Office of Education and Data Management

Spring 2018 Career Development

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Significant Changes in the 2015 International Energy Conservation Code

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Use of Office of Education and Data Management (OEDM) training materials must be approved in writing by the State of Connecticut, Department of Administrative Services' Office of Communications.

The Two Faces of IECC 2015

Commercial Chapters

1. Admin & Enforcement
2. Definitions [CE]
3. General Requirements
4. Energy Efficiency
5. Existing Buildings
6. Referenced Standards
7. Index

Residential Chapters

1. Admin & Enforcement
2. Definitions [RE]
3. General Requirements
4. Energy Efficiency
5. Existing Buildings
6. Referenced Standards
7. Index

Errata Central

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

- IECC 2012 had 9 changes between first and third printings
- IECC 2015 has 10 changes already since the first printing

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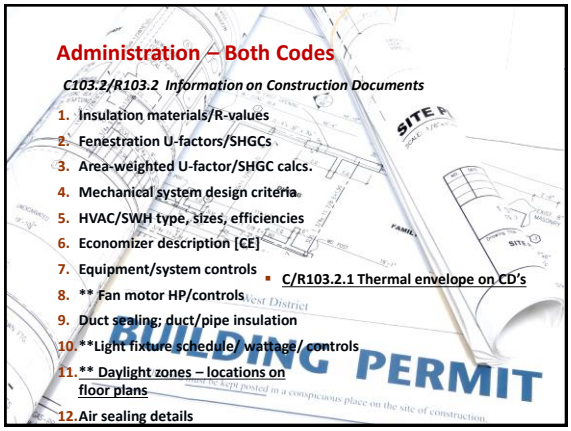
Administration – Both Codes

C103.2/R103.2 Information on Construction Documents

1. Insulation materials/R-values
2. Fenestration U-factors/SHGCs
3. Area-weighted U-factor/SHGC calcs.
4. Mechanical system design criteria
5. HVAC/SWH type, sizes, efficiencies
6. Economizer description [CE]
7. Equipment/system controls
8. ** Fan motor HP/controls
9. Duct sealing; duct/pipe insulation
10. **Light fixture schedule/ wattage/ controls
11. ** Daylight zones – locations on floor plans
12. Air sealing details

- C/R103.2.1 Thermal envelope on CD's



Scoping and Administration

C103.2 / R103.2 Information on Documents

[CE] [RE] Mechanical Equipment Schedules

- Equipment efficiencies and load sizing
- Fan and pump nameplate motor and brake horsepower
- Fan efficiency grade (FEG), where applicable
- Economizer descriptions; controls; fault diagnostics (C403.2.4.7)
- Hydronic system supply and return water design temperatures for boilers and terminal devices (baseboards, unit ventilators)
- Steam system design pressure for boilers and all terminal devices (if applicable)

Administration – OPTIONS

C/R 103.2 No Information Required on Construction Documents!

Both Commercial & Residential

- IECC vs. ASHRAE for CE Ch.4
- Prescriptive vs. Performance
- Component (R) vs. Assembly (U)
  - ✓ **C402.1.5 Component performance**
- Delineate thermal boundaries
- COM✓/RES✓ vs. TBP / ECBM
- **Commercial and Mixed Occupancy**
- Daylighting Option (Y/N)
  - ✓ **Mandatory Daylighting Changes**
- ILPA Building or Space-by-Space
- ELPA Tradeable vs. Use or Lose
- Six Efficiency Options – pick 2

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Required Inspections

C104.2 Required 'Approvals' Amended: Detail the Information

- Footings/foundation
- Framing & rough-ins:
  - ✓ **Plumbing**
  - ✓ **Mechanical**
  - ✓ **Electrical**
- Final
  - **Systems, Controls**
    - ✓ **All specified equipment**
  - **Commissioning**
    - ✓ **Preliminary Report**

Definitions: New and Amended

Section C202 / R202 (Applicable to Climate Zone 5 requirements)

- *Building Official* (code official)
- *Below-grade walls*
  - ✓ C202 ≥85%;
  - ✓ R202 ≥ 50%
- *Continuous insulation*
- *Insulating siding* (new)
- *Historic Building* C/R 202 (amended)
- *Roof recover / re-roof / repair* (new)
- *Vertical glazing* (amended)

- ✓ **Hidden Acronyms: pgs.ix & x in Preface**

Definitions

C202 & R202 Applicable to Climate Zone 5 requirements

- *Above-grade walls**
  - ✓ C202 Walls ≥15% above exterior grade
    R202*Walls ≥50% above grade
- *Opaque Doors** [CE] – C202.2)
  - ✓ Doors with less than 50% glass area
- *SHGC* C402.4.3*; R402.3.3
  - ✓ Solar Heat Gain Coefficients
- PF - *Projection Factor*
  - ✓ Measures ratio (< 1.0) of dimensions for shading devices/fixed overhangs: horizontal over vertical
  - ✓ Table C402.4 sets maximum PF factors

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Chapter 3: General Requirements

(consistent between the separate divisions)

- CE / RE 301.4 Tropical Climate Zone
- CE / RE303.1.1 adds insulated siding; term defined in R202

Existing Buildings Road Map

[CE] [RE] Relocations of specific Commercial & Residential sections

Existing building requirements move to newly created Chapters 5

501.1 EXISTING BUILDINGS - SCOPE & ADMINISTRATION		
Section Title	**2015[CE]**	**2015[RE]**
Scope	C501.1	R501.1
Historic Buildings	C501.6	R501.6
Additions, Alterations, Repairs	C502. 503, 504	R502, 503, 504
Compliance	C501.4	R501.3
Change to Conditioned Space	C503.2	R503.2
Low Energy Building Exemption	C402.1.1	N/A
Roof Solar Reflectance	C402.3	N/A

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COM*Check* Version 4.0.8.2

C101.5.1 UA Compliance Alternative

- Can be used to show compliance with 2015 IECC or ASHRAE 90.1-2013
  - ✓ **Now updated to 2013-2015**
- Completely electronic: user inputs all of the building data
- Will demonstrate whether building meets performance or tradeoff based compliance
- If used, report is submitted with construction documents.

www.energycodes.gov/comcheck

Commercial Compliance Options

C401.2 Application: Commercial Buildings Packages

Comply with one of the following:

1. **(CT)** 90.1; use ASHRAE Appendix 'G,' Tables G3.1.1-1 to G3.1.1-4
2. C402-405 + C406*
3. Total Building Performance ≤ 85%
   - ✓ **C402.5 Air Barriers**
   - ✓ **C403.2 Mechanical (mandatory)**
   - ✓ **C404 Service Water Heating**
   - ✓ **C405.6 Metered dwelling units**
   - ✓ **C407 Tables C407.5 using Standard v. Proposed Design**

Envelope Requirements

C402.1.1 Low Energy Buildings

- Peak energy use < 3.4Btuh/sf for space conditioning purposes
- Does not contain conditioned space
- Utilizing non-purchased renewables only, and no backup heat sources:
  - ✓ **On-site wind, water, solar**
  - ✓ **Wood-burning heating appliances**
- Greenhouses (see Definitions)

Envelope Requirements

C402.1.2 "Equipment Buildings"

