltage landscape lights
 - ✓ Sign illumination
 - ✓ Festoon lighting
 - ✓ Temporary lighting

AKF

Additional Efficiency Package Options

C406 (Three Options)

- C406.2 HVAC Performance – all systems; only when all applicable equipment meet/exceed Table C406.2(1-7) values
- C406.3 Efficient lighting system – Table C406.3 reduced values
- C406.4 On-Site Renewables - ≥ 1.75 Btu OR 0.50w per S.F. OR ≥ 3% of building energy use

AKF

Added Efficiency Packages

C406.2 HVAC Reductions - Tables 1-7

- Increased efficiency beyond NAECA minimum requirements
 - ✓ Air Conditioning
 - ✓ Heat pumps
 - ✓ Warm air furnaces
 - ✓ Boilers
 - ✓ Chillers, absorption



Added Efficiency Packages

C406.3 ILPA / ELPA Reductions

- Reduced Lighting Power Density
 - ✓ Whole building lighting power density must be reduced 10% below Table C405.5.2 values or follow C406.3 prescriptive table
 - ✓ Reduced Interior Lighting Power Table C406.3 (b) requires offices and retail to provide ≥ 30% F/A daylight zones, (c) warehouses 70% F/A zones



Added Efficiency Packages

C406.4 On-Site Supply of Renewable Energy

- Renewable systems not located on adjacent or remote land
- ≥ 1.75 Btu/SF or
- ≥ 3% energy use of regulated energy



Commercial Buildings

C408 Commissioning (New Section added)

- Threshold: < 600k Btu/h Heating; 480k Btu/h cooling; all systems and their controls
- Building commissioning: Develop a plan for mechanical system commissioning; provide evidence of commissioning.
- HVAC air and water flow rates must be balanced; equipment, controls, and lighting must be performance tested.
- Preliminary report: submitted to the building owner, and acknowledge report receipt to the code official.



Systems Commissioning

C408.2 Mechanical Systems Commissioning

Commissioning Plan

- Adjusting/balancing
 - ✓ Air systems
 - ✓ Hydronic systems
- Equipment
- Controls
- Economizers

Functional Testing

- HVAC Systems/Controls
- ILP/ELP Systems/Controls
- Preliminary Report
 - ✓ Uncorrected Deficiencies
 - ✓ Deferred testing
- Documentation requirements



HVAC Commissioning

C408 Systems balancing


- Systems must be adjusted to deliver final air and water flow rates within 10% of design
 - ✓ Each supply air outlet and zone terminal device
 - ✓ Heating and cooling coils
- Systems and equipment must be installed with ability to be adjusted and have performance measured



Systems Commissioning

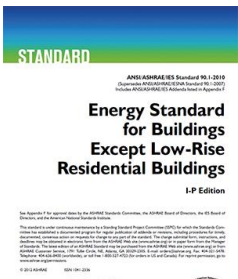
C408 Commissioning Changes - Documentation

<p>Within 90 days of C of O:</p> <ul style="list-style-type: none"> ■ Construction documents which must include location and performance data on each piece of equipment ■ Manual for operation and maintenance ■ System balancing report ■ Final Commissioning Report 	<p>Report Contains:</p> <ul style="list-style-type: none"> ■ Results of all Functional Performance Tests ■ Deficiencies found during testing and corrective measures proposed ■ All Functional Performance Test procedures used during commissioning process
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Commercial Compliance

C401.2 Compliance Options – ASHRAE 90.1-2010



- DOE - the *de facto* standard
 - ✓ Commercial yardstick
- Applies to [CE] Chapter 4
 - ✓ IECC Ch. 1, 2, 3 apply
- Energy requirements
 - ✓ Efficiency and conservation



Abbreviations, Acronyms, Symbols


90.1- Section 3.3 has 74; IECC Definitions has 9

<p>Where to find them</p> <ul style="list-style-type: none"> ■ IECC defines some <ul style="list-style-type: none"> ✓ Chapter 2 (9) ✓ Figures in various Chapters ■ ASHRAE does <ul style="list-style-type: none"> ✓ ASHRAE 3.3 ✓ Chapter 12 	<p>Who's your audience?</p> <ul style="list-style-type: none"> ■ Construction Industry ■ Clients / Developers ■ Administrators ■ General Public
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ASHRAE Definitions: Sidelighting

90.1 Section 3.2


- Primary sidelighted area
- Secondary sidelighted area
- Side extension [2']
- Head height
- Daylight area
- Clerestory, dormer



ASHRAE Definitions: Toplighting


90.1 Section 3.2

- Skylight [$< 60^\circ$ horizontal]
- Daylight area
- Skylight well
- Skylight aperture
- Rooftop monitor



