

## **CHAPTER 1 ADMINISTRATION**

### **SECTION 101 GENERAL**

#### **101.1 Title.**

These regulations shall be known as the North Carolina Energy Conservation Code as approved by the North Carolina Building Code Council on September 13, 2005, to be effective July 1, 2006. References to the International Codes shall mean the North Carolina Codes. The North Carolina amendments to the International Codes are underlined.

#### **101.4.1 Residential buildings.**

For residential buildings the following shall be used as the basis for compliance assessment: a systems approach for the entire building (Chapter 4), an approach based on performance of individual components of the building envelope (Chapter 5), an approach based on performance of the total building envelope (Chapter 5), an approach based on acceptable practice for each envelope component (Chapter 5), an approach by prescriptive specification for individual components of the building envelope (Chapter 5), or an approach based on simplified, prescriptive specification (Chapter 6).

##### **101.4.1.1 Detached one- and two-family dwellings.**

Deleted.

##### **101.4.1.2 Residential buildings, Group R-2, R-4 or townhouses.**

Deleted.

#### **101.5 Requirements of other State agencies, occupational licensing boards, or commissions.**

The North Carolina State Building Codes do not include all additional requirements for buildings and structures that may be imposed by other State agencies, occupational licensing boards, and commissions. It shall be the responsibility of a permit holder, design professional, contractor, or occupational license holder to determine whether any additional requirements exist.

### **SECTION 104 CONSTRUCTION DOCUMENTS**

Deleted. See the North Carolina Administrative Rules and Policies.

### **SECTION 105 INSPECTIONS**

Deleted. See the North Carolina Administrative Rules and Policies.

## **CHAPTER 2 DEFINITIONS**

PROCESS ENERGY. Energy consumed in support of manufacturing, industrial, or commercial process other than conditioning spaces and maintaining comfort and amenities for the occupants of a building.

RESIDENTIAL BUILDING, GROUP R-4. Residential occupancies shall include buildings arranged for occupancies as Residential Care/Assisted Living Facilities, or adult and child day care facilities that provide accommodations in a residence occupied as a home by the caregiver for persons of any age for less than 24 hours, including more than five but not more than 16 occupants, excluding staff. For the purpose of this code, reference to Group R-4 occupancies shall refer to buildings which are three stories or less in height above grade.

## **CHAPTER 3 DESIGN CONDITIONS**

### **SECTION 301 GENERAL**

#### **301.1 Design criteria.**

The criteria of this chapter establish the design conditions for use with Chapters 4, 5, 6 and 8.

### **SECTION 302 THERMAL DESIGN PARAMETERS**

#### **302.1 Exterior design conditions.**

The following design parameters in Table 302.1 shall be used for calculations required under this code.

#### **TABLE 302.1 EXTERIOR DESIGN CONDITIONS**

For SI: °C = [(°F)-32]/1.8.

- a. The outdoor design temperature shall be selected from the columns of 99 percent values for winter and 1 percent values for summer from tables in the ASHRAE Fundamentals Handbook. Adjustments shall be permitted to reflect local climates which differ from the tabulated temperatures, or to reflect local weather experience.
- b. The degree days heating (base 65° F) and cooling (base 65° F) shall be selected from NOAA “Annual Degree Days to Selected Bases Derived from the 1961-1990 Normals,” the ASHRAE Handbook of Fundamentals, data available from adjacent military installations, or other source of local weather data.
- c. The climate zone shall be selected from the applicable map provided in Figures ~~902.1(1) through 902.1(51) in Chapter 9 of this code~~ 302.1(34).

**(copy Figure 902.1(34), North Carolina from page 179 and insert on page 12 as Figure 302.1(34))**

**CHAPTER 4**  
**RESIDENTIAL BUILDING DESIGN BY SYSTEMS ANALYSIS AND DESIGN**  
**OF BUILDINGS UTILIZING**  
**RENEWABLE ENERGY SOURCES**

**402.2.3.1.3 Fenestration system solar heat gain coefficient, standard design.**

The fenestration system solar heat gain coefficient (SHGC), inclusive of framed sash and glazing area, of the glazing systems in the standard design shall be 0.40 for ~~HDD < 3,500~~ and 0.68 for ~~HDD > 3,500~~ during periods of mechanical heating and cooling operation.

