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
Significant Changes in the 2015 International Energy Code

Administration – Both Codes

C103.2/R103.2 Information on Construction Documents
1. Insulation materials/R-values
2. Fenestration U-factors/SHGCs
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

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 *
  - 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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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.
## 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 S

## 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
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 sq. ft. 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**
### Glazing: Orientation (2015 prescriptive)

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

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4 except Marine</th>
<th>5 and Marine</th>
<th>6</th>
<th>7/8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vertical Fenestration</td>
<td>U-factors</td>
<td>SHGC</td>
<td>ESW</td>
<td>N</td>
<td>ESW</td>
<td>N</td>
</tr>
<tr>
<td>Fixed</td>
<td>0.50</td>
<td>0.50</td>
<td>0.46</td>
<td>0.38</td>
<td>0.38</td>
<td>0.36</td>
<td>0.29</td>
</tr>
<tr>
<td>Operable</td>
<td>0.65</td>
<td>0.65</td>
<td>0.60</td>
<td>0.45</td>
<td>0.45</td>
<td>0.43</td>
<td>0.37</td>
</tr>
<tr>
<td>Doors</td>
<td>1.10</td>
<td>0.83</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
</tr>
<tr>
<td>SHGC</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R</td>
<td>N/R</td>
</tr>
<tr>
<td>PF = 0.2</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>D&lt;PF&lt;0.5</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>PF ≥ 0.5</td>
<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
<td>0.48</td>
</tr>
<tr>
<td>Skylights</td>
<td>0.75</td>
<td>0.65</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>SHGC</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
</tr>
</tbody>
</table>

### 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°F ∆t
- Separate control
Significant Changes in the 2015 International Energy Code

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.
**Ventilation Fan Controls**

*C403.2.6.2 Enlosed 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**

*C403.7 Ventilation Systems - Energy Recovery*

- Tables C403.7 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 > 5,000 CFM

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
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**Significant Changes in the 2015 International Energy Code**

**June 2018**

**HVAC: Pipe Sizing and Insulation**

Table C403.2.10 Minimum Pipe Insulation Thickness

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

<table>
<thead>
<tr>
<th>FLUID OPERATING TEMP (°F)</th>
<th>INSULATION CONDUCTIVITY</th>
<th>MINIMUM PIPE INSULATION THICKNESS (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C1.0</td>
</tr>
<tr>
<td>-50</td>
<td>0.372</td>
<td>1.25</td>
</tr>
<tr>
<td>100</td>
<td>0.292</td>
<td>1.00</td>
</tr>
</tbody>
</table>

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
Significant Changes in the 2015 International Energy Code

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.

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
Significant Changes in the 2015 International Energy 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.
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)

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'

- 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 aislesways
    - 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 Luminaires

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

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 not covered by zones 1, 2 or 4
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

<table>
<thead>
<tr>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Site Allowance</td>
<td>500 W</td>
<td>600 W</td>
<td>750 W</td>
</tr>
<tr>
<td>Tradable Surfaces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncovered Parking Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiering area and driveways</td>
<td>0.04 W/ft²</td>
<td>0.06 W/ft²</td>
<td>0.10 W/ft²</td>
</tr>
<tr>
<td>Building Concave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walkways less than 10 feet wide</td>
<td>0.7 W/linear foot</td>
<td>0.9 W/linear foot</td>
<td>1.0 W/linear foot</td>
</tr>
<tr>
<td>Walkways 10 feet wide or greater</td>
<td>0.14 W/ft²</td>
<td>0.14 W/ft²</td>
<td>0.18 W/ft²</td>
</tr>
<tr>
<td>Partial Table</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special Feature Areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Concave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stairways</td>
<td>0.75 W/ft²</td>
<td>1.0 W/ft²</td>
<td>1.0 W/ft²</td>
</tr>
<tr>
<td>Pedestrian Tunnels</td>
<td>0.15 W/ft²</td>
<td>0.15 W/ft²</td>
<td>0.2 W/ft²</td>
</tr>
</tbody>
</table>
## Electrical Power Changes

<table>
<thead>
<tr>
<th>C405.9 Equipment Efficiencies Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>- A17.1 safety rules limit to automatic sensing for slowdown / resume speed</td>
</tr>
<tr>
<td>- Transformer efficiency</td>
</tr>
<tr>
<td>- Motor drives; controls</td>
</tr>
<tr>
<td>- Elevators:</td>
</tr>
<tr>
<td>- Power reduction controls</td>
</tr>
<tr>
<td>- Escalators:</td>
</tr>
<tr>
<td>- Regenerative drives</td>
</tr>
<tr>
<td>- Moving Walkways:</td>
</tr>
<tr>
<td>- Energy demand reductions</td>
</tr>
</tbody>
</table>

## Additional Efficiency Package Options

<table>
<thead>
<tr>
<th>C406.1: Six Choices; Choose Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>- High efficiency HVAC performance</td>
</tr>
<tr>
<td>- Reduced LPD demands</td>
</tr>
<tr>
<td>- Enhanced digital lighting controls</td>
</tr>
<tr>
<td>- On-site renewable energy</td>
</tr>
<tr>
<td>- Dedicated energy recovery air system</td>
</tr>
<tr>
<td>- SWH energy reductions</td>
</tr>
</tbody>
</table>

## Additional Efficiency Package Options

Service Connections

- This energy efficiency code change option was not accepted
Significant Changes in the 2015 International Energy Code

June 2018

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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
- < 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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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.

