**Florida Supplement to the 8th Edition (2023) 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.

**Chapter 1 SCOPE AND ADMINISTRATION**

No change

**CHAPTER 2 [CE] DEFINITIONS**

**CONSTRUCTION DOCUMENTS.** Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit.

**[CE#29 AS]**

**DEMAND CONTROL KITCHEN VENTILATION (DCKV).** A system that provides *automatic*, continuous control over exhaust hood and makeup air fan speed in response to temperature, optical or infrared (IR) sensors that monitor cooking activity or through direct communication with cooking appliances.

**[CE#32 AS]**

**DEMAND RESPONSIVE CONTROL.** A control capable of receiving and automatically responding to a *demand response signal*.

**[CE#34 AS]**

**DX-DEDICATED OUTDOOR AIR SYSTEM UNIT (DX-DOAS UNIT).** A type of air-cooled,

water-cooled or water source factory-assembled product that dehumidifies 100 percent outdoor air to a low dew point and includes reheat that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designated supply air temperature. It may precondition outdoor air with an *energy recovery ventilation system*

**[CE#36 AS]**

**EAST-ORIENTED.** Facing within 45 degrees of true east to the south and within less than 22.5 degrees of true east to the north in the northern hemisphere or facing within 45 degrees of true east to the north and within less than 22.5 degrees of true east to the south in the southern hemisphere

**[CE#37 AS]**

**EMITTANCE.** The ratio of the radiant heat flux emitted by a specimen measured on a scale from 0 to 1, where a value of 1 indicates perfect release of thermal radiation.

**[CE#38 AS]**

**ENERGY RECOVERY, SERIES.** A three-step process in which the first step is to remove energy from a single airstream without the use of mechanical cooling. In the second step, the airstream is mechanically cooled for the purpose of dehumidification. In the third step, the energy removed in the first step is reintroduced to the airstream.

**[CE#39 AS]**

**ENERGY RECOVERY RATIO, SERIES (SERR).** The difference between the dry- bulb air temperatures leaving the *series energy recovery* unit and leaving the dehumidifying coil divided by the difference between 75°F (24°C) and the dry-bulb temperature of the air leaving the dehumidifying cooling coil.

**[CE#40 AS]**

**ENERGY STORAGE SYSTEM (ESS).** One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.

**[CE#41 AS]**

**ENERGY USE INTENSITY (EUI).** The metric indicating the total amount of energy consumed by a *building* in 1 year divided by the gross floor area of the *building*

**[CE#42 AS]**

**EXTERIOR WALL ENVELOPE.** A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural members, including framing and sheathing materials, and conditioned interior space from the detrimental effects of the exterior environment.

**[CE#44 AS]**

**FAN ELECTRICAL INPUT POWER.** The electrical input power in kilowatts required to operate an individual fan or *fan array* at design conditions. It includes the power consumption of motor controllers, where present.

**[CE#45 AS]**

**FAN SYSTEM.** All the fans that contribute to the movement of air serving spaces that pass through a point of a common *duct*, plenum or cabinet.

**[CE#46 AS]**

**FAN SYSTEM, COMPLEX.** A *fan system* that combines a *single-cabinet fan system* with other supply fans, exhaust fans or both.

**[CE#47 AS]**

**FAN SYSTEM, EXHAUST OR RELIEF.** A *fan system* dedicated to the removal of air from interior spaces to the outdoors.

**[CE#48 AS]**

**FAN SYSTEM, SINGLE-CABINET.** A fan system that supplies air to a space and recirculates the air, wherein a single cabinet houses a single fan, a single *fan array*, a single set of fans operating in parallel or fans or fan arrays in series.

**[CE#50 AS]**

**FAN SYSTEM, TRANSFER.** A *fan system* that exclusively moves air from one occupied space to another.

**[CE#51 AS]**

**FAN SYSTEM AIRFLOW.** The sum of the airflow of all fans with *fan electrical input power* greater than 1 kW at *fan system design conditions*, excluding the airflow that passes through downstream fans with *fan electrical input power* less than 1 kW.

**[CE#52 AS]**

**GREENHOUSE.** A structure or a thermally isolated area of a *building* that maintains a specialized sunlit environment with a skylight roof ratio of 50 percent or more above the growing area 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

**[CE#56 AS]**

**HORTICULTURAL LIGHTING.** Electric lighting used for horticultural production, cultivation or maintenance.

**[CE#58 AS]**

**HUMIDISTATIC CONTROLS.** *Automatic* controls used to maintain humidity at a setpoint.

**[CE#59 AS]**

**INDOOR GROW.** A space, other than a *greenhouse*, used exclusively for and essential to horticultural production, cultivation or maintenance.

**[CE#61 AS]**

**NORTH-ORIENTED.** Facing within 67.5 degrees of true north in the northern hemisphere or facing within 67.5 degrees of true south in the southern hemisphere.

**[CE#65 AS]**

**OCCUPIED-STANDBY MODE.** Mode of operation when an HVAC *zone* is scheduled to be occupied and an occupant sensor indicates no occupants are within the *zone*.

**[CE#66 AS]**

**PHOTOSYNTHETIC PHOTON EFFICACY (PPE).** Photosynthetic photon flux emitted by a light source divided by its electrical input power in units of micromoles per second per watt, or micromoles per joule (μmol/J) between 400–700nm as defined by [**ANSI/ASABE S640**](#_bookmark679)

**[CE#71 AS]**

**PHYSICAL RENEWABLE ENERGY POWER PURCHASE AGREEMENT.** A contract for the purchase of renewable electricity from a specific renewable electricity generator to a purchaser of renewable electricity.

**[CE#72 AS]**

**PROCESS APPLICATION.** A manufacturing, industrial or commercial procedure or activity where the primary purpose is other than conditioning spaces and maintaining comfort and amenities for the occupants of a *building*.

**[CE#73 AS]**

**PSI-FACTOR (Ψ-FACTOR).** The heat loss factor per unit length of a *thermal bridge* characterized as a linear element of a *building thermal envelope* (Btu/h × ft × °F) [W/(m × K)].

**[CE#74 AS]**

**PUMP ENERGY INDEX (PEI).** The ratio of a pump’s energy rating divided by the energy rating of a minimally compliant pump. For pumps with the constant load operating mode, the relevant PEI is PEICL. For pumps with the variable load operating mode, the relevant PEI is PEIVL.

**[CE#75 AS]**

**SENSIBLE ENERGY RECOVERY RATIO.** Change in the dry-bulb temperature of the outdoor air supply divided by the difference between the outdoor air and entering exhaust air dry-bulb temperatures, expressed as a percentage.

**[CE#81 AS]**

**SIMULATED BUILDING PERFORMANCE.** A process in which the proposed building design is compared to a *standard reference design* for the purposes of estimating relative energy use against a baseline to determine code compliance.

**[CE#82 AS]**

**SOUTH-ORIENTED.** Facing within 45 degrees of true south in the northern hemisphere or facing within 45 degrees of true north in the southern hemisphere.

**[CE#83 AS]**

**STANDARD REFERENCE DESIGN.** A version of the *proposed design* that meets the minimum requirements of this code and is used to determine the maximum annual energy use requirement for compliance based on total simulated building performance.

**[CE#84 AS]**

**THERMAL BRIDGE.** An element or interface of elements that has higher thermal conductivity than the surrounding *building thermal envelope*, which creates a path of least resistance for heat transfer.

**[CE#88 AS]**

**WEST-ORIENTED.** Facing within 45 degrees of true west to the south and within less than 22.5 degrees of true west to the north in the northern hemisphere or facing within 45 degrees of true west to the north and within less than 22.5 degrees of true west to the south in the southern hemisphere.

**[CE#91 AS]**

**CHAPTER 3 [CE] GENERAL REQUIREMENTS**

**TABLE C303.1.3(1) DEFAULT GLAZED FENESTRATION U-FACTORS**

Under “Frame Type”, change “Glazed block” to “Glass block.”

**[CE#97 AS]**

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

TABLE C402.1.1.1

**FENESTRATION BUILDING THERMAL ENVELOPE MAXIMUM REQUIREMENTS**

**[CE#103 AS]**

**TABLE C402.1.4 OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, *U*-FACTOR METHODa, b**

For SI: 1 pound per square foot = 4.88 g/m2, 1 pound per cubic foot = 16 kg/m3. ~~ci = Continuous Insulation, NR = No Requirement, LS = Liner System.~~

**[CE#105 AS]**

**C402.1.3.1 *R*-value of multi-layered insulation components.** Where *cavity insulation* is installed in multiple layers, the cavity insulation *R*-values shall be summed to determine compliance with the cavity insulation *R-value* requirements. Where *continuous insulation* is installed in multiple layers, the *continuous insulation R*-values shall be summed to determine compliance with the *continuous insulation R-value* requirements. Cavity insulation *R*-values shall not be used to determine compliance with the *continuous insulation R-value* requirements in [**Table C402.1.3**](#_bookmark125).

**C402.1.3.2 Area-weighted averaging of *R*-values.** Area-weighted averaging shall not be permitted for *R-value* compliance.

**Exception:** For tapered above-deck roof insulation, compliance with the *R*-values required in [**Table C402.1.3**](#_bookmark125) shall be permitted to be demonstrated by multiplying the rated *R-value* per inch of the insulation material by the average thickness of the roof insulation. The average thickness of the roof insulation shall equal the total volume of the roof insulation divided by the area of the roof.

**[CE#115 AS]**

**C402.3.1 Aged roof solar reflectance.** Where an aged solar reflectance required by [**Section C402.3**](#_bookmark144) is not available, it shall be determined in accordance with [**3**](#_bookmark147).

Equation 4-3

where:

*Raged* = The aged solar reflectance.

*Rinitial* = The initial solar reflectance determined in accordance with [**CRRC-S100**](#_bookmark717)

**[CE#131 AS]**

**C402.4.3.2 Increased skylight *U-*factor.** Where skylights are installed above *daylight zones* provided with *daylight responsive controls*, a maximum *U-factor* of 0.9 shall be permitted in Climate Zones 0 through 3 and a maximum *U-factor* of 0.75 shall be permitted in *Climate Zones* 4 through 8.

**[CE#136 AS]**

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

1. The *air barrier* shall be continuous for all assemblies that ~~are~~ compromise the

*building thermal envelope* ~~of the~~ *~~building~~* and across the joints and assemblies.

2. *Air barrier* joints and seams shall be sealed, including sealing transitions in places and changes in materials. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure from wind, stack effect and mechanical ventilation.

3. Penetrations of the *air barrier* shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Sealing shall allow for expansion, contraction and mechanical vibration. ~~Joints and seams associated with penetrations shall be sealed in the same manner or taped.~~ Sealing materials shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair the penetrations’ ability to resist positive and negative pressure ~~from wind, stack effect and mechanical ventilation~~. Sealing of concealed fire sprinklers, where required, shall be in a manner that is recommended by the fire sprinkler manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.

4. Recessed lighting fixtures shall comply with Section C402.5.8. Where similar objects are installed that penetrate the *air barrier* , provisions shall be made to maintain the integrity of the *air barrier* .

5. Electrical and communication boxes shall comply with Section C402.5.10.

**[CE#140 AS]**

**C402.5.1.2 Air ~~barrier~~ leakage 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 I occupancies, shall meet the provisions of~~ [**~~Section C402.6.2.2~~**](#_bookmark175)~~.~~

**~~Exception:~~** ~~Buildings in Climate Zones 2B, 3C and 5C.~~

~~2.~~  ~~Buildings or portions of buildings other than~~ *~~Group R~~* ~~and I occupancies shall meet the provisions of~~ [**~~Section C402.6.2.1~~**](#_bookmark174)~~.~~

~~Exceptions:~~

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

~~2.~~  ~~Buildings larger than 5,000 square feet (464.5 m2) floor area in Climate Zones 0B, 1, 2A, 4B and 4C.~~

~~3. Buildings between 5,000 square feet (464.5 m2) and 50,000 square feet (4645 m 2) floor area in Climate Zones 0A, 3A and 5B.~~

~~3.~~  ~~Buildings or portions of buildings that do not complete air barrier testing shall meet the provisions of~~ [**~~Section C402.6.2.3.~~**](#_bookmark177)**~~1~~** ~~or~~ [**~~C402.6.2.3.2~~**](#_bookmark178) ~~in addition to~~ [**~~Section C402.6.2.3~~**](#_bookmark176)~~.~~

Air leakage of the *building thermal envelope* shall be tested by an approved third party in accordance with Section 402.5.1.2.3. The measured air leakage shall not be greater than

0.35 cubic feet per minute per square foot (1.8 L/s x m2) of the *building thermal envelope* area at a pressure differential of 0.3 inch water gauge (75 Pa) with the calculated *building thermal envelope* surface area being the sum of the above- and below-grade *building thermal envelope*.

**Exceptions:**

1. Where the measured *air leakage* rate is greater than 0.35 cfm/ft2 (1.8 L/s × m2) but is not greater than 0.45 cfm/ft2 (2.3 L/s × m2), the *approved* third party shall perform a diagnostic evaluation using a smoke tracer or infrared imaging. The evaluation shall be conducted while the building is pressurized or depressurized along with a visual inspection of the air barrier in accordance with [**ASTM E1186**](#_bookmark697). All identified leaks shall be sealed where such sealing can be made without damaging existing building components. A report specifying the corrective actions taken to seal leaks shall be deemed to establish compliance with the requirements of this section where submitted to the *code official* and the *building* owner. Where the measured *air leakage* rate is greater than 0.45 cfm/ft2 (2.3 L/s × m2), corrective actions must be made to the *building* and an additional test completed for which the results are 0.45 cfm/ft2 (2.3 L/s × m2) or less.

2. Buildings in Climate Zone 2B.

3. Buildings larger than 25,000 square feet (2323 m2) floor area in Climate Zones

0 through 4, other than *Group I and R* occupancies, that comply with [**Section**](#_bookmark176) C104.

1. As an alternative, *buildings* or portions of *buildings* containing Group I-1 and R-2 occupancies shall be permitted to be tested by an *approved* third party in accordance with Section C402.5.1.2.3. The reported *air leakage* of the *building thermal envelope* shall not be greater than 0.27 cfm/ft2 (1.4 L/s × m2) of the *testing unit enclosure area* at a pressure differential of 0.2 inch water gauge (50 Pa).

**[CE#142 AS]**

**C402.5.1.2.3 ~~Building thermal envelope testing~~. Whole building test method and reporting.** The *building thermal envelope* shall be tested by an *approved* third party in accordance with ~~ASTM E779, ANSI/RESNET/ICC 380,~~ [**ASTM E3158**](#_bookmark706) ~~or ASTM~~ ~~E1827~~ or an equivalent *approved* method *~~approved~~* ~~by the~~ *~~code official~~* . ~~The measured~~ *~~air leakage~~* ~~shall not exceed 0.40 cfm/ft 2(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:~~ A report that includes the tested surface area, floor area, air by volume, stories above grade, and air leakage rates shall be submitted to the *code official* and the building *owner*.

~~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.~~

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

Exceptions:

1. ~~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 infrared 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 the requirements of this section~~ For *buildings* less than 10,000 square feet (929 m2), the entire *building thermal envelope* shall be permitted to be tested in accordance with [**ASTM E779**](#_bookmark698), [**ASTM E3158**](#_bookmark706), [**ASTM**](#_bookmark701)[**E1827**](#_bookmark701) or an equivalent approved method.

2. For *buildings* greater than 50,000 square feet (4645 m2), portions of the *building* shall be permitted to be tested and the measured *air leakage* shall be area weighted by the surface areas of the *building thermal envelope* in each portion. The weighted-average tested *air leakage* shall not be greater than the whole building air leakage limit. The following portions of the *building* shall be tested:

2.1. The entire *building thermal envelope* area of stories that have any

*conditioned spaces* directly under a roof.

2.2. The entire *building thermal envelope* area of stories that have a building entrance, have a floor over unconditioned space, have a loading dock or that are below grade.

2.3. Representative above-grade portions of the building totaling not less than 25 percent of the wall area enclosing the remaining *conditioned space*.

**[CE#143 AS]**

**C402.5.1.2.1Materials.** Materials with an air permeability not greater than 0.004 cfm/ft2(0.02 L/s × m 2) under a pressure differential of 0.3 inch water gauge (75 Pa) when tested in accordance with [**ASTM E2178**](#_bookmark704) 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.

No change to the remaining text

**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~~ where tested in accordance with [**ASTM E2357**](#_bookmark705), [**ASTM E1677**](#_bookmark699), [**ASTM D8052**](#_bookmark700)or [**ASTM E283**](#_bookmark696)shall comply with this section. Assemblies listed in Items 1 through 3 below shall be deemed to comply, provided that joints are sealed and the requirements of [**SectionC402.6.1.2**](#_bookmark169) 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~~ greater than or equal to 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.

**[CE#146 AS]**

**C402.5.2 Air leakage of fenestration and opaque doors.** The *air leakage* of *fenestration* and opaque door assemblies shall comply with ~~meet the provisions of~~ [**Table**](#_bookmark180) C402.5.2. Testing shall be ~~in accordance with the~~ conducted by an accredited, independent testing laboratory in accordance with applicable reference test standards in Table C402.5.2 ~~by~~ ~~an accredited, independent testing laboratory~~ and *labeled* by the manufacturer.

Exceptions:

1. Field-fabricated fenestration assemblies that are sealed in accordance with [Section C402.5.1](#_bookmark167).

2. *Fenestration* in *buildings* that ~~comply with the testing alternative of Section C402.5~~ is tested in accordance with [**Section C402.5.1.2**](#_bookmark173) is ~~are~~ not required to meet the *air leakage* requirements in Table C402.5.2.