These fenestration system SHGC values shall be multiplied together with (added in series to) the interior shading values as specified in Section 402.2.3.1.4 to arrive at an overall solar heat gain coefficient for the installed glazing system.

Where the SHGC characteristics of the proposed fenestration products are not known, the default SHGC values given in Table 102.5.2(3) shall be used for the proposed design.

**402.2.3.5 Internal heat gains.**

Equation 4-1 shall be used to determine the input values, specific to internal heat gains, that shall be used in both the standard design and the proposed design in calculating annual energy performance:

$$\text{I-Gain} = 17,900 + (23.8 \cdot \text{CFA}) + (4140 \cdot \text{BR})$$

(Equation 4-1)

where:

I-Gain = Internal gains in Btu/day (~~kWh/day~~) per dwelling unit.

CFA = Conditioned floor area.

BR = Number of bedrooms.

## CHAPTER 5 RESIDENTIAL BUILDING DESIGN BY COMPONENT PERFORMANCE APPROACH

### 502.1.1 Moisture control.

The design shall not create conditions of accelerated deterioration from moisture condensation. Frame walls, floors and ceilings not ventilated to allow moisture to escape shall be provided with an approved vapor retarder having a permeance rating of 1 perm ( $5.7 \times 10^{-11}$  kg/Pa . s . m<sup>2</sup>) or less, when tested in accordance with the desiccant method using Procedure A of ASTM E 96. The vapor retarder shall be installed on the warm-in-winter side of the thermal insulation.

#### Exceptions:

1. In construction where moisture or its freezing will not damage the materials.
2. Vapor retarders shall not be required where the county in which the building is being constructed is considered a hot and humid climate area and identified as such in Figures 902.1(1) through 902.1(51) in Chapter 9 of this code.
3. Where other approved means to avoid condensation in unventilated framed wall, floor, roof and ceiling cavities are provided.

### 502.1.4.2 Caulking and sealants.

All penetrations; site-built windows, doors, and skylights; openings between window and door assemblies and their respective jambs and framing; and other sources of air leakage (infiltration and exfiltration) through the building thermal envelope shall be caulked, gasketed, weatherstripped, wrapped, or otherwise sealed to limit uncontrolled air movement.

This includes sealing around tubs and showers, at the attic and crawl space panels, at recessed lights and around all plumbing and electrical penetrations. These are openings located in the building envelope between conditioned space and unconditioned space or between the conditioned space and the outside.

### 502.1.5 Fenestration solar heat gain coefficient.

~~In locations with heating degree days (HDD) less than 3,500,~~ The combined solar heat gain coefficient (the area-weighted average) of all glazed fenestration products (including the effects of any permanent exterior solar shading devices) in the building shall not exceed 0.4.

### 502.2.1.1.1 Steel stud framed walls.

When the walls contain steel stud framing, the value of  $U_w$  used in Equation 5-1 shall be recalculated using a series path procedure to correct for parallel path thermal bridging. The  $U_w$  for purposes of Equation 5-1 of steel stud walls shall be determined as follows:

(Equation 5-3)

where:

$R_s$  = The total thermal resistance of the elements comprising the wall assembly along the path of heat transfer, excluding the cavity insulation and the steel stud.

$R_{ins}$  = The R-value of the cavity insulation.

F<sub>c</sub> = The correction factor listed in Table 502.2.1.1.1.

**Exception:** Overall system tested U<sub>w</sub> values for steel stud framed walls from approved laboratories, ~~when such data are acceptable to the code official.~~

#### **502.2.1.5 Crawl space walls.**

If the floor above a crawl space does not meet the requirements of Section 502.2.1.3 and the crawl space does not have ventilation openings that communicate directly with the outside air, then the exterior walls of the crawl space shall have a thermal transmittance value not exceeding the value given in Table 502.2. Where the inside ground surface is less than 12 inches (305 mm) or greater below the outside finish ground level or the vertical wall insulation stops less than 12 inches (305 mm) below the outside finish ground, crawl space wall insulation shall extend vertically and horizontally a minimum total distance of 24 inches (610 mm) linearly from the outside finish ground level from the top of the wall to at least the inside ground surface [see Appendix Detail 502.2.1.5(1), 502.2.1.5(2), 502.2.1.5(3) and the DOE Foundation Design Handbook]. ~~Where the inside ground surface is less than 12 inches (305 mm) below the outside finish ground level, insulation shall extend from the top of the crawl space wall to the top of the footing [see Appendix Detail 502.2.1.5(2) and the DOE Foundation Design Handbook].~~

