**Florida Supplement to the 2020 Florida Building Code, Energy Conservation**

**ICC EDIT VERSION**

**Note 1**: Throughout the document, change International Building Code to Florida Building Code, Building; Energy Conservation Code tothe Florida Building Code, Energy Conservation; change the International Existing Building Code to Florida Building Code, Existing Building; change the International Fire code to Florida Fire Prevention Code; change International Fuel Gas Code to Florida Building Code, Fuel Gas; change the International Mechanical Code to Florida Building Code, Mechanical; change the International Plumbing Code to Florida Building Code, Plumbing; change the International Residential Code to Florida Building Code, Residential.

***COMMERCIAL PROVISIONS***

**PREFACE**

**……**

The model codes used for the Florida Building Code, 8th Edition (2023) include: the ~~2018~~ 2021 editions of the International Building Code®; the International Plumbing Code®; the International Mechanical Code®; the International Fuel Gas Code®; the International Residential Code®; the International Existing Building Code®; the International Energy Conservation Code®; the National Electrical Code, 20~~1720~~ edition; or substantive criteria from ASHRAE Standard 90.1-20~~16~~ 19. State and local codes adopted and incorporated into the code include the Florida Building Code, Accessibility, and special hurricane protection standards for the High-Velocity Hurricane Zone.

**……**

**Marginal Markings**

Solid vertical lines in the margins within the body of the code indicate a change from the requirements of the Florida Building Code, Fuel Gas, 7th Edition (20~~17~~20) to the Florida Building Code, Fuel Gas, 8th Edition (20~~20~~23) effective December 31, 20~~20~~23.

Sections deleted from the base code are designated “Reserved” in order to maintain the structure of the base code.

Chapter 1 **SCOPE AND ADMINISTRATION**

**Revise as follows:**

## C103.1 General. Construction documents and other supporting data shall be submitted in one or more sets, or in a digital format where allowed by the building official, with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *code official* is authorized to require necessary construction documents to be prepared by a registered design professional.

**Exception:** The *code official* is authorized to waive the requirements for construction documents or other supporting data if the *code official* determines they are not necessary to confirm compliance with this code.

**(EN9119 / AMD46-19 Part III AS)**

**Revise as follows:**

**C103.2 Information on construction documents.** Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, the following as applicable:

1. Energy compliance path

2. Insulation materials and their *R*-values.

3. Fenestration *U*-factors and solar heat gain coefficients (SHGCs).

4. Area-weighted *U*-factor and solar heat gain coefficient (SHGC) calculations.

5. Mechanical system design criteria.

6. Mechanical and service water heating systems and equipment types, sizes and efficiencies.

7. Economizer description.

8. Equipment and system controls.9. Fan motor horsepower (hp) and controls.

10. Duct sealing, duct and pipe insulation and location.

11. Lighting fixture schedule with wattage and control narrative.

12. Location of *daylight* zones on floor plans.

13. Air sealing details.

**(EN8565 / CE13-19 Part I AS)**

**C104.2.6 Final inspection.**The building shall have a final inspection and shall not be occupied until approved. The final inspection shall include verification of the installation and proper operation of all required building controls, and documentation verifying activities associated with required building commissioning have been conducted and findings of noncompliance corrected. Buildings, or portions thereof, shall not be considered for a final inspection until the code official has received the Preliminary Commissioning Report and has also received a letter of transmittal from the building owner acknowledging that the building owner has received the Preliminary Commissioning Report as required in Section C408.2.4.

**(EN10363 AM A2)**

**CHAPTER 2 [CE] DEFINITIONS**

**Revise as follows:**

**DEMAND RECIRCULATION WATER SYSTEM.** A water distribution system ~~having~~ where 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 prime the service hot water piping with heated water upon a demand for hot water.

**(EN8569 / CE22-19 Part I AS)**

**GENERAL LIGHTING.** ~~Lighting~~ Interior lighting that provides a substantially uniform level of illumination throughout ~~an area. General lighting shall not include decorative lighting or lighting that provides a dissimilar level of illumination to serve a specialized application or feature within such area.~~ a space.

**(EN8848 / CE163-19 AS)**

Chapter 2 [CE] - Add new definition:

**LARGE DIAMETER CEILING FAN**. A ceiling fan that is greater than or equal to 84.5 inches (2.15 meters) in diameter. These fans are sometimes referred to as High-Volume, Low-Speed (HVLS) fans.

**(EN10086 AS)/(EN8783 / CE141-19 AM)**

**Revise as follows:**

**ON-SITE RENEWABLE ENERGY.** Energy from renewable energy resources harvested at the building site*.*  ~~solar radiation, wind, waves, tides, landfill gas, biogas, biomass or the internal heat of the earth. The energy system providing on-site renewable energy shall be located on the project site.~~ ~~derived~~

**Add new text as follows:**

**RENEWABLE ENERGY RESOURCES.** Energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or extracted from hot fluid or steam heated within the earth.

**(EN8574 / CE31-19 Part I AS)**

**FENESTRATION.** Products classified as either skylights or vertical fenestration.

**Skylights** Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal, including unit skylights, tubular daylighting devices and glazing materials in solariums, sunrooms, roofs, *greenhouses*, and sloped walls are included in this definition.

**Vertical fenestration** Windows that are fixed or operable, opaque doors, glazed doors, glazed block and combination opaque and glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of not less than 60 degrees (1.05 rad) from horizontal.

**(EN8634 / CE56-19 AS)**

**Revise as follows:**

**GREENHOUSE.** A structure or a thermally isolated area of a building that maintains a specialized sunlit environment exclusively used for, and essential to, the cultivation, protection or maintenance of plants. *Greenhouses* are those that are erected for a period of 180 days or more.

**Add new definition as follows:**

**INTERNAL CURTAIN SYSTEM.** An *internal curtain system* consists of moveable panels of fabric or plastic film used to cover and uncover the space enclosed in a *greenhouse* on a daily basis.

**(EN8634 / CE56-19 AS)**

**NETWORKED GUESTROOM CONTROL SYSTEM.** A control system, ~~accessible~~ with access from the front desk or other central location associated with a *Group R*-1 building, that is capable of identifying the ~~occupancy~~ rented and unrented status of each guestroom according to a timed schedule, and is capable of controlling HVAC in each hotel and motel guestroom separately.

**(EN8775/CE135-19 AS)/** **(EN8572 / CE29-19 Part I AS)**

**Add new definition as follows:**

**THERMAL DISTRIBUTION EFFICIENCY (TDE).** The resistance to changes in air heat as air is conveyed through a distance of air duct. TDE is a heat loss calculation evaluating the difference in the heat of the air between the air duct inlet and outlet caused by differences in temperatures between the air in the duct and the duct material. TDE is expressed as a percent difference between the inlet and outlet heat in the duct.

**(EN8854 / CE151-19 Part I AS)**

**WALL, ABOVE-GRADE.** A wall associated with the *building thermal envelope* that is more than 15 percent above grade and is on the exterior of the building or any wall that is associated with the *building thermal envelope* that is not on the exterior of the building. This includes, but is not limited to, between-floor spandrels, peripheral edges of floors, roof knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

**(EN8576 / CE35-19 AS)**

**CHAPTER 3 [CE] GENERAL REQUIREMENTS**

**C303.1.3 Fenestration product rating.**

*U*-factors of fenestration products shall be determined as follows:

1. For windows, doors and skylights, *U*-factor ratings shall be determined in accordance with NFRC 100.

2. Where required, for garage door and rolling doors, *U*-factor ratings shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

*U*-factors shall be determined by an accredited, independent laboratory, and *labeled* and certified by the manufacturer.

      Products lacking such a *labeled U*-factor shall be assigned a default *U*-factor from Table C303.1.3(1) or C303.1.3(2). The solar heat gain coefficient (SHGC) and *visible transmittance* (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and *labeled* and certified by the manufacturer. Products lacking such a *labeled* SHGC or VT shall be assigned a default SHGC or VT from Table C303.1.3(3). For Tubular Daylighting Devices, VTannual shall be measured and rated in accordance with ANSI/NFRC 203.

**(EN10406 AS)**

***ADD Section C303.1.5 to Chapter 3 General***

**C303.1.5** Roof solar reflectance and thermal emittance

Low-sloped roofs directly above cooled conditioned spaces in Climate Zones 1a shall comply with one or more of the options in Table C402.3.

**(EN9903 AS)**

**CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY**

**Revise as follows:**

**C402.1.1 Low-energy buildings and greenhouses.** The following low-energy buildings, or portions thereof separated from the remainder of the building by *building thermal envelope* assemblies complying with this section, shall be exempt from the *building thermal envelope* provisions of Section C402.

1. Those with a peak design rate of energy usage less than 3.4 Btu/h • ft2 (10.7 W/m2) or 1.0 watt per square foot (10.7 W/m2) of floor area for space conditioning purposes.

2. Those that do not contain *conditioned space*.

~~3.~~ ~~Greenhouses.~~

**Add new text as follows:**

**402.1.1.1 Greenhouses.** *Greenhouse* structures or areas that are mechanically heated or cooled and that comply with all of the following shall be exempt from the building envelope requirements of this code:

1. Exterior opaque envelope assemblies comply with Sections C402.2 and C402.4.5.

**Exception:** Low energy greenhouses that comply with Section C402.1.1.

2. Interior partition building thermal envelope assemblies that separate the greenhouse from conditioned space comply with Sections C402.2, C402.4.3 and C402.4.5.

3. Fenestration assemblies that comply with the thermal envelope requirements in Table C402.1.1.1. The U-factor for a roof shall be for the roof assembly or a roof that includes the assembly and an internal curtain system.

**Exception:** Unconditioned greenhouses.

**TABLE C402.1.1.1**

**FENESTRATION THERMAL ENVELOPE MAXIMUM REQUIREMENTS**

|  |  |
| --- | --- |
| **Component** | **U-factor (BTU/h-ft2-°F)** |
| Skylight | 0.5 |
| Vertical fenestration | 0.7 |

**(EN8634 / CE56-19 AS)**

## Revise as follows:

## C402.1.2 Equipment buildings. Buildings that comply with the following shall be exempt from the *building thermal envelope* provisions of this code:

1. Are separate buildings with floor area not more than ~~500~~ 1,200 square feet (~~50~~ (110 m2).

2. Are intended to house ~~electronic~~ electric equipment with installed equipment power totaling not less than 7 watts per square foot (75 W/m2) and not intended for human occupancy.

3. Have a heating system capacity not greater than (17,000 Btu/hr) (5 kW) and a heating thermostat setpoint that is restricted to not more than 50°F (10°C).

4. Have an average wall and roof U-factor less than 0.200 in Climate Zones 1 through 5 and less than 0.120 in Climate Zones 6 through 8.

5. Comply with the roof solar reflectance and thermal emittance provisions for Climate Zone 1.

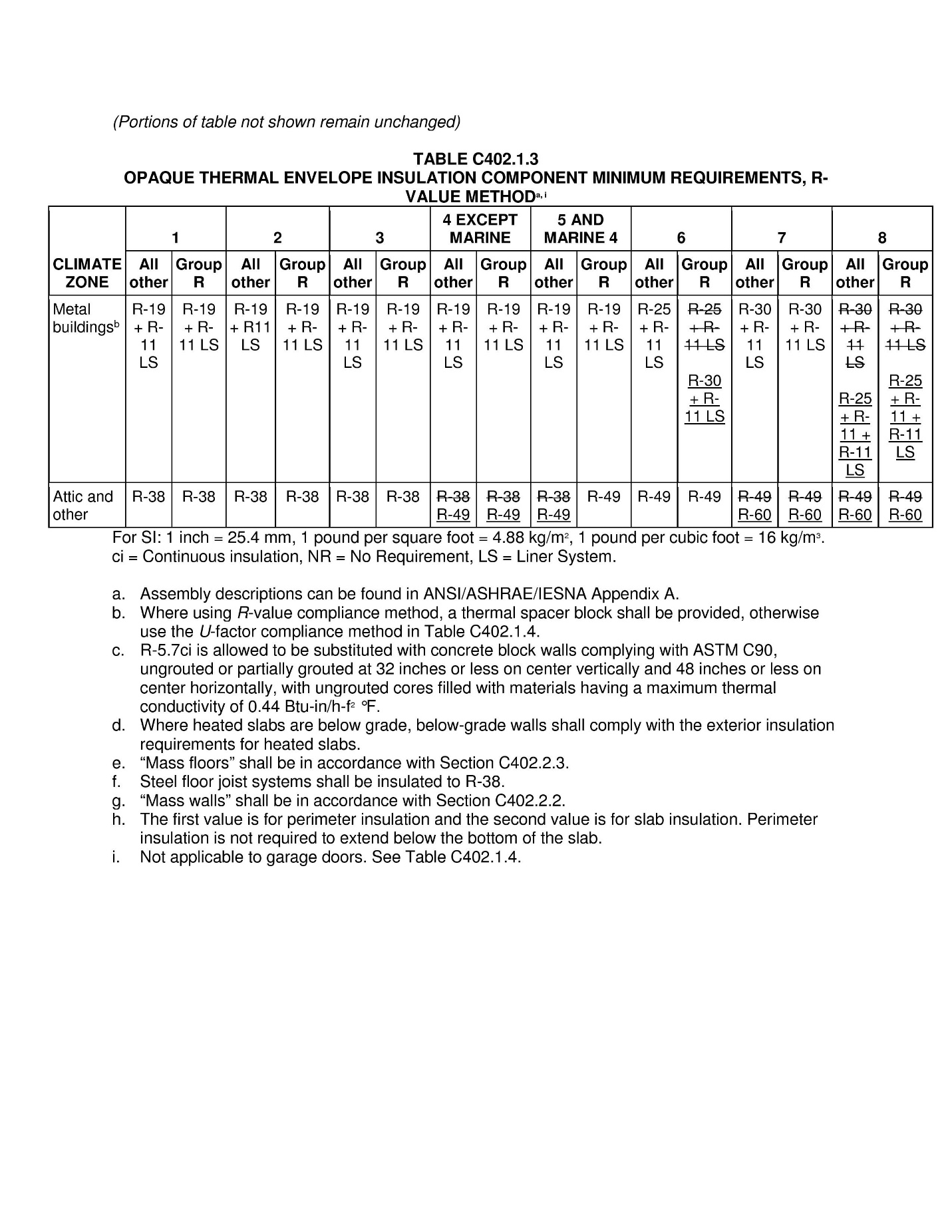
**(EN8636 / CE58-19 AS)**

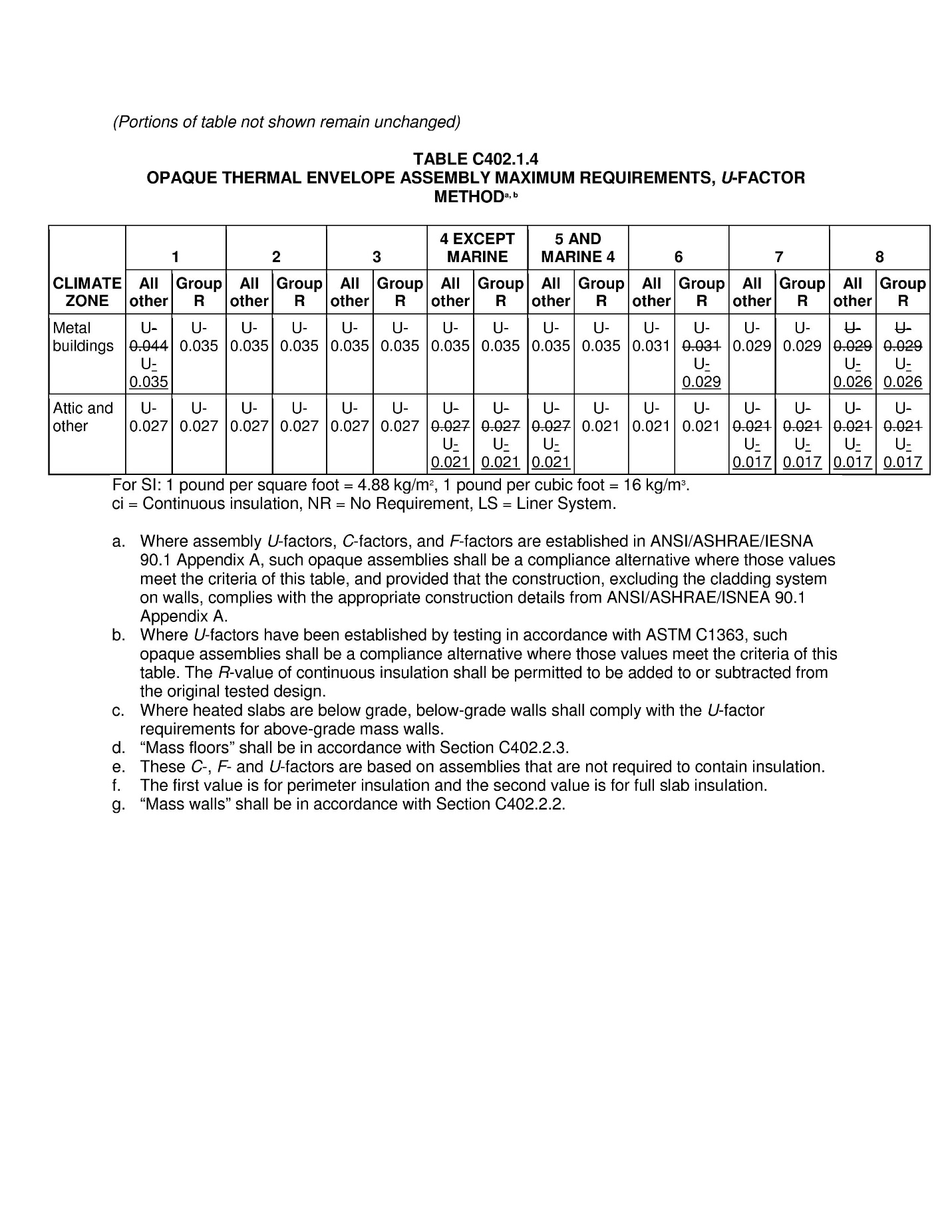
**TABLE C402.1.3**

**OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHODa**

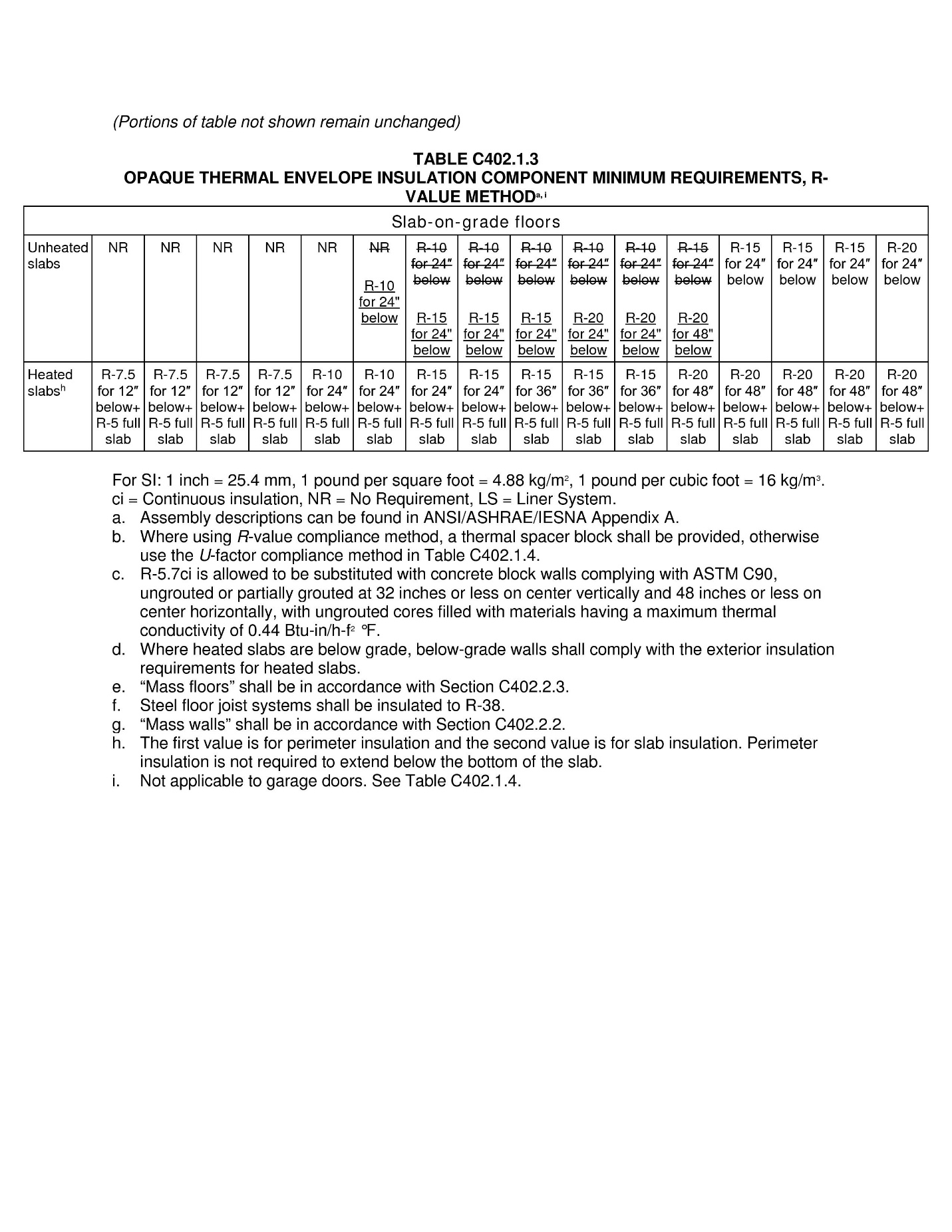
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CLIMATE ZONE** | **1** | | **2** | |
| **All other** | **Group R** | **all other** | **Group R** |
| **Floors** | | | | |
| Masse | NR | NR | R-6.3ci | R-8.3ci |
| Joist/framing | ~~NR~~R-13 | ~~NR~~R-13 | R-30 | R-30 |

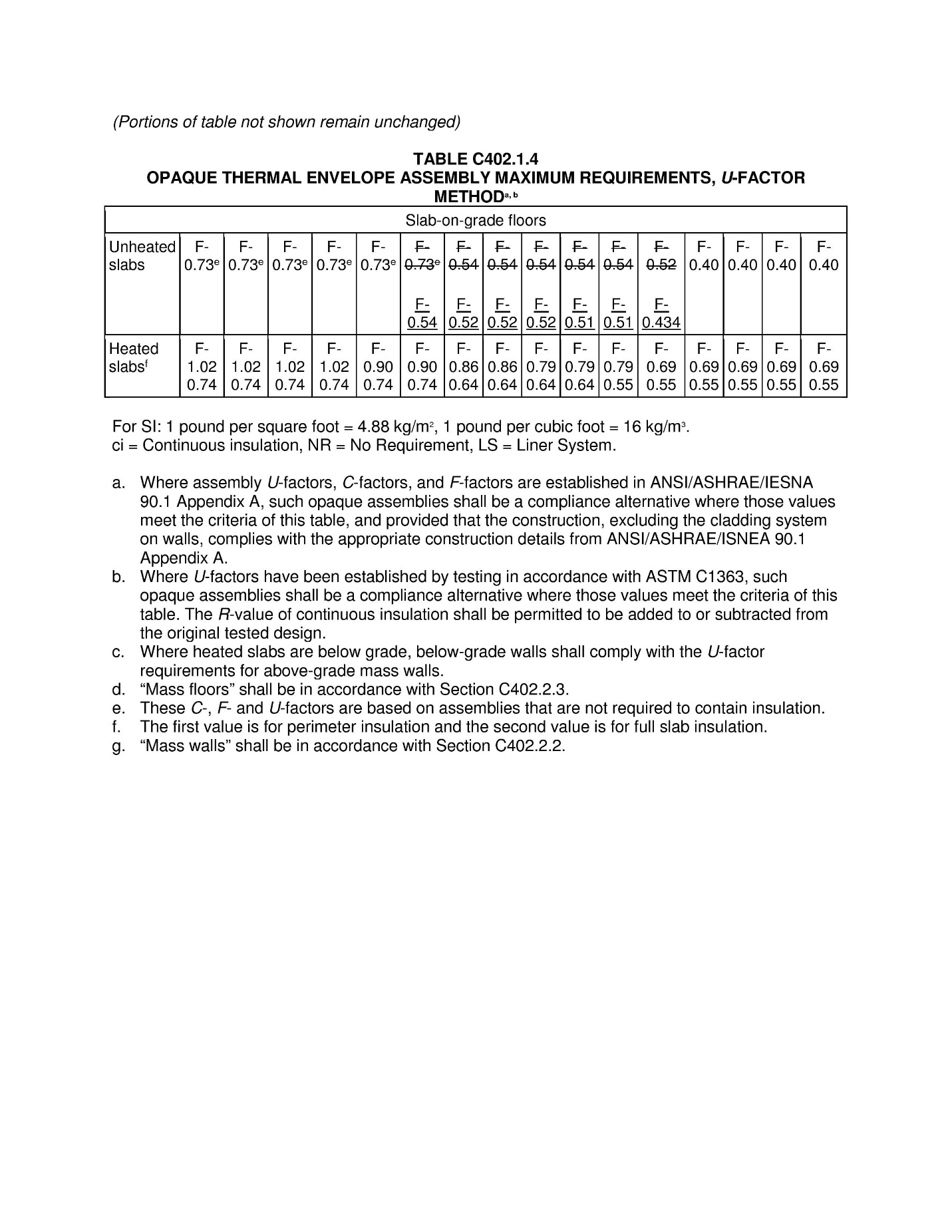
**(EN10449 AS)**





**(EN8639 / CE61-19 AS)**





**(EN8647 / CE68-19 AS)**

**TABLE C402.1.4**

**OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHODa, b**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CLIMATE ZONE** | **1** | | **2** | |
| **All other** | **Group R** | **All other** | **Group R** |
| **Roofs** | | | | |
| Insulation entirely above roof deck | U-0.048 | U-0.039 | U-0.039 | U-0.039 |
| Metal buildings | U-~~0.044~~0.035 | U-0.035 | U-0.035 | U-0.035 |
| Attic and other | U-0.027 | U-0.027 | U-0.027 | U-0.027 |

**(EN10456 AS)**

**Revise as follows:**

**C402.2.5 ~~Slabs-on-grade perimeter insulation.~~ Slabs-on-grade. (Prescriptive).** ~~Where the slab on grade is in contact with the ground, the~~ The minimum thermal resistance (*R*-value) of the insulation ~~around the perimeter of~~ for unheated or heated slab-on-grade floors designed in accordance with the *R*-value method of Section C402.1.3 shall be as specified in Table C402.1.3. ~~The perimeter insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The perimeter insulation shall extend downward from the top of the slab for the minimum distance shown in the table or to the top of the footing, whichever is less, or downward to not less than the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by not less than of 10 inches (254 mm) of soil.~~

**~~Exception:~~** ~~Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade, perimeter insulation is not required.~~

**Add new text as follows:**

**C402.2.5.1 Insulation installation (Prescriptive).**Where installed, the perimeter insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The perimeter insulation shall extend downward from the top of the slab for the minimum distance shown in the table or to the top of the footing, whichever is less, or downward to not less than the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. Insulation extending away from the building shall be protected by pavement or by not less than of 10 inches (254 mm) of soil. Where installed, full slab insulation shall be continuous under the entire area of the slab-on-grade floor, except at structural column locations and service penetrations. Insulation required at the heated slab perimeter shall not be required to extend below the bottom of the heated slab and shall be continuous with the full slab insulation.

**Exception:** Where the slab-on-grade floor is greater than 24 inches (61 mm) below the finished exterior grade, perimeter insulation is not required.

**(EN8686 / CE79-19 AM)**

C402.2.7 Airspaces. Where the R-value of an airspace is used for compliance in accordance with Section C402.1, the airspace shall be enclosed in an unventilated cavity bounded on all sides by building components and constructed to minimize airflow into and out of the enclosed airspace. Airflow shall be deemed minimized where one of the following conditions occur:

1. The enclosed airspace is unventilated.
2. The enclosed airspace is bounded on at least one side by an anchored masonry veneer, constructed in accordance with Chapter 14 of the IBC, and vented by veneer weep holes located only at the bottom of the airspace and spaced not less than 15 inches on center with the top of the cavity airspace closed.

Exception: For ventilated cavities, the effect of the ventilation of airspaces located on the exterior side of the continuous air barrier and adjacent to and behind the exterior wall-covering material shall be determined in accordance with ASTM C1363 modified with an airflow entering the bottom and exiting the top of the airspace at an air movement rate of not less than 70 mm/second.

**(EN9963 AM A1)**

**C402.3**Roof solar reflectance and thermal emittance.

Low-sloped roofs directly above cooled conditioned spaces in Climate Zones 1, 2 and 3 shall comply with one or more of the options in Table C402.3.

Exceptions: The following roofs and portions of roofs are exempt from the requirements of Table C402.3:

1. Portions of the roof that include or are covered by the following:

1.1. Photovoltaic systems or components.

1.2. Solar air or water-heating systems or components.

1.3. Roof gardens or landscaped roofs.

1.4. Above-roof decks or walkways.

1.5. Skylights.

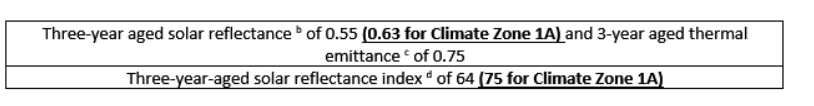
1.6. HVAC systems and components, and other opaque objects mounted above the roof.

2. Portions of the roof shaded during the peak sun angle on the summer solstice by permanent features of the building or by permanent features of adjacent buildings.

3. Portions of roofs that are ballasted with a minimum stone ballast of 17 pounds per square foot [74 kg/m2] or 23 psf [117 kg/m2] pavers.

4. Roofs where not less than 75 percent of the roof area complies with one or more of the exceptions to this section.

     TABLE C402.3MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS a



a. The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for either solar reflectance or thermal emittance shall be assigned both a 3-year-aged solar reflectance in accordance with Section C402.3.1 and a 3-year-aged thermal emittance of 0.90.

b. Aged solar reflectance tested in accordance with ASTM C1549, ASTM E903 or ASTM E1918 or CRRC-1 Standard.

c. Aged thermal emittance tested in accordance with ASTM C1371 or ASTM E408 or CRRC-1 Standard.

d. Solar reflectance index (SRI) shall be determined in accordance with ASTM E1980 using a convection coefficient of 2.1 Btu/h · ft2 ·°F (12W/m2 · K). Calculation of aged SRI shall be based on aged tested values of solar reflectance and thermal emittance.