Fenestration Limitations

5.5.4.2 Vertical Fenestration Area – (prescriptive option)



Vertical fenestration limits

- 40% without auto controls
 - ✓ Exception (c): $< 75\%$ front facade
- 40% with daylight zone F.A. $\geq 50\%$
 - ✓ Limited to CZ 1-6
 - ✓ ≥ 3 stories $\geq 25\%$ (2015)

Visible transmittance [VT]

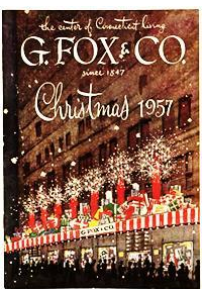
- $VT \geq 1.1 \times SHGC$

Fenestration

5.5.4.2 Fenestration Area Increase – (prescriptive option only)

**5.5.4.2.1 Vertical Fenestration:
Street Side Exception in 5.5.4.4.1**

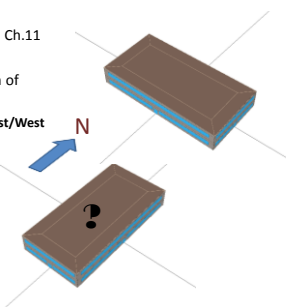
- Height of street story ≤ 20ft
- Continuous overhang PF > 0.5
- ≤ 75% gross wall area of story
- Separate SHGC computation for SHGC and glazing – no averaging



Fenestration Orientation - 2010

5.5.4.5 Fenestration

- Changes to section 5.5.4.5 and Ch.11 for locations of fenestration
- E & W orientations < 25% each of total vertical fenestration
 - ✓ Must be within 30° of true East/West
- Physical dimensions of design solution may be affected



Building Thermal Glazing Changes

5.5.4 Prescriptive Envelope Fenestration Limits

- Fenestration remains capped at 40%; SHGC by VT/SHGC; dependent on percentages of glazing
 - ✓ Vertical glazing orientation limitations covered by Section 5.5.4.5
 - ✓ Dynamic glazing SHGC 5.5.4.2
 - ✓ Must be separately analyzed from remainder of conventional glazing



Building Thermal Glazing Changes

5.5.4 Skylight Area Limits

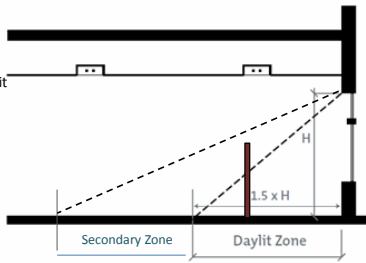


- Skylights remain at two niches: 0-2% and 2.1-5%
- Different U- and SHGC factors
- Table has 3 classes for skylight glazing materials, curb heights
 - ✓ Exception: Skylights outside of scope NFRC 200, VT determined by ASTM E972

Sidelighting

Prescriptive Figures in 3.2: Daylight Zones

- Equals head height
- 2x for secondary limit
- Side margins of 2'
- Opaque wall cutoffs
- Obstruction < 5 ft
- No allowances yet - technical strategies



DAYLIT ZONE—SIDELIGHTING

Increased Skylighting – (Prescriptive mandate)

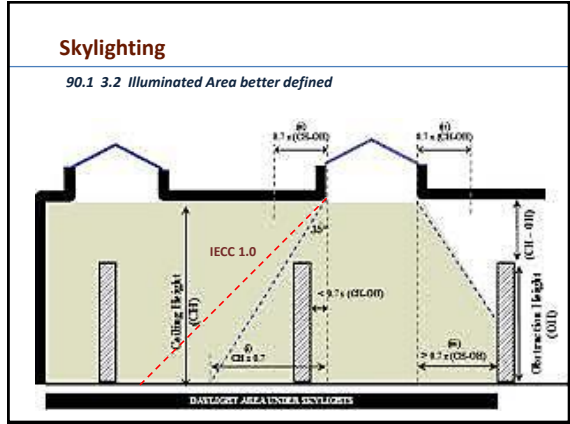
5.5.4.2.3(a) Minimum Skylight Areas; 15 Types



- Assembly Uses:**
 - Gym/exercise center; convention and transportation centers
 - Business & Mercantile Uses**:**
 - Offices**; Retail stores**
 - Automotive services**
 - Associated spaces**
 - Atrium; Concourse; Corridor; Lobby
 - Factory Uses:**
 - Manufacturing**; Workshop;
 - Storage Uses**:**
 - Warehouses (non-refrigerated); Distribution/Sorting, Storage
- ** 90% haze factor; these uses**