**[CE#147 AS]**

**C402.5.4 Doors and access openings to shafts, chutes, stairways and elevator lobbies.** Doors and *access* openings from *conditioned space* to shafts, chutes, stairways and elevator lobbies not within the scope of the fenestration assemblies covered by [**Section**](#_bookmark179)[**C402.5.2**](#_bookmark179) shall be gasketed, weather-stripped or sealed.

Exceptions:

1. Door openings required to comply with **Section 716** of the *Florida Building Code, Building*.

2. Doors and door openings required ~~to comply with~~ by the *Florida* ***Building Code, Building*** to comply with [**UL 1784**](#_bookmark757)~~by the~~ *~~International Building Code~~* .

**C402.5.5 Air intakes, exhaust openings, stairways and shafts.** Stairway enclosures, elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building thermal envelope shall be provided with dampers in accordance with Section C403.2.4.3.

**C402.5.7 Vestibules.** *Building entrances* shall be protected with an enclosed vestibule ~~, with all doors~~. Doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time. The installation of one or more revolving doors in the *building entrance* shall not eliminate the requirement that a vestibule be provided on any doors adjacent to revolving doors.

**Exceptions:** Vestibules are not required for the following:

1. Buildings in Climate Zones 0 through 2.

2. Doors not intended to be used by the public, such as doors to mechanical or electrical *equipment rooms*, or intended solely for employee use.

3. Doors opening directly from a *sleeping unit* or *dwelling unit* .

4. Doors that open directly from a space less than 3,000 square feet (298 m2) in area.

5. Revolving doors.

6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

7. Doors that have an air curtain unit with a velocity of not less than 6.56 feet per second (2 m/s) at 6 inches (152 mm) above ~~at~~ the floor that ~~have~~ has been tested in accordance with [**ANSI/AMCA 220**](#_bookmark668) or [**ISO 27327-1**](#_bookmark739) and installed in accordance with the manufacturer’s instructions. *Manual* or *automatic* controls shall be provided that will operate the *air curtain unit* with the opening and closing of the door ~~and comply with~~ [**~~Section C403.4.1.5~~**](#_bookmark231). *Air ~~curtains~~ curtain units* and their controls shall comply with [**Section C408.2.3**](#_bookmark557).

**[CE#149 AS]**

**C402.5.6 Loading dock weather seals.** Cargo door openings and loading door openings shall be equipped with weather seals that restrict ~~infiltration~~ *air leakage* and provide direct contact along the top and sides of vehicles that are parked in the doorway.

**[CE#150 AS]**

Revise Section C402.5.10 to read as follows:

**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 Section C402.5.~~11~~10.1, 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.

EN-FBC-EC/C – Ch.4 – Errata #1

Replace Table C403.2.3(1) with the following:

TABLE C403.2.3(1)

**ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS—MINIMUM EFFICIENCY REQUIREMENTSc**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEADING SECTION TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Air conditioners, air cooled | < 65,000  Btu/hb | All | Split system, three phase and applications outside US single phaseb | 13.4 SEER2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
| Single-package, three phase and applications outside US single phaseb | 13.4 SEER2 |
| Space constrained, air cooled | ≤ 30,000  Btu/hb | All | Split system, three phase and applications outside US single phaseb | 11.7 SEER2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
| Single package, three phase and applications outside US single phaseb | 11.7 SEER2 |
| Small duct, high velocity, air cooled | < 65,000  Btu/hb | All | Split system, three phase and applications outside US single phaseb | 12. 0 SEER2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
| Air conditioners, air cooled | ≥ 65,000  Btu/h and < 135,000  Btu/h | Electric resistance (or none) | Split system and single package | 14.8 IEER | [**AHRI 340/360**](#_bookmark649) |
| All other | 14.6 IEER |
| ≥ 135,000  Btu/h and < 240,000  Btu/h | Electric resistance (or none) | 14.2 IEER |
| All other | 14.0 IEER |
| ≥ 240,000  Btu/h and < 760,000  Btu/h | Electric resistance (or none) | Split system and single package | 13.2 IEER | [**AHRI 340/360**](#_bookmark649) |
| All other | 13.0 IEER |
| ≥ 760,000  Btu/h | Electric resistance (or none) | 12.5 IEER |
| All other | 12.3 IEER |
| Air conditioners, water cooled | < 65,000  Btu/h | All | Split system and single package | 12.1 EER  12.3 IEER | [**AHRI 210/240**](#_bookmark647) |
| ≥ 65,000  Btu/h and < 135,000  Btu/h | Electric resistance (or none) | 12.1 EER  13.9 IEER | [**AHRI 340/360**](#_bookmark649) |
|  |  | All other |  | 11.9 EER  13.7 IEER |  |
| ≥ 135,000  Btu/h and < 240,000  Btu/h | Electric resistance (or none) | 12.5 EER  13.9 IEER |
| All other | 12.3 EER  13.7 IEER |
| ≥ 240,000  Btu/h and < 760,000  Btu/h | Electric resistance (or none) | 12.4 EER  13.6 IEER |
| All other | 12.2 EER  13.4 IEER |
| ≥ 760,000  Btu/h | Electric resistance (or none) | 12.2 EER  13.5 IEER |
| All other | 12.0 EER  13.3 IEER |
| Air conditioners, evaporatively cooled | < 65,000  Btu/hb | All | Split systemand single package | 12.1 EER  12.3 IEER | [**AHRI 210/240**](#_bookmark647) |
| ≥ 65,000  Btu/h and < 135,000  Btu/h | Electric resistance (or none) | 12.1 EER  12.3 IEER | [**AHRI 340/360**](#_bookmark649) |
| All other | 11.9 EER  12.1 IEER |
| ≥ 135,000  Btu/h and < 240,000  Btu/h | Electric resistance (or none) | 12.0 EER  12.2 IEER |
| All other | 11.8 EER  12.0 IEER |
| ≥ 240,000  Btu/h and < 760,000  Btu/h | Electric resistance (or none) | 11.9 EER  12.1 IEER |
| All other | 11.7 EER  11.9 IEER |
| ≥ 760,000  Btu/h | Electric resistance (or none) | 11.7 EER  11.9 IEER |
| All other | 11.5 EER  11.7 IEER |
| Condensing units, air cooled | ≥ 135,000  Btu/h | — | — | 10.5 EER  11.8 IEER | [**AHRI 365**](#_bookmark650) |
| Condensing units, water cooled | ≥ 135,000  Btu/h | — | — | 13.5 EER  14.0 IEER | [**AHRI 365**](#_bookmark650) |
| Condensing units, evaporatively cooled | ≥ 135,000  Btu/h | — | — | 13.5 EER  14.0 IEER | [**AHRI 365**](#_bookmark650) |

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

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Single-phase, US air-cooled air conditioners less than 65,000 Btu/h are regulated as consumer products by the US Department of Energy Code of Federal Regulations [**DOE 10 CFR 430**](#_bookmark729). SEER and SEER2 values for single-phase products are set by the US Department of Energy.

c. [**DOE 10 CFR 430**](#_bookmark729) Subpart B Appendix M1 includes the test procedure updates effective January 1, 2023, documented in [**AHRI 210/240—2023**](#_bookmark647).

**[CE#157 AS]**

Replace Table C403.2.3(2) with the following:

TABLE C403.2.3(2)

**ELECTRICALLY OPERATED AIR-COOLED UNITARY HEAT PUMPS—MINIMUM EFFICIENCY REQUIREMENTSc**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEADING SECTION TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Air cooled (cooling mode) | < 65,000 Btu/h | All | Split system, three phase and applications outside US single phaseb | 14.3 SEER2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
| Single package, three phase and applications outside US single phaseb | 13.4 SEER2 |
| Space constrained, air cooled (cooling mode) | ≤ 30,000 Btu/h | All | Split system, three phase and applications outside US single phaseb | 11.7 SEER2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
| Single package, three phase and applications outside US single phaseb | 11.7 SEER2 |
| Small duct, high velocity, air cooled (cooling mode) | < 65,000 Btu/h | All | Split system, three phase and applications outside US single phaseb | 12.0 SEER2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
| Air cooled (cooling mode) | ≥ 65,000 Btu/h  and < 135,000  Btu/h | Electric resistance (or none) | Split system and single package | 14.1 IEER | [**AHRI 340/360**](#_bookmark649) |
| All other | 13.9 IEER |
| ≥ 135,000 Btu/h  and < 240,000  Btu/h | Electric resistance (or none) | 13.5 IEER |
| All other | 13.3 IEER |
| ≥ 240,000 Btu/h | Electric resistance (or none) | 12.5 IEER |
| All other | 12.3 IEER |
| Air cooled (heating mode) | < 65,000 Btu/h (cooling capacity) | — | Split system, three phase and applications outside US single phaseb | 7.5 HSPF2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
|  |  |  | Single package, three phase and applications outside US single phaseb | 6.7 HSPF2 |  |
| Space constrained, air cooled (heating mode) | ≤ 30,000 Btu/h (cooling capacity) | — | Split system, three phase and applications outside US single phaseb | 6.3 HSPF2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
| Single package, three phase and applications outside US single phaseb | 6.3 HSPF2 |
| Small duct high velocity, air cooled (heating mode) | < 65,000 Btu/h | — | Split system, three phase and applications outside US single phaseb | 6.1 HSPF2 | [**AHRI 210/**](#_bookmark647)[**240—2023**](#_bookmark647) |
| Air cooled (heating mode) | ≥ 65,000 Btu/h  and < 135,000  Btu/h (cooling capacity) | — | 47°F db/43°F wb outdoor air | 3.40 COPH | [**AHRI 340/360**](#_bookmark649) |
| 17°F db/15°F wb outdoor air | 2.25 COPH |
| ≥ 135,000 Btu/h  and < 240,000  Btu/h (cooling capacity) | 47°F db/43°F wb outdoor air | 3.30 SOPH |
| 17°F db/15°F wb outdoor air | 2.05 COPH |
| ≥ 240,000 Btu/h (cooling capacity) | 47°F db/43°F wb outdoor air | 3.20 COPH |
| 17°F db/15°F wb outdoor air | 2.05 COPH |

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

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Single-phase, US air-cooled heat pumps less than 65,000 Btu/h are regulated as consumer products by the US Department of Energy Code of Federal Regulations [**DOE 10 CFR 430**](#_bookmark729). SEER, SEER2 and HSPF values for single-phase products are set by the US Department of Energy.

c. [**DOE 10 CFR 430**](#_bookmark729) Subpart B Appendix M1 includes the test procedure updates effective January 1, 2023, documented in [**AHRI 210/240—2023**](#_bookmark647).

**[CE#158 AS]**

Replace Table C403.2.3(7) with the following:

**TABLE C403.2.3(7)**

**LIQUID-CHILLING PACKAGES—MINIMUM EFFICIENCY REQUIREMENTSa, b, e**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **UNITS** | **PATH A** | **PATH B** | **TEST PROCEDUREc** |
| Air cooled | < 150 tons | EER  (Btu/ Wh) | ≥ 10.100 FL | ≥ 9.700 FL | [**AHRI 550/590**](#_bookmark655) |
| ≥ 13.700 IPLV.IP | ≥ 15.800 IPLV.IP |
| ≥ 150 tons | ≥ 10.100 FL | ≥ 9.700FL |
| ≥ 14.000 IPLV.IP | ≥ 16.100 IPLV.IP |
| Air cooled without condenser, electrically operated | All capacities | EER  (Btu/ Wh) | Air-cooled without condenser must be rated with matching condensers and comply with air-cooled chiller efficiency requirements | | [**AHRI 550/590**](#_bookmark655) |
| Liquid-cooled, electrically operated positive displacement | < 75 tons | kW/ ton | ≤ 0.750 FL | ≤ 0.780 FL | [**AHRI 550/590**](#_bookmark655) |
| ≤ 0.600 IPLV.IP | ≤ 0.500 IPLV.IP |
| ≥ 75 tons  and < 150 tons | ≤ 0.720 FL | ≤ 0.750 FL |
| ≤ 0.560 IPLV.IP | ≤ 0.490 IPLV.IP |
| ≥ 150 tons  and < 300 tons | ≤ 0.660 FL | ≤ 0.680 FL |
| ≤ 0.540 IPLV.IP | ≤ 0.440 IPLV.IP |
| ≥ 300 tons  and < 600 tons | ≤ 0.610 FL | ≤ 0.625 FL |
| ≤ 0.520 IPLV.IP | ≤ 0.410 IPLV.IP |
| ≥ 600 tons | ≤ 0.560 FL | ≤ 0.585 FL |
| ≤ 0.500 IPLV.IP | ≤ 0.380 IPLV.IP |
| Liquid-cooled, electrically operated centrifugal | < 150 tons | kW/ ton | ≤ 0.610 FL | ≤ 0.695 FL | [**AHRI 550/590**](#_bookmark655) |
| ≤ 0.550 IPLV.IP | ≤ 0.440 IPLV.IP |
| ≥150 tons and <300 tons | ≤ 0.610 FL | ≤ 0.635 FL |
| ≤ 0.550 IPLV.IP | ≤ 0.400 IPLV.IP |
| ≥ 300 tons  and < 400 tons | ≤ 0.560 FL | ≤ 0.595 FL |
| ≤ 0.520 IPLV.IP | ≤ 0.390 IPLV.IP |
| ≥ 400 tons  and < 600 tons | ≤ 0.560 FL | ≤ 0.585 FL |
| ≤ 0.500 IPLV.IP | ≤ 0.380 IPLV.IP |
| ≥ 600 tons | ≤ 0.560 FL | ≤ 0.585 FL |
| ≤ 0.500 IPLV.IP | ≤ 0.380 IPLV.IP |
| Air cooled absorption, single effect | All capacities | COP (W/W) | ≥ 0.600 FL | NAd | [**AHRI 560**](#_bookmark656) |
| Liquid-cooled absorption, single effect | All capacities | COP (W/W) | ≥ 0.700 FL | NAd | [**AHRI 560**](#_bookmark656) |
| Absorption double effect, indirect fired | All capacities | COP (W/W) | ≥ 1.000 FL | NAd | [**AHRI 560**](#_bookmark656) |
| ≥ 0.150 IPLV.IP |
| Absorption double effect, direct fired | All capacities | COP (W/W) | ≥ 1.000 FL | NAd | [**AHRI 560**](#_bookmark656) |
| ≥ 1.000 IPLV |

[a. **Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. The requirements for centrifugal chillers shall be adjusted for nonstandard rating conditions per [**Section C403.2.3.1**](#_bookmark219) and are applicable only for the range of conditions listed there. The requirements for air-cooled, water-cooled positive displacement and absorption chillers are at standard rating conditions defined in the reference test procedure.

c. Both the full-load and IPLV.IP requirements must be met or exceeded to comply with this standard. When there is a Path B, compliance can be with either Path A or Path B for any application.

d. NA means the requirements are not applicable for Path B, and only Path A can be used for compliance.

e. FL is the full-load performance requirements, and IPLV.IP is for the part-load performance requirements.

