

# **FLORIDA BUILDING CODE MECHANICAL**

## **2003 Revisions**

**This package of replacement pages is designed to update the 2nd edition of the Florida Building Code® to the latest revisions. To update your existing code, replace sheets by page number. Place all these sheets in the code and remove any existing sheets per instructions contained herein.**



# PREFACE

## Introduction

The State of Florida first mandated statewide building codes during the 1970s at the beginning of the modern construction boom. The first law required all municipalities and counties to adopt and enforce one of the four state recognized model codes known as the state minimum building codes. During the early 1990s a series of natural disasters, together with the increasing complexity of building construction regulation in vastly changed markets precipitated the comprehensive review of the state building code system. The study revealed that building code adoption and enforcement was inconsistent throughout the state and those local codes thought to be the strongest proved inadequate when tested by major hurricane events. The consequences were devastation to lives and economies and a statewide property insurance crisis. The response was reform of the state building construction system which placed emphasis on uniformity and accountability.

The Florida Building Code (the Code) is the central piece of the new building code system. This single statewide unified code is developed and maintained by the Florida Building Commission. It is administered and enforced by local jurisdictions and certain state agencies which may, under certain strictly defined conditions, amend requirements to be more stringent. The reformed building code system also establishes accountability for licensed contractors and designers and for local enforcement jurisdictions. It also establishes building code education requirements for all licensees and uniform procedures and quality control in a product approval system.

The Code supersedes all local codes and is automatically effective on the 2001 date established by state law. The Code is based on a national model building code and national consensus standards and incorporates all state agency building codes and regulations. It has been harmonized with the Florida Fire Prevention Code to established unified and consistent standards. Together, the Florida Building Code and the Florida Fire Prevention Code contain all state standards for the design and construction of buildings in the state of Florida. All local amendments to these codes may be obtained from the Florida Department of Community Affairs or the Florida Department of Insurance, State Fire Marshal, respectively.

The Code is compiled in four volumes with the National Electrical Code<sup>®</sup> adopted by reference. The four volumes are: Building, which includes energy, accessibility and state agency regulations; Plumbing; Mechanical; and Fuel Gas. The National Electrical Code<sup>®</sup> is reference standard NFPA 70-2002 which must be obtained separately.

## Development

Chapter 98-287, Laws of Florida, established the Florida Building Commission and directed it to develop the Code. In October 1998 the Commission selected the model codes which form the base requirements of the Code. These base codes were then amended to tailor requirements, including energy, accessibility and hurricane resistance, to be Florida specific. The draft Code was presented to the 2000 Florida Legislature which directed specific changes and authorized, by Chapter 2000-141, Laws of Florida, the final Code to become effective July 1, 2001. The Commission completed the changes and reconsideration directed by the Legislature and adopted this first edition of the Code by administrative rule in January 2001. The 2001 code became effective on March 1, 2002.

The base codes include: the Standard Building Code, 1997 edition; the National Electrical Code<sup>®</sup>, 2002 edition; the Standard Plumbing Code, 1997 edition; the International Mechanical Code, 1998 edition; the International Fuel Gas Code, 1997 edition; and, structural requirements of the South Florida Building Code as they apply to the “High Velocity Hurricane Zone.” State codes adopted include the Florida Energy Efficiency Code for Building Construction, the Florida Accessibility Code for Building Construction and the Fair Housing Guidelines.

The base codes were amended through an extensive public review and input process. Nine technical advisory committees (TAC) were established using ANSI guidelines for consensus standards committees. The TACs are: Joint Building Fire (a joint committee of the Commission and the State Fire Marshal); Building Structural; Plumbing and Fuel Gas; Mechanical; Electrical; Energy; Accessibility; Special Occupancy (state agency construction and facility licensing regulations); and Administrative/Enforcement. The TACs reviewed proposed amendments to the Code and made recommendations to the Commission. The Commission obtained public comment on the first working draft compiled from the TAC recommendations then refined the Code through development of two additional drafts. The third draft was presented to the 2000 Legislature for review and approval.

### **Adoption and Maintenance**

The Florida Building Code is adopted and updated by the Florida Building Commission. The first edition and future updates and editions supersede all previous codes upon adoption by the Commission and do not require adoption by local jurisdictions. Minimum requirements for permitting, plans review and inspections are established by the Code, and local jurisdictions may adopt additional administrative requirements which are more stringent. Local technical amendments are subject to strict criteria established by s. 553.73, F.S. They are subject to Commission review when it updates the Code triennially and are subject to appeal to the Commission according to the procedures established by s. 553.73, F.S.

### **Marginal Markings**

Short horizontal lines in the margins within the body of the code indicate a change from the of the base codes except where a change was minor.



Dotted lines in the margins within the body of the code indicate a change from the 2001 Florida Building Code to the 2002 revisions.



Solid lines in the margins within the body of the code indicate a change from the 2002 Florida Building Code to the June 30, 2003 revisions.



Deletion indicators (☆) are provided in the margin where a paragraph or item listing has been deleted if the deletion resulted in a change of requirements through the 2002 revisions.

Deletion indicators (★) are provided in the margin where a paragraph or item listing has been deleted if the deletion resulted in a change of requirements from the 2002 edition to the June 30, 2003 edition.

### **Acknowledgments**

The Florida Building Code is the work product of hundreds of building designers, contractors, regulators and other interested parties. Its development spanned two and one half years and involved more than one hundred thousand hours of volunteer and staff time. The majority of the Code is derived from the base codes and the efforts of the organizations which developed and maintain these codes and the standards referenced within them. These organizations include the Southern Building Code Congress International, the International Code Council, the National Fire Protection Association, the Broward County Board of Rules and Appeals, the Miami-Dade County Building Department and Code Compliance Office and all organizations listed in the reference standards chapters of each volume of the Code. Special acknowledgment is given to staff and the hundreds of volunteers who committed their time and effort to development of the code and to the Florida Conflict Resolution Consortium for its facilitation and consensus processes design. Their commitment and efforts to develop a final consensus code are the basis of its strength and value to the citizens of Florida.

## CHAPTER 3 GENERAL REGULATIONS

### SECTION 301 GENERAL

**301.1 Scope.** This chapter shall govern the approval and installation of all equipment and appliances that comprise parts of the building mechanical systems regulated by this code.

**301.2 Energy utilization.** Heating, ventilating and air-conditioning systems of all structures shall be designed and installed for efficient utilization of energy in accordance with Chapter 13 of the *Florida Building Code, Building*.

**301.3 Fuel gas appliances and equipment.** The approval and installation of fuel gas distribution piping and equipment, fuel gas-fired appliances and fuel gas-fired appliance venting systems shall be in accordance with the *Florida Building Code, Fuel Gas*.

**301.4 Listed and labeled.** All appliances regulated by this code shall be listed and labeled, unless otherwise approved in accordance with Sections 301.4.1 through 301.4.4.

**301.4.1 Modifications.** Whenever there are practical difficulties involved in carrying out the provisions of this code, the code official shall have the authority to grant modifications for individual cases, provided the code official shall first find that special individual reason makes the strict letter of this code impractical and the modification is in compliance with the intent and purpose of this code and that such modification does not lessen health, life and fire safety requirements. The details of action granting modifications shall be recorded and entered in the files of the mechanical inspection department.

**301.4.2 Alternative materials, methods, equipment and appliances.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material or method of construction shall be approved where the code official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

**301.4.3 Required Testing.** Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate

claims for alternative materials or methods, the code official shall have the authority to require tests as evidence of compliance to be made at no expense to the jurisdiction.

**301.4.3.1 Test methods.** Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the code official shall approve the testing procedures.

**301.4.3.2 Testing agency.** All tests shall be performed by an approved agency.

**301.4.3.3 Test reports.** Reports of tests shall be retained by the code official for the period required for retention of public records.

**301.4.4 Materials, equipment and appliance reuse.** Materials, equipment, appliances and devices shall not be reused unless such elements have been reconditioned, tested and placed in good and proper working condition and approved.

**301.5 Labeling.** Labeling shall be in accordance with the procedures set forth in Sections 301.5.1 through 301.5.2.3.

**301.5.1 Testing.** An approved agency shall test a representative sample of the mechanical equipment and appliances being labeled to the relevant standard or standards. The approved agency shall maintain a record of all of the tests performed. The record shall provide sufficient detail to verify compliance with the test standard.

**301.5.2 Inspection and identification.** The approved agency shall periodically perform an inspection, which shall be in-plant if necessary, of the mechanical equipment and appliances to be labeled. The inspection shall verify that the labeled mechanical equipment and appliances are representative of the mechanical equipment and appliances tested.

**301.5.2.1 Independent.** The agency to be approved shall be objective and competent. To confirm its objectivity, the agency shall disclose all possible conflicts of interest.

**301.5.2.2 Equipment.** An approved agency shall have adequate equipment to perform all required tests. The equipment shall be periodically calibrated.

**301.5.2.3 Personnel.** An approved agency shall employ experienced personnel educated in conducting, supervising and evaluating tests.

**301.6 Label information.** A permanent factory-applied nameplate(s) shall be affixed to appliances on which shall appear legible lettering, the manufacturer's name or trademark, the model number, serial number and the seal or mark of the approved agency. A label shall also include the following:

1. Electrical equipment and appliances: Electrical rating in volts, amperes and motor phase; identification of individual electrical components in volts, amperes or watts, motor phase; Btu/h (W) output; and required clearances.
2. Absorption units: Hourly rating in Btu/h (W); minimum hourly rating for units having step or automatic modulating controls; type of fuel; type of refrigerant; cooling capacity in Btu/h (W); and required clearances.
3. Fuel-burning units: Hourly rating in Btu/h (W); type of fuel approved for use with the appliance; and required clearances.
4. Electric comfort heating appliances: Name and trademark of the manufacturer; the model number or equivalent; the electric rating in volts, ampacity and phase; Btu/h (W) output rating; individual marking for each electrical component in amperes or watts, volts and phase; required clearances from combustibles; and a seal indicating approval of the appliance by an approved agency.

