

Housing and Building Codes

State and local housing, property maintenance, and building codes contain a wide array of legal requirements pertaining to housing construction and maintenance. Housing and building codes, for example, typically contain provisions governing moisture, pests, and ventilation.

Many jurisdictions rely on “model” codes to provide the framework for local fire, building, housing, property maintenance, plumbing, electrical, energy, and mechanical codes. Currently, these model codes are developed by the International Code Council (ICC), which was founded in 1994 by three regional code associations. ICC has moved away from a regional approach to code development, toward the development of national model codes. The drawback to this national approach is that the codes are less able to account for local and regional factors such as climate and housing type. For current information on model code adoptions by state and local jurisdictions, see <http://www.iccsafe.org/government/adoptions.htm>.

The chart below highlights provisions found in model codes that address several attributes of a healthy home: dry (water and moisture control); toxin-free; well-ventilated (to ensure adequate indoor air quality); pest-free; and other (comfortable, for example). Brief summaries of the code sections are provided below the table, grouped according to topic (dry, etc.). (Explanatory notes or comments are in parentheses.)

Code	Dry (Water and Moisture Control)	Toxin-Free	Well-Ventilated (Indoor Air Quality Control)	Pest-Free	Other (e.g., comfortable)
International Property Maintenance Code (2000) (IPMC) ⁱ	§ 302.2 § 303.6 § 303.7 § 303.13 § 303.13.1 § 303.16 § 403.2 § 403.5 § 504.1 § 506.1	§ 304.3	§ 303.11 § 303.13.2 § 403.1 § 505.4 § 602.2 § 603.2 § 603.5	§ 302.5 § 303.5 § 303.13.1 § 303.14 § 303.16 § 303.17 § 306.1	§ 505.1 § 602.2 § 602.3
International Building Code (2000) (IBC) ⁱⁱ	§ 1202.2 § 1202.4.2.1 § 1209.3 § 1209.4 § 1403.2 § 1403.3 § 1404.2 § 1405.3		§ 1202.1 § 1202.2 § 1202.3 § 1202.4 § 1202.4.1	§ 1202.2.1 § 1202.3 § 2304.11.6 Appendix F	§ 1203.1

	§ 1405.3.1 § 1405.3.2 § 1503.1 § 1503.2 § 1503.2.1 § 1503.4 § 1504 § 1507 § 1510.3 § 1510.6 § 1803.3 § 1805.3.4 § 1806.1 § 1806.2 § 1806.2.1 § 1806.2.2 § 1806.3 § 1806.3.1 § 1806.3.2 § 1806.3.3 § 1806.4 § 1806.4.1 § 1806.4.2 § 1911.1 § 2104.1.8 § 2509.2 § 2509.3 § 2512.1.2				
International Energy Conservation Code (2000) (IECC) ⁱⁱⁱ	§ 502.1.1 § 503.3.3.5 § 602.1.5 § 802.1.2			§ 502.2.1 § 602.1.10	§ 503.3.2.1
International Mechanical Code (2000) (IMC) ^{iv}	§ 307.1 § 406.1 § 504.1 § 603.4.1 § 603.11 § 604.11 § 604.13 § 1002.1		§ 301.9 § 303.3 § 401.2 § 401.5 § 401.5.1 § 403.2.1 § 403.3 § 501.2 § 501.3 § 501.4 § 505.1 § 512 § 601.3	§ 401.6 § 504.4	§ 309.1

			§ 602.1		
			§ 701.1		
			§ 701.2		
			§ 701.3		
			§ 801.2		

Water and Moisture Control

IPMC § 302.2: Grading and Drainage. Premises must be graded to prevent the accumulation of stagnant water on the premises or within the building. (Stagnant water can provide a breeding ground for mosquitoes and other insects, and also can lead to mold growth.)

IPMC § 303.6: Exterior Walls. Exterior walls must be maintained free from holes and weatherproof. (Exterior walls must be capable of preventing dampness or water from entering the structure.)

IPMC § 303.7: Roofs and Drainage. The roof and flashing must not have defects that admit rain. Roof drainage must be adequate to prevent dampness in the walls or interior of the home, and roof drains and gutters must be in good repair and free of obstruction.