**[CE#159 AS]**

Replace Table C403.2.3(3) with the following:

TABLE C403.2.3(3)

**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—MINIMUM EFFICIENCY REQUIREMENTSe**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY (INPUT)** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCYd** | **TEST PROCEDUREa** |
| PTAC (cooling mode) standard size | < 7,000  Btu/h | 95°F db/75°F wb outdoor airc | 11.9 EER | [**AHRI 310/380**](#_bookmark648) |
| ≥ 7,000  Btu/h and ≤ 15,000 Btu/h | 14.0 – (0.300  × Cap/1,000) EERd |
| > 15,000  Btu/h | 9.5 EER |
| PTAC (cooling mode) nonstandard sizea | < 7,000  Btu/h | 95°F db/75°F wb outdoor airc | 9.4 EER | [**AHRI 310/380**](#_bookmark648) |
| ≥ 7,000  Btu/h and ≤ 15,000 Btu/h | 10.9 – (0.213  × Cap/1,000) EERd |
| > 15,000  Btu/h | 7.7 EER |
| PTHP (cooling mode) standard size | < 7,000  Btu/h | 95°F db/75°F wb outdoor airc | 11.9 EER | [**AHRI 310/380**](#_bookmark648) |
| ≥ 7,000  Btu/h and ≤ 15,000 Btu/h | 14.0 – (0.300  × Cap/1,000) EERd |
| > 15,000  Btu/h | 9.5 EER |
| PTHP (cooling mode) nonstandard sizeb | < 7,000  Btu/h | 95°F db/75°F wb outdoor airc | 9.3 EER | [**AHRI 310/380**](#_bookmark648) |
| ≥ 7,000  Btu/h and ≤ 15,000 Btu/h | 10.8 – (0.213  × Cap/1,000) EERd |
| > 15,000  Btu/h | 7.6 EER |
| PTHP (heating mode) standard size | < 7,000  Btu/h | 47°F db/43°F wb outdoor air | 3.3 COPH | [**AHRI 310/380**](#_bookmark648) |
| ≥ 7,000  Btu/h and ≤ 15,000 Btu/h | 3.7 – (0.052 × Cap/1,000) COPHd |
| > 15,000  Btu/h | 2.90 COPH |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PTHP (heating mode) nonstandard sizeb | < 7,000  Btu/h | 47°F db/43°F wb outdoor air | 2.7 COPH | [**AHRI 310/380**](#_bookmark648) |
| ≥ 7,000  Btu/h and ≤ 15,000 Btu/h | 2.9 – (0.026 ×  Cap/1000) COPHd |
| > 15,000  Btu/h | 2.5 COPH |
| SPVAC (cooling mode) single and three phase | < 65,000  Btu/h | 95°F db/75°F wb outdoor airc | 11.0 EER | [**AHRI 390**](#_bookmark651) |
| ≥ 65,000  Btu/h and ≤ 135,000  Btu/h | 10.0 EER |
| ≥ 135,000  Btu/h and ≤ 240,000  Btu/h | 10.0 EER |
| SPVHP (cooling mode) | < 65,000  Btu/h | 95°F db/75°F wb outdoor airc | 11.0 EER | [**AHRI 390**](#_bookmark651) |
| ≥ 65,000  Btu/h and ≤ 135,000  Btu/h | 10.0 EER |
| ≥ 135,000  Btu/h and ≤ 240,000  Btu/h | 10. 0 EER |
| SPVHP (heating mode) | < 65,000  Btu/h | 47°F db/43°F wb outdoor air | 3.3 COPH | [**AHRI 390**](#_bookmark651) |
| ≥ 65,000  Btu/h and ≤ 135,000  Btu/h | 3.0 COPH |
| ≥ 135,000  Btu/h and ≤ 240,000  Btu/h | 3.0 COPH |
| Room air conditioners without reverse cycle with louvered sides for applications outside USd | < 6,000  Btu/h | — | 11.0 CEER | [**ANSI/AHAM**](#_bookmark645)[**RAC-1**](#_bookmark645) |
| ≥ 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 < 28,000 Btu/h | — | 9.4 CEER |
| ≥ 28,000  Btu/h | — | 9.0 CEER |
| Room air conditioners without louvered sides | < 6,000  Btu/h | — | 10.0 CEER | [**ANSI/AHAM**](#_bookmark645)[**RAC-1**](#_bookmark645) |
| ≥ 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 |
|  | — | 9.3 CEER |
| ≥ 20,000  Btu/h | — | 9.4 CEER |
| Room air conditioners with reverse cycle, with louvered sides for applications outside USd | < 20,000  Btu/h | — | 9.8 CEER | [**ANSI/AHAM**](#_bookmark645)[**RAC-1**](#_bookmark645) |
| ≥ 20,000  Btu/h | — | 9.3 CEER |
| Room air conditioners with reverse cycle without louvered sides for applications outside USd | < 14,000  Btu/h | — | 9.3 CEER | [**ANSI/AHAM**](#_bookmark645)[**RAC-1**](#_bookmark645) |
| ≥ 14,000  Btu/h | — | 8.7 CEER |
| Room air conditioners, casement only for applications outside USd | All | — | 9.5 CEER | [**ANSI/AHAM**](#_bookmark645)[**RAC-1**](#_bookmark645) |
| Room air conditioners, casement slider for applications outside USd | All | — | 10.4 CEER | [**ANSI/AHAM**](#_bookmark645)[**RAC-1**](#_bookmark645) |

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.

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Nonstandard size units must be factory labeled as follows: “MANUFACTURED FOR NONSTANDARD SIZE APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW

STANDARD PROJECTS.” Nonstandard size efficiencies apply only to units being installed in existing sleeves having an external wall opening of less than 16 inches high or less than 42 inches wide and having a cross-sectional area less than 670 square inches.

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

d. Room air conditioners are regulated as consumer products by [**10 CFR 430**](#_bookmark729). For US applications of room air conditioners, refer to Informative Appendix F, Table F-3, for the US DOE minimum efficiency requirements for US applications.

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

**[CE#160 AS]**

Replace Table C403.2.3(4) with the following:

**TABLE C403.2.3(4)**

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DESCRIPTION** | **FUEL** | **ELECTRIC POWER PHASE** | **APPLICATION LOCATION** | **HEATING CAPACITY (INPUT),**  **Btu/hb** | **COMBO- UNIT COOLING CAPACITY,**  **Btu/h** | **SUBTYPE** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Warm-air furnace | Gas | 1 | Inside US | < 225,000 | < 65,000 | See Informative Appendix F, Table F-4f | | |
| Warm-air furnace | Gas | 1 | Inside US | < 225,000 | ≥ 65,000 | Nonweatherized | 80% AFUE | Appendix Ng |
| Weatherized | 81% AFUE  or 80% E c  t | Appendix Ng |
| [**ANSI Z21.47**](#_bookmark670) |
| Warm-air furnace | Gas | 1 | Outside US | < 225,000 | All | Nonweatherized | 80% AFUE | Appendix Ng |
| Weatherized | 81% AFUE  or 80% E c  t | Appendix Ng |
| [**ANSI Z21.47**](#_bookmark670) |
| Warm-air furnace | Gas | 3 | All | < 225,000 | All | Nonweatherized | 80% AFUE | Appendix Ng |
| Weatherized | 81% AFUE  or 80% E c  t | Appendix Ng |
| [**ANSI Z21.47**](#_bookmark670) |
| Warm-air furnace | Gas | All | All | ≥ 225,000  and ≤ 400,000 | All | All | 81% E c  t | [**ANSI Z21.47**](#_bookmark670) |
| Warm-air furnace | Gas | All | Inside US | > 400,000 | All | All | c  80%Et  before 1/1/ 2023  81% E c after  t  1/1/2023 | [**ANSI Z21.47**](#_bookmark670) |
| Warm-air furnace | Gas | All | Outside US | > 400,000 | All | All | 80%Etc before 1/1/ 2023  81% Etc after 1/1/ 2023 | [**ANSI Z21.47**](#_bookmark670)  or [**ANSI Z83.8**](#_bookmark671) |
| Warm-air furnace | Oil | 1 | Inside US | < 225,000 | < 65,000 | See Informative Appendix F, Table F-4f | | |
| Warm-air furnace | Oil | 1 | Inside US | < 225,000 | ≥ 65,000 | Nonweatherized | 83% AFUE | Appendix Ng |
| Weatherized | 78% AFUE  or 80% E d  t | Appendix Ng |
| Section 42 [**UL**](#_bookmark754)  [**727**](#_bookmark754) |
| Warm-air furnace | Oil | 1 | Outside US | < 225,000 | All | Nonweatherized | 83% AFUE | Appendix Ng |
| Weatherized | 78% AFUE  or 80% E d  t | Appendix Ng |
| Section 42 [**UL**](#_bookmark754)  [**727**](#_bookmark754) |
| Warm-air furnace | Oil | 3 | All | <225,000 | All | Nonweatherized | 83% AFUE | Appendix Ng |
| Weatherized | 78% AFUE  or 80%E d  t | Appendix Ng |
| Section 42 [**UL**](#_bookmark754)  [**727**](#_bookmark754) |
| Warm-air furnace | Oil | All | All | ≥ 225,000 | All | All | 82% E d  t | Section 42 [**UL**](#_bookmark754)  [**727**](#_bookmark754) |
| Warm-air furnace | Electric | 1 | Inside US | < 225,000 | < 65,000 | See Informative Appendix F, Table F-4f | | |
| Warm-air furnace | Electric | 1 | Inside US | < 225,000 | ≥ 65,000 | All | 96% AFUE | Appendix Ng |
| Warm-air furnace | Electric | 1 | Outside US | < 225,000 | All | All | 96% AFUE | Appendix Ng |
| Warm-air furnace | Electric | 3 | All | < 225,000 | All | All | 96% AFUE | Appendix Ng |
| Warm-air duct furnaces | Gas | All | All | All | All | All | 80% E d  c | [**ANSI Z83.8**](#_bookmark671) |
| Warm-air unit heaters | Gas | All | All | All | All | All | 80% E d, e  c | [**ANSI Z83.8**](#_bookmark671) |
| Warm-air unit heaters | Oil | All | All | All | All | All | 80% E d, e  c | Section 40 [**UL**](#_bookmark755)  [**731**](#_bookmark755) |

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

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure. For this table, the following applies:

- Appendix N = 10 CFR 430 Appendix N

- [**ANSI Z21.47**](#_bookmark670) = Section 2.39, Thermal Efficiency, [**ANSI Z21.47**](#_bookmark670)

- [**ANSI Z83.3**](#_bookmark671) = Section 2.10, Efficiency, [**ANSI Z83.3**](#_bookmark671)

- [**UL 727**](#_bookmark754) = Section 42, Combustion, [**UL 727**](#_bookmark754)

- [**UL 731**](#_bookmark755) = Section 40, Combustion, [**UL 731**](#_bookmark755)

b. Compliance of multiple firing rate units shall be at the maximum firing rate.

c. *Et* = thermal efficiency. Units must also include an interrupted or intermittent ignition device (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 space.

d. *Ec* = combustion efficiency (100 percent less flue losses). See test procedure for detailed discussion.

*e.* Units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an *automatic*

flue damper.

f. Includes combination units with cooling capacity < 65,000 Btu/h. For US applications of federally covered < 225,000 Btu/h products, see Informative Appendix F, Table F-4.

g. [**10 CFR 430**](#_bookmark729) is limited to-single phase equipment that is not contained within the same cabinet with a central air conditioner whose rated cooling capacity is above 65,000 Btu/h but for the test and rating procedures are not impacted for three-phase and can be used for AFUE ratings for [**ASHRAE/IES Standard 90.1**](#_bookmark678) three-phase products and single-phase products with a cooling capacity greater than 65,000 Btu/h.

**[CE#161 AS]**

Replace Table C403.2.3(5) with the following:

TABLE C403.2.3(5)

MINIMUM EFFICIENCY REQUIREMENTS: GAS- AND OIL-FIRED BOILERS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPEb** | **SUBCATEGORY OR RATING CONDITION** | **SIZE CATEGORY (INPUT)** |  | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Boilers, hot water | Gas fired | < 300,000 Btu/hg, h for applications outside US |  | 84% AFUE | [**DOE 10 CFR**](#_bookmark729)  [**430**](#_bookmark729) Appendix N |
| ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/he |  | 84% *E* d  *t* | [**DOE 10 CFR**](#_bookmark731)  [**431.86**](#_bookmark731) |
| > 2,500,000 Btu/hb and ≤ 10,000,000 Btu/hb |  | 82% *Ec*c |
| > 10,000,000 Btu/hb |  | c  82% *Ec* |
| Oil firedf | < 300,000 Btu/hg, h for applications outside US |  | 86% AFUE | [**DOE 10 CFR**](#_bookmark729)  [**430**](#_bookmark729) Appendix N |
| ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/he |  | 82% *E* d  *t* | [**DOE 10 CFR**](#_bookmark731)  [**431.86**](#_bookmark731) |
| > 2,500,000 Btu/hb and ≤ 10,000,000 Btu/hb |  | 84% *E* c  *c* |
| > 10,000,000 Btu/hb |  | c  84% *Ec* |
| Boilers, steam | Gas fired | < 300,000 Btu/hg for applications outside US |  | 82% AFUE | [**DOE 10 CFR**](#_bookmark729)  [**430**](#_bookmark729) Appendix N |
| Gas fired—all, except natural draft | ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/he |  | 79% *E* d  *t* | [**DOE 10 CFR**](#_bookmark731)  [**431.86**](#_bookmark731) |
| > 2,500,000 Btu/hb and ≤ 10,000,000 Btu/hb |  | 79% *E* d  *t* |
| > 10,000,000 Btu/hb |  | d  79% *Et* |
| Gas fired—natural draft | ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/he |  | 79% *E* d  *t* |
| > 2,500,000 Btu/hb |  | 79% *E* d  *t* |
| Oil firedf | < 300,000 Btu/hg for applications outside US |  | 82% AFUE | [**DOE 10 CFR**](#_bookmark729)  [**430**](#_bookmark729) Appendix N |
| ≥ 300,000 Btu/h and ≤ 2,500,000 Btu/he |  | 84% *E* d  *t* | [**DOE 10 CFR**](#_bookmark731)  [**431.86**](#_bookmark731) |
| > 2,500,000 Btu/hb and ≤ 10,000,000 Btu/hb |  | 81% *E* d  *t* |
| > 10,000,000 Btu/hb |  | d  81% *Et* |

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

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. 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.

c. *Ec* = Combustion efficiency (100 percent less flue losses).

d. *Et* = Thermal efficiency.

e. Maximum capacity—minimum and maximum ratings as provided for and allowed by the unit’s controls.

f. Includes oil-fired (residual).

g. Boilers shall not be equipped with a constant burning pilot light.

h. 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.

**[CE#162 AS]**

Replace Table C403.2.3(8) with the following:

TABLE C403.2.3(8)

**PERFORMANCE REQUIREMENTS FOR HEAT REJECTION EQUIPMENT—MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **TOTAL SYSTEM HEAT-REJECTION CAPACITY AT RATED CONDITIONS** | **SUBCATEGORY OR RATING CONDITIONh** | **PERFORMANCE REQUIREDa, b, c, f,**  **g** | **TEST PROCEDUREd,**  **e** |
| Propeller or axial fan open-circuit cooling towers | All | 95°F entering water  85°F leaving water  75°F entering wb | ≥ 40.2 gpm/hp | [**CTI ATC-105**](#_bookmark719)  and [**CTI**](#_bookmark726)[**STD-201 RS**](#_bookmark726) |
| Centrifugal fan open-circuit cooling towers | All | 95°F entering water  85°F leaving water  75°F entering wb | ≥ 20.0 gpm/hp | [**CTI ATC-105**](#_bookmark719)  and [**CTI**](#_bookmark726)[**STD-201 RS**](#_bookmark726) |
| Propeller or axial fan closed-circuit cooling towers | All | 102°F entering water  90°F leaving water  75°F entering wb | ≥ 16.1 gpm/hp | [**CTI ATC-105S**](#_bookmark723)  and [**CTI**](#_bookmark726)[**STD-201 RS**](#_bookmark726) |
| 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**](#_bookmark723)  and [**CTI**](#_bookmark726)[**STD-201 RS**](#_bookmark726) |
| 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**](#_bookmark724)[**ATC-105DS**](#_bookmark724) |
| Propeller or axial fan evaporative condensers | All | R-448A test fluid 165°F entering gas temperature 105°F  condensing temperature 75°F entering wb | ≥ 160,000 Btu/h  × hp | [**CTI ATC-106**](#_bookmark725) |
| Propeller or axial fan evaporative condensers | All | Ammonia test fluid  140°F entering gas temperature 96.3°F  condensing temperature 75°F entering wb | ≥ 134,000 Btu/h  × hp | [**CTI ATC-106**](#_bookmark725) |
| Centrifugal fan evaporative condensers | All | R-448A test fluid 165°F entering gas temperature 105°F  condensing temperature 75°F entering wb | ≥ 137,000 Btu/h  × hp | [**CTI ATC-106**](#_bookmark725) |
| 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**](#_bookmark725) |
| 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**](#_bookmark654) |

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

a. 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 the table divided by the fan motor nameplate power.

b. For purposes of this table, closed-circuit cooling tower performance is defined as the process water-flow rating of the tower at the thermal rating condition listed in the table divided by the sum of the fan motor nameplate power and the integral spray pump motor nameplate power.

c. For purposes of this table, dry-cooler performance is defined as the process water-flow rating of the unit at the thermal rating condition listed in the table divided by the total fan motor nameplate power of the unit, and air-cooled condenser performance is defined as the heat rejected from the refrigerant divided by the total fan motor nameplate power of the unit.

d. [**ASHRAE 90.1**](#_bookmark678) Section 13 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure. towers.

e. 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 separate wet and dry heat exchange sections. The certification requirements do not apply to field-erected cooling

f. All 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.

g. 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.

h. Requirements for evaporative condensers are listed with ammonia R-717 and R-448A as test fluids in the table. Evaporative condensers intended for use with halocarbon refrigerants other than R-448A must meet the minimum efficiency requirements listed with 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.

