2012 NC Mechanical Code

The changes below are to the 2009 International Mechanical Code. These mark-ups will be adopted for the 2012 NC Mechanical Code.

Chapter 1 – SCOPE AND ADMINISTRATION

101.1 Title. These regulations shall be known as the *North Carolina Mechanical Code* as adopted by the North Carolina Building Code Council on September 14, 2010, to be effective September 1, 2011. References to the *International Codes* shall mean the North Carolina Codes. The North Carolina amendments to the *International Codes* are underlined.

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 Code and Policies.

SECTION 104 DUTIES AND POWERS OF THE CODE OFFICIAL
Deleted. See the North Carolina Administrative Code and Policies.

SECTION 106 PERMITS
Deleted. See the North Carolina Administrative Code and Policies.

SECTION 107 INSPECTIONS AND TESTING
Deleted. See the North Carolina Administrative Code and Policies.

SECTION 108 VIOLATIONS
Deleted. See the North Carolina Administrative Code and Policies.

SECTION 109 MEANS OF APPEAL
Deleted. See the North Carolina Administrative Code and Policies.

Chapter 2 - DEFINITIONS

APPROVED. Acceptable to the code official for compliance with the provisions of the applicable code or referenced standard.

CLOSET. An enclosed or recessed area used to store clothing, linens or other household items.

LABELED. *Appliances, equipment,* materials or products to which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, inspection agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates either that the *appliance, equipment*, material or product meets identified standards or has been tested and found suitable for a specified purpose.

LISTED. *Appliances*, *equipment*, materials, products or services included in a list published by an organization acceptable to the code official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the *appliance, equipment*, material, product or service meets identified standards or has been tested and found suitable for a specified purpose.

MECHANICAL JOINT. Deleted.

JOINT, MECHANICAL. A general form of gas-tight joints obtained by the joining of metal parts through a positive-holding mechanical construction, such as flanged joint, screwed joint or flared joint. These joints include both the press-type and push-fit joining systems.

REGISTERED DESIGN PROFESSIONAL. An individual who is registered or licensed to practice his respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed. Design by a registered design professional is not required where exempt under the registration or licensure laws.

CHAPTER 3 – GENERAL REGULATIONS

301.4 Listed and labeled. Appliances regulated by this code shall be *listed* and *labeled* for the application in which they are installed and used, unless otherwise *approved* in accordance with Section 105.

Exceptions:

1. Listing and labeling of *equipment* and appliances used for refrigeration shall be in accordance with Section 1101.2.
2. Field erected equipment shall be deemed acceptable provided it is assembled using listed components and parts, provided that the design thereof is by a *Registered design professional.*

301.14.1 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 opening with cement mortar, concrete masonry, silicone caulking or noncorrosive metal.

303.5 Indoor locations for fuel-fired appliances. Fuel-fired furnaces, fuel-fired water heaters and fuel-fired boilers installed in closets and alcoves shall be *listed* for such installation. For purposes of this section, a closet or alcove shall be defined as a room or space having a volume less than 12 times the total volume of fuel-fired appliances other than boilers and less than 16 times the total volume of boilers.

Room volume shall be computed using the gross floor area and the actual ceiling height up to a maximum computation height of 8 feet (2438 mm).

304.2 Conflicts. Deleted.

304.3.1 Parking garages. Connection of a parking garage with any room in which there is a fuel-fired *appliance* shall be by means of a vestibule providing a two-doorway separation, except that a single door is permitted where the sources of ignition in the *appliance* are elevated in accordance with Section 304.3.
Exceptions:
1. This section shall not apply to *appliance* installations complying with Section 304.6.
2. This does not apply to one- and two-family dwellings and townhouses.

304.9 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. 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.

304.10 Under-floor and exterior grade installations.
304.10.1 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 (51 mm) thick.
304.10.2 Under-floor installation. Suspended equipment shall be a minimum of 6 inches (152 mm) above the adjoining grade.
304.10.3 Crawl space supports. A support shall be provided at each corner of the unit not less than 8 x 8 inches. The unit shall be supported a minimum of 2 inches above grade. When constructed of brick, the bricks shall be mortared together. All units stacked shall be mortared together. Fabricated units, formed concrete, or other approved materials shall be permitted.
304.10.4 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.