**(EN9903 AS)**

**Revise as follows:**

**TABLE C402.4**

**BUILDING ENVELOPE FENESTRATION MAXIMUM U-FACTOR AND SHGC REQUIREMENTS**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CLIMATE ZONE** | **1** | | **2** | | **3** | | **4 EXCEPT MARINE** | | **5 AND**  **MARINE 4** | | **6** | | **7** | | **8** | |
| **Vertical fenestration** | | | | | | | | | | | | | | | | |
| ***U-*factor** | | | | | | | | | | | | | | | | |
| **Fixed fenestration** | **0.50** | | **0.45** | | **0.42** | | **0.36** | | **0.36** | | **0.34** | | **0.29** | | **0.26** | |
| **Operable fenestration** | **0.62** | | **0.60** | | **0.54** | | **0.45** | | **0.45** | | **0.42** | | **0.36** | | **0.32** | |
| **Entrance doors** | **0.83** | | **0.77** | | **0.68** | | **0.63** | | **0.63** | | **0.63** | | **0.63** | | **0.63** | |
| **SHGC** | | | | | | | | | | | | | | | | |
| **~~Orientationa~~** | **Fixed** | **Operable** | **Fixed** | **Operable** | **Fixed** | **Operable** | **Fixed** | **Operable** | **Fixed** | **Operable** | **Fixed** | **Operable** | **Fixed** | **Operable** | **Fixed** | **Operable** |
|  |
| **PF < 0.2** | **0.23** | **0.21** | **0.25** | **0.23** | **0.25** | **0.23** | **0.36** | **0.33** | **0.38** | **0.33** | **0.38** | **0.34** | **0.40** | **0.36** | **0.40** | **0.36** |
| **0.2 < PF < 0.5** | **0.28** | **0.25** | **0.30** | **0.28** | **0.30** | **0.28** | **0.43** | **0.40** | **0.46** | **0.40** | **0.46** | **0.41** | **0.48** | **0.43** | **0.48** | **0.43** |
| **PF ³ 0.5** | **0.37** | **0.34** | **0.40** | **0.37** | **0.40** | **0.37** | **0.58** | **0.53** | **0.61** | **0.53** | **0.61** | **0.54** | **0.64** | **0.58** | **0.64** | **0.58** |
| **Skylights** | | | | | | | | | | | | | | | | |
| ***U-*factor** | **0.70** | | **0.65** | | **0.55** | | **0.50** | | **0.50** | | **0.50** | | **0.44** | | **0.41** | |
| **SHGC** | **0.30** | | **0.30** | | **0.30** | | **0.40** | | **0.40** | | **0.40** | | **NR** | | **NR** | |

**NR = No Requirement, PF = Projection Factor.**

*Staff Note: The above table does not show the SHGC revisions included with CE84-19 for clarity. They are shown below. Highlighted areas indicate different values based on Orientation of North vs. Operable.*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Orientationa** | **SEW** |  |  |  | **N** |  | **SEW** |  |  |  | **N** |  | **SEW** |  |  |  | **N** |  | **SEW** |  |  |  | **N** |  | **SEW** |  |  |  | **N** |  | **SEW** |  |  |  | **N** |  | **SEW** |  |  | **N** |  | **SEW** |  | **N** |
| **PF < 0.2** | **0.21** | | **0.31** | | | **0.25** | | | **0.33** | | | **0.25** | | | **0.33** | | | **0.36** | | | **0.48** | | | **0.38** | | | **0.51** | | | **0.38** | | | **0.51** | | | **0.40** | | | **0.53** | | **0.40** | | | **0.53** |
| **0.2 < PF < 0.5** | **0.28** | | **0.34** | | | **0.30** | | | **0.28** | | | **0.37** | | | **0.37** | | | **0.43** | | | **0.53** | | | **0.46** | | | **0.56** | | | **0.46** | | | **0.56** | | | **0.48** | | | **0.58** | | **0.48** | | | **0.58** |
| **PF ³ 0.5** | **0.37** | | **0.37** | | | **0.40** | | | **0.37** | | | **0.40** | | | **0.40** | | | **0.58** | | | **0.58** | | | **0.61** | | | **0.61** | | | **0.61** | | | **0.61** | | | **0.64** | | | **0.64** | | **0.64** | | | **0.64** |
| **Skylights** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ***U-*factor** |  | **0.70** | | | |  |  | **0.65** | | | |  |  | **0.55** | | | |  |  | **0.50** | | | |  |  | **0.50** | | | |  |  | **0.50** | | | |  |  | **0.44** | | |  |  | **0.41** | |
| **SHGC** |  | **0.30** | | | |  |  | **0.30** | | | |  |  | **0.30** | | | |  |  | **0.40** | | | |  |  | **0.40** | | | |  |  | **0.40** | | | |  | | | **NR** |  |  | | | **NR** |

**Note: Use Table C402.4 of the 2021 IECC.**

**(EN9199/CCC EC-C4-20 AS)**

C402.5.1.1 Air barrier construction. The continuous air barrier shall be constructed to comply with the following:

5. Electrical and communication boxes shall comply with C402.5.10 to maintain the integrity of the air barrier.

**C402.5.10 Electrical and Communication Boxes.** Electrical and Communication boxes that penetrate the air barrier of the building thermal envelope, and that do not comply with C402.5.11.1, shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All openings on the concealed portion of the box shall be sealed. Where present, insulation shall rest against all concealed portions of the box.

**C402.5.10.1 Air-sealed boxes**. Where air-sealed boxes are installed, they shall be marked in accordance with NEMA OS 4. Air-sealed boxes shall be installed in accordance with the manufacturer’s instructions.

**(EN10070 AS)**

**C402.5.11 Building cavities.**

**C402.5.11.1 Vented dropped ceiling cavities.**Where vented dropped ceiling cavities occur over conditioned spaces, the ceiling shall be considered to be both the upper thermal envelope and pressure envelope of the building and shall contain a continuous air barrier between the conditioned space and the vented unconditioned space that is also sealed to the air barrier of the walls. See the definition of air barrier in Section C202.

**C402.5.11.2 Unvented dropped ceiling cavities.**Where unvented dropped ceiling cavities occur over conditioned spaces that do not have an air barrier between the conditioned and unconditioned space (such as T-bar ceilings), they shall be completely sealed from the exterior environment (at the roof plane) and adjacent spaces by a continuous air barrier that is also sealed to the air barrier of the walls. In that case, the roof assembly shall constitute both the upper thermal envelope and pressure envelope of the building.

**C402.5.11.3 Separate tenancies.**Unconditioned spaces above separate tenancies shall contain dividing partitions between the tenancies to form a continuous air barrier that is sealed at the ceiling and roof to prevent

airflow between them.

**C402.5.11.4 Air distribution system components.**

Building cavities designed to be air distribution system components shall be sealed according to the criteria for air ducts, plenums, etc., in Section C403.2.9.

(EN9845 AS)

**Revise as follows:**

**C402.5.1.2.1 Materials.** Materials with an air permeability not greater than 0.004 cfm/ft2 (0.02 L/s • m2) under a pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with ASTM E2178 shall comply with this section. Materials in Items 1 through 16 shall be deemed to comply with this section, provided that joints are sealed and materials are installed as air barriers in accordance with the manufacturer’s instructions.

1.   Plywood with a thickness of not less than 3/8 inch (10 mm).

2.   Oriented strand board having a thickness of not less than 3/8 inch (10 mm).

3.   Extruded polystyrene insulation board having a thickness of not less than 1/2 inch (12.7 mm).

4.   Foil-back polyisocyanurate insulation board having a thickness of not less than 1/2 inch (12.7 mm).

5.   Closed-cell spray foam having a minimum density of 1.5 pcf (2.4 kg/m3) and having a thickness of not less than 11/2 inches (38 mm).

6.   Open-cell spray foam with a density between 0.4 and 1.5 pcf (0.6 and 2.4 kg/m3) and having a thickness of not less than 4.5 inches (113 mm).

7.   Exterior or interior gypsum board having a thickness of not less than 1/2 inch (12.7 mm).

8.   Cement board having a thickness of not less than 1/2 inch (12.7 mm).

9.   Built-up roofing membrane.

10.  Modified bituminous roof membrane.

11.  ~~Fully adhered~~ single-ply roof membrane.

12.  A Portland cement/sand parge, or gypsum plaster having a thickness of not less than 5/8 inch (15.9 mm).

13.  Cast-in-place and precast concrete.

14.  Fully grouted concrete block masonry.

15.  Sheet steel or aluminum.

16.  Solid or hollow masonry constructed of clay or shale masonry units.

**(EN8734 / CE102-19 AS)**

**Revise as follows:**

**C402.5 Air leakage—thermal envelope (Mandatory).** The building thermal envelope ~~of buildings~~ shall comply with Sections C402.5.1 through C402.5.~~8~~ 10, or the building thermal envelope shall be tested in accordance with ~~ASTM E 779 at a pressure differential of 0.3 inch water gauge (75 Pa) or an equivalent method approved by the code official and deemed to comply with the provisions of this section when the tested air leakage rate of the building thermal envelope is not greater than 0.40 cfm/ft~~~~2~~ ~~(2.0 L/s • m~~~~2~~~~).~~ Section C402.5.1.2.3. Where compliance is based on such testing, the building shall also comply with Sections C402.5.5, C402.5.6 and C402.5.7.

**C402.5.1 Air barriers.** A continuous air barrier shall be provided throughout the building thermal envelope. The air barriers shall be ~~permitted to be~~ located on the inside or outside of the building thermal envelope, located within the assemblies composing the building thermal envelope, or any combination thereof. The air barrier shall comply with Sections C402.5.1.1 and C402.5.1.2.

**Exception:** Air barriers are not required in buildings located in Climate Zone 2B.

**C402.5.1.2 Air barrier compliance.** A continuous air barrier for the opaque building envelope shall comply with the following:

1. Buildings or portions of buildings including group R and group I occupancy shall meet the provisions of Section C402.5.1.2.1 or C402.5.1.2.2.

2. Buildings or portions of buildings of other than group R and group I occupancy shall meet the provisions of Section C402.5.1.2.3.

**Exceptions:**

1. Buildings in Climate Zones 2B, 3B, 3C, and 5C.

2. Buildings larger than 5000 square feet floor area in Climate Zones 0B, 1, 2A, 4B, and 4C.

3. Buildings between 5000 and 50,000 square feet floor area in Climate Zones 0A, 3A and 5B.

3. Buildings or portions of buildings other than group R and group I occupancy that do not complete air barrier testing shall meet the provisions of Section C402.5.1.2.1 or C402.5.1.2.2.

**C402.5.1.2.3 Building thermal envelope testing.** The building thermal envelope shall be tested in accordance with ASTM E 779, ANSI/RESNET/ICC 380, or ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.40 cfm/ft2 (2.0 L/s · m2) of the building thermal envelope area at a pressure differential of 0.3 inch water gauge (75 Pa). Alternatively, portions of the building shall be tested and the measured air leakages shall be area-weighted by the surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:

1. The entire envelope area of all stories that have any spaces directly under a roof,

2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are below grade, and

3. Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space.

**Exception:**Where the measured air leakage rate exceeds 0.40 cfm/ft2 (2.0 L/s•m2) but does not exceed 0.60 cfm/ft2(3.0 L/s•m2), a diagnostic evaluation using smoke tracer or infra-red imaging shall be conducted while the building is pressurized along with a visual inspection of the air barrier. Any leaks noted shall be sealed where such sealing can be made without destruction of existing building components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner, and shall be deemed to comply with satisfy the requirements of this section.

**(EN8721/ CE97-19 AM)/ (EN9845 AS)**

**Revise as follows:**

**C402.5.1.2.2 Assemblies.** Assemblies of materials and components with an average air leakage not greater than 0.04 cfm/ft2 (0.2 L/s • m2) under a pressure differential of 0.3 inch of water gauge (w.g.)(75 Pa) when tested in accordance with ASTM E2357, ASTM E1677, ASTM D8052 or ASTM E283 shall comply with this section. Assemblies listed in Items 1 through 3 shall be deemed to comply, provided that joints are sealed and the requirements of Section C402.5.1.1 are met.

1. Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating.

2. Masonry walls constructed of clay or shale masonry units with a nominal width of 4 inches (102 mm) or more.

3. A Portland cement/sand parge, stucco or plaster not less than 1/2 inch (12.7 mm) in thickness.

**(EN8731 / CE101-19 AM)**

**Revise as follows:**

**Add new text as follows:**

**C402.5.10 Operable openings interlocking. (Mandatory).** Where occupancies utilize operable openings to the outdoors that are larger than 40 square feet in area such openings shall be interlocked with the heating and cooling system so as to raise the cooling set point to 90 degrees and lower the heating set point to 55 degrees whenever the operable opening is open. The change in heating and cooling setpoints shall occur within 10 minute of opening the operable opening.

**Exceptions:**

1. Separately zoned areas associated with the preparation of food that contribute~~s~~ to the HVAC loads of a restaurant or similar type of.

2. Warehouses that utilize overhead doors for the function of the occupancy, where approved by the code official.

3. The first entrance doors where located in the exterior wall and are part of a vestibule system.

**C402.5.10.1 Operable controls (Mandatory).** Controls shall comply with Section C403.13.

**C403.6 Operable opening interlocking controls (Mandatory).** The heating and cooling systems shall have controls that will interlock these mechanical systems to the set temperatures of 90 degrees for cooling and 55 degrees for heating when the conditions of Section C402.5.9 exist. The controls shall configure to shut off the systems entirely when the outdoor temperatures are below 90 degrees or above 55 degrees.

**(EN8736 / CE106-19 AMPC1)**

**C403.2.2 Equipment Sizing**  
  
The output capacity of heating and cooling equipment shall be not greater than the loads calculated in accordance with Section C403.2.1. A single piece of equipment providing both heating and cooling shall satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.  
  
  
**Exceptions:**

1. Required standby equipment and systems provided with controls and devices that allow such systems or equipment to operate automatically only when the primary equipment is not operating.

2. Multiple units of the same equipment type with combined capacities exceeding the design load and provided with controls that have the capability to sequence the operation of each unit based on load.

3. "Living Spaces" in Commercial Buildings shall be sized in accordance with R403.7.1.1 and its exceptions.

**(EN10112 AS)**

**TABLE C403.2.3(5)**

**MINIMUM EFFICIENCY REQUIREMENTS: GAS- AND OIL-FIRED BOILERS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT TYPEa** | **SUBCATEGORY ORRATING CONDITION** | **SIZE CATEGORY (INPUT)** | **MINIMUM EFFICIENCYd, ee, f** | **TEST PROCEDURE** |
| Boilers, hot water | Gas-fired | < 300,000 Btu/hf, gg, h  US Residential Application | 84% AFUE | 10 CFR Part 430 |
|  300,000 Btu/h and   2,500,000 Btu/hbc | 80% *Et* | 10 CFR Part 431 |
| > 2,500,000 Btu/hab | 82% *Ec* |
| Oil-firedcd | < 300,000 Btu/hgg, h  US Residential Application | 86% AFUE | 10 CFR Part 430 |
|  300,000 Btu/h and   2,500,000 Btu/hbc | 82% *Et* | 10 CFR Part 431 |
| > 2,500,000 Btu/hab | 84% *Ec* |
| Boilers, steam | Gas-fired | < 300,000 Btu/hfg  US Residential Application | 82% AFUE | 10 CFR Part 430 |
| Gas-fired—all, except natural draft |  300,000 Btu/h and   2,500,000 Btu/hbc | 79% *Et* | 10 CFR Part 431 |
| > 2,500,000 Btu/hab | 79% *Et* |
| Gas-fired—natural draft |  300,000 Btu/h and   2,500,000 Btu/hbc | 77% *Et*  79% *Et* effective  March 2, 2022 |
| > 2,500,000 Btu/hab | 77% *Et*  79% *Et* effective  March 2, 2022 |
| Oil-firedcd | < 300,000 Btu/hg  US Residential Application | 85% AFUE | 10 CFR Part 430 |
|  300,000 Btu/h and   2,500,000 Btu/hbc | 81% *Et* | 10 CFR Part 431 |
| > 2,500,000 Btu/hab | 81% *Et* |

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

1. Chapter 6 contains a complete specification of the referenced standards, which include test procedure, including the reference year version of the test procedure.
2. These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.
3. Maximum capacity – minimum and maximum ratings as provided for and allowed by the unit’s controls.
4. Includes oil-fired (residual).
5. Ec = Combustion efficiency (100 percent less flue losses).
6. Et = Thermal efficiency. See referenced standard for detailed information.
7. Boilers shall not be equipped with a constant burning ignition pilot.
8. A boiler not equipped with a tankless domestic water heating coil shall be equipped with an automatic means for adjusting the temperature of the water such that an incremental change in inferred heat load produces a corresponding incremental change in the temperature of the water supplied.

**(EN10212 AS)**

**TABLE C403.2.3(1)**

**MINIMUM EFFICIENCY REQUIREMENTS:**

**ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITSc**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Air conditioners, air cooled | < ~~6~~45,000 Btu/hb | All | Split System, three phase and applications outside US single phaseb | 14.0 SEER before 1/1/2023  14.3 SEER2  after 1/1/2023 | AHRI 210/240 – 2017  before 1/1/2023 AHRI 210/240 – 2023  after 1/1/2023 |
| ≥ 45,000 Btu/hb and  < 65,000 Btu/hb | 14.0 SEER before 1/1/2023  13.8 SEER2  after 1/1/2023 |
| < 65,000 Btu/hb | Single Package, three phase and applications outside US single phaseb | 14.0 SEERc before 1/1/2023  13.4 SEER2  after 1/1/2023 |
| Through-the-wall (air cooled) |  30,000 Btu/hb | All | Split system, three phase and applications outside US single phaseb | 12.0 SEER before 1/1/2023  11.7 SEER2  after 1/1/2023 |
| Single Package, three phase and applications outside US single phaseb | 12.0 SEER before 1/1/2023  11.7 SEER2  after 1/1/2023 |
| Small-duct high- velocity(air cooled) | < 65,000 Btu/hb | All | Split system, three phase and applications outside US single phaseb | 12.0 SEER before 1/1/2023  12.0 SEER2  after 1/1/2023 |
| Air conditioners, air cooled |  65,000 Btu/h and  < 135,000 Btu/h | Electric Resistance  (or None) | Split System and Single Package | 11.2 EER  12.9 IEER before 1/1/2023  14.8 IEER  after 1/1/2023 | AHRI 340/360 |
| All other | Split System and Single Package | 11.0 EER  12.7 IEER before 1/1/2023  14.6 IEER  after 1/1/2023 |
|  135,000 Btu/h and  < 240,000 Btu/h | Electric Resistance  (or None) | Split System and Single Package | 11.0 EER  12.4 IEER before 1/1/2023  14.2 IEER  after 1/1/2023 |
| All other | Split System and Single Package | 10.8 EER  12.2 IEER before 1/1/2023  14.0 IEER  after 1/1/2023 |
|  240,000 Btu/h and  < 760,000 Btu/h | Electric Resistance  (or None) | Split System and Single Package | 10.0 EER  11.6 IEER before 1/1/2023  13.2 IEER  after 1/1/2023 |
| All other | Split System and Single Package | 9.8 EER  11.4 IEER before 1/1/2023  13.0 IEER  after 1/1/2023 |
|  760,000 Btu/h | Electric Resistance  (or None) | Split System and Single Package | 9.7 EER  11.2 IEER before 1/1/2023  12.5 IEER  after 1/1/2023 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | All other | Split System andSingle Package | 9.5 EER  11.0 IEER before 1/1/2023  12.3 IEER  after 1/1/2023 |  |

*(continued)*

**TABLE C403.2.3(1)—continued MINIMUM EFFICIENCY REQUIREMENTS:**

**ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITSc**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPE** | **SUB-CATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Air conditioners,water cooled | < 65,000 Btu/hb | All | Split System and | 12.1 EER | AHRI |
| Single Package | 12.3 IEER | 210/240 |
|  65,000 Btu/h and  < 135,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 12.1 EER  13.9 IEER | AHRI 340/360 |
| All other | Split System and Single Package | 11.9 EER  13.7 IEER |
|  135,000 Btu/h and  < 240,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 12.5 EER  13.9 IEER |
| All other | Split System and Single Package | 12.3 EER  13.7 IEER |
|  240,000 Btu/h and  < 760,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 12.4 EER  13.6 IEER |
| All other | Split System and Single Package | 12.2 EER  13.4 IEER |
|  760,000 Btu/h | Electric Resistance | Split System and | 12.2 EER |
| (or None) | Single Package | 13.5 IEER |
| All other | Split System and | 12.0 EER |
| Single Package | 13.3 IEER |
| Air conditioners, evaporatively cooled | < 65,000 Btu/hb | All | Split System and | 12.1 EER | AHRI |
| Single Package | 12.3 IEER | 210/240 |
|  65,000 Btu/h and  < 135,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 12.1 EER  12.3 IEER | AHRI 340/360 |
| All other | Split System and Single Package | 11.9 EER  12.1 IEER |
|  135,000 Btu/h and  < 240,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 12.0 EER  12.2 IEER |
| All other | Split System and Single Package | 11.8 EER  12.0 IEER |
|  240,000 Btu/h and  < 760,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 11.9 EER  12.1 IEER |
| All other | Split System and Single Package | 11.7 EER  11.9 IEER |
|  760,000 Btu/h | Electric Resistance | Split System and | 11.7 EER |
| (or None) | Single Package | 11.9 IEER |
| All other | Split System and | 11.5 EER |
| Single Package | 11.7 IEER |
| Condensing units, air cooled |  135,000 Btu/h |  |  | 10.5 EER | AHRI 340/360 |
| 11.8 IEER |
| Condensing units, water cooled |  135,000 Btu/h |  |  | 13.5 EER |
| 14.0 IEER |
| Condensing units, evaporatively cooled |  135,000 Btu/h |  |  | 13.5 EER |
| 14.0 IEER |

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

* + 1. Chapter 6 contains a complete specification of the referenced standards, which include test procedure, including the reference year version of the test procedure.
    2. Single-phase, US air-cooled air conditioners less than 65,000 Btu/h are regulated ~~by NAECA~~as consumer products by the US Department of Energy Code of Federal Regulations DOE 10 CFR 430. SEER and SEER2 values for single-phase products are set by the US Department of Energy~~SEER values are those set by NAECA.~~
    3. DOE 10 CFR 430 Subpart B Appendix M1 includes the test procedure updates effective 1/1/2023 that will be incorporated in AHRI 210/240 – 2023.

**(EN10213 AS)**

**TABLE C403.2.3(2)**

**MINIMUM EFFICIENCY REQUIREMENTS: ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPSc, d**

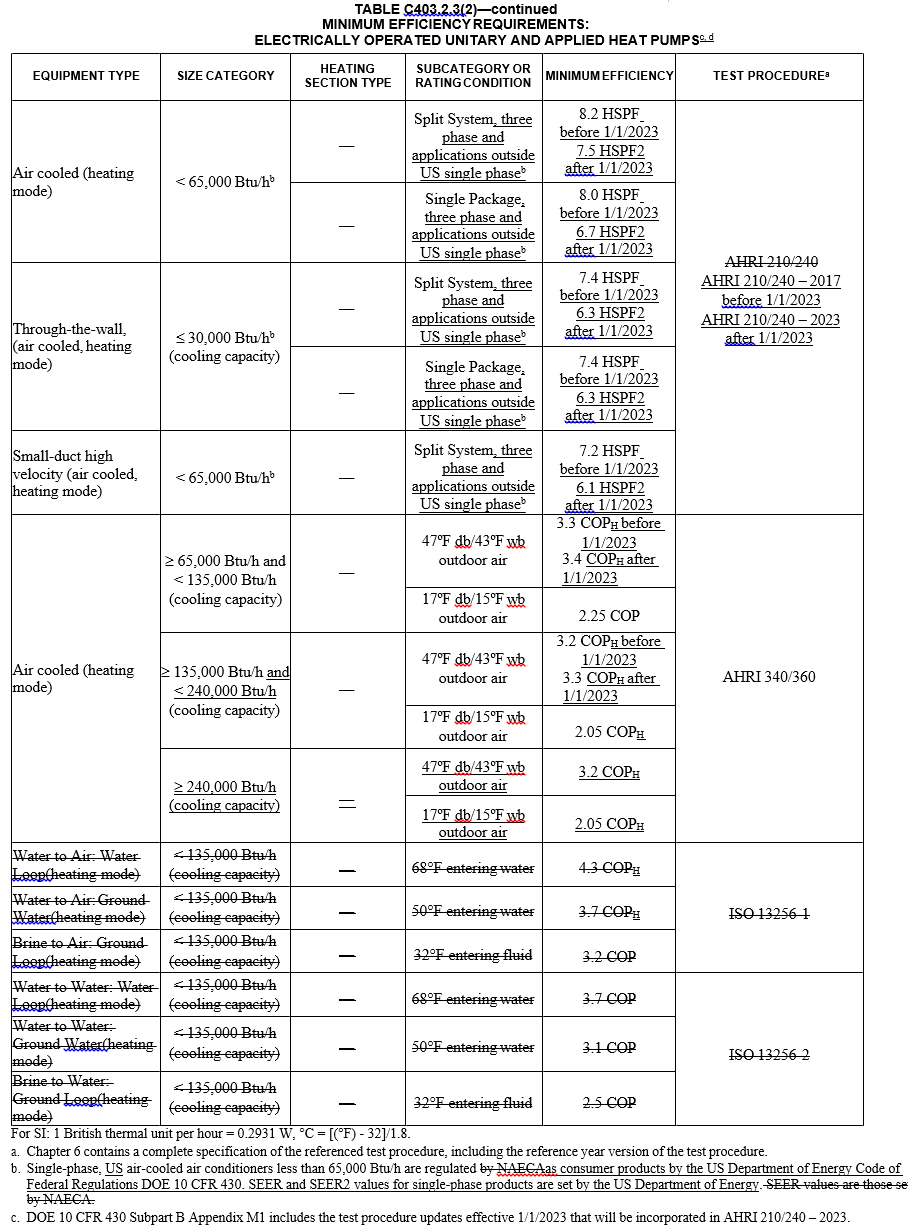
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Air cooled (cooling mode) | < 65,000 Btu/hb | All | Split System, three phase and applications outside US single phaseb | 14.0 SEER before 1/1/2023  14.3 SEER2  after 1/1/2023 | ~~AHRI 210/240~~ AHRI 210/240 – 2017  before 1/1/2023 AHRI 210/240 – 2023  after 1/1/2023 |
| Single Package, three | 14.0 SEER before 1/1/2023  13.4 SEER2  after 1/1/2023 |
|  |  |  | phase and  applications outside US single phaseb |
| Through-the-wall, air cooled |  30,000 Btu/hb | All | Split System, three phase and applications outside  US single phaseb | 12.0 SEER before 1/1/2023  11.9 SEER2  after 1/1/2023 |
| Single Package, three | 12.0 SEER before 1/1/2023  11.9 SEER2  after 1/1/2023 |
|  |  |  | phase and applications outside  US single phaseb |
| Single-duct high-velocity air cooled | < 65,000 Btu/hb | All | Split System, three phase and applications outside US single phaseb | 12.0 SEER before 1/1/2023  12.0 SEER2  after 1/1/2023 |
| Air cooled (cooling mode) |  65,000 Btu/h and  < 135,000 Btu/h | Electric Resistance (or None) | Split System and Single Package | 11.0 EER 12.2~~0~~ IEER before 1/1/202314.1  IEER  after 1/1/2023 | AHRI 340/360 |
| All other | 10.8 EER 12.0~~11.8~~  IEER before 1/1/2023 13.9 IEER  after 1/1/2023 |
|  135,000 Btu/h and  < 240,000 Btu/h | Electric Resistance (or None) | 10.6 EER 11.6 IEER before 1/1/2023  13.5 IEER  after 1/1/2023 |
| All other | 10.4 EER 11.4 IEER before 1/1/2023  13.3 IEER  after 1/1/2023 |
|  240,000 Btu/h | Electric Resistance (or None) | 9.5 EER 10.6 IEER before 1/1/2023  12.5 IEER  after 1/1/2023 |
| All other | 9.3 EER 10.4 IEER before 1/1/2023  12.3 IEER  after 1/1/2023 |

*(continued)*

**~~TABLE C403.2.3(2) —continued~~**

**~~MINIMUM EFFICIENCY REQUIREMENTS: ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS~~**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **~~SIZE~~ ~~CATEGORY~~** | **~~HEATING~~ ~~SECTION TYPE~~** | **~~SUBCATEGORY~~ ~~OR RATING~~ ~~CONDITION~~** | **~~MINIMUM~~ ~~EFFICIENCY~~** | **~~TEST PROCEDURE~~a** |
|  | ~~< 17,000 Btu/h~~ | ~~All~~ | ~~86~~o~~F entering water~~ | ~~12.2 EER~~ |  |
| Water to Air: Water Loop(cooling mode) | ~~ 17,000 Btu/h~~ ~~and~~  ~~< 65,000 Btu/h~~ | ~~All~~ | ~~86~~o~~F entering water~~ | ~~13.0 EER~~ | ~~ISO 13256-1~~ |
|  | ~~ 65,000 Btu/h~~ ~~and~~  ~~< 135,000 Btu/h~~ | ~~All~~ | ~~86~~o~~F entering water~~ | ~~13.0 EER~~ |  |
| Water to Air:  Ground Water (cooling mode) | ~~< 135,000 Btu/h~~ | All | ~~59~~o~~F entering water~~ | ~~18.0 EER~~ | ~~ISO 13256-1~~ |
| Brine to Air: Ground Loop(cooling mode) | ~~< 135,000 Btu/h~~ | ~~All~~ | ~~77~~o~~F entering water~~ | ~~14.1 EER~~ | ~~ISO 13256-1~~ |
| Water to Water: Water Loop(cooling mode) | ~~< 135,000 Btu/h~~ | ~~All~~ | ~~86~~o~~F entering water~~ | ~~10.6 EER~~ |  |
| Water to Water:  Ground Water (cooling mode) | ~~< 135,000 Btu/h~~ | ~~All~~ | ~~59~~o~~F entering water~~ | ~~16.3 EER~~ | ~~ISO 13256-2~~ |
| Brine to Water: Ground Loop  (cooling mode) | ~~< 135,000 Btu/h~~ | ~~All~~ | ~~77~~o~~F entering fluid~~ | ~~12.1 EER~~ |  |

****

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY (INPUT)** | **SUBCATEGORY ORRATING CONDITION** | **MINIMUM EFFICIENCYd** | **TEST PROCEDUREa** |
| PTAC (cooling mode) ~~new construction~~ standard size | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air | 11.9 EER | AHRI 310/380 |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 14.0 – (0.300 × Cap/1000) EER |
| >15,000 Btu/h | 9.5 EER |
| PTAC (cooling mode) ~~replacements~~b nonstandard sizeb | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air | 9.4 EER |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 10.9 - (0.213 × Cap/1000)  EER |
| >15,000 Btu/h | 7.7 EER |
| PTHP (cooling mode) ~~new construction~~ standard size | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air | 11.9 EER |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 14.0 - (0.300 × Cap/1000)  EER |
| >15,000 Btu/h | 9.5 EER |
| PTHP (cooling mode) ~~replacements~~b nonstandard sizeb | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air | 9.3 EER |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 10.8 - (0.213 × Cap/1000)  EER |
| >15,000 Btu/h | 7.6 EER |
| PTHP (heating mode) ~~new construction~~ standard size | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air~~—~~ | 3.3 COPH |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 3.7 - (0.052 × Cap/1000)  COPH |
| >15,000 Btu/h | 2.9 COPH |
| PTHP (heating mode) ~~replacements~~ Nonstandard sizeb | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air~~—~~ | 2.7 COPH |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 2.9 - (0.026 × Cap/1000) COPH |
| >15,000 Btu/h | 2.5 COPH |
| SPVAC  (cooling mode) | < 65,000 Btu/h | 95°F db/ 75°F wb  outdoor air | 11.0 EER | AHRI 390 |
|  65,000 Btu/h and  < 135,000 Btu/h | 95°F db/ 75°F wb outdoor air | 10.0 EER |
|  135,000 Btu/h and  < 240,000 Btu/h | 95°F db/ 75°F wb outdoor air | 10.0 EER |
| SPVHP  (cooling mode) | < 65,000 Btu/h | 95°F db/ 75°F wb  outdoor air | 11.0 EER |
|  65,000 Btu/h and  < 135,000 Btu/h | 95°F db/ 75°F wb outdoor air | 10.0 EER |
|  135,000 Btu/h and  < 240,000 Btu/h | 95°F db/ 75°F wb outdoor air | 10.0 EER |
| SPVHP  (heating mode) | < 65,000 Btu/h | 47°F db/ 43°F wb  outdoor air | 3.3 COPH | AHRI 390 |
|  65,000 Btu/h and  < 135,000 Btu/h | 47°F db/ 43°F wb outdoor air | 3.0 COPH |
|  135,000 Btu/h and  < 240,000 Btu/h | 47°F db/ 75°F wb outdoor air | 3.0 COPH |

**(EN10214 AS)**

**TABLE C403.2.3(3)**

**MINIMUM EFFICIENCY REQUIREMENTS: ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS,**

**PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS, SINGLE-PACKAGE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS AND ROOM AIR-CONDITIONER**

**HEAT PUMPS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY (INPUT)** | **SUBCATEGORY ORRATING CONDITION** | **MINIMUM EFFICIENCYd** | **TEST PROCEDUREa** |
| PTAC (cooling mode) ~~new construction~~ standard size | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air | 11.9 EER | AHRI 310/380 |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 14.0 – (0.300 × Cap/1000) EER |
| >15,000 Btu/h | 9.5 EER |
| PTAC (cooling mode) ~~replacements~~b nonstandard sizeb | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air | 9.4 EER |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 10.9 - (0.213 × Cap/1000)  EER |
| >15,000 Btu/h | 7.7 EER |
| PTHP (cooling mode) ~~new construction~~ standard size | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air | 11.9 EER |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 14.0 - (0.300 × Cap/1000)  EER |
| >15,000 Btu/h | 9.5 EER |
| PTHP (cooling mode) ~~replacements~~b nonstandard sizeb | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air | 9.3 EER |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 10.8 - (0.213 × Cap/1000)  EER |
| >15,000 Btu/h | 7.6 EER |
| PTHP (heating mode) ~~new construction~~ standard size | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air~~—~~ | 3.3 COPH |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 3.7 - (0.052 × Cap/1000)  COPH |
| >15,000 Btu/h | 2.9 COPH |
| PTHP (heating mode) ~~replacements~~ Nonstandard sizeb | ~~All Capacities~~  <7,000 Btu/h | 95°F db/ 75°F wb outdoor air~~—~~ | 2.7 COPH |
| ≥7,000 Btu/h and  ≤15,000 Btu/h | 2.9 - (0.026 × Cap/1000) COPH |
| >15,000 Btu/h | 2.5 COPH |
| SPVAC  (cooling mode) | < 65,000 Btu/h | 95°F db/ 75°F wb  outdoor air | 11.0 EER | AHRI 390 |
|  65,000 Btu/h and  < 135,000 Btu/h | 95°F db/ 75°F wb outdoor air | 10.0 EER |
|  135,000 Btu/h and  < 240,000 Btu/h | 95°F db/ 75°F wb outdoor air | 10.0 EER |
| SPVHP  (cooling mode) | < 65,000 Btu/h | 95°F db/ 75°F wb  outdoor air | 11.0 EER |
|  65,000 Btu/h and  < 135,000 Btu/h | 95°F db/ 75°F wb outdoor air | 10.0 EER |
|  135,000 Btu/h and  < 240,000 Btu/h | 95°F db/ 75°F wb outdoor air | 10.0 EER |
| SPVHP  (heating mode) | < 65,000 Btu/h | 47°F db/ 43°F wb  outdoor air | 3.3 COPH | AHRI 390 |
|  65,000 Btu/h and  < 135,000 Btu/h | 47°F db/ 43°F wb outdoor air | 3.0 COPH |
|  135,000 Btu/h and  < 240,000 Btu/h | 47°F db/ 75°F wb outdoor air | 3.0 COPH |

*(continued)*

**TABLE C403.2.3(3)—continued MINIMUM EFFICIENCY REQUIREMENTS:**

**ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS, PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS,**

**SINGLE-PACKAGE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS AND ROOM AIR-CONDITIONER HEAT PUMPS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY (INPUT)** | **SUBCATEGORY ORRATING CONDITION** | **MINIMUM EFFICIENCYd** | **TEST PROCEDUREa** |
| Room air conditioners without reverse cycles, with louvered sides for applications outside US | < 6,000 Btu/h | — | 11.0 CEER | ANSI/AHAM RAC-1 |
|  6,000 Btu/h and  < 8,000 Btu/h | — | 11.0 CEER |
|  8,000 Btu/h and  < 14,000 Btu/h | — | 10.9 CEER |
|  14,000 Btu/h and  < 20,000 Btu/h | — | 10.7 CEER |
|  20,000 Btu/h and  < ~~25~~28,000 Btu/h | — | 9.4 CEER |
|  ~~25~~28,000 Btu/h |  | 9.0 CEER |
| Room air conditioners, without louvered sides | < 6,000 Btu/h | — | 10.0 CEER | ANSI/AHAM RAC-1 |
|  6,000 Btu/h and  < 8,000 Btu/h | — | 10.0 CEER |
|  8,000 Btu/h and  < 11,000 Btu/h | — | 9.6 CEER |
|  11,000 Btu/h and  < 14,000 Btu/h | — | 9.5 CEER |
|  14,000 Btu/h and  < 20,000 Btu/h | — | 9.3 CEER |
|  20,000 Btu/h | — | 9.4 CEER |
| Room air-conditioner with reverse cycle~~heat~~ ~~pumps~~ withlouvered  sides for applications outside US | < 20,000 Btu/h | — | 9.8 CEER | ANSI/ AHAM RAC-1 |
|  20,000 Btu/h | — | 9.3 CEER |
| Room air-conditioner heat pumps without  louvered sides for applications outside US | < 14,000 Btu/h | — | 9.3 CEER |
|  14,000 Btu/h | — | 8.7 CEER |
| Room air conditioner casement only for applications outside US | All capacities | — | 9.5 CEER | ANSI/ AHAM RAC-1 |
| Room air conditioner casement-slider for applications outside US | All capacities | — | 10.4 CEER |

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) - 32]/1.8, wb = wet bulb, db = dry bulb.