**[CE#163 AS]**

Replace Table C403.2.3(11) with following:

TABLE C403.2.3(11)

**ELECTRICALLY OPERATED VARIABLE-REFRIGERANT-FLOW AIR CONDITIONERS—MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| VRF air conditioners, air cooled | < 65,000 Btu/h three- phase for applications in the US and single- and three-phase for applications outside the US | All | VRF multisplit system | 13.0 SEER | [**AHRI 210/240**](#_bookmark647) |
| ≥ 65,000 Btu/h and < 135,000 Btu/h | Electric resistance (or none) | VRF multisplit system | 10.5 EER  15.5 IEER | [**AHRI 1230**](#_bookmark659) |
| ≥ 135,000 Btu/h and  < 240,000 Btu/h | Electric resistance (or none) | VRF multisplit system | 10.3 EER  14.9 IEER |
| ≥ 240,000 Btu/h | Electric resistance (or none) | VRF multisplit system | 9.5 EER  13.9 IEER |

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

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

**[CE#164 AS]**

Replace Table C403.2.3(12) with the following:

TABLE C403.2.3(12)

**ELECTRICALLY OPERATED VARIABLE-REFRIGERANT-FLOW AND APPLIED HEAT PUMPS—MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| VRF air cooled (cooling mode) | < 65,000 Btu/h three- phase for applications in the US and single- and three- phase for applications outside the US | All | VRF multisplit system | SEER2 = 13.4 | [**AHRI 210/240**](#_bookmark647) |
| ≥ 65,000 Btu/h and < 135,000 Btu/h | Electric resistance (or none) | 10.3 EER  14.6 IEER | [**AHRI 1230**](#_bookmark659) |
| VRF multisplit system with heat recovery | 10.1 EER  14.4 IEER |
| ≥ 135,000 Btu/h and  < 240,000 Btu/h | VRF multisplit system | 9.9 EER  14.4 IEER |
| VRF multisplit system with heat recovery | 9.7 EER  13.9 IEER |
| ≥ 240,000 Btu/h | VRF multisplit system | 9.1 EER  12.7 IEER |
| VRF multisplit system with heat recovery | 8.9 EER  12.5 IEER |
| VRF water source (cooling mode) | < 65,000 Btu/h | All | VRF multisplit systems  86°F entering water | 12.0 EER  16.0 IEER | [**AHRI 1230**](#_bookmark659) |
| VRF multisplit systems 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**](#_bookmark659) |
| 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 |
| VRF ground source (cooling mode) | < 135,000 Btu/h | All | VRF multisplit system  77°F entering water | 13.4 EER | [**AHRI 1230**](#_bookmark659) |
| 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 air cooled (heating mode) | < 65,000 Btu/h (cooling capacity) three-phase for applications in the US and single- and three- phase for applications outside the US |  | VRF multisplit system with heat recovery  77°F entering water | 10.8 EER |  |
| ≥ 65,000 Btu/h and < 135,000 Btu/h (cooling capacity) |  | VRF multisplit system | HSPF2 = 7.5 | [**AHRI 210/240**](#_bookmark647) |
| ≥ 135,000 Btu/h (cooling capacity) |  | VRF multisplit system  47°F db/43°F wb outdoor air | 3.3 COPH | [**AHRI 1230**](#_bookmark659) |
|  | < 65,000 Btu/h |  | 17°F db/15°F wb outdoor air | 2.25 COPH |  |
|  | (cooling capacity) |  | VRF multisplit system  47°F db/43°F wb outdoor air | 3.2 COPH |  |
|  | ≥ 65,000 Btu/h and < |  | 17°F db/15°F wb outdoor air | 2.05 COPH |  |
| VRF water source | 135,000 Btu/h (cooling capacity) |  | VRF multisplit system  68°F entering water | 4.3 COPH | [**AHRI 1230**](#_bookmark659) |
| (heating mode) | ≥ 135,000 Btu/h and  < 240,000 Btu/h |  | VRF multisplit system  68°F entering water | 4.3 COPH |  |
|  | (cooling capacity) |  | VRF multisplit system  68°F entering water | 4.0 COPH |  |
|  | ≥ 240,000 Btu/h |  | VRF multisplit system  68°F entering water | 3.9 COPH |  |
|  | (cooling capacity) |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | VRF multisplit |  |  |
| VRF  groundwater  source  (heating mode) | < 135,000 Btu/h (cooling capacity) | system 50°F entering | 3.6 COPH |  |
|  |  | water |  | [**AHRI 1230**](#_bookmark659) |
|  | ≥ 135,000 Btu/h (cooling capacity) | VRF multisplit |  |
|  |  | system 50°F entering | 3.3 COPH |  |
|  |  | water |  |  |
| VRF ground  source  (heating  mode) | < 135,000 Btu/h  (cooling capacity) | VRF multisplit |  |  |
|  |  | system 32°F entering | 3.1 COPH |  |
|  |  | water |  | [**AHRI 1230**](#_bookmark659) |
|  | ≥ 135,000 Btu/h  (cooling capacity) | VRF multisplit |  |
|  |  | system 32°F entering | 2.8 COPH |  |
|  |  | water |  |  |

For SI: °C = (°F – 32)/1.8, 1 British thermal unit per hour = 0.2931 W, db = dry bulb temperature, wb

= wet bulb temperature.

1. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

**[CE#165 AS]**

Replace Table C403.2.3(9) with the following:

TABLE C403.2.3(9)

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **STANDARD MODEL** | **NET SENSIBLE COOLING CAPACITY** | **MINIMUM NET SENSIBLE COP** | **RATING CONDITIONS RETURN AIR**  **(dry bulb/dew point)** | **TEST PROCEDURE** |
| Air cooled | Downflow | < 80,000 Btu/h | 2.70 | 85°F/52°F  (Class 2) | [**AHRI 1360**](#_bookmark661) |
| ≥ 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 1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 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 1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 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 |
| Water cooled with fluid economizer | Downflow | < 80,000 Btu/h | 2.77 | 85°F/52°F  (Class 1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 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 1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 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 1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 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, COP = (Btu/h × hp)/(2,550.7).

**[CE#166 AS]**

Replace Table C403.2.3(13) with the following:

TABLE C403.2.3(13)

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

|  |  |  |  |
| --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDURE** |
| 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 |

**[CE#167 AS]**

Replace Table C403.2.3(14) with the following:

TABLE C403.2.3(14)

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

|  |  |  |  |
| --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Air cooled (dehumidification mode) | — | 3.8 ISMRE2 | [**AHRI 920**](#_bookmark663) |
| Air-source heat pumps (dehumidification mode) | — | 3.8 ISMRE2 | **AHRI 920** |
| Water cooled (dehumidification mode) | Cooling tower condenser water | 4.7 ISMRE2 | **AHRI 920** |
| Air-source heat pump (heating mode) | — | 2.05 ISCOP2 | **AHRI 920** |
| Water-source heat pump (dehumidification mode) | Ground source, closed and open loopb | 4.6 ISMRE2 | **AHRI 920** |
| Water source | 3.8 ISMRE2 |
| Water-source heat pump (heating mode) | Ground source, closed and open loopb | 2.13 ISCOP2 | **AHRI 920** |
| Water source | 2.13 ISCOP2 |

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Open-loop systems are rated using closed-loop test conditions.

**[CE#168 AS]**

Replace Table C403.2.3(15) with the following:

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) | — | 5.0 ISMRE2 | **AHRI 920** |
| Air-source heat pumps (dehumidification mode) | — | 5.0 ISMRE2 | **AHRI 920** |
| Water cooled (dehumidification mode) | Cooling tower condenser water | 5.1 ISMRE2 | **AHRI 920** |
| Air-source heat pump (heating mode) | — | 3.2 ISCOP2 | **AHRI 920** |
| Water-source heat pump (dehumidification mode) | Ground source, closed and open loopb | 5.0 ISMRE2 | **AHRI 920** |
| Water source | 4.6 ISMRE2 |
| Water-source heat pump (heating mode) | Ground source, closed and open loopb | 3.5 ISCOP2 | **AHRI 920** |
| Water source | 4.04 ISCOP2 |

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Open-loop systems are rated using closed-loop test conditions.

**[CE#169 AS]**

Replace Table C403.2.3(16) with the following:

TABLE C403.2.3(16)

**ELECTRICALLY OPERATED WATER-SOURCE HEAT PUMPS—MINIMUM EFFICIENCY REQUIREMENTSb**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **HEATING SECTION TYPE** | **SUBCATEGORY OR RATING CONDITION** | **MINIMUM EFFICIENCY** | **TEST PROCEDUREa** |
| Water-to-air, water loop (cooling mode) | < 17,000 Btu/h | All | 86°F entering water | 12.2 EER | [**ISO 13256-1**](#_bookmark740) |
| ≥ 17,000 Btu/h  and < 65,000 Btu/h | 13.0 EER |
| ≥ 65,000 Btu/h  and < 135,000  Btu/h | 13.0 EER |
| Water-to-air, ground water (cooling mode) | < 135,000  Btu/h | All | 59°F entering water | 18.0 EER | [**ISO 13256-1**](#_bookmark740) |
| Brine-to-air, ground loop (cooling mode) | < 135,000  Btu/h | All | 77°F entering water | 14.1 EER | [**ISO 13256-1**](#_bookmark740) |
| Water-to-water, water loop (cooling mode) | < 135,000  Btu/h | All | 86°F entering water | 10.6 EER | [**ISO 13256-2**](#_bookmark741) |
| Water-to-water, ground water (cooling mode) | < 135,000  Btu/h | All | 59°F entering water | 16.3 EER | [**ISO 13256-2**](#_bookmark741) |
| Brine-to-water, ground loop (cooling mode) | < 135,000  Btu/h | All | 77°F entering water | 12.1 EER | [**ISO 13256-2**](#_bookmark741) |
| Water-to-water, water loop (heating mode) | < 135,000  Btu/h (cooling capacity) | — | 68°F entering water | 4.3 COPH | [**ISO 13256-1**](#_bookmark740) |
| Water-to-air, ground water (heating mode) | < 135,000  Btu/h (cooling capacity) | — | 50°F entering water | 3.7 COPH | [**ISO 13256-1**](#_bookmark740) |
| Brine-to-air, ground loop (heating mode) | < 135,000  Btu/h (cooling capacity) | — | 32°F entering water | 3.2 COPH | [**ISO 13256-1**](#_bookmark740) |
| Water-to-water, water loop (heating mode) | < 135,000  Btu/h (cooling capacity) | — | 68°F entering water | 3.7 COPH | **ISO 13256-1** |
| Water-to-water, ground water (heating mode) | < 135,000  Btu/h (cooling capacity) | — | 50°F entering water | 3.1 COPH | **ISO 13256-2** |

Brine-to-water, ground loop (heating mode)

< 135,000

Btu/h (cooling capacity)

—

32°F entering water

2.5 COPH

**ISO 13256-2**

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

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

b. Single-phase, US air-cooled heat pumps < 65,000 Btu/h are regulated as consumer products by [**10 CFR 430**](#_bookmark729). SEER, SEER2, HPSF and HPSF2 values for single-phase products are set by the US DOE. Informative Note: See [**ASHRAE 90.1**](#_bookmark678) Informative Appendix F for the US DOE minimum.

**[CE#170 AS]**

Replace Table C403.2.3(17) with the following:

TABLE C403.2.3(17)

**CEILING-MOUNTED COMPUTER ROOM AIR CONDITIONERS—MINIMUM EFFICIENCY REQUIREMENTS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **STANDARD MODEL** | **NET SENSIBLE COOLING CAPACITY** | **MINIMUM NET SENSIBLE COP** | **RATING CONDITIONS RETURN AIR (dry**  **bulb/dew point)** | **TEST PROCEDUREa** |
| Air cooled with free air discharge condenser | Ducted | < 29,000  Btu/h | 2.05 | 75°F/52°F (Class  1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 2.02 |
| ≥ 65,000  Btu/h | 1.92 |
| Nonducted | < 29,000  Btu/h | 2.08 |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 2.05 |
| ≥ 65,000  Btu/h | 1.94 |
| Air cooled with free air discharge condenser with fluid economizer | Ducted | < 29,000  Btu/h | 2.01 | 75°F/52°F (Class  1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 1.97 |
| ≥ 65,000  Btu/h | 1.87 |
| Nonducted | < 29,000  Btu/h | 2.04 |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 2.00 |
| ≥ 65,000  Btu/h | 1.89 |
| Air cooled with ducted condenser | Ducted | < 29,000  Btu/h | 1.86 | 75°F/52°F (Class  1) | [**AHRI 1360**](#_bookmark661) |
|  |  | ≥ 29,000  Btu/h and  < 65,000  Btu/h | 1.83 |  |  |
| ≥ 65,000  Btu/h | 1.73 |
| Nonducted | < 29,000  Btu/h | 1.89 |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 1.86 |
| ≥ 65,000  Btu/h | 1.75 |
| Air cooled with fluid economizer and ducted condenser | Ducted | < 29,000  Btu/h | 1.82 | 75°F/52°F (Class  1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 1.78 |
| ≥ 65,000  Btu/h | 1.68 |
| Nonducted | < 29,000  Btu/h | 1.85 |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 1.81 |
| ≥ 65,000  Btu/h | 1.70 |
| Water cooled | Ducted | < 29,000  Btu/h | 2.38 | 75°F/52°F (Class  1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 2.28 |
| ≥ 65,000  Btu/h | 2.18 |
| Nonducted | < 29,000  Btu/h | 2.41 |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 2.31 |
|  |  | ≥ 65,000  Btu/h | 2.20 |  |  |
| Water cooled with fluid economizer | Ducted | < 29,000  Btu/h | 2.33 | 75°F/52°F (Class  1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 2.23 |
| ≥ 65,000  Btu/h | 2.13 |
| Nonducted | < 29,000  Btu/h | 2.36 |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 2.26 |
| ≥ 65,000  Btu/h | 2.16 |
| Glycol cooled | Ducted | < 29,000  Btu/h | 1.97 | 75°F/52°F (Class  1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 1.93 |
| ≥ 65,000  Btu/h | 1.78 |
| Nonducted | < 29,000  Btu/h | 2.00 |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 1.98 |
| ≥ 65,000  Btu/h | 1.81 |
| Glycol cooled with fluid economizer | Ducted | < 29,000  Btu/h | 1.92 | 75°F/52°F (Class  1) | [**AHRI 1360**](#_bookmark661) |
| ≥ 29,000  Btu/h and  < 65,000  Btu/h | 1.88 |
| ≥ 65,000  Btu/h | 1.73 |
| Nonducted | < 29,000  Btu/h | 1.95 |

≥ 29,000

Btu/h and

< 65,000

Btu/h

≥ 65,000

Btu/h

1.93

1.76

For SI: 1 British thermal unit per hour = 0.2931 W, °C = (°F – 32)/1.8, COP = (Btu/h × hp)/(2,550.7).

a. [**Chapter 6**](#_bookmark644) contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.

**[CE#172 AS]**

**C403.3.2.1 Water-cooled centrifugal chilling packages.** Equipment not designed for operation at AHRI Standard 550/590 test conditions of 44.00°F leaving and 54.00°F entering chilled-fluid temperatures, and with 85.00°F entering and 94.30°F leaving condenser-fluid temperatures, shall have maximum full-load kW/ton (FL) and part- load rating requirements adjusted using the following equations:

**** Equation 4-~~6~~

 **Equation 4-~~7~~**

**[CE#173 AS] No change needed**

**C403.7 Boilers.** Boiler systems shall comply with the following:

1. Combustion air positive shutoff shall be provided on all newly installed boiler systems that meet one or more of the following conditions:

1.1. The total input capacity is not less than 2,500,000 Btu/h (733 kW) and one or more of the boilers are designed to operate with a nonpositive vent static pressure.

1.2. Any stack serving the *boiler system* is connected to two or more boilers with a total combined input capacity of not less than 2,500,000 Btu/h (733 kW).

2. Newly installed boilers or boiler systems with a combustion air fan motor *nameplate horsepower* rating of 10 horsepower (7.46 kW) or more shall comply with one of the following:

2.1. The fan motor shall be variable speed.

2.2. The fan motor shall include controls that modulate fan airflow as a function of the load to a speed 50 percent or less of design air volume.

**C403.7.1 Boiler oxygen concentration controls.** Newly installed boilers with an input capacity of 5,000,000 Btu/h (1465 kW) and steady state full-load less than 90 percent shall maintain stack-gas oxygen concentrations not greater than the values specified in [**Table**](#_bookmark223)[**C403.7.1**](#_bookmark223). Combustion air volume shall be controlled with respect to measured flue gas oxygen concentration. The use of a common gas and combustion air control linkage or jack shaft is not permitted.

**Exception:** These concentration limits do not apply where 50 percent or more of the

*boiler system* capacity serves Group R-2 occupancies.

**[CE#174 AS]**

TABLE C403.7.1

**BOILER OXYGEN CONCENTRATIONS**

|  |  |
| --- | --- |
| **BOILER APPLICATION** | **MAXIMUM STACK-GAS OXYGEN CONCENTRATIONa** |
| Commercial boilers or where ≤ 10% of the boiler system capacity is used for process applications at design conditions | 5% |
| Process boilers | 3% |

a. Concentration levels measured by volume on a dry basis over firing rates of 20 to 100 percent. These concentration limits do not apply where 50 percent or more of the boiler system capacity serves Group R-2 occupancies.

**[CE#175 AS]**

**[CE#176 AS] (No change needed)**

Revise C403.2.3 to read as follows:

**C403.2.3 HVAC equipment performance requirements.** Equipment shall meet the minimum efficiency requirements of Tables C403.2.3(1), C403.2.3(2), C403.2.3(3), C403.2.3(4), C403.2.3(5), C403.2.3(6), C403.2.3(7), C403.2.3(8), C403.2.3(9), C403.2.3(10), C403.2.3(11), C403.2.3(12), C403.2.3(13), C403.2.3(14), C403.2.3(15), C403.2.3(16) and C403.2.3(17) when tested and rated in accordance with the applicable test procedure. ~~Plate-type liquid-to-liquid heat exchangers shall meet the minimum requirements of Table C403.2.3(10)~~. ….

No change to the remaining text.

EN-FBC-EN/C – Ch.4 – Errata #2

Revise Section C403.3 (Exception 7) to read as follows:

**C403.3 Economizers (Prescriptive).** Each cooling system shall include either an air or water economizer complying with Sections C403.3.1 through C403.3.4.

**Exceptions:**

**…**

7. The required air or water economizer may be eliminated if the minimum code required cooling efficiency of the HVAC unit rated with an IPLV, IEER, SEER2 or SEER is increased by at least 17 percent. If the HVAC unit is only rated with a full-load metric like EER cooling, then it must be increased by at least 17 percent.

EN-FBC-EN/C – Ch.4 – Errata #3

**C403.2.4 HVAC system controls.** ~~Each heating~~ Heating and cooling system shall be provided with controls in accordance with Section C403.2.4.1, C403.2.4.1.3, C403.2.4.2, C403.2.4.3, C403.2.12.5, C403.3.1, C403.4, or C403.4.4..

**C403.2.4.1 Thermostatic controls.** The supply of heating and cooling energy to each *zone* shall be controlled by individual thermostatic controls capable of responding to temperature within the *zone*. Where humidification or dehumidification or both is provided, not fewer than one humidity control device shall be provided for each humidity control system.