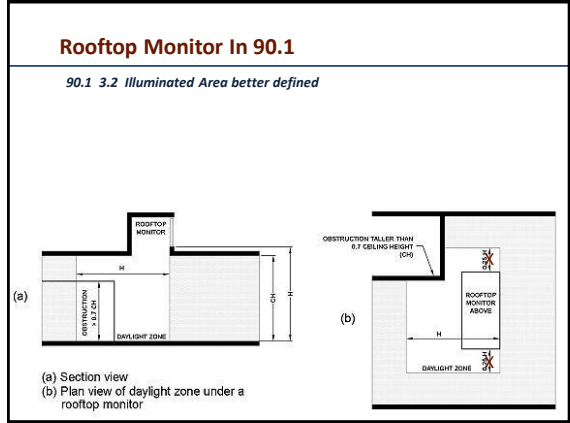
Skylighting

90.1 3.2 Illuminated Area better defined



Rooftop Monitor In 90.1

90.1 3.2 Illuminated Area better defined



Combining Sloped Glazing, Skylights

5.5.4.2 Using Both Percentages to Best Effect



AKF

Lighting Control Compared

Sections ICC C405 and 90.1-9.4.1

IECC [CE]	Controls	ASHRAE 90.1
■ C405.2.1.2	■ Lighting reduction controls in spaces that use < 6w/sf	■ 9.4.2.1a
■ C405.2	■ Space Control -50% on	■ 9.4.1
■ C405.2.2	■ Auto shutoff	■ 9.4.1.1
■ C405.2.2.3	■ Primary Sidelighting	■ 9.4.1.4
■ C405.2.2.3.3	■ Secondary Sidelighting	■ (9.4.1.4 separate)
■ C405.2.2.3	■ Toplighting*	■ 9.4.1.5
■ C405.2.3	■ Additional controls	■ 9.4.1.6



Commissioning

9.4.4 Functional Testing – Lighting Controls

Devices and Control Systems Tests

- Occupant sensors performance
- Programmable/T.O.D. controls can turn lights off
- Photosensors will reduce lighting levels based on usable daylight
- Safety/security exceptions
 - ✓ 4.2.4 Inspections. Electrical equipment and systems; after installation; before concealment

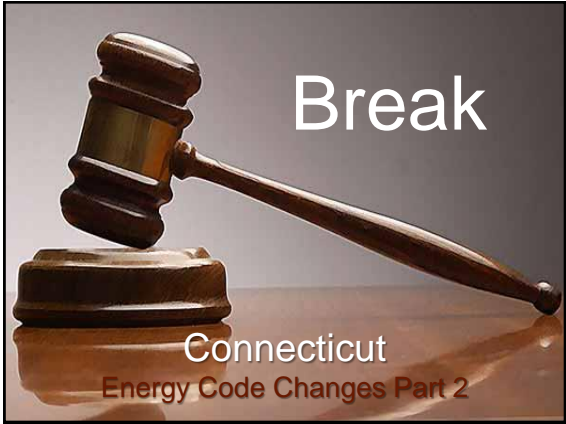


DEEP 16a-38k High Performance Buildings

An OVERLAY - Not governed by the CT Codes Adoption


- Applies to State and State-funded construction
 - ✓ > \$5 million new
 - ✓ > \$2 million addition
- **21% less energy use**
- Demonstrate whether building meets performance or tradeoff compliance
- If applicable, a report is submitted with CDs.






Relationship Between IECC & IRC

R103.2 Construction Documents



VS



- IECC addresses only energy
- IECC addresses residential and commercial;
- IRC addresses all R-3 Residential topics (*structural, plumbing, etc.*),
 - ✓ Allows builder to carry only one code book
 - ✓ Chapter 11 covers energy efficiency
- IRC addresses subsets of residential;
 - detached one- and two-family dwellings
 - townhouses 3 stories or fewer
- 2012 consolidates IECC *Residential Provisions* with IRC energy Chapter 11 (actually a change to the IRC, not the IECC)

How Does My Residential Project Need to Comply?


IECC	IRC
R-2/R-3/R-4 - three stories or less in height	One- and two-family dwellings; townhouses



Residential Changes [RE]

Six Principal Areas


- R101 Administration
- R202 Definitions
- R402 Thermal Envelope
- R403 Mechanical/SWH
- R404 Power & Lighting
- R405 Performance Alternative



http://www.energycodes.gov/events/energycodes/documents/ecodes11/EC2011_2012iecc_residential_update.pdf

Compliance

R101.5.2 Low Energy Buildings CT Amends



“Buildings and structures for which heating and cooling is supplied solely by non-purchased renewable energy sources...that do not rely on backup heat from other purchased, non-renewable sources.”

