2018 IECC Commercial Significant Changes

Ken Baker – (thanks to Eric Makela and CADMUS)
Climate Zone Modifications (ASHRAE)
Compliance Options For 2018 IECC

ASHRAE 90.1-2016

Component Performance

Performance Approach

Prescriptive
2012 IECC – Option: Prescriptive

Pick One

- C406.2 – Eff. HVAC Performance
- C406.3 – Eff. Lighting Systems
- C406.4 – On-site Renewable Energy

Prescriptive
2018 IECC – Option: Prescriptive

Prescriptive

- C406.2 – Eff. HVAC Performance
- C406.3 – Reduced LPD
- C406.4 – Digital Lighting Controls
- C406.5 – On-Site Renewable Energy
- C406.6 – DOAS Dedicated OSA
- C406.7 – Reduced Energy Use in SWH
- C406.8 - Enhanced Envelope
- C406.9 - Reduced Air Infiltration

Pick One
2018 IECC – Option: Performance

Performance Approach

- C407 Total Building Performance
- C402.5 – Air Leakage
- C403 – System Design, Sizing, Performance, and many more!
- C404 – SWH

Mandatory Sections

- C405.2 - Controls
- C405.3 - Int. Requirements
- C405.4 - Ext. Requirements
- C405.6 - Transformers
- C405.7 - Elect Motors
- C405.8 - Trans Systems
- C405.9 - Voltage Drop
2018 IECC Scope and Administration Major Changes
Construction Documents (C103)

Construction Documents must be drawn to scale and include:

- Location and Nature of Work
- Equipment and Systems
- Lighting Fixture Schedule and Control Narrative

Code Official Discretion:
- Prepared by Registered Design Professional
- Electronic Media Documents Permitted

C103.6
Building Documentation and Closeout Requirements
Construction or work for which a permit is required is subject to inspection by the code official or designated agent. Construction must be kept accessible and exposed for inspection until approved.

**Required Inspections**
- Footing and foundation inspection
- Thermal envelope
- Framing and rough-in inspection
- Plumbing system
- Mechanical system
- Electrical system
- Final inspection
2015 IECC Commercial Envelope Major Changes
Low-energy buildings, or portions of low-energy buildings separated from the remainder of the building by building thermal envelope assemblies complying with this section shall be exempt from requirements of Section C402.

- Those with a peak design rate of energy usage less than 3.4 Btu/h x ft² (10.7 W/m²) or 1.0 watt per square foot (10.7 W/m²) of floor area
- Those that do not contain conditioned space
- Greenhouses
Equipment Buildings

C402.1.2

Buildings that comply with the following are exempt from the building thermal envelope provisions:

- Separate buildings with floor area not more than 500ft² (50m²)
- Buildings intended to house electronic equipment with installed equipment power totaling not less than 7W/ft² (75W/m²) and not intended for human occupancy
- Buildings with a heating capacity not greater than (17,000 Btu/hr)(5kW) and a heating thermostat set point that is restricted to not more than 50°F
- Buildings with an average wall and roof U-factor less than 0.2 in CZ1-5 and less than .12 in CZ6-8
- Buildings that comply with the roof solar reflectance and thermal emittance provisions for CZ1
<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>6B – All Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Other</td>
</tr>
<tr>
<td>Insulation Entirely Above Deck</td>
<td>R-30ci</td>
</tr>
<tr>
<td>Metal Buildings(with R-5 thermal blocks)</td>
<td>R-25 + R-11 LS</td>
</tr>
<tr>
<td>Attic and other</td>
<td>R-49</td>
</tr>
</tbody>
</table>

### Walls

<table>
<thead>
<tr>
<th></th>
<th>6B – All Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>R-13.3ci</td>
</tr>
<tr>
<td>Metal Building</td>
<td>R-13 + R-13ci</td>
</tr>
<tr>
<td>Metal Framed</td>
<td>R-13+R-7.5ci</td>
</tr>
<tr>
<td>Wood framed and other</td>
<td>R-13 R-7.5ci or R-20 + R-3.8ci</td>
</tr>
<tr>
<td>Below-Grade Wall</td>
<td>R-7.5ci</td>
</tr>
<tr>
<td>Climate Zone</td>
<td>6B</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>All Other</td>
</tr>
<tr>
<td><strong>Floors</strong></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>R-12.5ci</td>
</tr>
<tr>
<td>Joist/Framing</td>
<td>R-30</td>
</tr>
<tr>
<td><strong>Slab on Grade Floors</strong></td>
<td></td>
</tr>
<tr>
<td>Unheated Slabs</td>
<td>R-10 for 24” below</td>
</tr>
<tr>
<td>Heated Slabs</td>
<td>R-15 for 36” below + R-5 full slab</td>
</tr>
<tr>
<td><strong>Opaque Doors</strong></td>
<td></td>
</tr>
<tr>
<td>Swinging ??</td>
<td>U-0.37</td>
</tr>
<tr>
<td>Roll-up or Sliding Nonswinging</td>
<td>R-4.75</td>
</tr>
</tbody>
</table>
NA for MT - Building Envelope

- Cool Roofs
- Required in CZ 1-3 for roofs ≤ 2:12
- Roofs can qualify using one of four minimum roof reflectance and emittance options
- Several exceptions

Three-year aged solar reflectance of 0.55 and three-year aged thermal emittance of 0.75

Three-year-aged solar reflectance index of 64
NA for MT - 2015 High Albedo Roofs – Exceptions C402.3

• Portions of roofs that include or are covered by:
  – PV systems or components
  – Solar air or water heating systems or components
  – Roof gardens or landscaped roofs
  – Above-roof decks or walkways
  – Skylights
  – HVAC systems, components, and other opaque objects mounted above the roof

• Portions of roofs shaded during peak sun angle on the summer solstice by permanent features of the building or adjacent buildings

• Portion of roofs that are ballasted with a minimum stone ballast of 17 lbs/sq ft or 23 psf pavers.