“Cap” = The rated cooling capacity of the project in Btu/h. Where the unit’s capacity is less than 7,000 Btu/h, use 7,000 Btu/h in the calculation. Where the unit’s capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculations.

* + 1. Chapter 6 contains a complete specification of the referenced, which includes test procedures, including the referenced year version of the test procedure.

b. ~~Replacement~~ Nonstandard size unit ~~shall~~must be factory labeled as follows: “MANUFACTURED FOR ~~REPLACEMENT~~NONSTANDARD APPLICATIONS ONLY: NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS.” ~~Replacemen~~tNonstandard size efficiencies apply only to units with existing sleeves having an external wall opening of less than 16 inches (406 mm) high~~in height~~ and or less than 42 inches (1067 mm) wide~~in width~~ and less than 670 square inches (0.43 m2 ).

c.The cooling-mode wet bulb temperature requirement only applies for units that reject condensate to the condenser coil.

d. “Cap” in EER and COPH equations for PTACs and PTHPs means cooling capacity in Btu/h at 95F outdoor dry-bulb temperature.

**(EN10216 AS)**

# ~~TABLE 403.2.3(4)~~

**~~WARM AIR FURNACES AND COMBINATION WARM AIR FURNACES/AIR-CONDITIONING UNITS,~~ ~~WARM-AIR DUCT FURNACES AND UNIT HEATERS, MINIMUM EFFICIENCY REQUIREMENTS~~**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **~~EQUIPMENT TYPE~~** | **~~SIZE CATEGORY~~ ~~(INPUT)~~** | **~~SUBCATEGORY OR~~ ~~RATING CONDITION~~** | **MINIMUM EFFICIENCYd, e** | **TEST PROCEDUREa** |
| ~~Warm air furnaces, gas-fired~~ ~~Non-weatherized~~  ~~Weatherized gas furnace~~ | ~~< 225,000 Btu/h~~ | ~~—~~ | ~~80% AFUE or 80%~~*~~E~~* c  *t*  ~~81% AFUE~~ | ~~DOE 10 CFR, Part 430 or~~  ~~Section 2.39, Thermal Efficiencyof~~ ~~ANSI Z 21.47~~ |
| ~~ 225,000 Btu/h~~ | ~~Maximum capacity~~c | ~~80%~~*~~E~~t*f | ~~Section 2.39, Thermal Efficiency of~~ ~~ANSI Z21.47~~ |
| ~~Warm air furnaces, oil-fired~~  ~~Non-weatherized Weatherized~~ ~~oil-fired furnace~~ | ~~< 225,000 Btu/h~~ | ~~—~~ | ~~83% AFUE or 80%~~*~~E~~* c  *t*  ~~78% AFUE~~ | DOE 10 CFR, Part 430 or  ~~Section 42, Combustion, of UL 727~~ |
| ~~ 225,000 Btu/h~~ | ~~Maximum capacity~~b | g  ~~81%~~*~~E~~t* | Section 42, Combustion, of UL 727 |
| ~~Warm air duct furnaces, gas-fired~~ | ~~All capacities~~ | ~~Maximum capacity~~b | ~~80%~~*~~E~~c* | ~~Section 2.10, Efficiency of~~ ~~ANSI Z83.8~~ |
| ~~Warm air unit heaters, gas-fired~~ | ~~All capacities~~ | ~~Maximum capacity~~b | ~~80%~~*~~E~~c* | ~~Section 2.10, Efficiency of~~ ~~ANSI Z83.8~~ |
| ~~Warm air unit heaters, oil-fired~~ | ~~All capacities~~ | ~~Maximum capacity~~b | ~~80%~~*~~E~~c* | ~~Section 40, Combustion, of UL 731~~ |
| ~~Mobile home furnace, gas-fired~~ | ~~< 225,000 Btu/h~~ | ~~—~~ | ~~80% AFUE~~ | ~~DOE 10 CFR, Part 430~~ |
| ~~Mobile home furnace, oil-fired~~ | ~~< 225,000 Btu/h~~ | ~~—~~ | ~~75% AFUE~~ | ~~DOE 10 CFR, Part 430~~ |

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

1. ~~Chapter 6, Referenced Standards, contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure~~.
2. ~~Minimum and maximum ratings as provided for and allowed by the unit’s controls~~.
3. ~~Combination units not covered by the National Appliance Energy Conservation Act of 1987 (NAECA) (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h [19 kW]) shall comply with either rating~~.
4. *~~E~~t* = Thermal efficiency. See test procedure for detailed discussion.
5. *~~E~~c* ~~= Combustion efficiency (100% less flue losses). See test procedure for detailed discussion~~.
6. *~~E~~c* ~~= Combustion efficiency. Units shall also include an IID, have jackets not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space~~.
7. *Et* = Thermal efficiency. Units shall also include an IID, have jacket losses not exceeding 0.75 percent of the input rating, and have either power venting or a ~~flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned spa~~

# TABLE 403.2.3(4)

**WARM AIR FURNACES AND COMBINATION WARM AIR FURNACES/AIR-CONDITIONING UNITS, WARM-AIR DUCT FURNACES AND UNIT HEATERS, MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY(INPUT)** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Warm air furnaces, gas fired for US Residential Application | < 225,000 Btu/h | Nonweatherized excluding mobile home | 80% AFUE | DOE 10 CFR, Part 430  Appendix N |
| Nonweatherized excluding mobile home | 80% AFUE |
| Weatherized | 81% AFUE |
| Warm air furnaces, gas fired for application outside the US | < 225,000 Btu/h | Maximum capacityc | 80% AFUE  (nonweatherized) or 81% AFUE  (weatherized) or 80%*E* b, d  *t* | DOE 10 CFR, Part 430  Appendix N or Section 2.39, Thermal  Efficiencyof ANSI Z 21.47 |
| Warm air furnaces, gas- fired |  225,000 Btu/h | Maximum capacityc | 80%*Et*b, d  before 1/1/2023  81%*Et*d after 1/1/2023 | Section 2.39, Thermal Efficiency of ANSI Z21.47 |
| Warm air furnaces, oil- fired for US Residential Application | < 225,000 Btu/h | Nonweatherized excluding mobile home | 83% AFUE | DOE 10 CFR, Part 430  Appendix N |
| Nonweatherized excluding mobile home | 75% AFUE |
| Weatherized | 78% AFUE |
| Warm air furnaces, oil- fired for application outside the US | < 225,000 Btu/h | Maximum capacityc | 83% AFUE  (nonweatherized)  or 78% AFUE (weatherized) or 80%*Et*b, d | DOE 10 CFR, Part 430  Appendix N or Section 42, Combustion,  UL 727 |
| Warm air furnaces, oil- fired |  225,000 Btu/h | Maximum capacityc | 81%*Et*  before 1/1/2023 82%*Et* after 1/1/2023 | Section 42, Combustion, UL 727 |
| Electric furnaces for US Residential Application | < 225,000 Btu/h | All | 78% AFUE | DOE 10 CFR, Part 430  Appendix N |
| Electric furnaces for  application outside the US | < 225,000 Btu/h | All | 96% AFUE | DOE 10 CFR, Part 430  Appendix N |
| Warm air duct furnaces, gas-fired | All capacities | Maximum capacityc | 80%*E* e  *c* | Section 2.10, Efficiency of ANSI Z83.8 |
| Warm air unit heaters, gas-fired | All capacities | Maximum capacityc | 80%*E* e, f  *c* | Section 2.10, Efficiency of ANSI Z83.8 |
| Warm air unit heaters, oil- fired | All capacities | Maximum capacityc | 80%*E* e, f  *c* | Section 40, Combustion, of UL 731 |
| Mobile home furnace, gas-fired | < 225,000 Btu/h | — | 80% AFUE | DOE 10 CFR, Part 430 |
| Mobile home furnace, oil- fired | < 225,000 Btu/h | — | 75% AFUE | DOE 10 CFR, Part 430 |

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

1. Chapter 6 contains a complete specification of the referenced standards, which include test procedure, including the reference year version of the test procedure.
2. Combination units (i.e., furnaces contained within the same cabinet as an air conditioner) not covered by 10 CFR 430 (i.e., three-phase power or with cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating. All other units less than 225,000 Btu/h sold in the U.S. must meet the AFUE standards for consumer products and test using USDOE’s AFUE test procedure at 10 CFR 430, Subpart B, Appendix N.
3. Compliance of multiple firing rate units shall be at the maximum firing rate.
4. *Et* = Thermal efficiency. See test procedure for detailed discussion. Units shall also include an IID, have jackets not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
5. *Ec* = Combustion efficiency (100% less flue losses). See test procedure for detailed discussion.
6. Units must also include an interrupted or intermittent ignition device (IID) and either power venting or an automatic flue damper.

**(EN10218 AS)**

# TABLE C403.2.3(7)

**WATER CHILLING PACKAGES – EFFICIENCY REQUIREMENTS**a, b, e

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **EQUIPMENTTYPE** | **SIZE CATEGORY** | **UNITS** | **~~BEFORE 1/1/2015~~** | | **~~AFTER 1/1/2015~~** | | **TEST PROCEDURE**c |
| **~~Path A~~** | **~~Path B~~** | **Path A** | **Path B** |
| Air-cooled chillers | < 150 tons | EER  (Btu/W) | ~~ 9.562 FL~~ | ~~NA~~c |  10.100 FL |  9.700 FL | AHRI 550/590 |
| ~~ 12.500~~  ~~IPLV~~ |  13.700 IPLV |  15.800  IPLV.IP |
|  150 tons | ~~ 9.562 FL~~ | ~~NA~~c |  10.100 FL |  9.700 FL |
| ~~ 12.500~~  ~~IPLV~~ |  14.000 IPLV |  16.100  IPLV.IP |
| Air cooled  without condenser, electrically operated | All capacities | EER  (Btu/W) |  |  | Air-cooled chillers without condenser shall be rated with matching  condensers and complying with air-  cooled chiller efficiency requirements | |
| Water cooled, electrically operated positive displacement | < 75 tons | kW/ton | ~~ 0.780 FL~~ | ~~ 0.800~~  ~~FL~~ |  0.750 FL |  0.780 FL |
| ~~ 0.630 IPLV~~ | ~~ 0.600~~  ~~IPLV~~ |  0.600 IPLV |  0.500 IPLV.IP |
|  75 tons and  < 150 tons | ~~ 0.775 FL~~ | ~~ 0.790~~  ~~FL~~ |  0.720 FL |  0.750 FL |
| ~~ 0.615 IPLV~~ | ~~ 0.586~~  ~~IPLV~~ |  0.560 IPLV |  0.490 IPLV.IP |
|  150 tons and  < 300 tons | ~~ 0.680 FL~~ | ~~ 0.718~~  ~~FL~~ |  0.660 FL |  0.680 FL |
| ~~ 0.580 IPLV~~ | ~~ 0.540~~  ~~IPLV~~ |  0.540 IPLV |  0.440 IPLV.IP |
|  300 tons and  < 600 tons | ~~ 0.620 FL~~ | ~~ 0.639~~  ~~FL~~ |  0.610 FL |  0.625 FL |
| ~~ 0.540 IPLV~~ | ~~ 0.490~~  ~~IPLV~~ |  0.520 IPLV |  0.410 IPLV.IP |
|  600 tons | ~~ 0.620 FL~~ | ~~ 0.639~~  ~~FL~~ |  0.560 FL |  0.585 FL |
| ~~ 0.540 IPLV~~ | ~~ 0.490~~  ~~IPLV~~ |  0.500 IPLV |  0.380 IPLV.IP |
| Water cooled, electrically operated centrifugal | < 150 tons | kW/ton | ~~ 0.634 FL~~ | ~~ 0.639~~  ~~FL~~ |  0.610 FL |  0.695 FL |
| ~~ 0.596 IPLV~~ | ~~ 0.450~~  ~~IPLV~~ |  0.550 IPLV |  0.440 IPLV.IP |
|  150 tons and  < 300 tons | ~~ 0.634 FL~~ | ~~ 0.639~~  ~~FL~~ |  0.610 FL |  0.635 FL |
| ~~ 0.596 IPLV~~ | ~~ 0.450~~  ~~IPLV~~ |  0.550 IPLV |  0.400 IPLV.IP |
|  300 tons and  < 400 tons | ~~ 0.576 FL~~ | ~~ 0.600~~  ~~FL~~ |  0.560 FL |  0.595 FL |
| ~~ 0.549 IPLV~~ | ~~ 0.400~~  ~~IPLV~~ |  0.520 IPLV |  0.390 IPLV.IP |
|  400 tons and  < 600 tons | ~~ 0.576 FL~~ | ~~ 0.600~~  ~~FL~~ |  0.560 FL |  0.585 FL |
| ~~ 0.549 IPLV~~ | ~~ 0.400~~  ~~IPLV~~ |  0.500 IPLV |  0.380 IPLV.IP |
|  600 tons | ~~ 0.570 FL~~ | ~~ 0.590~~  ~~FL~~ |  0.560 FL |  0.585 FL |
| ~~ 0.539 IPLV~~ | ~~ 0.400~~  ~~IPLV~~ |  0.500 IPLV |  0.380 IPLV.IP |
| Air cooled, absorption, single effect | All capacities | COP (W/W) | ~~ 0.600 FL~~ | ~~NA~~c |  0.600 FL | NAd | AHRI 560 |
| Water cooled absorption, single effect | All capacities | COP (W/W) | ~~ 0.700 FL~~ | ~~NA~~c |  0.700 FL | NAd |
| Absorption, double effect, indirect fired | All capacities | COP (W/W) | ~~ 1.000 FL~~ | ~~NA~~c |  1.000 FL | NAd |
| ~~ 1.050 IPLV~~ |  1.050 IPLV |
| Absorption double effect direct fired | All capacities | COP (W/W) | ~~ 1.000 FL~~ | ~~NA~~c |  1.000 FL | NAd |
| ~~ 1.000 IPLV~~ |  1.050 IPLV |

1. Chapter 6 contains a complete specification of the reference standards, which include test procedures, including the reference year version of the procedure
2. The requirements for centrifugal chiller shall be adjusted for nonstandard rating conditions in accordance with Section C403.2.3.1 and are only applicable for the range of conditions listed in Section C403.2.3.1. The requirements for air-cooled, water-cooled positive displacement and absorption chillers are at standard rating conditions defined in the reference test procedure.
3. Both the full-load and IPLV.IP requirements shall be met or exceeded to comply with this standard. Where there is a Path B, compliance can be with either PathA or Path B for any application.
4. NA means the requirements are not applicable for Path B and only Path A can be used for compliance.
5. FL represents the full-load performance requirements and IPLV.IP the part-load performance requirements.

**(EN10219 AS)**

**TABLE C403.2.3(8)**

**~~MINIMUM EFFICIENCY REQUIREMENTS:~~PERFORMANCE REQUIREMENTS FOR HEAT REJECTION EQUIPMENT–MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT TYPEa** | **TOTAL SYSTEM HEAT REJECTION CAPACITY AT RATED CONDITIONS** | **SUBCATEGORY ORRATING CONDITIONi** | **PERFORMANCE REQUIREDb, c, d, g, h** | **TEST PROCEDUREe, f** |
| Propeller or axial fanopen-circuit cooling towers | All | 95°F entering water 85°F leaving water75°F entering wb |  40.2 gpm/hp | CTI ATC-105 andCTI STD-201 |
| Centrifugal fan open-circuit coolingtowers | All | 95°F entering water 85°F leaving water75°F entering wb |  20.0 gpm/hp | CTI ATC-105 andCTI STD-201 |
| Propeller or axial fanclosed-circuit coolingtowers | All | 102°F entering water 90°F leaving water 75°F entering wb |  16.1 gpm/hp | CTI ATC-105S andCTI STD-201 |
| Centrifugal fan closed-circuit cooling towers | All | 102°F entering water 90°F leaving water 75°F entering wb |  7.0 gpm/hp | CTI ATC-105S andCTI STD-201 |
| Propeller or axial fan dry coolers (air- cooled fluid coolers) | All | 115°F entering water 105°F leaving water 95°F entering wb |  4.5 gpm/hp | CTI ATC-105DS |
| Propeller or axial fan evaporative condensers | All | Ammonia Test Fluid 140°F entering gas temperature96.3°F condensing temperature  75°F entering wb |  134,000 Btu/h·hp | CTI ATC-106 |
| Centrifugal fan evaporative condensers | All | Ammonia Test Fluid 140°F entering gas temperature 96.3°F condensing temperature  75°F entering wb | 110,000 Btu/h·hp | CTI ATC-106 |
| Propeller or axial fan evaporative condensers | All | ~~R-507A~~R-448A Test Fluid 165°F  entering gas temperature105°F condensing temperature  75°F entering wb | ~~~~ 157,000 Btu/h·hp   160,000 Btu/h·hp | CTI ATC-106 |
| Centrifugal fan evaporative condensers | All | ~~R-507A~~R-448A Test Fluid 165°F  entering gas temperature105°F condensing temperature  75°F entering wb |  135,000 Btu/h·hp   137,000 Btu/h·hp | CTI ATC-106 |
| Air-cooled condensers | All | 125°F Condensing Temperature 190°F Entering Gas Temperature 15°F subcooling  95°F entering db |  176,000 Btu/h·hp | AHRI 460 |

For SI: °C = [(°F)-32]/1.8, L/s · kW = (gpm/hp)/(11.83), COP = (Btu/h · hp)/(2550.7), db = dry bulb temperature, °F, wb = wet bulb temperature, °F.

1. The efficiencies and test procedures for both open- and closed-circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of wet and dry heat exchange sections.
2. For purposes of this table, open circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition listed in Table 403.2.3(8) divided by the fan nameplate-rated motor power.
3. For purposes of this table, closed-circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition listed in Table 403.2.3(8) divided by the sum of the fan nameplate-rated motor power and the spray pump nameplate-rated motor power.
4. For purposes of this table, air-cooled condenser performance is defined as the heat rejected from the refrigerant divided by the fan nameplate-rated motor power.
5. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure. The certification requirements do not apply to field-erected cooling towers.
6. Where a certification program exists for a covered product and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be listed in the certification program; or, where a certification program exists for a covered product, and it includes provisions for verification and challenge of equipment efficiency ratings, but the product is not listed in the existing certification program, the ratings shall be verified by an independent laboratory test report.
7. Cooling towers shall comply with the minimum efficiency listed in the table for that specific type of tower with the capacity effect of any project-specific accessories and/or options included in the capacity of the cooling tower.
8. For purposes of this table, evaporative condenser performance is defined as the heat rejected at the specified rating condition in the table divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power.
9. Requirements for evaporative condensers are listed with ammonia (R-717) and ~~R-507A~~R-448A as test fluids in the table. Evaporative condensers intended for use with halocarbon refrigerants other than ~~R-507A~~R-448A shall meet the minimum efficiency requirements listed in this table with ~~R-507A~~ R-448A as the test fluid. For ammonia, the condensing temperature is defined as the saturation temperature corresponding to the refrigerant pressure at the condenser entrance. For R-448A, which is a zeotropic refrigerant, the condensing temperature is defined as the arithmetic average of the dew point and the bubble point temperatures corresponding to the refrigerant pressure at the condenser entrance.

**(EN10221 AS)**

**~~TABLE C403.2.3(9)~~**

**~~MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS~~**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **~~Equipment~~ ~~Type~~** | **~~Net Sensible Cooling~~ ~~Capacitya~~** | **~~Standard Model~~** | **~~Minimum Net Sensible COPb (NSCOP)~~** | | | **~~Test Procedure~~** |
| **~~Return Air Dry-Bulb Temperature /~~ ~~Dew-Point Temperature~~** | | |
| **~~Class 1~~** | **~~Class 2~~** | **~~Class 3~~** |
| ~~Air cooled~~ | ~~< 65,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.30~~ |  | ~~AHRI 1360~~ |
| ~~Upflow unit—ducted~~ |  | ~~2.10~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.09~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.45~~ |
| ~~ 65,000 and~~  ~~< 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.20~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~2.05~~ |  |
| ~~Upflow unit—nonducted~~ | ~~1.99~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.35~~ |
| ~~ 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.00~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~1.85~~ |  |
| ~~Upflow unit—nonducted~~ | ~~1.79~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.15~~ |
| ~~Water cooled~~ | ~~< 65,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.50~~ |  | ~~AHRI 1360~~ |
| ~~Upflow unit—ducted~~ |  | ~~2.30~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.25~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.70~~ |
| ~~ 65,000 and~~  ~~< 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.40~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~2.20~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.15~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.60~~ |
| ~~ 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.25~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~2.10~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.05~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.45~~ |
| ~~Water cooled with~~  *~~fluid economizer~~* | ~~< 65,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.45~~ |  | ~~AHRI 1360~~ |
| ~~Upflow unit—ducted~~ |  | ~~2.25~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.20~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.60~~ |
| ~~ 65,000 and~~  ~~< 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.35~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~2.15~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.10~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.55~~ |
| ~~ 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.20~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~2.05~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.00~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.40~~ |

*~~(continued)~~*

**~~TABLE C403.2.3(9)—continued~~**

**~~MINIMUM EFFICIENCY AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS~~**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **~~Equipment~~ ~~Type~~** | **~~Net Sensible Cooling~~ Capacitya** | **~~Standard Model~~** | **Minimum Net Sensible COPb (NSCOP)** | | | **~~Test Procedure~~** |
| **~~Return Air Dry-Bulb Temperature /~~ ~~Dew-Point Temperature~~** | | |
| **~~Class 1~~** | **~~Class 2~~** | **~~Class 3~~** |
| ~~Glycol cooled~~ | ~~< 65,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.30~~ |  | ~~AHRI 1360~~ |
| ~~Upflow unit—ducted~~ |  | ~~2.10~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.00~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.40~~ |
| ~~ 65,000 and~~  ~~< 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.05~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~1.85~~ |  |
| ~~Upflow unit—nonducted~~ | ~~1.85~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.15~~ |
| ~~ 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~1.95~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~1.80~~ |  |
| ~~Upflow unit—nonducted~~ | ~~1.75~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.10~~ |
| ~~Glycol cooled~~ ~~with~~ *~~fluid econo-~~ ~~mizer~~* | ~~< 65,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~2.25~~ |  | ~~AHRI 1360~~ |
| ~~Upflow unit—ducted~~ |  | ~~2.10~~ |  |
| ~~Upflow unit—nonducted~~ | ~~2.00~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.35~~ |
| ~~ 65,000 and~~  ~~< 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~1.95~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~1.80~~ |  |
| ~~Upflow unit—nonducted~~ | ~~1.75~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.10~~ |
| ~~ 240,000 Btu/h~~ | ~~Downflow unit~~ |  | ~~1.90~~ |  |
| ~~Upflow unit—ducted~~ |  | ~~1.80~~ |  |
| ~~Upflow unit—nonducted~~ | ~~1.70~~ |  |  |
| ~~Horizontal-flow unit~~ |  |  | ~~2.10~~ |

~~For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) – 32]/1.8~~

1. ~~Net Sensible Cooling Capacity. The rate, expressed in Btu/h and/or kW, at which the equipment removes sensible heat from the air passing through it under specified conditions of operation, including the fan energy dissipated into the conditioned space~~.
2. ~~Net Sensible Coefficient of Performance (NSCOP). A ratio of the Net Sensible Cooling Capacity in kilowatts to the total power input in kilowatts (excluding reheaters and humidifiers) at any given set of Rating Conditions defined in AHRI Standard 1360~~.

**TABLE C403.2.3(9)**

**FLOOR-MOUNTED AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS–MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EquipmentType** | **Standard Model** | **Net Sensible Cooling Capacityb** | **Minimum Net Sensible COPc** | **Rating Conditions Return Air**  (dry bulb /dew point) | **Test Procedurea** |
| Air cooled | Downflow | < 80,000 Btu/h | 2.70 | 85F/52F (Class 2) | AHRI 1360 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.58 |
| ≥ 295,000 Btu/h | 2.36 |
| Upflow–ducted | < 80,000 Btu/h | 2.67 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.55 |
| ≥ 295,000 Btu/h | 2.33 |
| Upflow–nonducted | < 65,000 Btu/h | 2.16 | 75F/52F (Class 1) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.04 |
| ≥ 240,000 Btu/h | 1.89 |
| Horizontal | < 65,000 Btu/h | 2.65 | 95F/52F (Class 3) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.55 |
| ≥ 240,000 Btu/h | 2.47 |
| Air cooled with fluid economizer | Downflow | < 80,000 Btu/h | 2.70 | 85F/52F (Class 2) | AHRI 1360 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.58 |
| ≥ 295,000 Btu/h | 2.36 |
| Upflow–ducted | < 80,000 Btu/h | 2.67 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.55 |
| ≥ 295,000 Btu/h | 2.33 |
| Upflow–nonducted | < 65,000 Btu/h | 2.09 | 75F/52F (Class 1) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 1.99 |
| ≥ 240,000 Btu/h | 1.81 |
| Horizontal | < 65,000 Btu/h | 2.65 | 95F/52F (Class 3) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.55 |
| ≥ 240,000 Btu/h | 2.47 |
| Water cooled | Downflow | < 80,000 Btu/h | 2.82 | 85F/52F (Class 2) | AHRI 1360 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.73 |
| ≥ 295,000 Btu/h | 2.67 |
| Upflow–ducted | < 80,000 Btu/h | 2.79 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.70 |
| ≥ 295,000 Btu/h | 2.64 |
| Upflow–nonducted | < 65,000 Btu/h | 2.43 | 75F/52F (Class 1) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.32 |
| ≥ 240,000 Btu/h | 2.20 |
| Horizontal | < 65,000 Btu/h | 2.79 | 95F/52F (Class 3) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.68 |
| ≥ 240,000 Btu/h | 2.60 |

*(continued)*

**TABLE C403.2.3(9)–continued**

**FLOOR-MOUNTED AIR CONDITIONERS AND CONDENSING UNITS SERVING COMPUTER ROOMS–MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EquipmentType** | **Standard Model** | **Net Sensible Cooling Capacityb** | **Minimum Net Sensible COPc** | **Rating Conditions Return Air**  (dry bulb /dew point) | **Test Procedurea** |
| Water cooled with fluid economizer | Downflow | < 80,000 Btu/h | 2.77 | 85F/52F (Class 2) | AHRI 1360 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.68 |
| ≥ 295,000 Btu/h | 2.61 |
| Upflow–ducted | < 80,000 Btu/h | 2.74 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.65 |
| ≥ 295,000 Btu/h | 2.58 |
| Upflow–nonducted | < 65,000 Btu/h | 2.35 | 75F/52F (Class 1) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.24 |
| ≥ 240,000 Btu/h | 2.12 |
| Horizontal | < 65,000 Btu/h | 2.71 | 95F/52F (Class 3) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.60 |
| ≥ 240,000 Btu/h | 2.54 |
| Glycol cooled | Downflow | < 80,000 Btu/h | 2.56 | 85F/52F (Class 2) | AHRI 1360 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.24 |
| ≥ 295,000 Btu/h | 2.21 |
| Upflow–ducted | < 80,000 Btu/h | 2.53 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.21 |
| ≥ 295,000 Btu/h | 2.18 |
| Upflow–nonducted | < 65,000 Btu/h | 2.08 | 75F/52F (Class 1) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 1.90 |
| ≥ 240,000 Btu/h | 1.81 |
| Horizontal | < 65,000 Btu/h | 2.48 | 95F/52F (Class 3) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.18 |
| ≥ 240,000 Btu/h | 2.18 |
| Glycol cooled with fluid economizer | Downflow | < 80,000 Btu/h | 2.51 | 85F/52F (Class 2) | AHRI 1360 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.19 |
| ≥ 295,000 Btu/h | 2.15 |
| Upflow–ducted | < 80,000 Btu/h | 2.48 |
| ≥80,000 Btu/h and  < 295,000 Btu/h | 2.16 |
| ≥ 295,000 Btu/h | 2.12 |
| Upflow–nonducted | < 65,000 Btu/h | 2.00 | 75F/52F (Class 1) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 1.82 |
| ≥ 240,000 Btu/h | 1.73 |
| Horizontal | < 65,000 Btu/h | 2.44 | 95F/52F (Class 3) |
| ≥65,000 Btu/h and  < 240,000 Btu/h | 2.10 |
| ≥ 240,000 Btu/h | 2.10 |

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) – 32]/1.8

* + 1. Chapter 6 contains a complete specification of the referenced standards, which includes the test procedures, including the referenced year version of the test procedure.
    2. Net Sensible Cooling Capacity. The rate, expressed in Btu/h and/or kW, at which the equipment removes sensible heat from the air passing through it under specified conditions of operation, including the fan energy dissipated into the conditioned space.
    3. Net Sensible Coefficient of Performance. A ratio of the Net Sensible Cooling Capacity in kilowatts to the total power input in kilowatts (excluding reheaters and humidifiers) at any given set of Rating Conditions defined in AHRI Standard 1360.