- On-site wind
- On-site water
- ✓ Geothermal, water power
- On-site PV solar power
- Wood-burning heating appliances

Construction Documents

R103.2/N1101.8 Information on Construction Documents

- Describes Categories
 1. Insulation: R-values
 2. U- & SHGC factors
 3. Area-weighted U- & SHGC
 4. HVAC system design criteria
 5. HVAC & SWH types, sizes, efficiencies
 6. Equipment/systems controls
 7. Fan motor HP; controls
 8. Duct sealing; duct & pipe insulation
 9. Air sealing details
 10. Light Fixture Schedule; controls



Construction Documents

R103.5– Document Retention - C.G.S. Amendments

- **Chapter 188, C.G.S. - Records**
- *“One set of approved construction documents shall be retained by the building official for a period as set forth in the records/disposition schedule adopted pursuant to Chapter 188 of the Connecticut General Statutes”*



Definitions and Errata

R202 Added / Amended / Not Applicable

ADD

- Continuous air barrier
- Demand recirculation water system
- Fenestration product – site built
- Whole-house ventilation

AMD

- Residential building
- Skylight (2405.2)*

N/A

- Entrance door* (RE12)
- Visible Transmittance* (dynamic glazing)



Definitions

R201.3 Terms Defined in Other Codes

- *“Where terms are not defined in this code and are defined in other codes adopted as portions of the 2012 State Building Code, such terms shall have the meanings ascribed to them as in those codes”*



Definitions - Glazing

R202; IBC 2404.2*



- Vertical Glazing $\leq 30^\circ$
 - ✓ Changes to 90.1 definition
- Sloped Glazing $\leq 15^\circ$
 - ✓ IBC 2405.2 Safety Glazing
- Visible transmittance [VT]
 - ✓ drives SHGC
- Undefined:
 - ✓ Dynamic glazing
 - ✓ Sidelighting
 - ✓ Toplighting

Prescriptive Residential Changes

Chapter 4 [RE] Summary

- Increased performance : *envelope, windows, skylights*
- Reduced allowable air leakage: *envelope & duct systems*
- Increased duct tightness *(reduced allowed leakage)*
- Requires supply & exhaust ventilation *(IRC R702.7; IBC 1405.3)*
- Greater HVAC/SHW efficiencies * *(commercial equipment tables)*
- Mandatory Equipment Sizing based on loads *ACCA Manuals S & J*
- Increased H/E lighting *by fixture count or by socket*

Insulation and Fenestration Performance

Table R402.1.1 - by Climate Zone

CLIMATE ZONE	INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT*									
	FENESTRATION U-FACTOR†	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC‡	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE	BASEMENT WALL R-VALUE	SLAB‡ R-VALUE & DEPTH	CRAWL SPACE WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/5	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5 ^b	8/13	19	5/17	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5 ^b	8/13	19	10/13	10, 2 R	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5 ^b	13/17	30 ^c	15/19	10, 2 R	15/19
6	0.32	0.55	NR	49	20+5 or 13+10 ^b	15/20	30 ^c	15/19	10, 4 R	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10 ^b	19/21	38 ^c	15/19	10, 4 R	15/19

For SI, 1 foot = 304.8 mm.
 a. R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed R-value of this insulation shall not be less than the R-value specified in the table.
 b. The Insulation R-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
 c. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement or R-19 cavity insulation at the interior of the basement wall.
 d. "5/13" means R-5 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
 e. R-5 shall be added to the required slab edge R-values for heated slabs. Slab edge depth shall be the depth of the footing or 2 feet, whichever is less in Climate Zones 1 through 3 for heated slabs.
 f. There are no SHGC requirements in the Marine Zone.
 g. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
 h. CA insulation sufficient to fill the framing cavity, R-19 minimum.
 i. First value is cavity insulation, second is continuous insulation or insulated siding, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers 40 percent or less of the exterior, continuous insulation R-value shall be permitted to be reduced by no more than R-3 in the locations where structural sheathing is used - to maintain a consistent total sheathing thickness.
 j. The second R-value applies when more than half the insulation is on the interior of the mass wall.

Table Notes

Insulation and Fenestration

Table R402.1.3 Equivalent U-Factors History: Climate Zone 5

U-Factors	2009	2012	CT
Fenestration	0.35	0.32	0.32
Skylight	0.60	0.55	0.55
Ceiling	0.030	0.026	0.026
Frame Wall	0.057	0.057	0.060
Mass Wall	0.082	0.082	0.082
Floor	0.033	0.033	0.033
Basement	0.059	0.050	0.050
Crawl Space	0.065	0.055	0.055
*Sunroom	0.50	0.45	0.45
*Skylight	0.75	0.70	0.70

Insulation and Fenestration

Table R402.1.1 Requirements by Component – Table Note “h”

- Allows for an R-value for the continuous insulation to be **reduced** not more than R-3, over not more than **40%** of wall structural sheathing, to maintain a uniform total “insulated sheathing plus c.i. thickness.”
- The minimum R-value continuous insulation must be installed over the remainder of the entire wall.



