2012 INTERNATIONAL ENERGY CONSERVATION CODE

Significant Changes

Agenda

1. 2012 IECC - Significant Changes
   a) Organizational
   b) Commercial
   c) Residential
Organizational Changes

- Two separate sets of provisions
  - Commercial
    - All buildings except for residential buildings 3 stories or less in height
  - Residential
    - Detached one- and two-family dwellings
    - Multiple single family dwellings
    - Group R-2, R-3 and R-4 buildings 3 stories or less in height
# Table of Contents

- Chapter 1 - Scope and Administration
- Chapter 2 - Definitions
- Chapter 3 - General Requirements
- Chapter 4 - Energy Efficiency
  - Commercial
  - Residential
- Chapter 5 - Referenced Standards

Each code section is preceded by a letter. “C” for Commercial provisions and “R” for Residential provisions

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## Overview - Commercial

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Energy Systems Laboratory
7/11/2012
Chapter 1 (CE) Scope and Administration

- C101.2 Scope
  - Applies to commercial buildings
- C101.3 - Intent
  - Added - over the useful life of each building
- C106.1 - Referenced codes and standards
  - Adds two subsections and clarifies when standards are to be considered
    - C106.1.1 Conflicts
    - C106.1.2 Provision in referenced codes and standards

Chapter 2 (CE) Definitions

- Revised definitions
  - Buildings - added - including any mechanical systems, service water heating systems and electric power and lighting systems located on the building site and supporting the building
  - Skylight - changed measurement from a slope of 15° or more from vertical to 60° or less from horizontal
  - Storefront - added - with or without mulled windows and doors
Chapter 2 (CE) Definitions

- New definitions
  - Building Commissioning
  - Building Entrance
  - Building Site
  - Coefficient of Performance (COP) - Cooling
  - Coefficient of Performance (COP) - Heating
  - Continuous Air Barrier
  - Demand Recirculation Water System
  - Dynamic Glazing
  - Fenestration Product, Field-Fabricated

- Fenestration Product, Site-Built
- Furnace Electricity Ratio
- General Lighting
- Integrated Part Load Value (IPLV)
- Nonstandard Part Load Value (NPLV)
- On-Site Renewable Energy
- Residential Building
- Skylight
- Visible Transmittance (VT)

Chapter 3 (CE) General Requirements

- Revised C303.1.3 Fenestration product rating
  - Added Visible Transmittance (VT) to the NFRC 200

<table>
<thead>
<tr>
<th>TABLE C303.1.3(3)</th>
<th>DEFAULT GLAZED FENESTRATION SHGC AND VT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SINGLE GLAZED</td>
</tr>
<tr>
<td></td>
<td>Clear</td>
</tr>
<tr>
<td>SHGC</td>
<td>0.8</td>
</tr>
<tr>
<td>VT</td>
<td>0.6</td>
</tr>
</tbody>
</table>
Chapter 4 (CE) Commercial Energy Efficiency

- **C401.2 Application**
  - Projects shall comply with one of the following
    1. ANSI/ASHRAE/IESNA 90.1
    2. Sections C402, C403, C404 and C405, and with either Section C406.2, C406.3, or C406.4
    3. Section C407, C402.4, C403.2, C404, C405.2, C405.3, C405.4, C405.6 and C405.7
       - The building energy costs shall be <85% of the standard reference design building

- **C401.2.1 Application to existing buildings**
  - Additions, alterations and repairs to existing buildings shall comply with
    1. Sections C402, C403, C404 and C405
    2. ANSI/ASHRAE/IESNA 90.1
### Table C402.1.2

<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>All other</strong></td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td><strong>Group A</strong></td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td><strong>Group B</strong></td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td><strong>Group C</strong></td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
</tbody>
</table>

#### Notes

- Use of opaque assembly (C-factor, K-factor, and F-factors) from NFPA 220-2010 (Appendix J) shall be permitted, provided the construction complies with the applicable construction details from NFPA 220-2010 (Appendix J).
- Where heated sinks are below grade, below-grade walls shall comply with the F-factor requirements for heated slabs.

---

### Table C402.2

<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>All other</strong></td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td><strong>Group A</strong></td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td><strong>Group B</strong></td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
<tr>
<td><strong>Group C</strong></td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
</tbody>
</table>

#### Notes

- Use of opaque assembly (C-factor, K-factor, and F-factors) from NFPA 220-2010 (Appendix J) shall be permitted, provided the construction complies with the applicable construction details from NFPA 220-2010 (Appendix J).
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Energy Systems Laboratory

7/11/2012
Chapter 4 (CE)
Building Thermal Envelope

- C402.2 Specific insulation requirements
  - Added requirements for layering continuous insulation boards
- C402.2.1 Roof assembly
  - Added requirements for skylight curbs to be insulated to level of roofs
    - Exception for curbs included in NFRC assembly

C402.2.1.1 Roof solar reflectance and thermal emittance
- Low-sloped roofs above cooled conditioned space in Climate Zones 1, 2, 3 shall comply with Table C402.2.1.1
Exceptions -

- Portions of roof covered by
  - Photovoltaic systems
  - Solar air or water heating systems
  - Roof gardens
  - Above roof decks
  - Skylights
  - HVAC systems
- Portions of roof shaded during peak sun angle
- Portions of roof that are ballasted
- Roofs where 75% of roof area meets one of the above

C402.2.6 Slabs on grade

- Added requirement for protection of insulation extending away from the building
- Exception - when the slab on grade is greater than 24” below the finished exterior

C402.2.8 Insulation of radiant heating systems (new section)

- Minimum insulation requirements for system components and the floor structures incorporating the heating
Chapter 4 (CE) Fenestration

- C402.3 Fenestration
  - C402.3.1 Maximum area - reduced to 30%
    - C402.3.1.1 Increased vertical fenestration area with daylighting controls
      - Increase max fenestration to 40% provided
        - No less than 50% of conditioned floor has daylighting
        - Automatic daylighting controls are used
        - VT of fenestration is 1.1 times SHGC
          - Exception - fenestration outside scope of NFRC 200
    - C402.3.1.2 Increased skylight area with daylighting controls - increased to 5%