- < 500 square feet
- Not intended for occupancy
  - ✓ **Not habitable or occupied, except for workers**
- Housing "electronic equipment"
- Waste heat ≥ 7 W/sf (22 Btu/h)
  - ✓ **Heating only**
  - ✓ **Thermostat set ≤ 50°F**
- Energy use ≤ 17kBtu/SF
- Envelope UA-factor: < 0.20 in Zone 5 *C402.1.2 Envelope Exception*

R-Values / U-Factors

Table C402.1.2 Opaque Thermal Envelope

- ROOFS – Insulation R-value above deck (increases – R25 to R30)

Prescriptive Envelope

C402.1.3/4/5 C402.2.6, C402.4.3.3 Changes

- C402.1.3&4 Expansion of R-value/U-factor provisions
  - ✓ **Table C402.1.4.1 Effective R-values for Steel Stud Walls**
- C402.1.5 Component Performance Alternative (non-standard): added
  - ✓ **Similar to COMCheck option: user analysis of U/F/C factors**
- C402.2.6 Insulation of radiant heating systems
- C402.4.3.3 Dynamic glazing requirements – when/if used

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Mass Walls

C402.5.1; C 202 Materials

- C402.5.1.2.1 adds clay, shale masonry units as compliance options
- C402.5.1.2.2 amended to include coatings for air barrier materials

Commercial Glazing

C402.4 Prescriptive Fenestration Overview

Overview:

- Vertical fenestration area still 30% since 2012
  - ✓ **40% vertical when daylighting controls used per C402.4.1.1**
- U-factors for skylights reduced; allowed % skylight area increases from 3% to 5% of total roof area
  - ✓ **5% skylights when daylighting controls used per C402.4.1.2**
- SHGC now varies by orientation: N/S – E/W
- In 16 building types ≥ 2,500 SF floor area must be located in a "daylight" zone

Daylighting

C402.3.2 Daylighting Prescriptive Requirement

- Enclosed spaces **> 2,500 s.f.** directly under a roof with ceiling heights **≥ 15' for 75% F/A**
  - ✓ **Four exceptions**

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; these uses*

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Glazing: Orientation *(2015 prescriptive)*

Table C402.4 U-factor / SHGC Requirements by Orientation

Ciimate Zone	1		2		3		4 except Marine		5 and Marine		6		7/8	
Vertical Fenestration U-factors														
Fixed	0.50		0.50		0.46		0.38		0.38		0.36		0.29	
Operable	0.65		0.65		0.60		0.45		0.45		0.43		0.37	
Doors	1.10		0.83		0.77		0.77		0.77		0.77		0.77	
SHGC	ESW	N	ESW	N	ESW	N	ESW	N	ESW	N	ESW	N	ESW	N
PF < 0.2	0.25	0.33	0.25	0.33	0.25	0.33	0.40	0.53	0.40	0.53	0.40	0.53	0.45	N/R
0.2≤PF<0.5	0.30	0.37	0.30	0.37	0.30	0.37	0.48	0.58	0.48	0.58	0.48	0.58	N/R	N/R
PF ≥ 0.5	0.40	0.40	0.40	0.40	0.40	0.40	0.64	0.64	0.64	0.64	0.64	0.64	N/R	N/R
Skylights														
U-factor	0.75		0.65		0.50		0.50		0.50		0.50		0.50	
SHGC	0.35		0.35		0.35		0.40		0.40		0.40		N/R	

Envelope Requirements

C402.5.3 Isolation of Fuel-fired Equipment

- Separately sealed and insulated rooms
- Isolate appliances from conditioned spaces
- Isolate combustion air & vent openings

Vestibule Requirements

C402.5.7 (6) Exception for Air Curtains

Air curtain wall technology option for vestibule barriers

- 6.56 fps minimum air velocity
- Heated; no A/C
- Max. 55^0F Δt
- Separate control

Building Mechanical Systems

Tables C403.2.3(1) to (9) Minimum Equipment Efficiencies

Federal NAECA changes (all effective)

- Numerous changes as a result of final determinations by DOE under the National Appliance Energy Conservation Act [NAECA]

Commercial HVAC

C403.2 Mandatory Provisions

- Load calculations must account for ERV systems
- HVAC Zone Isolation: <25kSF
- Heat Rejection Equipment
- Chiller NPLV required performance
- Auto-start controls
- DCV for all systems w/ >25 occupants/100sf
- Pipe insulation Table C403.2.10

Exhaust Systems

C403.2.4 – C403.2.8 Exhaust Air Requirements

- Economizers: Fault detection
- Energy recovery: Tables C403.2.7.1 and C403.2.7.2
- Kitchen exhaust systems
  - ✓ **≤ 10% shall be direct outdoor air**
  - ✓ **≥ 50% exhaust shall be transfer air from other building exhausts**
- Enclosed parking garage ventilation

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Ventilation Fan Controls

C403.2.6.2 Enclosed parking garage ventilation controls

- Contamination sensing automatic fail-safe controls;
- Stage fans to ≤ 50% capacity or operate < 20% of time; failure mode is 100% capacity
- Exceptions: Unconditioned garages
  - ✓ **< 22,500 CFM of exhaust capacity**
  - ✓ **Fan efficiency > 1125 cfm/hp**

HVAC: Economizers

C403.3 / C403.2.4.7 Fault Detection (FDD - new)

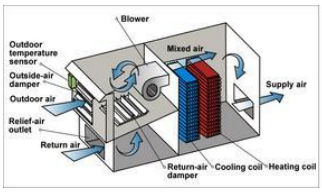
- Fault detection is now required in all systems with economizers
- Units under 54,000 Btu/h cooling capacities – economizer N/R
- Economizers have nine exceptions - tradeoffs possible

Building Mechanical Systems

C403.2.7 Ventilation Systems - Energy Recovery

- Tables C403.2.7 for systems (1) less than AND (2) greater than 8,000 CFM;

- Minimum 50% enthalpy recovery for makeup ventilation
- C403.3.1 calls for integrated control to ignore false loading



HVAC Economizer Systems

Performance, Fault Detection & Diagnostics [FDD]

- C403.3 applies to both air and chilled water units > 54,000 Btu/h
- C403.3.1 requires integrated AC operation on partial load; no false loads
- C403.2.7 indicates that most systems will include enthalpy recovery

Building Mechanical Systems

C403.2.8 Kitchen Exhaust hoods

- C403.2.8: ≥ 20% total energy recovery on kitchen hoods > 5,000CFM

Duct Changes

C403.2.9 Duct Insulation

- Insulate when not completely inside the thermal envelope
- Duct insulation outside of thermal envelope must be R-12 (R-8) Zone 5

TABLE 1
Dew Point Comparison

There are many ways to arrive at the same dew point (in this case, 75F):

130F, 20% RH – 75F DP (dew point)
120F, 28% RH – 75F DP
110F, 33% RH – 75F DP
100F, 46% RH – 75F DP
90F, 63% RH – 75F DP
80F, 86% RH – 75F DP
75F, 100% RH – 75F DP

HVAC: Pipe Sizing and Insulation

Table C403.2.10 Minimum Pipe Insulation Thickness

- Maximum allowable flow rates for chilled and condensed water
  - ✓ **Based on nominal pipe size**
- Requirements change for pipe insulation used for heating systems Table C403.2.10
  - ✓ **Increases 0.5"- 2" depending on tube size and temp range**