Fenestration U-factors

Table R402.1.3 Equivalencies



- Doors U-0.32
- Windows U-0.32
- Skylights U-0.55
- SHGC *N/R*

Prescriptive Insulation Requirements

R402.2.2 Ceilings w/o Attic Spaces

- **R38** allowed for 500 ft² or 20% total insulated ceiling area, whichever is less, in 'cathedral' ceilings where:
 - ✓ **R-49** Insulation levels would be required
 - ✓ Insufficient framing cavity space to meet tabular levels
- ✓ *This does not apply to 'cathedral' trusses*



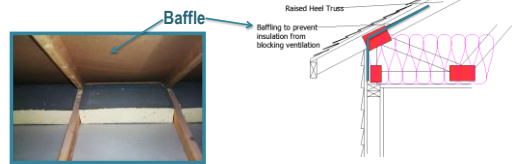
Note: Reduction ONLY applies to the R-value prescriptive path, not the U-factor or Total UA alternatives

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Eave Baffles

R402.2.3 Baffles for air permeable insulations in vented attics

- ✓ Installed adjacent to soffit and eave vents
- ✓ Maintains air openings \geq size of vent
- ✓ Extends over top and ends of attic insulation
- ✓ May be of any solid material

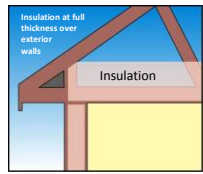


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Ceilings with Attics



C402.2.3.1 Exception:



- If insulation is full height over exterior wall top plate:
 - ✓ R-38 complies where R-49 is required

Note: Reductions ONLY apply to the R-value prescriptive path, not the U-factor or Total UA alternatives

Steel-Frame Ceilings / Walls

Section R402.2.6; Table R402.2.6 Expanded Requirements

Steel-Frame Ceiling, Wall and Floor Insulation (R-Value)

Wood Frame R-value Requirement	Cold-Formed Steel Equivalent R-value*
Steel Truss Ceilings ^b	
R-30	R-38 or R-30 + 3 or R-26 + 5
R-38	R-49 or R-38 + 3
R-49	R-38 + 5
Steel Joist Ceilings ^b	
R-30	R-38 in 2x4, or 2x6, or 2x8 R-49 any framing
R-38	R-49 2x4, or 2x6, or 2x8, or 2x10
Steel Framed Wall	
R-13	R-13 + 4.2 or R-19 +2.1, or R-21 +2.8 or R-0+9.3 or R-15+8.3 or R-21 +3.1
R-13+R-3	R-0 + 11.2 or R-13 +6.1, or R-15 +5.7 or R-19+5.0 or R-21+4.7

Sunrooms

R202; R402.2.12; R402.3.5

- "A one-story structure attached to a dwelling with glazing in excess of 40 per cent of the gross area of the exterior walls and roof."

- Roof - R24
- Walls - R13
- Glazing - 0.45
 - ✓ SHGC -0.48
- Skylight -0.70
 - ✓ SHGC - NR



Air Barriers / Insulation - Common Walls

Table R402.4.1.1 Common Walls – (see Appendix K)

- There is no requirement for an air barrier or insulation in common walls between conditioned living spaces of adjacent dwelling units in townhouses or two-families. However, IRC Appendix 'K' is adopted.

- Multi-family dwellings must comply with IBC 1207.2 for sound attenuation
- Appendix K requiring sound attenuation between dwelling units is not adopted



Building Thermal Envelope (Mandatory)

R402.4.1 Air Leakage



- Show envelope compliance - R402.1.2
- Air barrier installation
 - Whole-house pressure test
 - Procedures for testing outlined
 - Testing may occur any time after creation of all building envelope penetrations*
 - Signed report shall be provided

Air Leakage Rate	Climate Zone	Test Pressure
ACH ≤ 5	1-2	50 Pascals
ACH ≤ 3	3-8	50 Pascals

Building Thermal Envelope (Mandatory)

R402.4.1.2 Exceptions



- **CT Table R402.4.1.1 Exceptions:**
 - Relaxed ACH for Townhouses
 - ✓ 5.0 ACH > 850sf
 - ✓ 6.5 ACH ≤ 850sf
 - ✓ Sampling buildings > 7 units
 - ✓ Visual: Additions/alterations
- **CT R402.4.2 AMD Fireplace sealing requirements**

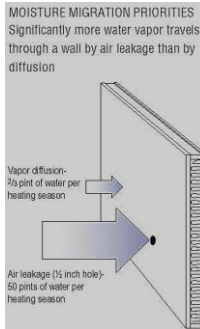


Canadian Airtight Study - 1998

SINGLE FAMILY - ACH

- Mean Age: 20-30yr
- Multiply # by 20 for ACH
- Tight: 0.19-0.24
- Good: 0.48-0.59
- Typical: 0.96-1.18
- Leaky: 1.93-2.35