#### **502.2.4 Compliance by prescriptive specification on an individual component basis.**

~~For buildings with a window area less than or equal to 8 percent, 12 percent, 15 percent, 18 percent, 20 percent or 25 percent (detached one and two family dwellings) or 20 percent, 25 percent or 30 percent (Group R-2, R-4 or townhouse residential buildings) of the gross exterior wall area, The thermal resistance of insulation applied to the opaque building envelope components shall be greater than or equal to the minimum R-values, and the area-weighted average thermal transmittance (U-factor) of all fenestration assemblies (other than opaque doors which are governed by Section 502.2.4.6) shall be less than or equal to the maximum U-factors shown in Table 502.2.4(1), 502.2.4(2), 502.2.4(3), 502.2.4(4), 502.2.4(5), 502.2.4(6), 502.2.4(7), 502.2.4(8), or 502.2.4(9) or 502.2.4(8), as applicable.~~

Sections 502.2.4.1 through 502.2.4.19 shall apply to the use of these tables.

#### **502.2.4.4 Window area, exempt.**

~~One percent~~ Fifteen square feet of the total window area computed under Section 502.2.4.3 shall be exempt from the “Glazing U-factor” requirement. In addition, impact glazing in wind borne debris regions meeting the requirements of the Large Missile Test of ASTM E 1996 and of ASTM E 1886 shall be exempt from the “Glazing U-Factor” requirements.

#### **502.2.4.15 Fenestration solar heat gain coefficient.**

~~In locations with HDD less than 3,500, Fenestration products shall also meet the requirements of Section 502.1.5. Fifteen square feet of total glazed fenestration shall be exempt from the SHGC requirement. In addition, all glazing in doors shall be exempt from the SHGC requirement.~~

#### **502.2.5 Prescriptive path for additions and window replacements.**

As an alternative to demonstrating compliance with Section 402 or 502.2, additions with a conditioned floor area less than 500 square feet (46.5 m<sup>2</sup>) to existing single family residential buildings and structures shall meet the prescriptive envelope component criteria in Table 502.2.5 for the designated heating degree days (HDD) applicable to the location. The U-factor of each individual fenestration product (windows, doors and skylights) shall be used to calculate an area-weighted average fenestration product U-factor for the addition, which shall not exceed the applicable listed values in Table 502.2.5. For additions, other than sunroom additions, the total area of fenestration products shall not exceed 40 percent of the gross wall and roof area of the addition. The R-values for opaque thermal envelope components shall be equal to or greater than the applicable listed values in Table 502.2.5. Replacement fenestration products (where some or all of an existing fenestration unit is replaced with an entire new replacement unit, including the frame, sash and glazing) shall meet the prescriptive fenestration U-factor criteria in Table 502.2.5 for the designated HDD applicable to the location. Conditioned sunroom additions shall maintain thermal isolation; shall not be used as kitchens or sleeping rooms; and shall be served by a separate heating or cooling system, or be thermostatically controlled as a separate zone of the existing system. Fenestration products used in additions and as replacement windows in accordance with this section shall also meet the requirements of Section 502.1.5 ~~in locations with HDD less than 3,500.~~

**Exception:** Replacement skylights shall have a maximum U-factor of 0.60 when installed in any location above 1,999 HDD.

**TABLE 502.2.4(1)  
PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, DETACHED ONE-  
AND TWO-FAMILY DWELLINGS WINDOW AREA 8 PERCENT OF GROSS  
EXTERIOR WALL AREA**

Deleted.

**TABLE 502.2.4(2)  
PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, DETACHED ONE-  
AND TWO-FAMILY DWELLINGS WINDOW AREA 12 PERCENT OF GROSS  
EXTERIOR WALL AREA**

Deleted.