**(EN10222 AS)**

**~~TABLE C403.2.3(11)~~**

**~~MINIMUM EFFICIENCY REQUIREMENTS~~**

**~~VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONERS AND HEAT PUMPS~~**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **~~EQUIPMENT TYPE~~** | **~~SIZE CATEGORY~~** | **HEATING TYPEa** | **~~MINIMUM EFFICIENCY~~** | **~~TEST PROCEDUREb~~** |
| ~~VRF Multi-split~~ ~~Air Conditioners~~ ~~(Air-cooled)~~ | ~~< 65,000 Btu/h~~ | ~~All~~ | ~~13.0 SEER~~ | ~~AHRI 1230~~  ~~(omit Sections 5.1.2~~ ~~and 6.6)~~ |
| ~~ 65,000 Btu/h and~~  ~~< 135,000 Btu/h~~ | ~~Electric resistance (or none)~~ | ~~11.2 EER~~ |
| ~~All other~~ | ~~11.0 EER~~ |
| ~~ 135,000 Btu/h and~~  ~~< 240,000 Btu/h~~ | ~~Electric resistance (or none)~~ | ~~11.0 EER~~ |
| ~~All other~~ | ~~10.8 EER~~ |
| ~~ 240,000 Btu/h and~~  ~~< 760,000 Btu/h~~ | ~~Electric resistance (or none)~~ | ~~10.0 EER~~ |
| ~~All other~~ | ~~9.8 EER~~ |
| ~~VRF Multi-split~~ ~~Heat Pumps~~ ~~(Air-cooled)~~ | ~~< 65,000 Btu/h~~ | ~~All~~ | ~~13.0 SEER~~  ~~7.7 HSPF~~ |
| ~~ 65,000 Btu/h and~~  ~~< 135,000 Btu/h~~ | ~~Electric resistance (or none)~~ | ~~11.0 EER~~  ~~3.3 COP~~ |
| ~~All other~~ | ~~10.8 EER~~  ~~3.3 COP~~ |
|  ~~135,000 Btu/h and~~  ~~< 240,000 Btu/h~~ | ~~Electric resistance (or none)~~ | ~~10.6 EER~~  ~~3.2 COP~~ |
| ~~All other~~ | ~~10.4 EER~~  ~~3.2 COP~~ |
| ~~ 240,000 Btu/h and~~  ~~< 760,000 Btu/h~~ | ~~Electric resistance (or none)~~ | ~~9.5 EER~~  ~~3.2 COP~~ |
| ~~All other~~ | ~~9.3 EER~~  ~~3.2 COP~~ |
| ~~VRF Multi-split~~ ~~Air Conditioners~~ ~~(Water-source)~~ | ~~< 17,000 Btu/h~~ | ~~Without heat recovery~~ | ~~12.0 EER~~  ~~4.3 COP~~ |
| ~~With heat recovery~~ | ~~11.8 EER~~  ~~4.3 COP~~ |
| ~~ 17,000 Btu/h and~~  ~~< 65,000 Btu/h~~ | ~~All~~ | ~~12.0 EER~~  ~~4.3 COP~~ |
| ~~ 65,000 Btu/h and~~  ~~< 135,000 Btu/h~~ | ~~All~~ | ~~12.0 EER~~  ~~4.3 COP~~ |
| ~~ 135,000 Btu/h and~~  ~~< 760,000 Btu/h~~ | ~~Without heat recovery~~ | ~~10.0 EER~~  ~~4.0 COP~~ |
| ~~With heat recovery~~ | ~~9.8 EER~~  ~~4.0 COP~~ |

~~For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) – 32]/1.8~~

1. ~~VRAF Multi-split Heat Pumps (air-cooled) with heat recovery fall under the category of “All Other Types of Heating” unless they also have electric resistance heating, in which case it falls under the category for “No Heating or Electric Resistance Heating.”~~
2. ~~Chapter 6, Referenced Standards, contains a complete specification of the referenced test procedure, including the reference year version of the test procedure~~.

**TABLE C403.2.3(11)**

**ELECTRICALLY OPERATED VARIABLE REFRIGERANT FLOW MULTI-SPLIT AIR CONDITIONERS–MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPEa** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| VRF air conditioners, air-cooled | < 65,000 Btu/h | All | VRF multisplit system | 13.0 SEER | AHRI 1230 |
|  65,000 Btu/h and  < 135,000 Btu/h | Electric resistance (or none) | VRF multisplit system | 11.0 EER  15.5 IEER |
|  135,000 Btu/h and  < 240,000 Btu/h | Electric resistance (or none) | VRF multisplit system | 11.0 EER  14.9 IEER |
|  240,000 Btu/h | Electric resistance (or none) | VRF multisplit system | 10.0 EER  13.9 IEER |

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) – 32]/1.8

a. Chapter 6, Referenced Standards, contains a complete specification of the referenced test procedure, including the reference year version of the test procedure.

**(EN10223 AS)**

New Table C403.2.3(12). This new table substitutes heat pump part of variable refrigerant flow products listed in Table C403.2.3(11) of the 2020 FBC-EC code.

TABLE C403.2.3(12)

ELECTRICALLY OPERATED VARIABLE REFRIGERANT FLOW AND APPLIED HEAT PUMPS–MINIMUM EFFICIENCY REQUIREMENTS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPEa** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| VRF air cooled (cooling mode) | < 65,000 Btu/h | All | VRF multisplit system | 13.0 SEER | AHRI 1230 |
|  65,000 Btu/h and  < 135,000 Btu/h | Electric resistance (or none) | 11.0 EER  14.6 IEER |
| VRF multisplit system  with heat recovery | 10.8 EER  14.4 IEER |
|  135,000 Btu/h and  < 240,000 Btu/h | VRF multisplit system | 10.6 EER  13.9 IEER |
| VRF multisplit system  with heat recovery | 10.4 EER  13.7 IEER |
|  240,000 Btu/h | VRF multisplit system | 9.5 EER  12.7 IEER |
| VRF multisplit system  with heat recovery | 9.3 EER  12.5 IEER |
| VRF water source (cooling mode) | < 65,000 Btu/h | All | VRF multisplit system  86F entering water | 12.0 EER  16.0 IEER | AHRI 1230 |
| VRF multisplit system  with heat recovery 86F entering water | 11.8 EER  15.8 IEER |
|  65,000 Btu/h and  < 135,000 Btu/h | VRF multisplit system 86F entering water | 12.0 EER  16.0 IEER |
| VRF multisplit system  with heat recovery 86F entering water | 11.8 EER  15.8 IEER |
|  135,000 Btu/h and  < 240,000 Btu/h | VRF multisplit system  86F entering water | 10.0 EER  14.0 IEER |
| VRF multisplit system  with heat recovery 86F entering water | 9.8 EER  13.8 IEER |
|  240,000 Btu/h | VRF multisplit system  86F entering water | 10.0 EER  12.0 IEER |
| VRF multisplit system  with heat recovery 86F entering water | 9.8 EER  11.8 IEER |
| VRF groundwater source (cooling mode) | < 135,000 Btu/h | All | VRF multisplit system  59F entering water | 16.2 EER | AHRI 1230 |
| VRF multisplit system  with heat recovery 59F entering water | 16.0 EER |
|  135,000 Btu/h | VRF multisplit system  59F entering water | 13.8 EER |
| VRF multisplit system  with heat recovery 59F entering water | 13.6 EER |

*(continued)*

TABLE C403.2.3(12)–continued

ELECTRICALLY OPERATED VARIABLE REFRIGERANT FLOW AND APPLIED HEAT PUMPS–MINIMUM EFFICIENCY REQUIREMENTS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPEa** | **Subcategory or Rating Condition** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| VRF ground source (cooling mode) | < 135,000 Btu/h | All | VRF multisplit system  77F entering water | 13.4 EER | AHRI 1230 |
| VRF multisplit system  with heat recovery 77F entering water | 13.2 EER |
|  135,000 Btu/h | VRF multisplit system  77F entering water | 11.0 EER |
| VRF multisplit system  with heat recovery 77F entering water | 10.8 EER |
| VRF air cooled (heating mode) | < 65,000 Btu/h  (cooling mode) | – | VRF multisplit system | 7.7 HSPF | AHRI 1230 |
|  65,000 Btu/h and  < 135,000 Btu/h (cooling mode) | VRF multisplit system  47F db/43F wb outdoor air | 3.3 COPH |
| VRF multisplit system 17F db/15F wb outdoor air | 2.25 COPH |
|  135,000 Btu/h (cooling mode) | VRF multisplit system  47F db/43F wb outdoor air | 3.2 COPH |
| VRF multisplit system  17F db/15F wb outdoor air | 2.05 COPH |
| VRF water source (heating mode) | < 65,000 Btu/h (cooling mode) | – | VRF multisplit system  68F entering water | 4.3 COPH | AHRI 1230 |
|  65,000 Btu/h and  < 135,000 Btu/h (cooling mode) | VRF multisplit system 68F entering water | 4.3 COPH |
|  135,000 Btu/h and  < 240,000 Btu/h (cooling mode) | VRF multisplit system 68F entering water | 4.0 COPH |
|  240,000 Btu/h (cooling mode) | VRF multisplit system  68F entering water | 3.9 COPH |
| VRF groundwater source (heating mode) | < 135,000 Btu/h (cooling mode) | – | VRF multisplit system  50F entering water | 3.6 COPH | AHRI 1230 |
|  135,000 Btu/h  (cooling mode) | VRF multisplit system  50F entering water | 3.3 COPH |
| VRF ground source (heating mode) | < 135,000 Btu/h (cooling mode) | – | VRF multisplit system  32F entering water | 3.1 COPH | AHRI 1230 |
|  135,000 Btu/h  (cooling mode) | VRF multisplit system  32F entering water | 2.8 COPH |

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) – 32]/1.8

a. Chapter 6, Referenced Standards, contains a complete specification of the referenced test procedure, including the reference year version of the test procedure.

**(EN10224 AS)**

# COMMERCIAL ENERGY EFFICIENCY New Table C403.2.3(13)

**TABLE C403.2.3(13)**

**VAPOR-COMPRESSION-BASED INDOOR POOL DEHUMIDIFIERS–MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
|  |
| Single package indoor (with or without  economizer) | Rating Conditions: A or C | 3.5 MRE | AHRI 910 |
| Single package indoor water cooled (with or  without economizer) | Rating Conditions: A, B or C | 3.5 MRE |
| Single package indoor air cooled (with or without  economizer) | Rating Conditions: A, B or C | 3.5 MRE |
| Split system indoor air cooled (with or without  economizer) | Rating Conditions: A, B or C | 3.5 MRE |

1. Chapter 6 contains a complete specification of the referenced standards, which includes the test procedures, including the referenced year version of the test procedure.
2. MRE is moisture removal efficiency, defined as a ratio of the moisture removal capacity in lb of moisture/h to the power input values in kW at any given set of Rating Conditions expressed in lb of moisture/kWh.

**(EN10225 AS)**

**TABLE C403.2.3(14)**

**ELECTRICALLY OPERATED DX-DOAS UNITS, SINGLE-PACKAGE AND REMOTE CONDENSER, WITHOUT ENERGY RECOVERY–MINIMUM EFFICIENCY REQUIREMENTSb**

|  |  |  |  |
| --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SUBCATEGORY OR RATING**  **CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Air cooled (dehumidification mode) | – | 4.0 ISMRE | AHRI 920 |
| Air-source heat pump (dehumidification mode) | – | 4.0 ISMRE | AHRI 920 |
| Water cooled (dehumidification mode) | Cooling tower condenser water | 4.9 ISMRE | AHRI 920 |
| Chilled water | 6.0 ISMRE |
| Air-source heat pump (heating mode) |  | 2.7 ISCOP | AHRI 920 |
| Water-source heat pump (dehumidification mode) | Ground source, closed loop | 4.8 ISMRE | AHRI 920 |
| Ground-water source | 5.0 ISMRE |
| Water source | 4.0 ISMRE |
| Water-source heat pump (heating mode) | Ground source, closed loop | 2.0 ISCOP | AHRI 920 |
| Ground-water source | 3.2 ISCOP |
| Water source | 3.5 ISCOP |

1. Chapter 6 contains a complete specification of the referenced standards, which includes the test procedures, including the referenced year version of the test procedure.
2. This table is a replica of ASHRAE 90.1 Table 6.8.1-13 Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, without Energy Recovery–Minimum Efficiency Requirements

**(EN10226 AS)**

**COMMERCIAL ENERGY EFFICIENCY New Table C403.2.3(15)**

**TABLE C403.2.3(15)**

**ELECTRICALLY OPERATED DX-DOAS UNITS, SINGLE-PACKAGE AND REMOTE CONDENSER, WITH ENERGY RECOVERY–MINIMUM EFFICIENCY REQUIREMENTS**

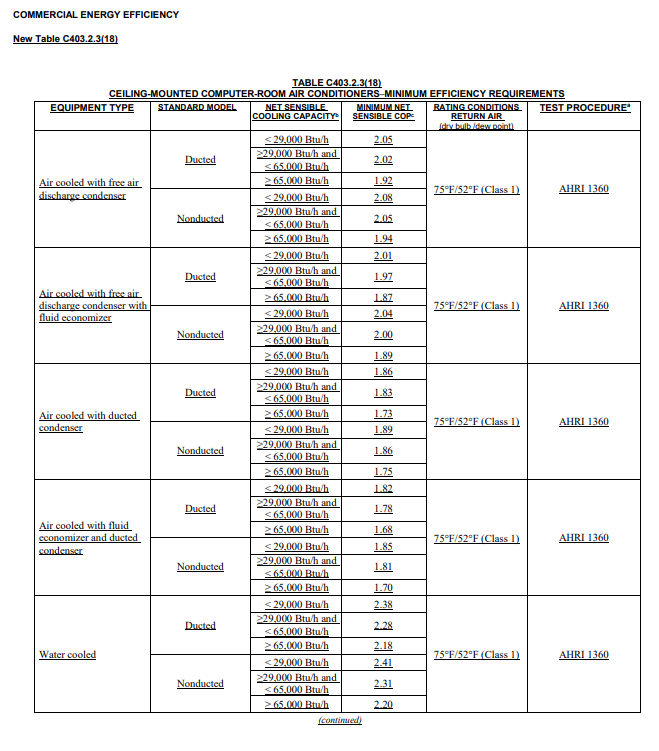
|  |  |  |  |
| --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SUBCATEGORY OR RATING**  **CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Air cooled (dehumidification mode) | – | 5.2 ISMRE | AHRI 920 |
| Air-source heat pump (dehumidification mode) | – | 5.2 ISMRE | AHRI 920 |
| Water cooled (dehumidification mode) | Cooling tower condenser water | 5.3 ISMRE | AHRI 920 |
| Chilled water | 6.6 ISMRE |
| Air-source heat pump (heating mode) | – | 3.3 ISCOP | AHRI 920 |
| Water-source heat pump (dehumidification mode) | Ground source, closed loop | 5.2 ISMRE | AHRI 920 |
| Ground-water source | 5.8 ISMRE |
| Water source | 4.8 ISMRE |
| Water-source heat pump (heating mode) | Ground source, closed loop | 3.8 ISCOP | AHRI 920 |
| Ground-water source | 4.0 ISCOP |
| Water source | 4.8 ISCOP |

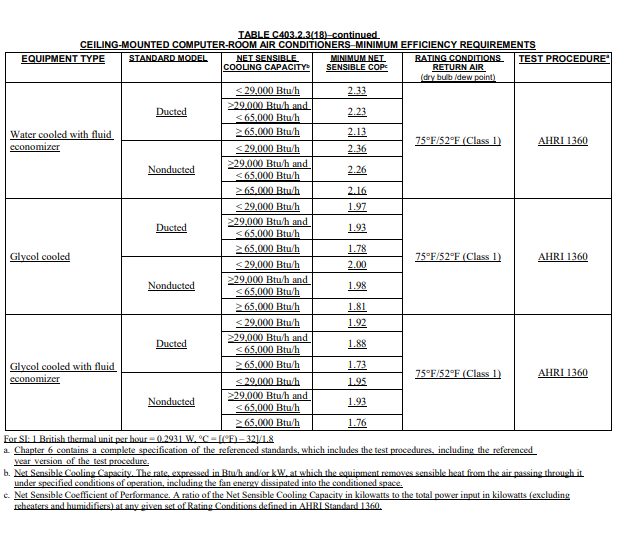
1. Chapter 6 contains a complete specification of the referenced standards, which includes the test procedures, including the referenced year version of the test procedure.
2. ISMRE is Integrated Seasonal Moisture Removal Efficiency expressed in lb of moisture/kW-h.
3. ISCOP is Integrated Seasonal Coefficient of Performance (ISCOP) expressed in W/W.

**(EN10227 AS)**



**(EN10228 AS)**





**(EN10233 AS)**

**TABLE C404.2**

**MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY**  **(input)** | **SUBCATEGORY OR RATING CONDITION** | **DRAW PATTERN** | **PERFORMANCE REQUIREDa, b, g** | **TEST PROCEDURE** |
|  |  | Tabletop,e   20 gallons and   120 gallons | Very small  Low Medium High  Very small Low Medium High  Very small Low Medium High  Very small Low Medium High | 0.6323 - (0.0058 × V), UEF  0.9188 - (0.0031 × V), UEF  0.9577 - (0.0023 × V), UEF  0.9884 - (0.0016 × V), UEF  0.8808 - (0.0008 × V), UEF  0.9254 - (0.0003 × V), UEF  0.9307 - (0.0002 × V), UEF  0.9349 - (0.0001 × V), UEF  1.9236 - (0.0011 × V), UEF  2.0440 - (0.0011 × V), UEF  2.1171 - (0.0011 × V), UEF  2.2418 - (0.0011 × V), UEF  1.0136 - (0.0028 × V), UEF  0.9984 - (0.0014 × V), UEF  0.9853 - (0.0010 × V), UEF  0.9720 - (0.0007 × V), UEF |  |
|  |  |  20 gallons and   55 gallons |  |
| Storage water heaters, electric |  12 kWd |  | DOE 10 CFR Part 430 |
|  |  | > 55 gallons and   120 gallons |  |
|  |  | Grid-enabledf  > 75 gallons |  |
|  | > 12 kW | All |  | (0.3 + 27/Vm), SL, %/h | DOE 10 CFR Part 431 |
|  |  |  | Very small | 0.91, UEF |  |
| Instantaneous water heaters, electric |  2 gal | Low Medium High | 0.91, UEF   * 1. , UEF   2. , UEF | DOE 10 CFR Part 430 |
| > 12 kW and   58.6 kW | Residential-duty commercial   2 gal | Very small Low Medium High | 0.80, UEF  0.80, UEF  0.80, UEF  0.80, UEF | DOE 10 CFR Part 431 |
|  |  4,000 Btu/h/gal and < 10 gal |  |  |  |
|  58.6 kW | No Requirement |
|  4,000 Btu/h/gal and  10 gal |
|  |  |  | Very small | 0.3456 - (0.0020 × V), UEF |  |
|  |  |  20 gallons and   55 gallons | Low Medium | 0.5982 - (0.0019 × V), UEF  0.6483 - (0.0017 × V), UEF |  |
|  |  |  | High | 0.6920 - (0.0013 × V), UEF |  |
|  |  75,000 Btu/h |  |  |  | DOE 10 CFR Part 430 |
| Storage water heaters, gas |  | > 55 gallons and   100 gallons | Very small Low Medium High | 0.6470 - (0.0006 × V), UEF  0.7689 - (0.0005 × V), UEF  0.7897 - (0.0004 × V), UEF  0.8072 - (0.0003 × V), UEF |  |
|  | > 75,000 Btu/h |  4,000 Btu/h/gal |  | 80% *Et*  Q/800 + 110 V SL, Btu/h |  |
|  | > 75,000 Btu/h and   105,000 Btu/h | Residential-duty commercial   120 gal | Very small Low Medium High | 0.2674 - (0.0009 × V), UEF  0.5362 - (0.0012 × V), UEF  0.6002 - (0.0011 × V), UEF  0.6597 - (0.0009 × V), UEF | DOE 10 CFR Part 431 |
|  |  |  | Very small | 0.80, UEF |  |
| Instantaneous water heaters, gas | > 50,000 Btu/h and   200,000 Btu/hc |  4,000 Btu/h/gal and  2 gal | Low Medium High | 0.81, UEF  0.81, UEF  0.81, UEF | DOE 10 CFR Part 430 |
| > 200,000 Btu/h |  4,000 Btu/h/gal and < 10 gal |  | 80% *Et* | DOE 10 CFR Part 431 |
| > 200,000 Btu/h |  4,000 Btu/h/gal  and  10 gal |  | 80% *Et*  Q/800 + 110 V SL, Btu/h |

*(continued)*

**TABLE C404.2—continued**

**MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY**  **(input)** | **SUBCATEGORY OR RATING CONDITION** | **DRAW PATTERN** | **PERFORMANCE REQUIREDa, b, g** | **TEST PROCEDURE** |
| Storage water heaters, oil |  105,000 Btu/h |  20 gal  50 gallons | Very small Low Medium High | 0.2509 - (0.0012 × V), UEF  0.5330 - (0.0016 × V), UEF  0.6078 - (0.0016 × V), UEF  0.6815 - (0.0014 × V), UEF | DOE 10 CFR Part 430 |
| > 105,000 Btu/h | < 4,000 Btu/h/gal |  | 80% Et  Q/800 + 110 V SL, Btu/h | ANSI Z21.10.3 |
| > 105,000 Btu/h and   140,000 Btu/h | Residential-duty commercial   120 gal | Very small Low Medium High | 0.2932 - (0.0015 × V), UEF  0.5596 - (0.0018 × V), UEF  0.6194 - (0.0016 × V), UEF  0.6740 - (0.0013 × V), UEF | DOE 10 CFR Part 431 |
| Instantaneous water heaters, oil |  210,000 Btu/h |  4,000 Btu/h/gal and < 2 gal |  | 0.59 - 0.0019V*,* EF | DOE 10 CFR Part 430 |
| > 210,000 Btu/h |  4,000 Btu/h/gal and < 10 gal |  | 80% *Et* | DOE 10 CFR Part 431 |
| > 210,000 Btu/h |  4,000 Btu/h/gal and  10 gal |  | 78% *Et*  Q/800 + 110 V SL, Btu/h |
| Hot water supply boilers, gas and oil |  300,000 Btu/h and  < 12,500,000 Btu/h |  4,000 Btu/h/gal and < 10 gal |  | 80% *Et* | DOE 10 CFR Part 431 |
| Hot water supply boilers, gas |  300,000 Btu/h and  < 12,500,000 Btu/h |  4,000 Btu/h/gal and  10 gal |  | 80% *Et*  Q/800 + 110 V SL, Btu/h |
| Hot water supply boilers, oil | > 300,000 Btu/h and  < 12,500,000 Btu/h | > 4,000 Btu/h/gal and  10 gal |  | 78% *Et*  Q/800 + 110 V SL, Btu/h |
| Pool heaters, gas and oil | All | — |  | 82% Et | ASHRAE 146 |
| Heat pump pool heaters | All | — |  | 4.0 COP  At low air temperature | AHRI 1160 h, i |
| Unfired storage tanks | All | — |  | Minimum insulation requirement R-12.5 (h **·** ft2 **·** °F)/Btu | DOE 10 CFR Part 431 |

For SI: °C = [(°F) - 32]/1.8, 1 British thermal unit per hour = 0.2931 W, 1 gallon = 3.785 L, 1 British thermal unit per hour per gallon = 0.078 W/L.

1. Energy factor (EF), uniform energy factor (UEF) and thermal efficiency (*Et*) are minimum requirements. In the EF and UEF equations, *V* is the rated volume in gallons.
2. Standby loss (SL) is the maximum Btu/h based on a nominal 70°F temperature difference between stored water and ambient requirements. In the SL equation, *Q* is the nameplate input rate in Btu/h. In the equations for electric water heaters, V is the rated volume in gallons and *Vm* is the measured volume in gallons. In the SL equation for oil and gas water heaters and boilers, *V* is the rated volume in gallons.
3. Instantaneous water heaters with input rates below 200,000 Btu/h shall comply with these requirements where the water heater is designed to heat water to temperatures 180°F or higher.
4. Electric water heaters with an input rating of 12 kW (40,950 Btu/h) or less that are designed to heat water to temperatures of 180°F or greater shall comply with the requirements for electric water heaters that have an input rating greater than 12 kW (40,950 Btu/h).
5. A tabletop water heater is a water heater that is enclosed in a rectangular cabinet with a flat top surface not more than 3 feet (0.91 m) in height.
6. A grid-enabled water heater is an electric resistance water heater that meets all of the following:
   1. Has a rated storage tank volume of more than 75 gallons.
   2. Is manufactured on or after April 16, 2015.
   3. Is equipped at the point of manufacture with an activation lock.
   4. Bears a permanent label applied by the manufacturer that complies with all of the following:
      1. Is made of material not adversely affected by water.
      2. Is attached by means of non-water-soluble adhesive.
      3. Advises purchasers and end-users of the intended and appropriate use of the product with the following notice printed in 16.5 point Arial Narrow Bold font: “IMPORTANT INFORMATION: This water heater is intended only for use as part of an electric thermal storage or demand response program. It will not provide adequate hot water unless enrolled in such a program and activated by your utility company or another program operator. Confirm the availability of a program in your local area before purchasing or installing this product.”
7. Water heaters and hot water supply boilers having more than 140 gallons of storage capacity need not meet the standby loss requirement if: (1) The tank surface area is thermally insulated to R-12.5 or more; (2) a standing pilot light is not used; and (3) for gas or oil-fired storage water heaters, they have a fire damper or fan-assisted combustion.
8. Test report from independent laboratory is required to verify procedure compliance.
9. Geothermal swimming pool heat pumps are not required to meet this standard.

**(EN10234 AS)**

**Revise as follows:**

**C403.2.4.1.1 Heat pump supplementary heat (Mandatory).** Heat pumps having supplementary electric resistance heat shall have controls that ~~, except during defrost, prevent supplementary heat operation where the heat pump can provide the heating load.~~limit supplemental heat operation to only those times when:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting,

2. The heat pump is operating in defrost mode,

3. The vapor compression cycle malfunctions, or

4. The thermostat malfunctions.

**(EN8743 / CE116-19 Part I AS)**

**C403.2.4.8 Automatic control of HVAC systems serving guest rooms (Mandatory).** In *Group R*-1 buildings containing more than 50 guestrooms, each guestroom shall be provided with controls complying with the provisions of Sections C403.7.6.1 and C403.7.6.2. Card key controls comply with these requirements.

**Revise as follows:**

**C403.2.4.8.1 Temperature setpoint controls.** Controls shall be provided on each HVAC system that are capable of and configured with three modes of temperature control.

1. When the guest room is rented but unoccupied, the controls shall ~~to~~ automatically raise the cooling setpoint and lower the heating setpoint by not less than 4°F (2°C) from the occupant setpoint within 30 minutes after the occupants have left the guestroom.

2. When the guest room is unrented and unoccupied, the controls shall ~~The controls shall be capable of and configured to~~ automatically raise the cooling setpoint to not lower than 80°F (27°C) and lower the heating setpoint to not higher than 60°F (16°C) ~~when the guestroom is unrented or has not been continuously occupied for more than 16 hours or~~ . Unrented and unoccupied guest room mode shall be initiated within 16 hours of the guest room being continuously occupied or where a *networked guestroom control system* indicates that the guestroom is unrented and the guestroom is unoccupied for more than ~~30~~ 20 minutes. A *networked guestroom control system* that is capable of returning the thermostat setpoints to default occupied setpoints 60 minutes prior to the time a guestroom is scheduled to be occupied is not precluded by this section. Cooling that is capable of limiting relative humidity with a setpoint not lower than 65-percent relative humidity during unoccupied periods is not precluded by this section.

3. When the guest room is occupied, HVAC set points shall return to their occupied set points once occupancy is sensed.

**C403.2.4.8.2 Ventilation controls.** Controls shall be provided on each HVAC system that are capable of and configured to automatically turn off the ventilation and exhaust fans within ~~30~~ 20 minutes of the occupants leaving the guestroom, or *isolation devices* shall be provided to each guestroom that are capable of automatically shutting off the supply of outdoor air to and exhaust air from the guest room.

**Exception:** Guestroom ventilation systems are not precluded from having an automatic daily pre-occupancy purge cycle that provides daily outdoor air ventilation during unrented periods at the design ventilation rate for 60 minutes, or at a rate and duration equivalent to one air change.

**(EN8775 / CE135-19 AS)**

**Revise as follows:**

**C403.2.6.2 Enclosed parking garage ventilation controls (Mandatory).** Enclosed parking garages used for storing or handling automobiles operating under their own power shall employ ~~contamination-sensing devices~~ carbon monoxide detectors applied in conjunction with nitrogen dioxide detectors and automatic controls configured to stage fans or modulate fan average airflow rates to 50 percent or less of design capacity, or intermittently operate fans less than 20 percent of the occupied time or as required to maintain acceptable contaminant levels in accordance with International Mechanical Code provisions. Failure of contamination-sensing devices shall cause the exhaust fans to operate continuously at design airflow.

**Exceptions:**

1. Garages with a total exhaust capacity less than ~~22~~8,~~500~~ 000 cfm (~~10 620~~ 3 775 L/s) with ventilation systems that do not utilize heating or mechanical cooling.

2. Garages that have a garage area to ventilation system motor nameplate power ratio that exceeds 1125 cfm/hp (710 L/s/kW) and do not utilize heating or mechanical cooling.

**(EN8755 / CE129-19 AMPC1)**

**Revise as follows:**

**C403.2.10 Piping insulation (Mandatory).** Piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table C403.2.10.

**Exceptions:**

1. Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code.

2. Factory-installed piping within room fan-coils and unit ventilators tested and rated according to AHRI 440 (except that the sampling and variation provisions of Section 6.5 shall not apply) and AHRI 840, respectively.

3. Piping that conveys fluids that have a design operating temperature range between 60°F (15°C) and 105°F (41°C).

4. Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power.

5. Strainers, control valves, and balancing valves associated with piping 1 inch (25 mm) or less in diameter.

6. Direct buried piping that conveys fluids at or below 60°F (15°C).

7. In radiant heating systems, sections of piping intended by design to radiate heat.

**(EN8825 / CE153-19 AS)**

Add new text as follows:

**C403.2.12.6 Large-diameter ceiling fans**. Where provided, large-diameter ceiling fans shall be tested and labeled in accordance with AMCA 230 and shall meet the efficiency

requirements of Table C403.2.12.6 and Section C403.2.12.6.1.