**301.7 Conflicts.** Where conflicts between this code and the conditions of listing or the manufacturer's installation instructions occur, the provisions of this code shall apply.

**Exception:** Where enforcement of a code provision would violate the conditions of the listing of the equipment or appliance, the conditions of the listing and the manufacturer's installation instructions shall apply.

**301.8 Electrical.** Electrical wiring, controls and connections to equipment and appliances regulated by this code shall be in accordance with Chapter 27 of the *Florida Building Code, Building*.

**301.9 Plumbing connections.** Potable water supply and building drainage system connections to equipment and appliances regulated by this code shall be in accordance with the *Florida Building Code, Plumbing*.

**301.10 Fuel types.** Fuel-fired appliances shall be designed for use with the type of fuel to which they will be connected and the altitude at which they are installed. Appliances that comprise parts of the building mechanical system shall not be converted for the usage of a different fuel, except where approved and converted in accordance with the manufacturer's instructions. The fuel input rate shall not be increased or decreased beyond the limit rating for the altitude at which the appliance is installed.

**301.11 Vibration isolation.** Where vibration isolation of equipment and appliances is employed, an approved means of supplemental restraint shall be used to accomplish the support and restraint.

**301.12 Repair.** Defective material or parts shall be replaced or repaired in such a manner so as to preserve the original approval or listing.

**301.13 Wind resistance.** Mechanical equipment, appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures on the equipment and the supports as determined in accordance with the *Florida*

*Building Code, Building*. This may be accomplished by design or by application of section 301.13.1.

**301.13.1 Ground-mounted units.** Ground-mounted units for R3 residential applications may be anchored with #14 screws with gasketed washers according to the following.

1. For units with sides less than 12 inches, one screw shall be used at each side of the unit.
2. For units between 12 and 24 inches, two screws shall be used per side.
3. For units between 24 and 36 inches, three screws shall be used per side.
4. For units greater than 36 inches or 5 tons, anchorage shall be designed in accordance with 301.13.

**NOTES:**

1. Corrosion protection. Buildings located within 3,000 feet of the ocean should utilize non-ferrous metal, stainless steel or steel with minimum G-90 hot-dip galvanized coating for equipment stands and anchors and stainless steel screws.
2. Strapping. Job site strengthening of fan cowlings and vent hoods is recommended. Two or four stainless steel cables are recommended, depending on design wind conditions. Alternatively, additional, heavy straps can be screwed to the cawling and curb.

**301.14 Flood hazard.** For structures located in a flood-hazard zone or a high-hazard zone, mechanical systems shall be either placed above the base flood elevation or protected so as to prevent water from entering or accumulating within the equipment, appliances, ducts or plenum space during floods up to the base flood elevation.

**301.15 NFPA Standards.** Unless otherwise specified in this code, air conditioning equipment shall comply with the following standards:

1. NFPA 90A (Standard for the Installation of Air Conditioning and Ventilating Systems)
2. NFPA 90B (Standard for the Installation of Warm Air Heating and Air Conditioning Systems)

## SECTION 302 PROTECTION OF STRUCTURE

**302.1 Penetrations of floor/ceiling assemblies and fire-resistance-rated assemblies.** Penetrations of floor/ceiling assemblies and assemblies required to have a fire-resistance rating shall be protected in accordance with the *Florida Building Code, Building*.

**302.2 Cutting, notching and boring holes.** Notches on the ends of solid wood joists shall not exceed one-fourth of the depth. Holes bored for pipes or cable shall not be within 2 inches (51 mm) of the top or bottom of the solid wood joist, and the diameter of any such hole shall not exceed one-third of the depth of the joist. Notches for pipes in the top or bottom of solid wood joists shall not exceed one-sixth of the depth and shall not be located in the middle one-third of the span.

**302.3 Notching and cutting of wood studs.** In exterior walls and bearing partitions, wood studs shall not be cut or notched to a depth exceeding 25 percent of its depth. Wood studs shall not be cut or notched to a depth exceeding 40 percent of the

depth of the stud in nonload-bearing partitions supporting no loads other than the weight of the partition.

**302.3.1 Bored holes.** The diameter of a bored hole shall not exceed 40 percent of the stud depth.

**Exceptions:**

1. In nonload-bearing partitions, the diameter of bored holes shall not exceed 60 percent of the depth of the stud.
2. Where each stud that is bored is doubled and not more than two adjacent double studs are bored, the diameter of bored holes shall not exceed 60 percent of the depth of the stud.

**302.3.1.1 Location.** The edge of the bored hole shall not be nearer than  $\frac{5}{8}$  inch (15.9 mm) to the edge of the stud. Bored holes shall not be located at the same section of stud as a cut or notch.

### SECTION 303 EQUIPMENT AND APPLIANCE LOCATION

**303.1 General.** Equipment and appliances shall be located as required by this section, specific requirements elsewhere in this code and the conditions of the equipment and appliance listing.

**303.2 Hazardous locations.** Appliances shall not be located in a hazardous location unless listed and approved for the specific installation.

**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.
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 and fireplaces, 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 or 704. Access to such enclosure shall be through a solid door, weather-stripped in accordance with the exterior door air leakage requirements of the energy code and equipped with an approved self-closing device.

**303.4 Protection from damage.** Appliances shall not be installed in a location where subject to mechanical damage unless protected by approved barriers.

**303.5 Indoor locations.** Fuel-fired furnaces and 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 not less than 12 times the total volume of fuel-fired appliances other than boilers and not 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).

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

**303.7 Pit locations.** Appliances installed in pits or excavations shall not come in direct contact with the surrounding soil. The sides of the pit or excavation shall be held back a minimum of 12 inches (305 mm) from the appliance. Where the depth exceeds 12 inches (305 mm) below adjoining grade, the walls of the pit or excavation shall be lined with concrete or masonry. Such concrete or masonry shall extend a minimum of 4 inches (102 mm) above adjoining grade and shall have sufficient lateral load-bearing capacity to resist collapse. The appliance shall be protected from flooding in an approved manner.

### SECTION 304 INSTALLATION

**304.1 General.** Equipment and appliances shall be installed as required by the terms of their approval. Equipment and appliances shall be installed in accordance with the conditions of listing and the manufacturer's installation instructions and this code. Manufacturer's installation instructions shall be available on the job site at the time of inspection.

**304.2 Public garages/Parking structures.** Appliances shall be installed in accordance with the manufacturer's instructions and NFPA 88B.

**304.5 Construction and protection.** Boiler rooms and furnace rooms shall be protected as required by the *Florida Building Code, Building*.

**304.6 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 door stops or limits, closers, drapery ties or guards shall not be used to provide the required clearances.

**304.7 Clearances from grade.** Equipment and appliances installed at grade level shall be supported on a level minimum  $3 \frac{1}{2}$  inch concrete slab or other approved material extending a minimum of 2 inches above adjoining finished grade. Suspended equipment and appliances shall be

installed a minimum of 6 inches (152 mm) above adjoining grade to provide support and protection from contact with soil or water.

**Exception:** On changeouts or new installations of existing buildings where equipment is replaced that has a support platform approved under a previous code.

**304.8 Guards.** Guards shall be provided where appliances, equipment, fans or other components that require service are located within 10 feet (3048 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 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 *Florida Building Code, Building*.

**304.9 Area served.** Appliances serving different areas of a building other than where they are installed shall be permanently marked in an approved manner that uniquely identifies the appliance and the area it serves.

**SECTION 305  
PIPING SUPPORT**

**305.1 General.** All mechanical system piping shall be supported in accordance with this section.

**305.2 Materials.** Pipe hangers and supports shall have sufficient strength to withstand all anticipated static and specified dynamic loading conditions associated with the intended use. Pipe hangers and supports that are in direct contact with piping shall be of approved materials that are compatible with the piping and that will not promote galvanic action.

**305.3 Structural attachment.** Hangers and anchors shall be attached to the building construction in an approved manner.

**305.4 Interval of support.** Piping shall be supported at distances not exceeding the spacing specified in Table 305.4, or piping shall be supported in accordance with MSS SP-69.

**TABLE 305.4  
PIPING SUPPORT SPACING<sup>a</sup>**

PIPING MATERIAL	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)
ABS pipe	4	10 <sup>b</sup>
Aluminum pipe and tubing	10	15
Brass pipe	10	10
Brass tubing, 1 1/4 -inch diameter and smaller	6	10
Cast-iron pipe <sup>b</sup>	5	15
Copper or copper alloy pipe	12	10
Copper or copper alloy tubing, 1 1/4-inch diameter and smaller	6	10
Copper or copper alloy tubing, 1 1/2-inch diameter and larger	10	10
CPVC pipe or tubing, 1 inch and smaller	3	10 <sup>b</sup>
CPVC pipe or tubing, 1 1/4 inch and larger	4	10 <sup>b</sup>
Steel pipe	12	15
Steel tubing	8	10
Lead pipe	Continuous	4
PB pipe or tubing	2 2/3 (32 inches)	4
PVC pipe	4	10 <sup>b</sup>

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm.

- a The maximum horizontal spacing of cast-iron pipe hangers shall be increased to 10 feet where 10-foot lengths of pipe are installed.
- b Mid-story guide for sizes 2-inches and smaller.