• Roofs, where a minimum of 75% of the roof area complies with one or more of the exceptions to this section.
NA for MT - 2012 High Albedo Roofs – Exceptions C402.2.1.1 (cont’d)

- Portions of roofs that include or are covered by:
  - PV systems or components
  - Solar air or water heating systems or components
  - Roof gardens or landscaped roofs
  - Above-roof decks or walkways
  - Skylights
  - HVAC systems, components, and other opaque objects mounted above the roof
- Portions of roofs shaded during peak sun angle on June 21 by permanent features of the building or adjacent buildings
- Ballasted roofs with minimum stone ballast of 17 lbs/ft² or 23 lbs/ft² pavers
- Roofs, where a minimum of 75% of the roof area meets one of the above exceptions
## 2012 Compliance

### Chapter 4 Prescriptive Approach

<table>
<thead>
<tr>
<th>Table C402.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILDING ENVELOPE REQUIREMENTS: FENESTRATION</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vertical fenestration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed fenestration</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>
<td>0.29</td>
</tr>
<tr>
<td>Operable fenestration</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>
<td>0.37</td>
</tr>
<tr>
<td>Entrance 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>
<td>0.77</td>
</tr>
<tr>
<td><strong>SHGC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHGC</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td><strong>Skylights</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SKY-1</td>
<td>0.75</td>
<td>0.65</td>
<td>0.55</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
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<td>0.50</td>
</tr>
<tr>
<td>SHGC</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>
### Table C402.4

**BUILDING ENVELOPE REQUIREMENTS: FENESTRATION**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vertical fenestration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed fenestration</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>
<td>0.29</td>
</tr>
<tr>
<td>Operable fenestration</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>
<td>0.37</td>
</tr>
<tr>
<td>Entrance 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>
<td>0.77</td>
</tr>
<tr>
<td><strong>SHGC (on next side)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Skylights</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td>0.75</td>
<td>0.65</td>
<td>0.55</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>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>
## 2018 Compliance
### Chapter 4 Prescriptive Approach (cont’d)

#### Table C402.4
**BUILDING ENVELOPE REQUIREMENTS: FENESTRATION**

<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 4</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>SEW</td>
<td>N</td>
<td>SEW</td>
<td>N</td>
<td>SEW</td>
<td>N</td>
<td>SEW</td>
</tr>
<tr>
<td>PF &lt; 0.2</td>
<td>0.25</td>
<td>0.33</td>
<td>0.25</td>
<td>0.33</td>
<td>0.25</td>
<td>0.33</td>
<td>0.40</td>
</tr>
<tr>
<td>0.2 ≤ PF ≥ 0.5</td>
<td>0.30</td>
<td>0.37</td>
<td>0.30</td>
<td>0.37</td>
<td>0.30</td>
<td>0.37</td>
<td>0.48</td>
</tr>
<tr>
<td>PF ≥ 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>0.64</td>
</tr>
</tbody>
</table>
2012 Increased Vertical Fenestration with Daylighting Controls \textit{C402.3.1.1}

Up to 40% vertical fenestration area allowed in Climate zones 1-6, only if-

- No less than 50% of the conditioned floor area is within a daylight zone
- Automatic daylighting controls are installed in daylight zones;
- VT of vertical fenestration is $\geq 1.1$ times SHGC

\textbf{Exception:}
Fenestration that is outside the scope of NFRC 200 isn’t required to comply with VT
2018 Increased Vertical Fenestration with Daylighting Controls \( c402.4.1.1 \)

Up to 40% vertical fenestration area allowed in Climate zones 1-6 if:

- No less than 50% of the net floor area is within a daylight zone in buildings 2 stories or less
- No less than 25% of the net floor area is within a daylight zone in buildings with 3 or more stories
- Daylight responsive controls are installed in daylight zones
- VT of vertical fenestration is \( \geq 1.1 \) times SHGC

Exception:
Fenestration that is outside the scope of NFRC 200 isn’t required to comply with VT
Minimum Skylight Fenestration Area

**C402.4.2**

- In certain types of enclosed spaces > 2,500 ft² directly under a roof with not less than 75% of the ceiling area with a ceiling height > 15 ft
  - total daylight zone under skylights to not be < half the floor area and must provide either
    - A minimum skylight area to daylight zone under skylights of not less than 3% where all skylights have a VT of at least 0.40 **OR**
    - A minimum skylight effective aperture of at least 1%

**Exceptions**

- Climate zones 6-8
- Spaces with LPDs < 0.5 W/ft²
- Documented shaded spaces
- Daylight area under rooftop monitors is > 50% of floor area
- Spaces where total area minus area of daylight zones adjacent to vertical fenestration is less than 2,500ft² and where lighting is controlled per C405.2.5

- Limited to ≤ 3% of Roof Area (C402.4.1.1)
- Up to 6% allowed if automatic daylighting controls installed in daylight zones under skylights (C402.4.1.2)
Air Barriers and Construction

**C402.5.1 and C402.5.1.1**

**Air barrier requirements:**

- Continuous for all assemblies part of the thermal envelope and across joints and assemblies
- Joints and seams to be sealed and securely installed
- Penetrations and joints and seals associated with penetrations must be sealed in a manner compatible with construction material and location
- Recessed lighting to comply with C402.5.7. Where similar objects are installed that penetrate the air barrier, make provisions to maintain integrity of air barrier

**Placement allowed:**

- Inside of building envelope
- Outside of building envelope

**Located within assemblies composing envelope OR**

- Any combination thereof
Mandatory Requirements

Thermal envelope air leakage
Air barriers
Fenestration air leakage
Rooms containing fuel-burning appliances
Doors and access openings to shafts, chutes, stairways and elevator lobbies
Air intakes, exhaust openings, stairways and shafts
Loading dock weatherseals
Vestibules or air curtain
Recessed lighting
Air Barrier Compliance Options C402.5.1.2 and C402.5

Three ways to comply with air barrier requirements
Air Barrier Materials (Compliance)  
C402.5.1.2.1

Materials with air permeability \( \leq 0.004 \text{ cfm/ft}^2 \) under pressure differential of 0.3 inches w.g. when tested in accordance with ASTM E 2178 comply with materials provision.