**Exception:** Independent perimeter systems that are designed to offset only *building thermal envelope* heat losses, gains or both serving one or more perimeter *zones* also served by an interior system provided:

No change to the remaining text

**[CE#177 AS]**

**C403.2.4.1.2 Deadband.** Where used to control both heating and cooling, *zone* thermostatic controls shall: ~~be configured to provide a temperature range or deadband of~~ ~~not less than 5°F (2.8°C) within which the supply of heating and cooling energy to the~~ *~~zone~~* ~~is shut off or reduced to a minimum.~~

1. Have separate setpoints for heating and cooling, each individually adjustable.

2. Be capable of and initially configured to provide a temperature range or deadband between the two setpoints of not less than 5°F (3°C) within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

3. Have a minimum deadband of not less than 1°F (0.56°C) when setpoints are adjusted.

Exceptions:

1. *Thermostats* requiring *manual* changeover between heating and cooling modes.

2. Occupancies or applications where applicable codes or accreditation standards requiring precision in indoor temperature control ~~as~~ *~~approved~~* ~~by the~~ *~~code official~~* ~~.~~ shall be permitted to be initially configured to not less than 1°F (0.56°C) deadband.

**[CE#178 AS]**

**C403.8 Humidification and dehumidification controls.** Humidification and dehumidification controls shall be in accordance with this section.

**C403.8.1 Dehumidification.** *Humidistatic controls* shall not use mechanical cooling to reduce the humidity below the lower of a dew point of 55°F (13°C) or relative humidity of

60 percent in the coldest *zone* served by the system. Lower humidity shall be permitted where mechanical cooling is being used for temperature control.

Exceptions:

1. Where approved, systems serving zones where specific humidity levels are required, such as museums and hospitals, and where *humidistatic controls* are capable of and configured to maintain a dead band of at least 10 percent relative humidity where no active humidification or dehumidification takes place.

2. Systems serving *zones* where humidity levels are required to be maintained with precision of not more than ±5 percent relative humidity to comply with applicable codes or accreditation standards or as *approved* by the authority having jurisdiction.

**C403.8.2 Humidification.** *Humidistatic controls* shall not use fossil fuels or electricity to produce relative humidity above 30 percent in the warmest *zone* served by the system.

Exceptions:

1. Where *approved* , systems serving *zones* where specific humidity levels are required, such as museums and hospitals, and where *humidistatic controls* are capable of and configured to maintain a deadband of at least 10 percent relative humidity where no active humidification or dehumidification takes place.

2. Systems serving *zones* where humidity levels are required to be maintained with precision of not more than ±5 percent relative humidity to comply with applicable codes or accreditation standards or as *approved* by the authority having jurisdiction.

**C403.8.3 Control interlock.** Where a *zone* is served by a system or systems with both humidification and dehumidification capability, means such as limit switches, mechanical stops, or for DDC systems, software programming, shall be provided capable of and configured to prevent simultaneous operation of humidification and dehumidification equipment.

**Exception:** Systems serving *zones* where humidity levels are required to be maintained with precision of not more than ±5 percent relative humidity to comply with applicable codes or accreditation standards or as *approved* by the authority having jurisdiction.

**[CE#183 AS]**

**C403.2.8 Kitchen exhaust systems.** Replacement air introduced directly into the exhaust hood cavity shall not be greater than 10 percent of the hood exhaust airflow rate. Conditioned supply air delivered to any space shall not exceed the greater of the following:

1. The ventilation rate required to meet the space heating or cooling load.

2. The hood exhaust flow minus the available transfer air from adjacent space where available transfer air is considered to be that portion of outdoor *ventilation* air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces.

Kitchen exhaust hood systems serving Type I exhaust hoods shall be provided with *demand control kitchen ventilation* (DCKV) controls where a kitchen or kitchen/dining facility has a total Type I kitchen hood exhaust airflow rate greater than 5,000 cubic feet per minute (2360 L/s). DCKV systems shall be configured to provide a minimum of 50 percent reduction in exhaust and replacement air system airflow rates. Systems shall include controls necessary to modulate exhaust and replacement air system airflows in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle operation. Each hood shall be a factory-built commercial exhaust hood *listed* by a nationally recognized testing laboratory and shall have a maximum exhaust rate as specified in Table C403.2.8.

~~Where total kitchen hood exhaust airflow rate is greater than 5,000 cfm (2360 L/s), each~~ ~~hood shall be a factory-built commercial exhaust hood~~ *~~listed~~* ~~by a nationally recognized testing~~ ~~laboratory in compliance with UL 710. Each hood shall have a maximum exhaust rate as~~ ~~specified in Table C403.7.5 and shall comply with one of the following:~~

~~1. Not less than 50 percent of all replacement air shall be transfer air that would otherwise be exhausted.~~

~~2. Demand ventilation systems on not less than 75 percent of the exhaust air that are configured to provide not less than a 50-percent reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle.~~

~~3.~~ *~~Listed~~* ~~energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust airflow.~~

Where a single hood, or hood section, is installed over appliances with different duty ratings, the maximum allowable flow rate for the hood or hood section shall be based on the requirements for the highest appliance duty rating under the hood or hood section.

Exceptions:

1. ~~Where not less than 75 percent of all the replacement air is transfer air that would otherwise be exhausted.~~ [**UL 710**](#_bookmark753) listed exhaust hoods that have a design maximum exhaust flow rate not greater than 250 cubic feet per minute (118 L/s) per linear foot (305 mm) of hood that serve kitchen or kitchen/dining facilities with a total kitchen hood exhaust airflow rate less than 5,000 cfm (2360 L/s).

2. Where allowed by the ***Florida Building Code, Mechanical***, an *energy recovery ventilation system* is installed on the kitchen exhaust with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust hood airflow.

**TABLE C403.2.8** (need to get this table from the 2024 IECC)

**MAXIMUM NET EXHAUST FLOW RATE, CFM PER LINEAR FOOT OF HOOD LENGTH**

**TYPE OF**

**HOOD**

**LIGHT-DUTY**

**EQUIPMENT**

**MEDIUM-DUTY**

**EQUIPMENT**

**HEAVY-DUTY**

**EQUIPMENT**

**EXTRA-HEAVY-DUTY**

**EQUIPMENT**

**Wall-mounted**

**canopy 140 210 280 385**

**Single island 280 350 420 490**

**Double island**

**(per side) 175 210 280 385**

**Eyebrow 175 175 NA NA**

**Backshelf/**

**Pass-over 210 210 280 NA**

**For SI: 1 cfm = 0.4719 L/s; 1 foot = 304.8 mm.**

**NA = Not Allowe**

**[CE#192 AS]**

**C403.2.12.4 Fractional hp fan motors.** Motors for fans that are not less than 1/12 hp (0.062 kW) and are less than 1 hp (0.746 kW) shall be electronically commutated motors or shall have a minimum motor efficiency of 70 percent, rated in accordance with **DOE 10 CFR 431**. These motors shall have the means to adjust motor speed for either balancing or remote control. The use of belt-driven fans to sheave adjustments for airflow balancing instead of a varying motor speed shall be permitted.

No change to the remaining text.

**[CE#198 AS]**

Replace Table C403.2.12.7 with the following:

TABLE C403.2.12.7

**LOW-CAPACITY VENTILATION FAN**

|  |  |  |  |
| --- | --- | --- | --- |
| **SYSTEM TYPE** | **AIRFLOW RATE (CFM)** | **MINIMUM EFFICACY (CFM/ WATT)** | **TEST PROCEDURE** |
| Balanced ventilation system without heat or energy recovery | Any | 1.2a | [**ASHRAE Standard 51**](#_bookmark685)[**(ANSI/AMCA Standard**](#_bookmark685)[**210)**](#_bookmark685) |
| HRV, ERV | Any | 1.2 | [**CAN/CSA 439**](#_bookmark720) |
| Range hood | Any | 2.8 | [**ASHRAE 51 (ANSI/AMCA**](#_bookmark685)  [**Standard 210)**](#_bookmark685) |
| In-line supply or exhaust fan | Any | 3.8 |
| Other exhaust fan | ≤ 90 | 2.8 |
| ≥ 90 and < 200 | 3.5 |
| ≥ 200 | 4.0 |

For SI: 1 cfm/ft = 0.47 L/s.

a. For balanced systems, HRVs and ERVs, determine the efficacy as the outdoor airflow divided by the total fan power.

**[CE#200 AS]**

**C403.2.12.5.4 Intermittent exhaust control for bathrooms and toilet rooms.** Where an exhaust system serving a bathroom or toilet room is designed for intermittent operation, the exhaust system shall be provided with *manual* on capability and one or more of the following controls:

1. A timer control that has a minimum setpoint not greater than 30 minutes.

2. An *occupant sensor control* that automatically turns off exhaust fans within 30 minutes after all occupants have left the space.

3. A humidity control capable of *manual* or *automatic* adjustment from a minimum setpoint not greater than 50 percent to a maximum setpoint not greater than 80 percent relative humidity.

4. A contaminant control that responds to a particle or gaseous concentration.

**Exception:** Bathroom and toilet room exhaust systems serving as an integral component of an outdoor air ventilation system in Group R-2, R-3 and R-4 occupancies shall not be required to provide controls other than *manual* on capability.

An off setpoint shall not be used to comply with a minimum setpoint requirement

**[CE#201 AS]**

**C403.2.12.6 Large-diameter ceiling fans.** Where provided, *large-diameter ceiling fans* shall be tested and *labeled* in accordance with [**AMCA 230**](#_bookmark669)and shall meet the efficiency requirements of [**Table**](#_bookmark306)[**C403.2.12.6**](#_bookmark306) and [**Section C403.2.12.6.1**](#_bookmark307).

**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**](#_bookmark666)[**208**](#_bookmark666) with the following modifications to the calculations for the reference fan: using an airflow constant (Q) of 26,500 cfm (12.5 m3/s), a pressure constant (P) of 0.0027 inch of water (0.6719 Pa), and fan efficiency constant (η) of 42 percent.

**[CE#202 AS]**

**C403.2.12.8 Buildings with high-capacity space-heating gas boiler systems.** Gas hot water boiler systems for space heating with system input capacities of not less than 1,000,000 Btu/h (293 kW) and not greater than 10,000,000 Btu/h (2931 kW) in new buildings shall comply with [**Sections**](#_bookmark308)[**C403.2.12.8.1**](#_bookmark308) and [**C403.2.12.8.2**](#_bookmark309).

Exceptions:

1. Where 25 percent of the annual space heating requirement is provided by *on-site renewable energy* , site-recovered energy or heat recovery chillers.

2. Space heating boilers installed in individual *dwelling units* .

3. Where 50 percent or more of the design heating load is served using perimeter convective heating, radiant ceiling panels or both.

4. Individual gas boilers with input capacity less than 300,000 Btu/h (88 kW) shall not be included in the calculations of the total system input or total system efficiency.

**C403.2.12.8.1 Boiler efficiency.** Gas hot water boilers shall have a thermal efficiency (E t) of not less than 90 percent where rated in accordance with the test procedures in [**Table**](#_bookmark208)[**C403.2.3.(5)**](#_bookmark208). Systems with multiple boilers are allowed to meet this requirement where the space heating input provided by equipment with Et above or below 90 percent provides an input capacity-weighted average Et of not less than 90 percent. For boilers rated only for combustion efficiency, the calculation for the input capacity-weighted average Et shall use the combustion efficiency value.

**C403.2.12.8.2 Hot water distribution system design.** The hot water distribution system shall be designed to meet the following:

1. Coils and other heat exchangers shall be selected so that at design conditions the hot water return temperature entering the boilers is 120°F (49°C) or less.

2. Under all operating conditions, the water temperature entering the boiler is not greater than 120°F (49°C) or the flow rate of supply hot water that recirculates directly into the return system, such as by three-way valves or minimum flow bypass controls, shall be not greater than 20 percent of the design flow of the boilers.

**[CE#204 AS]**

**[CE#207 AS] Formatting not needed**

TABLE C403.2.14.2(1)

**WALK-IN COOLER AND FREEZER DISPLAY DOOR EFFICIENCY REQUIREMENTSa**

|  |  |  |  |
| --- | --- | --- | --- |
| **CLASS DESCRIPTOR** | **CLASS** | **MAXIMUM ENERGY CONSUMPTION**  **(kWh/day)a** | **TEST PROCEDURE** |
| Display door, medium temperature | DD, M | 0.04 × Add + 0.41 | [**10 CFR 431**](#_bookmark731) |
| Display door, low temperature | DD, L | 0.15 × Add + 0.29 | [**10 CFR 431**](#_bookmark731) |

a. Add is the surface area of the display door.

TABLE C403.2.14.2(2)

**WALK-IN COOLER AND FREEZER NONDISPLAY DOOR EFFICIENCY REQUIREMENTSa**

|  |  |  |  |
| --- | --- | --- | --- |
| **CLASS DESCRIPTOR** | **CLASS** | **MAXIMUM ENERGY CONSUMPTION**  **(kWh/day)a** | **TEST PROCEDURE** |
| Passage door, medium temperature | PD, M | 0.05 × And + 1.7 | [**10 CFR 431**](#_bookmark731) |
| Passage door, low temperature | PD, L | 0.14 × And + 4.8 | [**10 CFR 431**](#_bookmark731) |
| Freight door, medium temperature | FD, M | 0.04 × And + 1.9 | [**10 CFR 431**](#_bookmark731) |
| Freight door, low temperature | FD, L | 0.12 × And + 5.6 | [**10 CFR 431**](#_bookmark731) |

a. And is the surface area of the nondisplay door.

**[CE#208 AS**]

Revise title for Table C403.2.14.2(3) to read as follows:

TABLE C403.2.14.2(3)

WALK-IN COOLER AND FREEZER REFRIGERATION SYSTEMS EFFICIENCY REQUIREMENTS ~~(CE126-16AM)~~

EN-FBC-EN/C – Ch.4 – Errata #4

TABLE C403.2.14.2(3) Already in code

**WALK-IN COOLER AND FREEZER REFRIGERATION SYSTEM EFFICIENCY REQUIREMENTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **CLASS DESCRIPTOR** | **CLASS** | **MINIMUM ANNUAL WALK-IN ENERGY FACTOR (AWEF)**  **(Btu/W-h)a** | **TEST PROCEDURE** |
| Dedicated condensing, medium temperature, indoor system | DC.M.I | 5.61 | [**AHRI 1250**](#_bookmark660) |
| Dedicated condensing, medium temperature, outdoor system | DC.M.O | 7.60 |
| Dedicated condensing, low temperature, indoor system, net capacity (*qnet*) < 6,500 Btu/h | DC.L.I  < 6,500 | 9.091 × 10-5 × *qnet* + 1.81 |
| Dedicated condensing, low temperature, indoor system, net capacity (*qnet*) ≥ 6,500 Btu/h | DC.L.I  ≥ 6,500 | 2.40 |
| Dedicated condensing, low temperature, outdoor system, net capacity (*qnet*) < 6,500 Btu/h | DC.L.O  < 6,500 | 6.522 × 10-5 × *qnet* + 2.73 |
| Dedicated condensing, low temperature, outdoor system, net capacity (*qnet*) ≥ 6,500 Btu/h | DC.L.O  ≥ 6,500 | 3.15 |
| Unit cooler, medium | UC.M | 9.00 |
| Unit cooler, low temperature, net capacity (*qnet*) < 15,500 Btu/h | UC.L < 15,500 | 1.575 × 10-5 × *qnet* + 3.91 |
| Unit cooler, low temperature, net capacity (*qnet*) ≥ 15,500 Btu/h | UC.L ≥ 15,500 | 4.15 |

**[CE#209 AS]**

**[CE#210 AS] No change needed**

Replace Table C404.2 with the following:

**TABLE C404.2**

**MINIMUM PERFORMANCE OF WATER-HEATING EQUIPMENT**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EQUIPMENT TYPE** | **SIZE CATEGORY** | **SUBCATEGORY OR RATING CONDITION** | **DRAW PATTERN** | **PERFORMANCE REQUIREDa** | **TEST PROCEDUREb** |
| Electric table- top water heatersc | ≤ 12 kW | ≥ 20 gal ≤ 120 gald | Very small Low Medium High | UEF ≥ 0.6323 – (0.0058 × *Vr*) UEF ≥ 0.9188 – (0.0031 × *Vr*) UEF ≥ 0.9577 – (0.0023 × *Vr*) UEF ≥ 0.9884 – (0.0016 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
| Electric storage water heaterse, f: resistance and heat pump | ≤ 12 kW | ≥ 20 gal ≤ 55 galf | Very small Low Medium High | UEF ≥ 0.8808 – (0.0008 × *Vr*) UEF ≥ 0.9254 – (0.0003 × *Vr*) UEF ≥ 0.9307 – (0.0002 × *Vr*) UEF ≥ 0.9349 – (0.0001 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
| ≤ 12 kW | > 55 gal ≤120 galf | Very small Low Medium High | UEF ≥ 1.9236 – (0.0011 × *Vr*) UEF ≥ 2.0440 – (0.0011 × *Vr*) UEF ≥ 2.1171 – (0.0011 × *Vr*) UEF ≥ 2.2418 – (0.0011 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
| Electric storage water heaterse, f, l | > 12 kW | — | — | (0.3 + 27/*Vm*), %/h | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) App. B |
| Grid-enabled water heatersg | — | > 75 gald | Very small Low Medium High | UEF ≥ 1.0136 – (0.0028 × *Vr*) UEF ≥ 0.9984 – (0.0014 × *Vr*) UEF ≥ 0.9853 – (0.0010 × *Vr*) UEF ≥ 0.9720 – (0.0007 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**430**](#_bookmark729) App. E |
| Electric instantaneous water heatersh | ≤ 12 kW | < 2 gald | Very small Low Medium High | UEF ≥ 0.91  UEF ≥ 0.91  UEF ≥ 0.91  UEF ≥ 0.92 | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) |
| > 12 kW & ≤  58.6 kWi | ≤ 2 gal & ≤180ºF | All | UEF ≥ 0.80 | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) |
| Gas storage water heaterse, l | ≤ 75,000  Btu/h | ≥20 gal & ≤ 55 gald | Very small Low Medium High | UEF ≥ 0.3456 – (0.0020 × *Vr*) UEF ≥ 0.5982 – (0.0019 × *Vr*) UEF ≥ 0.6483 – (0.0017 × *Vr*) UEF ≥ 0.6920 – (0.0013 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
| ≤ 75,000  Btu/h | > 55 gal & ≤ 100 gald | Very small Low Medium High | UEF ≥ 0.6470 – (0.0006 × *Vr*) UEF ≥ 0.7689 – (0.0005 × *Vr*) UEF ≥ 0.7897 – (0.0004 × *Vr*) UEF ≥ 0.8072 – (0.0003 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
| > 75,000  Btu/h and ≤ 105,000  Btu/hj, k | ≤ 120 gal &  ≤180ºF | Very small Low Medium High | UEF ≥ 0.2674 – (0.0009 × *Vr*) UEF ≥ 0.5362 – (0.0012 × *Vr*) UEF ≥ 0.6002 – (0.0011 × *Vr*) UEF ≥ 0.6597 – (0.0009 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
| > 105,000  Btu/hk | — | — | 80% *Et* | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) |
| Gas instantaneous water heatersi | > 50,000  Btu/h and < 200,000  Btu/hk | < 2 gald | Very small Low Medium High | UEF ≥ 0.80  UEF ≥ 0.81  UEF ≥ 0.81  UEF ≥ 0.81 | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
|  | ≥ 200,000  Btu/hk | < 10 gal | — | 80% *Et* | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) |
| ≥ 200,000  Btu/hk | ≥10 gal | — | 80% *Et* |
| Oil storage water heaterse, l | ≤ 105,000  Btu/h | ≤ 50 gald | Very small Low Medium High | UEF = 0.2509 – (0.0012 × *Vr*) UEF = 0.5330 – (0.0016 × *Vr*) UEF = 0.6078 – (0.0016 × *Vr*) UEF = 0.6815 – (0.0014 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) |
| > 105,000  Btu/h and ≤ 140,000  Btu/hl | ≤ 120 gal &  ≤180ºF | Very small Low Medium High | UEF ≥ 0.2932 – (0.0015 × *Vr*) UEF ≥ 0.5596 – (0.0018 × *Vr*) UEF ≥ 0.6194 – (0.0016 × *Vr*) UEF ≥ 0.6740 – (0.0013 × *Vr*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
| > 140,000  Btu/h | All | — | 80% *Et* | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) |
| Oil instantaneous water heatersh, l | ≤ 210,000  Btu/h | < 2 gal | — | 80% *Et*  EF ≥ 0.59 – (0.0005 × *V*) | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  E |
| > 210,000  Btu/h | < 10 gal | — | 80% *Et* | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) |
| > 210,000  Btu/h | ≥ 10 gal | — | 78% *Et* | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) |
| Hot water supply boilers, gas and oilh | ≥ 300,000  Btu/h and < 12,500,000  Btu/h | < 10 gal | — | 80% *Et* | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) |
| Hot water supply boilers, gasi, l | ≥ 300,000  Btu/h and < 12,500,000  Btu/h | ≥ 10 gal | — | 80% *Et* | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) |
| Hot water supply boilers, oilh, l | ≥ 300,000  Btu/h and < 12,500,000  Btu/h | ≥ 10 gal | — | 78% *Et* | [**DOE 10 CFR**](#_bookmark731)  [**431.106**](#_bookmark731) |
| Pool heaters, gasd | All | — f | — | 82% *Et* | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  P |
| Heat pump pool heaters | All | 50°F db and 44.2°F wb  outdoor air 80.0°F entering water | — | 4.0 COP | [**DOE 10 CFR**](#_bookmark729)  [**Part 430**](#_bookmark729) App.  P |
| Unfired storage tanks | All | — | — | Minimum insulation requirement R-12.5 (h × ft2 × °F)/Btu | (none) |

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m2, °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.

a. Thermal efficiency (*Et*) is a minimum requirement, while standby loss is a maximum requirement. In the standby loss equation, *V* is the rated volume in gallons and *Q* is the nameplate input rate in Btu/h. *Vm* is the measured volume in the tank in gallons. Standby loss for electric water heaters is in terms of %/h and denoted by the term “S,” and standby loss for gas and oil water heaters is in terms of Btu/h and denoted by the term “SL.” Draw pattern (DP) refers to the water draw profile in the Uniform Energy Factor (UEF) test. UEF and Energy Factor (EF) are minimum requirements. In the UEF standard equations, *Vr* refers to the rated volume in gallons.

b. [**Chapter 6**](#_bookmark644)contains a complete specification, including the year version, of the referenced test procedure.

c. A tabletop water heater is a storage water heater that is enclosed in a rectangular cabinet with a flat top surface not more than 3 feet in height and has a ratio of input capacity (Btu/h) to tank volume (gal) < 4,000.

d. Water heaters or gas pool heaters in this category are regulated as consumer products by the US DOE, as defined in [**10 CFR 430**](#_bookmark729).

e. Storage water heaters have a ratio of input capacity (Btu/h) to tank volume (gal) < 4,000.

f. Efficiency requirements for electric storage water heaters ≤ 12 kW apply to both electric-resistance and heat pump water heaters. There are no minimum efficiency requirements for electric heat pump water heaters greater than 12 kW or for gas heat pump water heaters.

g. 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:

4.1. Is made of material not adversely affected by water.

4.2. Is attached by means of nonwater soluble adhesive.

4.3. 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 a 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.”

h. Instantaneous water heaters and hot water supply boilers have an input capacity (Btu/h) divided by storage volume (gal) ≥ 4,000 (Btu/h)/gal.

i. Electric instantaneous water heaters with input capacity >12 kW and ≤ 58.6 kW that (1) have a storage volume > 2 gallons, (2) are designed to provide outlet hot water at temperatures greater than 180°F, or (3) use three-phase power have no efficiency standard.

j. Gas storage water heaters with input capacity > 75,000 Btu/h and ≤ 105,000 Btu/h must comply with the requirements for the > 105,000 Btu/h if the water heater (1) has a storage volume > 120 gallons, (2) is designed to provide outlet hot water at temperatures greater than 180°F, or (3) uses three-phase power.

k. Refer to [**Section C404.2.1**](#_bookmark346)for additional requirements for gas storage and instantaneous water heaters and gas hot water supply boilers.l. Oil storage water heaters with input capacity > 105,000 Btu/h and ≤ 140,000 Btu/h must comply with the requirements for the > 140,000 Btu/h if the water heater either (1) has a storage volume > 120 gallons, (2) is designed to provide outlet hot water at temperatures greater than 180ºF, or (3) uses three-phase power.

l. Water heaters and hot water supply boilers with more than 140 gallons of storage capacity need not meet the standby loss requirement where: (1) the tank surface area is thermally insulated to R-12.5 or more, (2) there is no standing pilot light, and (3) for gas- or oil-fired storage water heaters, the heater is equipped with a fire damper or fan-assisted combustion.

**[CE#220 AS]**

**C405.2 Lighting controls (Mandatory).** ~~Lighting systems shall be provided with controls that comply with one~~ ~~of the following.~~ Lighting systems in *interior parking areas* shall be provided with controls that comply with **Section C405.2.8**. All other lighting systems powered through the energy service for the *building* and building site lighting for which the building *owner* is responsible shall be provided with controls that comply with [**Sections C405.2.1.1**](#_bookmark420) through [**C405.2.8**](#_bookmark397).

~~1. Lighting controls as specified in Sections C405.2.1 through C405.2.8.~~

~~2.~~  ~~Luminaire level lighting controls (LLLC) and lighting controls as specified in Sections C405.2.1, C405.2.5 and 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.~~ Spaces where an *automatic* shutoff could endanger occupant safety or security.

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

3. ~~Emergency egress lighting that is normally off.~~ Emergency lighting that is automatically off during normal operations.

4. Emergency lighting required by the ***Florida Building Code, Building*** in exit access components that are not provided with fire alarm systems.

5. Up to 0.02 watts per square foot (0.22 W/m2) of lighting in exit access components that are provided with fire alarm systems.

**[CE#228 AS]**

**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**](#_bookmark372) shall be provided with *time-switch controls* complying with [**Section C405.2.2.1**](#_bookmark377).

Exceptions:

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

Section 405.2.5.

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.~~

**[CE#230 AS]**

C405.2.4.2 Sidelit zone. The sidelit zone is the floor area adjacent to vertical fenestration which complies with all of the following:

1. Where the fenestration is located in a wall, the primary 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 C405.2.4.2(1).

2. Where the fenestration is located in a rooftop monitor, the primary 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 C405.2.4.2(1) and C405.2.4.2(2)

3 -6 No change

**[CE#235 AS]**

**C405.2.5 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](#_bookmark372)or a *time-switch control* complying with [**Section C405.2.2.1**](#_bookmark377). 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](#_bookmark410).

1.2. Display and accent, including lighting in display cases.

1.3. ~~Lighting in display cases.~~

1.~~4~~3. Supplemental task lighting, including permanently installed under-shelf or under- cabinet lighting.

1.~~5~~4. 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~~2. 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**](#_bookmark377)that is independent of the controls for other lighting within the room or space.

~~5~~3. Task lighting for medical and dental purposes that is in addition to *general lighting* shall be provided with a *manual control*.

4. Lighting integrated into range hoods and exhaust fans shall be controlled independently of fans.

**[CE#236 AS]**

**C405.2.7 Exterior lighting controls.** Exterior lighting systems shall be provided with controls that comply with [**Sections C405.2.7.1**](#_bookmark393) through [**C405.2.7.4**](#_bookmark396).

Exceptions:

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

2. Lighting controlled from within *dwelling units*.

**C405.2.7.1 Daylight shutoff.** Lights shall be automatically turned off when daylight is present and satisfies the lighting needs.

**C405.2.7.2 Building facade and landscape lighting.** Building facade and landscape

lighting shall automatically shut off from not later than 1 hour after *building* or business closing to not earlier than 1 hour before *building* or business opening.

**C405.2.7.3 Lighting setback.** Lighting that is not controlled in accordance with [**Section**](#_bookmark394)[**C405.2.7.2**](#_bookmark394) shall 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. From not later than midnight to not earlier than 6 a.m.

1.2. From not later than 1 hour after *building* or business closing to not earlier than 1 hour before *building* or business opening.

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

2. Luminaires serving exterior ~~outdoor~~ parking areas and having a rated input wattage of greater than ~~78~~ 40 watts and a mounting height of 24 feet (7315 mm) 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. Not more than 1,500 watts of lighting power shall be controlled together.

**[CE#237 AS]**

**C405.2.8 ~~Parking garage~~ Interior parking area lighting control.** ~~Parking~~ Interior parking area ~~garage~~ lighting shall be controlled by an *occupant sensor* complying with [**Section**](#_bookmark372)[**C405.2.1.1**](#_bookmark372)or a *time-switch control* complying with [**Section C405.2.2.1**](#_bookmark377). Additional lighting controls shall be provided as follows:

1. Lighting power of each luminaire shall be automatically reduced by not less than 30 percent when there is no activity detected within a lighting zone for 20 minutes. Lighting zones for this requirement shall be not larger than 3,600 square feet (334.5 m2).

**Exception:** Lighting zones provided with less than 1.5 footcandles 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~~ to buildings ~~and parking structures~~, such lighting shall be separately controlled by a device that automatically reduces lighting power by at least 50 percent from sunset to sunrise.

3. The power to luminaires within 20 feet (6096 mm) of perimeter wall openings shall automatically reduce in response to daylight by at least 50 percent.

Exceptions:

1. Where the opening-to-wall ratio is less than 40 percent 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.

**[CE#240 AS]**

**C405.3.1 Total connected interior lighting power.** The total connected interior lighting power shall be determined in accordance with [**Equation 4-9**](#_bookmark381).

Equation 4- 9

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.~~1. Emergency lighting automatically off during normal building operation.

~~3.~~2. 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.~~3. Mirror lighting in makeup or dressing ~~rooms~~ areas used for video broadcasting, video or film recording, or live theatrical and music performance.

~~6.~~4. Task lighting for medical and dental purposes that is in addition to *general lighting*.

~~7.~~5. Display lighting for exhibits in galleries, museums and monuments that is in addition to

*general lighting*.

~~8.~~6. Lighting ~~for theatrical purposes, including performance, stage, film production and video production.~~ in any location that is specifically used for video broadcasting, video or film recording, or live theatrical and music performance.

~~9.~~7. Lighting for photographic processes.

~~10.~~8. Lighting integral to equipment or instrumentation and installed by the manufacturer.

~~11.~~9. Task lighting for plant growth or maintenance.

~~12.~~10. Advertising signage or directional signage.

~~13.~~11. Lighting for food warming.

~~14.~~12. Lighting equipment that is for sale.

~~15.~~13. Lighting demonstration equipment in lighting education facilities.

~~16.~~14. Lighting approved because of safety considerations.

~~17.~~15. Lighting in retail display windows, provided that the display area is enclosed by ceiling- height partitions.

~~18.~~16. Furniture-mounted supplemental task lighting that is controlled by automatic shutoff.

~~19.~~17. Exit signs.

18. Lighting in *sleeping units* and *dwelling units* .

19. For exit access and exit stairways, including landings, where the applicable code requires an illuminance of 10 footcandles or more on the walking surface, the power in excess of the allowed power calculated according to [**Section C405.3.2.2**](#_bookmark409) is not included.

**[CE#242 AS]**

**Revise Section C405.3.2.2, Item #1 to read 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.~~

For each space enclosed by partitions that are less than 80 percent of the ceiling height, determine the applicable space type from Table C405.3.2(2). For space types not listed, select the space type that most closely represents the proposed use of the space. Where a space has multiple functions, the space may be divided into separate spaces.

EN-FBC-EN/C – Ch.4 – Glitch #1

Revise Section C405.3.2.2.1 to read as follows:

**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 controlled in accordance with Section C405.2.~~4~~5. 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:

No change to the remaining text.

EN-FBC-EN/C – Ch.4 – Errata #5

**C405.6 Electrical transformers (Mandatory).**

No change

**Exceptions:** The following transformers are exempt in accordance with the DOE definition of Distribution Transformers found in [**10 CFR 431.192**](#_bookmark731):

~~1.~~  ~~Transformers that meet the~~ *~~Energy Policy Act of 2005~~* ~~exclusions based on the DOE~~  ~~10 CFR 431 definition of special purpose applications.~~

~~2.~~  ~~Transformers that meet the~~ *~~Energy Policy Act of 2005~~* ~~exclusions that are not to be used in general purpose applications based on information provided in DOE 10 CFR 431.~~

~~3.~~ 1. Transformers ~~that meet the~~ *~~Energy Policy Act of 2005~~* ~~exclusions with multiple voltage taps where the highest tap is not less than 20 percent more than the lowest tap.~~ with a tap range of 20 percent or more.

~~4.~~ 2. Drive (isolation) transformers.

~~5.~~ 3. Rectifier transformers.

~~6.~~ 4. Auto-transformers.

~~7.~~ 5. Uninterruptible power system transformers.

~~8.~~ 6. ~~Impedance~~ Special impedance transformers.

~~9.~~ 7. Regulating transformers.

~~10.~~ 8. Sealed ~~and nonventilating~~ transformers.

~~11.~~ 9. Machine tool (control) transformers.

~~12.~~ 10. Welding transformers.

~~13.~~ 11. Grounding transformers.

~~14.~~ 12. Testing transformers.

13. Nonventilated transformers.

**[CE#253 AS]**

TABLE C405.6

**MINIMUM NOMINAL EFFICIENCY LEVELS FOR** [**DOE 10 CFR 431**](#_bookmark729) **LOW-VOLTAGE DRY-TYPE DISTRIBUTION TRANSFORMERS**

|  |  |  |  |
| --- | --- | --- | --- |
| **SINGLE-PHASE TRANSFORMERSa** | | **THREE-PHASE TRANSFORMERSa** | |
| **kVAa b** | **Efficiency (%)b c** | **kVAa b** | **Efficiency (%)b c** |
| 15 | 97.70 | 15 | 97.89 |
| 25 | 98.00 | 30 | 98.23 |
| 37.5 | 98.20 | 45 | 98.40 |
| 50 | 98.30 | 75 | 98.60 |
| 75 | 98.50 | 112.5 | 98.74 |
| 100 | 98.60 | 150 | 98.83 |
| 167 | 98.70 | 225 | 98.94 |
| 250 | 98.80 | 300 | 99.02 |
| 333 | 98.90 | 500 | 99.14 |
| — | — | 750 | 99.23 |
| — | — | 1000 | 99.28 |

a. ~~kiloVolt-Amp rating.~~ A low-voltage dry-type distribution transformer with a kVA rating not listed in the table shall have its minimum efficiency level determined by linear interpolation of the kVA and efficiency values listed in the table immediately above and below its kVA rating. Extrapolation shall not be used below the minimum values or above the maximum values shown for single-phase transformers and three-phase transformers.

b. kiloVolt-Amp rating.

~~b.~~ c. Nominal efficiencies shall be established in accordance with the [**DOE 10 CFR 431**](#_bookmark731)test procedure for low-voltage dry-type transformers.

