

## **CHAPTER 1 ADMINISTRATION**

### **SECTION 101 GENERAL**

#### **101.1 Title.**

These regulations shall be known as the North Carolina Mechanical 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.

#### **101.2 Scope.**

This code shall regulate the design, installation, maintenance, alteration and inspection of mechanical systems that are permanently installed and utilized to provide control of environmental conditions and related processes within buildings. This code shall also regulate those mechanical systems, system components, equipment and appliances specifically addressed herein. The installation of fuel gas distribution piping and equipment, fuel gas-fired appliances and fuel gas-fired appliance venting systems shall be regulated by the International Fuel Gas Code.

#### **Exceptions:**

1. Deleted.
2. Mechanical systems in existing buildings undergoing repair, alterations, or additions, and change of occupancy shall be permitted to comply with the International Existing Building Code.

#### **101.2.1 Appendices.**

Provisions in the appendices shall not apply unless specifically adopted or referenced in this code.

#### **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 103**

#### **DEPARTMENT OF MECHANICAL INSPECTION**

Deleted. See the North Carolina Administrative Rules and Policies.

### **SECTION 104**

#### **DUTIES AND POWERS OF THE CODE OFFICIAL**

Deleted. See the North Carolina Administrative Rules and Policies.

**SECTION 106**

**PERMITS**

Deleted. See the North Carolina Administrative Rules and Policies.

**SECTION 107**

**INSPECTIONS AND TESTING**

Deleted. See the North Carolina Administrative Rules and Policies.

**SECTION 108**

**VIOLATIONS**

Deleted. See the North Carolina Administrative Rules and Policies.

**SECTION 109**

**MEANS OF APPEAL**

Deleted. See the North Carolina Administrative Rules and Policies.

## CHAPTER 3 GENERAL REGULATIONS

### **301.14 Rodent proofing.**

**301.14.1 General.** Buildings or structures and the walls enclosing habitable or occupiable rooms and spaces in which persons live, sleep or work, or in which feed, food or foodstuffs are stored, prepared, processed, served or sold, shall be constructed in accordance with the provisions of this section.

**301.14.2 Foundation wall ventilation openings.** Foundation wall ventilator openings shall be covered for their height and width with perforated sheet metal plates no less than 0.070 inch (1.8 mm) thick, expanded sheet metal plates not less than 0.047 inch (1.2 mm) thick, cast iron grills or grating, extruded aluminum load-bearing vents or with hardware cloth of 0.035 inch (0.89 mm) wire or heavier. The openings therein shall not exceed 1/4 inch (6.4 mm).

**301.14.3 Foundation and exterior wall sealing.** Annular spaces around pipes, electric cables, conduits, or other openings in the walls shall be protected against the passage of rodents by closing such openings with cement mortar, concrete masonry or noncorrosive metal.

### **303.3 Prohibited locations.**

Fuel-fired appliances shall not be located in, or obtain combustion air from, any of the following rooms or spaces:

1. Sleeping rooms.
2. Bathrooms.
3. Toilet rooms.
4. ~~Storage closets.~~ Closets used for storage.
5. Surgical rooms.

**Exception:** This section shall not apply to the following appliances:

1. Direct-vent appliances that obtain all combustion air directly from the outdoors.
2. Solid fuel-fired appliances, provided that the room is not a confined space and the building is not of unusually tight construction.
3. Appliances installed in a dedicated enclosure in which all combustion air is taken directly from the outdoors, in accordance with Section 703. Access to such enclosure shall be through a solid door, weather-stripped in accordance with the exterior door air leakage requirements of the International Energy Conservation Code and equipped with an approved self-closing device.

### **303.6 Outdoor locations.**

Appliances installed in ~~other than indoor~~ outdoor locations shall be listed and labeled for outdoor installation.

### **304.2 Conflicts.**

Deleted.

### **304.3 Elevation of ignition source.**

Equipment and appliances having an ignition source and located in hazardous locations and public garages, private garages, repair garages, automotive motor-fuel-dispensing facilities and parking garages shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor surface on which the equipment or appliance rests. Such equipment and appliances shall not be installed in Group H occupancies or control areas where open use, handling or dispensing of combustible, flammable or explosive materials occurs. For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage.

**Exception :**

Elevation of the ignition source is not required for appliances that are listed as flammable ignition resistant.