The following materials meet this requirement:
<table>
<thead>
<tr>
<th>Materials</th>
<th>Thickness (Minimum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plywood</td>
<td>3/8 in.</td>
</tr>
<tr>
<td>Oriented strand board</td>
<td>3/8 in</td>
</tr>
<tr>
<td>Extruded polystyrene insulation board</td>
<td>½ in</td>
</tr>
<tr>
<td>Foil-back polyisocyanurate insulation board.</td>
<td>½ in</td>
</tr>
<tr>
<td>Closed-cell spray foam with minimum density of 1.5 pcf</td>
<td>1-1/2 in</td>
</tr>
<tr>
<td>Open-cell spray foam with density between 0.4 and 1.5 pcf</td>
<td>4.5 in</td>
</tr>
<tr>
<td>Exterior or interior gypsum board</td>
<td>½ in</td>
</tr>
<tr>
<td>Cement board</td>
<td>½ in</td>
</tr>
<tr>
<td>Built up roofing membrane</td>
<td></td>
</tr>
<tr>
<td>Modified bituminous roof membrane</td>
<td></td>
</tr>
<tr>
<td>Fully adhered single-ply roof membrane</td>
<td></td>
</tr>
<tr>
<td>Portland cement/sand parge or gypsum plaster</td>
<td>5/8 in</td>
</tr>
<tr>
<td>Cast-in-place and precast concrete</td>
<td></td>
</tr>
<tr>
<td>Fully grouted concrete block masonry</td>
<td></td>
</tr>
<tr>
<td>Sheet metal or aluminum</td>
<td></td>
</tr>
<tr>
<td>Solid or hollow masonry constructed of clay or shale masonry units</td>
<td></td>
</tr>
</tbody>
</table>
Barrier Assemblies (Compliance)  
*C402.5.1.2.2*

Assemblies of materials and components (sealants, tapes, etc.) with average air leakage ≤ 0.04 cfm/ft² under pressure differential of 0.3 in. w.g. tested in accordance with ASTM E 2357, 1677 or 283 comply with assemblies provision.

- Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating
- Masonry walls constructed of clay or shale masonry units with a nominal width of 4 in or more
- Portland cement/sand parge, stucco or plaster minimum ½ thick
Air Barrier Building Testing Alternative C402.5.

Thermal envelope of buildings must comply with either the materials or assemblies provision OR be tested in accordance with ASTM E 779 at a pressure differential of 0.3 inch water gauge or equivalent method approved by code official.

Building thermal envelope with a tested air leakage rate of ≤ 0.40 cfm/ft² complies with air leakage requirements.
2018 IECC Commercial Mechanical Major Changes
HVAC Systems

• Complete restructuring of HVAC provisions (SEHPCAC)
  o Grouped HVAC provisions together
    • Controls
    • Dampers
    • Variable Air Volume
    • Fan systems
    • Exhaust systems
SIMPLE AND COMPLEX SYSTEMS

Simple System

Complex System

Mechanical no longer separates simple and complex systems
# HVAC Load Calculations

**C403.11 Mandatory**

## Heating and Cooling Load Sizing Calculations Required

<table>
<thead>
<tr>
<th>ASHRAE/ACCA Standard 183</th>
<th>Other approved computation procedures – using design parameters specified in Chapter 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior design conditions</td>
<td>Specified by ASHRAE</td>
</tr>
<tr>
<td>Interior design conditions</td>
<td>Specified by Section 302 of the IECC</td>
</tr>
</tbody>
</table>

- Exterior design conditions:
  - ≤ 72°F for heating load
- Interior design conditions:
  - ≥ 75°F for cooling load
<table>
<thead>
<tr>
<th>EQUIPMENT TYPE</th>
<th>SIZE CATEGORY</th>
<th>Heating Section Type</th>
<th>SUBCATEGORY OR RATING CONDITION</th>
<th>MINIMUM EFFICIENCY</th>
<th>TEST PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air cooled, (Cooling mode)</td>
<td>&lt; 65,000 Btu/h</td>
<td>All</td>
<td>Split system</td>
<td>13.0 SEER</td>
<td>14.0 SEER</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single package</td>
<td>13.0 SEER</td>
<td>14.0 SEER</td>
</tr>
<tr>
<td></td>
<td>≥ 65,000 Btu/h and &lt; 135,000 Btu/h</td>
<td>Electric Resistance (or None)</td>
<td>Split system and single package</td>
<td>11.0 EER 11.2 IEER</td>
<td>11.0 EER 12.0 IEER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All other</td>
<td>Split system and single package</td>
<td>10.8 EER 11.0 IEER</td>
<td>10.8 EER 11.8 IEER</td>
</tr>
<tr>
<td></td>
<td>≥ 135,000 Btu/h and &lt; 240,000 Btu/h</td>
<td>Electric Resistance (or None)</td>
<td>Split system and single package</td>
<td>10.6 EER 10.78 IEER</td>
<td>10.6 EER 11.6 IEER</td>
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<tr>
<td></td>
<td></td>
<td>All other</td>
<td>Split system and single package</td>
<td>10.4 EER 10.5 IEER</td>
<td>10.4 EER 11.4 IEER</td>
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<tr>
<td></td>
<td>≥ 240,000 Btu/h</td>
<td>Electric Resistance (or None)</td>
<td>Split system and single package</td>
<td>9.5 EER 9.6 IEER</td>
<td>9.5 EER 10.6 IEER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All other</td>
<td>Split system and single package</td>
<td>9.3 EER 9.4 IEER</td>
<td>9.3 EER 9.4 IEER</td>
</tr>
<tr>
<td>Through-the-Wall (Air cooled, cooling mode)</td>
<td>&lt;30,000 Btu/h</td>
<td>All</td>
<td>Split System</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Air-cooled unitary direct-expansion units and VRF units equipped with an economizer must include a fault detection and diagnostics (FDD) system complying with the following:

- Outside air, supply air and return air temperature sensors must be permanently installed.
- Temperature sensors must have an accuracy of ±2°F over the range of 40°F to 80°F.
- Refrigerant pressure sensors, where used, must have an accuracy of ±3% of full scale.
- Unit controller must be capable of providing system status, manually initiating each operating mode and reporting faults to a fault management application.
- FDD system must be capable of detecting air temperature sensor fault, economizer faults, damper not modulating and excess outdoor air.
### Enclosed Parking Garage Ventilation Controls

**C403.7.2**

Enclosed parking garages used for storing or handling automobiles operating under their own power must employ contamination-sensing devices and automatic controls configured to stage fans or modulate fan average airflow rates to < 50% of design capacity, or intermittently operate fans <20% of the occupied time or as required to maintain acceptable contaminant levels in accordance with IMC.

<table>
<thead>
<tr>
<th>Exceptions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Garages with total exhaust capacity &lt;22,500cfm with ventilation systems that do not utilize heating or mechanical cooling</td>
</tr>
<tr>
<td>• Garages that have a garage area to ventilation system motor nameplate power ratio that exceeds 1,125 cfm/hp and do not utilize heating or mechanical cooling</td>
</tr>
</tbody>
</table>
2018 Demand Controlled Ventilation

C403.7.1 Mandatory

*DCV* must be provided for each zone with spaces > 500 ft² and the average occupant load > 25 people/1000 ft² of floor area where the HVAC system has:

- An air-side economizer,
- Automatic modulating control of the outdoor air damper, or
- A design outdoor airflow > 3,000 cfm

*Demand control ventilation (DCV)*: a ventilation system capability that provides for the automatic reduction of outdoor air intake below design rates when the actual occupancy of spaces served by the system is less than design occupancy.
Energy Recovery Ventilation Systems

**C403.7.4 Mandatory**

Applies to fan systems with supply airflow rates > values in Table C403.27.4(1) & Table C403.7.4(2)

Exhaust air recovery efficiency must be ≥ 50%

When an air economizer is required, a bypass or controls that permit operation of economizer per C403.3 must be included
| CLIMATE ZONE | PERCENT (%) OUTDOOR AIR AT FULL DESIGN AIRFLOW RATE | | | | | | ≥ 30% and <40% | ≥ 40% and <50% | ≥ 50% and 60% | ≥ 60% and <70% | ≥ 70% and 80% | ≥ 80% | |
|--------------|---------------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| 3B, 3C, 4B, 4C, 5B | NR | NR | NR | NR | ≥ 5000 | ≥ 5000 | |
| 1B, 2B, 5C | NR | NR | ≥ 26000 | ≥ 12000 | ≥ 5000 | ≥ 4000 | |
| 6B | ≥ 11000 | ≥ 5500 | ≥ 4500 | ≥ 3500 | ≥ 2500 | ≥ 1500 | |
| 1A, 2A, 3A, 4A, 5A, 6A | ≥ 5500 | ≥ 4500 | ≥ 3500 | ≥ 2000 | ≥ 1000 | ≥0 | |
| 7, 8 | ≥ 2500 | ≥ 1000 | >0 | >0 | >0 | >0 | |

**2012 Energy Recovery Ventilation Systems**

**C403.2.6 Mandatory**
## 2018 Energy Recovery Ventilation Systems

### C403.7.4(1) Mandatory

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>VENTILATIONS SYSTEMS OPERATING &lt; 8,000 hours per year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≥ 10% and &lt;20%</td>
</tr>
<tr>
<td>3B, 3C, 4B, 4C, 5B</td>
<td>NR</td>
</tr>
<tr>
<td>1B, 2B, 5C</td>
<td>NR</td>
</tr>
<tr>
<td>6B</td>
<td>≥ 28,000</td>
</tr>
<tr>
<td>1A, 2A, 3A, 4A, 5A, 6A</td>
<td>≥ 26,000</td>
</tr>
<tr>
<td>7, 8</td>
<td>≥ 4,500</td>
</tr>
</tbody>
</table>

### DESIGN SUPPLY FAN AIRFLOW RATE (cfm)

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>3B, 3C, 4B, 4C, 5B</th>
<th>1B, 2B, 5C</th>
<th>6B</th>
<th>1A, 2A, 3A, 4A, 5A, 6A</th>
<th>7, 8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>≥ 26,000</td>
<td>≥ 12,000</td>
</tr>
</tbody>
</table>
## 2018 Energy Recovery Ventilation Systems

### C403.2.7(2) Mandatory

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>VENTILATIONS SYSTEMS OPERATING ≥ 8,000 hours per year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≥ 10% and &lt;20%</td>
</tr>
<tr>
<td>3C, NR</td>
<td>NR</td>
</tr>
<tr>
<td>1B, 2B, 3B, 4C, 5C</td>
<td>NR</td>
</tr>
<tr>
<td>1A, 2A, 3A, 4B, 5B</td>
<td>≥ 2,500</td>
</tr>
<tr>
<td>4A, 5A, 6A, 6B, 7, 8</td>
<td>&gt; 200</td>
</tr>
</tbody>
</table>