IPMC § 303.13: Window, Skylight and Door Frames. Windows, skylights, and door frames must be in good repair and weather tight. (If not weather tight, moisture problems can result.)

IPMC § 303.13.1: Glazing. Glazing materials must be free from cracks and holes. (Holes in glass can admit moisture and pests.)

IPMC § 303.16: Basement Hatchways. Basement hatchways must be maintained to prevent the entry of rodents, rain, and surface drainage water.

IPMC § 403.2: Ventilation/Bathrooms and Toilet Rooms. Bathrooms and toilet rooms must have at least one openable window, unless equipped with a mechanical ventilation system. Mechanical ventilation systems must discharge air to the outside, and may not recirculate the air. (Bathroom ventilation is important due to high humidity levels associated with baths and showers.)

IPMC § 403.5: Clothes Dryer Exhaust. Clothes dryer exhaust systems must be independent of other systems, and must be exhausted in accordance with the manufacturer’s instructions. (Clothes dryers should vent to the outside to prevent excessive humidity levels.)

IPMC § 504.1: Plumbing Systems and Fixtures/General. Plumbing fixtures must be properly installed and maintained in working order, free of leaks, obstructions and defects. (Plumbing leaks can cause moisture problems, which can lead to mold growth.)

IPMC § 506.1: Sanitary Drainage System/Maintenance. Every plumbing stack, vent, waste and sewer line must function properly and be free of leaks and obstructions. (Plumbing leaks can cause moisture problems, which can lead to mold growth.)

IBC § 1202.2: Ventilation/Attic Spaces. Ventilation openings must be protected against the entry of snow and rain (to prevent the entry of moisture).

IBC § 1202.4.2.1: Ventilation/Bathrooms. Rooms containing bathtubs, showers, and similar fixtures must be mechanically vented in accordance with the International Mechanical Code.

IBC § 1209.3: Surrounding Materials/Showers. Shower compartments and walls above bathtubs with installed shower heads must be finished with a smooth, non-absorbent surface up to a height of at least 70 inches above the drain.

IBC § 1209.4: Waterproof joints. Built-in tubs with showers must have waterproofed joints between the tub and adjacent wall (to keep water and moisture from getting into the supporting floor and framing).

IBC § 1403.2: Weather protection. Exterior walls must provide the building with a weather resistant exterior wall envelope, and must include flashing, except for concrete or masonry walls. The exterior wall envelope must be constructed so as to prevent water from accumulating within the wall assembly by providing a water-resistant barrier behind the exterior veneer, and a means for draining any water that enters. The wall assembly must be protected against condensation in accordance with the International Energy Conservation Code.

IBC § 1403.3: Vapor retarder. An interior non-corrodible vapor retarder must be provided. (Vapor retarders are designed to prevent the movement of moisture-laden air from the warm side of the wall to the cool side. In temperate climates, vapor retarders are placed on the interior (warm in winter) side of the wall cavity; in hot, humid climates, they are placed on the exterior (warm) side of the wall cavity. According to the Asthma Regional Coordinating Council of New England, walls should be designed to dry to both the interior and the exterior and basements should be designed to dry to the interior. Installing vapor barriers interferes with the ability of walls to dry in both directions, so their use should be limited to severely cold climates. Paper-faced cavity insulation should be used in place of plastic interior vapor barriers.)

IBC § 1404.2: Water-resistive barrier. At least one layer of asphalt felt must be attached to the sheathing, with flashing, to provide a continuous water-resistant barrier behind the exterior wall veneer.

IBC § 1405.3: Flashing. Flashing must be installed so as to prevent moisture from entering the through top and sides of exterior window and door openings; at the intersection of chimneys and frame walls; under and at the ends of copings and sills;

above projecting wood trim; at the intersection of exterior walls and porches or decks; at wall-roof intersections; and at built-in gutters. (Flashing protects walls and roofs from moisture by preventing water from entering at points where water is most likely to intrude.)

IBC § 1405.3.1: Exterior wall pockets. Wall pockets or crevices in which moisture can accumulate in exterior walls should be avoided or protected with caps, covers, flashing or other means to prevent water damage.

IBC § 1405.3.2: Masonry. Flashing and weepholes must be located in masonry above ground level to prevent water from penetrating the wall, and provide a means for moisture to escape.