**304.8 Clearances to combustible construction.**

Heat-producing equipment and appliances shall be installed to maintain the required clearances to combustible construction as specified in the listing and manufacturer's instructions. ~~Such clearances shall be reduced only in accordance with Section 308.~~ Clearances to combustibles shall include such considerations as door swing, drawer pull, overhead projections or shelving and window swing, shutters, coverings and drapes. Devices such as doorstops or limits, closers, drapery ties or guards shall not be used to provide the required clearances.

**304.9 Under floor and exterior grade installations.**

**304.9.1 Exterior Grade Installations.** Equipment and appliances installed above grade level shall be supported on a solid base or approved material a minimum of 2 inches thick.

**304.9.2 Underfloor installation.** Suspended equipment shall be a minimum of 6 inches (152 mm) above the adjoining grade.

**304.9.3 Crawlspace supports.** In a crawl space, a minimum of 4x8x16 inch block or brick supports shall be held in place with mortar. Formed concrete or approved prefabricated steel units are acceptable.

**304.9.4 Drainage.** Below grade installations shall be provided with a natural drain or an automatic lift or sump pump. For pit requirements see Section 303.7.

**304.10 Guards.**

Guards shall be provided where appliances, equipment, fans or other components that require service are located within ~~10~~ 6 feet (~~3048~~ 1829 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall extend not less than 30 inches (762 mm) beyond each end of such appliance, equipment, fan or component and the top of the guard shall be located not less than 42 inches (1067 mm) above the elevated surface adjacent to the guard. The guard shall be constructed so as to prevent the passage of a 21-inch-diameter (533 mm) sphere and shall comply with the loading requirements for guards specified in the International Building Code.

**Exception:**

Guards not required at the time of original installation are not required by this paragraph for equipment repaired or replaced.

### **306.1.1 Central furnaces.**

Deleted.

### **306.3 Appliances in attics.**

Attics containing appliances requiring access shall be provided with an opening and unobstructed passageway large enough to allow removal of the largest appliance. The passageway shall not be less than 30 inches (762 mm) high and 22 inches (559 mm) wide and not more than 20 feet (6096 mm) in length measured along the centerline of the passageway from the opening to the appliance. The passageway shall have continuous solid flooring not less than 24 inches (610 mm) wide. A level service space not less than 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present at the front or service side of the appliance. The clear access opening dimensions shall be a minimum of 20 inches by 30 inches (508 mm by 762 mm), where such dimensions are large enough to allow removal of the largest appliance.

#### **Exceptions:**

1. The passageway and level service space are not required where the appliance is capable of being serviced and removed through the required opening.
2. Where the passageway is not less than 6 feet (1829 mm) high for its entire length, the passageway shall not be limited in length.

### **306.3.1 Electrical requirements.**

Deleted.

### **306.4 Appliances under floors.**

Underfloor spaces containing appliances requiring access shall be provided with an access opening and unobstructed passageway large enough to remove the largest appliance. The passageway shall not be less than ~~30~~ 22 inches (~~762~~ 559 mm) high and ~~22~~ 36 inches (~~559~~ 914 mm) wide, nor more than 20 feet (6096 mm) in length measured along the centerline of the passageway from the opening to the appliance. A level service space not less than 30 inches (762 mm) deep and 30 inches (762 mm) wide shall be present at the front or service side of the appliance. If the depth of the passageway or the service space exceeds 12 inches (305 mm) below the adjoining grade, the walls of the passageway shall be lined with concrete or masonry. Such concrete or masonry shall extend a minimum of 4 inches (102 mm) above the adjoining grade and shall have sufficient lateral-bearing capacity to resist collapse. The clear access opening dimensions shall be a minimum of 22 inches high by 30 inches wide (559 mm by 762 mm), where such dimensions are large enough to allow removal of the largest appliance.

#### **Exceptions:**

1. The passageway is not required where the level service space is present when the access is open and the appliance is capable of being serviced and removed through the required opening.
2. Where the passageway is not less than 6 feet high (1829 mm) for its entire length, the passageway shall not be limited in length.

### **306.4.1 Electrical requirements.**

Deleted.

### **307.2 Evaporators and cooling coils.**

Condensate drain systems shall be provided for equipment and appliances containing evaporators or cooling coils, or condensing furnaces. Condensate drain systems shall be designed, constructed and installed in accordance with Sections 307.2.1 through 307.2.4.