**TABLE 502.2.4(3)  
PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, DETACHED ONE-  
AND TWO-FAMILY DWELLINGS WINDOW AREA 15 PERCENT OF GROSS  
EXTERIOR WALL AREA**

*(make the following amendments within the Table)*

<b>Zone</b>	<b>Glazing U-factor</b>	<b>Slab perimeter R-value and depth</b>
6	<del>0.60</del> <u>0.40</u>	<del>R-4, 2 ft.</del> <u>R-0</u>

7	<del>0.55</del> <u>0.40</u>	<del>R-4, 2 ft.</del> <u>R-0</u>
8	<del>0.50</del> <u>0.40</u>	R 5, 2 ft.
9	<del>0.45</del> <u>0.40</u>	R 5, 2 ft.
11	<del>0.45</del> <u>0.40</u>	R 6, 2 ft.

**TABLE 502.2.4(4)  
PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, DETACHED ONE-  
AND TWO-FAMILY DWELLINGS WINDOW AREA 18 PERCENT OF GROSS  
EXTERIOR WALL AREA**

Deleted.

**TABLE 502.2.4(5)  
PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, DETACHED ONE-  
AND TWO-FAMILY DWELLINGS WINDOW AREA 20 PERCENT OF GROSS  
EXTERIOR WALL AREA**

Deleted.

**TABLE 502.2.4(6)  
PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, DETACHED ONE-  
AND TWO-FAMILY DWELLINGS WINDOW AREA 25 PERCENT OF GROSS  
EXTERIOR WALL AREA**

Deleted.

**TABLE 502.2.4(7)  
PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, GROUP R-2, R-4  
OR TOWNHOUSE RESIDENTIAL BUILDINGS WINDOW AREA 20 PERCENT  
OF GROSS EXTERIOR WALL AREA**

Deleted.

**TABLE 502.2.4(8)  
PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, GROUP R-2, R-4  
OR TOWNHOUSE RESIDENTIAL BUILDINGS WINDOW AREA 25 PERCENT  
OF GROSS EXTERIOR WALL AREA**

*(make the following amendments within the Table)*

<b>Zone</b>	<b>Glazing U-factor</b>
6	<del>0.55</del> <u>0.40</u>
7	<del>0.55</del> <u>0.40</u>
8	<del>0.55</del> <u>0.40</u>
9	<del>0.54</del> <u>0.40</u>
11	<del>0.52</del> <u>0.40</u>

**TABLE 502.2.4(9)  
 PRESCRIPTIVE BUILDING ENVELOPE REQUIREMENTS, GROUP R-2, R-4  
 OR TOWNHOUSE RESIDENTIAL BUILDINGS WINDOW AREA 30 PERCENT  
 OF GROSS EXTERIOR WALL AREA**

Deleted.

**TABLE 502.2.4.16(1)  
 16-INCH O.C. STEEL-FRAMED WALL EQUIVALENT R-VALUES  
 (*change heading of right-hand column to read “EQUIVALENT STEEL-FRAMED  
 WALL CAVITY R-VALUE PLUS SHEATHING R-VALUE”*)**

**TABLE 502.2.4.16(2)  
 24-INCH O.C. STEEL FRAMED WALL EQUIVALENT R-VALUES  
 (*change heading of right-hand column to read “EQUIVALENT STEEL-FRAMED  
 WALL CAVITY R-VALUE PLUS SHEATHING R-VALUE”*)**

**TABLE 502.2.5  
 PRESCRIPTIVE ENVELOPE COMPONENT CRITERIA ADDITIONS TO AND  
 REPLACEMENT WINDOWS FOR EXISTING DETACHED ONE- AND TWO-  
 FAMILY DWELLINGS  
 (*add column to left side for “Zone”*)  
 (*change 0.5 to 0.4 in u-factor column*)**

<u>ZONE</u>	<u>(hdd)</u>	<u>(u-factor)</u>
1 – 4		
5 – 8		0.4
9 – 12		
13 – 15		
16 - 17		

**TABLE 503.3.3.1  
 MINIMUM PIPE INSULATION  
 (*delete note “a” below table*)**

**TABLE 503.3.3.3  
 MINIMUM DUCT INSULATION  
 (*add column to left side for “Zone”*)**

<u>ZONE</u>
1 – 3

4 – 7
8 – 14
15 – 17

#### **503.3.3.4.2 Low-pressure duct systems.**

All longitudinal and transverse joints, seams and connections of supply and return ducts operating at static pressures less than or equal to 2 inches w.g. (500 Pa) shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's installation instructions. Pressure classifications specific to the duct system shall be clearly indicated on the construction documents in accordance with the International Mechanical Code.