- Canada: 0.11+ ACH
- ASHRAE 62 ≥ 0.35 ACH



Vapor Retarder – Class III

R702.7 IRC Class III Requirements

Table R702.7.1 Vapor retarder requirements allow the use of a coat of vinyl paint to satisfy the requirement in Zone 5 when:



- A **vapor-impermeable insulating sheathing** with a minimum value of **R-5** is located **outside** of a 2x4 stud wall with **wall cavities insulated to R-3.4 per inch**;
- A **vapor-impermeable insulating sheathing** with a minimum value of **R-7.5** is located **outside** of a 2x6 stud wall with **wall cavities insulated to R-3.4 per inch**;

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Moisture Diffusion in Materials (source)

IBC 1405.3.1 defines Vapor Retardant Class III Materials

MATERIAL	PERM RATING	VAPOR RETARDER(?)
½" GWB	38 -42	NO
TYVEK	52	NO
Latex Primer	7.0 – 10.0	NO
7/16" OSB (w/exterior glue)*	0.77* – 3.48	SOMETIMES
1" XPS	0.40 – 1.60	SOMETIMES
7/16" Plywood (exterior glue)	0.70	YES
Kraft Paper Facing	1.0	YES
2 mil polyethylene	0.06 – 0.22	YES
Alkyd-base or V/R paint	< 0.05	YES
1 mil aluminum foil laminate	< 0.05	YES
½" GWB + VWC	0.05 – 0.80	YES

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Wood-Burning Fireplaces

Section R402.4.2; Table R402.4.1.1 (Mandatory) – CT Amends

New wood-burning fireplaces shall have tight-fitting flue dampers (and outdoor combustion air - 2009).

Fireplaces shall have gasketed doors (DEL)



NAECA

**SINGLE / MULTI-FAMILY RESIDENTIAL
MECHANICAL SYSTEMS AND EQUIPMENT**


**National Appliance
Energy Conservation Act**
Equipment efficiency set by Federal law, not the I-Codes

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National Appliance Energy Conservation Act

C403.2.3 / Tables C403.2.3 (1-6)

- NAECA says: Code cannot require higher efficiencies than are set by energy standards adopted in 1987; amended by Environmental Protection Acts 1992/2005
- Equipment efficiency tables have being amended starting in 2013 and completing in 2016 (NOFR 9/12)
- Even if CT were to remain on IECC 2009 the tables still will be amended to more efficient equipment standards



System Controls

R403.1.1 Programmable for Forced Air Systems Only

- Control is required for each system
 - ✓ if zoned for each zone - multifamily



HVAC Air Systems

R403.2.2.1 Sealed Air Handler

- Air handlers are leak-tested at the factory and have a manufacturer's designation for air leakage of $\leq 2\%$ of design air flow rate per ASHRAE 193



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HVAC / SWH Changes

Section R403 Mechanical

- R403.2.2 Revised duct sealing and duct testing – either rough or final
- R403.5.1 Whole house mechanical ventilation
 - ✓ Meet Table R403.5.1 fan efficacy
 - ✓ Where leakage is < 5 ACH 50
- R403.6 Equipment sizing
 - ✓ Use ACCA Manual J



Duct Tightness Testing

R403.2.2 Sealing (Mandatory)

Duct tightness shall be verified by:

- **Post construction test**
 - ✓ Total leakage: ≤ 8 cfm/per 100 ft² (≤ 4)
 - ✓ All register boots taped or sealed
- **Rough-in test**
 - ✓ Total leakage: ≤ 8 cfm/per 100 ft² (≤ 4)
 - ✓ all register boots taped or sealed
 - ✓ if air handler not installed at time of test, total air leakage ≤ 4 cfm/ 100 ft² (≤ 3)



Exception: Duct tightness test is not required if the air handler and all ducts are located within the building thermal envelope

Building Framing Cavities

R403.2.3 Sealing (Mandatory)

Framing cavities cannot be used as ducts or plenums (or jump ducts)

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Whole House Fan Efficiency

Table R403.5.1 (New) – For Whole House Ventilation Systems

MECHANICAL VENTILATION SYSTEM FAN EFFICIENCY

FAN LOCATION	AIR FLOW MIN CFM	EFFICIENCY	MAX AIRFLOW
Range Hoods	Any	2.8cfm/watt	Any
In-line Fan	Any	2.8cfm/watt	Any
Bathroom/Utility	10	1.4cfm/watt	<90cfm
Bathroom/Utility	90	2.8cfm/watt	Any

Exception: For integral equipment fan motors, that shall be electronically commutated