**COMCheck Requirements Checklist**

C101.5.1 Compliance Materials

Compliance Report Information
- Project
- General Building/Systems
- Systems List
- Checklist

**ASHRAE 90.1 - 2013 CHANGES**

Significant Changes in the 2015 International Energy Code

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.

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
- NAECIA 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

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
Significant Changes in the 2015 International Energy Code

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.
**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%
- S.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.
Significant Changes in the 2015 International Energy Code

June 2018

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.

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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 C25 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’
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Significant Changes in the 2015 International Energy Code

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
- S. 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 (ILP):
- LPA = 1000 watts

Lighting: Room Cavity Ratio

Lighting Controls ‘by’ and Alterations ‘m’

- Automatic spaces.
Significant Changes in the 2015 International Energy Code

June 2018

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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%

Lighting Power Densities

Table 9.6.1 Interior Lighting Power – Space by Space

For each space type, apply the lighting control functions listed:
- *A rule for locating types of methods for LPD requirements, or same space type for control requirements: the 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
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Significant Changes in the 2015 International Energy Code

June 2018

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**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 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**
Significant Changes in the 2015 International Energy Code

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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
Significant Changes in the 2015 International Energy Code

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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 Formaldehyde
- R303.1.3 Default ratings

**Steel Frame Construction**

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

<table>
<thead>
<tr>
<th>Wood Frame R-value Required</th>
<th>Steel Framed R-value Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-013+R-3</td>
<td>R-013 + 4.2 or R-019 + 2.1 or R-021 + 3.1 or R-019 + 5.0 or R-021 + 4.7</td>
</tr>
</tbody>
</table>

**Air Barrier & Insulation Installation**

*Table R402.4.1.1 / N1102.4.1.1 (partial)*

<table>
<thead>
<tr>
<th>Component</th>
<th>Air Barrier Criteria</th>
<th>Insulation Installation Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>General requirements</td>
<td>A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier; doors or jogs in the air barrier shall be sealed.</td>
<td>Air permeable insulation shall not be used as a sealing material.</td>
</tr>
<tr>
<td>Exterior</td>
<td>The top plate and the top of any exterior wall shall be sealed. The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.</td>
<td>The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.</td>
</tr>
<tr>
<td>Skylights and doors</td>
<td>The space between window/door jamb and framing and framing and framing shall be sealed.</td>
<td>Contact with cover or header of jamb shall be insulated by continuous fitting or fitting with a semi-rigid having thermal resistance of 0.5 per inch.</td>
</tr>
<tr>
<td>Windows, skylights and doors</td>
<td>The space between window/door jamb and framing and framing and framing shall be sealed.</td>
<td>Contact with cover or header of jamb shall be insulated by continuous fitting or fitting with a semi-rigid having thermal resistance of 0.5 per inch.</td>
</tr>
</tbody>
</table>
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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

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

R403.3 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 < 40 LF in unconditioned spaces shall not be required to be tested in accordance with this section
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June 2018

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### Hot Water Recirculation

**R403.5 / N1103.5.1 Service Hot Water Systems**

- **R403.5.1 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
  - Connected to one or two showers

---

### Whole House Mechanical Ventilation

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

<table>
<thead>
<tr>
<th>DWELLING UNIT FLOOR AREA [square feet]</th>
<th>NUMBER OF BEDROOMS 0 to 1</th>
<th>2 to 3</th>
<th>4 to 5</th>
<th>6 to 7</th>
<th>over 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1,500</td>
<td>30</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>1,501-3,000</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>105</td>
</tr>
<tr>
<td>3,001-4,500</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>105</td>
<td>120</td>
</tr>
<tr>
<td>4,501-6,000</td>
<td>75</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>135</td>
</tr>
<tr>
<td>6,001-7,500</td>
<td>90</td>
<td>105</td>
<td>120</td>
<td>135</td>
<td>150</td>
</tr>
<tr>
<td>over 7,500</td>
<td>105</td>
<td>120</td>
<td>135</td>
<td>150</td>
<td>165</td>
</tr>
</tbody>
</table>

---

### 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

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
- N1106.1/R406.4.1 Tradeoffs DELETED
- CT R406.6.1&S 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
**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
  - R403.1 Low energy exemption
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Resources

Available Over Your Internet Connection

- www.iccsafe.org/errata_central
- www.energycodes.gov/resources
- www.bcnap.org
- www.buildingscience.com
- www.neep.org

Class Dismissed!