#### **307.2.1 Condensate disposal.**

Condensate from all cooling coils and evaporators shall be conveyed from the drain pan outlet to an approved place of disposal. When unable to drain by gravity a condensate pump may be used. Where pumps are used, they shall be installed with factory equipped auxiliary high level switch and shall shut off equipment served upon activation of the auxiliary high level switch. Where damage to any building components will occur as a result of over flow from the pump, the pump shall also be located in the auxiliary drain pan or in a separate drain pan equipped with a separate drain line or water level detection device. Condensate shall not discharge into a street, alley or other areas so as to cause a nuisance.

## **SECTION 308**

### **CLEARANCE REDUCTION FOR UNLISTED EQUIPMENT**

#### **308.2 Listed appliances and equipment.**

Deleted.

#### **TABLE 308.6**

### **CLEARANCE REDUCTION METHODS FOR UNLISTED EQUIPMENT**

#### **312.1 Load calculations.**

Heating and cooling system design loads for the purpose of sizing systems, appliances and equipment shall be determined in accordance with the procedures described in the ASHRAE Handbook of Fundamentals. Heating and cooling loads shall be adjusted to account for load reductions that are achieved when energy recovery systems are utilized in the HVAC system in accordance with the ASHRAE Handbook - HVAC Systems and Equipment. Alternatively, design loads shall be determined by an approved equivalent computation procedure, using the design parameters specified in Chapter 3 of the International Energy Conservation Code. For one-and two-family dwellings and townhouses, heating and cooling equipment shall be sized based on building loads calculated in accordance with ACCA Manual J.

## CHAPTER 4 VENTILATION

### 403.2.1 Recirculation of air.

The air required by Section 403.3 shall not be recirculated. Air in excess of that required by Section 403.3 shall not be prohibited from being recirculated as a component of supply air to building spaces, except that:

1. Ventilation air shall not be recirculated from one dwelling unit to another or to dissimilar occupancies.
2. Supply air to a swimming pool and associated deck areas shall not be recirculated unless such air is dehumidified to maintain the relative humidity of the area at 60 percent or less. Air from this area shall not be recirculated to other spaces.
3. Where mechanical exhaust is required by Table 403.3, recirculation of air ~~from such~~ to other spaces shall be prohibited. All air supplied to such spaces shall be exhausted, including any air in excess of that required by Table 403.3.

### TABLE 403.3

#### REQUIRED OUTDOOR VENTILATION AIR

(add footnote "h" to "Education, Classroom")

(change "Locker rooms" to "Phys. ed. Locker rooms" and add footnote "g", under "Education")

(change "Locker rooms" to "Athletic Locker rooms" and add footnote "g", under "Public spaces")

(add "Athletic Locker rooms", footnote "g", "0.5-cfm/ft<sup>2</sup>", under "Sports and amusement")

(add footnote "h" as follows)

h. **Exception:** Each school classroom's ventilation may be reduced to a minimum of 7.5-cfm/person as per ASHRAE 62, Section 6.1.3.4. Additional ventilation or exhaust systems shall be provided as required for conditions which generate unusual odors or sensory irritating contaminants. Outside air intake components (louvers, fresh air ducts) shall be sized to provide 15-cfm/person temporarily for special ventilation needs.

### 405.2 Fan shutdown controls.

In Group I-2 and I-3 occupancies each air distribution system shall be equipped with a manual emergency control to stop supply and return air in an emergency. The control device shall be mounted in a readily accessible location and be clearly identified.

#### **Exception:**

Air handling equipment serving a single space.

### 406.1 General.

Uninhabited spaces, such as crawl spaces and attics, shall be provided with natural ventilation openings as required by the International Building Code or shall be provided with a mechanical exhaust and supply air system. The mechanical exhaust rate shall be not less than 0.02 cfm per square foot (0.00001 m<sup>3</sup>/s • m<sup>2</sup>) of horizontal area and shall be automatically controlled to operate when the relative humidity in the space served exceeds 60 percent.

**Exception:**

Except as otherwise permitted in the North Carolina Building Code.