Whole House Mechanical Ventilation

Table M1507.3.3 /403.3 (info) Continuous Airflow

CONTINUOUS AIRFLOW RATE REQUIREMENTS

DWELLING UNIT FLOOR AREA [square feet]	NUMBER OF BEDROOMS				
	0 to 1	2 to 3	4 to 5	6 to 7	over 7
Airflow in CFM					
<1,500	30	45	60	75	90
1,501-3,000	45	60	75	90	105
3,001-4,500	60	75	90	105	120
4,500-6,000	75	90	105	120	135
6,000-7,500	90	105	120	135	150
over 7,500	105	120	135	150	165

Mechanical Piping Insulation

R403.3.1 Protection From Damages (Mandatory)

- Protect from weather and damage, including
 - ✓ Sunlight
 - ✓ Moisture
 - ✓ Wind
 - ✓ Maintenance personnel
- Provide shielding from solar radiation that can cause degradation of insulation
- Adhesive tape not allowed



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Damper Controls

R403.4.1 Manual or automatic shutoff (mandatory)

- Shutoff Dampers
- Motorized dampers that will automatically shut when the system or spaces are not in use.
- Exceptions
 - ✓ Gravity dampers permitted in buildings ≤ 2 stories
 - ✓ Gravity dampers permitted for outside air intake or exhaust airflows of 300 cfm (0.14m3/s) or less.



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HVAC / SWH Changes

Section R403.4 Mechanical

- Table R403.4.2 Insulate piping
- R403.9 Pool heaters/switches /pool covers
 - ✓ Heaters/pumps/motors shall have built-in timers
- Pool cover Exception: where >70% of energy is supplied by renewable sources on site



SWH Piping Insulation

Table R403.4.2 Maximum Run Length

Largest Ø in Run (inches)	3/8	1/2	3/4	>3/4
Max. Run Length (feet)	30	20	10	5

Piping:

- > 3/4 inch diameter
- > one dwelling unit
- To kitchen outlets
- Outside conditioned space
- To distribution manifold
- Under floor slab
- Buried piping
- Recirc. Supply & returns
- Runs more than Table max.



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Mechanical Ventilation

R403.5 Fan Efficacy per Table R403.5.1

- Supply and exhaust air
- Bath/utility fans
- Range Hoods
- HRV? / ERV?

Table R403.5.1 Mechanical Ventilation System Efficacy

Fan Location	Minimum CFM	Efficacy – CFM/Watt	Maximum CFM
Range Hood	Any	2.8 cfm/w	Any
In-line Fan	Any	2.8 cfm/w	Any
Bath/Utility	10	1.4 cfm/w	< 90
	90	2.8 cfm/w	Any

Equipment Sizing

R403.6 Sized in Accordance With Loads (Mandatory)

ACCA Standards

- J – Load Calculations
- S – Equipment Selections
- D – Duct Design* (N/R)
- ASHRAE/ACCA 183 [CE] similar



<http://www.acca.org/store/product.php?pid=97>

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Equipment Sizing for HVAC and SWH Systems

R403.7

- Systems serving multiple dwelling units shall comply with Commercial Provisions, Sections C403 and C404 in lieu of Section R403



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Hot Water System Controls

R403.4.1 Multi-family Systems Only

Ability to turn off circulating hot water pumps and heat trace tape when there is limited demand



- ✓ Automatic or manual
- ✓ Readily accessed

Motor Nameplate Horsepower

R403.4.1 Multi-family motors only (mandatory)

- Selected fan motor to be no larger than first available motor size greater than bhp
- Fan bhp on design documents
- **Exceptions**
 - ✓ Fans ≥ 5 bhp, where first available motor larger than bhp has nameplate rating within 50% of bhp, next larger nameplate motor size may be selected
 - ✓ Fans ≥ 6 bhp, where first available motor larger than bhp has nameplate rating within 30% of bhp, next larger nameplate motor size may be selected
 - ✓ Fans less than 5 bhp are exempt

bhp = brake horsepower

Multifamily HVAC and SWH Systems

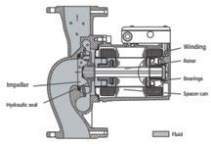
R403.7 - Multifamily Uses - C403 Mechanical & C404 SWH

- Controls
- Heat pump supplementary heat
- Ducts
 - ✓ Sealing (Mandatory) – **post-construction test option**
 - ✓ Insulation (Prescriptive) - unchanged
- HVAC piping insulation

Multifamily HVAC and SWH Systems

R403.7 - Multifamily Uses - C403 Mechanical & C404 SWH

- Service hot water circulating systems
- Ventilation
 - ✓ Dampers
- Loads / Equipment sizing
- Multiple dwelling units systems: Snow melt controls
- Pools and in-ground permanently installed spas