FLUID OPERATING TEMPERATURE RANGE AND USAGE (°F)	INSULATION CONDUCTIVITY		NOMINAL PIPE OR TUBE SIZE (Inches)				
	Conductivity Btu · in./(h · ft² · °F)*	Mean Rating Temperature, °F	< 1	1 to < 1¼	1¼ to < 4	4 to < 8	≥ 8
> 350	0.32 – 0.34	250	4.5	5.0	5.0	5.0	5.0
251 – 350	0.29 – 0.32	200	3.0	4.0	4.5	4.5	4.5
201 – 250	0.27 – 0.30	150	2.5	2.5	2.5	3.0	3.0

Piping Insulation

C403.2.10.1 Weather Protection - ERRATA

- Piping insulation exposed to the weather shall be protected from damage, including that due to sunlight, moisture, equipment maintenance and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

Commercial Refrigerators and Freezers

C403.2.14 – NEW; Tables for NAECA Requirements

- By type and energy use; AHRI #
- Efficiency requirements
- By Class; Family; operating mode
- By operating temperatures
- By energy use limits

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Building Mechanical Services

C403.2.14 Minimum Refrigeration Requirements Expanded

Coolers and freezers; large and small

- C403.2.14 Kitchen units
- C403.2.16 Walk-Ins
- C403.2.17 Reach-Ins

Commercial Refrigerators and Freezers

C403.2.14 – NEW; Tables for NAECA Requirements

- Construction
- Doors
- Fan motors
- Condensers – C403.5
- Anti-sweat heaters
- Controls
- Lighting

Mechanical Equipment Motors

C403.4.4.4 Fractional HP Fan Motors

- *KNOW WHAT YOU'VE GOT; mandated and integral to rated equipment*

- Fan motors > 1/12hp and < 7.5hp shall be
  - ✓ **Electronically commutated OR**
  - ✓ **≥ 70% motor efficiency AND**
  - ✓ **Be adjustable speed**
  - ✓ **Exceptions apply**

Service Water Performance Efficiency

C404.2 Equipment and Systems; Insulation

Table C404.5.1 Sizing by pipe length or pipe volume

Service Water Heating

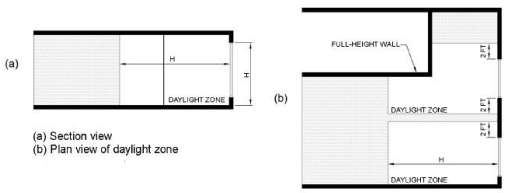
C404.3 SWH Equipment Performance Efficiency

- SWH may also provide building heating per Table C404.2
- SWH pipe insulation may be discontinuous through solid framing members
- Piping insulation: 7 Exceptions listed
- Tables for computing Exceptions:
  - ✓ **By length**
  - ✓ **By volume**
- Demand controls for HW circulating systems
- Prohibits gravity or thermo-siphon systems

Daylighting – Side Light Zones

Figure C405.2.3.2 Wall Fenestration

- Zones Adjacent to Wall



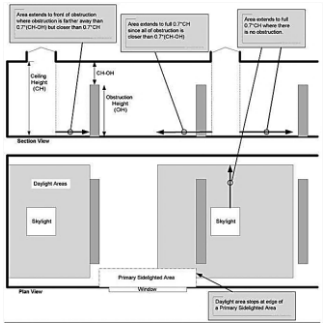
(a) Section view
(b) Plan view of daylight zone

Daylighting - Skylights

C402.4.1.2 / Fig. C405.2.3.3

- Twice the ceiling height [CH] times the 0.7 factor, plus the length AND twice the ceiling height times the 0.7 factor, plus the length, equals the control zone area

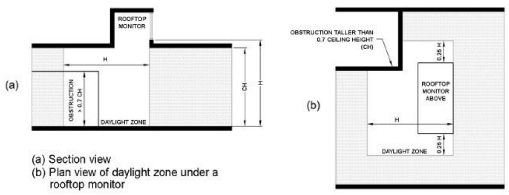
- W x L of skylight
- Zone boundary A_{fl} =
- [2 x 0.7 CH + L] x
- [2 x 0.7 CH + W]



Daylighting – Top Light Zones

Figure C405.2.3.2 Ceiling (non-skylight) Fenestration

- Under a Rooftop Monitor



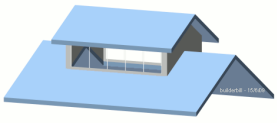
(a) Section view
(b) Plan view of daylight zone under a rooftop monitor

Daylighting Responsive Controls

C402.2.3 / Fig.C405.2.3.2

Rooftop Monitor Zones Changes

- Zone: top of roof monitor fenestration, not 15'
  - ✓ **Accounts for rooftop monitor glazing**
  - ✓ **Exception: where site shading occurs**
- VT in existing buildings determines if a zone
- Figure C405.2.3.2. Partitions at > 70% of ceiling height using roof monitor daylighting have their floor area included



Power and Lighting Changes

[CE] [RE] Electrical Power and Lighting

- CT C 202 Definition: *Full Cutoff Luminaires*
- CT C405.5.2 Light Pollution Controls
- C405.2.3.2 Sidelight zone
- C405.2.3.3 Toplight zone
- C405.2.4 Specific application control (see diagrams for defined areas)
- R404 Power & Lighting
- R403.8 Systems serving multiple dwelling units
  - ✓ **Uses C405 for common areas and exterior lighting**
  - ✓ **Daylighting only for mixed uses**

Lighting Power Densities

C405.4.2 Building Area Method

- Across-the-board reductions in Light Power Density (LPD) W/sf
  - ✓ **21 lower / 5 higher / 5 unchanged**
- Introduction of Room Cavity Ratio (RCR) Adjustment, allows 20% increase in LPD for unusually tall or wide spaces using Space-by-Space Method

Lighting Power Density Changes

C405.4.2 Tables C405.4.2; 9.4.1 ASHRAE 90.1 - Addendum 'by'

- https://www.ashrae.org/standards/90_1_2010_2013Addenda.pdf

- Conforms with 90.1-2013 ILPD changes
- Building Type Option:
  - ✓ **5 densities INCREASED**
  - ✓ **5 densities UNCHANGED**
  - ✓ **21 densities DECREASED**
- Space-by Space densities also change
- Toplighting and Sidelighting
- Combines lighting; new Tables
- Adds occupancy sensor controls
  - ✓ **Locker rooms, warehouse aisleways**
  - ✓ **Control 50% reductions**

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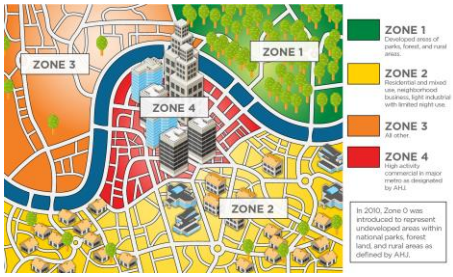
Lighting: Exterior LPD Zones

Table C405.5.2(2) Exterior Building Lighting Power – some tradeoffs



CT (ADD) C202.1 / C405.5.2 Full Cutoff Luminaire

Lighting: Exterior LPD

C405.5 and Table C405.5.2

- Exterior lighting LPD allowances now set by four lighting zones
- Expanded exterior lighting categories
- Divided by tradeable v. non-tradeable
- LIGHTING ZONE 3 definition revised: All other areas <u>not covered by zones 1,2 or 4</u>
- Zone 1 does not allow lighting for lighting applications intended for street frontage or building facades

Exterior Lighting LPD – By Zone

Table C405.5.2(2) Exterior Lighting Power Allowances

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

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Electrical Power Changes

C405.9 Equipment Efficiencies Added

- A17.1 safety rules limit to automatic sensing for slowdown / resume speed

- Transformer efficiency
- Motor drives; controls
- Elevators:
  - ✓ **power reduction controls**
- Escalators:
  - ✓ **Regenerative drives**
- Moving Walkways:
  - ✓ **energy demand reductions**

Additional Efficiency Package Options

C406.1: Six Choices; Choose Two

- High efficiency HVAC performance
- Reduced LPD demands
- Enhanced digital lighting controls
- On-site renewable energy
- Dedicated energy recovery air system
- SWH energy reductions

Additional Efficiency Package Options

Service Connections

- This energy efficiency code change option was not accepted

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Commissioning Building Systems

C408 Commissioning (New Section added)

Building commissioning:

- Develop a plan for mechanical system commissioning; provide evidence of commissioning by a registered design professional (or agency) to building department prior to the final mechanical inspection.