IBC § 1503.1: Weather Protection/General. Roof decks must be covered with roof coverings, designed, installed and maintained to protect the building. (Roofing protects the building from water intrusion. Historically, the roof system is one of the most problematic areas of a building.)

IBC § 1503.2: Flashing. Flashing must be installed to prevent moisture from entering the wall through the joints in the coping, through moisture-permeable material, at intersections with the roof plane or at parapet wall penetrations.

IBC § 1503.2.1: Flashing/Locations. Flashing must be installed at wall and roof intersections; at gutters; where the roof changes slope or direction; and around roof openings. Where flashing is metal, it must be corrosion-resistant.

IBC § 1503.4: Roof Drainage. Design and installation of roof drainage systems must comply with the International Plumbing Code.

IBC § 1504: Roof Assemblies and Rooftop Structures/Performance Requirements. Roof decks and roof coverings must be wind and impact resistant.

IBC § 1507: Requirements for Roof Coverings. This section specifies the installation requirements for several types of roof coverings: asphalt shingles, clay and concrete tiles, metal roof panels, slate shingles, wood shingles, wood shakes, built-up roofs (e.g., coal-tar roofs), modified bitumen roofing, and others. Each type of roofing has a corresponding minimum slope requirement, to ensure adequate drainage, as well as minimum deck requirements such as solid wood sheathing or spaced sheathing. Underlayment also is specified for each type of covering. Underlayment serves to separate the roof deck from the roof covering, and provides additional protection against rain and moisture. Appropriate fasteners and proper attachment of roof coverings is specified. Ice dam protection is required in cold climates for some roof types. Flashing requirements also are specified.

IBC § 1510.3: Reroofing/Recovering vs. Replacement. New roof coverings must not be installed without first removing the existing roof coverings if the existing roof is water

soaked or has deteriorated to the point that it does not provide an adequate base for additional roofing. (An existing roof must be allowed to dry completely before new roof covering is applied, in order to avoid trapping moisture below the new layer of covering which could lead to deterioration of the new roof covering as well as the existing sheathing.)

IBC § 1510.6: Reroofing/Flashings. Flashings must be reconstructed during reroofing.

IBC § 1803.3: Site Grading. The ground immediately adjacent to the foundation must be sloped away from the building at a 5% incline for a distance of ten feet, or an appropriate method for diverting water away from the building must be used. (Grading prevents the accumulation of water around and under a building. In arid climates, grading requirements may be reduced.)

IBC § 1805.3.4: Foundation elevation. On graded sites, the top of the exterior foundation must extend above the elevation of the street gutter at the point of discharge or the inlet of an approved drainage device a minimum of 12 inches. (This protects the building from flooding due to heavy rain.)

IBC § 1806.1: Damp-proofing and Waterproofing/Where Required. Walls that retain earth and enclose interior spaces and floors below grade must be waterproofed or damp-proofed. (Damp-proofing is the application of coatings or other materials in order to prevent the passage of water under slight hydrostatic pressure; waterproofing is required to prevent the passage of water or water vapor under significant pressure.)

IBC § 1806.2: Damp-proofing Required. Where hydrostatic pressure will not occur, damp-proofing for walls and floors is required.

IBC § 1806.2.1: Damp-proofing Required/Floors. Damp-proofing materials must be installed between the floor and the base course (gravel), unless a separate floor is installed above the concrete slab, in which case the damp-proofing can be applied above the concrete slab. Where applied below the slab, damp-proofing should consist of 6-mil polyethylene or other approved material; above the slab, 4-mil polyethylene is acceptable. (This prevents moisture from entering below-ground spaces. Rigid insulation would be preferable.)

IBC § 1806.2.2: Damp-proofing Required/Walls. Damp-proofing materials for walls must be installed on the exterior surface of the wall, and extend from the top of the footing to above ground level.

IBC § 1806.3: Waterproofing Required. Where hydrostatic pressure exists, walls and floors must be waterproofed if the design does not include a groundwater control system.

IBC § 1806.3.1: Waterproofing Required/Floors. Floors requiring waterproofing must be concrete and designed to resist maximum hydrostatic pressures to which the

floor will be subjected. Waterproofing is accomplished by placing a membrane underneath the concrete slab.