Add new text as follows:

**TABLE C403.2.12.6 CEILING FAN EFFICIENCY REQUIREMENTSa**

|  |  |  |
| --- | --- | --- |
| EQUIPMENT TYPE | MINIMUM EFFICIENCYb,c | TEST PROCEDURE |
| Large-diameter ceiling fan  for applications outside the  U.S.c | CFEI = 1.00 at high (maximum) speed  CFEI = 1.31 at 40% of high speed or the  nearest speed that is not less than 40% of  high speed | 10 CFR 430 Appendix U or AMCA Standard  230 and AMCA Standard 208 (for FEI  calculations) |
| Large-diameter ceiling fan | CFEI = 1.00 at high (maximum) speed; and  CFEI = 1.31 at 40% of high speed or the  nearest speed that is not less than 40% of  high speed | 10 CFR 430 Appendix U |

a. The minimum efficiency requirements at both high speed and 40% of maximum speed shall be met or exceeded to comply with this code.

b. Ceiling fans are regulated as consumer products by 10 CFR 430.

c. Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

**C403.2.12.6.1 Ceiling Fan Energy Index (CFEI).**The Ceiling Fan Energy Index shall be calculated as the ratio of the electric input power of a reference large-diameter ceiling fan to the electric input power of the actual large-diameter ceiling fan as calculated in accordance with AMCA 208 with the following modifications to the calculations for the reference fan: using an airflow constant (Q) of 26,500 cfm (12.507 m3/s), a pressure constant (P) of 0.0027 in. of water (0.6719 Pa), and fan efficiency constant (?) of 42%.

Add new standard(s) as follows:

230—15 with errata Laboratory Methods of Testing Air Circulating Fans for Rating and Certification

AMCA Air Movement and Control Association International 30 West University Drive Arlington Heights IL 60004-1806

10 CFR, Part 430, App U Uniform Test Method for Measuring the Energy Consumption of Ceiling Fans

DOE US Department of Energy c/o Superintendent of Documents 1000 Independence Avenue SW Washington DC 20585

**(EN10086 AS)/ (EN8783 / CE141-19 AM)**

**Add new text as follows:**

**C403.2.12.7 Low-capacity ventilation fans.** Mechanical ventilation system fans with motors less than 1/12 horsepower in capacity shall meet the efficacy requirements of Table C403.12.7 at one or more rating points.

**Exceptions:**

1. Where ventilation fans are a component of a listed heating or cooling appliance.

2. Dryer exhaust duct power ventilators, domestic range hoods, and domestic range booster fans that operate intermittently.

**TABLE C403.2.12.7**

**LOW-CAPACITY VENTILATION FAN EFFICACY EFFICACYa**

*Portions of table not shown remain unchanged.*

|  |  |  |  |
| --- | --- | --- | --- |
| **FAN LOCATION** | **AIR FLOW RATE MINIMUM**  **(CFM)** | **MINIMUM EFFICACY**  **(CFM/WATT)** | **AIR FLOW RATE MAXIMUM**  **(CFM)** |
| HRV or ERV | Any | 1.2 cfm/watt | Any |
| In-line fan | Any | 3.8 cfm/watt | Any |
| Bathroom, utility room | 10 | 2.8 cfm/watt | < 90 |
| Bathroom, utility room | 90 | 3.5 cfm/watt | Any |

a. Air flow shall be tested in accordance with HVI Standard 916 and listed. Efficacy shall be listed, or shall be derived from listed power and air flow. Fan efficacy for fully ducted HRV, ERV, balanced, and in-line fans shall be determined at a static pressure not less than 0.2 in. w.c. Fan efficacy for ducted range hoods, bathroom, and utility room fans shall be determined at a static pressure not less than 0.1 in. w.c.

**(EN8782 / CE140-19 AMPC1)**

**Revise as follows:**

**C403.2.4.1.1 Heat pump supplementary heat (Mandatory).** Heat pumps having supplementary electric resistance heat shall have controls that ~~, except during defrost, prevent supplementary heat operation where the heat pump can provide the heating load.~~limit supplemental heat operation to only those times when:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting,

2. The heat pump is operating in defrost mode,

3. The vapor compression cycle malfunctions, or

4. The thermostat malfunctions.

**(EN8743 / CE116-19 Part I AS)**

**Revise as follows:**

**C403.4.2.3.3 Two-position valve.** Each hydronic heat pump on the hydronic system having a total pump system power exceeding 10 hp (7.5 kW) shall have a two-position automatic valve interlocked to shut off the water flow when the compressor is off.

**(EN8749 / CE122-19 AS)**

**C403.4.2.4 Part-load controls.**

Hydronic systems greater than or equal to ~~500,000 Btu/h (146.5 kW)~~ 300,000 Btu/h (146.5 kW) in design output capacity supplying heated or chilled water to comfort conditioning systems shall include controls that ~~have the capability~~ are configured to do all of the following:

1. Automatically reset the supply-water temperatures in response to varying building heating and cooling demand using coil valve position, zone-return water temperature, building-return water temperature or outside air temperature. The temperature shall be capable of being reset by not less than 25 percent of the design supply-to-return water temperature difference.
2. Automatically vary fluid flow for hydronic systems with a combined motor capacity of ~~10 hp (7.5 kW)~~ 2 hp (1.5 kW) or larger with three or more control valves or other devices by reducing the system design flow rate by not less than 50 percent by designed valves that modulate or step open and close, or pumps that modulate or turn on and off as a function of load.
3. Automatically vary pump flow on heating-water systems, chilled-water systems and heat rejection loops serving water-cooled unitary air conditioners with a combined motor capacity of ~~10 hp (7.5 kW)~~ 2 hp (1.5 kW) or larger by reducing pump design flow by not less than 50 percent, utilizing adjustable speed drives on pumps, or multiple-staged pumps where not less than one-half of the total pump horsepower is capable of being automatically turned off. Pump flow shall be controlled to maintain one control valve nearly wide open or to satisfy the minimum differential pressure.

**Exceptions:**

1. Supply-water temperature reset for chilled-water systems supplied by off-site district chilled water or chilled water from ice storage systems.
2. Minimum flow rates other than 50 percent as required by the equipment manufacturer for proper operation of equipment where using flow bypass or end-of-line 3-way valves.
3. Variable pump flow on dedicated equipment circulation pumps where configured in primary/secondary design to provide the minimum flow requirements of the equipment manufacturer for proper operation of equipment.

**(EN10014 AS)**

**Revise as follows:**

**C403.4.4.5 Supply-air temperature reset controls.** Multiple-*zone* HVAC systems shall include controls that are capable of and configured to automatically reset the supply-air temperature in response to representative building loads, or to outdoor air temperature. The controls shall be configured to reset the supply air temperature not less than 25 percent of the difference between the design supply-air temperature and the design room air temperature. Controls that adjust the reset based on zone humidity are allowed in Climate Zones 0B, 1B, 2B, 3B, 3C and 4 through 8. HVAC zones that are expected to experience relatively constant loads, shall have maximum airflow designed to accommodate the fully reset supply air temperature.

**Exceptions:**

1. Systems that prevent reheating, recooling or mixing of heated and cooled supply air.

2. Seventy-five percent of the energy for reheating is from site-recovered or site-solar energy sources.

3. Systems in Climate Zones ~~with peak supply air quantities of 300 cfm (142 L/s) or less.~~0A, 1A, and 3A with less than 3000 cfm (1500 L/s) of design outside air.

4. Systems in Climate Zone 2A with less than 10,000 cfm (5000 L/s) of design outside air.

5. Systems in Climate Zones 0A, 1A, 2A, and 3A with not less than 80 percent outside air and employing exhaust air *energy* recovery complying with Section C403.7.4.

**Add new text as follows:**

**C403.4.4.5.1 Dehumidification Control Interaction.** In Climate Zones 0A, 1A, 2A, and 3A, the system design shall allow supply air temperature *reset* while dehumidification is provided. When dehumidification *control* is active, air economizers shall be locked out.

**(EN8752 / CE125-19 AS)**

**Revise as follows:**

**C403.4.6 Hot gas bypass limitation (Mandatory).** Cooling systems shall not use hot gas bypass or other evaporator pressure control systems unless the system is designed with multiple steps of unloading or continuous capacity modulation. The capacity of the hot gas bypass shall be limited as indicated in Table C403.3.3, as limited by Section C403.5.1.

**C403.4.2.5 Boiler turndown (Mandatory).** Boiler systems with design input of greater than 1,000,000 Btu/h (293 kW) shall comply with the turndown ratio specified in Table C403.3.4.

The system turndown requirement shall be met through the use of multiple single-input boilers, one or more modulating boilers or a combination of single-input and modulating boilers.

**(EN8742 / CE114-19 AS)**

**C404.2.1 High input service water-heating systems.** Gas-fired water-heating equipment installed in new buildings shall be in compliance with this section. Where a singular piece of water-heating equipment serves the entire building and the input rating of the equipment is 1,000,000 Btu/h (293 kW) or greater, such equipment shall have a thermal efficiency, Et , of not less than ~~90~~ 92 percent. Where multiple pieces of water-heating equipment serve the building and the combined input rating of the water-heating equipment is 1,000,000 Btu/h (293 kW) or greater, the combined input-capacity-weighted-average thermal efficiency, Et , shall be not less than 90 percent.

**Exceptions:**

1. Where not less than 25 percent of the annual service water-heating requirement is provided by on-site renewable energy or site-recovered energy, the minimum thermal efficiency requirements of this section shall not apply.

2. The input rating of water heaters installed in individual dwelling units shall not be required to be included in the total input rating of service water-heating equipment for a building.

3. The input rating of water heaters with an input rating of not greater than 100,000 Btu/h (29.3 kW) shall not be required to be included in the total input rating of service water-heating equipment for a building.

**(EN8826 / CE156-19 AS)**

**Revise as follows:**

**C404.5.2.1 Water volume determination.** The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters and manifolds between the nearest source of heated water and the termination of the fixture supply pipe. The volume in the piping shall be determined from the “Volume” column in Table ~~C404.5.1.~~ C404.5.1 or from Table C404.5.2.1. The volume contained within fixture shutoff valves, within flexible water supply connectors to a fixture fitting and within a fixture fitting shall not be included in the water volume determination. Where heated water is supplied by a recirculating system or heat-traced piping, the volume shall include the portion of the fitting on the branch pipe that supplies water to the fixture.

**TABLE C404.5.2.1**

**INTERNAL VOLUME OF VARIOUS WATER DISTRIBUTION TUBING**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **OUNCES OF WATER PER FOOT OF TUBE** | | | | | | | | | |
| **Size Nominal, Inch** | **Copper Type M** | **Copper Type L** | **Copper Type K** | **CPVC CTS SDR 11** | **CPVC SCH 40** | **CPVC SCH 80** | **PE-RT SDR 9** | **Composite ASTM F 1281** | **PEX CTS SDR 9** |
| 3/8 | 1.06 | 0.97 | 0.84 | N/A | 1.17 | — | 0.64 | 0.63 | 0.64 |
| 1/2 | 1.69 | 1.55 | 1.45 | 1.25 | 1.89 | 1.46 | 1.18 | 1.31 | 1.18 |
| 3/4 | 3.43 | 3.22 | 2.90 | 2.67 | 3.38 | 2.74 | 2.35 | 3.39 | 2.35 |
| 1 | 5.81 | 5.49 | 5.17 | 4.43 | 5.53 | 4.57 | 3.91 | 5.56 | 3.91 |
| 11/4 | 8.70 | 8.36 | 8.09 | 6.61 | 9.66 | 8.24 | 5.81 | 8.49 | 5.81 |
| 11/2 | 12.18 | 11.83 | 11.45 | 9.22 | 13.20 | 11.38 | 8.09 | 13.88 | 8.09 |
| 2 | 21.08 | 20.58 | 20.04 | 15.79 | 21.88 | 19.11 | 13.86 | 21.48 | 13.86 |

For SI: 1 ounce = 0.030 liter.

**(EN8828 / CE158-19 AMPC1)**

**Revise as follows:**

**C405.1 General (Mandatory).** This section covers lighting system controls, the maximum lighting power for interior and exterior applications and electrical energy consumption. Dwelling units within multifamily buildings shall comply with Section R404.1. All other dwelling units shall comply with Section R404.1, or with Sections C405.2.4 and C405.3. Sleeping units shall comply with Section C405.2.4, and with Section R404.1 or C405.3. ~~Lighting installed in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall comply with the lighting requirements of Section C403.2.14.~~

**C405.1.1 Walk-in cooler lighting**

Lights in walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers shall either use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, or shall use light sources with an efficacy of not less than 40 lumens per watt, including ballast losses, in conjunction with a device that turns off the lights within 15 minutes when the space is not occupied.

General lighting shall consist of all lighting included when calculating the total connected interior lighting power in accordance with Section C405.3.1 and which does not require specific application controls in accordance with Section C405.2.4.

**C405.3.1 Total connected interior lighting power.** The total connected interior lighting power shall be determined in accordance with Equation 4-10.

 **(Equation 4-10)**

where:

TCLP = Total connected lighting power (watts).

LVL = For luminaires with lamps connected directly to building power, such as line voltage lamps, the rated wattage of the lamp.

BLL = For luminaires incorporating a ballast or transformer, the rated input wattage of the ballast or transformer when operating that lamp.

LED = For light-emitting diode luminaires with either integral or remote drivers, the rated wattage of the luminaire.

TRK = For lighting track, cable conductor, rail conductor, and plug-in busway systems that allow the addition and relocation of luminaires without rewiring, the wattage shall be one of the following:

1. The specified wattage of the luminaires, but not less than 8 W per linear foot (25 W/lin m).

2. The wattage limit of the permanent current-limiting devices protecting the system.

3. The wattage limit of the transformer supplying the system.

Other = The wattage of all other luminaires and lighting sources not covered previously and associated with interior lighting verified by data supplied by the manufacturer or other approved sources.

The connected power associated with the following lighting equipment and applications is not included in calculating total connected lighting power.

1. Television broadcast lighting for playing areas in sports arenas.

2. Emergency lighting automatically off during normal building operation.

3. Lighting in spaces specifically designed for use by occupants with special lighting needs, including those with visual impairment and other medical and age-related issues.

4. Casino gaming areas.

5. Mirror lighting in dressing rooms.

6. Task lighting for medical and dental purposes that is in addition to *general lighting* ~~and controlled by an independent control device~~.

7. Display lighting for exhibits in galleries, museums and monuments that is in addition to *general lighting* ~~and controlled by an independent control device~~.

8. Lighting for theatrical purposes, including performance, stage, film production and video production.

9. Lighting for photographic processes.

10. Lighting integral to equipment or instrumentation and installed by the manufacturer.

11. Task lighting for plant growth or maintenance.

12. Advertising signage or directional signage.

13. Lighting for food warming.

14. Lighting equipment that is for sale.

15. Lighting demonstration equipment in lighting education facilities.

16. Lighting approved because of safety considerations.

17. Lighting in retail display windows, provided that the display area is enclosed by ceiling-height partitions.

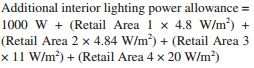
18. Furniture-mounted supplemental task lighting that is controlled by automatic shutoff.

19. Exit signs.

**C405.3.2.2.1 Additional interior lighting power.** Where using the Space-by-Space Method, an increase in the interior lighting power allowance is permitted for specific lighting functions. Additional power shall be permitted only where the specified lighting is installed ~~and automatically controlled separately from the general lighting, to be turned off during nonbusiness hours.~~ controlled in accordance with Section C405.2.4. This additional power shall be used only for the specified luminaires and shall not be used for any other purpose. An increase in the interior lighting power allowance is permitted in the following cases:

1. For lighting equipment to be installed in sales areas specifically to highlight merchandise, the additional lighting power shall be determined in accordance with Equation 4-11. Additional interior lighting power allowance = 1000 W + (Retail Area 1 x 0.45 W/ft2) + (Retail Area 2 x 0.45W/ft2) + (Retail Area 3 x 1.05 W/ft2) + (Retail Area 4 x 1.87 W/ft2)

For SI units:

 **(Equation 4-11)**

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.

**Exception:** Other merchandise categories are permitted to be included in Retail Areas 2 through 4, provided that justification documenting the need for additional lighting power based on visual inspection, contrast, or other critical display is approved by the code official.

2. For spaces in which lighting is specified to be installed in addition to the general lighting for the purpose of decorative appearance or for highlighting art or exhibits, provided that the additional lighting power shall be not more than 0.9 W/ft2 (9.7 W/m2) in lobbies and not more than 0.75 W/ft2 (8.1 W/m2) in other spaces.

**C405.2.1 Occupant sensor controls.** Occupant *sensor controls* shall be installed to control lights in the following

space types:

1. Classrooms/lecture/training rooms.

2. Conference/meeting/multipurpose rooms.

3. Copy/print rooms.

4. Lounges/breakrooms.

5. Enclosed offices.

6. Open plan office areas.

7. Restrooms.

8. Storage rooms.

9. Locker rooms.

10. Corridors.

11. Warehouse storage areas.

12. Other spaces 300 square feet (28 m2) or less that are enclosed by floor-to-ceiling height partitions.

**Exception:** Luminaires that are required to have specific application controls in accordance with

Section C405.2.5.

**C405.2.2 Time-switch controls.** Each area of the building that is not provided with *occupant sensor controls*

complying with Section C405.2.1.1 shall be provided with *time-switch controls* complying with Section

C405.2.2.1.

**Exceptions:**

1. Luminaires that are required to have specific application controls in accordance with Section

C405.2.4.

2. Spaces where patient care is directly provided.

3. Spaces where an automatic shutoff would endanger occupant safety or security.

4. Lighting intended for continuous operation.

5. Shop and laboratory classrooms.

**C405.2.~~4~~.5 Specific application controls.** Specific application controls shall be provided for the following:

1. The following lighting shall be controlled by an occupant sensor complying with Section C405.2.1.1 or a time-switch control complying with Section C405.2.2.1. In addition, a manual control shall be provided to control such lighting separately from the general lighting in the space:

1.1. Luminaires for which additional lighting power is claimed in accordance with Section C405.3.2.2.1.

1.2. Display and accent.

1.3. Lighting in display cases.

1.4. Supplemental task lighting, including permanently installed under-shelf or under-cabinet lighting.

1.5. Lighting equipment that is for sale or demonstration in lighting education.

1.6. Display lighting for exhibits in galleries, museums and monuments that is in addition to *general lighting*.

2. *Sleeping units* shall have control devices or systems that are configured to automatically switch off all permanently installed luminaires and switched receptacles within 20 minutes after all occupants have left the unit.

**Exceptions:**

1. Lighting and switched receptacles controlled by card key controls.

2. Spaces where patient care is directly provided.

3. Permanently installed luminaires within *dwelling units* shall be provided with controls complying with Section C405.2.1.1 or C405.2.3.1.

4. Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a time switch control complying with Section C405.2.2.1 that is independent of the controls for other lighting within the room or space.

5. Task lighting for medical and dental purposes that is in addition to *general lighting* shall be provided with a *manual control*.

**C405.2. ~~5~~6 Manual controls. No change**

**(EN8848 / CE163-19 AS)/(EN9972 AS)/ (EN8851 / CE169-19 AM)**

**Revise as follows:**

## C405.2.1.2 Occupant sensor control function in warehouses storage areas. Lighting in warehouse storage areas shall be controlled as follows:

1. Lighting in each aisleway shall be controlled independently of lighting in all other aisleways and open areas.

2. Occupant sensors shall ~~In warehouses, the lighting in aisleways and open areas shall be controlled with occupant sensors that~~ automatically reduce lighting power within each controlled area to an unoccupied setpoint of not more ~~by not less~~ than 50 percent within 20 minutes after all occupants have left the controlled area. ~~when the areas are unoccupied. The~~

3. Lights which are not turned off by occupant sensors shall be turned off by time-switch control complying with Section C405.2.2.1. ~~control lighting in each aisleway independently and shall not control lighting beyond the aisleway being controlled by the sensor.~~

4. A manual control shall be provided to allow occupants to turn off lights in the space.

**(EN8849/ CE166-19 AM)/ (EN8846/ CE162-19 AM)**

**Revise as follows:**

**C405.2 Lighting controls (Mandatory).** Lighting systems shall be provided with controls that comply with one of the following.

1. Lighting controls as specified in Sections C405.2.1 through ~~C405.2.6~~ C405.2.7.

2. Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, ~~C405.2.4~~ C405.2.5 and ~~C405.2.5~~ C405.2.6. The LLLC luminaire shall be independently capable of:

2.1. Monitoring occupant activity to brighten or dim lighting when occupied or unoccupied, respectively.

2.2. Monitoring ambient light, both electric light and daylight, and brighten or dim artificial light to maintain desired light level.

2.3. For each control strategy, configuration and reconfiguration of performance parameters including; bright and dim setpoints, timeouts, dimming fade rates, sensor sensitivity adjustments, and wireless zoning configurations.

**Exceptions:** Lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted.

2. Interior exit stairways, interior exit ramps and exit passageways.

3. Emergency egress lighting that is normally off.

**C405.2.2.1 Time-switch control function.** ~~Each space provided with time-switch controls shall be provided with a manual control for light reduction in accordance with Section C405.2.2.2.~~ Time-switch controls shall ~~include an override switching device that complies with~~ comply with the all of the following:

1. Automatically turn lights off when the space is scheduled to be unoccupied.

2. Have a minimum 7-day clock.

3. Be capable of being set for seven different day types per week.

4. Incorporate an automatic holiday “shutoff” feature, which turns off all controlled lighting loads for not fewer than 24 hours and then resumes normally scheduled operations.

5. Have program backup capabilities, which prevent the loss of program and time settings for not fewer than 10 hours, if power is interrupted.

6. Include an override switch that complies with the following:

6.1. The override switch shall be a manual control.

6.2. The override switch, when initiated, shall permit the controlled lighting to remain on for not more than 2 hours.

6.3. Any individual override switch shall control the lighting for an area not larger than 5,000 square feet (465 m2).

**Exception ~~Exceptions~~:**

1. Within mall concourses, auditoriums, sales areas, manufacturing facilities and sports arenas:

1.1. The time limit shall be permitted to be greater than 2 hours, provided that the switch is a captive key device.

1.2. The area controlled by the override switch shall not be limited to 5,000 square feet (465 m2) provided that such area is less than 20,000 square feet (1860m2).

~~2. Where provided with manual control, the following areas are not required to have light reduction control:~~

~~2.1. Spaces that have only one luminaire with a rated power of less than 100 watts.~~

~~2.2. Spaces that use less than 0.6 watts per square foot (6.5 W/m2).~~

~~2.3. Corridors, lobbies, electrical rooms and or mechanical rooms.~~

**~~C405.2.2.2~~ C405.2.3.1** **Light-reduction ~~controls~~ control function.** Spaces required to have light-reduction controls shall have a manual control that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern by not less than 50 percent. Lighting reduction shall be achieved by one of the following or another approved method:

1. Controlling all lamps or luminaires.

2. Dual switching of alternate rows of luminaires, alternate luminaires or alternate lamps.

3. Switching the middle lamp luminaires independently of the outer lamps.

4. Switching each luminaire or each lamp.

**~~Exception:~~** ~~Light reduction controls are not required in daylight zones with daylight responsive controls complying with Section C405.2.3.~~

**Add new text as follows:**

**405.2.3 Light reduction controls.** Where not provided with occupant sensor controls complying with Section C405.2.1.1, general lighting shall be provided with light reduction controls complying with C405.2.3.1.

**Exceptions:**

1. Luminaires controlled by daylight responsive controls complying with C405.2.4.

2. Luminaires controlled by special application controls complying with C405.2.5.

3. Where provided with manual control, the following areas are not required to have light reduction control:

3.1. Spaces that have only one luminaire with a rated power of less than 100 watts.

3.2. Spaces that use less than 0.6 watts per square foot (6.5 W/m2 )

3.3. Corridors, lobbies, electrical rooms and or mechanical rooms.

**~~C405.2.3~~ C405.2.4 Daylight-responsive controls.** Daylight-responsive controls complying with Section C405.2.3.1 shall be provided to control the electric lights within daylight zones in the following spaces:

1. Spaces with a total of more than 150 watts of general lighting within sidelit zones complying with Section C405.2.3.2 General lighting does not include lighting that is required to have specific application control in accordance with Section C405.2.4.

2. Spaces with a total of more than 150 watts of general lighting within toplit zones complying with Section C405.2.3.3.

**Exceptions:** Daylight responsive controls are not required for the following:

1. Spaces in health care facilities where patient care is directly provided.

2. Lighting that is required to have specific application control in accordance with Section C405.2.4.

3. Sidelit zones on the first floor above grade in Group A-2 and Group M occupancies.

4. New buildings where the total connected lighting power calculated in accordance with Section C405.3.1 is not greater than the adjusted interior lighting power allowance (LPAadj) calculated in accordance with Equation 4-9

 **(Equation 4-9)**

where:

LPAadj = Adjusted building interior lighting power allowance in watts.

LPAnorm = Normal building lighting power allowance in watts calculated in accordance with Section C405.3.2 and reduced in accordance with Section C406.3 where Option 2 of Section C406.1 is used to comply with the requirements of Section C406.

UDZFA = Uncontrolled daylight zone floor area is the sum of all sidelit and toplit zones, calculated in accordance with Sections C405.2.3.2 and C405.2.3.3, that do not have daylight responsive controls.

TBFA = Total building floor area is the sum of all floor areas included in the lighting power allowance calculation in Section C405.3.2.

**(EN8870 / CE175-19 AS)/(EN8872 / CE178-19 AS)**

**Revise as follows:**

**C405.2.1.1 Occupant sensor control function.** Occupant sensor controls in warehouses shall comply with

Section C405.2.1.2. Occupant sensor controls in open plan office areas shall comply with Section C405.2.1.3. Occupant sensor controls in corridors shall comply with Section C405.2.1.4. Occupant sensor controls for all other spaces specified in Section

C405.2.1 shall comply with the following:

1. They shall automatically turn off lights within 20 minutes after all occupants have left the space.

2. They shall be manual on or controlled to automatically turn on the lighting to not more than 50-percent power.

3. They shall incorporate a manual control to allow occupants to turn off lights.

**Exception:** Full automatic-on controls with no manual control shall be permitted ~~to control lighting~~ in ~~public~~ corridors, interior parking areas, stairways, restrooms~~, primary building entrance areas and lobbies~~, locker rooms, lobbies, library stacks, and areas where ~~manual-on~~ manual operation would endanger ~~the safety or security of the room or building occupants.~~ ~~3.~~ ~~They shall incorporate a manual control to allow occupants to turn off lights.~~ occupant safety or security.

**Add new text as follows:**

**C405.2.1.4 Occupant sensor control function in corridors.**Occupant sensor controls in corridors shall uniformly reduce lighting power to an unoccupied setpoint of not more than 50 percent of full power within 20 minutes after all occupants have left the space.

**Exception:** Corridors provided with less than two foot-candles of illumination on the floor at the darkest point with all lights on.

**(EN8851 / CE169-19 AM)/ (EN8850 / CE167-19 AS)**

## 

## C405.2.3.1 Daylight-responsive control function. Where required, daylight-responsive controls shall be provided within each space for control of lights in that space and shall comply with all of the following:

1. Lights in toplit zones in accordance with Section C405.2.3.3 shall be controlled independently of lights in sidelit zones in accordance with Section C405.2.3.2.

2. Daylight responsive controls within each space shall be configured so that they can be calibrated from within that space by authorized personnel.

3. Calibration mechanisms shall be in a location with ready access.

4. ~~Where located in offices, classrooms, laboratories and library reading rooms, daylight~~ Daylight responsive controls shall dim lights continuously from full light output to 15 percent of full light output or lower.

5. Daylight responsive controls shall be configured to completely shut off all controlled lights.

6. When occupant sensor controls have reduced the lighting power to an unoccupied setpoint in accordance with Sections C405.2.1.2 through C405.2.1.4, daylight responsive controls shall continue to adjust electric light levels in response to available daylight, but shall be configured to not increase the lighting power above the specified unoccupied setpoint.

7. Lights in sidelit zones in accordance with Section C405.2.3.2 facing different cardinal orientations [within 45 degrees (0.79 rad) of due north, east, south, west] shall be controlled independently of each other.

**Exception:** Up to 150 watts of lighting in each space is permitted to be controlled together with lighting in a daylight zone facing a different cardinal orientation.

**(EN8852 / CE170-19 AS)/ (EN8880 / CE185-19 AS)**

**Revise as follows:**

## C405.2.1.3 Occupant sensor control function in open plan office areas. Occupant sensor controls in open plan office spaces less than 300 square feet (28 m2) in area shall comply with Section C405.2.1.1. Occupant sensor controls in all other open plan office spaces shall comply with all of the following:

1. The controls shall be configured so that *general lighting* can be controlled separately in control zones with floor areas not greater than 600 square feet (55 m2) within the open plan office space.

2. General lighting in each control zone shall be permitted to automatically turn on upon occupancy within the control zone. *General lighting* in other unoccupied zones within the open plan office space shall be permitted to turn on to no more than 20 percent of full power or remain unaffected.

~~2.~~3. The controls shall automatically turn off *general lighting* in all control zones within 20 minutes after all occupants have left the open plan office space.

~~3. The~~ ~~controls shall be configured so that general lighting power~~.

4. General lighting in each control zone ~~is reduced by not less than 80 percent of the full zone general lighting power in a reasonably uniform illumination pattern within 20 minutes of all occupants leaving that control zone. Control functions that switch control zone lights completely off when the zone is vacant meet this requirement.~~ shall tum off or uniformly reduce lighting power to an unoccupied setpoint of not more than 20 percent of full power within 20 minutes after all occupants have left the control zone.

~~4.~~5. ~~The controls shall be configured such that any daylight responsive control will activate open plan office space general lighting or control zone general lighting only when occupancy for the same area is detected.~~

**Exception:** Where general lighting is turned off by time-switch control complying with Section C405.2.2.1.

4. General lighting in each control zone shall turn off or uniformly reduce lighting power to an unoccupied setpoint of not more than 20 percent of full power within 20 minutes after all occupants have left the control zone.

**(EN8853 / CE171-19 AS)/ (EN8852 / CE170-19 AS)/ (EN8869/ CE172-19 AM)**

**Revise as follows:**

Delete C405.2.2.2 and replace with the following:

**~~C405.2.2.2~~ C405.2.3 Light-reduction controls.** Where not provided with occupant sensor controls complying with Section

C405.2.1.1, general lighting shall be provided with light reduction controls complying with Section C405.2.3.1.

**Exceptions:**

1. Luminaires controlled by daylight responsive controls complying with Section C405.2.4.

2. Luminaires controlled by special application controls complying with Section C405.2.5.

3. Where provided with manual control, the following areas are not required to have lightreduction

control:

3.1. Spaces that have only one luminaire with a rated power of less than 60 watts.

3.2. Spaces that use less than 0.45 watts per square foot (4.9 W/m²). 3.3. Corridors, lobbies, electrical rooms

and/or mechanical rooms.

**(EN8875/ CE181-19 AMPC1)/ (EN8878 / CE182-19 AS)**

**Revise as follows:**

**C405.2.3.2 Sidelit zone.** The sidelit zone is the floor area adjacent to vertical fenestration that complies with all of the following:

1. Where the fenestration is located in a wall, the sidelit zone shall extend laterally to the nearest full-height wall, or up to 1.0 times the height from the floor to the top of the fenestration, and longitudinally from the edge of the fenestration to the nearest full-height wall, or up to 2 feet (610 mm), whichever is less, as indicated in Figure C405.2.3.2.

2. Where the fenestration is located in a rooftop monitor, the sidelit daylight zone shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.3.2(1) and C405.2.3.2(2).

3. The area of the fenestration is not less than 24 square feet (2.23 m2).

4. The distance from the fenestration to any building or geological formation that would block access to daylight is greater than one half of the height from the bottom of the fenestration to the top of the building or geologic formation.

5. The visible transmittance of the fenestration is not less than 0.20.

6. The projection factor (determined in accordance with Equation 4-5) for any overhanging projection which is shading the fenestration is not greater than 1.0 for fenestration oriented 45 degrees or less from true north, and not greater than 1.5 for all other orientations.