Table C402.3

<table>
<thead>
<tr>
<th>TABLE C402.3</th>
<th>BUILDING ENVELOPE REQUIREMENTS: FENESTRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLIMATE ZONE</td>
<td>1</td>
</tr>
<tr>
<td>Vertical fenestration</td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td></td>
</tr>
<tr>
<td>Fixed fenestration</td>
<td>0.50</td>
</tr>
<tr>
<td>Operable fenestration</td>
<td>0.65</td>
</tr>
<tr>
<td>Entrance doors</td>
<td>1.10</td>
</tr>
<tr>
<td>SHGC</td>
<td></td>
</tr>
<tr>
<td>SHGC</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Skylights</strong></td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td></td>
</tr>
<tr>
<td>Fixed fenestration</td>
<td>0.75</td>
</tr>
<tr>
<td>Operable fenestration</td>
<td>0.35</td>
</tr>
<tr>
<td>Entrance doors</td>
<td></td>
</tr>
<tr>
<td>SHGC</td>
<td></td>
</tr>
<tr>
<td>SHGC</td>
<td>0.35</td>
</tr>
</tbody>
</table>
| NR = No requirement.
Chapter 4 (CE) Fenestration

C402.3.2 Minimum skylight fenestration area (new section)
- Enclosed space greater than 10,000 sq. ft.,
- Directly under a roof with ceiling heights greater than 15 feet, and
- Used as an office, lobby, atrium, concourse, corridor, storage, gym/exercise center, convention center, auto service, manufacturing, non-refrigerated warehouse, retail store, distribution area, transportation or workshop

Minimum Skylights

Total daylight - not less than half the floor area and provide a minimum skylight to daylight of either
- Not less than 3% of a skylight VT of at least 0.40
- Provide a minimum skylight effective aperture of at least 1% determined in accordance with Equation 4-1
- Exceptions
Chapter 4 (CE) Fenestration

- C402.3.2.1 Lighting controls in daylight zones under skylights (new section)
  - All lighting in the daylight zone shall be controlled by multilevel lighting controls
  - Exceptions

- C402.3.2.2 Haze factor
  - Skylights in listed occupancies shall have a glazing material or diffuser with a measured haze factor greater than 90% when tested according to ASTM 1003
  - Exceptions

Chapter 4 (CE) Fenestration

- C402.3.3 Maximum $U$-factor and SHGC
  - Additional language - “Where different windows or glass doors have different PF values, they shall each be evaluated separately”

- C402.3.3.1 SHGC adjustment
  - Where the PF is greater than or equal to 0.2, the required maximum SHGC shall be adjusted using Table C402.3.3.1

<table>
<thead>
<tr>
<th>Projection Factor</th>
<th>Oriented within 45 degrees of true north</th>
<th>All other orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2 ≤ PF &lt; 0.5</td>
<td>1.1</td>
<td>1.2</td>
</tr>
<tr>
<td>PF ≤ 0.3</td>
<td>1.2</td>
<td>1.6</td>
</tr>
</tbody>
</table>
Chapter 4 (CE) Fenestration

- **C402.3.3.2 Increased vertical fenestration**
  - Climate Zones 1, 2, and 3, fenestration located not less than 6’ above the finished floor may increase SHGC to 0.40

- **C402.3.3.3 Increased skylight SHGC**
  - Climate Zones 1 - 6, maximum SHGC 0.60 where located above daylight zones with automated controls

- **C402.3.3.4 Increased skylight U-factor**
  - When skylights are installed above daylight zones with automatic controls, a maximum $U$-factor
    - 0.9 in Climate Zones 1 - 3
    - 0.75 in Climate Zones 4 - 8

- **C402.3.3.5 Dynamic glazing**
  - Shall be considered separately from other fenestration
    - SHGC - manufacturer’s lowest-rated
    - VT/SHGC ratio - use maximum VT and SHGC
Chapter 4 (CE) Fenestration

- **C402.3.4 Area-weighted U-factor**
  - Area-weighted average permitted for each fenestration product category
  - Individual fenestration products from different fenestration product categories shall not be combined in calculation

Chapter 4 (CE) Air Leakage

- **C402.4 Air leakage**
  - **C402.4.1 Air barriers (new section)**
    - Continuous air barrier shall be provided
    - Exception - Climate Zones 1, 2 and 3
  - **C402.4.1.1 Air barrier construction**
    1. Continuous for all assemblies that are the thermal envelope - including joints and assemblies
    2. Air barrier joints and seams shall be sealed
    3. Recessed lighting fixtures shall comply with C404.2.8 and similar penetrations shall maintain the integrity of the air barrier
    - Exception - Compliance with C402.1.2.3 - not required to comply with Items 1 and 3
Chapter 4 (CE) Air Leakage

- C402.4.1.2 Air barrier compliance options
  - Comply with C402.4.1.2.1, C402.4.1.2.2, or C402.4.1.2.3
    - C402.4.1.2.1 Materials
      - Joints must be sealed and materials are installed as air barriers in accordance with manufacturer’s instructions
        - 3/8” plywood or oriented strand board
        - ½” extruded polystyrene insulation board
        - ½” foil-back polyisocyanurate insulation board
        - Closed cell spray foam - 1.5 pcf density - 1½” thick
        - Open cell spray foam - 0.4 - 1.5 pcf density - 4.5” thick
        - ½” cement board or exterior or interior gypsum board
        - Built-up roofing membrane
        - Modified bituminous roof membrane
        - Fully adhered single-ply roof membrane
        - 5/8” gypsum plaster or Portland cement/sand parge
        - Cast-in-place or precast concrete
        - Full grouted concrete block masonry
        - Sheet steel or aluminum

- C402.4.1.2.2 Assemblies
  - Materials and components tested with ASTM E 2357, ASTM E 1677 or ASTM 3 283
  - An average air leakage not to exceed 0.04 cfm, tested at 0.3” w.g. (75 Pa)

- C402.4.1.2.3 Building Test
  - Completed building tested in accordance with ASTM E 779
  - Leakage not to exceed 0.04 cfm, tested at 0.3” w.g. (75 Pa)
Chapter 4 (CE) Air Leakage

☐ C402.4.2 Air barrier penetrations
  ☐ Added language clarifying sealing requirements