IBC § 1806.3.2: Waterproofing Required/Walls. Walls requiring waterproofing must be waterproofed from the bottom of the wall to at least 12 inches above the maximum ground water level. The remainder of the wall must be damp-proofed.

IBC § 1806.3.3: Waterproofing Required/Joints and Penetrations. Joints in walls and floors, joints between the wall and floor and penetrations of the wall and floor must be made watertight (to ensure the effectiveness of waterproofing, and prevent water from entering the building or becoming trapped in the foundation walls or floor slab).

IBC § 1806.4: Subsoil Drainage System. Where hydrostatic pressure does not exist, damp-proofing must be applied, and a base installed under the floor, as well as a drain around the foundation perimeter.

IBC § 1806.4.1: Floor Base Course. Floors of basements must be placed over a floor base course at least 4 inches thick consisting of gravel or crushed stone. (The gravel or stone provides a capillary break so that moisture from the soil below will not rise to the underside of the floor. It can also act as a drainage system for water under the slab.)

IBC § 1806.4.2: Foundation Drain. A drain must be placed around the perimeter of a foundation consisting of gravel or crushed stone.

IBC § 1911.1: Minimum Slab Provisions/General. Floor slabs placed directly on the ground must be at least 3½ inches thick. A polyethylene vapor retarder or other approved material must be placed between the base course or subgrade and the concrete floor slab.

IBC § 2104.1.8: Masonry Construction/Weep Holes. In masonry construction, walls must be provided with weep holes. (Because masonry is not water tight, small holes are necessary to allow water to drain from masonry walls.)

IBC § 2509.2: Gypsum Board in Showers and Water Closets/Base for Tile. When gypsum board is used as a base for tile and wall panels in showers and tubs, water resistant gypsum backing board is required. (Ideally, gypsum board should not be used at all in wet areas. The backing paper on gypsum board provides excellent food for mold to grow. Alternatives to gypsum board include concrete masonry, ceramic tile on cement backer board, or cement plaster, which perform well in high-moisture areas.)

IBC § 2509.3: Gypsum Board in Showers and Water Closets/Limitations. Gypsum board, including water-resistant gypsum backing board may not be used over a vapor retarder in a shower or bathtub. (Although water-resistant gypsum board is required when used as a base for tiles or wall panels in showers and tubs under, in extreme conditions, even water-resistant gypsum board will not provide an adequate level of moisture protection. Installing water-resistant gypsum board over a vapor retarder would create a waterproof membrane on both sides of the gypsum board. Moisture would

become trapped in the gypsum board, causing it to fail. Ideally, gypsum board should not be used at all in wet areas.)

IBC § 2512.1.2: Exterior Plaster/Weep Screeds. For exterior plaster walls, a corrosion-resistant weep screed with a vertical attachment flange must be provided at the base of the exterior walls. The attachment flange must overlap the base of the water-resistant barrier on the wall cavity. (This will allow water that becomes trapped behind the plaster wall to run down the water-resistant barrier behind the exterior plaster, over the attachment flange, and drain to the exterior, not the interior, of the building.)

IECC § 502.1.1: Building Envelope Requirements/Moisture Control. In residential buildings of less than 4 stories, the building design must not create conditions of accelerated condensation. All framed walls, floors, and ceilings not ventilated to allow moisture to escape must be provided with a vapor retarder on the warm-in-winter side of the insulation. (See parenthetical to IBC § 1403.3 above for a cautionary note regarding vapor barriers.)

IECC § 503.3.3.5: Mechanical Ventilation. Automatic or gravity dampers that close when the HVAC system is not operating must be provided for outdoor air intake and exhausts. (This is intended to reduce air infiltration when the system is not operating. Air infiltration could lead to condensation, if, for example, warm moist air meets cooler air.)

IECC § 602.1.5: Basement Walls. Where the basement is not considered a conditioned space (heated or cooled), either the basement wall or the basement ceiling should be insulated. (According to the Asthma Regional Coordinating Council of New England, basements should be designed to be conditioned and dry, and should be insulated around their perimeters, not between floors. Insulating the basement ceiling impedes the ability of the basement to dry.)