Exemptions:

- ✓ **< 480k Btuh – cooling and**
- ✓ **< 600k Btuh – combined heating + SWH**
- ✓ **Systems serving individual dwelling units**

Mechanical / Electrical Commissioning

C408.2 Mechanical and SWH Systems Commissioning and Completion

- Mechanical / SWH systems and controls function and performance evaluations

C408.3 Functional Testing: Lighting & Controls

- Testing of lighting systems / controls expanded

Systems Commissioning

C408

Commissioning Plan

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

Functional Testing

- HVAC Systems/Controls
  - ✓ **Fault detection**
  - ✓ **Fail-safe modes**
- SWH Systems/Controls
  - ✓ **Accessibility requirements**
- ILP/ELP Systems/Controls

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Systems Commissioning

C408.2.4 Procedures

Functional Testing

- HVAC air and water flow rates must be balanced;
- Equipment, controls, lighting must be performance tested.

Preliminary Report

- Test Procedures
- Results
  - ✓ **HVAC separate from SWH**
  - ✓ **Design Professional or**
  - ✓ **Third party agency**
- Identify, itemize
  - ✓ **Deficiencies still uncorrected**
  - ✓ **Deferred testing and climatic conditions necessary to complete**
- Submitted to the building owner; acknowledge report receipt to the code official.

Systems Commissioning

C408.2.5.4 Final Report

Within 90 days of C of O:

- Construction documents which must include location and performance data on each piece of equipment
- Manual for operation and maintenance
- System balancing report
- Preliminary Report before C.O.
- Final Commissioning Report

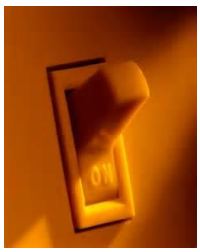
Report Contains:

- Results of all Functional Performance Tests
- Deficiencies found during testing and corrective measures proposed
- All Functional Performance Test procedures used during commissioning process

Lighting: Commissioning

C408.3.1 Functional testing (90.1-2013 'bd')

- Any project/retrofit which alters 10% of the connected lighting load must comply with 90.1 ASHRAE.
- All lighting controls must be tested and documented by a 3rd party that equipment is installed to manufacturer's specifications and meets performance criteria.



COM*Check* Requirements Checklist

C101.5.1 Compliance Materials

Compliance Report Information

- **Project**
- **General Building/Systems**
- **Systems List**
- **Checklist**


COMcheck Software Version 3.6.0
Mechanical Compliance Certificate

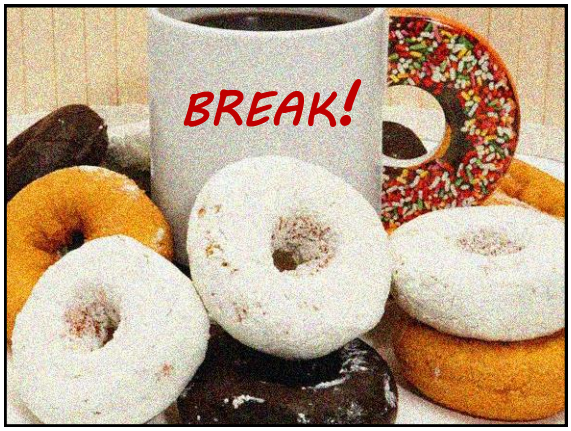
2006 IECC

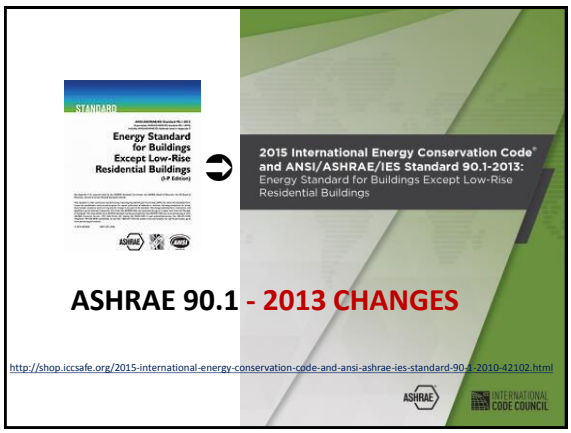
Section 1: Project Information

Section 2: General Information

Section 3: Mechanical Systems List

Section 4: Requirements Checklist





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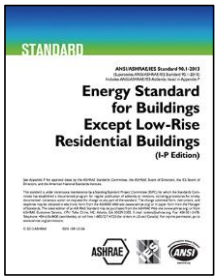
Energy Conservation Code - 90.1 Option

Amendments to ASHRAE 90.1-2013 Definitions

- **3.2 DEFINITIONS**
  - ✓ **Computer room**
  - ✓ **Data center 90.1-2016**
  - ✓ **Roof monitor (clerestory)**
  - ✓ **Sectional garage door**
  - ✓ **Fan Efficiency Grade**
  - ✓ **Wet bulb temperatures**
  - ✓ **Dry bulb temperatures**
  - ✓ **NAECA refrigeration units**
- **3.2**
  - ✓ **Zones**



Definitions

90.1 Section 3.2 Definitions: Climate Zone 5 requirements

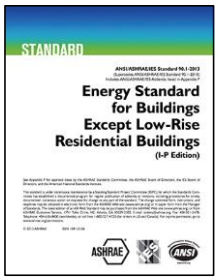
- *Historic Building (new)*

- **3.2 Fig.1-4 Daylighting areas**
  - ✓ **Zones – primary / secondary**
  - ✓ **Sidelight areas**
  - ✓ **Toplight areas**
  - ✓ **Head & sill measurements**
  - ✓ **Intervening partitions**

Energy Conservation Code - 90.1 Option

Key Changes to ASHRAE 90.1-2013 Commercial Requirements

- 5.1.3 Low-E storm windows and roof recover vs. replacement
- 5.4.3.2 High-speed door leakage
- 5.4.3.4 Vestibules for larger spaces
- 5.5.4.2 skylights up to 6% w/DRC
- 5.5.4.4 Fenestration orientation < 25% on E & W facades
- 5.7.4 Daylight zones shown on CD's



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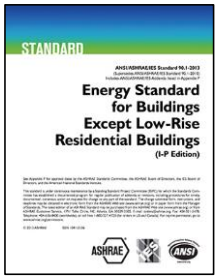
Energy Conservation Code - 90.1 Option