☐ C402.4.3 Air leakage of fenestration
  ☐ Table C402.4.3

<table>
<thead>
<tr>
<th>PENETRATION ASSEMBLY</th>
<th>MAXIMUM AIR INFLATION RATE (CFM/FT²)</th>
<th>TEST PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>0.20 ft²</td>
<td>AAMA/WDMA/CSA101.9.1 S2/A440 or NFRC 400</td>
</tr>
<tr>
<td>Sliding doors</td>
<td>0.20 ft²</td>
<td></td>
</tr>
<tr>
<td>Swinging doors</td>
<td>0.20 ft²</td>
<td></td>
</tr>
<tr>
<td>Skylights + condensation weepage openings</td>
<td>0.30 ft²</td>
<td></td>
</tr>
<tr>
<td>Skylights – all other</td>
<td>0.20 ft²</td>
<td></td>
</tr>
<tr>
<td>Curtain walls</td>
<td>0.05 ft²</td>
<td></td>
</tr>
<tr>
<td>Storefront glazing</td>
<td>0.06 ft²</td>
<td>NFRC 400 or ASTM E 283 at 1.57 psf (75 Pa)</td>
</tr>
<tr>
<td>Commercial glazed + swinging romance doors</td>
<td>1.00 ft²</td>
<td>ASTM E 283 at 1.57 psf (75 Pa)</td>
</tr>
<tr>
<td>Receiving doors</td>
<td>1.00 ft²</td>
<td></td>
</tr>
<tr>
<td>Garage doors</td>
<td>0.60 ft²</td>
<td>ANSI/ADASMA 105, NFRC 400, or ASTM E 283 at 1.57 psf (75 Pa)</td>
</tr>
<tr>
<td>Rolling doors</td>
<td>1.00 ft²</td>
<td></td>
</tr>
</tbody>
</table>

For SE: 1 cubic foot per minute = 0.477 ft³/s, 1 square foot = 0.093 m²
a. The maximum rate for windows, sliding and swinging doors, and skylights is considered to be 0.3 cfm per square foot of fenestration or door area when tested in accordance with AAMA/WDMA/CSA101.9.1 S2/A440 or ASTM E 283 at 1.57 psf (75 Pa).

Chapter 4 (CE) Air Leakage

☐ C402.4.4 Doors and access openings to shafts chutes, stairways and elevator lobbies
  ☐ Exception

☐ C402.4.5 Air intakes, exhaust openings, stairways and shafts
  ☐ C402.4.5.1 Stairway and shaft vents
  ☐ C402.4.5.2 Outdoor air intakes and exhausts
    ☐ Exceptions
C402.4.7 Vestibules
- Added all building entrances
- Added the installation of revolving doors in the building entrance shall not eliminate the vestibule on any door adjacent to the revolving door

Exceptions
- Added doors intended solely for employee use to exception 2

C402.4.8 Recessed lighting
- Removed language addressing air movement from the conditioned space to the ceiling cavity.
Chapter 4 (CE) Mechanical

- C403.2.1 Calculation of heating and cooling loads
  - Added - The design loads shall account for the building envelope, lighting, ventilation and occupancy loads based on the project design

- C403.2.2 Equipment and system sizing
  - Clarified the output capacity of heating and cooling equipment systems shall not exceed the loads calculated

Chapter 4 (CE) Mechanical

- C403.2.3 HVAC equipment performance requirements
  - Added - Plate-type liquid-to-liquid heat exchangers shall meet the minimum requirements of Table C403.2.3(9)

- C403.2.3.1 Water-cooled centrifugal chilling packages
  - Changed the formulas
    - Adjusted minimum full-load COP ratings
    - Adjusted minimum NPLV rating
  - Exception - chillers designed to operate outside these ranges need not comply
Chapter 4 (CE) Mechanical

- Table C403.2.3(1)
- Table C403.2.3(2)
- Table C403.2.3(3)
- Table C403.2.3(4)
- Table C403.2.3(5)
- Table C403.2.3(6)
- Table C403.2.3(7)
- Table C403.2.3(8)
- Table C403.2.3(9)

... (continued from previous page)

C403.2.3.2 Positive displacement (air- and water-cooled) chilling packages (new)
- Equipment with a leaving fluid temperature higher than 32°F shall meet Table C403.2.3(7)

C403.2.4.3.3 Automatic start capabilities (new)
- Controls shall be provided for each HVAC system
- Capable of automatically adjusting the daily start time in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy
Chapter 4 (CE) Mechanical

- **C403.2.5.1** Demand controlled ventilation
  - Reduced average occupant load to 25 people

- **Exception**
  - Additional exception where demand control ventilation is not required
    - Ventilation provided for process loads only

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Chapter 4 (CE) Mechanical

- **C403.2.6** Energy recovery ventilation systems
  - Required where the supply airflow rate of a fan system exceeds the values specified in Table C403.2.6
  - Changes to Exceptions 5, 6, and 7 - added 8 and 9
    - 5. Changed to Climate Zones 1 and 2
    - 6. Changed to Climate Zones 3C, 4C, 5B, 5C, 6B, 7 and 8
    - 7. Changed to dehumidification that employ energy recovery in series with the cooling coil
    - Where the largest source of exhausted air at a single location is less than 75% of the design outdoor air flow
    - Systems expected to operate less than 20 hrs per week at the outdoor air % covered by Table C403.2.6
Chapter 4 (CE) Mechanical

Table C403.2.6

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>DESIGN SUPPLY FAN AIRFLOW RATE (cfm)</th>
<th>ENERGY RECOVERY REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≥ 30% and &lt; 60%</td>
<td>≥ 60% and &lt; 80%</td>
</tr>
<tr>
<td>3B, 3C, 4B, 4C, 5B</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>1B, 2B, 5C</td>
<td>≥ 11000</td>
<td>≥ 5500</td>
</tr>
<tr>
<td>6B</td>
<td>≥ 5500</td>
<td>≥ 4500</td>
</tr>
<tr>
<td>1A, 2A, 3A, 4A, 5A, 6A</td>
<td>≤ 2500</td>
<td>≥ 1000</td>
</tr>
</tbody>
</table>

NR = not required

C403.2.7.1.3 High-pressure duct systems

- Changed formula: $CL = F/P^{0.65}$

C403.2.8 Piping insulation

- Changed Table C403.2.8

Exceptions

- 3. Increased minim temperature to 60°F
- 5. Replaced with new requirements
  - Removed exception for runout piping
  - Strainers, control valves, and balancing valves associated with piping 1" or less
- 6. Added direct buried piping that conveys fluids at or below 60°F
Chapter 4 (CE) Mechanical