IECC § 802.1.2: Building Envelope Requirements/Moisture Control. In residential buildings of 4 or more stories, all framed walls, floors, and ceilings not ventilated to allow moisture to escape must be provided with a vapor retarder on the warm-in-winter side of the insulation. (See parenthetical to IBC § 1403.3 above for a cautionary note regarding vapor barriers.)

IMC § 307.1: Condensate Disposal/Fuel-Burning Appliances. Liquid combustion products must be collected and discharged to an approved plumbing fixture or disposal area in accordance with the manufacturer's instructions. (Some appliances produce liquid by-products, which must be disposed of.)

IMC § 504.1: Clothes Dryer Exhaust/Installation. Clothes dryers must be exhausted in accordance with the manufacturer's instructions, be independent of all other systems, and convey any moisture and combustion products to the outside. (Clothes dryers emit high levels of moisture, which could lead to mold growth and building deterioration if vented to the indoors.)

IMC § 406.1: Ventilation of Uninhabited Spaces/General. Crawl spaces and attics must be provided with natural or mechanical ventilation. A mechanical system must be automatically controlled to operate when the relative humidity of the space exceeds 60 percent. (This can prevent excess moisture from building up in enclosed spaces. However, if the outdoor air has a higher relative humidity than the air in the enclosed space, the system would run continuously, and possibly increase humidity levels in the enclosed space.)

IMC § 603.4.1: Duct Construction and Installation/Gypsum Ducts. The use of gypsum boards to form ducts is limited to return air systems where the board surface temperature is maintained above the air stream dew-point temperature. Gypsum board ducts may not be used in air handling systems using evaporative coolers. (If the surface temperature of the gypsum board is lower than the air stream dew point temperature, water will condense on the surface of the gypsum board, causing it to deteriorate. Evaporative cooling equipment uses water as a cooling agent, resulting in increased moisture in the air stream, which could lead to mold growth and deterioration of the gypsum board.)

IMC § 603.11: Condensation. Provisions must be made to prevent the formation of condensation on the exterior of any duct. (Insulating ducts and covering them with a moisture barrier can prevent moisture vapor from condensing on the duct and insulation. Condensation on duct exteriors is typically a problem when ducts carrying cooled air pass through warm areas where humidity is not controlled. This provision does not address condensation on duct interiors, which can occur when ducts carrying warm, moist air pass through cooler areas.)

IMC § 604.11: Vapor Retarders. Where ducts used for cooling are externally insulated, the insulation must be covered with a vapor retarder. (Insulation alone will not prevent condensation unless it is impervious to moisture.)

IMC § 604.13: Internal Insulation. Internal insulation that is not impervious to water may not be used to line ducts or plenums from the exit of a cooling coil to the downstream end of the drain pan. (Insulation in this location could easily become wet, which could lead to mold growth.)

IMC § 1002.1: Water Heaters/General. Water heaters must be installed in accordance with the manufacturer's directions. (Ideally, hot water heaters should be installed in a room with a floor drain, and should be equipped with a shut-off valve, to minimize damage in the event of a leak.)

Toxin-Free

IPMC § 304.3: Interior Surfaces. All interior surfaces, including doors and windows, must be maintained in good, clean, and sanitary condition. Peeling, chipping, and flaking paint must be removed, repaired, or covered. Defective surface conditions also must be

corrected. (Deteriorated paint can pose significant hazards if the paint is lead-based. Ideally, the code also would require the use of lead-safe work practices when disturbing painted surfaces in buildings constructed prior to 1978, the year lead-based paint was banned for residential use in this country.)

Well-Ventilated

IPMC § 303.11: Chimneys and Towers. Chimneys must be structurally safe and in good repair. (Obstruction of chimneys that serve as a vent for fuel-burning appliances can lead to high levels of carbon monoxide.)

IPMC § 303.13.2: Openable Windows. Windows other than fixed windows must be easily openable. (Open windows provide natural ventilation.)

IPMC § 403.1: Ventilation/Habitable Space. Every habitable space must have at least one openable window.

IPMC § 505.4: Water Heating Facilities. Gas-burning water-heating facilities must not be located in any bathroom, toilet room, bedroom or other occupied room normally kept closed, unless adequate combustion air is provided. (Asphyxiation can result from inadequate combustion air.)