**305.5 Sway bracing.** Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees (0.8 rad) for pipe sizes 4 inches (102 mm) and larger.

## SECTION 306 ACCESS AND SERVICE SPACE

**306.1 Clearances for maintenance and replacement.** Clearances around appliances to elements of permanent construction, including other installed equipment and appliances, shall be sufficient to allow inspection, service, repair or replacement without removing such elements of permanent construction or disabling the function of a required fire-resistance-rated assembly.

**306.1.1 Central furnaces.** Central furnaces within compartments or alcoves shall have a minimum working space clearance of 3 inches (76 mm) along the sides, back and top with a total width of the enclosing space being at least 12 inches (305 mm) wider than the furnace. Furnaces having a firebox open to the atmosphere shall have at least 6 inches (152 mm) working space along the front combustion chamber side. Combustion air openings at the rear or side of the compartment shall comply with the requirements of Chapter 7.

**Exception:** This section shall not apply to replacement appliances installed in existing compartments and alcoves where the working space clearances are in accordance with the equipment or appliance manufacturer's installation instructions.

**306.2 Appliances in rooms.** Rooms containing appliances requiring access shall be provided with a door and an unobstructed passageway measuring not less than 36 inches (914 mm) wide and 80 inches (2032 mm) high.

**Exception:** Within a dwelling unit, appliances installed in a compartment, alcove, basement or similar space shall be accessed by an opening or door and an unobstructed passageway measuring not less than 24 inches (610 mm) wide and large enough to allow removal of the largest appliance in the space, provided that a level service space of not less than 30 inches (762 mm) deep and the height of the appliance, but not less than 30 inches (762 mm), present at the front or service side of the appliance with the door open.

**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 6 feet (1829 mm) in length measured along the centerline of the passageway from the attic access opening to the appliance's service panel. 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 open-

ing 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.

**Exception:** The passageway and level service space are not required where the appliance is capable of being serviced and removed through the required opening.

**306.3.1 Electrical requirements.** A lighting fixture with receptacle outlet, controlled by a switch located at the passageway opening, shall be provided so as to light the passageway and service area and installed in accordance with NFPA 70.

**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 inches (762 mm) high and 22 inches (559 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 by 30 inches (559 mm by 762 mm), where such dimensions are large enough to allow removal of the largest appliance.

**Exception:** 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.

**306.4.1 Electrical requirements.** A lighting fixture with receptacle outlet, controlled by a switch located at the passageway opening, shall be provided so as to light the passageway and service area and installed in accordance with NFPA 70.

**306.5 Equipment and appliances on roofs or elevated structures.** Where equipment and appliances requiring access 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 4 units vertical in 12 units horizontal (33-percent slope).

**306.6 Sloped roofs.** Where appliances are installed on a roof having a slope of 3 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 to which access is required by the manufacturer's installation instructions for service, repair or maintenance. The platform shall not be less than 30 inches (762 mm) in any dimension and shall be provided with guards in accordance with Section 304.8.

## SECTION 307 CONDENSATE DISPOSAL

**307.1 Fuel-burning appliances.** Liquid combustion by-products of condensing appliances shall be collected and discharged to an approved plumbing fixture or disposal area in accordance with the manufacturer's installation instructions. Condensate piping shall be of approved corrosion-resistant material and shall not be smaller than the drain connection on the appliance. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than one-eighth inch vertical in one foot horizontal (1-percent slope).

**307.2 Evaporators and cooling coils.** Condensate drain systems shall be provided for equipment and appliances containing evaporators or cooling coils. Condensate drain systems shall be designed, constructed and installed in accordance with Sections 307.2.1 through 307.2.5.

**307.2.1 Condensate disposal.** Condensate from all cooling coils or evaporators shall be conveyed from the drain pan outlet to an approved place of disposal as follows:

1. Units larger than 6 tons (21.1 kW) nominal capacity shall discharge to a sanitary sewer drain, storm sewer drain or a French drain constructed in accordance with Section 307.2.1.1. Where discharging to a sanitary sewer, such drains shall be indirectly connected in accordance with the *Florida Building Code, Plumbing*.
2. Units 6 tons (21.1 kW) and smaller nominal capacity shall discharge in accordance with Item 1, or shall discharge to a gutter, roof drain or other approved location.
3. Condensate drains from rooftop units shall discharge in accordance with Item 1 or 2, or shall discharge onto rooftops where the condensate does not discharge into a street, alley or other areas so as to cause a nuisance.

**307.2.1.1 French drain.** A French drain shall consist of a pit excavated in the earth not less than 24 inches (610 mm) in any dimension completely filled with coarse gravel. The drain pipe shall extend to the pit and shall be securely anchored in place.

**307.2.2 Drain pipe materials and sizes.** Components of the condensate disposal system shall be cast iron, galvanized steel, copper, polybutylene, polyethylene, ABS, CPVC or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. Condensate waste and drain line size shall be not less than  $\frac{3}{4}$ -inch (19 mm) internal diameter and shall not decrease in size from the drain pan connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method. All horizontal sections of drain piping shall be installed in uniform alignment at a uniform slope.

**307.2.3 Auxiliary drain pans.** Except as provided for in Section 307.2.4, auxiliary drain pans shall be installed under all coils on which condensation will occur and under units containing coils that are located in attic spaces, suspended ceiling spaces, furred spaces or any area where damage will occur to the building or building contents, as a result of an overflow of the equipment or appliance drain pan or a stoppage in the condensate drain piping. Auxiliary drain pans shall have a minimum depth of  $1\frac{1}{2}$  inches (38 mm), shall be not less than 3 inches (76 mm) larger than the unit or coil dimensions in width and length, and shall be constructed of an approved corrosion-resistant material. Metallic pans shall have a minimum thickness of not less than 0.0276-inch (0.7 mm) galvanized sheet steel. Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm). A separate drain line shall extend from the pan to a conspicuous point and serve as an alarm which indicates that the primary drain is restricted. As an alternative to a separate drain line, an approved water level detector or float switch device shall be used to control overflow by automatically shutting down the equipment or appliance that produces the condensate.

**307.2.4 Secondary drain system.** Where an auxiliary drain pan cannot be installed under units containing cooling coils, a drain pipe shall be connected to the secondary drain (overflow) connection so that the overflowing condensate resulting from flow restrictions in the primary drain pipe will be carried away without causing damage to the unit and its surroundings. The overflowing condensate shall be drained to a conspicuous point and serve as an alarm which indicates that the primary drain pipe is restricted. As an alternative, overflowing condensate shall be piped to a secondary drain pan, firmly secured and located along the side of the cooling unit, from which the condensate will be drained to a conspicuous point. A secondary drain pan shall have a capacity of not less than the capacity of the condensate drain pan, shall be not less than  $1\frac{1}{2}$  inches (38 mm) deep, and shall be constructed of not less than 0.0276-inch (0.7 mm) thick galvanized sheet metal. As an alternative to a separate drain line, an

# CHAPTER 4 VENTILATION

## SECTION 401 GENERAL

**401.1 Scope.** This chapter shall govern the ventilation of spaces within a building intended to be occupied. This chapter does not govern the requirements for smoke control systems.

**401.2 Ventilation required.** Every occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403.

**401.3 When required.** Ventilation shall be provided during the periods that the room or space is occupied.

**401.4 Vestibule ventilation.** Vestibule ventilation for smoke-proof enclosures shall be in accordance with the *Florida Building Code, Building*.

**401.5 Opening location.** Outside air exhaust and intake openings shall be located a minimum of 10 feet (3048 mm) from lot lines or buildings on the same lot. Where openings front on a street or public way, the distance shall be measured to the centerline of the street or public way.

**Exception:** Use Group R-3.

**401.5.1 Intake openings.** Mechanical and gravity outside air intake openings shall be located a minimum of 10 feet (3048 mm) from any hazardous or noxious contaminant, such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading docks, except as otherwise specified in this code. Fresh air intakes shall not be located closer than 10 ft (3048 mm) from any chimney or vent outlet, or sanitary sewer vent outlet.

**401.5.2 Exhaust openings.** Outside exhaust openings shall be located so as not to create a nuisance. Exhaust air shall not be directed onto walkways.

**401.6 Outdoor opening protection.** Air exhaust and intake openings that terminate outdoors shall be protected with corrosion-resistant screens, louvers or grilles. Openings in louvers, grilles and screens shall be sized in accordance with Table 401.6. Openings shall be protected against local weather conditions. Outdoor air exhaust and intake openings located in exterior walls shall meet the provisions for exterior wall opening protectives in accordance with the *Florida Building Code, Building*.

**TABLE 401.6**

**OPENING SIZES IN LOUVERS, GRILLES AND SCREENS  
PROTECTING OUTDOOR EXHAUST AND AIR INTAKE OPENINGS**

OUTDOOR OPENING	MINIMUM AND MAXIMUM OPENING SIZES IN LOUVERS, GRILLES AND SCREENS MEASURED IN ANY DIRECTION
Exhaust openings	Not < 1/4 inch and not > 1/2 inch
Intake openings in residential occupancies	Not < 1/4 inch and not > 1/2 inch
Intake openings in other than residential occupancies	> 1/4 inch and not > 1 inch

For SI: 1 inch = 25.4 mm.

**401.7 Contaminant sources.** Stationary local sources producing air-borne particulates, heat, odors, fumes, spray, vapors, smoke or gases in such quantities as to be irritating or injurious to health shall be provided with an exhaust system in accordance with Chapter 5 or a means of collection and removal of the contaminants. Such exhaust shall discharge directly to an approved location at the exterior of the building.

## SECTION 402 NATURAL VENTILATION

**402.1 General.** Natural ventilation of an occupied space shall be through windows, doors, louvers or other openings to the outdoors.