[B] 304.11 Guards. Guards shall be providedwhere appliances, equipment, fans or other components that require service and roof hatch openings are located within 6 feet (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 appliances, equipment, fans, components and roof hatch openings 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 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), and 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 shall be provided with an access opening and unobstructed passageway large enough to remove the largest appliance. The passageway shall not be less than 22 inches (559 mm) high and 36 inches (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), and 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 (1829 mm) high for its entire length, the passageway shall not be limited in length.

306.4.1 Electrical requirements. Deleted.

306.5 Equipment and appliances on roofs or elevated structures. Where *equipment* and appliances requiring periodic maintanence are installed on roofs or elevated structures at a height exceeding 16 feet (4877 mm), such access shall be provided by a permanent *approved* means of access, the extent of which shall be from grade or floor level to the *equipment* and appliances' level service space. Such access shall not require climbing over obstructions greater than 30 inches (762 mm) high or walking on roofs having a slope greater than four units vertical in 12 units horizontal (33-percent slope). Where access involves climbing over parapet walls, the height shall be measured to the top of the parapet wall.

Permanent ladders installed to provide the required access shall comply with the following minimum design criteria:
1. The side railing shall extend above the parapet or roof edge not less than 30 inches (762 mm).
2. Ladders shall have rung spacing not to exceed 14 inches (356 mm) on center.
3. Ladders shall have a toe spacing not less than 6 inches (152 mm) deep.
4. There shall be a minimum of 18 inches (457 mm) between rails.
5. Rungs shall have a minimum 0.75-inch (19 mm) diameter and be capable of withstanding a 300-pound (136.1 kg) load.
6. Ladders over 30 feet (9144 mm) in height shall be provided with offset sections and landings capable of withstanding 100 pounds per square foot (488.2 kg/m2). Landing dimensions shall be not less than 18 inches (457 mm) and not less than the width of the ladder served. A guard rail shall be provided on all open sides of the landing.
7. Ladders shall be protected against corrosion by approved means.

Catwalks installed to provide the required access shall be not less than 24 inches (610 mm) wide and shall have railings as required for service platforms.

Exception: This section shall not apply to Group R-3 occupancies.

306.5.1 Sloped roofs. Where appliances, *equipment*, fans or other components that require periodic maintanence are installed on a roof having a slope of three units vertical in 12 units horizontal (25-percent slope) or greater and having an edge more than 30 inches (762 mm) above grade at such edge, a level platform shall be provided on each side of the *appliance* or *equipment* to which access is required for service, repair or maintanence. The platform shall be not less than 30 inches (762 mm) in any dimension and shall be provided with guards. The guards shall extend not less than 42 inches (1067 mm) above the platform, shall be constructed so as to prevent the passage of a 21 –inch diameter (533 mm) shpere and shall comply with the loading requirements for guards specified in the *International Building Code*. Access shall not require walking on roofs having a slope greater than four units vertical in 12 units horizontal (33-percent slope). Where access involves obstructions greater than 30 inches (762 mm) in height, such obstructions shall be provided with ladders installed in accordance with Section 306.5 or stairs installed in accordance with the requirements specified in the *International Building Code* in the path of travel to and from appliances, fans or *equipment* requiring service.

306.5.2 Electrical requirements. Deleted.

307.2 Evaporators, condensing furnaces and cooling coils. Condensate drain systems shall be provided for equipment and appliances containing evaporators, 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 condensing furnaces, cooling coils and evaporators shall be conveyed from the drain pan outlet to an *approved* place of disposal. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than one-eighth unit vertical in 12 units horizontal (1-percent slope). When unable to drain by gravity a condensate pump may be used. Where pumps are used, they shall be installed with a 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 overflow 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.

307.2.2 Drain pipe materials and sizes. Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC, or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Joints and connections shall be made in accordance with the applicable provisions of Chapter 7 of the *International Plumbing Code* relative to the material type. Condensate waste and drain line size shall be not less than ¾-inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal.

TABLE 307.2.2 CONDENSATE DRAIN SIZING – Deleted.