IPMC § 602.2: Heating Facilities/Residential Occupancies. Cooking appliances may not be used to provide space heating. (Fuel-fired cooking appliances typically are not vented, and therefore discharge combustion products directly to the occupied space. Prolonged use can result in high levels of carbon monoxide and other contaminants, particularly because windows likely will be closed to conserve heat.)

IPMC § 603.2: Removal of Combustion Products. Fuel-burning equipment and appliances must be connected to an approved chimney or vent. (Failure to vent properly can cause build-up of carbon monoxide.)

IPMC § 603.5: Combustion Air. A supply of air for complete combustion of the fuel and for ventilation must be provided for fuel-burning equipment. (Failure to supply adequate air can result in improper draft, soot production, increased carbon monoxide production, and risk of fire or explosion; failure to vent properly can cause build-up of carbon monoxide, high temperatures and increased risk of fire.)

IBC § 1202.1: Ventilation/General. Buildings must be provided with natural ventilation or mechanical ventilation.

IBC § 1202.2: Ventilation/Attic Spaces. Enclosed attics and rafter spaces formed where ceilings are applied directly to the underside of roofs must be cross-ventilated. Ventilation openings must be protected against the entrance of snow and rain (to prevent the entry of moisture).

IBC § 1202.3: Under-floor Ventilation. Crawl spaces must be cross-ventilated through foundation or exterior walls. In cold climates, ventilation instead can be to the interior (which may help to conserve energy, but could present a problem if high concentrations of radon gas are present). Less ventilation is required if the ground surface is treated with a vapor retardant material.

IBC § 1202.4: Natural Ventilation. Natural ventilation shall be through doors, windows, or other openings to the outdoors. Openings must be readily controllable by occupants.

IBC § 1202.4.1: Ventilation Area Required. Minimum openable area to the outdoors must be 4 percent of the floor area being ventilated.

IMC § 301.9: Fuel Types. Appliances that comprise part of the building's mechanical system may not be converted for use with a different type of fuel, unless approved and converted in accordance with the manufacturer's instructions. (Incorrectly performed fuel conversions can adversely impact the venting of combustion gases.)

IMC § 303.3: Equipment and Appliance Location/Prohibited Locations. Fuel-fired appliances may not be located in bedrooms, bathrooms, or storage closets, unless all combustion air is obtained from the outdoors, or it is a solid fuel-fired appliance not located in an enclosed space. (This is to avoid buildup of combustion gases, or the depletion of oxygen levels.)

IMC § 401.2: Ventilation Required. Every occupied space must be ventilated naturally or mechanically.

IMC § 401.5: Ventilation/Opening Location. Outside air exhaust and intake openings must be located at least 10 feet from lot lines, buildings, and the center of the street (if fronting on the street). (This prevents contaminants from being introduced into the ventilation system, and also prevents exhaust from entering into occupied areas or other buildings.)

IMC § 401.5.1: Ventilation/Intake Openings. Outside air intake openings must be located at least 10 feet from any contaminant sources, such as chimneys, plumbing vents, streets, parking lots, etc.

IMC § 403.2.1: Recirculation of Air. Air may be recirculated only if it exceeds the minimum outdoor airflow rate required under § 403.3. Ventilation air may not be recirculated from one dwelling to another. (Ideally, recirculation would not be allowed between *dwelling units* (single living units within the same building), in order to prevent the flow of contaminants such as environmental tobacco smoke from one unit to another.)

IMC § 403.3: Ventilation Rate. Ventilation systems must be designed to have the capacity to supply the appropriate corresponding minimum outdoor airflow rate, based upon maximum occupancy load and other factors.

IMC § 501.2: Exhaust Systems/Independent System Required. Mechanical exhaust systems for bathrooms must be independent of other exhaust systems.

IMC § 501.3: Exhaust Systems/Outdoor Discharge. The air removed by a mechanical exhaust system must be discharged to the outdoors, and may not be exhausted to an attic or crawl space.

IMC § 501.4: Exhaust Systems/Pressure Equalization. Mechanical exhaust systems must be designed to remove the quantity of air required to be exhausted. The volume of air supplied must be approximately equal to the volume of air exhausted.