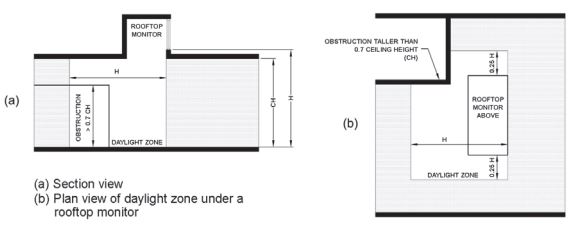
**C405.2.3.3 Toplit zone.** The toplit zone is the floor area underneath a roof fenestration assembly that complies with all of the following:

1. The toplit zone shall extend laterally and longitudinally beyond the edge of the roof fenestration assembly to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.7 times the ceiling height, whichever is less, as indicated in Figure C405.2.3.3(1).

~~2. Where the fenestration is located in a rooftop monitor, the toplit zone shall extend laterally to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 1.0 times the height from the floor to the bottom of the fenestration, whichever is less, and longitudinally from the edge of the fenestration to the nearest obstruction that is taller than 0.7 times the ceiling height, or up to 0.25 times the height from the floor to the bottom of the fenestration, whichever is less, as indicated in Figures C405.2.3.3(2) and C405.2.3.3(3).~~

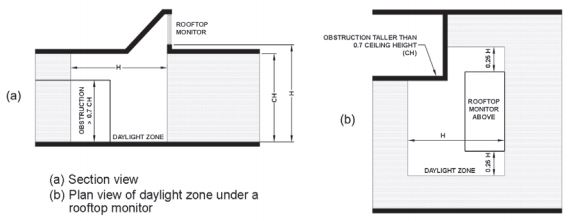
3. Direct sunlight is not blocked from hitting the roof fenestration assembly at the peak solar angle on the summer solstice by buildings or geological formations.

4. The product of the visible transmittance of the roof fenestration assembly and the area of the rough opening of the roof fenestration assembly divided by the area of the toplit zone is not less than 0.008.



**FIGURE ~~C405.2.3.3(2)~~ C405.2.3.2(1)**

**DAYLIGHT ZONE UNDER A ROOFTOP MONITOR**

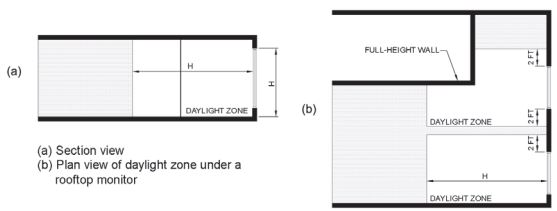


**FIGURE ~~C405.2.3.3(3)~~ C405.2.3.2(2)**

**DAYLIGHT ZONE UNDER A SLOPED ROOFTOP MONITOR**

**(EN8896 / CE193-19 AS)/ (EN8889/ CE192-19 AM)/ (EN8884 / CE190-19 AS)**

**Revise as follows:**



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

(b) Plan view

**FIGURE C405.2.3.2**

**SIDELIT ZONE**

**(EN8897 / CE194-19 AS)**

**Add new text as follows:**

**C405.2.3.4 Atriums.** Daylight zones at atrium spaces shall be established at the top floor surrounding the atrium and at the floor of the atrium space, and not on intermediate floors, as indicated in Figure C405.2.3.4.



**FIGURE C405.2.3.4**

**DAYLIGHT ZONES AT A MULTISTORY ATRIUM**

**(EN8898 / CE196-19 AS)**

**Revise as follows:**

**C405.2.6 Exterior lighting controls.** Exterior lighting systems shall be provided with controls that comply with Sections C405.2.6.1 through C405.2.6.4. ~~Decorative lighting systems shall comply with Sections C405.2.6.1, C405.2.6.2 and C405.2.6.4.~~

**Exceptions:**

1. Lighting for covered vehicle entrances and exits from buildings and parking structures where required for eye adaptation.

2. Lighting controlled from within dwelling units.

**C405.2.6.2 ~~Decorative lighting~~ shutoff Building facade and landscape lighting.** Building facade and landscape lighting shall automatically shut off from not later than 1 hour after business closing to not earlier than 1 hour before business opening.

**(EN8899 / CE197-19 AS)**

**Revise as follows:**

**C405.2.6.3 Lighting setback.** Lighting that is not controlled in accordance with Section C405.2.6.2 shall be comply with the following:

1. Be controlled so that the total wattage of such lighting is automatically reduced by not less than 50 percent by selectively switching off or dimming luminaires at one of the following times:

~~1.~~1.1. From not later than midnight to not earlier than 6 a.m.

~~2.~~1.2. From not later than one hour after business closing to not earlier than one hour before business opening.

~~3.~~1.3. During any time where activity has not been detected for 15 minutes or more.

2. Luminaires serving outdoor parking areas and having a rated input wattage of greater than 78 W and a mounting height of 24 feet or less above the ground shall be controlled so that the total wattage of such lighting is automatically reduced by not less than 50 percent during any time where activity has not been detected for 15 minutes or more. No more than 1500 W of lighting power shall be controlled together.

**(EN8900 / CE198-19 AS)**

**Add new text as follows:**

**C405.2.7 Parking Garage Lighting Control.** Parking garage lighting shall be controlled by an *occupant sensor* complying with Section C405.2.1.1 or a *time-switch control* complying with Section C405.2.2.1.  Additional lighting controls shall be provided as follows:

1. Lighting power of each luminaire shall be automatically reduced by not less than 30% when there is no activity detected within a lighting zone for 20 minutes.

Lighting zones for this requirement shall be no larger than 3600 ft2.

**Exception:** Lighting zones provided with less than 1.5 foot-candles of illumination on the floor at the darkest point with all lights on are not required to have automatic light reduction controls.

2. Where lighting for eye adaptation is provided at covered vehicle entrances and exits from buildings and parking structures, such lighting shall be separately controlled by a device that automatically reduces lighting power by at least 50% from sunset to sunrise.

3. The power to luminaires within 20 ft of perimeter wall openings shall automatically reduce in response to daylight by at least 50%

**Exceptions:**

1. Where the opening to-wall-ratio is less than 40% as viewed from the interior and encompassing the vertical distance from the driving surface to the lowest structural element.

2. Where the distance from the opening to any exterior daylight blocking obstruction is less than one-half the height from the bottom of the opening ~~or fenestration~~ to the top of the obstruction.

3. Where openings are obstructed by permanent screens or architectural elements restricting daylight entering the interior space.

**(EN8901 / CE199-19 AMPC 1, 2, 3)**

**C405.3.2 Interior lighting power allowance.** The total interior lighting power allowance (watts) ~~is~~ for an entire building shall be determined according to ~~Table C405.3.2(1) using the~~ C405.3.2.1 Building Area Method, or ~~Table C405.3.2(2) using the Space-by-Space Method, for all areas of the building covered in this permit.~~C405.3.2.2 Space-by-Space method, The interior lighting power allowance for projects that only involve portions of a building shall be determined according C405.3.2.2 Space-by-Space Method. Buildings with unfinished spaces shall use the Space-by-Space Method.

**Delete and substitute as follows:**

**~~C405.3.2.1~~ ~~Building Area Method.~~** ~~For the Building Area Method, the interior lighting power allowance is the floor area for each building area type listed in~~ ~~Table C405.3.2(1)~~ ~~times the value from~~ ~~Table C405.3.2(1)~~ ~~for that area. For the purposes of this method, an “area” shall be defined as all contiguous spaces that accommodate or are associated with a single building area type, as listed in~~ ~~Table C405.3.2(1). Where this method is used to calculate the total interior lighting power for an entire building, each building area type shall be treated as a separate area.~~

**C405.3.2.1 Building Area Method.** For the Building Area Method, the interior lighting power allowance is calculated as follows:

1. For each building area type inside the building, determine the applicable building area type and the allowed lighting power density for that type from Table C405.3.2(1). For building area types not listed, select the building area type that most closely represents the use of that area. For the purposes of this method, an "area" shall be defined as all contiguous spaces that accommodate or are associated with a single building area type.

2. Determine the floor area for each building area type listed in Table C405.3.2(1) and multiply this area by the applicable value from Table C405.3.2(1) to determine the lighting power (watts) for each building area type.

3. The total interior lighting power allowance (watts) for the entire *building* is the sum of the lighting power from each building area type.

**~~C405.3.2.2~~ ~~Space-by-Space Method.~~** ~~For the Space-by-Space Method, the interior lighting power allowance is determined by multiplying the floor area of each space times the value for the space type in~~ ~~Table C405.3.2(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.~~

**C405.3.2.2 Space-by-Space Method.** Where a building has unfinished spaces, the lighting power allowance for the unfinished spaces shall be the total connected lighting power for those spaces, or 0.2 watts per square foot, whichever is less.

For the Space by-Space Method, the interior lighting power allowance is ­calculated as follows:

1. For each building area type inside the building, determine the applicable building area type and the allowed lighting power density for that type from Table C405.3.2(1). For building area types not listed, select the building area type that most closely represents the use of that area. For the purposes of this method, an "area" shall be defined as all contiguous spaces that accommodate or are associated with a single building area type.

2. Determine the total floor area of all the spaces of each space type and multiply by the value for the space type in Table C405.3.2(2) to determine the lighting power (watts) for each space type.

3. The total interior lighting power allowance (watts) shall be the sum of the lighting power allowances for all space types.

**(EN8908 / CE203-19 AS)/ (EN8907 / CE202-19 AS)**

**Revise as follows:**

**TABLE C405.3.2(1)**

**INTERIOR LIGHTING POWER ALLOWANCES: BUILDING AREA METHOD**

|  |  |
| --- | --- |
| **BUILDING AREA TYPE** | **LPD (w/ft2)** |
| Automotive facility | ~~0.71~~0.75 |
| Convention center | ~~0.76~~ 0.64 |
| Courthouse | ~~0.90~~ 0.79 |
| Dining: bar lounge/leisure | ~~0.90~~ 0.80 |
| Dining: cafeteria/fast food | ~~0.79~~ 0.76 |
| Dining: family | ~~0.78~~ 0.71 |
| Dormitorya, b | ~~0.61~~0.53 |
| Exercise center | ~~0.65~~ 0.72 |
| Fire stationa | ~~0.53~~ 0.56 |
| Gymnasium | ~~0.68~~ 0.76 |
| Health care clinic | ~~0.82~~ 0.81 |
| Hospitala | ~~1.05~~ 0.96 |
| Hotel/Motela, b | ~~0.75~~ 0.56 |
| Library | ~~0.78~~ 0.83 |
| Manufacturing facility | ~~0.90~~ 0.82 |
| Motion picture theater | ~~0.83~~ 0.44 |
| Multifamilyc | ~~0.68~~ 0.45 |
| Museum | ~~1.06~~ 0.55 |
| Office | ~~0.79~~ 0.64 |
| Parking garage | ~~0.15~~ 0.18 |
| Penitentiary | ~~0.75~~ 0.69 |
| Performing arts theater | ~~1.18~~ 0.84 |
| Police station | ~~0.80~~ 0.66 |
| Post office | ~~0.67~~ 0.65 |
| Religious building | ~~0.94~~ 0.67 |
| Retail | ~~1.06~~ 0.84 |
| School/university | ~~0.81~~0.72 |
| Sports arena | ~~0.87~~ 0.76 |
| Town hall | ~~0.80~~ 0.69 |
| Transportation | ~~0.61~~ 0.50 |
| Warehouse | ~~0.48~~ 0.45 |
| Workshop | ~~0.90~~ 0.91 |

a. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.

b. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

c. Dwelling units are excluded. Neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

**(EN8909 / CE206-19 AS)**

**Revise as follows:**

**TABLE C405.3.2(2)**

**INTERIOR LIGHTING POWER ALLOWANCES: SPACE-BY-SPACE METHOD**

|  |  |
| --- | --- |
| **COMMON SPACE TYPESa** | **LPD (watts/~~sq.ft~~ ft2)** |
| Atrium | |
| Less than 40 feet in height | ~~0.03 per foot in total height~~0.48 |
| Greater than 40 feet in height | ~~0.40 + 0.02 per foot in total height~~ 0.60 |
| Audience seating area | |
| In an auditorium | ~~0.63~~ 0.61 |
| ~~In a convention center~~ | ~~0.82~~ |
| In a gymnasium | ~~0.65~~ 0.23 |
| In a motion picture theater | ~~1.14~~ 0.27 |
| In a penitentiary | ~~0.28~~0.67 |
| In a performing arts theater | ~~2.03~~ 1.16 |
| In a religious building | ~~1.53~~ 0.72 |
| In a sports arena | ~~0.43~~ 0.33 |
| Otherwise | ~~0.43~~ 0.23 |
| Banking activity area | ~~0.86~~ 0.61 |
| Breakroom (See Lounge/breakroom) | |
| Classroom/lecture hall/training room | |
| In a penitentiary | ~~1.34~~ 0.89 |
| Otherwise | ~~0.96~~ 0.71 |
| Computer room | ~~1.33~~ 0.94 |
| Conference/meeting/multipurpose room | ~~1.07~~ 0.97 |
| Copy/print room | ~~0.56~~ 0.31 |
| Corridor | |
| In a facility for the visually impaired (and not used primarily by the staff)b | ~~0.92~~ 0.71 |
| In a hospital | ~~0.92~~ 0.71 |
| ~~In a manufacturing facility~~ | ~~0.29~~ |
| Otherwise | ~~0.66~~ 0.41 |
| Courtroom | ~~1.39~~ 1.20 |
| Dining area | |
| In bar/lounge or leisure dining | ~~0.93~~ 0.86 |
| In cafeteria or fast food dining | ~~0.63~~ 0.40 |
| In a facility for the visually impaired (and not used primarily by the staff)b | ~~2.00~~ 1.27 |
| In family dining | ~~0.71~~ 0.60 |
| In a penitentiary | ~~0.96~~ 0.42 |
| Otherwise | ~~0.63~~ 0.43 |
| Electrical/mechanical room | 0.43 |
| Emergency vehicle garage | ~~0.41~~ 0.52 |
| Food preparation area | ~~1.06~~ 1.09 |
| Guestroomc, d | ~~0.77~~ 0.41 |
| Laboratory | |
| In or as a classroom | ~~1.20~~1.11 |
| Otherwise | ~~1.45~~ 1.33 |
| Laundry/washing area | ~~0.43~~ 0.53 |
| Loading dock, interior | ~~0.58~~ 0.88 |
| Lobby | |
| For an elevator | ~~0.68~~ 0.65 |
| In a facility for the visually impaired (and not used primarily by the staff)b | ~~2.03~~ 1.69 |
| In a hotel | ~~1.06~~ 0.51 |
| In a motion picture theater | ~~0.45~~ 0.23 |
| In a performing arts theater | ~~1.70~~ 1.25 |
| Otherwise | ~~1.0~~ 0.84 |
| Locker room | ~~0.48~~ 0.52 |
| Lounge/breakroom | |
| In a healthcare facility | ~~0.78~~ 0.42 |
| Otherwise | ~~0.62~~0.59 |
| Office | |
| Enclosed | ~~0.93~~ 0.74 |
| Open plan | ~~0.81~~ 0.61 |
| Parking area, interior | ~~0.14~~ 0.15 |
| Pharmacy area | ~~1.34~~ 1.66 |
| Restroom | |
| In a facility for the visually impaired (and not used primarily by the staffb | ~~0.96~~ 1.26 |
| Otherwise | ~~0.85~~ 0.63 |
| Sales area | ~~1.22~~ 1.05 |
| Seating area, general | ~~0.42~~ 0.23 |
| Stairway (see Space containing stairway) | |
| Stairwell | ~~0.58~~ 0.49 |
| Storage room | ~~0.46~~ 0.38 |
| Vehicular maintenance area | ~~0.56~~ 0.60 |
| Workshop | ~~1.14~~ 1.26 |
| BUILDING TYPE SPECIFIC SPACE TYPESa | LPD (watts/~~sq.ft~~ ft2) |
| Automotive (see Vehicular maintenance area) | |
| Convention Center—exhibit space | ~~0.88~~ 0.61 |
| Dormitory—living quartersc, d | ~~0.54~~ 0.50 |
| Facility for the visually impairedb | |
| In a chapel (and not used primarily by the staff) | ~~1.06~~0.70 |
| In a recreation room (and not used primarily by the staff) | ~~1.80~~ 1.77 |
| Fire Station—sleeping quartersc | ~~0.20~~ 0.23 |
| Gymnasium/fitness center | |
| In an exercise area | ~~0.50~~ 0.90 |
| In a playing area | ~~0.82~~ 0.85 |
| Healthcare facility | |
| In an exam/treatment room | ~~1.68~~ 1.40 |
| In an imaging room | ~~1.06~~ 0.94 |
| In a medical supply room | ~~0.54~~0.62 |
| In a nursery | ~~1.00~~0.92 |
| In a nurse’s station | ~~0.81~~ 1.17 |
| In an operating room | ~~2.17~~ 2.26 |
| In a patient roomc | ~~0.62~~ 0.68 |
| In a physical therapy room | ~~0.84~~ 0.91 |
| In a recovery room | ~~1.03~~ 1.25 |
| Library | |
| In a reading area | ~~0.82~~ 0.96 |
| In the stacks | ~~1.20~~ 1.18 |
| Manufacturing facility | |
| In a detailed manufacturing area | ~~0.93~~ 0.80 |
| In an equipment room | ~~0.65~~ 0.76 |
| In an extra-high-bay area (greater than 50′ floor-to-ceiling height) | ~~1.05~~ 1.42 |
| In a high-bay area (25-50’ floor-to-ceiling height) | ~~0.75~~ 1.24 |
| In a low-bay area (less than 25’ floor-to-ceiling height) | ~~0.96~~ 0.86 |
| Museum | |
| In a general exhibition area | ~~1.05~~ 0.31 |
| In a restoration room | ~~0.85~~ 1.10 |
| Performing arts theater—dressing room | ~~0.36~~ 0.41 |
| Post office—sorting area | ~~0.68~~ 0.76 |
| Religious buildings | |
| In a fellowship hall | ~~0.55~~ 0.54 |
| In a worship/pulpit/choir area | ~~1.53~~ 0.85 |
| Retail facilities | |
| In a dressing/fitting room | ~~0.50~~ 0.51 |
| In a mall concourse | ~~0.90~~ 0.82 |
| Sports arena—playing area | |
| For a Class I facilitye | ~~2.47~~ 2.94 |
| For a Class II facilityf | ~~1.96~~ 2.01 |
| For a Class III facilityg | ~~1.70~~ 1.30 |
| For a Class IV facilityh | ~~1.13~~ 0.86 |
| Transportation facility | |
| In a baggage/carousel area | ~~0.45~~ 0.39 |
| In an airport concourse | ~~0.31~~ 0.25 |
| At a terminal ticket counter | ~~0.62~~ 0.51 |
| Warehouse—storage area | |
| For medium to bulky, palletized items | ~~0.35~~ 0.33 |
| For smaller, hand-carried items | 0.69 |

a. In cases where both a common space type and a building area specific space type are listed, the building area specific space type shall apply

b. A ‘Facility for the Visually Impaired’ is a facility that is licensed or will be licensed by local or state authorities for senior long-term care, adult daycare, senior support or people with special visual needs.

c. Where sleeping units are excluded from lighting power calculations by application of Section R405.1, neither the area of the sleeping units nor the wattage of lighting in the sleeping units is counted.

d. Where dwelling units are excluded from lighting power calculations by application of Section R405.1, neither the area of the dwelling units nor the wattage of lighting in the dwelling units is counted.

e. Class I facilities consist of professional facilities; and semiprofessional, collegiate, or club facilities with seating for 5,000 or more spectators.

f. Class II facilities consist of collegiate and semiprofessional facilities with seating for fewer than 5,000 spectators; club facilities with seating for between 2,000 and 5,000 spectators; and amateur league and high-school facilities with seating for more than 2,000 spectators.

g. Class III facilities consist of club, amateur league and high-school facilities with seating for 2,000 or fewer spectators.

h. Class IV facilities consist of elementary school and recreational facilities; and amateur league and high-school facilities without provision for spectators.

**(EN8910 / CE208-19 AS)**

**Add new text as follows:**

**C405.9 Lighting for plant growth and maintenance (Mandatory).** Not less than 95 percent of the permanently installed luminaires used for plant growth and maintenance shall have a photon efficiency of not less than 1.6 μmol/J ~~rated~~ as defined in accordance with ANSI/ASABE S640.

**Renumber remaining sections as appropriate.**

**(EN8912/ CE209-19 AM)**

**Delete and substitute as follows:**

**~~C405.4.2~~ ~~Exterior lighting power allowance.~~** ~~The total exterior lighting power allowance is the sum of the base site allowance plus the individual allowances for areas that are to be illuminated by lighting that is powered through the energy service for the building. Lighting power allowances are as specified in~~ ~~Table C405.4.2(2). The lighting zone for the building exterior is determined in accordance with~~ ~~Table C405.4.2(1)~~ ~~unless otherwise specified by the~~ *~~code official~~*~~.~~

**C405.4.2 Exterior lighting power allowance.** The exterior lighting power allowance (watts) is calculated as follows:

1. Determine the Lighting Zone (LZ) for the building according to Table C405.4.2(1) unless otherwise specified by the code official.

2. For each exterior area that is to be illuminated by lighting that is powered through the energy service for the building, determine the applicable area type from Table C405.4.2(2). For area types not listed, select the area type that most closely represents the proposed use of the area.

3. Determine the total area or length of each area type and multiply by the value for the area type in Table C405.4(2) to determine the lighting power (Watts) allowed for each area type.

4. The total exterior lighting power allowance (Watts) is the sum of the base site allowance determined according to Table C405.4.2(2), plus the Watts from each area type.

**Revise as follows:**

**C405.4.2.1 Additional exterior lighting power.** ~~Any increase in the~~ Additional exterior lighting power ~~allowance is limited to~~ allowances are available for the specific lighting applications ~~indicated~~ listed in Table C405.4.2(3). ~~The~~ These additional power allowances shall be used only for the luminaires ~~that are~~ serving these specific applications and shall not be used ~~for~~ to increase any other ~~purpose~~ lighting power allowance.

**(EN8914 / CE211-19 AS)**

**C405.8.1 Elevator cabs (Mandatory).** For the luminaires in each elevator cab, not including signals and displays, the sum of the lumens divided by the sum of the watts shall be not less than 35 lumens per watt. Ventilation fans in elevators that do not have their own air-conditioning system shall not consume more than 0.33 watts/cfm at the maximum rated speed of the fan. Controls shall be provided that will de-energize ventilation fans and lighting systems when the elevator is stopped, unoccupied and with its doors closed for over 15 minutes.

**C405.8.2 Escalators and moving walks (Mandatory). .** Escalators and moving walks shall comply with ASME A17.1/CSA B44 ~~and~~ ~~Where a traffic analysis indicates that an escalator or moving walk application will have sufficient periods with no riders while it is operating, it~~ and shall have automatic controls ~~configured to~~ that reduce speed ~~to the minimum~~ as permitted ~~speed~~ in accordance with ASME A17.1/CSA B44 or applicable local code ~~when not conveying passengers~~.

**Exception:** A variable voltage drive system that reduces operating voltage in response to light loading conditions is an alternative to the reduced speed function.

**C405.8.2.1 ~~Regenerative drive.~~ Energy Recovery (Mandatory).** ~~An~~ Escalator shall be designed to recover electrical energy when resisting overspeed in the down direction.  ~~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 the escalator is loaded~~ The escalator shall be designed to recover, on average, more power than is consumed by the power recovery feature of its motor controller system.

**C407.2 Mandatory requirements.** Compliance with this section requires compliance with Sections C402.5, C403.2, C403.3 through C403.3.2, C403.4 through C403.4.2.3, C403.5.5, C403.7, C403.8.1 through C403.8.4, C403.10.1 through C403.10.3, C403.11, C403.12, C404 and ~~C405.~~C405.1, C405.2, C405.4 through C405.9.

**(EN8916 / CE213-19 AMPC1, 3)/** **(EN8915 / CE212-19 AS)**

**C408.1 General –**No change.

**C408.1.1 Building operation and Maintenance information. –**No Change.

**C408.2 Mechanical systems and service water-heating systems commissioning and completion requirements.**

Prior to the final mechanical and plumbing inspections, the licensed design professional, electrical engineer, mechanical engineer or *approved agency* shall provide evidence of mechanical systems *commissioning* and completion in accordance with the provisions of this section.

*Construction document* notes shall clearly indicate provisions for *commissioning* and completion requirements in accordance with this section and are permitted to refer to specifications for further requirements. Copies of all documentation shall be given to the owner or owner’s authorized agent and ~~made available~~ provided to the *code official* ~~upon request~~ in accordance with Sections C408.2.4 and C408.2.5.

**Exceptions:**The following systems are exempt:

1. Mechanical systems and service water heater systems in buildings where the total mechanical equipment capacity is less than 480,000 Btu/h (140.7 kW) cooling capacity and 600,000 Btu/h (175.8 kW) combined service water-heating and space-heating capacity. Capacities of individual systems serving dwelling units or sleeping units shall not be counted in determining the total mechanical and/or water heating system’s capacity for the whole building.
2. Systems included in Section C403.3 that serve individual *dwelling units* and *sleeping units*.

**No changes to intervening sections.**

**C408.2.4.1 Acceptance of report.**

Buildings, or portions thereof, shall not be considered acceptable for a final inspection pursuant to Section C104.3 until the *code official* has received ~~a letter of transmittal from the building owner acknowledging that the building owner or owner’s authorized agent has received~~ the Preliminary Commissioning Report.

**C408.2.4.2 Copy of report.**

The *code official* shall ~~be permitted to~~ require that a copy of the Preliminary Commissioning Report be made available for review by the *code official*.

**C408.2.5 Documentation requirements.**

The *construction documents* shall specify that the documents described in this section be provided to the building owner or owner’s authorized agent and provided to the code official within 90 days of the date of receipt of the *certificate of occupancy*.

**No changes in intervening sections.**

**C408.3.2 Documentation requirements.**

The construction documents shall specify that the documents described in this section be provided to the building owner or owner’s authorized agent and provided to the code official within 90 days of the date of receipt of the c*ertificate of occupancy.*

**(EN10364 AS)**

**Revise as follows:**

C408.3.1 Functional testing. Prior to passing final inspection, the registered design professional or approved agency shall provide evidence that the lighting control systems have been tested to ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer’s instructions. Functional testing shall be in accordance with Sections C408.3.1.1 through C408.3.1.3 for the applicable control type

**(EN8932 / CE249-19 AS)**

C408.2.3 Functional performance testing.

Functional performance testing specified in Sections C408.2.3.1 through C408.2.3.3 shall be ~~conducted~~ witnessed and documented by a licensed design professional, electrical engineer, mechanical engineer or approved agency. The reporting commissioning professional shall be present for any functional performance tests being conducted.

**(EN10446 AM A1)**

**CHAPTER 5 [CE] EXISTING BUILDINGS**

**SECTION C501  
GENERAL**

**Revise as follows:**

**C501.1 Scope.** The provisions of this chapter shall control the alteration, repair, addition and change of occupancy of existing buildings and structures.

**~~C501.~~2 C501.1.1 Existing buildings.** Except as specified in this chapter, this code shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

**~~C501.~~4 C501.2 Compliance.** Alterations Additions, alterations, repairs, ~~additions~~ and changes of occupancy to, or relocation of, existing buildings and structures shall comply Sections C502, C503, C504, or C505 of this code, and with the provisions for alterations, repairs, additions and changes of occupancy or relocation, respectively, ~~in this code and~~ in the International Building Code , International Existing Building Code , International Fire Code , International Fuel Gas Code , International Mechanical Code , International Plumbing Code , International Property Maintenance Code , International Private Sewage Disposal Code and NFPA 70. Changes where unconditioned space is changed to conditioned space shall comply with Section C502.

**Exception:** Additions, alterations, repairs, or changes of occupancy complying with ANSI/ASHRAE/IESNA 90.1

**SECTION C502  
ADDITIONS**

**Revise as follows:**

**C502.1 General.** Additions to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this code. Additions shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building. *~~Additions~~* ~~shall comply with Sections C402, C403, C404, C405 and C502.2.~~

*~~Additions~~* ~~complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.~~

**~~C503.~~2 C502.2 Change in space conditioning.** Any nonconditioned or low-energy space that is altered to become conditioned space shall be required to ~~be brought into full compliance with this code.~~comply with Section C502.

**Exceptions:**

1. Where the component performance alternative in Section C402.1.5 is used to comply with this section, the proposed UA shall be not greater than 110 percent of the target UA.

2. Where the total building performance option in Section C407 is used to comply with this section, the annual energy cost of the proposed design shall be not greater than 110 percent of the annual energy cost otherwise permitted by Section C407.3.

**~~C502.~~2 C502.3 ~~Prescriptive~~ compliance Compliance.** Additions shall comply with Sections ~~C502.2.1~~ C502.3.1 through ~~C502.2.6.2.~~ C502.3.6.2.

**~~C502.2.~~1 C502.3.1 Vertical fenestration area.** Additions shall comply with the following:

1. Where an addition has new ~~New~~ vertical fenestration area that results in a total building fenestration area less than or equal to that ~~specified in~~ permitted by Section C402.4.1 the addition shall comply with Section C402.1.5, C402.4.3 or C407.

2. ~~Additions~~ Where an additions with vertical fenestration that ~~result~~ results in a total building fenestration area greater than Section C402.4.1 or additions that exceed the fenestration area greater than that permitted by Section C402.4.1 the fenestration shall comply with Section C402.4.1.1 for the addition only. ~~Additions that result~~

3. Where an addition has vertical fenestration that results in a total building vertical fenestration area exceeding that ~~specified in~~ permitted by Section C402.4.1.1 the addition shall comply with Section C402.1.5 or C407.

**~~C502.2.~~2 C502.3.2 Skylight area.** Skylights shall comply as follows:

1. Where an addition has new skylight area that results in a total building fenestration area less than or equal to that ~~specified in~~ permitted by Section C402.4.1, the addition shall comply with Section C402.1.5 or C407.

2. ~~Additions~~ ~~with~~ Where an addition has new skylight area that ~~result~~ results in a total building skylight area greater than permitted by C402.4.1 or where additions ~~that exceed~~ have skylight area greater than that permitted by C402.4.1, the skylight area shall comply with Section C402.4.1.2 for the addition only.

3. ~~Additions~~ ~~that result~~ Where an addition has skylight area that results in a total building skylight area exceeding that specified in permitted by Section C402.4.1.2, the addition shall comply with Section C402.1.5 or C407.

**~~C502.2.~~3 C502.3.3 Building mechanical systems.** New mechanical systems and equipment that are part of the addition and serve the building heating, cooling and ventilation needs shall comply with ~~Section~~ Sections C403, and C408.

**C502.2.6 Lighting power and systems.** New lighting systems that are installed as part of the addition shall comply with ~~Section~~ Sections C405 and C408.

**C502.2.6.1 Interior lighting power.** The total interior lighting power for the addition shall comply with Section C405.3.2 for the addition alone, or the existing building and the addition shall comply as a single building.

**C502.2.6.2 Exterior lighting power.** The total exterior lighting power for the addition shall comply with Section C405.4.2 for the addition alone, or the existing building and the addition shall comply as a single building.

**SECTION C503  
ALTERATIONS**

**Revise as follows:**

**C503.1 General.** Alterations to any building or structure shall comply with the requirements of Section C503 ~~and the code for new construction~~. Alterations shall be such that the existing building or structure is not less conforming to the provisions of this code than the existing building or structure was prior to the *~~alteration~~*~~.~~ alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems.

*~~Alterations~~* ~~complying with ANSI/ASHRAE/IESNA 90.1. need not comply with Sections C402, C403, C404 and C405.~~

**Exception:** The following alterations need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing *fenestration*..

2. Surface-applied window film installed on existing single-pane fenestration assemblies reducing solar heat gain, provided that the code does not require the glazing or fenestration to be replaced.

3. Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.

4. Construction where the existing roof, wall or floor cavity is not exposed.

5. Roof recover.

6. Air barriers shall not be required for roof recover and roof replacement where the alterations or renovations to the building do not include alterations, renovations or repairs to the remainder of the building envelope.

**C503.4 Heating and cooling systems.** New heating, cooling and duct systems that are part of the alteration shall comply with Sections C403 and C408.

**C503.5 Service hot water systems.** New service hot water systems that are part of the alteration shall comply with ~~Section~~ Sections C404, and C408.

**C503.6 Lighting systems.** New lighting systems that are part of the alteration shall comply with Section C405 and C408.