**Exception:** Ducts exposed within the conditioned space they serve shall not be required to be sealed.

#### **503.3.3.4.3 Sealing required.**

All joints, longitudinal and transverse seams, and connections in ductwork, shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded fabric systems or tapes. Tapes and mastics used to seal ductwork shall be listed and labeled in accordance with UL 181A or UL 181B. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Unlisted duct tape is not permitted as a sealant on any metal ducts.

**Exception:** Ducts exposed within the conditioned space they serve shall not be required to be sealed.

**CHAPTER 6  
SIMPLIFIED PRESCRIPTIVE REQUIREMENTS FOR DETACHED ONE- AND TWO-FAMILY DWELLINGS AND GROUP R-2, R-4 OR TOWNHOUSE RESIDENTIAL BUILDINGS**

**601.2 Compliance.**

Compliance shall be demonstrated in accordance with Section 601.2.1 or 601.2.2. REScheck Version 3.6, Release 2 for the 2003 IECC shall be permitted to demonstrate compliance, except that SHGC of 0.4 is required for all locations and that envelope requirements may not be traded off against the use of high efficiency heating and cooling equipment. No trade-off calculations are required for termite inspection and treatment gaps required for slabs and basement walls.

**601.2.1 Residential buildings, detached one- and two-family dwellings.**

Compliance for detached one- and two-family dwellings shall be demonstrated by either:

1. Meeting the requirements of this chapter for ~~buildings with a glazing area that does not exceed 15 percent of the gross area of exterior walls;~~ or
2. Meeting the requirements of Chapter 4, or Chapter 5 for detached one- and two-family dwellings.

**601.2.2 Residential buildings, Groups R-2, R-4 or town-houses.**

Compliance for Group R-2, R-4 or townhouse residential buildings shall be demonstrated by either:

1. Meeting the requirements of this chapter for ~~buildings with a glazing area that does not exceed 25 percent of the gross area of exterior walls;~~ or
2. Meeting the requirements of Chapter 4, or Chapter 5 for Group R-2, R-4 or townhouse residential buildings.

**TABLE 602.1  
SIMPLIFIED PRESCRIPTIVE BUILDING ENVELOPE THERMAL COMPONENT CRITERIA  
MINIMUM REQUIRED THERMAL PERFORMANCE (U-FACTOR AND R-VALUE)**

*(make the following amendments within the Table)*

<b>Climate Zone</b>	<b>Glazing U-Factor</b>	<b>Slab Perimeter R-Value and depth</b>
6	<del>0.60</del> <u>0.40</u>	<del>R-4, 2 ft.</del> <u>R-0</u>
7	<del>0.55</del> <u>0.40</u>	<del>R-4, 2 ft.</del> <u>R-0</u>
8	<del>0.50</del> <u>0.40</u>	R-5, 2 ft.
9	<del>0.45</del> <u>0.40</u>	R-5, 2 ft.
11	<del>0.45</del> <u>0.40</u>	R-6, 2 ft.

**602.1.10 Caulking, sealants and gasketing.**

All penetrations; site-built windows, doors, and skylights; openings between window and door assemblies and their respective jambs and framing; and other sources of air leakage

(infiltration and exfiltration) through the building thermal envelope shall be caulked, gasketed, weatherstripped, wrapped, or otherwise sealed to limit uncontrolled air movement.

This includes sealing around tubs and showers, at the attic and crawl space panels, at recessed lights and around all plumbing and electrical penetrations. These are openings located in the building envelope between conditioned space and unconditioned space or between the conditioned space and the outside.

### **602.2 Maximum solar heat gain coefficient for fenestration products.**

In locations with heating degree days (HDD) less than 3,500, The area-weighted-average solar heat gain coefficient (SHGC) for glazed fenestration installed in the building envelope shall not exceed 0.40. Fifteen square feet of the total glazed fenestration shall be exempt from the SHGC requirement. In addition, all glazing in doors shall be exempt from the SHGC requirement.