**Design Supply Fan Airflow Rate (cfm)**

- **3C**: NR, NR, NR, NR, NR, NR, NR, NR
- **1B, 2B, 3B, 4C, 5C**: NR, ≥ 19,500, ≥ 9,000, ≥ 5,000, ≥ 4,000, ≥ 3,000, ≥ 1,500, > 120
- **1A, 2A, 3A, 4B, 5B**: ≥ 2,500, ≥ 2,000, ≥ 1,000, ≥ 500, > 140, > 120, > 100, > 80
- **4A, 5A, 6A, 6B, 7, 8**: > 200, > 130, > 100, > 80, > 70, > 60, > 50, > 40
Replacement air introduced directly into exhaust hood cavity must not be > 10% of hood exhaust airflow rate. Conditioned supply air delivered to any space must not exceed the greater of:

- Ventilation rate required to meet the space heating or cooling load
- Hood exhaust flow minus available transfer air from adjacent space

Each hood must comply with one of the following:

- Not < 50% of replacement air may be transfer air that would be exhausted
- Demand ventilation systems of not < 75% of the exhaust air that are capable of not < a 50% reduction in exhaust and replacement air system airflow rates
- Listed energy recovery devices with a sensible heat recovery effectiveness of not < 40% on not < 50% of total exhaust airflow

Exception: Where not < 75% of all replacement air is transfer air that would otherwise be exhausted

Where total kitchen hood exhaust airflow rate is > 5,000cfm, each hood must be a factory built commercial exhaust hood.
Duct and Plenum Insulation and Sealing

**C403.11.1 Mandatory**

Required for Supply and Return Ducts and Plenums Ducts

- Located in Unconditioned Space – R6 Insulation
- Ducts Located Outside the Building Envelope – R8 Insulation in CZ 1-4 and R-12 in CZ 5-8
- Located in Envelope Assembly – Must Be Separated from Building Exterior with R8 Insulation in CZ 1-4 and R12 in CZ 5-8

**Exceptions**
- Ducts Located within Equipment
- Maximum Design Temperature Difference (Interior – Exterior) is < 15°F
Mechanical Systems Commissioning and Completion \textit{C408} Mandatory

 HVAC & Service Water Heating

Applies to buildings with a total building equipment capacity ≥

- 480,000 Btu/h cooling capacity, or
- 600,000 Btu/h heating capacity

Requires:

- Commissioning plan
- Systems adjusting and balancing
- Functional performance testing
  - Equipment
  - Controls
  - Economizers
- Preliminary commissioning report
- Construction documents and O&M Manuals
- Final commissioning report and air balancing report
- Functional testing of lighting controls
Simple HVAC Systems & Equipment

C403.3

Must include economizers dependent on climate zone

Capable of providing 100-percent outdoor air even if additional mechanical cooling is required (integrated economizer)

Must provide a means to relieve excess outdoor air
### 2012

#### Economizers C403.3.1

**Table C403.3.1(1)**

<table>
<thead>
<tr>
<th>CLIMATE ZONES</th>
<th>Economizer Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A, 1B</td>
<td>No requirement</td>
</tr>
<tr>
<td>2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8</td>
<td>Economizers on cooling systems $\geq 33,000$ Btu/h&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> The total capacity of all systems without economizers shall not exceed 300,000 Btu/h per building, or 20 percent of its air economizer capacity, whichever is greater.
The total capacity of all systems without economizers shall not exceed 300,000 Btu/h per building, or 20 percent of its air economizer capacity, whichever is greater.

<table>
<thead>
<tr>
<th>CLIMATE ZONES</th>
<th>Economizer Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A, 1B</td>
<td>No requirement</td>
</tr>
<tr>
<td>2A, 2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B, 7, 8</td>
<td>Economizers on cooling systems ≥ 54,000 Btu/h (^a)</td>
</tr>
</tbody>
</table>

\(^a\) The total capacity of all systems without economizers shall not exceed 300,000 Btu/h per building, or 20 percent of its air economizer capacity, whichever is greater.
Table C403.5(2)

<table>
<thead>
<tr>
<th>CLIMATE ZONES</th>
<th>COOLING EQUIPMENT PERFORMANCE IMPROVEMENT (EER OR IPLV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A, 2B</td>
<td>10% Efficiency Improvement</td>
</tr>
<tr>
<td>3A, 3B</td>
<td>15% Efficiency Improvement</td>
</tr>
<tr>
<td>4</td>
<td>20% Efficiency Improvement</td>
</tr>
</tbody>
</table>

Trade-off high cooling efficiency for economizer
Fractional hp Fan Motors

C403.8.4

Motors for fans not < 1/12 hp and <1 hp must:

- Be electronically commutated motors OR
- Have a minimum efficiency of 70% AND
- Have the means to adjust motor speed for either balancing or remote control

Exceptions:
- Motors in the airstream within fan coils and terminal units that only provide heating to the space served
- Motors in space-conditioning equipment that comply with Section 403.3.2 or C403.8.1 – C403.8.3
- Motors that comply with Section C405.7

The use of belt-driven fans to sheave adjustments for airflow balancing instead of a varying motor speed is permitted.
Refrigeration Systems
C403.10

Refrigeration Equipment Performance

• Sets maximum kWh/day for the following type of refrigeration equipment
  • Commercial refrigeration e.g refrigerators and freezers with solid or transparent doors
  • Commercial refrigerators and freezers
• Walk-in Coolers, freezers, refrigerated warehouse freezers
  • Automatic door closers
  • Minimum envelope insulation levels
  • Double or triple-pane glass with inert gas or heat-reflective treated glass for reach-in doors
  • Fan motor requirements for evaporator and condenser motors
  • High efficacy lighting