307.2.3 Auxiliary and secondary drain systems. In addition to the requirements of Section 307.2.1, where damage to any building components could occur as a result of overflow from the equipment primary condensate removal system, one of the following auxiliary protection methods shall be provided for each cooling coil or fuel-fired appliance that produces condensate:

1. An auxiliary drain pan with a separate drain shall be provided under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a minimum depth of 11/2 inches (38 mm), shall not be less than 3 inches (76 mm) larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Galvanized sheet steel pans shall have a minimum thickness of not less than 0.0236 inch (0.6010 mm) (No. 24 gage). Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm).
2. A separate overflow drain line shall be connected to the drain pan provided with the equipment. Such overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.
3. An auxiliary drain pan without a separate drain line shall be provided under the coils on which condensate will occur. Such pan shall be equipped with a water-level detection device conforming to UL 508 that will shut off the equipment served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.
4. A water level detection device conforming to UL 508 shall be provided that will shut off the equipment served in the event that the primary drain is blocked. The device shall be installed in the primary drain line upstream of the primary drain line trap, the overflow drain line, or in the equipment-supplied drain pan, located at a point higher than the primary drain line connection and below the overflow rim of such pan.

Exception: Fuel-fired appliances that automatically shut down operation in the event of a stoppage in the condensate drainage system.

SECTION 308 – CLEARANCE REDUCTION FOR UNLISTED EQUIPMENT AND UNLISTED APPLIANCES

308.2 Listed appliances and equipment. Deleted.

TABLE 308.6 CLEARANCE REDUCTION METHODS FOR UNLISTED EQUIPMENT

*Under the last column "6" of the table, change the number 2 to number 3.

308.7 Solid fuel-burning appliances. The clearance reduction methods specified in Table 308.6 shall not be utilized to reduce the clearance required for solid fuel-burning appliances that are labeled for installation with clearances.

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/ACCA Standard 183. 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 in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies.

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* 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 where 10 percent or more of the resulting supply airstream consists of air recirculated from these spaces.
3. Where mechanical exhaust is required by Note b in Table 403.3, recirculation of air 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.
4. Where mechanical exhaust is required by Note g in Table 403.3, mechanical exhaust is required and recirculation to other spaces is prohibited where 10 percent or more of the resulting supply airstream consists of air recirculated from these spaces.

TABLE 403.3 – MINIMUM VENTILATION RATES
(NC amendments to table and footnotes)
OCCUPANCY CLASSIFICATION – Private dwellings, single and multiple
- Garages, separate for each dwelling - 100 cfm per car

Delete from Table

a. Based upon net occupiable floor area.
b. Mechanical exhaust required and the recirculation of air to other spaces is prohibited (see Section 403.2.1, Item 3).
c. Spaces unheated or maintained below 50°F are not covered by these requirements unless the occupancy is continuous.
d. Ventilation systems in enclosed parking garages shall comply with Section 404.
e. Rates are per water closet or urinal. The higher rate shall be provided where periods of heavy use are expected to occur, such as toilets in theaters, schools and sports facilities. The lower rate shall be permitted where periods of heavy use are not expected.
f. Rates are per room unless otherwise indicated. The higher rate shall be provided where the exhaust system is designed to operate intermittently. The lower rate shall be permitted where the exhaust system is designed to operate continuously during normal hours of use.
g. Mechanical exhaust is required and recirculation to other spaces is prohibited except that recirculation shall be permitted where the resulting supply airstream consists of not more than 10 percent air recirculated from these spaces (see Section 403.2.1, Items 2 and 4).
h. For nail salons, the required exhaust shall include ventilation tables or other systems that capture the contaminants and odors at their source and are capable of exhausting a minimum of 50 cfm per station.

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 m3/s • m2) 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

501.3 Pressure equalization. Mechanical exhaust systems shall be sized to remove the quantity of air required by this chapter to be exhausted. The system shall operate when air is required to be exhausted. Where mechanical exhaust is required in a room or space in other than occupancies in R-3 and dwelling units in R-2, such space shall be maintained with a neutral or negative pressure. If a greater quantity of air is supplied by a mechanical ventilating supply system than is removed by a mechanical exhaust for a room, adequate means shall be provided for the natural or mechanical exhaust of the excess air supplied. If only a mechanical exhaust system is installed for a room or if a greater quantity of air is removed by a mechanical exhaust system than is supplied by a mechanical ventilating supply system for a

room, adequate makeup air consisting of supply air, transfer air or outdoor air shall be provided to satisfy the deficiency. The calculated building infiltration rate shall not be used to satisfy the requirements of this section.
Exception: Domestic exhaust systems in residential occupancies and similar uses (domestic clothes dryer, domestic range hood, domestic bathroom exhaust).