### **602.3 Fenestration exemption.**

Fifteen square feet of the total glazing area shall be exempt from the “Glazing U-factor” requirement in Table 602.1. In addition, impact glazing in wind borne debris regions meeting the requirements of the Large Missile Test of ASTM E 1996 and of ASTM E 1886 shall be exempt from the U-Factor requirement.

### **602.4 Replacement fenestration.**

Where ~~some or all of an existing~~ an entire fenestration ~~unit product is replaced with an entirely new replacement fenestration product,~~ including frame, sash and glazed portion, is being replaced, the replacement fenestration product shall have a U-factor that does not exceed the “Fenestration U-factor” requirement in Table 502.2.5 applicable to the climate zone (HDD) where the building is located. The replacement fenestration product(s) must also satisfy the air leakage requirements and SHGC of Sections 601.3.2.2 and 602.2, respectively.

**Exception:** Replacement skylights shall have a maximum U-factor of ~~0.60~~ 0.50 when installed in any location above 1,999 HDD.

## **CHAPTER 8**

### **DESIGN BY ACCEPTABLE PRACTICE FOR COMMERCIAL BUILDINGS**

#### **802.3.6 Vestibules.**

A door that separates conditioned space from the exterior shall be protected with an enclosed vestibule, with all 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.~~

#### **Exceptions:**

1. Buildings in Climate Zones 1a through 4b as indicated in Table 302.1.
2. Doors not intended to be used as a building entrance door, such as doors to mechanical or electrical equipment rooms.
3. Doors opening directly from a guestroom or dwelling unit.
4. Doors that open directly from a space less than 3,000 square feet (298 m<sup>2</sup>) in area.
5. Revolving doors.
6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.
7. Doors in buildings less than four stories above grade.

#### **803.2.1.1 Equipment and system sizing.**

Heating and cooling equipment and systems capacity shall not exceed the loads calculated in accordance with Section 803.2.1. A single piece of equipment providing both heating and cooling must satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

**Exception:** When the equipment selected is the smallest size needed to meet the load within available options of the desired equipment line.

#### **803.2.3.1 Temperature controls.**

Each heating and cooling system shall have at least one solid-state programmable thermostat. The thermostat shall have the capability to set back or shut down the system based on day of the week and time of day, and provide a readily accessible manual override that will return to the setback or shutdown schedule without reprogramming.

#### **Exceptions:**

1. HVAC systems serving hotel/motel guestrooms or other residential units complying with Section 503.3.2.2 requirements.
2. Packaged terminal air conditioners, packaged terminal heat pumps and room air conditioner systems.

#### **803.2.6 Cooling with outdoor air.**

Each system with a cooling capacity greater than ~~65,000~~ 90,000 Btu/h (~~19~~ 26 kW) located in other than Climate Zones 1, 2, 3b, 5a or 6b as shown in Table 302.1 shall have an economizer that will automatically shut off the cooling system and allow all of the supply air to be provided directly from outdoors.

Economizers shall be capable of operating at 100-percent outside air, even if additional mechanical cooling is required to meet the cooling load of the building. ~~Where a single~~

~~room or space is supplied by multiple air systems, the aggregate capacity of those systems shall be used in applying this requirement.~~

**Exceptions:**

1. Where the cooling equipment is covered by the minimum efficiency requirements of Table 803.2.2(1) or 803.2.2(2) and meets the efficiency requirements of Table 803.2.6.
2. Systems with air or evaporatively cooled condensers and which serve spaces with open case refrigeration or that require filtration equipment in order to meet the minimum ventilation requirements of Chapter 4 of the International Mechanical Code.
3. Systems with a cooling capacity less than 135,000 Btu/h (40 kW) in Climate Zones 3c, 5b, 7, 13b, and 14.

**803.2.8 Duct and plenum insulation and sealing.**

All supply and return air ducts and plenums shall be insulated with a minimum of R-5 insulation when located in unconditioned spaces and with a minimum of R-8 insulation when located outside the building. When located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8 insulation.