Key Changes to ASHRAE 90.1-2013 Commercial Requirements

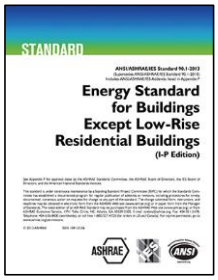
- 6.4.5 Adds NAECA commercial refrigeration equipment
- 6.4.3.3.3 Optimum start required for any DDC system
- 6.5.6.1 ERV systems required
- 6.6 Escalator/walkway speed reduction controls
- 6.8.1 Equipment efficiencies
- 6.4.3.8 DCV threshold occupancy now 25 per 1,000 SF



Energy Conservation Code - 90.1 Option

Key Changes to ASHRAE 90.1-2013 Commercial Requirements

- 8.4.2 Plug Loads 50% receptacles; 25% of branch circuit feeders
- 9.4.1.1 Sidelighting ADR controls
- 9.4.1.3 Controls/ guest bathrooms
- 9.4.1.4 Exterior light shutoff
- Table 9.6.1 Use of controls
- Table 9.6.2 Added LPD w/control
- 9.7 Submittals: Identify ADC luminaires; top- and sidelighting



Building Thermal Envelope Changes

5.5.5 Prescriptive Envelope Option – Addendum 'bb'

Major improvements: Non-Residential, Residential R-values / U-factors

- Thermal envelope opaque components improved; Semi-heated has only minor changes
- Fenestration remains capped at 40%; distribution by orientation.
- SHGC set by VT/SHGC dependent on glazing percentages

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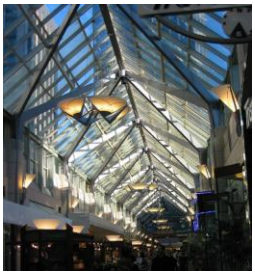
Envelope: Skylight Minimums

5.5.4.2.3 Minimum Skylight Fenestration Area

For many spaces, ≤ 4 floors, >15ft top-level ceiling and ≥ 2500sf, minimum skylight areas apply:

- Minimum 3% F/A-skylight A w/ minimum 0.40 transmittance, or
- Minimum 50% of daylight floor area with minimum effective skylight aperture of 1%
- 5.5.4.2 allows up to 6% skylights for daylight areas w/DR controls

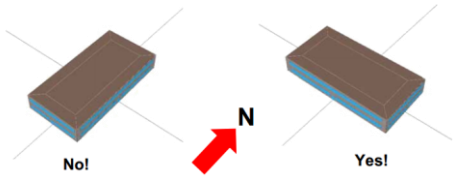


Building Orientation: Fenestration

5.5.4.5 Glazing Locations – Addendum 'bw'

South facing vertical fenestration area ≤ East or West face areas

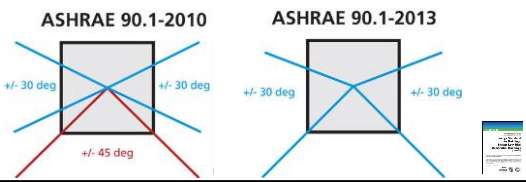
Storefront/ urban infill sites are exempt.



Building Orientation: Fenestration

5.5.4.5 Orientation of fenestration Option

- Revises the fenestration orientation rules and adds a compliance option. Either:
- East- and west-oriented glazing must each be less than 25% of the total glazing, OR
- East- and west-oriented glazing, multiplied by their solar heat gain coefficients (SHGC), must each be less than the total building sum of glazed area multiplied by each area's SHGC.



Use of Office of Education and Data Management (OEDM) training materials must be approved in writing by the State of Connecticut, Department of Administrative Services' Office of Communications.

HVAC: Equipment Efficiencies

Tables 6.8.1 (A-K) for Direct Digital Controls

Significant Efficiency Rating Increases:

- Packaged Heat Pumps/Air Conditioners
- Air-cooled and water-cooled chillers
  - ✓ **Changes for part-load chillers**
- Air-cooled Air Conditioners and Heat Pumps – Addendum 'aq'
- Water-cooled Air Conditioners and Heat Pumps
- Turndown ratios for boilers Direct Digital Control (DDC – 'Addendum 'aa')

HVAC: ERVs

6.5.6.1; Tables 6.5.6.1(1)&(2) Energy Recovery Ventilation (ERV – Mandatory)

- Energy Recovery (ERV) systems now required for all systems CZ5 with any % of outside air
  - ✓ **Required when system airflow exceeds Table values**
  - ✓ **Enthalpy recovery ≥ 50%**
  - ✓ **System size varies if used < 8,000 hours/year**
  - ✓ **Ten exceptions**

Lighting Power Densities

Tables 9.5.1 & 9.6.1 – Several Addenda

- LPD allowances have been reduced again, by technology and new products

Addendum 'co'

- Building Use Groups
- 32 Building Types

Addenda 'bh' and 'cr'

- Space Utilizations
- 97 Room Occupancy Types
- LPD Additions: Addendum 'm'

Lighting: Controls

9.4.1.1 Interior Lighting Controls

- Automatic shutoff controls required in **nearly all spaces**.
- All lighting controls must be "manual-on" or "automatic-on" to only 50% power.
- Multi-level automatic daylighting controls required when
  - **primary sidelighted area exceeds 2500 sf**
  - **primary toplighted area exceeds 900sf**
- 8.4. 2 adds requirements for "auto-off" plug load receptacles

Lighting: Space by Space Method

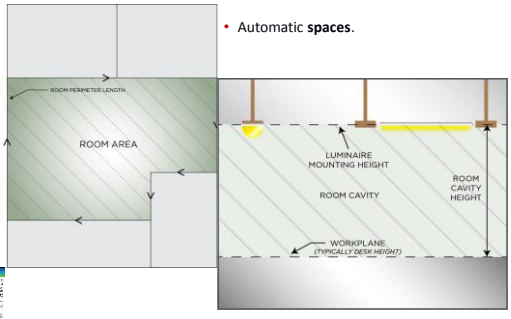
Section 9.6.2 – Additional ILP Allowances – Addendum 'm'

- Many LPD reductions in Table 9.6.1; too numerous to show in detail
- Addendum "m" reduces the allowance for specific lighting to highlight merchandise
- This shows proposed reductions for the additional interior Lighting Power Allowance (LPA):
- LPA = 1000 watts

Lighting: Room Cavity Ratio

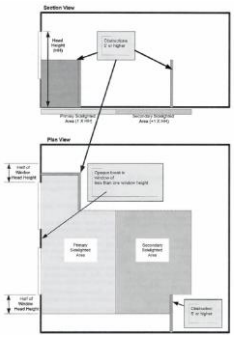
Lighting Controls 'by' and Alterations 'm'

- Automatic **spaces**.