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 (0.0645 m^2) shall be provided in the closet enclosure or *makeup air* shall be provided by other *approved* means.

504.6.1 Material and size. Exhaust ducts shall have a smooth interior finish and shall be constructed of metal a minimum 0.016 inch (0.4 mm) thick. With the exception of the transition duct, flexible ducts are prohibited. The exhaust duct size shall be 4 inches (102 mm) nominal in diameter.

504.6.2 Duct installation. Exhaust ducts shall be supported at 4-foot (1219 mm) intervals and secured in place and shall terminate not less than 12 inches (305 mm) above finished grade. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Ducts shall not be joined with screws or similar fasteners that protrude into the inside of the duct.
Exception: Where the duct termination is less than 12 inches (305 mm) above finished grade an areaway shall be provided with a cross-sectional area not less than 200 square feet (18.6 m2). The bottom of the duct termination shall be no less than 12 inches (305 mm)above the areaway bottom.

504.6.3 Transition ducts. Transition ducts used to connect the dryer to the exhaust duct system shall be a single length that is *listed* and *labeled* in accordance with UL 2158A. Transition ducts shall be a maximum of 8 feet (2438 mm) in length, shall not be concealed within construction, and must remain entirely within the room in which the appliance is installed.

504.6.5 Length identification. The equivalent length of the exhaust duct shall be identified on a permanent label or tag. The label or tag shall be located within 6 feet (1829 mm) of the exhaust duct connection.

504.6.6 Exhaust duct required. Where space for a clothes dryer is provided, an exhaust duct system shall be installed.
Exception: Where a *listed* condensing clothes dryer is installed prior to occupancy of structure.

505.1 Domestic systems. Where domestic range hoods and domestic appliances equipped with downdraft exhaust are located within dwelling units, such hoods and appliances shall discharge to the outdoors through sheet metal ducts constructed of galvanized steel, stainless steel, aluminum or copper. Such ducts shall have smooth inner walls and shall be air tight and equipped with a backdraft damper.
Exceptions:
1. Where installed in accordance with the manufacturer's installation instructions and where mechanical or natural ventilation is otherwise provided in accordance with Chapter 4, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.

2. Ducts for domestic kitchen cooking appliances equipped with downdraft exhaust systems shall be permitted to be constructed of Schedule 40 PVC pipe and fittings provided that the installation complies with all of the following:
2.1. The duct shall be installed under a concrete slab poured on grade.
2.2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel.
2.3. The PVC duct shall extend not more than 2 inch (50 mm) above the indoor concrete floor surface.
2.4. The PVC duct shall extend not more than 2 inch (50 mm) above grade outside of the building.
2.5. The PVC ducts shall be solvent cemented.

506.3.2.5 Grease duct test. Prior to the use or concealment of any portion of a grease duct system, a leakage test shall be performed in the presence of the code official. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on all sides. The permit holder shall be responsible to provide the necessary *equipment* and perform the grease duct leakage test. A light test shall be performed to determine that all welded and brazed joints are liquid tight.
A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of ductwork to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls. A test shall be performed for the entire duct system, including the hood-to-duct connection. The duct work shall be permitted to be tested in sections, provided that every joint is tested. For listed factory-built grease ducts, this test shall be limited to duct joints assembled in the field and shall exclude factory welds.

506.3.10 Grease duct enclosures. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall penetrate exterior walls only at locations where unprotected openings are permitted by the *International Building Code*. The duct enclosure shall serve a single grease duct and shall not contain other ducts, piping or wiring systems. Duct enclosures shall be either field-applied or factory-built. Duct enclosures shall have a fire-resistance rating not less than that of the assembly penetrated, but need not exceed 2 hours. Duct enclosures shall be as prescribed by Section 506.3.10.1, 506.3.10.2 or 506.3.10.3.
Exception: A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

506.3.10.4 Duct enclosure not required. Deleted.

507.2.1 Type I hoods. Type I hoods shall be installed where cooking *appliances* produce grease or smoke. Type I hoods shall be installed over *heavy-duty* and *extra-heavy-duty cooking appliances*. Type I hoods shall be installed over *light-duty cooking appliances* and *medium-duty cooking appliances* that produce grease or smoke.