**[CE#254 AS]**

**C405.7 Electric motors (Mandatory).**

No change

**Exception:** The standards in this section shall not apply to the following exempt electric motors:

1. Air-over electric motors.

2. Component sets of an electric motor.

3. Liquid-cooled electric motors.

4. Submersible electric motors.

5. Inverter-only electric motors.

6. Definite-purpose machines within the scope of [**ANSI/NEMA MG 1**](#_bookmark742), Part 18

**[CE#255 AS]**

**C405.10 Data centers and computer rooms.** Electrical equipment in *data centers* and *computer rooms* shall comply with this section.

**C405.10.1 Data centers.** Transformers, uninterruptable power supplies, motors and electrical power processing equipment in *data centers* shall comply with Section 8 of [**ASHRAE 90.4**](#_bookmark680) in addition to this code.

**C405.10.2 Computer rooms.** Uninterruptable power supplies in *computer rooms* shall comply with the requirements in Tables 8.5 and 8.6 of [**ASHRAE 90.4**](#_bookmark680) in addition to this code.

**Exception:** AC-output UPS that utilizes standardized NEMA 1-15P or NEMA 5-15P input plug, as specified in [**ANSI/NEMA WD-6**](#_bookmark676)

**[CE#256 AS]**

**[CE#262 AS] Not applicable**

##### SECTION C407

**~~TOTAL~~ SIMULATED BUILDING PERFORMANCE**

**C407.1 Scope.** This section establishes criteria for compliance using ~~total~~ simulated building performance. The following systems and loads shall be included in determining the ~~total~~ simulated building performance: heating systems, cooling systems, *service water heating*, *fan systems*, lighting power, receptacle loads and process loads.

**Exception:** Energy used to recharge or refuel vehicles that are used for on-road and off-site transportation purposes.

**[CE#311 AS]**

**~~C407.5.2 Algorithms not tested.~~** ~~Algorithms not tested in accordance with~~ [**~~Section~~**](#_bookmark550)[**~~C407.5.1.2~~**](#_bookmark550)~~, including algorithms that are alternatives to those that were tested, and numerical settings not tested, such as time steps and tolerances, shall be permitted to be used where modeling the~~ *~~proposed design~~* ~~and~~ *~~standard reference design~~* ~~.~~

~~(~~Since Section C407.5.1.2 was not approved – this section should be deleted)

**[CE#317 AS]**

**C407.6.3 Exceptional calculation methods.** Where the simulation program does not model a design, material or device of the *proposed design* , an exceptional calculation method shall be used where *approved* by the *code official* . Where there are multiple designs, materials or devices that the simulation program does not model, each shall be calculated separately and exceptional savings determined for each. The total exceptional savings shall not constitute more than half of the difference between the baseline simulated building performance and the proposed simulated building performance. Applications for approval of an exceptional method shall include all of the following:

1. Step-by-step documentation of the exceptional calculation method performed, detailed enough to reproduce the results.

2. Copies of all spreadsheets used to perform the calculations.

3. A sensitivity analysis of energy consumption where each of the input parameters is varied from half to double the value assumed.

4. The calculations shall be performed on a time step basis consistent with the simulation program used.

5. The performance rating calculated with and without the exceptional calculation method.

**[CE#318 AS]**

**CHAPTER 5 [CE] EXISTING BUILDINGS**

**C502.2 Change in space conditioning.** Any nonconditioned or low-energy space that is altered to become *conditioned space* shall be required to comply with [**Section C502**](#_bookmark605).

Exceptions:

1. Where the component performance alternative in [**Section C402.1.4**](#_bookmark129) 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~~ simulated building performance option in [**Section C407**](#_bookmark533)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**](#_bookmark534) C407.3

**[CE#328 AS]**

**CHAPTER 6 [RE] Reference Standards**

**AERC**

**Attachments Energy Rating Council**

**355 Lexington Ave 15th Floor**

**New York, NY 10017**

**AERC 1—2017: Procedures for Determining Energy Performance Properties of Fenestration Attachments**

**[CE#342 AS]**

**AHAM**

**ANSI/AHAM RAC-1—~~2015~~2020: Room Air Conditioners …**[**Table C403.3.2(4)**](#_bookmark206)

**[CE#343 AS]**

**AHRI**

**210/240—~~2017 and~~ 2023 (2020): Performance Rating of Unitary Air-conditioning and Air-source Heat Pump Equipment** [**Table C403.3.2(1)**](#_bookmark203)[**Table C403.3.2(2)**](#_bookmark204)[**Table C403.3.2(8)**](#_bookmark210)[**Table C403.3.2(9)**](#_bookmark211)

**310/380—2017 (CSA-C744-17): Packaged Terminal Air Conditioners and Heat Pumps**

**[Table C403.3.2(4)](#_bookmark206)**

**340/360—~~2019~~2022: Performance Rating of Commercial and Industrial Unitary Air-conditioning and Heat Pump Equipment** [**Table C403.3.2(1)**](#_bookmark203)[**Table C403.3.2(2)**](#_bookmark204)

**365 (I-P)—2009: Commercial and Industrial Unitary Air-conditioning Condensing Units**

[**Table C403.3.2(1)**](#_bookmark203)

**390 (I-P)—2003: Performance Rating of Single Package Vertical Air-conditioners and Heat Pumps** [**C403.3.2(4)**](#_bookmark0)

**400 (I-P)—2015: Performance Rating of Liquid to Liquid Heat Exchangers**

[**C403.3.2**](#_bookmark202)

**440 (I-P)~~—2008~~2019: Performance Rating of ~~Room~~ Fan Coils~~—with Addendum 1~~**

[**C403.13.3**](#_bookmark333)

**460—2005: Performance Rating of Remote Mechanical-draft Air-cooled Refrigerant Condensers**[**Table C403.3.2(7)**](#_bookmark209)

**550/590 (I-P)—~~2018~~2022: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle**

**[Table C403.3.2(3)](#_bookmark205)**[**Table C403.3.2(15)**](#_bookmark217)

**560—~~2018~~2000: Absorption Water Chilling and Water Heating Packages**

[**Table C403.3.2(3)**](#_bookmark205)[**Table C403.3.2(15)**](#_bookmark217)

**840 (I-P)—1998: Performance Rating of Unit Ventilators**

[**C403.13.3**](#_bookmark333)

**910 (I-P)—2014: Performance Rating of Indoor Pool Dehumidifiers**

[**Table C403.3.2(11)**](#_bookmark213)

**920 (I-P)—2020: Performance Rating of Direct Expansion-Dedicated Outdoor Air System Units (with Addendum 1)** [**Table C403.3.2(12)**](#_bookmark214)[**Table C403.3.2(13)**](#_bookmark215)

**~~920—2015::~~ ~~Performance Rating of DX-Dedicated Outdoor Air System Units~~**

**~~TT~~**

**~~920—2015::~~ ~~Performance Rating of DX-Dedicated Outdoor Air System Units~~**

**~~TT~~**

**1200 (I-P)—~~2013~~2022: Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets** [**Table C403.12.1**](#_bookmark318)

**1230—~~2014~~2021: Performance Rating of Variable Refrigerant Flow (VRF) Multi-split Air-Conditioning and Heat Pump Equipment ~~(with Addendum 1)~~**

**1250 (I-P)—~~2014~~2020: Standard for Performance Rating in Walk-in Coolers and Freezers**

[**Table C403.12.2.1(3)**](#_bookmark322)

**1360 (I-P)—2017: Performance Rating of Computer and Data Processing Room Air Conditioners** [**Table C403.3.2(10)**](#_bookmark212)[**Table C403.3.2(16)**](#_bookmark218)

**1380 (I-P)—2019: Demand Response through Variable Capacity HVAC Systems in Residential and Small Commercial Applications** [**C403.4.6.1**](#_bookmark0)

**ANSI/AHRI 1300-2013(R2023)(I-P): Performance Rating of Commercial Heat Pump Water Heaters** [**C406.2.3.1.2**](#_bookmark489)

**ASHRAE/ANSI/AHRI/ISO 13256-1 (2012): Water-to-Air and Brine-to-Air Heat Pumps—Testing and Rating for Performance**[**Table C403.3.2(14)**](#_bookmark216)

**ASHRAE/ANSI/AHRI/ISO 13256-2 (2012): Water-to-Water and Brine-to-Water Heat Pumps—Testing and Rating for Performance ….**[**Table C403.3.2(14)**](#_bookmark216)

**[CE#344 AS]**

**AISI**

American Iron and Steel Institute

25 Massachusetts Avenue, NW, Suite 800

Washington, DC 20001

**AISI S250—22: North American Standard for Thermal Transmittance of Building Envelopes with**

**Cold-Formed Steel Framing, with Supplement 1, dated 2022**

**[CE#345 AS]**

**AMCA**

**208—18: Calculation of the Fan Energy Index**

[**C403.8.3**](#_bookmark298)[**C403.9.1**](#_bookmark307)

**500D—18: Laboratory Methods for Testing Dampers for Rating**[**C403.7.7**](#_bookmark289)

**ANSI/AMCA 220—~~19~~21: Laboratory Methods of Testing Air Curtain Units for Aerodynamic Performance Rating** [**C402.6.6**](#_bookmark183)

**ANSI/AMCA 230—~~15~~22: Laboratory Methods of Testing Air Circulating Fans for Rating and Certification** [**C403.9**](#_bookmark305)

**[CE#346 AS]**

**ANSI**

American National Standards Institute 25 West 43rd Street, 4th Floor New York, NY 10036

**ANSI Z21.47—2016/CSA 2.3—~~2016~~21: Gas-Fired Central Furnaces ….**[**Table C403.3.2(5)**](#_bookmark207)

**ANSI Z83.8—2016/CSA 2.6—2016: Gas Unit Heater, Gas Packaged Heaters, Gas Utility Heaters And Gas-Fired Duct Furnaces** [**Table C403.3.2(5)**](#_bookmark207)

**ANSI/CTA-2045-A—2018: Modular Communications Interface for Energy Management**

**C403.4.6.2**[**C406.3**](#_bookmark520)

**ANSI/CTA-2045-B—2018: Modular Communications Interface for Energy Management**

[**C406.3.7**](#_bookmark529)

**ANSI/CTA-2045-B—2019: Modular Communications Interface for Energy Management**

**C403.4.6.2**

**ANSI/CTA-2045-B—2021: Modular Communications Interface for Energy Management**

**Table C404.10**

**ANSI/NEMA WD 6—2016: Wiring Devices—Dimensional Specifications**

[**C405.9.2**](#_bookmark431)

**~~Z21.10.3/CSA 4.3—17::~~ ~~Gas Water Heaters, Volume III—Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour,~~ ~~Circulating Tank and Instantaneous~~**

**[CE#347 AS]**

**ASABE**

**S640—~~2017~~July 2017(R2022): Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms)** [**C202**](#_bookmark63)

**[CE#348 AS]**

**ASHRAE**

**55—~~2017~~2020: Thermal Environmental Conditions for Human Occupancy** [**Table C407.4.1(1)**](#_bookmark540)

**62.1—2019: Ventilation for Acceptable Indoor Air Quality**

[**C403.6.1**](#_bookmark267)[**C406.3.3**](#_bookmark525)[**Table C409.6.1.10.2(1)**](#_bookmark589)

**90.1—~~2019~~2022: Energy Standard for Buildings Except Low-rise Residential Buildings**

**[C101.3](#_bookmark8)**[**C401.2.2**](#_bookmark104) [**C402.1.2**](#_bookmark113)[**Table C402.1.2**](#_bookmark114)[**C402.1.2.1**](#_bookmark115)[**C402.1.3**](#_bookmark124)[**Table C403.3.2(5)**](#_bookmark207)[**Table**](#_bookmark217)[**C403.3.2(15)**](#_bookmark217)[**C406.2C406.2**](#_bookmark467)[**C406.2.1.1**](#_bookmark475)[**C409.6.1.3.2**](#_bookmark582)[**C409.6.1.5**](#_bookmark583)[**C409.6.1.6**](#_bookmark584)[**Table C409.6.1.10.2(1)**](#_bookmark589)[**Table**](#_bookmark594)[**C409.7(1)**](#_bookmark594)[**C501.2**](#_bookmark601)[**C501.3**](#_bookmark602)

**90.4—~~2016~~2022: Energy Standard for Data Centers**

[**C403.1.2**](#_bookmark195)[**C405.9.1**](#_bookmark430)[**C405.9.2**](#_bookmark431)[**C406.2.2.3**](#_bookmark484)

**140—~~2014~~2020: ~~Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs~~Method of Test for Evaluating Building Performance Simulation Software (with Addenda A and B)**

[**C407.5.1.2**](#_bookmark550)[**C409.5.1**](#_bookmark578)

**~~146—2011::~~ ~~Testing for Rating Pool Heaters~~**

**~~T~~**

**ANSI/ASHRAE/ACCA Standard 183—~~(RA2017)~~2007 (RA2020): Peak Cooling and Heating Load Calculations in Buildings, Except Low-rise Residential Buildings**

[**C403.1.1**](#_bookmark194)

**ANSI/ASHRAE/ASHE Standard 170—2021: Ventilation of Health Care Facilities**

[**C409.2.1**](#_bookmark574)

**ASHRAE Standard 51—16/ANSI/AMCA Standard 210—16: Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating**

[**Table C403.8.5**](#_bookmark301)

**ASHRAE—2020: 2020 ASHRAE Handbook—HVAC Systems and Equipment**

**[C403.1.1](#_bookmark194)**

**ISO/AHRI/ASHRAE 13256-1 (2012): Water-to-Air and Brine-to-Air Heat Pumps—Testing and Rating for Performance** [**Table C403.3.2(14)**](#_bookmark216)

**ISO/AHRI/ASHRAE 13256-2 (2012): Water-to-Water and Brine-to-Water Heat Pumps—Testing and Rating for Performance…..Table C403.3.2(14)**

**[CE#349 AS]**

**ASME**

**ASME A17.1—~~2019~~2022/CSA B44—~~1922~~: Safety Code for Elevators and Escalators**

**[CE#350 AS]**

**ASTM**

**C90—~~2016A~~21: Specification for Load-bearing Concrete Masonry Units** [**Table C402.1.3**](#_bookmark125)

**C835—06(2020): Standard Test Method for Total Hemispherical Emittance of Surfaces up to 1400°C**[**C402.3**](#_bookmark143)

**C1363—~~11~~19: Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus**

[**C303.1.4.1**](#_bookmark95)[**Table C402.1.2**](#_bookmark114)[**C402.1.2.1**](#_bookmark115)[**C402.1.2.1.7**](#_bookmark121)[**Table C402.1.2.1.7**](#_bookmark122)[**C402.2.7**](#_bookmark142)

**C1371—15: Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers**

[**C402.3**](#_bookmark143)[**Table C402.4**](#_bookmark145)

**C1549—16: Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer**

[**C402.3**](#_bookmark143)[**Table C402.4**](#_bookmark145)

**D1003—~~13~~21: Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics** [**C402.6.2.3.2**](#_bookmark178)

**D8052/D8052M—~~2017~~22: Standard Test Method for Quantification of Air Leakage in Low-Sloped Membrane Roof Assemblies** [**C402.6.2.3.2**](#_bookmark178)

**E283/E283M—~~2004(2012)~~19: Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain** **Walls and Doors Under Specified Pressure Differences Across the Specimen**

[**C402.6.1.2.1**](#_bookmark170) [**C402.6.2.3.2**](#_bookmark178)[**Table C402.6.3**](#_bookmark180)

**E408—13(2019): Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-meter Techniques**[**C402.3**](#_bookmark143)[**Table C402.4**](#_bookmark145)

**E779—~~10(2018)~~19: Standard Test Method for Determining Air Leakage Rate by Fan Pressurization** [**C402.6.2.1**](#_bookmark174)[**C402.6.2.2**](#_bookmark175)

**E903—20~~12~~: Standard Test Method Solar Absorptance, Reflectance and Transmittance of Materials Using Integrating Spheres ~~(Withdrawn 2005)~~**

[**C402.3**](#_bookmark143)[**Table C402.4**](#_bookmark145)

**E1186—22: Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems** [**C402.6.2**](#_bookmark173)

**E1677—~~11~~19: Standard Specification for Air Barrier (AB) Material or ~~Systems~~Assemblies for Low-Rise Framed Building Walls**[**C402.6.2.3.2**](#_bookmark178)

**E1827—~~2011(2017)~~22: Standard Test Methods for Determining Airtightness of Building Using an Orifice Blower Door** [**C402.6.2.1**](#_bookmark174)[**C402.6.2.2**](#_bookmark175)

**E1918—~~06(2016)~~21: Standard Test Method for Measuring Solar Reflectance of Horizontal or Low-sloped Surfaces in the Field**[**Table C402.4**](#_bookmark145)

**E1980—11(2019): Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-sloped Opaque Surfaces** [**Table C402.4**](#_bookmark145)

**E2178—~~13~~21a: Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials** [**C402.6.2.3.1**](#_bookmark177)

**E2357—~~2018~~23: Standard Test Method for Determining Air Leakage of Air Barriers Assemblies** [**C402.6.2.3.2**](#_bookmark178)

**E3158— 18: Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building**[**C402.6.2.1**](#_bookmark174)

**F1281—17(2021): Standard Specification for Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL\_PEX) Pressure Pipe**

**[Table C404.5.2.1](#_bookmark355)**

**F1361—~~2017~~21: Standard Test Method for Performance of Open ~~Deep Fat~~Vat Fryers**

[**Table C406.2.6.2(1)**](#_bookmark513)

**F1484—18: Standard Test Method for Performance of Steam Cookers**

**[Table C406.2.6.2(2)](#_bookmark514)**

**F1495—~~2014a~~20: Standard Specification for Combination Oven Electric or Gas Fired**

[**Table C406.2.6.2(4)**](#_bookmark516)