C403.2.8.1 Protection of piping insulation (new)

- Piping insulation exposed to weather shall be protected from damage, including
  - Sunlight
  - Moisture
  - Equipment maintenance
  - Wind
  - Shielding from solar radiation

- Adhesive tape is not permitted
Chapter 4 (CE) Mechanical

- C403.2.9 Mechanical systems commissioning and completion requirements
  - Shall meet requirements in C408.2
- C403.2.10.1 Allowable fan floor horsepower
  - Added - Single zone variable-air-volume systems shall comply with the constant volume fan power limitation
- Exception
  - 1. Added vivarium
  - 3. Removed

Chapter 4 (CE) Mechanical

- Table C403.2.10.1(1)
  - Changes to footnotes
Chapter 4 (CE) Mechanical

- **Table C403.2.10.1(2)**
  - Added devices
  - Changes to adjustments on some devices

### Table C403.2.10.1(2)

<table>
<thead>
<tr>
<th>Device</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return and exhaust air flow control devices</td>
<td>0.5 inch w.c. (3.15 in w.c. for laboratory and vivarium systems)</td>
</tr>
<tr>
<td>Exhaust filters, scrubbers, or other exhaust treatment</td>
<td>0.3 inch w.c.</td>
</tr>
<tr>
<td>Particulate filtration credit: MERV 9 less</td>
<td>0.5 inch w.c.</td>
</tr>
<tr>
<td>Particulate filtration credit: MERV 13 less</td>
<td>0.1 inch w.c.</td>
</tr>
<tr>
<td>Carbon and other gas-phase air cleaners</td>
<td>Clean filters, pressure drop at fan system design conditions.</td>
</tr>
<tr>
<td>Energy recovery device, other than coil renewable loop</td>
<td>Pressure drop of devices at fan system design conditions.</td>
</tr>
<tr>
<td>Coil renewable loop</td>
<td>0.6 inch w.c. for each air stream</td>
</tr>
<tr>
<td>Pressure drop of devices at fan system design conditions</td>
<td></td>
</tr>
<tr>
<td>Sound attenuation section</td>
<td>0.15 inch w.c.</td>
</tr>
<tr>
<td>Exhaust system serving fume hoods</td>
<td>0.15 inch w.c.</td>
</tr>
<tr>
<td>Laboratory and vivarium exhaust systems in high rise buildings</td>
<td>0.25 inch w.c./100 feet of vertical duct exceeding 35 feet</td>
</tr>
</tbody>
</table>

w.c. = water column. For 1 inch w.c. = 2.59 Pa. 1 inch = 25.4 mm.

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Chapter 4 (CE) Mechanical

- **C403.3 Simple HVAC systems**
  - Economizers - each cooling system that has a fan shall include either an air or water economizer meeting C403.3.1.1 - C403.1.1.4
  - **Exception**
    - Individual units with a supply less than the minimum in Table c403.3.1(1)
    - Where more than 25% of the air designed to be supplied is to spaces that are to be humidified above 35% dew-point temperature to satisfy process needs
Chapter 4 (CE) Mechanical

- C403.3 Simple HVAC systems
  - Economizers - Exceptions continued
    - Systems that serve residential spaces where the capacity is less than five times the requirement listed in 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 all cooling systems ( \geq 33,000 \text{ Btu/h} )</td>
</tr>
</tbody>
</table>

For SI: 1 British thermal unit per hour = 0.2931 W.

- Systems expected to operate less than 20 hours a week
- Where the use of outdoor air for cooling will affect supermarket open refrigerated casework systems
- Where the cooling efficiency meets or exceeds the efficiency requirements in Table C403.3.1(2)
Chapter 4 (CE) Mechanical

- **C403.3.1.1 Air economizers (new)**
  - **C403.3.1.1.1 Design capacity**
    - System shall be capable of modulating outdoor air and return air dampers to provide up to 100% of design supply air quantity as outdoor air for cooling
  - **C403.3.1.1.2 Control signal**
    - Dampers capable of being sequenced with the cooling equipment and not controlled only by mixed air temperature
    - **Exception**
      - Use of mixed air temperature limit control shall be permitted for some systems such as single-zone systems

- **C403.3.1.1.3 High-limit shutoff**
  - Capable of automatically reducing outdoor air intake to the minimum quantity when intake will not longer reduce cooling energy usage
  - High-limit shutoff control types for specific climates shall be from Table C403.3.1.1.3(1)
  - High-limit shutoff control settings for these control types shall be as specified in Table C403.3.1.1.3(2)
Chapter 4 (CE) Mechanical

- **C403.3.1.1.4 Relief of excess outdoor air**
  - Capable of relieving excess outdoor air during air economizer operation to prevent over-pressurizing the building.
  - Locate the relief valve to avoid recirculation into the building.

Chapter 4 (CE) Mechanical

- **C403.4 Complex HVAC systems**
  - **C403.4.1 Economizers**
    - Removed air economizers
  - **C403.4.1.1 Design capacity - water economizers**
    - Cooling by indirect evaporation
    - Provide up to 100% of the expected cooling load
    - Outdoor air temperatures of 50°F dry bulb/45°F wet bulb
    - Expected system cooling load at 45°F dry bulb/40°F wet bulb
  - **Exception**
    - Where dehumidification requirements cannot be met
Chapter 4 (CE) Mechanical

- **C403.4.1.2 Maximum pressure drop**
  - Precooling coils and water-to-water heat exchangers used as part of a water economizer system shall either have a water-side pressure drop of less than 15' or a secondary loop shall be created so that the pressure drop is not seen by the circulating pumps, when the system is in the normal (noneconomizer) mode.