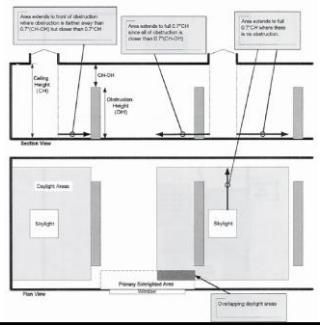
SideLighting: Primary & Secondary Zones

9.4.1.4 Lighting Controls



Toplighting: Skylights

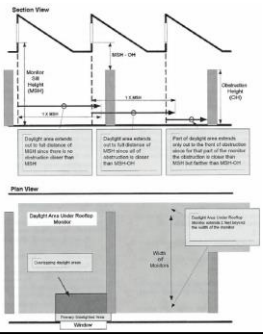
Lighting Controls 'by' and Alterations 'm'



TopLighting: Roof Monitors

90.1 Lighting Controls and Alterations

- 3.2-1 Diagrams daylight area under roof monitors
- Three parts of the illustrated plan and section define how zone is measured depending on partitions
  - ✓ **Depth is determined by the height of glazing above floor surface lit**
  - ✓ **Width extends two feet beyond monitor ends, each side**
  - ✓ **Obstruction counts when distance is greater than dimension from the partition top to the window sill**



Use of Office of Education and Data Management (OEDM) training materials must be approved in writing by the State of Connecticut, Department of Administrative Services' Office of Communications.

Lighting Control Outside the Envelope

9.4.1.3 Parking Garage Lighting Control

- Automatic lighting shutoff
- LPD reduction ≥ 30% in lighting zones unoccupied for > 30 min.
  - ✓ **Except where HID < 150w used**
- Daylight transition zone separately controlled using daylight sensors
- Daylight-responsive control of perimeter sidelighting areas*
  - ✓ **Except transition zones and ramps without parking**

Lighting Power Densities

Table 9.5.1 Interior Lighting Power –Building Area

- For most building types, LPDs are reduced.
- Table shows samples.
- Average LPDs:
  - ✓ **• 90.1-2007…… avg.= 1.09**
  - ✓ **• 90.1-2010…… avg.= 0.906**
  - ✓ **• Difference …… -16.9%**

TABLE 9.5.1 Lighting Power Densities Using the Building Area Method

Building Area Type*	LPD (W/ft²)
Automotive facility	~~0.9~~ 0.82
Convention center	~~1.2~~ 1.08
Courthouse	~~1.2~~ 1.05
Dining: bar lounge/leisure	~~1.3~~ 0.99
Dining: cafeteria fast food	~~1.4~~ 0.90
Dining: family	~~1.6~~ 0.89
Dormitory	~~1.0~~ 0.61
Exercise center	~~1.0~~ 0.88
Gymnasium	~~1.1~~ 1.00
Health-care clinic	~~1.0~~ 0.87
Hospital	~~1.2~~ 1.21
Hotel	~~1.0~~ 1.00
Library	~~1.3~~ 1.18
Manufacturing facility	~~1.3~~ 1.11
Motel	~~1.0~~ 0.88
Motion picture theater	~~1.2~~ 0.83
Multifamily	~~0.7~~ 0.60
Museum	~~1.1~~ 1.06
Office	~~1.0~~ 0.90
Parking garage	~~0.3~~ 0.25

Lighting Power Densities

Table 9.6.1 Interior Lighting Power – Space by Space

TABLE 9.6.1 Lighting Power Density Allowances Using the Space-by-Space Method and Minimum Control Requirements Using Either Method

The control functions below shall be implemented in accordance with the descriptions found in the referenced paragraphs within Section 9.4.1.1. For each space type:
(1) All REQs shall be implemented.
(2) At least one ADD1 (when present) shall be implemented.
(3) At least one ADD2 (when present) shall be implemented.

Informative Note: This table is divided into two sections; this first section covers space types that can be commonly found in multiple building types. The second part of this table covers space types that are typically found in a single building type.

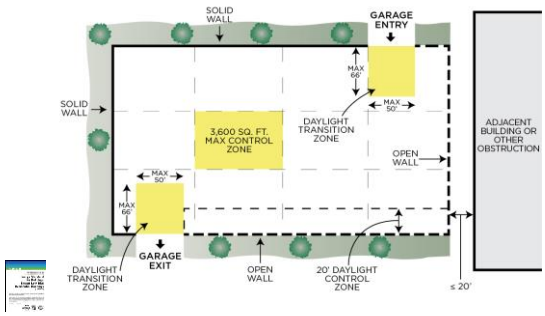
Common Space Types[1]	LPD, W/ft²	SCR Threshold	a Local Control (See Section 9.4.1.1(a))	b Restricted to Manual ON (See Section 9.4.1.1(b))	c Restricted to Partial Automatic ON (See Section 9.4.1.1(c))	d Bilevel Lighting Control (See Section 9.4.1.1(d))	e Automatic Daylight Responsive Controls for Sidelighting (See Section 9.4.1.1(e)[2])	f Automatic Daylight Responsive Controls for Toplighting (See Section 9.4.1.1(f)[2])	g Automatic Partial OFF (See Section 9.4.1.1(g) [Full Off exception])	h Automatic Full OFF (See Section 9.4.1.1(h))	i Scheduled Shutoff (See Section 9.4.1.1(i))
Atrium											
… that is <20 ft in height	0.03/ft total height	NA	REQ	ADD1	ADD1	—	REQ	REQ	—	ADD2	ADD2
… that is ≥20 ft and ≤40 ft in height	0.03/ft total height	NA	REQ	ADD1	ADD1	REQ	REQ	REQ	—	ADD2	ADD2
… that is >40 ft in height	0.40 + 0.02/ft total height	NA	REQ	ADD1	ADD1	REQ	REQ	REQ	—	ADD2	ADD2
Audience Seating Area											
… in an auditorium	0.63	6	REQ	ADD1	ADD1	REQ	REQ	REQ	—	ADD2	ADD2
… in a convention center	0.82	4	REQ	ADD1	ADD1	REQ	REQ	REQ	—	ADD2	ADD2

For each space type, apply the lighting control functions listed.

- If using the Space-by-Space method for LPD requirements, use same space type for control requirements. For space types not listed, use a reasonable equivalent
- "REQ" = mandatory
- "ADD1" = at least one of these must be implemented
- "ADD2" = at least one of these must be implemented

Lighting Control: Open Parking Garage

Glazing Locations – Addendum 'bw'



Lighting: Functional Testing

9.4.3 Requirements

Functional testing (calibrated/adjusted/programmed) of lighting control devices and systems required within 90 days of occupancy

- Must be performed by individuals NOT involved in design, manufacture, or installation
- For occupant sensors:
  - ✓ Certify location and aiming per manufacturer recommendation
  - ✓ Test all sensors if project has ≤ 7
  - ✓ If > 7 sensors, test for each unique combination of sensor type and space geometry. Verify:
    - Operation of Status indicator
    - Lights turn off or down to permitted level at preset times
    - Auto-on – lights turn on to permitted level when occupied
    - Manual on – lights turn on only when manually activated
    - Lights are not incorrectly turned on by movement in nearby areas or by HVAC operation

Existing Buildings

A New Chapter 5

- C501 (et al) provides limited alternative to IEBC

- Alterations
  - ✓ **Limited in type and scope**
- Additions
  - ✓ **Can comply with ASHRAE 90.1**
- Repairs
- Changes of Occupancy
- Historic buildings
- Maintenance

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IECC – Energy Provisions

Option 3 - Performance Compliance Method

- Mandatory compliance with 2015 edition for additions, relocations
- Only those systems or portions of the existing building that are altered are required to comply.
- IEBC historic buildings may be modified or exempted only by request approved through SBI
- Option to comply with ASHRAE Energy Standard 90.1 – 2013

Functional Testing

9.7.2.3 Daylighting Documentation

For automatic time switches:

- **Confirm programmed schedules**
- **Document schedules for own**
- **Verify correct time and date are set**
- **Verify battery backups are installed and energized**
- **Verify override time limit set to ≤ 2 hours**
- **Simulate occupied condition/verify and document:**
  - **Lights turn on and off with respective switches**
  - **Switch only operates lights in enclosed space where switch is located**
- **Simulate unoccupied condition and verify and document:**
  - **All nonexempt lights turn off**
  - **Manual override only operates lighting where it is located**

For daylighting controls

- **Properly located, field-calibrated, and set to have appropriate setpoints and threshold light levels**
- **Daylight controlled lighting loads adjust to correct levels with available daylight**

✓ Location where calibration adjustments are made is readily accessible only to authorized personnel

✓ Daylighting documentation

- **Identify all general lighting located within daylight areas under skylights, daylight areas under roof monitors as well as primary sidelighted areas and secondary sidelighted areas**

RESIDENTIAL CHANGES

Relationship Between IECC & IRC

R103.2 Construction Documents

VS

- IECC addresses only energy
- IECC addresses residential and commercial;
- IRC addresses all R-3 Residential Use 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
- 2015 consolidates IECC *Residential Provisions* with IRC energy Chapter *11* (actually a change to the IRC, not the IECC)

RES*Check* Version 4.6.4.0

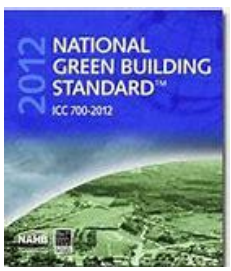
R101.5.1/N1101.3 UA Compliance Alternative

- Can be used to show compliance with both 2015 IECC or IRC
  - ✓ **Now updated to 2015**
- Completely electronic: user inputs all of the building data
- Will demonstrate whether building meets performance or tradeoff based compliance
- If used, report is submitted with construction documents.
- Should include checklists for envelope, mechanical, common spaces in multi-family

Energy Conservation Code – IRC Ch. 11

R102.1.1 / N1101.4 Above-Code Programs

- **A national, state or local energy efficiency program may be deemed to exceed the energy efficiency required by this Chapter.**
- **May include:**
  - ✓ **LEED**
  - ✓ **Green Globes**
  - ✓ **Green Building Standard**
  - ✓ **Approved equivalent rating system**



Scoping and Administration

R103.2 / N1101.5 Information on Documents

[RE] Insulation, Fenestration/Daylighting, U-factor/SHGC, Air Sealing

- Insulation materials / R-values (U-factor/C-factor/F-factor)
- Fenestration: U-factors / SHGC coefficients
- Area-weighted U & SHGC calculations
- Mechanical system design criteria
- HVAC / SWH equipment types, sizes, efficiencies
- Equipment & systems controls
- Duct sealing, duct/pipe insulation & locations
- Air sealing details
- Depict thermal envelope boundaries on overall plans/elevations

Important [RE] Definition Changes

R 202 / 1101.6 Definitions

ADDED DEFINITIONS

- Building Site
- Bldg. Thermal Envelope
- Continuous Air Barrier
- Demand Recirculation*
- Roof Recover v. Replacement
- Visible Transmittance*
- Whole house ventilation

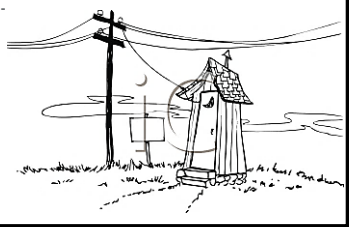
EXISTING DEFINITIONS

- Residential Building
  - ✓ **Non-transient occupancy**
  - ✓ **# stories < 4**

General Requirements – Low Energy Buildings

R402.1 / N1102.1 General Exceptions for Thermal Envelope

- Those with peak energy usage < 3.4 Btuh/sf for conditioning
- Those without conditioned space
- (CT) Where heating & cooling are supplied by on-site non-renewable sources:
  - ✓ **Wind**
  - ✓ **Water**
  - ✓ **Wood stoves**



Building Thermal Envelope

R402.1 (N1102.1) Compliance Changes

- R402.1 General
- CT Low-energy buildings Exception 3
- Peak energy use < 3.4Btuh/sf for space conditioning purposes
- Does not contain conditioned space
- Utilizing non-purchased renewables only, without backup heat sources:
  - ✓ **On-site wind, water, solar**
  - ✓ **Wood-burning heating appliances**

- R402.1.1 *Vapor retarder*: Comply with R702.7 or IBC 1405.3R402.1.3
- R-value computations: reduce insulated siding by R-0.06

Prescriptive Table R402.1.1

TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION U-FACTOR[b]	SKYLIGHT[b] U-FACTOR	GLAZED FENESTRATION SHGC[b,e]	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE[i]	FLOOR R-VALUE	BASEMENT[c] WALL R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE[c] 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	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13+5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13+5[h]	8/13	19	10 /13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13+5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20+5 or 13+10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20+5 or 13+10[h]	19/21	38[g]	15/19	10, 4 ft	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 the insulation shall not be less than the *R*-value specified in the table.

b. The fenestration *U*-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 wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.

d. R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Climate Zones 1 through 3 for heated slabs.

e. There are no SHGC requirements in the Marine Zone.

f. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.

g. Or insulation sufficient to fill the framing cavity, R-19 minimum.

h. 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.

i. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

Envelope Changes

R 402.2/N1102. Building Thermal Envelope

- Prescriptive Tables
  - **R402.1.1**
  - **R402.1.3R-Values U-Factors (+ C/F)**
  - **R402.2.6 Steel Equivalents Cavity + c.i. options**
- Table Notes "a","c","h"
- Sunroom R-values
- "Certificate" information
- Fenestration Defaults

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Envelope Changes

R402.1.2/N1102.1 and Table Note "h"

- Thickness reduction facilitates even wall surfaces

- Insulated siding defined
- Partial structural sheathing ≤ 40% of thermal envelope

AND

- R402.2.4 Access hatches / Exception for doors
- R402.2.7 Wall corners, headers
- R402.2.8 Floor cavities over unconditioned space
- R402.4.1.2 / N1101.10.1.1.1 Formaldehyde
- R303.1.3 Default ratings

Steel Frame Construction

Table R402.2.6 / N1102.2.6 Equivalent Framing (partial)

Wood Frame R-value Requirement	Cold-Formed Steel Equivalent R-value[a]
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+R-3.8 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

Air Barrier & Insulation Installation

Table R402.4.1.1 / N1102.4.1.1 (partial)

Component	Air Barrier Criteria	Insulation Installation Criteria
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stair or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.	

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Envelope Requirements

R402.4.4 / N1102.4.4 Isolation of Fuel-fired Equipment

- Separately sealed and insulated rooms
- Isolate appliances from conditioned spaces
- Isolate combustion air & vent openings

Hot Water Systems

R403.2 Outdoor temperature Setback

- Boilers with one- or two-pipe heating systems require an outdoor setback control that lowers the boiler water temperature in response to the outdoor temperature.

Hard-Ducted Return Air

R 403.2.3 Building Cavity Returns Not Acceptable

Return air runs must be hard ducted. Supply or return air can no longer be "panned" through the floor joists.