**F1496—~~2013~~13(2019): Standard Test Method for Performance of Convection Ovens**

[**Table C406.2.6.2(4)**](#_bookmark516)

**F1696—~~2018~~20: Standard Test Method for Energy Performance of Stationary-Rack, Door-Type Commercial Dishwashing** **Machines**

[**Table C406.2.6.2(3)**](#_bookmark515)

**F1920—~~2015~~20: Standard Test Method for Performance of Rack Conveyor Commercial Dishwashing Machines**[**Table C406.2.6.2(3)**](#_bookmark515)

**F2093—18: Standard Test Method for Performance of Rack Ovens**

[**Table C406.2.6.2(4)**](#_bookmark516)

**F2144—~~2017~~21: Standard Test Method for Performance of Large Open Vat Fryers**

[**Table C406.2.6.2(1)**](#_bookmark513)

**F2861—~~2017~~20: Standard Test Method for Enhanced Performance of**

**Combination Oven in Various Modes** [**Table C406.2.6.2(4)**](#_bookmark516)

**[CE#351 AS]**

**CRRC**

**ANSI/CRRC S100—~~2020~~2021: Standard Test Methods for Determining Radiative Properties of Materials**

[**Table C402.4**](#_bookmark145) [**C402.4.1**](#_bookmark146)

**[CE#352 AS]**

**CSA**

**AAMA/WDMA/CSA 101/I.S.2/A440—~~17~~22: North American Fenestration Standard/Specification for Windows, Doors and Skylights**[**Table C402.6.3**](#_bookmark180)

**CAN/CSA C439—18: Laboratory Methods of Test for Rating the Performance of Heat/Energy-Recovery Ventilators** [**C403.7.4.1**](#_bookmark280)

**CSA B55.1—20~~15~~: Test Method for Measuring Efficiency and Pressure Loss of Drain Water Heat Recovery Units** [**C404.7**](#_bookmark361)[**C406.2.3.6**](#_bookmark497)

**CSA B55.2—20~~15~~: Drain Water Heat Recovery Units**

**C404.7**

**[CE#353 AS]**

**CTI**

**ATC-105—2019: Acceptance Test Code for Water Cooling Towers**

[**Table C403.3.2(7)**](#_bookmark209)

**ATC-105DS—~~2018~~2019: Acceptance Test Code for Dry Fluid Coolers**

[**Table C403.3.2(7)**](#_bookmark209)

**ATC-105S—~~11~~2021: Acceptance Test Code for Closed Circuit Cooling Towers**

[**Table C403.3.2(7)**](#_bookmark209)

**ATC-106—2011: Acceptance Test for Mechanical Draft Evaporative Vapor Condensers**

[**Table C403.3.2(7)**](#_bookmark209)

**CTI STD-201 RS~~(17)~~2021: Performance Rating of Evaporative Heat Rejection Equipment**

**[CE#354 AS]**

**DASMA**

**ANSI/DASMA 105—~~2017~~2020: Test Method for Thermal Transmittance and Air Infiltration of Garage Doors and Rolling Doors** [**C303.1.3**](#_bookmark90)[**Table C402.6.3**](#_bookmark180)

**[CE#355 AS]**

**DOE**

**10 CFR 50: Domestic Licensing of Production and Utilization Facilities**

[**C403.17**](#_bookmark342)

**10 CFR, Part 430—2015: Energy Conservation Program for Consumer Products: Test Procedures and Certification and Enforcement Requirement for Plumbing Products; and Certification and Enforcement Requirements for Residential Appliances; Final Rule**

[**Table C403.3.2(1)**](#_bookmark203)[**Table C403.3.2(2)**](#_bookmark204)[**Table C403.3.2(4)**](#_bookmark206)[**Table C403.3.2(5)**](#_bookmark207)[**Table C403.3.2(6)**](#_bookmark208)[**Table**](#_bookmark216)[**C403.3.2(14)**](#_bookmark216)[**C403.15**](#_bookmark341)[**Table C404.2**](#_bookmark345)[**C406.2.3.1.2**](#_bookmark489)[**Table C406.2.3.5**](#_bookmark496)

**10 CFR, Part 430, Appendix U: Uniform Test Method for Measuring the Energy Consumption of Ceiling Fans** [**C403.8.5**](#_bookmark300)[**Table C403.9**](#_bookmark306)

**10 CFR, Part 431—2015: Energy Efficiency Program for Certain Commercial and Industrial Equipment: Test Procedures and Efficiency Standards; Final Rules**

[**Table C403.3.2(6)**](#_bookmark208)[**C403.8.4**](#_bookmark299) [**C403.12**](#_bookmark316) [**C403.12.1**](#_bookmark317)[**Table C403.12.1**](#_bookmark318) [**C403.12.2**](#_bookmark319)[**Table**](#_bookmark321)[**C403.12.2.1(2)**](#_bookmark321)[**C404.2**](#_bookmark344)[**Table C404.2**](#_bookmark345)[**C405.7**](#_bookmark422)[**Table C405.7**](#_bookmark423)[**C405.8**](#_bookmark424)[**Table C405.8(1)**](#_bookmark425)[**Table C405.8(2)**](#_bookmark426)[**Table**](#_bookmark427)[**C405.8(3)**](#_bookmark427)[**Table C405.8(4)**](#_bookmark428)

**[CE#356 AS]**

**~~AAMA~~FGIA**

Fenestration & Glazing Industry Alliance (formerly American Architectural Manufacturers Association)

1900 E. Golf Road, Suite 1250

**AAMA/WDMA/CSA 101/I.S.2/A440—~~17~~22: North American Fenestration Standard/Specification for Windows, Doors, and Skylights**

Table C402.6.3

**[CE#357 AS]**

**ICC**

**IBC—~~21~~24: International Building Code®**

[**C201.3**](#_bookmark61)[**C202**](#_bookmark63)[**C303.1.1**](#_bookmark87)[**C303.1.2**](#_bookmark89)[**C303.2**](#_bookmark96)[**C402.1.5**](#_bookmark131)[**C402.2.7**](#_bookmark142) [**C402.6.4**](#_bookmark181)[**C405.2**](#_bookmark370)[**C405.5.1**](#_bookmark415) **CG101.2.6**[**C405.15.2.1**](#_bookmark453)[**C501.2C501.2**](#_bookmark601)[**C503.2.4**](#_bookmark624)

**ICC 500—20: Standard for the Design and Construction of Storm Shelters**

[**C402.5.2**](#_bookmark153)

**IFC—~~21~~24: International Fire Code®**

[**C201.3**](#_bookmark61)**C405.16.2.1C405.16.2.2**[**C501.2**](#_bookmark601)

**IFGC—~~21~~24: International Fuel Gas Code®**

[**C201.3**](#_bookmark61)[**C501.2**](#_bookmark601)

**IMC—~~21~~24: International Mechanical Code®**

[**C201.3**](#_bookmark61)[**C402.1.5**](#_bookmark131)[**C403.2.2**](#_bookmark198)[**C403.6**](#_bookmark266)[**C403.6.1**](#_bookmark267)[**C403.6.6**](#_bookmark272)[**C403.7.1**](#_bookmark277)[**C403.7.2**](#_bookmark278)[**C403.7.4.2**](#_bookmark281)[**C403.7.5**](#_bookmark284)[**C403.7.7**](#_bookmark289)[**C403.8.6.1**](#_bookmark327)[**C403.13.1**](#_bookmark327)[**C403.13.2**](#_bookmark328) [**C403.13.2.1**](#_bookmark329) [**C403.13.2.2**](#_bookmark330)[**C406.2.2.5**](#_bookmark486)[**C406.3.3**](#_bookmark525)[**Table C407.4.1(1)**](#_bookmark540)[**C408.2.2.1**](#_bookmark555)[**C501.2**](#_bookmark601)

**IPC—~~21~~24: International Plumbing Code®**

[**C201.3**](#_bookmark61)[**C501.2**](#_bookmark601)

**IPMC—~~21~~24: International Property Maintenance Code®**

[**C501.2**](#_bookmark601)

**IPSDC—~~21~~24: International Private Sewage Disposal Code®** [**C501.2**](#_bookmark601)

**[CE#359 AS]**

**IEEE**

**515.1—2012: IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications**

[**C404.6.2**](#_bookmark359)

**1547—2018a: IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric** **Power Systems Interfaces**

C405.16

**[CE#361 AS]**

[IES](https://www.ies.org/)

**ANSI/ASHRAE/IES 90.1—~~2019~~2022: Energy Standard for Buildings, Except Low-Rise Residential Buildings** [**C101.3**](#_bookmark8)[**C401.2**](#_bookmark102)[**C401.2.2**](#_bookmark104)[**Table C402.1.2**](#_bookmark114)[**C402.1.2.1**](#_bookmark115)[**C402.1.3**](#_bookmark124)[**Table C402.1.3**](#_bookmark125)[**Table C403.3.2(5)**](#_bookmark207)[**Table**](#_bookmark217)[**C403.3.2(15)**](#_bookmark217)[**C406.2**](#_bookmark467)[**C406.2.1.1**](#_bookmark475)[**C409.6.1.3.2C409.6.1.3.2**](#_bookmark582)[**C409.6.1.5**](#_bookmark583)[**C409.6.1.6**](#_bookmark584)[**Table C409.6.1.10.2(1)**](#_bookmark589)[**Table**](#_bookmark594)[**C409.7(1)**](#_bookmark594)[**C501.2**](#_bookmark601)[**C501.3**](#_bookmark602)

**ANSI/IES RP-2—2020: Recommended Practice: Lighting Retail Spaces**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-3—2020: Recommended Practice: Lighting Educational Facilities**

C406.2.5

**[CE#362 AS]**

**ANSI/IES RP-4—2020: Recommended Practice: Lighting Library Spaces**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-6—2020: Recommended Practice: Lighting Sports and Recreational Areas**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-7—2020: Recommended Practice: Lighting Industrial Facilities**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-8—2021: Recommended Practice: Lighting Roadway and Parking Facilities**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-9—2020: Recommended Practice: Lighting Hospitality Spaces**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-10—2020: Recommended Practice: Lighting Common Applications**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-27—2020: Recommended Practice: Photobiological Safety for Lighting Systems** [**C406.2.5**](#_bookmark499)

**ANSI/IES RP-29—2020: Recommended Practice: Lighting Hospital and Healthcare Facilities**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-30—2020: Recommended Practice: Lighting Museums**

[**C406.2.5**](#_bookmark499)

**ANSI/IES RP-41—2020: Recommended Practice: Lighting Theaters and Worship Spaces**

[**C406.2.5**](#_bookmark499)

**ANSI/IES/ALA RP-11—2020: Recommended Practice: Lighting for Interior and Exterior Residential Environments**[**C406.2.5**](#_bookmark499)

**[CE#363 AS]**

[ISO](https://www.iso.org/home.html)

**ISO 9050—2003: Glass in Building: Determination of Light Transmittance, Solar Direct Transmittance, Total Solar Energy Transmittance, Ultraviolet Transmittance and Related Glazing Factors**

[**C402.3**](#_bookmark143)

**ISO 25745-2—2015: Energy Performance of Lifts, Escalators and Moving Walks—Part 2: Energy calculation and classification for lifts (elevators)**

[**C406.2.6.1**](#_bookmark511)

**ISO 27327-1—2009: Fans—Air Curtain Units—Laboratory Methods of Testing for Aerodynamic Performance Rating**[**C402.6.6**](#_bookmark183)

**ISO/AHRI/ASHRAE 13256-1—2017: Water-to-Air and Brine-to-Air Heat Pumps—Testing and Rating for Performance** [**Table C403.3.2(14)**](#_bookmark216)

**ISO/AHRI/ASHRAE 13256-2—2017: Water-to-Water and Brine-to-Water Heat Pumps—Testing and Rating for Performance** [**Table C403.3.2(14)**](#_bookmark216)

**[CE#364 AS]**

NEMA

**ANSI/NEMA MG1—~~2016~~2021: Motors and Generators**

[**C202**](#_bookmark63)

**OS 4—2016: Requirements for Air-Sealed Boxes for Electrical and Communication Applications** [**C402.6.1.2.2.1**](#_bookmark172)

**[CE#365 AS]**

[NFPA](https://www.nfpa.org/)

**70—~~20~~23: National Electrical Code**

[**C405.12.1**](#_bookmark434) **CG101.2.6C405.16.2.3**[**C501.2**](#_bookmark601)

**[CE#366 AS]**

[NFRC](https://www.nfrc.org/)

**100—~~2020~~2023: Procedure for Determining Fenestration Products *U*-factors**

[**C303.1.3**](#_bookmark90)[**Table C402.1.2**](#_bookmark114)[**C402.1.2.1.7**](#_bookmark121)[**Table C402.1.4**](#_bookmark130) [**C402.2.1.2**](#_bookmark135) [**C402.5.1.1**](#_bookmark151)

**200—~~2020~~2023: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal**

**Incidence**

[**C303.1.3**](#_bookmark90) [**C402.5.1.1**](#_bookmark151)

**203—~~2017~~2023: Procedure for Determining Visible Transmittance of Tubular Daylighting Devices** [**C303.1.3**](#_bookmark90)

**300—2023: Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems** [**C402.3**](#_bookmark143)

**400—~~2020~~2023: Procedure for Determining Fenestration Product Air Leakage**

**[CE367 AS]**

RESNET

Residential Energy Services Network, Inc.

P.O. Box 4561

Oceanside, CA 92052-4561

**ANSI/RESNET/ICC 380-2022: Standard for Testing Airtightness of Building, Dwelling Unit and Sleeping Unit Enclosures; Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems**

**[CE#369 AS]**

[SMACNA](https://www.smacna.org/)

**ANSI/SMACNA 016, 2nd edition—2012: HVAC Air Duct Leakage Test Manual Second Edition (ANSI/SMACNA 016—2012)**[**C403.13.2.3**](#_bookmark331) [**C503.3.3**](#_bookmark626)

**[CE#370 AS]**

**UL**

**710—2012: Exhaust Hoods for Commercial Cooking Equipment—with Revisions through ~~November 2013~~February 2021** [**C403.7.5**](#_bookmark284)

**727—2018: Oil-fired Central Furnaces**

[**Table C403.3.2(5)**](#_bookmark207)

**731—2018: Oil-fired Unit Heaters**

[**Table C403.3.2(5)**](#_bookmark207)

**1741—2021: Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources**

[**C405.16**](#_bookmark457)

**1784—2015: Air Leakage Tests of Door Assemblies—with Revisions through February 2015**

**[CE#371 AS]**

**WDMA**

**AAMA/WDMA/CSA 101/I.S.2/A440—~~17~~22: North American Fenestration Standard/Specification for windows, doors and skylights** [**Table C402.6.3**](#_bookmark180)

**[CE#372 AS]**

***RESIDENTIAL PROVISIONS***

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

**R101.2 Scope.** This code applies to ~~residential buildings, building sites and associated systems and equipment~~ the design and construction of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) and Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

R101.2.1 Appendices. Provisions in the appendices shall not apply unless specifically adopted

**[RE#1 AS]**

**SECTION R103**

**CONSTRUCTION DOCUMENTS**

**R105.2.2 Solar-ready system.** Where a solar-ready zone is provided, the construction documents shall indicate details for a dedicated roof area for the solar-ready zone, roof dead load, roof live load, ground snow load and the routing of conduit or prewiring from the solar-ready zone to an electrical service panel or plumbing from the solar-ready zone to a service water heating system

# [RE#6 AS]

**CHAPTER 2 [RE] DEFINITIONS**

No change

**CHAPTER 3 [RE] GENERAL REQUIREMENTS**

No change

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

Add new exception 3 to Section R402.1 to read as follows:

3. Thermal efficiency standards for unvented attic and unvented enclosed rafter assemblies.

3.1 Unvented attic and unvented enclosed rafter assemblies that are insulated and air sealed with a minimum of R-20 air impermeable insulation meet the requirements of sections R402, if all of the following apply:

(a) The building has a blower door test result of less than 3 ACH50.

(b) The building has a positive input ventilation system or a balanced or hybrid whole-house mechanical ventilation system.

(c) If the insulation is installed below the roof deck and the exposed portion of roof rafters is not already covered by the R-20 air-impermeable insulation, the exposed portion of the roof rafters is insulated by a minimum of R-3 air-impermeable insulation unless directly covered by a finished ceiling. Roof rafters are not required to be covered by a minimum of R-3 air impermeable insulation if continuous insulation is installed above the roof deck.

(d) All indoor heating, cooling, and ventilation equipment and ductwork is inside the building thermal envelope.

**(Code language for consistency with HB 267 – bill effective date – July 1, 2025)**

Revise Section R403.12 to read as follows:

**R403.12 Residential pools and permanent residential spas.** Residential swimming pools and permanent residential spas that are accessory to detached one- and two-family dwellings and townhouses three stories or less in height above grade plane and that are available only to the household and its guests shall be in accordance with ~~APSP~~ PHTA -15.

Supplement 4 – Errata

**CHAPTER 5 [RE] EXISTING BUILDINGS**

No change

**CHAPTER 6 [RE] Reference Standards**

**User notes:**

***About this chapter:*** *This code contains numerous references to standards promulgated by other organizations that are used to provide requirements for materials and methods of construction. Chapter 6 contains a comprehensive list of all standards that are referenced in this code. These standards, in essence, are part of this code to the extent of the reference to the standard. *

##### *referenced standards shall be as specified in*

# 

# (RE#27 – AS)

Revise reference standard to read as follows:

ANSI/RESNET/ Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air

ICC 380—201~~6~~9 Distribution Systems and Airflow of Mechanical Ventilation Systems

EN-FBC-EC/R – Ch.6 – Errata #1