## CHAPTER 5 EXHAUST SYSTEMS

### 504.5 Makeup air.

Where a closet is designed for the installation of a clothes dryer, an opening having an area of not less than 100 square inches (645 mm<sup>2</sup>) for makeup air shall be provided in the closet enclosure, or makeup air shall be provided by other approved means.

### 504.6 Domestic clothes dryer ducts.

Residential dryer exhaust ducts which are not designed for a specific dryer shall be constructed of minimum 0.0157 inch (0.4mm) galvanized steel or other noncombustible material of equivalent strength and corrosion resistance. The ducts shall have a smooth interior finish with joints running in the direction of the air flow. Minimum size of the exhaust duct shall be 4 inches (102 mm) ID. The maximum length of rigid metal duct shall not exceed 45 ft. (13716 mm) from dryer location to wall or roof cap. There shall be a deduction of 5 ft. (1524 mm) for each 45 degree (0.785 rad) bend and 10 ft. (3048 mm) for 90 degree (1.57 rad) bend. The maximum length for noncombustible flexible duct shall not exceed 25 ft. (7620 mm) from dryer location to the wall or roof cap. There shall be a deduction of 2-1/2 ft (762 mm) for each 45 degree (0.785 rad) bend and 5 feet (1524 mm) for each 90 degree (1.57 rad) bend. All wall or roof caps shall be nonscreened with backdraft damper and minimum size of 4 inches (102 mm). The entire exhaust system shall be properly secured in place and shall terminate not less than 12-inches above finished grade.

Clothes dryer transition ducts used to connect the appliance to the exhaust duct system shall be metal and limited to a single length not to exceed 8 feet (2438 mm) and shall be listed and labeled for the application. Transition ducts shall not be concealed within construction.

**Exception:** Where the make and model of the clothes dryer to be installed is known and the manufacturer's installation instructions for such dryer are provided to the code official, the maximum length of the exhaust duct, including any transition duct, shall be permitted to be in accordance with the dryer manufacturer's installation instructions.

#### 504.6.1 Maximum length.

Deleted. (*relocated "Exception" to 504.6*)

#### 506.3.4 Air velocity.

Grease duct systems serving a Type I hood shall be designed and installed to provide an air velocity within the duct system of not less than 500 feet per minute (2.5 m/s).

**Exceptions:** The velocity limitations shall not apply within duct transitions utilized to connect ducts to differently sized or shaped openings in hoods and fans, provided that such transitions do not exceed 3 feet (914 mm) in length and are designed to prevent the trapping of grease.

#### 507.2.2 Type II hoods.

Type II hoods shall be installed where cooking or dishwashing appliances produce heat, steam, or products of combustion and do not produce grease or smoke, such as steamers, kettles, pasta cookers and dishwashing machines.

**Exceptions:**

1. Under-counter-type commercial dishwashing machines.
2. A Type II hood is not required for dishwashers and potwashers that are provided with heat and water vapor exhaust systems that are supplied by the appliance manufacturer and are installed in accordance with the manufacturer's instructions.
3. A single light-duty electric convection, bread, retherm or microwave oven. The additional heat and moisture loads generated by such appliances, shall be accounted for in the design of the HVAC system.
4. A Type II hood is not required for the following electrically heated appliances: toasters, steam tables, popcorn poppers, hot dog cookers, coffee makers, rice cookers, egg cookers, holding/warming ovens. The additional heat and moisture loads generated by such appliances, shall be accounted for in the design of the HVAC system.

**507.2.3 Domestic cooking appliances used for commercial purposes.**

Domestic cooking appliances utilized for commercial purposes shall be provided with Type I or Type II hoods as required for the type of appliances and processes in accordance with Sections 507.2, 507.2.1 and 507.2.2.

**Exception:** A maximum of two (2) residential ranges (4 burner) installed in dwelling units, churches, schools, day care centers, break areas, and similar installations.

**507.8 Cleaning and grease gutters.**

A hood shall be designed to provide for thorough cleaning of the entire hood. Grease gutters shall drain to an approved collection receptacle that is fabricated, designed and installed to allow access for cleaning. The container shall have a minimum capacity of 1-gallon (3.8 L) unless otherwise approved by the mechanical official.

**507.16.2 Certification.**

These tests should be witnessed by the code official, or at his option, the test may be witnessed by a professional engineer who shall provide certification of performance to the code official.