**402.2 Ventilation area required.** The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.

**402.2.1 Adjoining spaces.** Where rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the opening to the adjoining rooms shall be unobstructed and shall have an area not less than 8 percent of the floor area of the interior room or space, but not less than 25 square feet (2.3 m<sup>2</sup>). The minimum openable area to the outdoors shall be based on the total floor area being ventilated.

**402.2.2 Openings below grade.** Where openings below grade provide required natural ventilation, the outside horizontal clear space measured perpendicular to the opening shall be one and one-half times the depth of the opening. The depth of the opening shall be measured from the average adjoining ground level to the bottom of the opening.

**402.3 Contaminants exhausted.** Naturally ventilated spaces having contaminant sources as covered in Section 401.7 shall be provided with an exhaust system in accordance with Chapter 5 or an approved means of collection and removal of the contaminants.

**402.3.1 Bathrooms.** Rooms containing bathtubs, showers, spas and similar bathing fixtures shall be mechanically ventilated in accordance with Section 403.

**Exception:** Residential bathrooms with windows having no less than 3 sq. ft. of open space.

**402.4 Openings on yards or courts.** Where natural ventilation is to be provided by openings onto yards or courts, such yards or courts shall comply with the requirements of the *Florida Building Code, Building*.

**SECTION 403  
MECHANICAL VENTILATION**

**403.1 Ventilation system.** Mechanical ventilation shall be provided by a method of supply air and return or exhaust air. The amount of supply air shall be approximately equal to the amount of return and exhaust air. The system shall not be prohibited from producing a negative or positive pressure. The system to convey the ventilation air shall be designed and installed in accordance with Chapter 6.

Ventilation supply systems shall be designed to deliver the required rate of supply air to the occupied zone within an occupied space. The occupied zone shall have boundaries measured at 3 inches (76 mm) and 72 inches (1829 mm) above the floor and 24 inches (610 mm) from the enclosing walls.

**403.2 Outdoor air required.** The minimum ventilation rate of required outdoor air shall be determined in accordance with Section 403.3.

**Exception 1:** Where the registered design professional demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design.

**Exception 2:** Shall not be required for R-3 detached one and two family dwellings except garages.

**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.

**403.2.2 Transfer air.** Except where recirculation from such spaces is prohibited by Table 403.3, air transferred from occupied spaces is not prohibited from serving as makeup air for required exhaust systems in such spaces as kitchens, baths, toilet rooms, elevators and smoking lounges. The amount of transfer air and exhaust air shall be sufficient to provide the flow rates as specified in Sections 403.3 and 403.3.1.

**403.3 Ventilation rate.** Ventilation systems, for other than Group R-3 (one and two family dwellings), shall be designed to have the capacity to supply the minimum outdoor air flow rate determined in accordance with Table 403.3 based on the occupancy of the space and the occupant load or other parameter as stated therein. The occupant load utilized for design of the ventilation system shall not be less than the number determined from the estimated maximum occupant load rate indicated in Table 403.3. Where peak occupancies of less than three hours duration occur, the outside air flow rate may be determined on the basis of average occupancy for the space for the duration of the system, provided the average occupancy used is not less than one-half the maximum. Ventilation rates for occupancies not represented in Table 403.3 shall be determined by an approved engineering analysis. The ventilation system shall be designed to supply the required rate of ventilation air continuously during the period the space is occupied, except as otherwise stated in other provisions of the code.

**Exception:** The occupant load is not required to be determined, based on the estimated maximum occupant load rate indicated in Table 403.3 where approved statistical data document the accuracy of an alternate anticipated occupant density.

**TABLE 403.3  
REQUIRED OUTDOOR VENTILATION AIR**

OCCUPANCY CLASSIFICATION	ESTIMATED MAXIMUM OCCUPANT LOAD, PERSONS PER 1,000 SQUARE FEET <sup>a</sup>	OUTDOOR AIR [cubic feet per minute (cfm) per person] UNLESS NOTED <sup>e</sup>
<b>Correctional facilities</b>		
Cells	20	20
Dining halls	100	15
Guard station	40	15
<b>Dry cleaners, laundries</b>		
Coin-operated dry cleaner	20	15
Coin-operated laundries	20	15
Commercial dry cleaner	30	30
Commercial laundry	10	25
Storage, pick up	30	35
<b>Education</b>		
Auditoriums	150	15
Classroom	50	15
Corridor	—	0.10 cfm/ft <sup>2</sup>
Laboratories	30	20
Libraries	20	15
Locker rooms	—	0.50 cfm/ft <sup>2</sup>
Music rooms	50	15
Smoking lounges <sup>b</sup>	70	60
Training shops	30	20
<b>Food and beverage service</b>		
Bars, cocktail lounges	100	30
Cafeteria, fast food	100	20
Dining room	70	20
Kitchens (cooking) <sup>f</sup>	20	15
<b>Hospitals, nursing and convalescent homes</b>		
Autopsy rooms <sup>b</sup>	—	0.50 cfm/ft <sup>2</sup>
Medical procedure rooms	20	15
Operating rooms	20	30
Patient rooms	10	25
Physical therapy	20	15
Recovery and ICU	20	15

(continued)

**503.4 Corrosion-resistant fans.** Fans located in systems conveying corrosives shall be of materials that are resistant to the corrosive or shall be coated with corrosion-resistant materials.

## SECTION 504 CLOTHES DRYER EXHAUST

**504.1 Installation.** Clothes dryers shall be exhausted in accordance with the manufacturer's instructions. Dryer exhaust systems shall be independent of all other systems and shall convey the moisture and any products of combustion to the outside of the building.

**504.2 Exhaust penetrations.** Ducts that exhaust clothes dryers shall not penetrate or be located within any fireblocking, draftstopping or any wall, floor/ceiling or other assembly required by the building code to be fire-resistance rated, unless such duct is constructed of galvanized steel or aluminum of the thickness specified in Section 603.3 and the fire-resistance rating is maintained in accordance with the *Florida Building Code, Building*.

**504.3 Cleanout.** Each vertical riser shall be provided with a means for cleanout. Such means may include the exhaust duct connection to an individual dryer outlet if it is accessible and readily disassembled.

**504.4 Exhaust installation.** Dryer exhaust ducts for clothes dryers shall terminate on the outside of the building and shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination. Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct the flow. Clothes dryer exhaust ducts shall not be connected to a gas vent connector, gas vent or chimney. Clothes dryer exhaust ducts shall not extend into or through ducts or plenums.

**504.5 Makeup air.** Installations exhausting more than 200 cfm (0.09 m<sup>3</sup>/s) shall be provided with 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<sup>2</sup>) shall be provided in the closet enclosure.

**504.6 Domestic clothes dryer ducts.** Exhaust ducts for domestic clothes dryers shall have a smooth interior finish and the maximum developed length shall not exceed 25 feet (7620 mm) from the dryer location to the outlet terminal. The maximum length of the duct shall be reduced 2 1/2 feet (762 mm) for each 45-degree (0.79 rad) bend and 5 feet (1524 mm) for each 90-degree (1.6 rad) bend. The exhaust duct shall be a minimum nominal size of 4 inches (102 mm) diameter. The entire exhaust system shall be supported and secured in place. The male end of the duct at overlapped duct joints shall extend in the direction of airflow. Clothes dryer transition ducts used to connect the appliance to the exhaust duct system shall be limited to single lengths not to exceed 8 feet (2438 mm) in length and shall be listed and labeled for the application. Transition ducts shall not be concealed within construction. Developed duct lengths longer than 25 feet (7620 mm) shall be allowed for specific dryer installations where the dryer manufacturer's installation instructions specify the allowable developed length of an engineered system.

**504.6.1 Rough-in required.** When a compartment or space for a domestic clothes dryer is provided, an exhaust duct of approved material and size shall be installed.

**504.7 Commercial clothes dryers.** The installation of dryer exhaust ducts serving Type 2 clothes dryers shall comply with the appliance manufacturer's installation instructions. Exhaust fan motors installed in exhaust systems shall be located outside of the airstream. In multiple installations, the fan shall operate continuously or be interlocked to operate when any individual unit is operating. Ducts shall have a minimum clearance of 6 inches (152 mm) to combustible materials. Clothes dryer transition ducts used to connect the appliance to the exhaust duct system shall be limited to single lengths not to exceed 8 feet (2438 mm) in length and shall be listed and labeled for the application. Transition ducts shall not be concealed within construction.

## SECTION 505 DOMESTIC KITCHEN EXHAUST EQUIPMENT

**505.1 Domestic systems.** Where domestic range hoods and domestic appliances equipped with down & aft exhaust are located within dwelling units, such hoods and appliances shall discharge to the outdoors through ducts constructed of galvanized steel, stainless steel or copper. Such ducts shall have smooth inner walls and shall be air tight and equipped with a backdraft damper.

**Exception:** Where installed in accordance with the manufacturer's installation instructions, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.

**505.2 Installation of microwave ovens 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.

**505.3 Overhead exhaust hoods.** General. Domestic open-top broiler units shall be provided with a metal exhaust hood, not less than 28 gage, with a clearance of not less than 0.25 inch (6.4 mm) between the hood and the underside of combustible material or cabinets. A clearance of at least 24 inches (610 mm) shall be maintained between the cooking surface and the combustible material or cabinet. The hood shall be at least as wide as the broiler unit and shall extend over the entire unit. Such exhaust hood shall discharge to the outdoors and shall be equipped with a back draft damper or other means to control infiltration/exfiltration when not in operation. Broiler units incorporating an integral exhaust system, and listed and labeled for use without an exhaust hood, need not be provided with an exhaust hood.