507.2.2 Type II hoods. Type II hoods shall be installed above dishwashers and *light-duty appliances* and *medium-duty appliances* that produce heat or moisture and do not produce grease or smoke, except where the heat and moisture loads from such appliances are incorporated into the HVAC system design or into the design of a separate removal system. Type II hoods shall be installed above all *light-duty*

appliances and *medium-duty appliances* that produce products of *combustion* and do not produce grease or smoke. Spaces containing cooking appliances that do not require Type II hoods shall be ventilated in accordance with Section 403.3.

Exceptions:

1. Under-counter-type commercial dishwashing machines.
2. AType 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. Light-duty electric convection, bread, retherm or microwave ovens. 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.
5. Low-temperature commercial chemical-type dishwashers.

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 domestic ranges installed in dwelling units, churches, schools, day care centers, break areas and similar installations.

507.2.4 Extra-heavy-duty. Type I hoods for use over *extra-heavy-duty cooking appliances* shall not also cover *heavy-, medium-,* or *light-duty appliances*. Such hoods shall discharge to an exhaust system that is independent of other exhaust systems.

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 maximum capacity not exceeding 1 gallon (3.8 L) unless otherwise approved by the mechanical official.

507.16.2 Certification. These tests shall be witnessed by the code official, or at the code official's option, by a professional engineer who shall provide certification of performance to the code official.

510.8 Duct construction. Ducts used to convey hazardous exhaust shall be constructed of approved G90 galvanized sheet steel, with a minimum nominal thickness as specified in Table 510.8. Nonmetallic ducts used in systems exhausting nonflammable corrosive fumes or vapors shall be listed and labeled.

(divide the second paragraph as shown below)

Nonmetallic ducts shall have a flame spread index of 25 or less and a smoke-developed index of 50 or less, when tested in accordance with ASTM E 84 or UL 723. Ducts shall be *approved* for installation in such an exhaust system.

Where the products being exhausted are detrimental to the duct material, the ducts shall be constructed of alternate materials that are compatible with the exhaust.

Chapter 6 – DUCT SYSTEMS

602.2.1 Materials within plenums. Except as required by Sections 602.2.1.1 through 602.2.1.6, materials within plenums shall be noncombustible or shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 50 when tested in accordance with ASTM E 84 or UL 723.

Exceptions:

1. Rigid and flexible ducts and connectors shall conform to Section 603.
2. Duct coverings, linings, tape and connectors shall conform to Sections 603 and 604.
3. This section shall not apply to materials exposed within plenums in one- and two-family dwellings.
4. This section shall not apply to smoke detectors.
5. Combustible materials fully enclosed within continuous noncombustible raceways or enclosures, approved gypsum board assemblies or within materials listed and labeled for such application.
6. This section shall not apply to materials exposed within equipment rooms and furnace rooms in dwelling units.

603.1.1 Nothing in this section shall be deemed to preclude the use, within a conditioned space, of a fabric air distribution device that combines the function of air transport and air diffusion, provided that the materials used shall have a fire spread/smoke-developed rating not greater that 25/50.

603.7 Rigid duct penetrations. Duct system penetrations of walls, floors, ceilings and roofs and air transfer openings in such building components shall be protected as required by Section 607. Ducts in a private garage and ducts penetrating the walls or ceilings separating a *dwelling* unit from a private garage shall be continuous and constructed of a minimum 26 gage [0.0187 inch (0.4712 mm)] galvanized sheet metal or other approved noncombustible material and shall not have openings into the garage. Fire and smoke dampers are not required in such ducts passing through the wall or ceiling separating a *dwelling* unit from a private garage except where required by Chapter 7 of the *International Building Code*.

603.9 Joints, seams and connections. All longitudal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified inSMACNA *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, “181 A-M” for mastic or “181 A-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 “181B-M” for mastic.Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Mechanical fasteners for use with flexible nonmetallic air ducts shall comply with UL 181B and shall be marked 181B-C. Unlisted duct tape is not permitted as a sealant on any metal ducts.