• Refrigerated Display Cases
  • Lights controlled by automatic time switch or occupancy sensor
  • Temperature based defrost termination and anti-sweat controls
2018 IECC Service Water Heating Major Changes
Water Heating

- Reduce flow rate of fixed and handheld showers to 2.0 gpm at 80 psi. (Floyd)
Efficient Heated Water Supply Piping  
C404.5

- Sets maximum pipe length from the hot water source to the termination of the fixture supply pipe.
  - Maximum allowable pipe length method
    - Based on termination type
  - Maximum allowable pipe volume method
    - Sets the maximum volume of water between the heated water source and the fixture based on fixture type
    - Public lavatory faucet – not more than 2 ounces
    - Other plumbing fixtures – not more than 0.5 gallons

Figure 1: Conventional Single Trunk, Double Branch and Twig Plumbing Layout with Separate Hot and Cold Water Supply Lines to individual fixtures.
**Demand Recirculation Controls**

**C404.7**

A **demand recirculation water system** is a water distribution system with one or more recirculation pumps that pump water from a heated-water supply pipe back to the heated-water source through a cold water supply pipe.

**Pumps must have controls that:**

- Start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.
- Limit the temperature of the water entering the cold-water piping to 104°F.
2018 IECC COMMERCIAL LIGHTING REQUIREMENTS MAJOR CHANGES
What’s Covered Under Electrical Power and Lighting Systems Requirements

- Mandatory Interior Lighting requirements
  *Required Controls
  *Wattage/Efficiency Limits

- Interior Lighting Power Allowances (watts/ft²)

- Exterior Lighting Controls
  *Required Controls
  *Lamp Efficiency

- Exterior Lighting Power Allowances (watts/ft²)

- Electric Metering; Transformers; Motors; Transportation systems; Voltage drop feeders & branch circuits
Interior Lighting Controls

**C405.2**

Lighting systems must have the following controls:

- Occupant sensor controls (C405.2.1)
- Time-switch controls (C405.2.2)
- Daylight-responsive controls (C405.2.3)
- Specific application controls (C405.2.4)
- Manual Controls (C405.2.5)
- Exterior lighting controls (C405.2.6)

**Exemptions:**

- Security or emergency areas that must be continuously lighted
- Interior exit stairways, interior exit ramps and exit passageways
- Emergency egress lighting that is normally off
The following space types must have occupant sensor controls installed to control lights:
• Classrooms/lecture/training rooms
• Conference/meeting/multipurpose rooms
• Copy/print rooms
• Lounges
• Employee lunch and break rooms
• Private offices
• Restrooms
• Storage rooms
• Janitorial closets
• Locker rooms
• Other spaces 300ft² or less that are enclosed by floor-to-ceiling height partitions
• Warehouses

Occupant sensors for all spaces except warehouses must:
1. Automatically turn off lights within 20 minutes of all occupancies leaving space
2. Be manual on or controlled to automatically turn lighting on to not more than 50% power
3. Include manual control to allow occupants to turn lights off

In warehouses, Lighting in aisle-ways and open areas must be individually controlled with occupant sensors that automatically reduce lighting power by >50% when areas are unoccupied
Each area that is not provided with occupant sensor controls must have time-switch controls.

Exceptions: Automatic controls are not required in sleeping areas, spaces where patient care is directly provided, spaces where auto lighting would endanger safety or security, lighting intended for continuous operation, shop and laboratory classrooms.

Time-switch Control Function (C405.2.2.1)
Each space with time-switch controls must also have a manual control for lighting reduction and include an override switching device that:
- Has a minimum 7-day clock
- Is capable of being set for 7 different day types/week
- Incorporates an automatic holiday “shutoff”
- Has program backup capabilities
- Permits controlled lighting to be on for less than 2 hours
- Controls lighting for areas <5,000 ft²

Exceptions to Time-switch Control Functions:
1. Within malls, arcades, auditoriums, single-tenant retail spaces, industrial facilities and arenas the time limit may be greater than 2 hours if override switch is captive key device and may control area >5,000 ft² and <20,000 ft²
2. Where provided with manual control, the following are not required to have lighting reduction control: spaces that have only 1 luminaire with rated power <100W; spaces that use less than 0.6 W/ft²; corridors, equipment rooms, public lobbies, electrical or mechanical rooms.
Light Reduction Controls must allow the occupant to reduce connected lighting by at least 50% in a reasonably uniform illumination pattern.

Exception: Light reduction controls not required in daylight zones with daylight responsive controls complying with Section C405.2.3.
Daylight-Responsive Controls

**C405.2.3**

Daylight-responsive controls must be provided to control electric lights within daylight zones in:
- Spaces with total of more than 150W of general lighting within sidelight daylight zones
- Spaces with total of more than 150W of general lighting within top-light daylight zones

Daylight-responsive controls must comply with the following:
- Lights in top-light daylight zones controlled independently of lights in sidelight daylight zones
- Daylight responsive controls calibrated from within
- Calibration mechanisms readily accessible
- Where located in offices, classrooms, laboratories and library reading rooms, daylight responsive controls must dim lights continuously from full light output to < 15% of full light output
- Capable of a complete shutoff of all controlled lights
- Lights in sidelight daylight zones facing different cardinal orientations must be controlled independently of each other

Exception: Up to 150W in each space permitted to be controlled together with lighting in a daylight zone facing different cardinal direction
Specific Application Controls

**C405.2.4**

- Display and accent lighting
- Display case lighting
- Supplemental task lighting
- Lighting equipment for sale or demonstration in lighting education

Dwelling units need occ sensor or reduction controls:
- Master control device at main room entry
- Controls all permanently installed luminaires and switched receptacles (20 minutes to off)

Hotel and motel sleeping units and guest suites:
- Have control device integral to luminaires OR
- Be controlled by readily accessibly, wall-mounted control device

These types be controlled by dedicated, independent control:

Lighting for plant growth and food warming shall be controlled by a time switch control independent of the other room controls for lighting.