## SECTION 506 COMMERCIAL KITCHEN GREASE DUCTS AND EXHAUST EQUIPMENT

**506.1 General.** Commercial kitchen grease ducts and exhaust equipment shall comply with the requirements of this section. Commercial kitchen grease ducts shall be designed for the type of cooking appliance and hood served. Unless otherwise specified in this chapter, grease hoods and grease hood duct systems shall conform to NFPA 96.

**506.2 Corrosion protection.** Ducts exposed to the outside atmosphere or subject to a corrosive environment shall be protected against corrosion in an approved manner.

**506.3 Ducts serving Type I hoods.** Commercial kitchen exhaust systems serving Type I hoods shall be designed, constructed and installed in accordance with Sections 506.3.1 through 506.3.14.2.

**506.3.1 Exhaust fans.** Exhaust fan housings serving a Type I hood shall be constructed of steel.

**Exception:** Fans listed and labeled as power roof ventilators for restaurant cooking appliances.

**506.3.1.1 Fan motor.** Exhaust fan motors shall be located outside of the exhaust airstream.

**506.3.2 Grease diverter.** Where a centrifugal fan with horizontal discharge is located outside the building, such fan shall be provided with a duct or duct fitting connected to the fan outlet that diverts the discharge from the grease exhaust duct system in an upward direction. Such diverter duct or fitting shall comply with the following:

1. The duct or duct fitting shall be constructed of metal as set forth in Chapter 6.
2. The maximum total developed length of the duct or duct fitting measured along the centerline shall not exceed three times the vertical dimension of the fan outlet.
3. The duct or duct fitting shall be provided with openings at the lowest point to permit drainage of grease to an approved collection device.

**506.3.3 Grease duct materials.** Grease ducts serving a Type I hood shall be constructed of steel not less than 0.055 inch (1.4 mm) (No. 16 Gage) in thickness or stainless steel not less than 0.044 inch (1.1 mm) (No. 18 Gage) in thickness or shall be listed and labeled factory-built commercial kitchen grease ducts installed in accordance with Section 304.1.

**506.3.4 Joints, seams and penetrations of grease ducts.** Joints, seams and penetrations of grease ducts shall be made with a continuous liquid-tight weld made on the external surface of the duct system.

**Exceptions:**

1. Penetrations shall not be required to be welded where sealed by devices that are listed for the application.
2. Internal welding shall not be prohibited provided that the joint is formed or ground smooth and is provided with ready access for inspection.
3. Listed and labeled factory-built commercial kitchen grease ducts installed in accordance with Section 304.1.

**506.3.4.1 Duct joint types.** Duct joints shall be butt joints or overlapping duct joints of either the telescoping or bell type. Overlapping joints shall be installed to

prevent ledges and obstructions from collecting grease or interfering with gravity drainage to the intended collection point. The difference between the inside cross-sectional dimensions of overlapping sections of duct shall not exceed  $\frac{1}{4}$  inch (6 mm). The length of overlap for overlapping duct joints shall not exceed 2 inches (51 mm).

**506.3.4.2 Duct to hood joints.** Duct to hood joints shall be made with continuous internal or external liquid-tight welded joints. Such joints shall be smooth, accessible for inspection, and without grease traps.

**Exceptions:** This section shall not apply to:

1. A vertical duct to hood collar connection made in the top plane of the hood in accordance with all of the following:
  - 1.1 The hood duct opening shall have a 1-inch (25.4 mm) deep, full perimeter, welded flange turned down into the hood interior at an angle of 90 degrees from the plane of the opening.
  - 1.2 The duct shall have a 1-inch (25.4 mm) deep flange made by a 1-inch by 1-inch (25.4 mm by 25.4 mm) angle iron welded to the full perimeter of the duct not less than 1 inch (25.4 mm) above the bottom end of the duct.
  - 1.3 A gasket rated for use at not less than 1,500°F (815°C) is installed between the duct flange and the top of the hood.
  - 1.4 The duct to hood joint shall be secured by stud bolts not less than  $\frac{1}{4}$  inch (6.4 mm) in diameter welded to the hood with a spacing not greater than 4 inches (102 mm) on center for the full perimeter of the opening. All bolts and nuts are to be secured with lockwashers.
2. Listed and labeled duct to hood collar connections installed in accordance with Section 304.1.

**506.3.4.3 Duct to exhaust fan connections.** Duct to exhaust fan connections shall be flanged and gasketed at the base of the fan for listed and labeled vertical discharge fans; shall be flanged, gasketed, and bolted to the inlet of the fan for side inlet utility fans; and shall be flanged, gasketed, and bolted to the inlet and outlet of the fan for in-line fans.

or Type II hood shall be installed at or above all commercial food heat-processing appliances that produce fumes, steam, odor or heat.

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

**507.2.3 Solid fuel.** Type I hoods for use over solid fuel-burning cooking appliances shall discharge to an exhaust system that is independent of other exhaust systems.

**507.3 Fuel-burning appliances.** Where vented fuel-burning appliances are located in the same room or space as the hood, provisions shall be made to prevent the hood system from interfering with normal operation of the appliance vents.

**507.4 Type I materials.** Type I hoods shall be constructed of steel not less than 0.043 inch (1.09 mm) (No. 18 MSG) in thickness, or stainless steel not less than 0.037 inch (0.94 mm) (No. 20 MSG) in thickness.

**507.5 Type II hood materials.** Type II hoods shall be constructed of steel not less than 0.030 inch (0.76 mm) (No. 22 gage) in thickness, stainless steel not less than 0.024 inch (0.61 mm) (No. 24 gage) in thickness, copper sheets weighing not less than 24 ounces per square foot (7.3 kg/m<sup>2</sup>), or of other approved material and gage.

**507.6 Supports.** Hoods shall be secured in place by non-combustible supports.

**507.7 Hood joints, seams and penetrations.** External hood joints, seams and penetrations shall be made with a continuous external liquid-tight weld to the lowest outermost perimeter of the hood. Internal hood joints, seams, penetrations, filter support frames, and other appendages attached inside the hood shall not be required to be welded but shall be otherwise sealed to be grease tight.

**Exceptions:**

1. Penetrations shall not be required to be welded where sealed by devices that are listed for the application.
2. Internal welding of seams, joints, and penetrations of the hood shall not be prohibited provided that the joint is formed smooth or ground so as to not trap grease, and is readily cleanable.
3. External hood joints and seams tested and listed in accordance with the requirements of UL 710 shall not be required to be welded.

**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.

**507.9 Clearances for Type I hood.** A Type I hood shall be installed with a clearance to combustibles of not less than 18 inches (457 mm).

**Exception:** Clearance shall not be required from gypsum wallboard provided that a smooth, cleanable, nonabsorbent and noncombustible material is installed between the hood and the gypsum wallboard over an area extending not less than 18 inches (457 mm) in all directions from the hood.

**507.10 Hoods penetrating a ceiling.** Type I hoods or portions thereof penetrating a ceiling, wall or furred space shall comply with all the requirements of Section 506.3.12.

**507.11 Grease filters.** Type I hoods shall be equipped with listed grease filters designed for the specific purpose. Grease-collecting equipment shall be provided with access for cleaning. The lowest edge of a grease filter located above the cooking surface shall be not less than the height specified in Table 507.11.

**TABLE 507.11  
MINIMUM DISTANCE BETWEEN THE LOWEST EDGE OF A  
GREASE FILTER AND THE COOKING SURFACE OR THE  
HEATING SURFACE**

TYPE OF COOKING APPLIANCE	HEIGHT ABOVE COOKING SURFACE (feet)
Without exposed flame	1/2
Exposed flame and burners	2
Exposed charcoal and charbroil type	4

For SI: 1 foot = 304.8 mm.

**507.11.1 Criteria.** Filters shall be of such size, type and arrangement as will permit the required quantity of air to pass through such units at rates not exceeding those for which the filter or unit was designed or approved. Filter units shall be installed in frames or holders so as to be readily removable without the use of separate tools, unless designed and installed to be cleaned in place and the system is equipped for such cleaning in place. Removable filter units shall be of a size that will allow them to be cleaned in a dishwashing machine or pot sink. Filter units shall be arranged in place or provided with drip-intercepting devices to prevent grease or other condensate from dripping into food or on food preparation surfaces. Listed grease filters shall conform to the requirements of UL 1046.

**507.11.2 Mounting position.** Filters shall be installed at an angle of not less than 45 degrees (0.79 rad) from the horizontal and shall be equipped with a drip tray beneath the lower edge of the filters.

**507.12 Canopy size and location.** The inside edge of canopy-type commercial cooking hoods shall overhang or extend a horizontal distance of not less than 6 inches (152 mm) beyond the edge of the cooking surface, on all open sides. The vertical distance between the lip of the hood and the cooking surface shall not exceed 4 feet (1219 mm).

**507.13 Capacity of hoods.** Canopy-type commercial cooking hoods shall exhaust a minimum quantity of air determined in accordance with this section and Sections 507.13.1 through 507.13.4.

where:

- $A$  = The horizontal surface area of the hood, in square feet (m<sup>2</sup>).
- $D$  = Distance in feet (mm) between the lower lip of the hood and the cooking surface.
- $P$  = That part of the perimeter of the hood that is open, in feet (mm).
- $Q$  = Quantity of air, in cubic feet per minute (L/s).