Exception:
1. Continuously welded joints and seams in ducts.
2. Ducts exposed within the conditioned space they serve shall not be required to be sealed.

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 (25 mm) in width and equivalent to or heavier gage than the duct being supported shall be used. Straps, when used, shall be at maximum 64-inch (1626 mm) intervals and shall be securely attached to the building structure. Straps shall be attached to the duct at a minimum of two points with screws or rivets. Hanger 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 instructions.

603.12 Condensation. Provisions shall be made to prevent the formation of condensation on the exterior of new duct. Ducts installed in attics, crawl spaces or outdoors, insulated per Section 403.2.1 or Section 503.2.7 of the *North Carolina Energy Code* shall be deemed to meet the intent of this section.

603.19 Under-floor furnace plenums. Under-floor furnace plenums shall be prohibited in new structures. Modification or repairs to existing under-floor furnace plenums in existing structures shall conform to the requirements of this section.

603.19.1 General. The space shall be cleaned of loose combustible materials and scrap, and shall be tightly enclosed. The ground surface of the space shall be covered with a moisture barrier having a minimum thickness of 4 mils (0.1 mm). Plumbing waste cleanouts shall not be located within the space.

603.19.2 Materials. The under-floor space, including the sidewall insulation, shall be formed by materials having flame-spread ratings not greater than 200 when tested in accordance with ASTM E 84.

603.19.3 Furnace connections. A duct shall extend from the furnace supply outlet to not less than 6 inches (152 mm) below the combustible framing. This duct shall comply with the provisions of Section 603. A noncombustible receptacle shall be installed below any 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.

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

603.19.5 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 higher than 150°F (66°C). The furnace shall additionally be equipped with an *approved* automatic control that limits the outlet air temperature to 200°F (93°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.

604.9 Thermal continuity. Where a duct liner has been interrupted, a duct covering of equal thermal performance shall be installed.
Exception: See Section 604.6.

606.2.2 Common supply and return air systems. Where multiple air-handling systems share common supply or return air ducts or plenums with a combined design capacity greater than 2,000 cfm (0.9m3/s), the return air system shall be provided with smoke detectors in accordance with Section 606.2.1.
Exceptions:
1. Individual smoke detectors shall not be required for any fan-powered unit serving only one space.
2. 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 m3/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.

607.5 Location and installation. Fire dampers, smoke dampers and combination fire/smoke dampers shall be provided at the locations prescribed in Sections 607.5.1 through 607.5.7 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 smoke damper shall be required.

Chapter 8 – CHIMNEYS AND VENTS

801.20 Plastic vent joints. Plastic pipe and fittings used to vent appliances shall be installed in accordance with the pipe manufacturer's installation instructions and the appliance manufacturer's installation instructions. Solvent cement joints between ABS pipe and fittings shall be cleaned. Solvent cement joints between CPVC pipe and fittings or PVC pipe and fittings shall be primed. The primer shall be a contrasting color.

TABLE 803.10.4 CHIMNEY CONNECTOR SYSTEMS AND CLEARANCES TO COMBUSTIBLE WALL MATERIALS FOR DOMESTIC HEATING APPLIANCESa,b,c,d
(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.

918.2 Minimum duct sizes. The minimum unobstructed total area of the outdoor and return air ducts or openings to a forced-air warm-air furnace shall be not less than 2 square inches per 1,000 Btu/h (4402 mm2/kW) output rating capacity of the furnace and not less than that specified in the furnace manufacturer's installation instructions. The minimum unobstructed total area of supply ducts from a forced-air warm-air furnace shall not be less than 2 square inches for each 1,000 Btu/h (4402 mm2/kW) output rating capacity of the furnace and not less than that specified in the furnace manufacturer's installation instructions.
Exception: The total area of the supply air ducts and outdoor and return air ducts shall not be required to be larger than the minimum size required by the furnace manufacturer's installation instructions. With the addition of a cooling coil the sizing criteria shall be based on 6 square inches for each 1,000 Btu/h (13 208 mm2/kW) output.