Dwelling units need occ sensor or reduction controls:
# Interior Lighting Power

## C405.4.2

## Two methods to determine allowance:

<table>
<thead>
<tr>
<th>Building Area Method</th>
<th>Space-by-Space Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Floor area for each building area type ( \times ) value for the area</td>
<td>- Floor area of each space ( \times ) value for the area</td>
</tr>
<tr>
<td>- “area” defined as all contiguous spaces that accommodate or are associated with a single building area type as per the table</td>
<td>- Then sum the allowances for all the spaces</td>
</tr>
<tr>
<td>- When used for an entire building, each building area type to be treated as a separate area</td>
<td>- Tradeoffs among spaces are allowed</td>
</tr>
<tr>
<td>Building Area Type</td>
<td>LPD (w/ft²)</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Office</td>
<td>0.79</td>
</tr>
<tr>
<td>Retail</td>
<td>1.06</td>
</tr>
<tr>
<td>Convention Center</td>
<td>0.76</td>
</tr>
<tr>
<td>Dining: Bar lounge/leisure</td>
<td>0.90</td>
</tr>
<tr>
<td>Dining: Family</td>
<td>0.78</td>
</tr>
<tr>
<td>Exercise Center</td>
<td>0.65</td>
</tr>
<tr>
<td>Fire Station</td>
<td>0.53</td>
</tr>
<tr>
<td>Gymnasium</td>
<td>0.68</td>
</tr>
<tr>
<td>Health Care Clinic</td>
<td>0.82</td>
</tr>
<tr>
<td>Hospital</td>
<td>1.05</td>
</tr>
<tr>
<td>Hotel/Motel</td>
<td>0.75</td>
</tr>
<tr>
<td>Library</td>
<td>0.78</td>
</tr>
<tr>
<td>School/University</td>
<td>0.81</td>
</tr>
<tr>
<td>Sports Arena</td>
<td>0.87</td>
</tr>
<tr>
<td>Common Space-By-Space Types</td>
<td>LPD (w/ft²)</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Office (Enclosed Plan/Open Plan)</td>
<td>0.93/ 0.81</td>
</tr>
<tr>
<td>Retail (Dressing / Mall Concourse / Sales)</td>
<td>0.50/ 0.90 / NA</td>
</tr>
<tr>
<td>Atrium First 40 ft in height</td>
<td>0.03 per ft. in total height</td>
</tr>
<tr>
<td>Atrium Above 40ft in height</td>
<td>0.40 + 0.02 per ft. in total height</td>
</tr>
<tr>
<td>Audience/seating area</td>
<td></td>
</tr>
<tr>
<td>For Auditorium</td>
<td>0.63</td>
</tr>
<tr>
<td>For Performing Arts Theatre</td>
<td>2.03</td>
</tr>
<tr>
<td>For Motion Picture Theatre</td>
<td>1.14</td>
</tr>
<tr>
<td>Class Room/Lecture/Training</td>
<td>0.96</td>
</tr>
<tr>
<td>Conference/Meeting/Multipurpose</td>
<td>1.07</td>
</tr>
<tr>
<td>Corridor</td>
<td>0.66</td>
</tr>
<tr>
<td>Dining Area</td>
<td></td>
</tr>
<tr>
<td>In a penitentiary</td>
<td>0.96</td>
</tr>
<tr>
<td>In a facility for the visually impaired</td>
<td>2.00</td>
</tr>
<tr>
<td>Bar/Lounge/Leisure Dining</td>
<td>0.93</td>
</tr>
<tr>
<td>Family Dining Area</td>
<td>0.71</td>
</tr>
<tr>
<td>Electrical/Mechanical</td>
<td>0.43</td>
</tr>
</tbody>
</table>
Additional Interior Lighting Power Allowance =
1000 watts +
(Retail Area 1 x 0.45 W/ft2) +
(Retail Area 2 x 0.45 W/ft2) +
(Retail Area 3 x 1.05 W/ft2) +
(Retail Area 4 x 1.87 W/ft2),
Where:
Retail Area 1 = the floor area for all products not listed in Retail Area 2, 3 or 4.
Retail Area 2 = the floor area used for the sale of vehicles, sporting goods and small electronics.
Retail Area 3 = the floor area used for the sale of furniture, clothing, cosmetics and artwork.
Retail Area 4 = the floor area used for the sale of jewelry, crystal, and china.
Lighting Systems (DOE)

• Exterior Lighting Power Allowances
  o Reduction in Base Site Allowance for all zones
  o Reduction for:
    • Uncovered parking areas
    • Building grounds
    • Building entrances and exits
    • Sales canopies
    • Outdoor sales
    • Non-tradeable surfaces
Electrical transformers must meet the minimum efficiency requirements of Table C405.6 as tested in accordance with DOE 10 CFR 431 and verified through certification under an approved certification program or data furnished by the manufacturer.