**Exception.** Alterations that replace less than 10 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

**(EN8933 / CE250-19 AM)**

**Revise as follows:**

## C503.3.2 Vertical fenestration. The addition of vertical fenestration that results in a total building fenestration area less than or equal to that specified in Section C402.4.1 shall comply with Section C402.1.5, C402.4.3 or C407. The addition of vertical fenestration that results in a total building fenestration area greater than Section C402.4.1 shall comply with Section C402.4.1.1 for the space adjacent to the new fenestration only. Alterations that result in a total building vertical fenestration area exceeding that specified in Section C402.4.1.1 shall comply with Section C402.1.5 or C407. Provided that the vertical fenestration area is not changed, using the same vertical fenestration area in the standard reference design as the building prior to alteration shall be an alternative to using the vertical fenestration area specified in Table C407.5.1(1).

## ~~C401.2.~~1 C503.3.2.1 ~~Application to replacement~~ Replacement fenestration products. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U-*factor and SHGC in Table C402.4.

**Exception:** An area-weighted average of the *U-*factor of replacement fenestration products being installed in the building for each fenestration product category listed in Table C402.4 shall be permitted to satisfy the *U-*factor requirements for each fenestration product category listed in Table C402.4. Individual fenestration products from different product categories listed in Table C402.4 shall not be combined in calculating the area-weighted average *U-*factor.

**(EN8935 / CE259-19 AS)**

**Chapter 6 [CE] – Referenced Standards**

**See attached.**

Appendix CA

**Add new text as follows:**

**APPENDIX CA  
BOARD OF APPEALS-COMMERCIAL**

**SECTION CA101   
GENERAL**

**CA101.1 Scope.** A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section C109 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

**CA101.2 Application for appeal.** Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

**CA101.2.1 Limitation of authority.** The board shall not have authority to waive requirements of this code or interpret the administration of this code.

**CA101.2.2 Stays of enforcement.** Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

**CA101.3 Membership of board.** The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member’s terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

**CA101.3.1 Qualifications.** The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

**CA101.3.2 Alternate members.** The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

**CA101.3.3 Vacancies.** Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

**CA101.3.4 Chairperson.** The board shall annually select one of its members to serve as chairperson.

**CA101.3.5 Secretary.** The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board’s decision, the vote of each member, the absence of a member and any failure of a member to vote.

**CA101.3.6 Conflict of interest.** A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

**CA101.3.7 Compensation of members.** Compensation of members shall be determined by law.

**CA101.3.8 Removal from the board.** A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

**CA101.4 Rules and procedures.** The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

**CA101.5 Notice of meeting.** The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

**CA101.5.1 Open hearing.** All hearings before the board shall be open to the public. The appellant, the appellant’s representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

**CA101.5.2 Quorum.** Three members of the board shall constitute a quorum.

**CA101.5.3 Postponed hearing.** When five members are not present to hear an appeal, either the appellant or the appellant’s representative shall have the right to request a postponement of the hearing.

**CA101.6 Legal counsel.** The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction’s expense in all matters arising from service within the scope of their duties.

**CA101.7 Board decision.** The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

**CA101.7.1 Resolution.** The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant’s representative and to the code official.

**CA101.7.2 Administration.** The code official shall take immediate action in accordance with the decision of the board.

**CA101.8 Court review.** Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

**(CA9105 / ADM41-19 Part III AS)**

**Add new text as follows:**

**APPENDIX AX 100  
ZERO CODE RENEWABLE ENERGY STANDARD**

**AX101 Purpose.** The purpose of the Zero Code Renewable Energy Appendix is to supplement the International Energy Conservation Code and require renewable energy systems of adequate capacity to achieve zero-net-carbon.

**AX102 Scope.** This appendix applies to new buildings that are addressed by the International Energy Conservation Code.

**Exceptions:**

1. Single-family houses, multifamily structures of three stories or fewer above grade in height, manufactured homes (mobile homes), and manufactured houses (modular).

2. Buildings that use neither electricity nor fossil fuel.

**AX103 Definitions.** The following definitions supplement or modify the definitions in the International Energy Conservation Code.

**ADJUSTED OFF-SITE RENEWABLE ENERGY.** The amount of energy production from off-site renewable energy systems that may be used to offset building energy.

**BUILDING ENERGY.** All energy consumed at the building site as measured at the site boundary. Contributions from on-site or off-site renewable energy systems shall not be considered when determining the building energy.

**ENERGY UTILIZATION INTENSITY(EUI).** The site energy for either the baseline building or the proposed building divided by the gross conditioned floor area plus any semi-heated floor area of the building. For the baseline building, the EUI can be divided between regulated energy use and unregulated energy use.

**OFF-SITE RENEWABLE ENERGY SYSTEM*.***Renewable energy system not located on the building project.

**ON-SITE RENEWABLE ENERGY SYSTEM.** Renewable energy systems on the building project.

**RENEWABLE ENERGY SYSTEM*.*** Photovoltaic, solar thermal, geothermal energy, and wind systems used to generate energy.

**ZERO ENERGY PERFORMANCE INDEX(zEPIPB,EE).** The ratio of the proposed building EUI without renewables to the baseline building EUI, expressed as a percentage.

**SEMI-HEATED SPACE*.*** An enclosed space within a building that is heated by a heating system whose output capacity is greater than or equal to 3.4 Btu/h\*ft2 of floor area but is not a conditioned space.

**AX104 Minimum renewable energy.** On-site renewable energy systems shall be installed or off-site renewable energy shall be procured to offset the building energy.

REonsite+REoffsite≥Ebuilding

Where

REonsite = annual site energy production from on-site renewable energy systems (see Section AX104.2)

REoffsite = adjusted annual site energy production from off-site renewable energy systems that may be credited against building energy use (see Section AX104.3)

Ebuilding = building energy use without consideration of renewable energy systems.

When Section C401.2 (2) is used for compliance with the International Energy Conservation Code, building energy shall be determined by multiplying the gross conditioned floor area plus the gross semi-heated floor area of the proposed building by an EUI selected from Table AX104.1. Use a weighted average for mixed-use buildings.

When Section C401.2 (1) or C401.2 (3) is used for compliance with the International Energy Conservation Code, building energy shall be determined from energy simulations.

**TABLE AX104.1**

**ENERGY UTILIZATION INTENSITY FOR BUILDING TYPES AND CLIMATES (kBtu/ftÂ²-Y)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Climate Zone |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Building Area Type | 0A/  1A | 0B/  1B | 2A | 2B | 3A | 3B | 3C | 4A | 4B | 4C | 5A | 5B | 5C | 6A | 6B | 7 | 8 |
| kBtu/ftÂ²-y |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Multifamily (R-2) | 43 | 45 | 41 | 41 | 43 | 42 | 36 | 45 | 43 | 41 | 47 | 46 | 41 | 53 | 48 | 53 | 59 |
| Healthcare/hospital (I-2) | 119 | 120 | 119 | 113 | 116 | 109 | 106 | 116 | 109 | 106 | 118 | 110 | 105 | 126 | 116 | 131 | 142 |
| Hotel/motel (R-1) | 73 | 76 | 73 | 68 | 70 | 67 | 65 | 69 | 66 | 65 | 71 | 68 | 65 | 77 | 72 | 81 | 89 |
| Office (B) | 31 | 32 | 30 | 29 | 29 | 28 | 25 | 28 | 27 | 25 | 29 | 28 | 25 | 33 | 30 | 32 | 36 |
| Restaurant (A-2) | 389 | 426 | 411 | 408 | 444 | 420 | 395 | 483 | 437 | 457 | 531 | 484 | 484 | 589 | 538 | 644 | 750 |
| Retail (M) | 46 | 50 | 45 | 46 | 44 | 44 | 37 | 48 | 44 | 44 | 52 | 50 | 46 | 60 | 52 | 64 | 77 |
| School (E) | 42 | 46 | 42 | 40 | 40 | 39 | 36 | 39 | 40 | 40 | 39 | 43 | 37 | 44 | 40 | 45 | 54 |
| Warehouse (S) | 9 | 12 | 9 | 11 | 12 | 11 | 10 | 17 | 13 | 14 | 23 | 17 | 15 | 32 | 23 | 32 | 32 |
| All others | 55 | 58 | 54 | 53 | 53 | 51 | 48 | 54 | 52 | 51 | 57 | 54 | 50 | 63 | 57 | 65 | 73 |

**AX104.1 Calculation of On-Site Renewable Energy.** The annual energy production from on-site renewable energy systems shall be determined using the PVWatts software or other software approved by the code official.

**AX104.2 Off-Site Renewable Energy.** Off-site energy shall comply with Sections AX104.2.1 and AX104.2.2

**AX104.2.1 Qualifying off-site procurement methods.** The following are considered qualifying off-site renewable energy procurement methods:

1. Community Renewables: an offsite renewable energy system for which the owner has purchased or leased renewable energy capacity along with other subscribers.

2. Renewable Energy Investment Fund: an entity that installs renewable energy capacity on behalf of the owner.

3. Virtual Power Purchase Agreement: a power purchase agreement for off-site renewable energy where the owner agrees to purchase renewable energy output at a fixed price schedule.

4. Direct Ownership: an offsite renewable energy system owned by the building project owner.

5. Direct Access to Wholesale Market: an agreement between the owner and a renewable energy developer to purchase renewable energy.

6. Green Retail Tariffs: a program by the retail electricity provider to provide 100 percent renewable energy to the owner.

7. Unbundled Renewable Energy Certificates (RECs): certificates purchased by the owner representing the environmental benefits of renewable energy generation that are sold separately from the electric power.

**AX104.2.2 Requirements for all procurement methods.** The following requirements shall apply to all *off-site renewable energy* procurement methods.

1. The building owner shall sign a legally binding contract to procure qualifying *off-site renewable energy*.

2. The procurement contract shall have duration of not less than 15 years and shall be structured to survive a partial or full transfer of ownership of the property.

3. RECs and other environmental attributes associated with the procured *off-site renewable energy* shall be assigned to the building project for the duration of the contract.

4. The *renewable energy* generating source shall be photovoltaic systems, solar thermal power plants, geothermal power plants, and/or wind turbines.

5. The generation source shall be located where the energy can be delivered to the building site by the same utility or distribution entity; the same ISO or RTO; or within integrated ISOâ€™s (electric coordination council).

6. The *off-site renewable* energy producer shall maintain transparent accounting that clearly assigns production to the building. Records on power sent to or purchased by the building shall be retained by the building owner and made available for inspection by the code official upon request.

**AX104.2.3 Adjusted Off-Site Renewable Energy.** The process for calculating the adjusted *off-site renewable energy* is shown in the following equation:

![](data:image/png;base64;base64,)

Where

REoffsite = Adjusted off-site renewable energy

PF**i** **=** Procurement factor for the ith renewable energy procurement method or class taken from Table AX104.2.

REi = Annual energy production for the ith renewable energy procurement method or class

n = The number of renewable energy procurement options or classes considered

**TABLE AX104.2**

**DEFAULT OFF-SITE RENEWABLE ENERGY PROCUREMENT METHODS, CLASSES, AND COEFFICIENTS**

|  |  |  |  |
| --- | --- | --- | --- |
| ***Class*** | ***Procurement Factor (PF)*** | ***Procurement Options*** | ***Additional Requirements (see also XXX4.2.2)*** |
| 1 | 0.75 | Community Solar |  |
|  |  | REIFs | Entity must be managed to prevent fraud or misuse of funds. |
|  |  | Virtual PPA |  |
|  |  | Self-Owned Off-Site | Provisions shall prevent the generation from being sold separately from the building. |
| 2 | 0.55 | Green Retail Tariffs | The offering shall not include the purchase of unbundled RECs. |
|  |  | Direct Access | The offering shall not include the purchase of unbundled RECs. |
| 3 | 0.20 | Unbundled RECs | The vintage of the RECs shall align with building energy use. |

**(EN8937 / CE264-19 AS)**

**APPENDIX CC**

**ELECTRIC VEHICLE CHARGING PROVISIONS FOR NEW COMMERCIAL CONSTRUCTION**

*(The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.)*

**SECTION CC 101**

**SCOPE**

**CC 101.1 General.**

These provisions shall be applicable for new commercial construction where electric vehicle charging provisions are required.

**SECTION CC 102**

**DEFINITIONS**

**ELECTRIC VEHICLE (EV).**An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current. Plug-in hybrid electric vehicles (PHEV) are electric vehicles having a second source of motive power. Off-road, self-propelled electric mobile equipment, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats, and the like are not considered electric vehicles.

**ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE).** The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the *Electric Vehicle* connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *Electric Vehicle.*

**EV CAPABLE SPACE.** Electrical distribution equipment capacity and space to support a minimum 40-ampere, 208/240-volt branch circuit for each EV parking space, and the installation of necessary wiring methods and materials to supply *EVSE*.

**EV READY SPACE.**A designated parking space which is provided with one 40-ampere, 208-volt or 240-volt branch circuit for *EVSE*supplying *Electric Vehicles.*The circuit shall terminate in a suitable termination point such as a receptacle, outlet box, enclosure, or an *EVSE,*and be located in close proximity to the proposed location of the  EV parking spaces.

**SECTION CC 103**

**REQUIREMENTS FOR ELECTRIC VEHICLE CHARGING**

**CC 103.1 Electric Vehicle (EV) power transfer for new construction.**New construction shall facilitate future installation and use of *EVSE* in accordance with NFPA 70.

**CC 103.2 New Commercial Buildings.** *EV Ready Spaces* and *EV Capable Spaces* shall be provided in accordance with Table CE 103.2. Where the calculation of percent served results in a fractional parking space, it shall be rounded up to the next whole number. The electrical distribution equipment circuit directory shall identify the spaces reserved to support EV power transfer as “EV Capable” or “EV Ready”. The box or enclosure provided for future *EVSE* shall be marked “FOR *EVSE* Use”. The marking shall comply with NFPA 70, Section 110.21(B).

**TABLE CC 103.2**

***EV READY SPACE*AND *EV CAPABLE SPACE*REQUIREMENTS**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Total                        Minimum Number           Minimum Number**

**Number of               of *EV Ready* of *EV Capable***

**Parking Spaces      *Spaces                            Spaces***

**1\_\_\_\_\_\_\_\_\_\_\_\_\_     1\_\_\_\_\_\_\_\_\_\_\_\_\_\_          0\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2-10\_\_\_\_\_\_\_\_\_\_      2\_\_\_\_\_\_\_\_\_\_\_\_\_\_          0\_\_\_\_\_\_\_\_\_\_\_\_\_**

**11-15\_\_\_\_\_\_\_\_\_      2\_\_\_\_\_\_\_\_\_\_\_\_\_\_          3\_\_\_\_\_\_\_\_\_\_\_\_\_**

**16-20\_\_\_\_\_\_\_\_\_      2\_\_\_\_\_\_\_\_\_\_\_\_\_\_          4\_\_\_\_\_\_\_\_\_\_\_\_\_**

**21-25\_\_\_\_\_\_\_\_\_      2\_\_\_\_\_\_\_\_\_\_\_\_\_\_          5\_\_\_\_\_\_\_\_\_\_\_\_\_**

**26+\_\_\_\_\_\_\_\_\_\_\_     2\_\_\_\_\_\_\_\_\_\_\_\_\_\_          20% of total\_\_\_\_**

**Parking spaces**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**CC 103.3 Identification.** Construction documents shall indicate the raceway or cable assembly termination point and the proposed location of future EV spaces and *EVSE.*Construction documents shall also provide information on the wiring methods, wiring schematics, and electrical load calculations to verify that the service capacity and premises wiring system have sufficient capacity to simultaneously charge all EVs at all required EV spaces at the full rating of the *EVSE.*

***(EN9974 AM) with comment post October 2022 TAC meeting***

***RESIDENTIAL PROVISIONS***

**CHAPTER 1 [RE] SCOPE AND ADMINISTRATION**

Revise Table R101.5.1 to read as follows:

**TABLE R101.5.1**

**INDEX TO CODE COMPLIANCE FORMS**

|  |  |
| --- | --- |
| **FORM** | **WHERE FOUND** |
| Form R402 | Appendix RD |
| ~~Florida REScheck~~ | ~~Computer printout~~ |
| Form R405 | Commission approved software printout |

**(EN-FBC-EC/R-Ch.1-Errata #1)**

**Revise as follows:**

**R103.1 General.** Construction documents, technical reports and other supporting data shall be submitted in one or more sets, or in a digital format where allowed by the building official, with each application for a permit. The construction documents and technical reports shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *code official* is authorized to require necessary construction documents to be prepared by a registered design professional.

**Exception:** The *code official* is authorized to waive the requirements for construction documents or other supporting data if the *code official* determines they are not necessary to confirm compliance with this code.

**(CA9121 / ADM46-19 Part IV AS)**

**Revise as follows:**

**R103.2 Information on construction documents.** Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the *building*, systems and equipment as herein governed. Details shall include the following as applicable:

1. Energy compliance path

2. Insulation materials and their *R*-values.

3. Fenestration *U-*factors and *solar heat gain coefficients* (SHGC).

4. Area-weighted *U-*factor and *solar heat gain coefficients* (SHGC) calculations.

5. Mechanical system design criteria.

6. Mechanical and service water-heating systems and equipment types, sizes and efficiencies.

7. Equipment and system controls.

8. Duct sealing, duct and pipe insulation and location.

9. Air sealing details.

**(EN8566 / CE13-19 Part II AS)**

**Add new text as follows:**

**SECTION R106   
NOTICE OF APPROVAL**

**Revise as follows:**

**~~R104.7~~ R106.1 Approval.** After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.

**~~R104.7.1~~ R106.2 Revocation.** The *code official* is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the *building* or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

Renumber following sections as appropriate.

**(CA9084 \ ADM31-19 Part III AS)**

**Revise as follows:**

**SECTION R108   
STOP WORK ORDER**

**R108.1 Authority.** Where the code official finds any work regulated by this code being performed in a manner ~~either~~ contrary to the provisions of this code or in a dangerous or unsafe manner, the code official is authorized to issue a stop work order.

**R108.2 Issuance.** The stop work order shall be in writing and shall be given to the owner of the property ~~involved~~, ~~to~~ the owner’s authorized agent~~,~~ or ~~to~~ the person ~~doing~~ performing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order and the conditions under which the cited work ~~will be permitted~~ is authorized to resume.

**R108.3 Emergencies.** Reserved.

**R108.4 Failure to comply.** Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to ~~a fine as set~~ fines established by the ~~applicable governing~~ authority having jurisdiction.

**(CA9106 / ADM41-19 Part IV AS)**

**CHAPTER 2 [RE] DEFINITIONS**

**SECTION R202   
GENERAL DEFINITIONS**

**CIRCULATING HOT WATER SYSTEM.** A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

**Revise as follows:**

**DEMAND RECIRCULATION WATER SYSTEM.** A water distribution system ~~having~~ where 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 prime the service hot water piping with heated water upon demand for hot water.

**(EN8570 / CE22-19 Part II AS)**

**Revise as follows:**

**SECTION R202   
GENERAL DEFINITIONS**

**Add new definition as follows:**

**ON-SITE RENEWABLE ENERGY.** Energy from renewable energy resources harvested at the building site.

**RENEWABLE ENERGY RESOURCES.** Energy derived from solar radiation, wind, waves, tides, landfill gas, biogas, biomass or extracted from hot fluid or steam heated within the earth.

**(EN8575 / CE31-19 Part II AS)**

**Revise as follows:**

**ROOF ~~RE-COVER~~ RECOVER.** The process of installing an additional roof covering over ~~a prepared~~ an existing roof covering without removing the existing roof covering.

**(EN8967 / RE9-19 Part I AS)**

**Revise as follows:**

**[RB] ROOF RECOVER.**The process of installing an additional *roof covering* over ~~a prepared~~ an existing roof covering without removing the existing roof covering.

**(EN8968 / RE9-19 Part II AS)**

**VERTICAL FENESTRATION.**Windows (fixed or ~~moveable~~ operable), opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of a least 60 degrees (1.05 rad) from horizontal.

**(EN10412 AS)**

**CHAPTER 3 [RE] GENERAL REQUIREMENTS**

**R303.1.1.3 Air-impermeable insulation.** Insulation having an air permeability not greater than 0.004 cubic

feet per minute per square foot [0.002 L/(s × m2)] under pressure differential of 0.3 inch water gauge (75 Pa) when

tested in accordance with ASTM E2178 shall be determined air-impermeable insulation.

**(EN8567 / CE19-19 Part II AMPC1)**

**CHAPTER 4 [RE] RESIDENTIAL ENERGY EFFICIENCY**

**Revise as follows:**

**R402.2.1 Ceilings with attics spaces.** Where Section R402.1.2 requires R-38 insulation in the ceiling or attic, installing R-30 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-49 insulation in the ceiling or attic, installing R-38 over 100 percent of the ceiling or attic area requiring insulation shall satisfy the requirement for R-49 insulation wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

**R402.2.2 Ceilings without attics ~~attic spaces~~.** Where Section R402.1.2 requires insulation *R*-values greater than R-30 in the ~~ceiling~~ interstitial space above a ceiling and below the structural roof deck and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation *R*-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section R402.1.2 shall be limited to 500 square feet (46 m2) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

**(EN8988 / RE42-19 AS)**

**Revise as follows:**

**R402.2.4 Access ~~hatches~~ hatch doors and ~~doors~~ insulation retention.** ~~Access~~ Vertical or horizontal access doors from *conditioned spaces* to *unconditioned spaces* such as attics and crawl spaces shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access that prevents damaging or compressing the insulation shall be provided to all equipment. Where loose-fill insulation is installed, a wood-framed or equivalent baffle, retainer, or ~~retainer~~ dam shall be installed to prevent ~~the~~ loose-fill insulation from spilling into ~~the~~ living space ~~when the attic access is opened.~~ , from higher to lower sections of the attic, and from attics covering conditioned spaces to unconditioned spaces. The baffle or retainer shall provide a permanent means of maintaining the installed Rvalue of the loose-fill insulation.

**Exception:** Vertical doors providing access from *conditioned spaces* to *unconditioned spaces* that comply with the fenestration requirements of Table R402.1.2 based on the applicable *climate zone* specified in Chapter 3.

**(EN8993/ RE49-19 AMPC1)**

**Revise as follows:**

**TABLE R402.2.6 (IRC N1102.2.6)**

**STEEL-FRAME CEILING, WALL AND FLOOR INSULATION *R*-VALUES**

|  |  |
| --- | --- |
| **WOOD FRAME R-VALUE REQUIREMENT** | **COLD-FORMED STEEL-FRAME EQUIVALENT R-VALUEa** |
| Steel Truss Ceilingsb | |
| R-30 | R-38 or R-30 + 3 or R-26 + 5 |
| R-38 | R-49 or R-38 + 3 |
| R-49 | R-38 + 5 |
| Steel Joist Ceilingsb | |
| R-30 | R-38 in 2 × 4 or 2 × 6 or 2 × 8 R-49in any framing |
| R-38 | R-49 in 2 × 4 or 2 × 6 or 2 × 8 or 2 × 10 |
| Steel-Framed Wall, 16 inches on center | |
| R-13 | R-13 + 4.2 or R-21 + 2.8 orR-0 + 9.3 or R-15 + 3.8 or R-21 + 3.1 |
| R-13 + 3 | R-0 + 11.2 or R-13 + 6.1 or R-15 + 5.7 orR-19 + 5.0 or R-21 + 4.7 |
| R-13+5 | R-0+15 or R-13+9 or R-15+8.5 or R19+8 or R-21+7 |
| R-13+10 | R0+20 or R-13+15 or R-15+14 or R19+13 or R-21+13 |
| R-20 | R-0 + 14.0 or R-13 + 8.9 or R-15 + 8.5 or R-19 + 7.8 ~~or R-19 + 6.2~~ or R-21 + 7.5 |
| R-20 + 5 | R-13 + 12.7 or R-15 + 12.3 or R-19 + 11.6 or R-21 + 11.3 or R-25 + 10.9 |
| R-21 | R-0 + 14.6 or R-13 + 9.5 or R-15 + 9.1 orR-19 + 8.4 or R-21 + 8.1 or R-25 + 7.7 |
| Steel Framed Wall, 24 inches on center | |
| R-13 | R-0 + 9.3 or R-13 + 3.0 or R-15 + 2.4 |
| R-13 + 3 | R-0 + 11.2 or R-13 + 4.9 or R-15 + 4.3 orR-19 + 3.5 or R-21 + 3.1 |
| R-13+5 | R-0+15 or R-13+7.5 or R-15+7 or R-19+6 or R-21+6 |
| R-13+10 | R-0+20 or R-13+13 or R-15+12 or R-19+11 or R-21+11 |
| R-20 | R-0 + 14.0 or R-13 + 7.7 or R-15 + 7.1 orR-19 + 6.3 or R-21 + 5.9 |
| R-20 + 5 | R-13 + 11.5 or R-15 + 10.9 or R-19 + 10.1 orR-21 + 9.7 or R-25 + 9.1 |
| R-21 | R-0 + 14.6 or R-13 + 8.3 or R-15 + 7.7 orR-19 + 6.9 or R-21 + 6.5 or R-25 + 5.9 |
| Steel Joist Floor | |
| R-13 | R-19 in 2 × 6, or R-19 + 6 in 2 × 8 or 2 × 10 |
| R-19 | R-19 + 6 in 2 × 6, or R-19 + 12 in 2 × 8 or 2 × 10 |

a. The first value is cavity insulation *R*-value, the second value is continuous insulation *R*-value. Therefore, for example, “R-30+3” means R-30 cavity insulation plus R-3 continuous insulation.

b. Insulation exceeding the height of the framing shall cover the framing.

Public comment 1

**TABLE R402.2.6**

**STEEL-FRAME CEILING, WALL AND FLOOR INSULATION *R*-VALUES**

|  |  |
| --- | --- |
| **WOOD FRAME R-VALUE REQUIREMENT** | **COLD-FORMED STEEL-FRAME EQUIVALENT R-VALUEa** |
| Steel Truss Ceilingsb | |
| R-30 | R-38 or R-30 + 3 or R-26 + 5 |
| R-38 | R-49 or R-38 + 3 |
| R-49 | R-38 + 5 |
| Steel Joist Ceilingsb | |
| R-30 | R-38 in 2 × 4 or 2 × 6 or 2 × 8 R-49in any framing |
| R-38 | R-49 in 2 × 4 or 2 × 6 or 2 × 8 or 2 × 10 |
| Steel-Framed Wall, 16 inches on center | |
| R-13 | R-13 + 4.2 or R-21 + 2.8 orR-0 + 9.3 or R-15 + 3.8 or R-21 + 3.1 |
| ~~R-13 + 3~~ | ~~R-0 + 11.2 or R-13 + 6.1 or R-15 + 5.7 orR-19 + 5.0 or R-21 + 4.7~~ |
| R-13+5 | R-0+15 or R-13+9 or R-15+8.5 or R19+8 or R-21+7 |
| R-13+10 | R0+20 or R-13+15 or R-15+14 or R19+13 or R-21+13 |
| R-20 | R-0 + 14.0 or R-13 + 8.9 or R-15 + 8.5 or R-19 + 7.8 or R-21 + 7.5 |
| R-20 + 5 | R-13 + 12.7 or R-15 + 12.3 or R-19 + 11.6 or R-21 + 11.3 or R-25 + 10.9 |
| R-21 | R-0 + 14.6 or R-13 + 9.5 or R-15 + 9.1 orR-19 + 8.4 or R-21 + 8.1 or R-25 + 7.7 |
| Steel Framed Wall, 24 inches on center | |
| R-13 | R-0 + 9.3 or R-13 + 3.0 or R-15 + 2.4 |
| ~~R-13 + 3~~ | ~~R-0 + 11.2 or R-13 + 4.9 or R-15 + 4.3 orR-19 + 3.5 or R-21 + 3.1~~ |
| R-13+5 | R-0+15 or R-13+7.5 or R-15+7 or R-19+6 or R-21+6 |
| R-13+10 | R-0+20 or R-13+13 or R-15+12 or R-19+11 or R-21+11 |
| R-20 | R-0 + 14.0 or R-13 + 7.7 or R-15 + 7.1 orR-19 + 6.3 or R-21 + 5.9 |
| R-20 + 5 | R-13 + 11.5 or R-15 + 10.9 or R-19 + 10.1 orR-21 + 9.7 or R-25 + 9.1 |
| R-21 | R-0 + 14.6 or R-13 + 8.3 or R-15 + 7.7 orR-19 + 6.9 or R-21 + 6.5 or R-25 + 5.9 |
| Steel Joist Floor | |
| R-13 | R-19 in 2 × 6, or R-19 + 6 in 2 × 8 or 2 × 10 |
| R-19 | R-19 + 6 in 2 × 6, or R-19 + 12 in 2 × 8 or 2 × 10 |

a. The first value is cavity insulation R-value, the second value is continuous insulation R-value. Therefore, for example, “R-30+3” means R-30 cavity insulation plus R-3 continuous insulation.

b. Insulation exceeding the height of the framing shall cover the framing.

**(EN8995 / RE51-19 AMPC1)**

**Add new text as follows:**

**R402.2.9 Basement Walls.** Basement walls shall be insulated in accordance with Table R402.1.2.

**Exception:** Basement walls associated with unconditioned basements where the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8.

**Revise as follows:**

**~~R402.2.9~~ R402.2.9.1 Basement walls insulation installation.** ~~Walls associated with conditioned basements~~ Where basement walls are insulated, the insulation shall be ~~insulated~~ installed from the top of the *basement wall* down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. ~~Walls associated with unconditioned basements shall comply with this requirement except where the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8.~~

**(EN8999 / RE59-19 AM)**

**Revise as follows:**

**R402.2.10 Slab-on-grade floors [Prescriptive].** Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table R402.1.2. ~~The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table R402.1.2 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the~~ *~~building~~*~~. Insulation extending away from the~~ *~~building~~* ~~shall be protected by pavement or by not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the~~ *~~exterior wall~~* ~~and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the~~ *~~exterior wall.~~*

**Exception:** Slab-edge insulation is not required in jurisdictions designated by the *code official* as having a very heavy termite infestation.

**Add new text as follows:**

**R402.2.10.1 Slab-on-grade floor insulation installation (Mandatory).** Where installed, the insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table R402.1.2, or the distance of the proposed design as applicable, by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the *building*. Insulation extending away from the *building* shall be protected by pavement or by not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the *exterior wall* and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the *exterior wall.*

**(EN9000/ RE60-19 AMPC2)**

**Add new text as follows:**

**R402.2.11 Crawl space walls.** Crawl space walls shall be insulated in accordance with Table R402.1.2.

**Exception:** Crawlspace walls associated with a crawlspace that is vented to the outdoors and the floor overhead is insulated in accordance with Sections R402.1.2 and R402.2.8.

**Revise as follows:**

**~~R402.2.11~~R402.2.11.1 Crawl space walls insulation installation (Mandatory).** ~~As an alternative to insulating floors over crawl spaces, crawl space walls shall be insulated provided that the crawl space is not vented to the outdoors. Crawl~~ Where crawl space wall insulation is installed, it shall be permanently fastened to the wall and shall extend downward from the floor to the finished grade elevation and then vertically or horizontally for not less than an additional 24 inches (610 mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with the International Building Code or International Residential Code , as applicable. Joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend not less than 6 inches (153 mm) up stem walls and shall be attached to the stem walls.

**(EN9001 / RE62-19 AS)**

**Revise Table R402.4.1.1 as follows:**

|  |  |  |
| --- | --- | --- |
| **COMPONENT** | **AIR BARRIER CRITERIA** | **INSULATION INSTALLATION CRITERIA** |
| Electrical~~/phone box on exterior walls~~, communication, and other equipment boxes, housings, and enclosures | ~~The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.~~  Boxes, housings, and enclosures that penetrate the *air barrier*shall be caulked, taped, gasketed, or otherwise sealed to the *air barrier* element being penetrated.  All concealed openings into the box, housing, or enclosure shall be sealed.  The continuity of the *air barrier* shall be maintained around boxes, housings, and enclosures that penetrate the *air barrier*.  Alternatively, air-sealed boxes shall be installed in accordance with R402.4.6. | Boxes, housings, and enclosures shall be buried in or surrounded by tightly fitted insulation. |

**Add new Section as follows:**

**R402.4.6 Air-Sealed Electrical and Communication Boxes.** Air-sealed electrical and communication boxes that penetrate the air barrier of the building thermal envelope shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. Air-sealed boxes shall be buried in or surrounded by insulation. Air-sealed boxes shall be marked in accordance with NEMA OS 4. Air-sealed boxes shall be installed in accordance with the manufacturer's instructions.