918.6 Prohibited sources. Outdoor or return air for a forced-air heating system shall not be taken from the following locations:
1. Less than 10 feet (3048 mm) from an appliance vent outlet, a vent opening from a plumbing drainage system or the discharge outlet of an exhaust fan, unless the outlet is 3 feet (914 mm) above the outdoor air inlet.
2. Where there is the presence of objectionable odors, fumes or flammable vapors; or where located less than 10 feet (3048 mm) above the surface of any abutting public way or driveway; or where located at grade level by a sidewalk, street, alley or driveway.
3. A hazardous or insanitary location or a refrigeration machinery room as defined in this code.
4. A room or space, the volume of which is less than 25 percent of the entire volume served by such system. Where connected by a permanent opening having an area sized in accordance with Sections 918.2 and 918.3, adjoining rooms or spaces shall be considered as a single room or space for the purpose of determining the volume of such rooms or spaces.
Exception: The minimum volume requirement shall not apply where the amount of return air taken from a room or space is less than or equal to the amount of supply air delivered to such room or space.
5. A closet, bathroom, toilet room, kitchen, garage, mechanical room, boiler room, furnace room or unconditioned attic.

Exception: Where return air intakes are located not less than 10 feet (3048 mm) from cooking appliances, and serve the kitchen area only, taking return air from a kitchen shall not be prohibited.
6. An unconditioned crawl space by means of direct connection to the return side of a forced air system.
7. A room or space containing a fuel-burning *appliance* or fireplace where such room or space serves as the sole source of return air.
Exceptions:
7.1. This shall not apply where the fuel-burning appliance is a direct-vent appliance.
7.2. This shall not apply where the room or space complies with the following requirements:
7.2.1. The return air shall be taken from a room or space having a volume exceeding 1 cubic foot for each 10 Btu/h (9.6 L/W) of combined input rating of all fuel-burning appliances therein.
7.2.2. The volume of supply air discharged back into the same space shall be approximately equal to the volume of return air taken from the space.
7.2.3. Return-air inlets shall not be located within 10 feet (3048 mm) of any appliance firebox or draft hood in the same room or space.
7.3. This shall not apply to rooms or spaces containing solid-fuel-burning appliances, provided that return-air inlets are located not less than 10 feet (3048 mm) from the firebox of the appliances.
7.4. This shall not apply to rooms and spaces containing a fireplace provided that return air inlets are located not less than 10 feet (3048 mm) from the fireplace opening.

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 (nonengineered 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 feet per minute (fpm) (2.3 m/s). At least one separate return shall be installed on each level of a multilevel 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 1,600 square feet (148.6 m2). 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 dwellings with 1,600 square feet (148.6m2) or less of conditioned area, a central return is permitted. When the dwelling contains more than 1,600 square feet (148.6m2) of conditioned area, additional returns shall be provided. Each return shall serve not more than 1,600 square feet (148.6 m2) 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 (406 mm) on center shall be a maximum of 375 cfm (0.177 m3/s) for 8-inch (203 mm) joists and 525 cfm (0.248 m3/s) for 10-inch (254 mm) joists. Wiring located in spaces used for return-air ducts shall comply with the *North Carolina Electrical Code*.

SECTION 928 RADIANT HEATING SYSTEMS

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

928.2 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*.

928.3 Installation of radiant panels. Radiant panels installed onwood 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 1/4 inch (6.4 mm) from an element.
3. Unless listed and labeled for field cutting, heating panels shall be installed as complete units.

928.4 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.

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

928.6 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 929 BASEBOARD CONVECTORS

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

SECTION 930 DUCT HEATERS

930.1 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 1996.

930.2 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.

930.3 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.
930.4 Access. Duct heaters shall be accessible for servicing, and clearance shall be maintained to permit adjustment, servicing and replacement of controls and heating elements.
930.5 Fan interlock. The fan circuit shall be provided with an interlock to prevent heater operation when the fan is not operating.

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.
Exceptions:
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 m3) 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 (in other than one- and two-family dwellings and apartment houses of less than six families) are under the jurisdiction of the North Carolina Department of Labor in accordance with General Statute Chapter 95, Article 7A, Chapter 95-69.10:
7.1. A heat input capacity of 200,000 Btu/h (58.6 kW).
7.2. A water temperature of 200°F (93.3°C).
7.3. A nominal water capacity of 120 gallons (454 L).