**511.1.1 Collectors and separators.**

Collectors and separators involving such systems as centrifugal separators, bag filter systems and similar devices, and associated supports shall be constructed of noncombustible materials and shall be located on the exterior of the building or structure. A collector or separator shall not be located nearer than 10 feet (3048 mm) to combustible construction or to an unprotected wall or floor opening, unless the collector is provided with a metal vent pipe that extends above the highest part of any roof within a distance of 30 feet (9144 mm).

**Exception:** Collectors such as "Point of Use" collectors, close extraction weld fume collectors, spray finishing booths, stationary grinding tables, sanding booths, and integrated or machine-mounted collectors shall be permitted to be installed indoors

provided the installation is in accordance with the International Fire Code and the ICC Electrical Code.

## **CHAPTER 6**

### **DUCT SYSTEMS**

#### **603.1 General.**

An air distribution system shall be designed and installed to supply the required distribution of air. The installation of an air distribution system shall not affect the fire protection requirements specified in the International Building Code. Ducts shall be constructed, braced, reinforced and installed to provide structural strength and durability. For one-and two-family dwellings and townhouses, supply and return ducts shall be allowed to be sized according to ACCA Manual D or SMACNA Installation Standards for Residential Heating and Air Conditioning Systems.

#### **603.9 Joints, seams and connections.**

All longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA HVAC Duct Construction Standards – Metal and Flexible and NAIMA Fibrous Glass Duct Construction Standards. 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 listed and labeled in accordance with UL 181A shall be marked “181A-P” for pressure-sensitive tape, “181A-M” for mastic or “181A-H” for heat-sensitive tape. Tapes and mastics used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked “181B-FX” for pressure-sensitive tape or “181A-M” for mastic. 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.

#### **603.10.1 For one-and two-family dwellings and townhouses.**

Metal ducts shall be securely supported. Where hung or suspended, metal straps a minimum of 1-inch in width and equivalent to or heavier gauge than the duct being supported shall be used. Straps, when used, shall be at maximum 64-inch intervals and shall be securely attached to the building structure. Straps shall be attached to the duct at a minimum of 2-points with screws or rivets. Hangar systems shall comply with this section or other approved means. Nonmetallic or listed duct systems shall be supported in accordance with the manufacturer’s installation instructions. All equipment shall be supported independently of the duct system except when the duct is used as a support base. When used as a support base, the duct shall be of sufficient strength and designed to support the weight of the unit. Listed bases shall be installed in accordance with the manufacturer’s installation instructions.

#### **603.12 Condensation.**

Provisions shall be made to prevent the formation of condensation on the exterior of ~~any~~ new duct.

#### **603.18 Under-floor plenums.**

An under-floor space used as a supply plenum shall conform to the requirements of this section. Fuel gas lines and plumbing waste cleanouts shall not be located within the space.

#### **603.18.1 General.**

The space shall be cleaned of loose combustible material and scrap, and shall be tightly closed. The ground surface of the space shall be covered with a moisture barrier having a minimum thickness of 4 mils (0.102 mm).

#### **603.18.2 Materials.**

The under-floor space, including the sidewall insulation, shall be formed by materials having flame-spread ratings not greater than 200.

#### **603.18.3 Furnace connections.**

A duct shall extend from the furnace supply outlet to not less than 6 inches (153 mm) below the combustible framing. This receptacle shall be installed below the floor opening into the plenum in accordance with the following requirements:

1. The receptacle shall be securely suspended from the floor members and shall not be more than 18 inches (457 mm) below the floor opening.
2. The area of the receptacle shall extend 3 inches (76 mm) beyond the opening on all sides.
3. The perimeter of the receptacle shall have a vertical lip at least 1 inch (25 mm) high at the open sides.

#### **603.18.4 Access.**

Access to an under-floor plenum shall be provided through an opening in the floor with minimum dimensions of 18 inches by 24 inches (457 mm by 610 mm).

#### **603.18.5 Furnace controls.**

The furnace shall be equipped with an automatic control that will start the air-circulating fan when the air in the furnace bonnet reaches a temperature not greater than 150 degrees F (66 degrees C). The furnace shall additionally be equipped with an approved automatic control that limits the outlet air temperature to 200 degrees F (93 degrees C).