**507.13.1 Solid fuel-burning cooking appliances.** The minimum airflow for Type I hoods used for solid fuel-burning cooking appliances, grease-burning charbroilers and similar appliances shall be:

Number of exposed sides	Formula
	For SI:
4 (island or central hood)	$Q = 300A$ $Q = 0.46A$
3 or less	$Q = 200A$ $Q = 0.31A$
Alternate formula	$Q = 100PD$ $Q = 0.16PD$

**507.13.2 High temperature.** The minimum airflow for Type I hoods used for high-temperature appliances such as deep-fat fryers shall be determined as follows:

Number of exposed sides	Formula
	For SI:
4 (island or central hood)	$Q = 150A$ $Q = 0.23A$
3 or less	$Q = 100A$ $Q = 0.16A$
Alternate formula	$Q = 100PD$ $Q = 0.16PD$

**507.13.3 Medium temperature.** The minimum airflow for Type I hoods used for medium-temperature appliances such as rotisseries, grills and ranges shall be determined as follows:

Number of exposed sides	Formula
	For SI:
4 (island or central hood)	$Q = 100A$ $Q = 0.16A$
3 or less	$Q = 75A$ $Q = 0.12A$
Alternate formula	$Q = 50PD$ $Q = 0.08PD$

**507.13.4 Low temperature.** The minimum airflow for Type I hoods used for low-temperature appliances such as medium-to-low-temperature ranges, roasters, roasting

ovens, pastry ovens and appliances approved for use under a Type II hood, such as pizza ovens, shall be determined as follows:

Number of exposed sides	Formula
	For SI:
4 (island or central hood)	$Q = 75A$ $Q = 0.12A$
3 or less	$Q = 50A$ $Q = 0.08A$
Alternate formula	$Q = 50PD$ $Q = 0.08PD$

**507.14 Noncanopy size and location.** Noncanopy-type hoods shall be located a maximum of 3 feet (914 mm) above the cooking surface. The edge of the hood shall be set back a maximum of 1 foot (305 mm) from the edge of the cooking surface.

**507.15 Capacity for noncanopy hoods.** In addition to all other requirements for hoods specified in this section, the volume of air exhausting through a noncanopy-type hood to the duct system shall be not less than 300 cfm per linear foot [0.5 m<sup>3</sup>/(s·m)] of the cooking appliances.

**507.16 Exhaust outlets.** Exhaust outlets located within the hood shall be located so as to optimize the capture of particulate matter. Each outlet shall serve not more than a 12-foot (3658 mm) section of hood.

**507.17 Performance test.** A performance test shall be conducted upon completion and before final approval of the installation of a ventilation system serving commercial food heat-processing appliances. The test shall verify the rate of airflow and proper operation as specified in this chapter. The permit holder shall furnish the necessary test equipment and devices required to perform the tests.

## SECTION 508 COMMERCIAL KITCHEN MAKEUP AIR

**508.1 Makeup air.** Makeup air shall be supplied during the operation of commercial kitchen exhaust systems that are provided for commercial food heat-processing appliances. The amount of makeup air supplied shall be approximately equal to the amount of exhaust air. The makeup air shall not reduce the effectiveness of the exhaust system. Makeup air shall be provided by gravity or mechanical means or both.

**Exception:** This section shall not apply to dwelling units.

**508.1.1 Makeup air temperature.** The temperature differential between the makeup air and the air in the conditioned space shall not exceed 10°F (6°C).

**Exceptions:**

1. Makeup air that is part of the air-conditioning system.
2. Makeup air that does not decrease the comfort conditions of the occupied space.



**SECTION 512  
SUBSLAB SOIL EXHAUST SYSTEMS**

**512.1 General.** When a subslab soil exhaust system is provided, the duct shall conform to the requirements of this section.

**512.2 Materials.** Subslab soil exhaust system duct material shall be air duct material listed and labeled to the requirements of UL 181 for Class O air ducts, or any of the following piping materials that comply with the plumbing code as building sanitary drainage and vent pipe: cast iron; galvanized steel; brass or copper pipe; copper tube of a weight not less than that of copper drainage tube, Type DWV; plastic piping.

**512.3 Grade.** Exhaust system ducts shall not be trapped and shall have a minimum slope of one-eighth unit vertical in 12 units horizontal (1-percent slope).

**512.4 Termination.** Subslab soil exhaust system ducts shall extend through the roof and terminate at least 6 inches (152 mm) above the roof and at least 10 feet (3048 mm) from operable openings or air intake.

**512.5 Identification.** Subslab soil exhaust ducts shall be permanently identified within each floor level by means of a tag, stencil or other approved marking.

**SECTION 513  
MAUSOLEUM RELIEF VENT**

**513.1 General.** A pressure relief vent shall be provided for each crypt. Niches shall not require pressure relief systems.

**513.2 Materials.** The pressure relief vent pipe and fittings shall conform to one of the standards listed in Table 513.2A and Table 513.2B.

**Table 513.2A  
CRYPT PRESSURE RELIEF PIPE**

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D 2661 ASTM F 628 CSA B181.1
Polyolefin pipe	CSA CAN/CSA B181.3
Polyvinyl chloride (PVC) plastic pipe (Type DWV)	ASTM D 2665 ASTM D 2949 ASTM F 891

**Table 513.2B  
CRYPT PRESSURE RELIEF PIPE**

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D 3311 CSA B181.1
Polyvinyl chloride (PVC) plastic pipe (Type DWV)	ASTM D 3311 ASTM D 2949 ASTM F 891
Plastic, general	ASTM F 409

**513.3 Pressure relief vent.** Each crypt shall have a pressure relief vent from the crypt to the roof of the mausoleum. The minimum nominal pipe size shall be 1 inch (25.4 mm). The system shall have a minimum of one-eighth unit vertical to 12 units horizontal (1-percent slope). The piping shall not be trapped or installed to trap water or condensate.

**513.4 Termination.** Crypt pressure relief system shall extend through the roof and terminate at least 6 inches (152 mm) above the roof and at least 10 feet (3048 mm) from any operable opening, air intake, or property line. The termination of the relief system pipe shall be done by a roof and vent cap compatible with the relief pressure pipe. The roof and vent cap shall be water proof.



## CHAPTER 6 DUCT SYSTEMS

### SECTION 601 GENERAL

**601.1 Scope.** Duct systems used for the movement of air in air-conditioning, heating, ventilating and exhaust systems shall conform to the provisions of this chapter except as otherwise specified in Chapters 5 and 7.

**Exception:** Ducts discharging combustible material directly into any combustion chamber shall conform to the requirements of NFPA 82.

**601.2 Air movement in egress elements.** Exits and exit access corridors shall not serve as supply, return, exhaust, relief or ventilation air ducts or plenums.

#### Exceptions:

1. Utilization of an exit access corridor as a source of makeup air for exhaust systems in rooms that open directly onto such corridors, such as toilet rooms, bathrooms, dressing rooms, smoking lounges and janitor closets, shall not be prohibited, provided that each such corridor is directly supplied with outdoor air at a rate not less than the rate of makeup air taken from the corridor.
2. The utilization of the space between the corridor ceiling and the floor or roof structure above as a return air plenum shall not be prohibited where the corridor is not required to be of fire-resistance-rated construction or is separated from the plenum by fire-resistance-rated construction.
3. Where located within a dwelling unit, the utilization of egress corridors as return air plenums shall not be prohibited.
4. Where located within tenant spaces of 1,000 square feet (93 m<sup>2</sup>) or less in area, utilization of exit access corridors as return air plenums shall not be prohibited.
5. Air transfer caused by pressure differentials shall not be prohibited when door clearances do not exceed those specified for fire doors in NFPA 80.
6. When used as part of an engineered smoke control system.
7. In Institutional Restrained Occupancies with grating partitions.

**601.3 Contamination prevention.** Exhaust ducts under positive pressure and venting systems shall not extend into or pass through ducts or plenums.

**601.4 Balanced Return Air.** Restricted return air occurs in buildings when returns are located in central zones and closed interior doors impede air flow to the return grill or when ceiling spaces are used as return plenums and fire walls restrict air movement from one portion of the return plenum to another. Provisions shall be made in both residential and commercial buildings to avoid unbalanced air flows and pressure differentials caused by restricted return air. Pressure differentials across closed doors where returns are centrally located shall be limited to 0.01 inch WC (2.5 pascals) or less. Pressure differentials across fire walls in ceiling space

plenums shall be limited to 0.01 inch WC (2.5 pascals) by providing air duct pathways or air transfer pathways from the high pressure zone to the low zone.

#### Exception:

1. Transfer ducts may achieve this by increasing the return transfer 1 1/2 times the cross sectional area (square inches) of the supply duct entering the room or space it's serving and the door having at least an unrestricted 1 inch undercut to achieve proper return air balance.
2. Transfer grilles shall use 50 square inches (of grille area) to 100 cfm (of supply air) for sizing through-the-wall transfer grilles and using an unrestricted 1 inch undercutting of doors to achieve proper return air balance.
3. Habitable rooms only shall be required to meet these requirements for proper balanced return air excluding bathrooms, closets, storage rooms and laundry rooms, except that all supply air into the master suite shall be included.

### SECTION 602 PLENUMS

**602.1 General.** A plenum is an enclosed portion of the building structure that is designed to allow air movement, and thereby serve as part of an air distribution system. Supply, return, exhaust, relief and ventilation air plenums shall be limited to uninhabited crawl spaces, areas above a ceiling or below the floor, attic spaces and mechanical equipment rooms. Plenums shall be limited to one fire area. Fuel-fired appliances shall not be installed within a plenum.

**602.2 Construction.** Plenum enclosures shall be constructed of materials permitted for the type of construction classification of the building.

Gypsum boards that form plenums shall be limited to return air systems where the air temperatures do not exceed 125°F (52°C) and the building and mechanical system design conditions are such that the gypsum board surface temperature will be maintained above the airstream dew-point temperature. Gypsum return air plenums shall not be incorporated in air-handling systems utilizing evaporative coolers.