Chapter 4 (CE) Mechanical

- **C403.4.1.3 Integrated economizer control**
  - Economizers shall be integrated with the cooling system and capable of providing partial cooling.
  - Capable of providing partial cooling
    - Even where additional mechanical cooling is required
  - Exception
    - Direct expansion systems that include controls that reduce the quantity of outdoor air required to prevent coil frosting
    - Individual direct expansion units that have a capacity less than 54,000 Btu/h and use nonintegrated controls that preclude simultaneous operations.
Chapter 4 (CE) Mechanical

- **C403.4.1.4 Economizer heating system impact**
  - Design and controls shall be such that economizer does not increase the building heating use during normal operation
  - **Exception**
    - Economizers on VAV systems that cause zone level heating to increase due to a reduction in supply air temperature

- **C403.4.2 Variable air volume fan control**
  - Added driven by a vine-axial fan with variable-pitch blades

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Chapter 4 (CE) Mechanical

- **C403.4.2.1 Static pressure sensor location**
  - Sensors used to control VAV fans shall be placed in a position that the controller setpoint is no greater than 1/3 the total design an static pressure
  - **Except for systems with zone reset controls**
  - Sensors installed down-stream of major duct splits, at lease one-sensor shall be located on each major branch to ensure static pressure can be maintained at each branch
Chapter 4 (CE) Water Heating

- **C404.5 Pipe Insulation**
  - Added heat-traced systems
  - Changed noncirculating systems to non-hot-water-supply temperature maintenance systems
  - Added exception - heat-traced systems shall meet the manufacturer’s installation instructions
    - Untraced piping within the heat-traced system shall be insulated

- **C404.6 Hot water system controls**
  - Changed from when system is not in operation to when there is limited demand
  - Added ready access shall be provided to the operating controls

C404.7 Pools and inground permanently installed spas (Mandatory)

- **C404.7.1 Heaters**
  - On-off switch to be mounted outside of the heater

- **C404.7.2 Time switches**
  - Applies to all, not just swimming pools
  - Heaters, pumps and motors with built in timers shall be deemed in compliance
Chapter 4 (CE) Water Heating

- **C404.7.3 Covers**
  - Added inground permanently installed spas
  - Removed R-value requirements for pools heated to more than 90°F
  - **Exception**
    - Not required for pools deriving over 70% of the heating energy from site-recovered energy, such as a heat pump or solar energy source computed over an operating season

Chapter 4 (CE) Lighting

- **C405.1 General**
  - Adds electrical energy consumption
  - **Exception**
    - Increases high efficacy requirement in dwelling units to 75%, exempting low-voltage from that requirement

- **C405.2.1 Manual lighting controls**
  - Adds requirement that all buildings include manual lighting controls that meet C405.2.1.1 and C405.2.1.2
Chapter 4 (CE) Lighting

- C405.2.1.2 Light reduction controls
  - Amends exceptions
    - Areas with only one luminaire, added - with rated power less than 100 watts
    - Expands exception for corridors, storerooms, restrooms or public lobbies to include electrical or mechanical rooms
    - Adds daylight spaces complying with C405.2.2.3.2

- C405.2.2 Additional lighting controls - each area shall also meet C405.2.2.1, C405.2.2.2 and C405.2.2.3
  - Additional exception - lighting intended for continuous operation
Chapter 4 (CE) Lighting

- **C405.2.2.1 Automatic time switch control devices installed to control lighting in all areas of the building**
  - Removed - buildings larger than 5,000 sq. ft.
  - Exceptions
    - Emergency egress lighting
    - Spaces controlled by occupancy sensor
  - Removed Holiday scheduling section and exception

- **C405.2.2.2 Occupancy sensors**
  - Installed in all classrooms, conference/meeting rooms, employee lunch and break rooms, private offices, restrooms, storage rooms and janitorial closets, other enclosed spaces 300 sq. ft. or less
  - Turn off lights within 30 minutes of all occupants leaving the space
  - Manual on or automatically turn the lighting on to not more than 50% power

- **Exception**
  - Full automatic-on controls permitted in public corridors, stairways, restrooms, primary building entrances areas and lobbies, and where manual-on operation would endanger the safety or security of the room or occupants
Chapter 4 (CE) Lighting

- C405.2.2.3 Daylight zone control - add limitation of 2500 sq. ft. per control zone
  - Exception - zones enclosed by wall or partitions and containing two or fewer luminaires not required to have a separate switch for general lighting

- C405.2.2.3.1 Manual daylighting controls (new)
  - Required unless automatic controls are installed

- C405.2.2.3.2 Automatic daylighting controls
  - Setpoint and other controls for calibrating lighting control device shall be readily accessible
  - Reduce the lighting power in response to available daylight by either
    - Continuous dimming using dimming ballast to reduce power to less than 35% of rated power
    - Stepped down dimming, using multi-level switching
    - Two control channels per zone
      - One step between 50% and 70% of design lighting power
      - Another step no greater than 35% of design power
Chapter 4 (CE) Lighting

C405.2.2.3.3 Multi-level lighting controls
- When multi-level controls are required the general lighting shall be controlled separately by at least one multi-level control that reduces the lighting power in response to daylight available.
- Where the daylight illuminance is greater than the rated illuminance of the general lighting, the general lighting is automatically controlled so that its power draw is no greater than 35% of its rated power.
- Located so that calibration and set point adjustment controls are readily accessible and separate from the light sensor.

Chapter 4 (CE) Lighting

C405.2.3 Specific application controls
- Dedicated controls independent of the controls for other lighting within the room or space required for:
  - Display and accent light
  - Lighting in display cases
  - Lighting for nonvisual applications
    - Plant growth
    - Food warming
  - Lighting equipment for sale or demonstration in lighting education
- Hotel and motel sleeping units and guest suites
  - Removed exception for the bathroom
- Supplemental task lighting
  - Permanently installed under shelf/cabinet lighting
  - Control device integral to the luminaires or readily accessible wall-mounted control device
Chapter 4 (CE) Lighting

- **C405.5.2 Interior lighting power determined by**
  - **Building Area Method**
    - Interior lighting power allowance = the floor area for each building area type listed \( \times \) the value from Table C405.5.2(1)
  - **Space-by-Space Method**
    - Interior lighting power allowance = the floor area of each space \( \times \) the value for the space type in Table C405.5.2(2) that most closely represents the proposed use of the space and then summing the lighting power allowances for all spaces
  - Tradeoffs among spaces are permitted
Chapter 4 (CE) Additional Efficiency Package Options (new)

- **C406.1 Buildings** shall comply with at least one of the following:
  1. **C406.1.2 Efficient HVAC Performance**
  2. **C406.1.3 Efficient Lighting Performance**
  3. **C406.1.4 On-Site Supply of Renewable Energy**

- Individual tenant spaces shall comply with either 1 or 2 unless compliance with 3 for the entire building is demonstrated.