#### **604.1 General.**

Duct insulation shall conform to the requirements of Sections 604.2 through 604.13 and the International Energy Conservation Code. Replacement or addition of cooling equipment to existing ductwork located in an attic shall require the ductwork to be insulated. Replacement of heating or the addition of cooling equipment in a crawl space shall not require the existing ductwork to be insulated.

#### **604.3 Coverings and linings.**

Coverings and linings, including adhesives when used, shall have a flame spread index not more than 25 and a smoke-developed index not more than 50, when tested in accordance with ASTM E 84, using the specimen preparation and mounting procedures of ASTM E 2231. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C 411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250°F (121°C).

#### **604.9 Thermal continuity.**

Where a duct liner has been interrupted, a duct covering of equal thermal performance shall be installed.

**Exception:**

See Section 604.6.

**606.1 Controls required.**

Air distribution systems shall be equipped with smoke detectors listed and labeled for installation in air distribution systems, as required by this section. Duct smoke detectors shall comply with UL 268A. Other smoke detectors shall comply with UL 268.

**Exception:**

Dwelling units.

**606.2.2 Common supply and return air systems.**

Where multiple air-handling systems share common spaces, common supply or return air ducts or plenums with a combined design capacity greater than 2,000 cfm (0.9 m<sup>3</sup>/s), the return air system shall be provided with smoke detectors in accordance with Section 606.2.1.

**Exception:** Individual smoke detectors shall not be required for any fan powered unit serving only one space. Individual smoke detectors shall not be required for each fan-powered terminal unit, provided that such units do not have an individual design capacity greater than 2,000 cfm (0.9 m<sup>3</sup>/s) and will be shut down by activation of one of the following:

1. Smoke detectors required by Sections 606.2.1 and 606.2.3.
2. An approved area smoke detector system located in the return air plenum serving such units.
3. An area smoke detector system as prescribed in the exception to Section 606.2.1.

In all cases, the smoke detectors shall comply with Sections 606.4 and 606.4.1.

**606.2.3 Return air risers.**

Where return air risers serve two or more stories or are part of a return air system having a design capacity greater than 15,000 cfm (7.1 m<sup>3</sup>/s), smoke detectors shall be installed at each story. Such smoke detectors shall be located upstream of the connection between the return air riser and any air ducts or plenums.

**606.2.4 Fan shutdown by smoke detector.**

In Groups I-1, I-2, I-3 and R, an air handling unit serving more than one floor shall be automatically shut down on detection of smoke by a duct type detector in the return from each floor level located upstream from connection to the common return.

**Exceptions:**

1. One-and two-family dwellings, adult and child day care in one-and two-family dwellings, individual apartments, condominiums, and townhouses.
2. Smoke detectors are not required in the return air system where the space served by the air distribution system is protected by a system of area smoke detectors in accordance with the North Carolina Building Code. The area smoke detector system shall comply with Section 606.4.

### **607.5 Location and installation.**

Fire dampers, smoke dampers, combination fire/smoke dampers and ceiling radiation dampers shall be provided at the locations prescribed in this section, and shall be shown and properly identified on the building plans by the designer. Where an assembly is required to have both fire dampers and smoke dampers, combination fire/smoke dampers or a fire damper and a smoke damper shall be required.

### **607.5.5.1 607.5.6 Penetrations of shaft enclosures.**

Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listing.

#### **Exceptions:**

1. Fire dampers are not required at penetrations of shafts where:
  - 1.1. Steel exhaust subducts extend at least 22 inches (559 mm) vertically in exhaust shafts provided there is a continuous airflow upward to the outside, or
  - 1.2. Penetrations are tested in accordance with ASTM E 119 as part of the fire-resistance-rated assembly, or
  - 1.3. Ducts are used as part of an approved smoke control system designed and installed in accordance with Section 909 of the International Building Code, and where the fire damper will interfere with the operation of the smoke control system, or
  - 1.4. The penetrations are in parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
2. In Group B occupancies, equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 of the International Building Code, smoke dampers are not required at penetrations of shafts where:
  - 2.1. Bathroom and toilet room exhaust openings with steel exhaust subducts, having a wall thickness of at least 0.019 inch (0.48 mm) extend at least 22 inches (559 mm) vertically and the exhaust fan at the upper terminus is powered continuously in accordance with the provisions of Section 909.11 of the International Building Code, and maintains airflow upward to the outside, or
  - 2.2. Ducts are used as part of an approved smoke control system designed and installed in accordance with Section 909 of the International Building Code, and where the smoke damper will interfere with the operation of the smoke control system.
3. Smoke dampers are not required at penetration of exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.