Exceptions:
- Transformers that meet the Energy Policy Act of 2005 exclusions based on the DOE 10 CFR 431 definition of special purpose applications
- Transformers that meet the Energy Policy Act of 2005 exclusions that are not to be used in general purpose applications based on information provided in DOE 10 CFR 431
- Transformers that meet the Energy Policy Act of 2005 exclusions with multiple voltage taps where the highest tap is at least 20% > than lowest tap
- The following transformers: Drive, Rectifier, Auto-transformers, Uninterruptible power system, Impendence, Regulating, Sealed and non-ventilating, machine tool, welding, grounding and testing.
Electrical motors must meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4) when tested and rated in accordance with the DOE 10 CFR 431. The efficiency will be verified through certification under an approved certification program, or, where a certification program does not exist, the equipment efficiency ratings shall be supported by data furnished by the motor manufacturer.
Elevator Cabs (C405.8.1)
• For the luminaires in each elevator cab, not including signals and displays, the sum of the lumens divided by the sum of the watts must be > 35 lumens per watt
• Ventilation fans in elevators that do not have their own air-conditioning system must not consume more than 0.33 watts/cfm at max rated speed of fan.
• Controls will de-energize ventilation fans and lighting systems when elevator is stopped, unoccupied and with its doors closed for over 15 minutes.

Escalators and Moving Walks (C405.8.2)
• Must comply with ASME A17.1/CSA B44
• Must have automatic controls configured to reduce speed to the minimum permitted
• Regenerative Drive (405.9.2.1). An escalator designed either for one-way down operation only or for reversible operation shall have a variable frequency regenerative drive that supplies electrical energy to the building electrical system when escalator is loaded with passengers whose weight > 750 pounds
2018 IECC Commercial Additional Requirements
Additional Efficiency Requirements

One or More Additional Efficiency Feature Must Be Selected to Comply with the IECC

- More efficient HVAC
- Reduced lighting power density
- Enhanced lighting controls
- On-site renewable energy
- Dedicated outdoor air system
- High-efficiency SWH
- Enhanced envelope
- Reduced air infiltration
## 2012 Additional Efficiency Requirements

One Additional Efficiency Feature Must Be Selected to Comply with the IECC

| More efficient lighting system <90% of C405.3.1 | More efficient HVAC system by 10% | Installation of onsite renewables  
  * 3% of the regulated building energy |

### High Efficiency HVAC

![High Efficiency HVAC](image)

### Onsite Renewables

![Onsite Renewables](image)
More Efficient HVAC Equipment Performance
C406.2

- Equipment must exceed minimum efficiency requirements listed in Tables C403.2.3(1) through C403.2.3(7) by 10% in addition to requirements of Section C403
- Where multiple performance requirements are provided, equipment must exceed all requirements by 10%
- Variable refrigerant flow systems must exceed ASHRAE 90.1 by 10%
- Equipment not listed in table is limited to 10% of the total building system capacity
Reduced Lighting Power Density
C406.3

Total interior lighting power of building must be determined using 90% of lighting power values specified in Tables C405.4.2(1) times the floor area for building types OR by using 90% of the interior lighting power allowance calculated by the space-by-space method.
Enhanced Digital Lighting Controls
C406.4

Interior lighting in the building must have the following controls:
• Luminaires must be capable of continuous dimming
• Luminaires must be capable of being addressed individually
• Not more than 8 luminaires may be controlled together in a daylight zone
• Fixtures must be controlled through a digital control system
• Construction documents must include submittal of a Sequence of Operations
• Functional testing of lighting controls must comply with Section 408
On-Site Renewable Energy
C406.5

Total minimum ratings of on-site renewables must comply with one of the following:

- Provide not less than 0.5 watts per square foot of conditioned floor area
- Provide ≥ 3 percent of the energy used within the building for building mechanical and service water heating equipment and lighting regulated in Chapter 4
Dedicated Outdoor Air Systems
C406.6

• Buildings covered by Section C403.4 shall be equipped with an independent ventilation system designed to provide > the minimum 100% outdoor air to each occupied space.
• Ventilation system must be capable of total energy recovery
• HVAC system must include supply-air temperature controls that automatically reset supply-air temperature in response to building loads or outdoor air temperatures
• Controls must reset the supply-air temperature at least 25% of the difference between the design supply-air temperature and design room-air temperature.
Reduced Energy Use in SWH
C406.7

Buildings must be of the following types to use this compliance option:
- Group R-1: Boarding houses, hotels or motels
- Group 1-2: Hospitals, psychiatric hospitals and nursing homes
- Group A-1: Restaurants and banquet halls or buildings containing food preparation areas
- Group F: Laundries
- Group R-2: Buildings with residential occupancies
- Group A-3: Health clubs and spas
- Buildings showing a service hot water load of 10% or more of total building energy loads

Load Fraction (C406.7.1)
Building SWH system must have one or more of the following that are sized to provide not less than 60% of hot water requirements or sized to provide 100% of hot water requirements if the building otherwise complies with C403.4.7:
- Waste heat recovery from SWH, heat recovery chillers, building equipment, process equipment, or a combined heat and power system
- Solar water-heating systems
Enhanced Envelope Performance
C406.8

• Total UA not less than 15% below the UA of the building envelope according to prescriptive code.
Reduced Air Infiltration

C406.9

• Leakage shall not exceed .25 cfm/ft² at 75 Pascals (0.3 inches water)
HVAC Commissioning
Applies to buildings with a total building equipment capacity ≥:
• 480,000 Btu/h cooling capacity
OR
• 600,000 Btu/h heating & water heating capacity

Requires:
✓ Commissioning plan
✓ Systems adjusting & balancing
✓ Functional performance testing
  • Equipment
  • Controls
  • Economizers
✓ Preliminary commissioning report
✓ Construction documents and O&M Manuals
✓ Final commissioning report and air balancing report
## Commissioning

<table>
<thead>
<tr>
<th>Require commissioning compliance checklist for preliminary commissioning report (Medina)</th>
<th>Checklist ensures that commissioning has been executed for all required systems</th>
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<td>Checklist requires information on when follow-up testing will occur</td>
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Renewables (SEIA)

• Require solar ready zone
  o Minimum roof area for solar
  o Roof loads and documentation
  o Interconnection pathway
  o Electrical service reserved space
  o Construction documentation certificate
Ken Baker
Managing Owner

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