Air Barrier Testing

CT R402.4.1.2 / N1102.4.1.2 Testing Protocol: Sampling

- For buildings ≥ 7 dwelling units
- ≥ 850 SF 5.0 ACH 50
- < 850 SF 6.5 ACH 50
- Third party blower door testing
- Sampling allowed:
- First group of 7 units – test all 7
- Next – test 1 in 7 from each group
- When a unit fails; test two more successfully to continue sampling. If more than two fail, start again from the beginning.

HVAC / SWH Changes

R 403 Systems

- R403.1.1 Programmable t'stats; all systems
- R403.3.2 Tighter duct sealing
- R403.3.3 Duct testing – either rough or final
- R403.4 SHW Insulation
- R403.2 HW boiler outside setback
- R403.7 ACCA loads/equipment sizing
- R403.5 Service HW systems
- R403.8 Systems serving multiple units

Duct Leakage and Testing

R403.3.3 (N1103.3.3) CT amends from R502.1.1.2

R403.3.3 Duct testing.

- Rough-In
- Postconstruction

Exceptions

- ✓ Duct testing not required where ducts and air handlers are located entirely within the building thermal envelope
- ✓ **(CT) Where existing ducts are extended due to an addition or alteration, new portions of ducts < 40LF in unconditioned spaces shall not be required to be tested in accordance with this section**

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Hot Water Recirculation

R403.5 / N1103.5.1 Service Hot Water Systems

- R403.5.1.1 Circulation Systems
  - ✓ **Demand-controlled Pump with automatic temp/flow sensor**
  - ✓ **Outlet temperature 104°F**
  - ✓ **Dedicated or cold pipe return**
  - ✓ **Gravity or thermosyphon prohibited**
- R403.5.1.2 Heat trace system
- ✓ Comply w/UL 515 or IEEE 515.1
- ✓ Controls shall sense demands
- R403.5.3 Pipe insulation
  - ✓ **≥ ¾ inch diameter**
  - ✓ **Serving more than one dwelling unit**
  - ✓ **Piping from water heater to manifold**
  - ✓ **Under floor slabs; buried**
  - ✓ **Piping in non-recirculating systems**
- R403.5.4 Drain water heat recovery
  - ✓ **Comply with CSA B55.1/B55.2**
  - ✓ **Connected to one or two showers**

Whole House Mechanical Ventilation

Tables R403.6.1 / N1103.6.1 Mechanical Ventilation Fan Efficacy

IRC Table M1507.3.3

CONTINUOUS AIRFLOW RATE REQUIREMENTS

DWELLING UNIT FLOOR AREA	NUMBER OF BEDROOMS				
	0 to 1	2 to 3	4 to5	6 to 7	over 7
[square feet]	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

Lighting Changes

R404.1, R403.8 / N1104.1 Lighting Equipment

- 75% - Fixture or Socket Count still an Option
- R403.8 Multi-family common areas must use LPD lighting requirements of C405.4/.5
- Fuel gas lighting – no standing pilots

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Lighting Equipment

R404.1 / N1104.1 – MANDATORY with Option

- A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps, or 75% of permanently installed lighting fixtures to contain only high efficacy lamps *(newly defined):*
  - ✓ **60 l/w > 40w**
  - ✓ **50 l/w > 15 to 39w**
  - ✓ **40 l/w < 15w**
- Exception:
  - ✓ **Low-voltage lighting**
  - ✓ ***Pilot lights are now prohibited on fuel gas lighting**

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ERI: The Energy Rating Index

R406.1 / N1106.1 – Performance by Energy Utilization Option

R406.2 Proposed Building

- R-2; R-3; R-4 Uses
- Whole building must be treated as a single zone
- Reference: 2006 = 100
  Zero Net Energy = 0
- Certification by builder of design
- Approved software tools

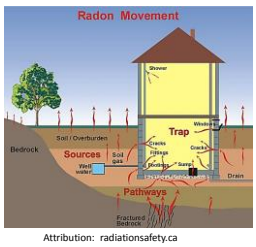
Required Target Values

- ~~Tables R406.4/N1106.4~~ DELETED
- R406.4 CT maximum ER Index ≤ 61 with no tradeoffs for renewables
- ~~N1106.4.1/R406.4.1 Tradeoffs~~ DELETED
- CT R406.6.1&5 Use ANSI Standard 301 for approved tools; other inputs
- CT Chapter 6 references ANSI/RESNET/ICC 600

Radon Systems – Appendix AF

CT AF104 Mitigation Preparations

- Soil Gas retarder
- T-fitting; vent pipe
- Floor Openings
  - ✓ Multi-level slab venting
  - ✓ Drain tile & sump depressurization
- Sumps
- Waterproofing/dampproofing
- Ventilation prep: conduit; circuit
- Accessible attic space - future fan



Attribution: radiationsafety.ca

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Performance Alternative

N1105/R405 / Table N1105.5.2/R405.5.2(1) - ECBM

- Glazing baseline is 15%
  - ✓Coordinated w/R402.1.1
- Air exchange rate set for whole-house testing
- HVAC systems matched w/R403.2 changes
- Thermal distribution system effects – Table 405.5.2

Simulated Performance Alternative

R405.4.2 Compliance reports – Permit; C.O.

Compliance Scope Changes:

- Orientation of fenestration EW/NS
  Fenestration set at **15%** Standard
- Air exchange rate set for whole-house testing
  - ✓ **Coordinated w/R402.1.1**
- HVAC systems matched with R403.1/.2/.3 changes
- Effects of thermal distribution systems; Table R405.5.2(1) amended for standard reference

Existing Buildings

R501 Scope and Application

R501 (et al) provides limited IRC alternative to adopting IEBC

- R501.1 Scope
- R501.6 Historic Buildings
- R502-4 Additions, Alterations
- R503.1.1.1 Fenestration
- R503.2 Conditioned space
- R505 Compliance
  - ✓ **R402.1 Low energy exemption**

An Existing Residential Road Map

R501 Relocations of specific Residential Administration sections

Applicability requirements move to newly created Existing Buildings section

EXISTING BUIDINGS - SCOPE & ADMINISTRATION		
Section Title	**2012**	**2015**
Scope	R101.4.1	R501
Historic Buildings	R101.4.2	R501.6
Additions, Alterations, Repairs	R101.4.3	R502 thru R504
Compliance	R101.4.4	R505
Change to Conditioned Space	R101.4.5	R503.2
Low energy building exemptions	R101.5.2	R402.1
Replacement fenestration	R402.3.6	R503.1.1.1

Historic Buildings

C202 Definitions (New)

- C202 HISTORIC BUILDING. Any building or structure that is one or more of the following:
  - ✓ **1. Listed, or certified as eligible for listing in the National Register of Historic Places by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places.**
  - ✓ **2. Designated as historic under an applicable state or local law.**
  - ✓ **3. Certified as a contributing resource within a National Register-listed, state-designated or locally designated historic district.**

Credits

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Building Codes Assistance Project	DOE Building Energy Codes Program	National Renewable Energy Laboratory
BCAP	Building Energy Codes	NREL
energycodesocean.org	energycodes.gov	nrel.gov/data/pix

Resources

Available Over Your Internet Connection

- www.iccsafe.org/errata central
- www.energycodes.gov/resources
- http://www.energycodes.gov/sites/default/files/documents/901-2013_finalCommercialDeterminationQualitativeAnalysis_TSD.pdf
- www.bcap.org
- www.buildingscience.com
- www.neep.org