**(EN10072 AS)**

**R402.4.1.2 Testing.**The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding seven air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380 and reported at a pressure of 0.2 inch w.g. (50 pascals). Testing shall be conducted by either individuals as defined in Section 553.993(5) or (7), *Florida Statutes,*or individuals licensed as set forth in Section 489.105(3)(f), (g) or (i) or an *approved*third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

**Exception:**Testing is not required for additions, alterations, renovations or repairs of the building thermal envelope of existing buildings in which the new construction is less than 85 percent of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.

2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.

3. Interior doors, if installed at the time of the test, shall be open.

4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed.

5. Heating and cooling systems, if installed at the time of the test, shall be turned off.

6. Supply and return registers, if installed at the time of the test, shall be fully open.

7.  If an attic is both air sealed and insulated at the roof deck, interior access doors and hatches between the conditioned space volume and the attic shall be opened during the test and the volume of the attic shall be added to the conditioned space volume for purposes of reporting an infiltration volume and calculating the air leakage of the home.

**(EN10151 AS)**

**R402.4.1.2 Testing.**The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding seven air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Dwelling units with an air leakage rate less than three air changes per hour shall be provided with whole-house mechanical ventilation in accordance with Section R403.6.1 of this code and M1507.3 of the *Florida Building Code, Residential.*Testing shall be conducted in accordance with ANSI/RESNET/ICC 380 and reported at a pressure of 0.2 inch w.g. (50 pascals). Testing shall be conducted by either individual as defined in Section 553.993(5) or (7), *Florida Statutes,*or individuals licensed as set forth in Section 489.105(3)(f), (g) or (i) or an *approved*third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*.  Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*.

No change to the remaining text.

**(EN10193 AS)**

**R403.1.3 Heat pump supplementary heat (Mandatory).**

Heat pumps with supplementary electric resistance heaters shall have controls that~~except during defrost, prevent supplemental heat operation when the capacity of the heat pump compressor can meet the heating load.~~ limit supplemental heat operation to only those times when one of the following applies:

1. The vapor compression cycle cannot provide the necessary heating energy to satisfy the thermostat setting.

2. The heat pump is operating in defrost mode.

3. The vapor compression cycle malfunctions.

4. The thermostat malfunctions.

**(EN10252 AS)**

|  |
| --- |
| **Revise as follows:**    **R403.3.1 Insulation (Prescriptive).**Supply and return ducts in attics shall be insulated to an *R*-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the building shall be insulated to not less than *R*-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter. Ducts buried beneath a building shall be insulated as required per this section or have an equivalent thermal distribution efficiency. Underground ducts utilizing the thermal distribution efficiency method shall be listed and labeled to indicate the *R*-value equivalency.    **Exception:** Ducts or portions thereof located completely inside the building thermal envelope. |
|  |

**(EN8854 / CE151-19 Part I AS)**

**Revise as follows:**

**R403.5.2 Demand recirculation water systems (Mandatory).** ~~Demand~~ Where installed, *demand recirculation water systems* shall have controls that comply with both of the following:

1. The controls shall 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.

2. The controls shall limit the temperature of the water entering the cold water piping to not greater than 104ºF (40ºC).

**(EN9034 / RE125-19 AS)**

**Revise as follows:**

**TABLE R403.6.1**

**WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACYa**

|  |  |  |  |
| --- | --- | --- | --- |
| **FAN LOCATION** | **AIR FLOW RATE MINIMUM(CFM)** | **MINIMUM EFFICACY(CFM/WATT)** | **AIR FLOW RATE MAXIMUM(CFM)** |
| HRV or ERV | Any | 1.2 cfm/watt | Any |
| Range hoods | Any | 2.8 cfm/watt | Any |
| In-line fan | Any | ~~2.8~~ 3.8 cfm/watt | Any |
| Bathroom, utility room | 10 | ~~1.4~~ 2.8 cfm/watt | < 90 |
| Bathroom, utility room | 90 | ~~2.8~~ 3.5 cfm/watt | Any |

For SI: 1 cfm = 28.3 L/min.

**a.** When tested in accordance with HVI Standard 916.

**(EN9046 / RE133-19 AS)**

**R404.1 Lighting equipment (Mandatory).**

~~Not less than 90 percent of the lamps in~~ All permanently installed luminaires, excluding those in kitchen appliances, shall have an efficacy of at least 45 lumens-per-watt or shall utilize lamps with an efficacy of not less than 65 lumens-per-watt.

**(EN10517 AM with A1)**

**R405.2 Mandatory requirements.**

Compliance with this section requires that the mandatory provisions identified in Section R401.2 be met. All supply and return ducts not completely inside the *building thermal envelope* shall be insulated to a minimum of R-6, except site-wrapped supply ducts not completely inside the *building thermal envelope* shall be insulated to a minimum of R-8.

**(EN10165 AS)**

**TABLE R405.5.2(1)  
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

|  |  |  |
| --- | --- | --- |
| **BUILDING COMPONENT** | **STANDARD REFERENCE DESIGN** | **PROPOSED DESIGN** |
| Vertical fenestration other than opaque doors | Vertical fenestration areah =  (a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area.  (b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area.  ~~(a)    The proposed vertical fenestration area (AVF), where the proposed total fenestration area (AF) is less than 15 percent of the conditioned floor area, (CFA) or~~  ~~(b)    The adjusted vertical fenestration area (AVF~~~~adj~~~~), where (AF) is 15 percent or more of CFA. AVF~~~~adj~~~~shall be calculated as follows:~~  ~~AVF~~~~adj~~~~= AVF \* 0.15 \* CFA/AF~~ | As proposed |
|  | Orientation: equally distributed to four cardinal compass orientations (N, E, S & W). | As proposed |
|  | U-factor: as specified for Fenestration in Table R402.1.4. | As proposed |
|  | SHGC: as specified for Glazed Fenestration in Table R402.1.2 except that for climate zones with no requirement (NR) SHGC = 0.40 shall be used. | As proposed |
|  | Interior shade fraction: 0.92 – (0.21 x SHGC for the standard reference design). | As proposed |
|  | External shading: none | As proposed |
| Skylights | None  ~~Skylight area~~~~h~~~~=~~  ~~(a)    The proposed skylight area (ASKY), where the proposed total fenestration area (AF) is less than 15 percent of the conditioned floor area (CFA), or~~  ~~(b)    The adjusted skylight area (ASKY~~~~adj~~~~), where AF is 15 percent or more of CFA. ASKY~~~~adj~~~~shall be calculated as follows:~~  ~~ASKY~~~~adj~~~~= ASKY \* 0.15 \* CFA/AF~~ | As proposed |
|  | ~~Orientation: as proposed~~ | ~~As proposed~~ |
|  | ~~U-factor: as specified for Skylights in Table R402.1.4~~ | ~~As proposed~~ |
|  | ~~SHGC: as specified by the exception in footnote (b) of Table R402.1.2, except that for climate zones with no requirement (NR) SHGC = 0.40 shall be used~~ | ~~As proposed~~ |
|  | ~~Interior shade fraction for the area of proposed skylights equipped and rated with factory-installed interior shades, the interior shade fraction is: 0.92 – (0.21 x SHGC)~~  ~~[SHGC as above for the standard reference design]~~ | ~~As proposed~~ |
|  | ~~External shading: none~~ | ~~As proposed~~ |

**(EN10503 AS)**

**[Ch. 4] R405.3 Performance-based compliance.**

Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have annual total normalized Modified Loads that are less than or equal to 95% of the annual total loads of the *standard reference design* as calculated in accordance with Appendix RC of this standard.

**(EN10230 AM A2)**

**R405.6.3.1 Water-heating ~~EF~~efficiency adjustment factors.**

The Energy Factor (EF) of an instantaneous water heater [those with capacity of two gallons (7.57 L) or less] in the Proposed home shall be reduced to 92 percent of the value in the manufacturer’s documentation or AHRI *Directory of Certified Product Performance*. The Uniform Energy Factor (UEF) of an instantaneous water heater in the Proposed home shall be reduced to 94 percent of the value in the manufacturer’s documentation or AHRI *Directory of Certified Product Performance*.

**(EN10158 AS)**

**R405.7.1 Installation criteria for homes claiming the radiant barrier option.**

The sheet radiant barrier or IRCC options may be claimed where the radiant barrier system is to be installed in one of the configurations depicted in Figure R405.7.1 and the following conditions are met:

1. It shall be fabricated over a ceiling insulated to a minimum of R-19 with conventional insulation and shall not be used as a means to achieve partial or whole compliance with a minimum attic insulation level of R-19. Either a sheet type or spray applied interior radiation control coating (IRCC) may be used

2. If the radiant barrier material has only one surface with high reflectivity or low emissivity, it shall be facing downward toward the ceiling insulation.

3. The attic airspace shall be vented in accordance with Section R806 of the Florida Building Code, Residential.

4. The radiant barrier system shall conform to ASTM C1313, *Standard Specification for Sheet Radiant Barriers for Building Construction Applications*, or ASTM C1321,*Standard Practice for Installation and Use of Interior Radiation Control Coating Systems (IRCCS) in Building Construction* as appropriate for the type of radiant barrier to be installed. The operative surface shall have an emissivity not greater than ~~0.06~~ 0.10 for sheet radiant barriers or 0.25 for interior radiation control coatings as demonstrated by independent laboratory testing according to ASTM C1371.

5. The radiant barrier system (RBS) shall conform with ASTM C1743, Standard Practice for Installation and Use of Radiant Barrier Systems (RBS) in Residential Building Construction~~ASTM C1158, Use and Installation of Radiant Barrier Systems (RBS) in Building Constructions for Sheet Radiant Barriers,~~ or ASTM C1321, Standard Practice for Installation and Use of Interior Radiation Control Coating Systems (IRCCS) in Building Construction for IRCC systems.

6. The radiant barrier shall be installed so as to cover gable ends without closing off any soffit, gable or roof ventilation.

**(EN9965 AS)**

**R406.2 Mandatory requirements.**

Compliance with this section requires that the provisions identified in Sections R401 through R404 labeled as “mandatory” and Section R403.5.3 of the 2015 International Energy Conservation Code be met. For buildings that do not utilize on-site renewable power production for compliance with this section, the building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in Table 402.1.1 or 402.1.3 of the 2009 International Energy Conservation Code. For buildings that utilize on-site renewable power production for compliance with this section, the building thermal envelope shall be greater than or equal to levels of efficiency and Solar Heat Gain Coefficient in Table R402.1.2 or Table R402.1.4 of the 2015 International Energy Conservation Code.

**Exception:** Supply and return ducts not completely inside the building thermal envelope shall be insulated to a minimum of R-6.

**[New]R406.2.1 Site-wrapped supply ducts.**

  Site-wrapped supply ducts not completely inside the *building thermal envelope* shall be insulated to a  minimum of R-8.

**(EN10166 AS)**

**CHAPTER 5 [RE] EXISTING BUILDINGS**

**R501.7.2 Electric space heating.**

Electric resistance shall not be the primary space heating system type used for complete central equipment replacements in Climate Zone 2.

**(EN10148 AS)**

**Revise as follows:**

**R503.1.4 Lighting.** New lighting systems that are part of the *alteration* shall comply with Section R404.1.R404.1.

**Exception:** *Alterations* that replace less than ~~50~~10 percent of the luminaires in a space, provided that such *alterations* do not increase the installed interior lighting power.

**(EN9093 / RE218-19 AS)**

**Chapter 6 [RE] – Reference Standards**

**See attached**

Appendix RA

**Add new text as follows:**

**APPENDIX RA  
BOARD OF APPEALS**

**SECTION RA101   
GENERAL**

**RA101.1 Scope.** A board of appeals shall be established within the jurisdiction for the purpose of hearing applications for modification of the requirements of this code pursuant to the provisions of Section C109 (Means of Appeals). The board shall be established and operated in accordance with this section, and shall be authorized to hear evidence from appellants and the code official pertaining to the application and intent of this code for the purpose of issuing orders pursuant to these provisions.

**RA101.2 Application for appeal.** Any person shall have the right to appeal a decision of the code official to the board. An application for appeal shall be based on a claim that the intent of this code or the rules legally adopted hereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The application shall be filed on a form obtained from the code official within 20 days after the notice was served.

**RA101.2.1 Limitation of authority.** The board shall not have authority to waive requirements of this code or interpret the administration of this code.

**RA101.2.2 Stays of enforcement.** Appeals of notice and orders, other than Imminent Danger notices, shall stay the enforcement of the notice and order until the appeal is heard by the board.

**RA101.3 Membership of board.** The board shall consist of five voting members appointed by the chief appointing authority of the jurisdiction. Each member shall serve for [INSERT NUMBER OF YEARS] years or until a successor has been appointed. The board member’s terms shall be staggered at intervals, so as to provide continuity. The code official shall be an ex officio member of said board but shall not vote on any matter before the board.

**RA101.3.1 Qualifications.** The board shall consist of five individuals, who are qualified by experience and training to pass on matters pertaining to building construction and are not employees of the jurisdiction.

**RA101.3.2 Alternate members.** The chief appointing authority is authorized to appoint two alternate members who shall be called by the board chairperson to hear appeals during the absence or disqualification of a member. Alternate members shall possess the qualifications required for board membership, and shall be appointed for the same term or until a successor has been appointed.

**RA101.3.3 Vacancies.** Vacancies shall be filled for an unexpired term in the same manner in which original appointments are required to be made.

**RA101.3.4 Chairperson.** The board shall annually select one of its members to serve as chairperson.

**RA101.3.5 Secretary.** The chief appointing authority shall designate a qualified clerk to serve as secretary to the board. The secretary shall file a detailed record of all proceedings which shall set forth the reasons for the board’s decision, the vote of each member, the absence of a member and any failure of a member to vote.

**RA101.3.6 Conflict of interest.** A member with any personal, professional or financial interest in a matter before the board shall declare such interest and refrain from participating in discussions, deliberations and voting on such matters.

**RA101.3.7 Compensation of members.** Compensation of members shall be determined by law.

**RA101.3.8 Removal from the board.** A member shall be removed from the board prior to the end of their terms only for cause. Any member with continued absence from regular meeting of the board may be removed at the discretion of the chief appointing authority.

**RA101.4 Rules and procedures.** The board shall establish policies and procedures necessary to carry out its duties consistent with the provisions of this code and applicable state law. The procedures shall not require compliance with strict rules of evidence, but shall mandate that only relevant information be presented.

**RA101.5 Notice of meeting.** The board shall meet upon notice from the chairperson, within 10 days of the filing of an appeal or at stated periodic intervals.

**RA101.5.1 Open hearing.** All hearings before the board shall be open to the public. The appellant, the appellant’s representative, the code official and any person whose interests are affected shall be given an opportunity to be heard.

**RA101.5.2 Quorum.** Three members of the board shall constitute a quorum.

**RA101.5.3 Postponed hearing.** When five members are not present to hear an appeal, either the appellant or the appellant’s representative shall have the right to request a postponement of the hearing.

**RA101.6 Legal counsel.** The jurisdiction shall furnish legal counsel to the board to provide members with general legal advice concerning matters before them for consideration. Members shall be represented by legal counsel at the jurisdiction’s expense in all matters arising from service within the scope of their duties.

**RA101.7 Board decision.** The board shall only modify or reverse the decision of the code official by a concurring vote of three or more members.

**RA101.7.1 Resolution.** The decision of the board shall be by resolution. Every decision shall be promptly filed in writing in the office of the code official within three days and shall be open to the public for inspection. A certified copy shall be furnished to the appellant or the appellant’s representative and to the code official.

**RA101.7.2 Administration.** The code official shall take immediate action in accordance with the decision of the board.

**RA101.8 Court review.** Any person, whether or not a previous party of the appeal, shall have the right to apply to the appropriate court for a writ of certiorari to correct errors of law. Application for review shall be made in the manner and time required by law following the filing of the decision in the office of the chief administrative officer.

**(CA9115 / ADM43-19 Part IV AS)**

**APPENDIX RC CALCULATION OF END USE ENERGY LOADS**

[Keep previously TAC approved Table C403.2.3(1) changes, and also modify related residential energy Appendix RC Table RC-1(1) as follows.]

**TABLE RC-1(1) COEFFICIENTS ‘a’ AND ‘b’**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | **FUEL TYPE AND END USE** | **a** | **b** | | Electric space heating | ~~2.4026~~2.5853 | 0.0000 | | Fossil fuel\* space heating | ~~1.0370~~0.7618 | ~~0.2962~~ -0.0477 | | Biomass space heating | ~~0.7297~~ 0.5361 | ~~0.1583~~ -0.1490 | | Electric air conditioning | ~~4.1020~~ 4.4104 | 0.0000 | | Electric water heating | 0.9500 | 0.0000 | | Fossil fuel\* water heating | 1.3774 | 1.2217 | | \* Such as natural gas, LP, fuel oil | | | |  |  |
|  |  |  |
| [No other changes to Appendix RC.] |  |  |

**(EN10213 AM A1)**

**[Appendix RC] RC-2**

Following normalization of the heating, cooling and hot water energy consumptions for the *Proposed Design* as specified in Section RC-1 above, the *Standard Reference Design* home’s total reference end use loads for heating, cooling and hot water (REULtot) shall be compared with the *Proposed Design* home’s total normalized modified end use loads for heating, cooling and hot water (nMEULtot). If the total normalized modified loads of the Proposed Design home (nMEULtot) are equal to or less than 95% of the total reference loads of the *Standard Reference Design* home (REULtot), the *Proposed Design* complies with this code.

**(EN10230 AM A2)**

**Text of modification: [Note: this A3 mod starts from the A2 mod which was approved by the Energy TAC in June, and now also addresses SEER2 labeled heat pumps and includes Section R404.1 lighting requirement changes that were approved by the Energy TAC in June via Mod 10517-A1. June TAC meeting approved A2 mod changes are kept in underline and cross-out format in black font, and new A3 mod changes are in underline and cross-out format in blue font.]**

***Florida Building Code, Energy Conservation***

**Residential Building Thermal Envelope Approach**

**FORM R402-202~~0~~3 *R*-Value Computation Method Florida Climate Zone**

|  |  |  |
| --- | --- | --- |
| **PROJECT NAME AND ADDRESS:** |  | **BUILDER:** |
|  | **PERMITTING OFFICE:** |
|  | **JURISDICTION NUMBER:** |
| **OWNER:** |  | **PERMIT NUMBER:** |
| **PERMIT TYPE:** |  | **NUMBER OF UNITS:** |
| **WORST CASE?** |  | **CONDITIONED FLOOR AREA:** |

**Scope:** Compliance with Section R402.1.2 of the *Florida Building Code, Energy Conservation*, shall be demonstrated by the use of Form R402 for single- and multiple-family residences of three stories or less in height, additions to existing residential buildings, alterations, renovations, and building systems in existing buildings, as applicable. To comply, a building must meet or exceed all of the energy efficiency requirements and applicable mandatory requirements summarized on this form. If a building does not comply with this method, or by the UA Alternative method, it may still comply under Section R405 or R406 of the *Florida Building Code, Energy Conservation*.

**General Instructions:**

1. Fill in all the applicable spaces of the “INSTALLED" row in the INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT table with the information requested. All "INSTALLED" values must be equal to or more efficient than the required levels. “AVG” indicates an area weighted average is allowed; “LOWEST” indicates the lowest *R*-value to be installed must be entered.
2. Complete the tables for air infiltration and installed equipment.
3. Read the MANDATORY REQUIREMENTS table and check each box to indicate your intent to comply with all applicable items.
4. Read, sign and date the "Prepared By" certification statement at the bottom of this form. The owner or owner's agent must also sign and date the form.

**INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT1**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **REQUIRE-MENT** | **FENESTRATION *U*-FACTOR2, 3, 4** | **SKYLIGHT2 *U*-FACTOR** | **GLAZED FENESTRATION SHGC2, 3** | **CEILING *R*-VALUE** | **WOOD FRAME WALL *R*-VALUE5** | **MASS WALL *R*-VALUE5, 6** | **FLOOR *R*-VALUE** | **BASEMENT WALL *R*-VALUE** | **SLAB7 R-VALUE & DEPTH** | **CRAWL SPACE WALL *R*-VALUE** |
| CLIMATE ZONE 1 | NR | 0.75 | 0.25 | 30 | 13 | 3/4 | 13 | 0 | 0 | 0 |
| CLIMATE ZONE 2 | 0.40 | 0.65 | 0.25 | 38 | 13 | 4/6 | 13 | 0 | 0 | 0 |
| VALUE | AVG | AVG | AVG | LOWEST | LOWEST | LOWEST | LOWEST | LOWEST | LOWEST | LOWEST |
| **INSTALLED:** |  |  |  |  |  |  |  |  |  |  |

*R*-Value Calculation Method - [PASS / FAIL]

For SI: 1 foot = 304.8 mm; NR = No requirement.

1. *R*-values are minimums. *U*-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed R-value of the insulation shall not be less than the R-value specified in the table.
2. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
3. For impact rated fenestration complying with Section R301.2.1.2 of the *Florida Building Code, Residential* or Section 1609.1.2 of the *Florida Building Code, Building*, the maximum *U*-factor shall be 0.65 in Climate Zone 2. An area-weighted average of *U*-factor and SHGC shall be accepted to meet the requirements, and up to 15 square feet of glazed fenestration area are exempted from the *U*-factor and SHGC requirement based on Section R402.3.1, R402.3.2 and R402.3.3.
4. One side-hinged opaque door assembly up to 24 square feet is exempted from this *U*-factor requirement based on Section R402.3.4.
5. *R*-values are for insulation material only as applied in accordance with manufacturer’s installation instructions.
6. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.
7. R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Climate Zones 1 through 3 for heated slabs.

|  |  |
| --- | --- |
| **Air infiltration**: | Blower door test is required on the building envelope to verify leakage 7 ACH50; test report must be provided to code official before CO is issued. *Florida Building Code, Energy Conservation* Section R402.4.1.2 testing exception may apply for additions, alterations, or renovations. |

**EQUIPMENT REQUIREMENTS AND INSTALLED VALUES**

Fill in the “INSTALLED EFFICIENCY LEVEL" column with the information requested. For multiple systems of the same type, indicate the minimum efficient system. All "INSTALLED" values must be equal to or more efficient than the required level. If a listed “SYSTEM TYPE” is not to be installed, write in “N/A” for not applicable.

|  |  |  |
| --- | --- | --- |
| **SYSTEM TYPE** | **MINIMUM EFFICIENCY LEVEL REQUIRED** | **INSTALLED EFFICIENCY LEVEL** |
| Air distribution system1 | Not allowed in attic | Location: |
| Air handling unit | Factory Sealed | Factory Sealed? Y/N |
| Duct *R*-Value | = R-8 (Ducts in unconditioned attics, Diameter => 3 in.)  = R-6 (Ducts in unconditioned non attics, Diam. => 3 in.)  = R-6 (Ducts in unconditioned attics, Diameter < 3 in.)  = R-4.2 (Ducts in uncond not attics, Diam. < 3 in.)  All ducts are in conditioned space (No minimum) | *R*-Value (In unc. attic) =  *R*-Value (In unc. non attics) =  *R*-value (Small ducts in attic) =  *R*-Value (Small ducts in unc) =  All in conditioned space? Y/N |
| Air Leakage/Duct test | Air handler installed: Total leakage = 4 cfm/100 s.f.  Air handler not installed: Total leakage = 3 cfm/100 s.f. | Total leakage (cfm/100 s.f.) =  Air handler installed? Y/N |
| Duct testing | Test not required if all ducts and AHU are within the building thermal envelope and for additions or alterations where ducts extended from existing heating and cooling system through unconditioned space are < 40 linear ft. | Test report required? Y/N |
| Air conditioning systems:  Central system < ~~6~~45,000 Btu/h  Central system 45,000 Btu/h  Central heat pump  PTAC, PTHP, SPVAC, or SPVHP  Other: | Minimum federal standard required by NAECA2  SEER2=14.~~0~~3  SEER2=13.8  SEER2 = 14.3  EER [from Table C403.2.3(3)]  See Tables C403.2.3(1)-(11) | Cap. (Btu/h)=  SEER2 (Min)=  SEER2 (Min)=  Type=  Cap. (Btu/h)=  EER (Min)=  Type =  Effic.(Min) = |
| Heating systems:  Electric resistance  Heat Pump ~~<= 65,000 Btu/h~~  Gas Furnace, non-weatherized  Oil Furnace, non-weatherized  PTHP or SPVHP  Other: | Minimum federal standard required by NAECA2  Not allowed in Climate Zone 2  HSPF2 ~~8.2~~7.5  ~~HSPF~~AFUE 80%  ~~HSPF~~AFUE 83%  COPH [from Table C403.2.3(3)]  See Tables C403.2.3(1)-(11) | HSPF2 (Min) =  AFUE (Min) =  AFUE (Min) =  Type=  Cap. (Btu/h)=  COPH (Min)=  Type =   Effic.(Min)= |
| Water heating system (storage type):  Electric3, 6  Gas fired4, 6  Other (describe)5, 6: | Minimum federal standard required by NAECA2  UEF: 40 gal.: ~~0.923~~0.931, 50 gal.: ~~0.921~~0.930, 60 gal.: ~~2.051~~2.176  UEF: 40 gal.: ~~0.580~~0.64, 50 gal.: ~~0.563~~0.627, 60 gal.: ~~0.766~~0.789 | Capacity =  UEF (Min) =  UEF (Min) =  Type=  Effic.(Min)= |

Equipment Efficiency - [PASS / FAIL]

1. Ducts & AHU installed “substantially leak free” per Section R403.3.2. Test required by either individuals as defined in Section 553.993(5) or (7),*Florida Statutes*, or individuals licensed as set forth in Section 489.105(3)(f), (g), or (i), *Florida Statutes*. The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope, and for additions where ducts from an existing heating and cooling system extended to the addition through unconditioned space are less than 40 linear ft.
2. Minimum efficiencies are those set by the *National Appliance Energy Conservation Act* of 1987 for typical residential equipment and are subject to NAECA rules and regulations. For other types of equipment, see Tables C403.2.3 (1-11) of the Commercial Provisions of the *Florida Building Code, Energy Conservation.*
3. For electric storage volumes <= 55 gallons, minimum UEF = 0.9349 – (0.0001 \* volume). For electric storage volumes > 55 gallons, minimum UEF = 2.2418 – (0.0011 \* volume).
4. For natural gas storage volumes <= 55 gallons, minimum UEF = 0.692 – (0.0013 \* volume). For natural gas storage volumes > 55 gallons, minimum UEF = 0.8072 – (0.0003 \* volume).
5. For electric tankless, min. UEF = 0.92. For natural gas tankless, min. UEF = 0.81.
6. Referenced UEFs shown are for ~~medium~~high draw pattern value provided by manufacturer.

|  |  |  |  |
| --- | --- | --- | --- |
| **~~MANDATORY~~ OTHER REQUIREMENTS** | | | |
| **Component** | **Section** | **Summary of Requirement(s)** | **Check** |
| Air leakage | R402.4 | To be caulked, gasketed, weatherstripped or otherwise sealed per Table R402.4.1.1. Recessed lighting IC-rated as having <= 2.0 cfm tested to ASTM E 283.Windows and doors: 0.3 cfm/sq.ft. (swinging doors: 0.5 cfm/sf) when tested to NFRC 400 or AAMA/WDMA/CSA 101/I.S. 2/A440. Fireplaces: Tight-fitting flue dampers & outdoor combustion air. |  |
| Programmable thermostat | R403.1.2 | A programmable thermostat is required for the primary heating or cooling system. |  |
| Air distribution system | R403.3.2  R403.3.4 | Ducts shall be tested as per Section R403.3.2 by either individuals as defined in Section553.993(5) or (7), *Florida Statutes*, or individuals licensed as set forth in Section 489.105(3) (f), (g) or (i), *Florida Statutes*. Air handling units are not allowed in attics. |  |
| Water heaters | R403.5 | Comply with efficiencies in Table C404.2. Hot water pipes insulated to >= R-3 to kitchen outlets, other cases. Circulating systems to have an automatic or accessible manual OFF switch. Heat trap required for vertical pipe risers. |  |
| Cooling/heating equipment | R403.7 | Sizing calculation performed & attached. Special occasion cooling or heating capacity requires separate system or variable capacity system. |  |
| Swimming pools & spas | R403.10 | Spas and heated pools must have vapor-retardant covers or a liquid cover or other means proven to reduce heat loss except if 70% of heat from site-recovered energy. Off/timer switch required. Gas heaters minimum thermal efficiency is 82%. Heat pump pool heaters minimum COP is 4.0. |  |
| Lighting equipment | R404.1 | ~~Not less than 90% of the lamps in~~ All permanently installed luminaires, excluding those in kitchen appliances, shall have an efficacy of at least 45 lumens-per-watt or shall utilize lamps with an efficacy of not less than 65 lumens-per-watt. |  |

|  |  |
| --- | --- |
| I hereby certify that the plans and specifications covered by this form are in compliance with the *Florida Building Code, Energy Conservation.*  PREPARED BY: \_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_  PREPARED BY SIGNATURE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Review of plans and specifications covered by this form indicate compliance with the *Florida Building Code, Energy Conservation* Before construction is complete, this building will be inspected for compliance in accordance with Section 553.908, F.S.  CODE OFFICIAL: \_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_  CODE OFFICIAL SIGNATURE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| I hereby certify that this building is in compliance with the *Florida Building Code, Energy Conservation.*  OWNER/AGENT: \_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_  OWNER/AGENT SIGNATURE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**(EN10457 AM A2 plus A3)**

|  |
| --- |
| **APPENDIX RE**    **ELECTRIC VEHICLE CHARGING PROVISIONS FOR ONE- AND TWO-FAMILY DWELLINGS AND TOWNHOUSES**    *(The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.)*    **SECTION RE 101**  **SCOPE**    **RE 101.1 General.**  These provisions shall be applicable for new construction where electric vehicle charging provisions are required.    **SECTION RE 102**  **DEFINITIONS**    **ELECTRIC VEHICLE (EV).**An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, primarily powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current. Plug-in hybrid electric vehicles (PHEV) are electric vehicles having a second source of motive power. Off-road, self-propelled electric mobile equipment, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats, and the like are not considered electric vehicles.    **ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE).** The conductors, including the ungrounded, grounded, and equipment grounding conductors, and the *Electric Vehicle* connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the *Electric Vehicle.*    **EV CAPABLE SPACE.** Electrical panel capacity and space to support a minimum 40-ampere, 240-volt branch circuit for each EV parking space, and the installation of raceways, both underground and surface mounted, to support the *EVSE.*    **SECTION RE 103**  **REQUIREMENTS FOR ELECTRIC VEHICLE CHARGING**    **RE 103.1 New one- and  two-family dwellings and *townhouses* with attached or  detached private garages.** Each dwelling unit with an attached or detached garage shall be designed with provision for future installation of *electric vehicle supply equipment* in accordance with this section.    **RE 103.2 Raceway.**    A listed raceway of minimum trade size 1 shall be installed to accommodate a branch circuit for *electric vehicle supply equipment.*    The raceway shall originate at the main electrical panel or a properly rated sub-panel, and terminate in a listed box or enclosure in close proximity to the proposed location of the *electric vehicle supply equipment.*    The raceway shall be continuous from the point of origin to the termination at the proposed location of the *electric vehicle supply equipment.*    The enclosure provided for future *electric vehicle supply equipment* shall be labeled “EV CAPABLE”. The label shall comply with NFPA 70 Section 110.21(B).    **RE 103.3 Service capacity.**    The electrical panel from which the *electric vehicle supply equipment* branch circuit originates shall be rated for, and be provided with open space for installation of a two-pole 40-ampere overcurrent protective device. The provided overcurrent device space(s) shall be identified in the panel circuit directory as “EV CAPABLE”. |
|  |

**(EN10370 AM) with comment post October 2022 TAC meeting**