IMC § 505.1: Domestic Kitchen Exhaust Equipment. Domestic range hoods and appliances should be vented to the outdoors, unless adequate natural or mechanical ventilation is provided.

IMC § 512: Subslab Soil Exhaust Systems. Radon mitigation systems are not required, but where they are installed, ducts must be constructed of specified materials, and must terminate at least 6 inches above the roof. Ducts also must be identified within each floor level.

IMC § 601.3: Duct Systems/Contamination Prevention. Exhaust ducts under positive pressure, chimneys, and vents must not extend into or pass through ducts. (This prevents cross-contamination from exhaust ducts, chimneys, etc. into the HVAC system.)

IMC § 602.1: Plenums/General. A plenum is an enclosed portion of the building designed to allow air movement, and serve as part of the air distribution system. Fuel-fired appliances may not be installed within a plenum. (This prevents the spread of combustion products throughout the building, and prevents flue gases from being drawn into the plenum space due to negative pressure that can exist in a plenum space.)

IMC § 701.1: Combustion Air/Scope. Chapter 7 of the IMC covers requirements for fuel-burning appliances burning solid or liquid fuel, other than gas-fired appliances, which are covered under the International Fuel Gas Code. Sections 702-707 set forth seven different methods for supplying adequate combustion and dilution air.

IMC § 701.2: Combustion and Dilution Air Required. Every room or space containing a fuel-burning appliance must be provided with combustion and dilution air. (Adequate combustion and dilution air is necessary to ensure complete combustion and proper draft and appliance venting in order to prevent buildup of carbon monoxide and soot, and to ensure proper functioning of appliances.)

IMC § 701.3: Circulation of Air. Mechanical exhaust systems, fireplaces, and other appliances operating in the same room from which combustion or dilution air is drawn must be installed so as to prevent their simultaneous operation from affecting the supply of combustion and dilution air.

IMC § 801.2: Chimneys and Vents/General. Fuel-burning appliances must discharge the products of combustion to a vent or chimney designed for the type of appliance used. (This ensures that combustion products such as carbon monoxide are properly removed from occupied spaces.)

Pest-Free

IPMC § 302.5: Rodent Harborage. Property exterior must be kept free from rodent harborage or infestation. If rodents are found, they should be eliminated using an approved method in a manner that is not injurious to human health. After extermination, measures should be taken to prevent reinfestation. (Ideally, the code would require or promote integrated pest management.)

IPMC § 303.5: Foundation Walls. Foundation walls must be maintained free from open cracks to prevent the entry of rodents and other pests.

IPMC § 303.13.1: Glazing. Glazing materials must be free from cracks and holes. (Holes in glass can admit moisture and pests.)

IPMC § 303.14: Window Screens. During [time period to be determined by code officials], doors, windows, and other outside openings required for ventilation must have tightly fitting screens of at least 16 mesh per inch. (Screens help to prevent pests from entering the home.)

IPMC § 303.16: Basement Hatchways. Basement hatchways must be maintained to prevent the entry of rodents, rain, and surface drainage water.

IPMC § 303.17: Guards for Basement Windows. Openable basement windows should have rodent shields, storm windows, or other barriers against the entry of rodents.

IPMC § 306.1: Infestation. Structures should be kept free of insect and rodent infestation. When insects or rodents are found, they should be exterminated using a process not injurious to human health. After extermination, measures should be taken to prevent reinfestation. (Ideally, the Code would require or promote integrated pest management.)

IBC § 1202.2.1. Openings into Attic. Exterior openings into the attic space must be covered with corrosion-resistant wire cloth screening, perforated vinyl or other similar material that will prevent the entry of birds, squirrels, rodents and other similar creatures into the building.

IBC § 1202.3. Openings for Under-Floor Ventilation. Ventilation openings must be covered with perforated plates, corrosion-resistant wire mesh or other covering to keep small animals out.

IBC § 2304.11.6: Termite Protection. In geographical areas where the hazard of termite damage is great, floor framing must be of naturally durable or preservative-treated wood, or provided with approved methods of termite protection.