**CHAPTER 8  
CHIMNEYS AND VENTS**

**TABLE 803.10.4  
CHIMNEY CONNECTOR SYSTEMS AND CLEARANCES TO COMBUSTIBLE  
WALL MATERIALS FOR DOMESTIC HEATING APPLIANCES<sup>a, b, c, d</sup>  
(FOR CHIMNEY CONNECTOR SYSTEM DETAILS, SEE APPENDIX A)**

## **CHAPTER 9**

### **SPECIFIC APPLIANCES, FIREPLACES AND SOLID FUEL-BURNING EQUIPMENT**

#### **917.4 Installation of microwave oven over a cooking appliance.**

The installation of a listed and labeled cooking appliance or microwave oven over a listed and labeled cooking appliance shall conform to the terms of the upper appliance's listing and label and the manufacturer's installation instructions.

#### **918.9 Refrigeration coils in warm-air furnaces.**

When a cooling coil is located in the supply plenum of a warm-air furnace, the furnace blower shall be rated at not less than 0.5 inch water column (124 Pa) static pressure unless the furnace is listed and labeled for use with a cooling coil. Cooling coils shall not be located upstream from heat exchangers unless listed and labeled for such use.

Conversion of existing furnaces for use with cooling coils shall be permitted provided the furnace will operate within the temperature rise specified for the furnace.

#### **918.10 Return air intake (non-engineered systems).**

If only one central return air grille is installed, it shall be of proper size. The size shall be sufficient to return a volume of air compatible with the CFM requirements and the temperature rise limitations specified by the equipment manufacturer. The face velocity of return air grilles shall not exceed 450 fpm. At least one separate return shall be installed on each level of a multi-level structure. For split-level and split-foyer structures one return may serve more than one level if located near the levels served and the total area of the levels does not exceed 1600 square feet. Return air grilles shall not be located in bathrooms. The return air from one residential living unit shall not be mixed with the return air from other living units.

In buildings with 1600 square feet or less of conditioned area, a central return is permitted. When the building contains more than 1600 square feet of conditioned area, additional returns shall be provided. Each return shall not serve more than 1600 square feet of area and shall be located in the area it serves. Return air may travel through the living space to the return air intake if there are no restrictions, such as solid doors, to the air movement. When panned joists are used for return air, the structural integrity shall be maintained. Air capacity for joists 16 inches on center shall be a maximum of 375 CFM for 8 inch joists and 525 CFM for 10 inch joists. Wiring located in spaces used for return air ducts shall comply with the North Carolina Electrical Code.

### **SECTION 926**

#### **DUCT HEATERS**

##### **926.1 General.**

Electric duct heaters shall be installed in accordance with the manufacturer's installation instructions and the North Carolina Electrical Code. Electric furnaces shall be tested in accordance with UL 1995.

##### **926.2 Installation.**

Electric duct heaters shall be installed so they will not create a fire hazard. Class I ducts, duct coverings and linings shall be interrupted at each heater to provide the clearances specified in the manufacturer's installation instructions. Such interruptions are not required for duct heaters listed and labeled for zero clearance to combustible materials. Insulation installed in the immediate area of each heater shall be classified for the maximum temperature produced on the duct surface.

**926.3 Installation with heat pumps and air conditioners.**

Duct heaters located within 4 feet (1219 mm) of a heat pump or air conditioner shall be listed and labeled for such installations. The heat pump or air conditioner shall additionally be listed and labeled for such duct heater installations.

**926.4 Access.**

Duct heaters shall be accessible for servicing, and clearance shall be maintained to permit adjustment, servicing and replacement of controls and heating elements.

**926.5 Fan interlock.**

The fan circuit shall be provided with an interlock to prevent heater operation when the fan is not operating.

**SECTION 927**

**RADIANT HEATING SYSTEMS**

**927.1 General.**

Electric radiant heating systems shall be installed in accordance with the manufacturer's installation instructions and the North Carolina Electrical Code.