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Chapter 4 (CE) Additional Efficiency Package Options

- **C406.2 Efficient HVAC performance**
  - Meet the efficiency of C406.2(1) - C406.2(7) in addition to C403
  - Only allowed where the equipment efficiencies in this section are greater than C403

- **C406.3 Efficient lighting system**
  - Total interior lighting power shall be determined by using Table C406.3 x the floor area for the building type
Chapter 4 (CE) Additional Efficiency Package Options

- C406.4 On-site renewable energy
  - Total minimum rating shall comply with one of the following
    - Not less than 1.75 Btu/h or not less than 0.50 watts per sq. ft. of conditioned floor space
    - Not less than 3% of the energy used for building mechanical and service water heating equipment and lighting

Chapter 4 (CE) Total Building Performance

- No Changes
C408.1 Commissioning of the building mechanical systems in C403 and electrical power and lighting systems in C405

C408.2 Mechanical systems commissioning and completion requirements

- Prior to final mechanical inspection
- Evidence by a registered design professional
- Construction document notes clearly indicate provisions
- Copies of all documents to owner and made available to code official
- Exceptions
  - Systems in buildings where the total capacity is >480,000 Btu/h cooling and 600,000 Btu/h heating
  - System serving dwelling units and sleeping units in hotels, etc.

C408.2.1 Commissioning Plan

- Developed by a registered design professional including
  - Narrative of the activities that will be accomplished during each phase, including personnel
  - Listing of specific equipment, appliances or systems to be tested and a description of tests
  - Functions to be tested, including, but not limited to calibrations and economizer controls
  - Conditions under which test will be performed, at a minimum winter and summer design conditions and full outside air conditions
  - Measurable criteria for performance
Chapter 4 (CE)  
System Commissioning

- **C408.2.2 Systems adjusting and balancing**
  - HVAC system shall be balanced in accordance with generally accepted engineering standards
    - Air and water flow rates shall be measured and adjusted to deliver final flow rates within the tolerances provided in the product specifications
    - Test and balance activities shall include air system and hydronic balancing

- **C408.2.2.1 Air system handling**
  - Relocated from 503.2.9.1
  - Added - air systems shall be balance in a manner to first minimize throttling losses, then
  - For fans with system power greater than 1 hp fan speed shall be adjusted to meet design flow conditions
  - Exception
    - fans with fan motors of 1 hp or less
Chapter 4 (CE)
System Commissioning

- **C408.2.2.2** Hydronic systems balancing
  - Relocated from 503.2.9.2
  - Added - shall be balanced in a manner to
    - First minimize throttling loses
    - Then the pump impeller shall be trimmed or pump speed adjusted to meet design flow conditions
  - Each hydronic system shall have the capacity to either
    - Measure pressure across the pump
    - Test ports at each side of each pump
  - Exception
    - Pumps with pump motors of 5 hp or less
    - Where throttling results in no greater than 5% of the nameplate horsepower draw above that required if the impeller were trimmed

Chapter 4 (CE)
System Commissioning

- **C408.2.3** Functional performance testing
  - **C408.2.3.1** Equipment - demonstrate the
    - Installation and operation of components, systems, and system-to-system interfacing, such that operation, function, and maintenance serviceability for each of the commissioned systems is confirmed
    - Testing shall include all modes and sequence of operation, including
      - Full-load, part-load and the following emergency
        - All modes described in the sequence of operation
        - Redundant or automatic back-up mode
        - Performance of alarms
        - Mode of operation upon loss and restoration of power
Chapter 4 (CE)  
System Commissioning

- C408.2.3.1 Exception - unitary or packaged equipment in C403.2.3 Tables that do not require supply air economizers
- C408.2.3.2 Controls - tested to document calibration, adjustment, and operation in accordance with plans and specifications for
  - Control devices, components, equipment and systems
- C408.2.3.3 Economizers - functional test for operations within manufacturer’s specifications

Chapter 4 (CE)  
System Commissioning

- C408.2.4 Preliminary commissioning report
  - Report of commissioning test procedures and results, provided to the building owner
  - Completed, identified as “Preliminary Commissioning Report” and certified by the registered design professional or approved agency
    - Itemization of deficiencies that have not been corrected at the time of report preparation
    - Deferred tests that cannot be performed due to climatic conditions
    - Climatic conditions required to perform deferred tests
Chapter 4 (CE)  
System Commissioning

- **C408.2.4.1 Acceptance of report**
  - Buildings or portions shall not pass the final mechanical inspection until the code official has received a letter from the building owner that the Preliminary Commissioning Report has been received.

- **C408.2.4.2 Copy of report**
  - Code official may require a copy of the report.

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Chapter 4 (CE)  
System Commissioning

- **C408.2.5 Documentation requirements**
  - Provided to the owner within 90 days of the date of the receipt of the certificate of occupancy.

- **C408.2.5.1 Drawings**
  - Construction documents that include location and performance data on each piece of equipment.
Chapter 4 (CE)  
System Commissioning

□ C408.2.5.2 Manuals
- Submittal data for each piece of equipment requiring maintenance
  - Equipment size and selected options
  - Manufacturer’s operation manuals and maintenance manuals
    - Routine maintenance actions shall be clearly identified
    - Except equipment not furnished as part of the project
- Name and address of at least one service agency
- HVAC controls system maintenance and calibration information
  - Desired or field-determined setpoints permanently recorded
- A written narrative on how each system is to operate including recommended setpoints

□ C408.2.5.3 System balancing report
- Written report describing activities completed in accordance with C408.2.2
□ Final commissioning report
- Report of test procedures and results, labeled “Final Commissioning Report” including
  - Functional performance tests results
  - Disposition of deficiencies found during testing including details of corrective measures used or proposed
  - Functional performance test procedures used, including measurable criteria for test acceptance
- Exception - deferred tests due to climatic conditions
Chapter 4 (CE)
System Commissioning - Lighting

C408.3.1 Functional testing
- Ensure that control hardware and software are calibrated, adjusted, programmed and in proper working order in accordance with construction documents and manufacturer’s installation instructions.
- State party who will be conducting testing:
  - Approved third party, when required by the building official.
  - Provide documentation certifying that the controls meet the provisions of Section C405.