**602.2.1 Materials exposed within plenums.** Except as required by Sections 602.2.1.1 through 602.2.1.3, materials exposed 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.

#### 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. Smoke detectors.

5. Condensate Pump Units with a total volume not exceeding 2 cubic feet.
6. Loudspeakers, loudspeaker assemblies, and their accessories exposed within a plenum shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a peak heat release rate not greater than 100 kW when tested in accordance with UL 2043.

**602.2.1.1 Wiring.** Combustible electrical or electronic wiring methods and materials, optical fiber cable, and optical fiber raceway exposed within a plenum shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread not greater than 5 feet (1524 mm) when tested in accordance with UL 910. Only type OFNP (plenum-rated non-conductive optical fiber cable) shall be installed in plenum-rated optical fiber raceways. Wiring, cable, and raceways addressed in this section shall be listed and labeled as plenum-rated and shall be installed in accordance with NFPA 70.

**602.2.1.2 Fire sprinkler piping.** Plastic fire sprinkler piping exposed within a plenum shall be used only in wet pipe systems and shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread of not greater than 5 feet (1524 mm) when tested in accordance with UL 1887. Piping shall be listed and labeled.

**602.2.1.3 Pneumatic tubing.** Combustible pneumatic tubing exposed within a plenum shall have a peak optical density not greater than 0.50, an average optical density not greater than 0.15, and a flame spread of not greater than 5 feet (1524 mm) when tested in accordance with UL 1820. Combustible pneumatic tubing shall be listed and labeled.

**602.3 Stud cavity and joist space plenums.** Stud wall cavities and the spaces between solid floor joists to be utilized as air plenums shall comply with the following conditions:

1. Such cavities or spaces shall not be utilized as a plenum for supply air.
2. Such cavities or spaces shall not be part of a required fire-resistance-rated assembly.
3. Stud wall cavities shall not convey air from more than one floor level.
4. Stud wall cavities and joist space plenums shall comply with the floor penetration protection requirements of the building code.
5. Stud wall cavities and joist space plenums shall be isolated from adjacent concealed spaces by approved fire-blocking as required in the *Florida Building Code, Building*.

**602.4 Flood hazard.** For structures located in a flood-hazard zone or a high-hazard zone, plenum spaces shall be located above the base flood elevation or shall be protected so as to prevent water from entering or accumulating within the plenum space during floods up to the base flood elevation. If the plenum spaces are located below the base flood elevation, they shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the base flood elevation.

## SECTION 603 DUCT CONSTRUCTION AND INSTALLATION

**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 building code. Ducts shall be constructed, braced, reinforced and installed to provide structural strength and durability. All transverse joints, longitudinal seams and fitting connections shall be securely fastened and sealed in accordance with the applicable standards of this section.

All enclosures which form the primary air containment passageways for air distribution systems shall be considered ducts or plenum chambers and shall be constructed and sealed in accordance with the applicable criteria of this section.

**603.1.1 Mechanical fastening.** All joints between sections of air ducts and plenums, between intermediate and terminal fittings and other components of air distribution systems, and between subsections of these components shall be mechanically fastened to secure the sections independently of the closure system(s).

**603.1.2 Sealing.** Air distribution system components shall be sealed to 100 percent closure with approved closure systems.

**603.1.3 Space provided.** Sufficient space shall be provided adjacent to all mechanical components located in or forming a part of the air distribution system to assure adequate access for (1) construction and sealing in accordance with the requirements of Section 603.1 of this code (2) inspection and (3) cleaning and maintenance. A minimum of 4" is considered sufficient space around air handling units.

**603.1.4 Product application.** Closure products shall be applied to the air barriers of air distribution system components being joined in order to form a continuous barrier or they may be applied in accordance with the manufacturer's instructions or appropriate industry installation standard where more restrictive.

**603.9.1 Approved Air Barriers.** The following air barriers are approved for use in mechanical closets:

1. One-half inch thick or greater gypsum wallboard, taped and sealed.
2. Other panelized materials having inward facing surfaces with an air porosity no greater than that of a duct product meeting Section 22 of UL 181 which are sealed on all interior surfaces to create a continuous air barrier.

**603.9.2 Approved Closure Systems.** The following closure systems are approved for use in mechanical closets:

1. Gypsum wallboard joint compound over taped joints between gypsum wallboard panels.
2. Sealants complying with the product and application standards of Section 603.4.2.1 for fibrous glass ductboard;
3. A suitable long-life caulk or mastic compliant with the locally adopted mechanical code for all applications.

**603.10 Enclosed Support Platforms.** Enclosed support platforms located between the return air inlet(s) from conditioned space and the inlet of the air handling unit or furnace, shall contain a duct section constructed entirely of rigid metal, rigid fibrous glass duct board, or flexible duct which is constructed and sealed according to the respective requirements of Section 603.1 and insulated according to the requirements of Sections 410 and 610 of Chapter 13 of the *Florida Building Code, Building*.

The duct section shall be designed and constructed so that no portion of the building structure, including adjoining walls, floors and ceilings, shall be in contact with the return air stream or function as a component of this duct section.

The duct section shall not be penetrated by a refrigerant line chase, refrigerant line, wiring, pipe or any object other than a component of the air distribution system.

Through-wall, through-floor and through-ceiling penetrations into the duct section shall contain a branch duct which is fabricated of rigid fibrous glass duct board or rigid metal and which extends to and is sealed to both the duct section and the grille side wall surface. The branch duct shall be fabricated and attached to the duct insert in accordance with Section 603.3 or Section 603.4.2, respective to the duct type used.

**603.11 Condensation.** Provisions shall be made to prevent the formation of condensation on the exterior of any duct.

**603.12 Location.** Ducts shall not be installed in or within 6 inches (152 mm) of the earth, except where such ducts comply with Section 603.7.

**603.13 Mechanical protection.** Ducts installed in locations where they are exposed to mechanical damage by vehicles or from other causes shall be protected by approved barriers.

**603.14 Weather protection.** All ducts including linings, coverings and vibration isolation connectors installed on the exterior of the building shall be adequately protected against the elements.

**603.15 Registers, grilles and diffusers.** Duct registers, grilles and diffusers shall be installed in accordance with the manufacturer's installation instructions, and shall have a flamespread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating not over 50 when tested in accordance with ASTM E84. Balancing dampers or other means of supply air adjustment shall be provided in the branch ducts or at each individual duct register, grille or diffuser.

**603.15.1 Floor registers.** Floor registers shall resist, without structural failure, a 200-pound (890 N) concentrated load on a 2-inch (51 mm) diameter disc applied to the most critical area of the exposed face.

## SECTION 604 INSULATION

**604.1 General.** Duct insulation shall conform to the requirements of Sections 604.2 through 604.11 and Chapter 13, Section 410.1.ABCD.2.1 or 610.1.ABC.2 of the *Florida Building Code, Building*.

**604.2 Surface temperature.** Ducts that operate at temperatures exceeding 120°F (49°C) shall have sufficient thermal insulation to limit the exposed surface temperature to 120°F (49°C).

**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. 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).

**604.4 Foam plastic insulation.** Foam plastic shall conform to the requirements of Section 604 of this code and of the *Florida Building Code, Building*.

**604.5 Appliance insulation.** Listed and labeled appliances that are internally insulated shall be considered as conforming to the requirements of Section 604.

**604.6 Penetration of assemblies.** Duct coverings shall not penetrate a wall or floor required to have a fire-resistance rating or required to be fireblocked.

**604.7 Identification.** External duct insulation and factory-insulated flexible duct shall be legibly printed or identified at intervals not greater than 36 inches (914 mm) with the name

of the manufacturer; the thermal resistance  $R$ -value at the specified installed thickness; and the flame spread and smoke-developed indexes of the composite materials. All duct insulation product  $R$ -values shall be based on insulation only, excluding air films, vapor retarders, or other duct components, and shall be based on tested  $C$ -values at 75°F (24°C) mean temperature at the installed thickness, in accordance with recognized industry procedures. The installed thickness of duct insulation used to determine its  $R$ -values shall be determined as follows:

1. For duct board, duct liner and factory-made rigid ducts not normally subjected to compression, the nominal insulation thickness shall be used.
2. For duct wrap, the installed thickness shall be assumed to be 75 percent (25-percent compression) of nominal thickness.
3. For factory-made flexible air ducts, the installed thickness shall be determined by dividing the difference between the actual outside diameter and nominal inside diameter by two.

**604.8 Lining installation.** Linings shall be interrupted at the area of operation of a fire damper and at a minimum of 6 inches (152 mm) upstream of and 6 inches (152 mm) downstream of electric-resistance and fuel-burning heaters in a duct system. Metal nosings or sleeves shall be installed over exposed duct liner edges that face opposite the direction of air flow.

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

**604.10 Service openings.** Service openings shall not be concealed by duct coverings unless the exact location of the opening is properly identified.

**604.11 Vapor retarders.** Where ducts used for cooling are externally insulated, the insulation shall be covered with a vapor retarder having a maximum permeance of 0.05 perm [2.87 ng/(s m<sup>2</sup> Pa)] or aluminum foil having a minimum thickness of 2 mils (0.051 mm). Insulations having a permeance of 0.05 perms [2.87 ng/(s m<sup>2</sup> Pa)] or less shall not be required to be covered. All joints and seams shall be sealed to maintain the continuity of the vapor retarder.