1005.1 Valves. Every boiler or modular boiler shall have a shutoff valve in the supply and return piping. For multiple boiler or multiple modular boiler installations, each boiler or modular boiler shall have individual shutoff valves in the supply and return piping.
Exception: Deleted.

Chapter 11 – REFRIGERATION

1101.10 Locking access port caps. Deleted.

SECTION 1109 – PERIODIC TESTING
1109.1 Testing required. Deleted.

Chapter 13 – FUEL OIL PIPING AND STORAGE

1301.2 Storage and piping systems. Fuel-oil storage systems shall comply with Section 603.3 of the *International Fire Code*. Fuel-oil piping systems shall comply with the requirements of this code.
Exception: Fuel-oil storage tanks for one- and two-family dwellings and townhouses shall comply with Section 1309.

1301.3 Fuel type. See Section 301.9.

SECTION 1309 – OIL TANKS FOR ONE- AND TWO-FAMILY DWELLINGS AND TOWNHOUSES.
1309.1 Materials. Supply tanks shall be listed and labeled and shall conform to UL 142 for aboveground tanks, UL 58 for underground tanks, and UL 80 for inside tanks.
1309.2 Above-ground tanks. The maximum amount of fuel oil stored above ground or inside of a building shall be 660 gallons (2498 L). The supply tank shall be supported on rigid noncombustible supports to prevent settling or shifting.
1309.2.1 Tanks with buildings. Supply tanks for use inside of buildings shall be of such size and shape to permit installation and removal from dwellings as whole units. Supply tanks larger than 10 gallons (38 L) shall be placed not less than 5 feet (1524 mm) from any fire or flame either within or external to any fuel-burning appliance.
1309.2.2 Outside above-ground tanks. Tanks installed outside above ground shall be a minimum of 5 feet (1524 mm) from an adjoining property line. Such tanks shall be suitably protected from the weather and from physical damage.
1309.3 Underground tanks. Excavations for underground tanks shall not undermine the foundations of existing structures. The clearance from the tank to the nearest wall of a basement, pit or property line shall not be less than 1 foot (305 mm). Tanks shall be set on and surrounded with noncorrosive inert materials such as clean earth, sand or gravel well tamped in place. Tanks shall be covered with not less than1 foot (305 mm) of earth. Corrosion protection shall be provided in accordance with Section 1309.8.
1309.4 Multiple tanks. Cross connection of two supply tanks shall be permitted in accordance with Section 1309.7.
1309.5 Oil gauges. Inside tanks shall be provided with a device to indicate when the oil in the tank has reached a predetermined safe level. Glass gauges or a gauge subject to breakage that could result in the escape of oil from the tank shall not be used.
1309.6 Flood-resistant installation. In areas prone to flooding as established by Table R301.2(1) of the *International Residential Code*, tanks shall be installed at or above the design flood elevation established in Section R324 of the *International Residential Code* or shall be anchored to prevent flotation, collapse and lateral movement under conditions of the design flood.
1309.7 Cross connection of tanks. Cross connection of supply tanks, not exceeding 660 gallons (2498 L) of aggregate capacity, with gravity flow from one tank to another, shall be acceptable provided that the two tanks are on the same horizontal plane.
1309.8 Corrosion protection. Underground tanks and buried piping shall be protected by corrosion-resistant coatings or special alloys or fiberglass-reinforced plastic.

Chapter 15 – REFERENCED STANDARDS

ACCA

Manual J-02	Residential Load Calculations, Eigth Edition	312
Manual S-04	Residential Equipment Selection	312

UL

58-?? Standard for Steel Underground Tanks for Flammable and Combustible Liquids 1309

80-?? Standard for Steel Tanks for Oil-Burner Fuels and Other Combustible Liquids 1309

142-?? Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids 1309

1996-??

APPENDIX A COMBUSTION AIR OPENINGS AND CHIMNEY CONNECTOR PASS-THROUGHS

The provisions contained in this appendix are adopted as part of this code.

(Delete Figures A-1, A-2, A-3 and A-4)

APPENDIX B RECOMMENDED PERMIT FEE SCHEDULE

Deleted.