**927.2 Clearances.**

Clearances for radiant heating panels or elements to any wiring, outlet boxes and junction boxes used for installing electrical devices or mounting lighting fixtures shall comply with the North Carolina Electrical Code.

**927.3 Installation of radiant panels.**

Radiant panels installed on wood framing shall conform to the following requirements:

1. Heating panels shall be installed parallel to framing members and secured to the surface of framing members or mounted between framing members.
2. Panels shall be nailed or stapled only through the unheated portions provided for this purpose and shall not be fastened at any point closer than ¼ inch (6.4 mm) from an element.
3. Unless listed and labeled for field cutting, heating panels shall be installed as complete units.

**927.4 Installation in concrete or masonry.**

Radiant heating systems installed in concrete or masonry shall conform to the following requirements:

1. Radiant heating systems shall be identified as being suitable for the installation, and shall be secured in place, as specified in the manufacturer's installation instructions.
2. Radiant heating panels or radiant heating panel sets shall not be installed where they bridge expansion joints unless protected from expansion and contraction.

**927.5 Gypsum panels.**

Where radiant heating systems are used on gypsum assemblies, operating temperatures shall not exceed 125 degrees F (52 degrees C).

**927.6 Finish surfaces.**

Finish materials installed over radiant heating panels or systems shall be installed in accordance with the manufacturer's installation instructions. Surfaces shall be secured so that nails or other fastenings do not pierce the radiant heating elements.

**SECTION 928**

**BASEBOARD CONVECTORS**

928.1 Baseboard convectors.

Electric baseboard convectors shall be installed in accordance with the manufacturer's installation instructions and the North Carolina Electrical Code.

## **CHAPTER 10**

### **BOILERS, WATER HEATERS AND PRESSURE VESSELS**

#### **1001.1 Scope.**

This chapter shall govern the installation, alteration and repair of boilers, water heaters and pressure vessels.

Exception:

1. Pressure vessels used for unheated water supply.
2. Portable unfired pressure vessels and Interstate Commerce Commission containers.
3. Containers for bulk oxygen and medical gas.
4. Unfired pressure vessels having a volume of 5 cubic feet (0.14 m<sup>3</sup>) or less operating at pressures not exceeding 250 pounds per square inch (psi) (1724 kPa) and located within occupancies of Groups B, F, H, M, R, S and U.
5. Pressure vessels used in refrigeration systems that are regulated by Chapter 11 of this code.
6. Pressure tanks used in conjunction with coaxial cables, telephone cables, power cables and other similar humidity control systems.
7. Boilers that exceed one of the following are under the jurisdiction of the North Carolina Department of labor per General Statute Chapter 95 Article 7A. (This exemption does not apply to one and two family dwellings and apartment house of less than six families.):
  - (A) A heat input capacity of 200,000 Btuh (58.6kW).
  - (B) A water temperature of 200 degrees F (93.3 C).
  - (C) A nominal water capacity of 120 gal. (454 L).

**CHAPTER 11**  
**REFRIGERATION**

**[F] 1106.5 Remote controls.**

Remote control of the mechanical equipment and appliances located in the machinery room shall be provided at an approved location immediately outside the machinery room and adjacent to its principal entrance. See Section 1109 of the International Fire Code.

**[F] SECTION 1109**  
**PERIODIC TESTING**

Deleted.

**CHAPTER 13**  
**FUEL OIL PIPING AND STORAGE**

**1301.3 Fuel type.**  
See Section 301.9.

**SECTION 1309**  
**SPECIAL PIPING AND STORAGE SYSTEMS**

*(insert previously approved Rule)*

**CHAPTER 15**  
**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 102.8.

**ACCA**

Manual D-95 Residential Duct Systems     603.1, 603.2  
Manual J-86 Residential Load Calculation-Seventh Edition     312.1

**SMACNA**

SMACNA     SMACNA Installation Standards  
                  for Residential Heating and Air Conditioning     603.1

**APPENDIX A  
COMBUSTION AIR OPENINGS AND CHIMNEY CONNECTOR PASS-  
THROUGHS**

(This appendix is adopted as part of the code.)

**APPENDIX B  
RECOMMENDED PERMIT FEE SCHEDULE**

Deleted.

**APPENDIX C  
GREASE HOOD DUCT FLANGES**

(This appendix is adopted as part of the code.)

*(insert figures from 2002 NC Mechanical Code)*