**604.12 Weatherproof barriers.** Insulated exterior ducts shall be protected with an approved weatherproof barrier.

**604.13 Internal insulation.** Materials used as internal insulation and exposed to the airstream in ducts shall be shown to be durable when tested in accordance with UL 181. Exposed internal insulation that is not impermeable to water shall not be used to line ducts or plenums from the exit of a cooling coil to the downstream end of the drain pan.

## SECTION 605 AIR FILTERS

**605.1 General.** Heating and air-conditioning systems of the central type shall be provided with approved air filters. Filters shall be installed in the return air system, upstream from any heat exchanger or coil, in an approved convenient location. Liquid adhesive coatings used on filters shall have a flashpoint not lower than 325°F (163°C).

**605.2 Approval.** Media-type and electrostatic-type air filters shall be listed and labeled. Air filters utilized within dwelling units shall be designed for the intended application and shall not be required to be listed and labeled.

**605.3 Airflow over the filter.** Ducts shall be constructed to allow an even distribution of air over the entire filter.

## SECTION 606 SMOKE DETECTION SYSTEMS CONTROL

**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.

**Exception:** Structures classified as R-3 occupancy type.

**606.2 Where required.** Smoke detectors shall be installed where indicated in Sections 606.2.1 through 606.2.3 and NFPA 90A-99.

**606.2.1 Supply air systems.** Smoke detectors shall be installed in supply air systems with a design capacity greater than 2,000 cfm (0.9 m<sup>3</sup>/s), in the supply air duct.

**Exception:** Smoke detectors are not required in the supply air system where the space served by the air distribution system is protected by a system of area smoke detectors in accordance with the *Florida Building Code, Building*. The area smoke detector system shall comply with Section 606.4.

**606.2.2 Common supply, return air and supply 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 (0.9 m<sup>3</sup>/s), the return air and supply air system shall be provided with smoke detectors in accordance with Section 606.2.1.

**606.2.3 Return and supply risers.** Where return air and supply air risers serve two or more stories and are part of a return air and supply 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 and between the air supply source and the first branch or take-off to the areas served.

3. Rooms or spaces containing solid fuel-burning appliances, provided that return-air inlets are located not less than 10 feet (3048 mm) from the fire box of such appliances.

6. A closet, bathroom, toilet room, kitchen, garage, mechanical room, boiler room or furnace room.

**918.7 Outside opening protection.** Outdoor air intake openings shall be protected in accordance with Section 401.6.

**918.8 Return-air limitation.** Return air from one dwelling unit shall not be discharged into another dwelling unit.

### SECTION 919 CONVERSION BURNERS

**919.1 Conversion burners.** The installation of conversion burners shall conform to ANSI Z21.8.

### SECTION 920 UNIT HEATERS

**920.1 General.** Unit heaters shall be installed in accordance with the listing and the manufacturer's installation instructions. Oil-fired unit heaters shall be tested in accordance with UL 731.

**920.2 Support.** Suspended-type gas-fired unit heaters shall be supported by elements that are designed and constructed to accommodate the weight and dynamic loads. Hangers and brackets shall be of noncombustible material. Suspended-type oil-fired unit heaters shall be installed in accordance with NFPA 31.

**920.3 Ductwork.** A unit heater shall not be attached to a warm-air duct system unless listed for such installation.

### SECTION 921 VENTED ROOM HEATERS

**921.1 General.** Vented room heaters shall be listed and labeled and shall be installed in accordance with the conditions of the listing and the manufacturer's instructions.

### SECTION 922 KEROSENE AND OIL-FIRED STOVES

**922.1 General.** Kerosene and oil-fired stoves shall be listed and labeled and shall be installed in accordance with the conditions of the listing and the manufacturer's installation instructions. Kerosene and oil-fired stoves shall comply with NFPA 31. Oil-fired stoves shall be tested in accordance with UL 896.

### SECTION 923 SMALL CERAMIC KILNS

**923.1 General.** The provisions of this section shall apply to kilns that are used for ceramics, have a maximum interior volume of 20 cubic feet (0.566 m<sup>3</sup>) and are used for hobby and noncommercial purposes.

**923.1.1 Installation.** Kilns shall be installed in accordance with the manufacturer's installation instructions and the provisions of this code.

### SECTION 924 OVENS AND FURNACES OVER 150,000 Btu/hr

**924.1 General.** Ovens and furnaces whose input exceeds 150,000 Btu per hour shall comply with NFPA 86.

### SECTION 925 ELECTRIC BASEBOARD CONVECTORS

**925.1 General.** Electric baseboard convectors shall be installed in accordance with the manufacturer's installation instructions.

### SECTION 926 RESIDENTIAL RADIANT HEATING SYSTEMS

**926.1 General.** Electric radiant heating systems shall be installed in accordance with the manufacturer's installation instructions and Chapter 27 of the *Florida Building Code*.

**926.2 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 Chapter 27 of the *Florida Building Code*.

**926.3 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 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.

**926.4 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.

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

**926.6 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 927

### RESIDENTIAL ELECTRIC DUCT HEATERS

**927.1 General.** Electric duct heaters shall be installed in accordance with the manufacturer's installation instructions and Chapter 27 of the *Florida Building Code, Building*. Electric furnaces shall be tested in accordance with UL 1995.

**927.2 Installation.** Electric duct heaters shall be installed so that they will not create a fire hazard. Class 1 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.

**927.3 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.

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

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

## SECTION 928

### VENTED RESIDENTIAL FLOOR FURNACES

**928.1 General.** Vented floor furnaces shall conform to ANSI/UL 729 and be installed in accordance with their listing, the manufacturer's installation instructions and the requirements of this code.

**928.2 Clearances.** Vented floor furnaces shall be installed in accordance with their listing and the manufacturer's installation instructions.

**928.3 Location.** Location of floor furnaces shall conform to the following requirements:

1. Floor registers of floor furnaces shall be installed not less than 6 inches (152 mm) from a wall.
2. Wall registers of floor furnaces shall be installed not less than 6 inches (152 mm) from the adjoining wall at inside corners.
3. The furnace register shall be located not less than 12 inches (305 mm) from doors in any position, draperies or similar combustible objects.
4. The furnace register shall be located at least 5 feet (1524 mm) below any projecting combustible materials.
5. The floor furnace burner assembly shall not project into an occupied under-floor area.
6. The floor furnace shall not be installed in concrete floor construction built on grade.
7. The floor furnace shall not be installed where a door can swing within 12 inches (305 mm) of the grill opening.

**928.4 Access.** An opening in the foundation not less than 18 inches by 24 inches (457 mm by 610 mm), or a trap door not less than 22 inches by 30 inches (559 mm by 762 mm) shall be provided for access to a floor furnace. The opening and passageway shall be large enough to allow replacement of any part of the equipment.

**928.5 Installation.** Floor furnace installations shall conform to the following requirements:

1. Thermostats controlling floor furnaces shall be located in the room in which the register of the floor furnace is located.
2. Floor furnaces shall be supported independently of the furnace floor register.
3. Floor furnaces shall be installed not closer than 6 inches (152 mm) to the ground. Clearance may be reduced to 2 inches (51 mm), provided that the lower 6 inches (152 mm) of the furnace is sealed to prevent water entry.
4. Where excavation is required for a floor furnace installation, the excavation shall extend 30 inches (762 mm) beyond the control side of the floor furnace and 12 inches (305 mm) beyond the remaining sides. Excavations shall slope outward from the perimeter of the base of the excavation to the surrounding grade at an angle not exceeding 45 degrees (0.79 rad) from horizontal.
5. Floor furnaces shall not be supported from the ground.

## SECTION 929

### VENTED RESIDENTIAL WALL FURNACES

**929.1 General.** Vented wall furnaces shall conform to ANSI/UL 730 and be installed in accordance with their listing, the manufacturer's installation instructions and the requirements of this code.



**929.2 Location.** The location of vented wall furnaces shall conform to the following requirements:

1. Vented wall furnaces shall be located so as not to cause a fire hazard to walls, floors, combustible furnishings or doors. Vented wall furnaces installed between bathrooms and adjoining rooms shall not circulate air from bathrooms to other parts of the building.
2. Vented wall furnaces shall not be located where a door can swing within 12 inches (305 mm) of the furnace air inlet or outlet measured at right angles to the opening. Doorstops or door closers shall not be installed to obtain this clearance.

**929.3 Installation.** Vented wall furnace installations shall conform to the following requirements:

1. Required wall thicknesses shall be in accordance with the manufacturer's installation instructions.
2. Ducts shall not be attached to a wall furnace. Casing extensions or boots shall only be installed when listed as part of a listed and labeled appliance.
3. A manual shut off valve shall be installed ahead of all controls.

**929.4 Access.** Vented wall furnaces shall be provided with access for cleaning of heating surfaces; removal of burners; replacement of sections, motors, controls, filters and other working parts; and for adjustments and lubrication of parts requiring such attention. Panels, grilles and access doors that must be removed for normal servicing operations shall not be attached to the building construction.

## **SECTION 930 VENTED RESIDENTIAL ROOM HEATERS**

**930.1 General.** Vented room heaters shall be tested in accordance with UL 1482 or UL 896 and installed in accordance with their listing, the manufacturer's installation instructions and the requirements of this code.

**930.2 Floor mounting.** Room heaters shall be installed on noncombustible floors or approved assemblies constructed of noncombustible materials that extend at least 18 inches (457 mm) beyond the appliance on all sides.

**Exceptions:**

1. Listed room heaters shall be installed on noncombustible floors, assemblies constructed of noncombustible materials or listed floor protectors with materials and dimensions in accordance with the appliance manufacturer's instructions.
2. Room heaters listed for installation on combustible floors without floor protection shall be installed in accordance with the appliance manufacturer's instructions.