IBC Appendix F: Rodent Proofing. Provides minimum mechanical methods for preventing the entry of rodents into buildings, including covering foundation wall vents with metal grills or plates; sealing openings in foundation and exterior walls created for pipes, cables and conduits; covering windows located within 2 feet of ground level with wire screens; and ensuring minimum clearance between doors and door jambs.

IECC § 502.2: Heating and Cooling Criteria/Table (footnote d). Slab edge insulation is not required for unheated slabs in areas of very heavy termite infestation probability. (This insulation can provide a pathway for termites.)

IECC § 602.1.10: Caulking, Sealants and Gasketing. All joints, seams, penetrations, openings and other sources of air leakage through the building envelope must be caulked, gasketed, weatherstripped, wrapped, or otherwise sealed to prevent uncontrolled air movement. (This helps to prevent the entry of pests and moisture into the building.)

IMC § 401.6: Outdoor Opening Protection. Air exhaust and intake openings terminating outdoors must be protected with corrosion-resistant screens or grills, and protected against weather conditions. (This protects against entry of pests and moisture.)

IMC § 504.4: Clothes Dryer Exhaust/Exhaust Installation. Dryer exhaust ducts must terminate outside the building, and be equipped with backdraft dampers, not screens. (The damper will prevent the entry of rodents. Screens are not permitted, because they could become clogged with lint.)

Comfortable

IPMC § 505.1: Water System/General. All sinks, lavatories, laundry facilities, bathtubs, and showers must be supplied with hot and cold running water.

IPMC § 602.2: Heating Facilities/Residential Occupancies. Dwellings must be provided with heating facilities capable of maintaining a temperature of 65°F (18°C) in all habitable rooms, bathrooms and toilet rooms. (Inadequate heat may prompt residents to use cooking appliances or other unsafe methods to heat the home.)

IPMC § 602.3: Heating Supply. Property owners who rent one or more dwelling units on terms, express or implied, to furnish heat must, [during time period to be specified], maintain a temperature of 65°F (18°C) in all habitable rooms, bathrooms and toilet rooms.

IBC § 1203.1: Temperature Control/Equipment and Systems. Interior spaces must be provided with active or passive heating systems capable of maintaining a minimum temperature of 68°F.

IECC § 503.3.2.1: HVAC System/System Controls. Each dwelling unit must be provided with thermostatic controls responding to temperature within the dwelling unit. (Occupants can control the temperature in the unit using a thermostat.)

IMC § 309.1: Space-Heating Systems. Interior spaces must have heating systems capable of maintaining a minimum temperature of 68°F.

References and Additional Information:

Environmental Protection Agency, *Model Standards and Techniques for Control of Radon in New Residential Buildings*, available at <http://www.epa.gov/iaq/radon/pubs/newconst.html>

Florida Radon Resistant Building Standards,
http://www.sbcci.org/Florida_Building_Code/changed/appen-e/APPENDIX-e.pdf

Texas Indoor Air Quality Guidelines for Government Buildings. These voluntary guidelines cover new and existing construction. They are available at http://www.tdh.state.tx.us/beh/IAQ/Gov_Bld_Gd.htm.

ⁱ The IPMC applies to existing residential and commercial structures and premises.

ⁱⁱ The IBC governs new construction in residential buildings 4 or more stories high. New construction in detached 1- and 2-family dwellings and townhouses not more than 3 stories high is regulated by the International Residential Code.

ⁱⁱⁱ The IECC sets forth alternative compliance approaches for new construction in both residential (1-and 2-family buildings, and multi-family buildings 3 or less stories in height) and commercial buildings (including residential buildings 4 or more stories high). For residential buildings, these approaches include a systems approach, which considers the entire building and its energy-using systems as a whole; an approach based on the performance of components in the building envelope; an approach based upon the performance of the building envelope as a whole; and others. Commercial buildings can comply using a prescriptive approach, which sets standards for the building envelope, mechanical, lighting, and service water-heating subsystems; a total building performance approach; or an energy cost budget approach. Therefore, the code provisions cited in this table may not be required in a particular building if that building is constructed using an alternative approach to compliance.

^{iv} The IMC governs the design, installation, maintenance, alteration, and inspection of permanently installed mechanical systems used to control environmental conditions within buildings. The IMC does not require the removal and replacement of existing mechanical systems, although work performed on existing systems must conform to the code's requirements for new work.