C408.3.1 Functional testing
- Confirm the following on occupant sensors, programmable schedule controls, photosensors or daylighting controls:
  - Placement, sensitivity and time-out adjustments yield acceptable performance.
  - Time switches and programmable schedule controls are programmed to turn the lights off.
  - Placement and sensitivity adjustments for photosensor controls reduce the electric light based on the amount of usable daylight in the space.
Chapter 5 (CE)
Referenced Standards

- ANSI/ASHRAE/IESNA 90.2 - 2010

Overview - Residential
Chapter 1 (RE) Scope and Administration

- R101.2 Scope
  - Applies to Residential buildings
- R101.3 - Intent
  - Added - over the useful life of each building
- R106.1 - Referenced codes and standards
  - Adds two subsections and clarifies when standards are to be considered
    - R106.1.1 Conflicts
    - R106.1.2 Provision in referenced codes and standards

Chapter 2 (RE) Definitions

- Revised definitions
  - Buildings - added - including any mechanical systems, service water heating systems and electric power and lighting systems located on the building site and supporting the building
  - Residential Building - rewritten - For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses), as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane
  - Skylight - changed measurement from a slope of 15 degrees or more from vertical to 60 degrees or less from horizontal.
Chapter 2 (RE) Definitions

- New definitions
  - Building Site
  - Continuous Air Barrier
  - Demand Recirculation Water System
  - Fenestration Product, Site-Built
  - Visible Transmittance (VT)
  - Whole House Mechanical Ventilation System

Chapter 3 (RE) General Requirements

- Revised R303.1.3 Fenestration product rating
  - Added Visible Transmittance (VT) to the NFRC 200
Chapter 4 (RE) Residential Energy Efficiency

- **R401.2 Compliance - simplified**
  - Projects shall comply with Sections identified as “mandatory” and with either sections identified as “prescriptive” or the performance approach in Section R405

- **R401.3 Certificate**
  - Added provisions to include - the results from any required duct system and building envelope air leakage testing done on the building

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**Chapter 4 (RE) - Table R402.1.1**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION U-FACTOR*</th>
<th>SKYLIGHT U-FACTOR</th>
<th>GLAZED FENESTRATION SHGC*</th>
<th>CEILING R-VALUE</th>
<th>WOOD FRAME WALL R-VALUE</th>
<th>MASS WALL R-VALUE</th>
<th>FLOOR R-VALUE</th>
<th>BASEMENT WALL R-VALUE</th>
<th>SLAB R-VALUE &amp; DEPTH</th>
<th>WALL R-VALUE</th>
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</thead>
<tbody>
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<td>NR</td>
<td>0.25</td>
<td>0.25</td>
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<td>0.55</td>
<td>0.25</td>
<td>30</td>
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<td>30</td>
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</tr>
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<td>7 and 8</td>
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<td>49</td>
<td>20 or 13 or 12 or 10</td>
<td>13/19</td>
<td>10</td>
<td>10/13</td>
<td>10/13</td>
<td>10/13</td>
</tr>
</tbody>
</table>

For SI: 1 ft = 304.8 mm.

- U-values are estimates. Efficiencies 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-values of the insulation shall not be less than the R-value specified in the table.
- The fenestration U-factor column includes 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 when the SHGC for such skylights does not exceed 0.30.
- "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 used 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.**
- "0/0" means R-0 continuous insulation on the interior or exterior of the home or R-0 cavity insulation at the interior of the basement wall.
- R-5 shall be added to the required slab edge R-values for backup slabs. Insulation depth shall be the depth of the footing or 2 ft, whichever is less in Climate Zones 1 through 3 for backup slabs.
- There are no SHGC requirements in the Marine Zones.
- Basement wall insulation is not required in warm-weather locations as defined by Figure R301.2 and Table R301.1.
- On insulation sufficient to fill the framing cavity, R-19 minimum.
- This table is not intended to be used with compartmentalized insulation in small spaces or with "12 or 13" means R-12 cavity insulation plus R-5 continuous insulation or insulated siding. Insulated siding may be required to be installed on the exterior of the frame.
- **This is a drawing that is not intended to be used with the R-5 in the drawing. The drawing shows an insulated floor with an R-5 in the drawing.**
Chapter 4 (RE) Table R402.1.3

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>FENESTRATION U-FACTOR</th>
<th>SKYLIGHT U-FACTOR</th>
<th>CEILING U-FACTOR</th>
<th>FRAME U-FACTOR</th>
<th>MASS WALL U-FACTOR</th>
<th>FLOOR U-FACTOR</th>
<th>BASEMENT WALL U-FACTOR</th>
<th>CRAWL SPACE WALL U-FACTOR</th>
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<td>0.054</td>
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<tr>
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<td>0.55</td>
<td>0.026</td>
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<tr>
<td>7 and 8</td>
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<td>0.048</td>
<td>0.057</td>
<td>0.028</td>
<td>0.050</td>
<td>0.054</td>
</tr>
</tbody>
</table>

a. Nonpermeable U-factors shall be obtained from measurement, calculation or an approved source.

b. When more than half the insulation is on the interior, the mass wall U-factors shall be a maximum of 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zones 3 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. Basement wall U-factor of 0.360 is used where locations as defined by Figures R304.1 and Table R301.1.

Chapter 4 (RE)
Building Thermal Envelope

- **R402.2.3 Eave baffle**
  - For air permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material.
Chapter 4 (RE) Table R402.2.6

- R402.2.6 Steel-frame ceilings, walls, and floors

Chapter 4 (RE) Building Thermal Envelope

- R402.2.12 Sunroom insulation (reorganized)
  - All sunrooms must meet the insulation requirements of this chapter
  - Exceptions - with thermal isolation
    - Minimum ceiling insulation R-values remain the same
    - Minimum Wall R-values remain the same
      - New walls separating the sunroom with a thermal isolation from conditioned space shall meet the building thermal envelope requirements of this code
Chapter 4 (RE) Building Thermal Envelope

- R402.2.3.5 Sunroom $U$-factor
  - All sunrooms enclosing conditioned space must meet the fenestration requirements of this chapter
  - Exception - sunrooms with thermal isolation and enclosing conditioned space
    - Climate Zones 4 - 8
      - Maximum $U$-factor 0.45
      - Maximum skylight $U$-factor 0.70
    - New fenestration separating the sunroom from the conditioned space shall meet the building thermal envelope requirements

Chapter 4 (RE) Air Leakage

- R402.4 Air leakage
  - R402.4.1 Building thermal envelope shall comply with Sections R402.4.1.1 and R402.4.1.2.
    - The sealing methods between dissimilar material shall allow for differential expansion and contraction
    - Removed - the itemized list of where to caulk, gasket, weatherstrip or otherwise seal with an air barrier material, suitable film or solid material
R402.4.1.1 Installation. The components of the building thermal envelope as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer’s instructions and the criteria listed in Table R402.4.1.1, as applicable to the method of construction.