**Exceptions:**

1. When located within equipment.
2. When the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15°F (8°C).

All joints, longitudinal and transverse seams and connections in ductwork, shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embed-dedfabric systems, or tapes. Tapes and mastics used to seal ductwork shall be listed and labeled in accordance with UL 181A or UL 181B. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Unlisted duct tape is not permitted as a sealant on any metal ducts.

**Exception:** Ducts exposed within the conditioned space they serve shall not be required to be sealed.

**803.2.8.1.2 Low-pressure duct systems.**

*(no change to subsection)*

**Exception:** Deleted.

**803.3.3.5 Economizers.**

Economizers shall be provided on each system with a cooling capacity greater than ~~65,000~~ 90,000 Btu/h (~~19~~ 26 kW) in accordance with Section 803.2.6.

**Exceptions:**

1. Water economizers that are capable of cooling supply air by direct or indirect evaporation or both and providing up to 100 percent of the expected system cooling load at outside air temperatures of 50°F (10°C) dry bulb/45°F (7°C) wet bulb and below.
2. Systems with a cooling capacity less than 135,000 Btu/h (40 kW) in Climate Zones 3c, 5b, 7, 13b, and 14.

**803.3.3.8 Heat rejection equipment fan speed control.**

Deleted.

~~Each fan powered by a motor of 7.5 hp (5.6 kW) or larger shall have the capability to operate that fan at two thirds of full speed or less, and shall have controls that automatically change the fan speed to control the leaving fluid temperature or condensing temperature/pressure of the heat rejection device.~~

~~Exception: Factory installed heat rejection devices within HVAC equipment tested and rated in accordance with Table 803.3.2(1) through 803.3.2(6).~~

**803.3.6 Duct and plenum insulation and sealing.**  
***(no change, add the following to end of subsection)***

Documentation shall be furnished demonstrating that representative sections totaling at least 25 percent of the duct area have been tested and that all tested sections meet the requirements of this section.

**803.3.8 HVAC system completion.**

~~Prior to the issuance of a certificate of occupancy, the design professional shall provide evidence of system completion in accordance with Sections 803.3.8.1 through 803.3.8.3 following shall be completed.~~

**803.3.8.1 Air system balancing.**

Each supply air outlet and zone terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the International Mechanical Code. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 25 hp (18.6 kW) and larger.

**803.3.8.2 Hydronic system balancing.**

Individual hydronic heating and cooling coils shall be equipped with means for balancing and pressure test connections.

**803.3.8.3 Manuals.**

The construction documents shall require that an operating and maintenance manual be provided to the building owner by the mechanical contractor. The manual shall include, at least, the following:

1. Equipment capacity (input and output) and required maintenance actions.
2. Equipment operation and maintenance manuals.
3. HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined set points shall be permanently recorded on control drawings, at control devices or, for digital control systems, in programming comments.
4. A complete written narrative of how each system is intended to operate.

**803.3.9 Heat recovery for service water heating.**

Deleted.

~~Condenser heat recovery shall be installed for heating or reheating of service hot water provided the facility operates 24 hours a day, the total installed heat capacity of water-cooled systems exceeds 6,000,000 Btu/hr of heat rejection, and the design service water heating load exceeds 1,000,000 Btu/h.~~

~~The required heat recovery system shall have the capacity to provide the smaller of:~~

- ~~1. Sixty percent of the peak heat rejection load at design conditions; or~~
- ~~2. The preheating required to raise the peak service hot water draw to 85 °F (29 °C).~~

~~Exceptions:~~

- ~~1. Facilities that employ condenser heat recovery for space heating or reheat purposes with a heat recovery design exceeding 30 percent of the peak water-cooled condenser load at design conditions.~~
- ~~2. Facilities that provide 60 percent of their service water heating from site solar or site recovered energy or from other sources~~

#### **805.2.2.2 Automatic lighting shutoff.**

***(no change, add exceptions to the end of the subsection)***

**Exceptions:**

1. Lighting intended for 24-hour operation.
2. Lighting in spaces where patient care is rendered.
3. Spaces where an automatic shutoff would endanger the safety or security of the room or building occupants.

**CHAPTER 10**  
**REFERENCED STANDARDS**

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 107.

**ASHRAE**  
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