Multi-Family HVAC Systems

R403.7- Use C403 for Simple or Complex Systems

Simple systems

- Unitary/package HVAC equipment
- One zone - single thermostat

Complex systems

- All equipment not covered under Section C403.3

Section C403.3 Simple Systems Buildings served by unitary or packaged HVAC each serving 1 zone controlled by 1 thermostat. Two-pipe heating systems serving multiple zones are included if no cooling system is installed

Section C403.4 Complex Systems All buildings served by HVAC systems not covered under 503.3

Service Water Heating

IPC Chapter 5 Multi-family Water Heaters Systems

IPC 404.2 Minimum Performance of Water-Heating Equipment (NAECA)

- ✓ Water Heater Types Covered
 - Electric Storage
 - Gas and Oil Storage
 - Instantaneous Water Heaters – gas/oil
 - Hot water boilers – gas/oil
 - Pool heaters
 - Unfired storage tanks



Temperature Controls (IPC 501.8)
Heat Traps (IPC 504.1)

Pools and Spas

R403.9 Permanent, In-Ground (mandatory)

C404.9.1 - Pool Heaters

- ✓ Switch accessible outside
- ✓ Natural or LPG fired pool heaters – no continuous pilots



C404.9.2 - Time switches; other automatic control * Controls operate on preset schedule

- ✓ Exceptions
 - Where 24 hour operation required
 - Where pumps operate using solar/waste heat recovery
- *Note: heaters, pumps and motors with built-in timers meet this requirement

Pools and Spas

R403.9.3 Heated Pool Covers

- 2009 - If heated to >90°F, vapor-retardant pool cover at least R-12
- 2012 – Heated pools and permanently installed spas shall be provided with a vapor-retardant cover
 - ✓ Exception: Over 70 % of the energy for heating from site-recovered energy



Lighting Allowance - OPTIONS

R404.1 - 75 percent High Efficacy Lighting

- SOCKETS
- FIXTURES



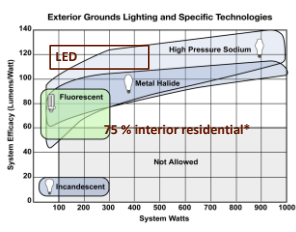
EXCEPTIONS: Low-voltage lighting; no fuel gas pilots

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Lighting Equipment

R404.1 - 75 percent High Efficacy Lighting

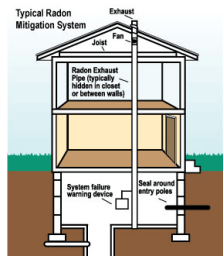
- R404.1 A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps, **OR** a minimum of 75 percent of the permanently installed fixtures shall contain only high-efficacy lamps
- C405.1 Exception: (ILPA) + Controls + equipment in multi-family dwelling units: are regulated *indirectly* by this Section



Radon Passive Systems

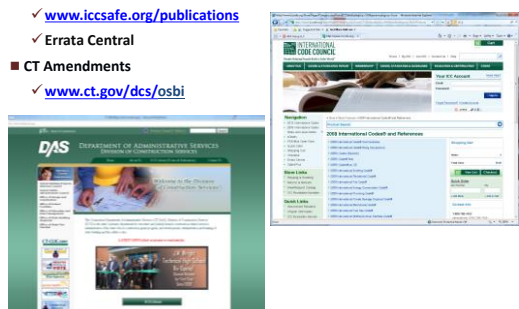
IRC Appendix AF101.2 Radon Mitigation Construction (CT)

- Sub-slab preparation/retarder
- Passive venting above roof
- Sealed system
- Termination above roof line
- Provisions for power source to accommodate future fan ventilator



Where to Find, Purchase and Maintain


- 2012 IBC, IFC, IEBC, IMC, IPC, IECC
 - ✓ www.iccsafe.org/publications
 - ✓ Errata Central
- CT Amendments
 - ✓ www.ct.gov/dcs/osbi



Suggested Resources

- ICC 2012 Codes - public ACCESS/ICC Codes 2009-2015
- www.iccsafe.org
- ICC 2015 Codes
- <http://codes.iccsafe.org/I-Codes.html#all>
- DOE Resource Guides for air leakage, HVAC
- <https://www.energycodes.gov/resource-center/resource-guides>
- DOE Resources for RESCheck Basics
- <https://www.energycodes.gov/sites/default/files/becu/rescheckbasics.pdf>
- DOE Video on Duct Testing
- <https://www.energycodes.gov/training-courses/duct-testing>
- Energy Star Checklists
- http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/InspectionChecklists.pdf

BECP - Your Resources



Additional resources, including:

- Code Notes
- Technical Assistance to Users
- Energy Codes 101
- Setting the Standard
- Training Materials
- Resource Center

Are available through the Building Energy Codes Program

www.energycodes.gov