Where required by the code official, an approved third party shall inspect all components and verify compliance.
Chapter 4 (RE) Air Leakage

R402.4.1.2 Testing

- The building or dwelling unit shall be tested with a blower door at a pressure of 0.2 w.g.(50 Pa) and verified as having an air leakage rate of not exceeding:
  - 5 air changes per hour - Climate Zones 1 and 2
  - 3 air changes per hour - Climate Zones 3 through 8
- Where required by the code official, testing shall be conducted by an approved third party.
- A written report of the results shall be signed by the party conducting the test and provided to the code official.

R402.4.2.2 Visual inspection option

Chapter 4 (RE) Air Leakage

R402.4.1.2 Testing shall be performed at any time after the creating of all penetrations of the building thermal envelope. During testing:

- Exterior windows and doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures;
- Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
- Interior doors, if installed at the time of the test, shall be open;
- Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
- Heating and cooling systems, if installed at the time of the test, shall be turned off; and
- Supply and return register, if installed at the time of the test, shall be fully open.

402.4.2.2 Visual inspection option
Chapter 4 (RE) Air Leakage

- R402.4.2 Fireplaces. New wood-burning fireplaces shall have tight-fitting flue dampers and outdoor combustion air

- R402.4.4 Recessed lighting
  - Removed wording - having an air leakage rate not more than 2.0 cfm of air movement from the conditioned space to the ceiling cavity
Chapter 4 (RE) Systems

- **R403.2.2 Duct Sealing**
  - **Added Exceptions**
    - Air-impermeable spray foam permitted without additional joint seals
    - For a duct connection that is partially inaccessible
      - Three screws equally spaced on the exposed portion of the joint so as to prevent a hinge effect
    - Continuously welded and locking-type longitudinal joints and seams
      - Ducts operation at static pressures less than 2" w.g. (500 Pa)

- **Post-Construction test**
  - Removed Leakage to outdoors test
  - Changed leakage rate from 12 cfm to 4 cfm, with air handler

- **Rough-in test**
  - Changed leakage rate
    - Total leakage from 6 cfm to 4 cfm, with air handler
    - Total leakage from 4 cfm to 3 cfm, without air handler

- **Exception changed**
  - Air handler and ducts located entirely within the building thermal envelope
Chapter 4 (RE) Systems

- **R403.2.2.1 Sealed air handler (new)**
  - Manufacturer’s designation for air leakage of no more than 2% of the design flow rate required
  - ASHRAE 193

- **R403.2.3 Use of building cavities as ducts or plenums prohibited**

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Chapter 4 (RE) Systems

- **R403.3.1 Protection of piping insulation (new)**
  - Piping insulation exposed to weather shall be protected from damage, including that caused by 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
Chapter 4 (RE) Systems

R403.4 Service hot water systems
- R403.4.1 Circulating hot water systems
  - Removed insulation requirements
- R403.4.2 Hot water pipe insulation (Prescriptive) (new)
  - R3 required on piping
    - Larger than ¾” diameter
    - Serving more than one dwelling unit
    - From the water heater to kitchen outlets
    - Located outside the conditioned space
    - From the water heater to a distribution manifold
    - Located under a floor slab
    - Buried
    - Recirculation systems except demand recirculation system
    - Run lengths greater than the maximum in Table R403.4.2

Chapter 4 (RE) Systems

R403.5 Mechanical ventilation
- Meets IRC or IMC or other approved means
- R403.5.1 Whole-house mechanical ventilation system fan efficacy (new)
  - Meet efficacy requirements of Table R403.5.1
    - Exception - fans integral to HVAC equipment
Chapter 4 (RE) Systems

- **R403.6 Equipment Sizing**
  - Sized in accordance with ACCA Manual S
  - Based on loads calculated with ACCA Manual J

- **R403.9 Pools and inground permanently installed spas**
  - **R403.9.1 Heaters**
    - On-off switch to be mounted outside of the heater
  - **R403.9.2 Time switches**
    - Heaters, pumps and motors with built in times shall be deemed in compliance
  - **R403.9.3 Covers**
    - Added inground permanently installed spas
    - Removed R-value requirements for pools heated to more than 90°F
Chapter 4 (RE)
Electrical Power and Lighting

- **R404.1 Lighting equipment**
  - Increased minimum of high-efficacy lamps to 75%
  - Added exception for low-voltage lighting
  - Added R404.1.1 Lighting equipment
    - Fuel gas lighting systems shall not have continuously burning pilot lights

Chapter 4 (RE)
Simulated Performance Alternative

- **R405.4 Documentation and R405.5**
  Calculation procedure had language added for clarification

- **R405.6 Calculation software tools**
  Calculation of whole-building sizing for HVAC equipment in the standard reference design in accordance with R403.6 not IRC
Chapter 4 (RE) Table R405.5.2(1)

- **Glazing**
  - Changed - Interior shade fraction: 0.92 - (0.21 x SHGC for the standard reference design) - same for Standard Reference and Proposed Designs

- **Air exchange rate**
  - Changes to both Standard Reference and Proposed Designs

- **Changes to footnotes**
  - b, c, and g

Chapter 4 (RE) Table R405.5.2(1)

- **Heating systems**
  - Standard Reference - where the proposed design utilizes electric heating without a heat pump the standard reference design shall be an air source heat pump - meeting Section R403 - IECC - Commercial Provisions

- **Thermal distribution system**
  - Removed requirements in Standard Reference Design
  - Proposed Design - system shall be tested as specified in Table R405.5.2(2).
Chapter 5 (RE) Referenced Standards

- No changes