Part IV — Energy Conservation

CHAPTER 11
ENERGY EFFICIENCY

SECTION N1100
ADMINISTRATION

N1100.0 Scope. This code is a statewide uniform code and shall not be made more stringent or lenient by local government. The code provides for a uniform standard of energy efficiency by, at a minimum, setting forth minimum requirements for exterior envelopes and selection of heating, ventilating, air-conditioning and service water heating systems. This chapter shall apply to all new single- and two-family residential buildings and townhomes, to additions to existing residential buildings and manufactured homes, to renovations to existing residential buildings, with certain exceptions, to changes of occupancy type, to the site-installed components and features of manufactured homes at their first set-up, and to the installation or replacement of building systems and components with new products for which thermal efficiency standards are set by this code. New residential buildings, with the exception of those exempted below, and in accordance with the specific exceptions of individual sections shall be designed to comply with this chapter.

N1100.0.1 Exempt residential buildings. Residential buildings exempt from compliance with this chapter include those listed below:

1. Existing buildings except those considered renovated buildings, changes of occupancy type, or previously unconditioned buildings to which comfort conditioning is added.
2. Any building that is neither heated nor cooled by a mechanical system designed to control or modify the indoor temperature and powered by electricity or fossil fuels. Such building shall not contain electrical, plumbing or mechanical systems which have been designed to accommodate the future installation of heating or cooling equipment.
3. Any building of less than 1,000 square feet (93 m^2) whose primary use is not as a principal residence and which is constructed and owned by a natural person for hunting or similar recreational purposes; however, no such person may build more than one exempt building in any 12-month period.

N1100.0.2 Building systems. Thermal efficiency standards are set for the following building systems where new products are installed or replaced in existing buildings, and for which a permit must be obtained. Such systems shall meet the minimum efficiencies allowed for that system on Form N1100B for residential buildings.

1. Heating, ventilating or air-conditioning systems;
2. Service water or pool heating systems.

Exceptions:

1. Where part of a functional unit is repaired or replaced. For example, replacement of an entire HVAC system is not required because a new compressor or other part does not meet code when installed with an older system. If the unit being replaced is itself a functional unit, such as a condenser, it does not constitute a repair. Outdoor and indoor units that are not designed to be operated together must meet the U.S. Department of Energy certification requirements contained in Section N1107.AB.3.1.1 [13-607.AB.3.1.1]. Matched systems are required, and this match may be verified by any one of the following means:
    1. ARI (AHRI) data
    2. Accredited laboratory (example ARL labs)
    3. Manufacturer's letter
    4. Letter from registered P.E. State of Florida
2. Where existing components are utilized with a replacement system, such as air distribution system ducts, such components or controls need not meet code if meeting code would require that component's replacement.
3. Replacement equipment that would require extensive revisions to other systems, equipment or elements of a building where such replacement is a like-for-like replacement, such as through-the-wall condensing units and PTACs, in confined spaces.
4. HVAC equipment sizing calculations are not required for systems installed in existing buildings not meeting the definition of renovation in Section N1100.7.3.

N1100.0.3 Additions. Additions to existing residential buildings shall be considered new building construction and shall comply with the requirements of either Method A or B, as applicable. Additions that are unable to comply with code requirements for the addition alone may comply with the code by bringing the entire building into compliance with Section N1100.A.5.2.

N1100.0.4 Renovations. Renovated buildings shall, when applicable (see Section N1100.7.3), meet the prescriptive requirements contained in Method B for insulation, HVAC

systems, water heating systems and exterior envelope for those components being retrofitted or replaced.

N1100.0.5 Manufactured homes. Site-installed components of manufactured homes and residential manufactured buildings shall meet the applicable prescriptive requirements for those components.

N1100.0.6 Buildings permitted together. Residences in which two buildings are permitted together that are not connected by conditioned space shall be considered separate residences for the purposes of compliance with this code if the following conditions apply:

1. The secondary building has its own bathroom and kitchenette or bar; and
2. The secondary building is heated and/or cooled by a separate heating and/or cooling system.

N1100.0.7 Changes of occupancy type.

N1100.0.7.1 Buildings having a change of occupancy type to residential that were permitted prior to March 15, 1979, shall meet the requirements for renovations in Section N1100.0.4, as appropriate, for those components that are being retrofitted or replaced.

N1100.0.7.2 Buildings having a change of occupancy to residential that were permitted after March 15, 1979, shall comply with the requirements of this code for new buildings. Where the efficiency of a building component is not known, it shall be determined in accordance with the criteria specified in Section N1100.5.2.1.

N1100.0.8 Existing buildings.

N1100.0.8.1 Existing buildings not previously conditioned. Previously unconditioned existing buildings that were permitted prior to March 15, 1979, to which heating or cooling systems are added shall meet the prescriptive requirements contained in Method B for insulation, HVAC systems, water heating system and/or exterior envelope for those components that are being retrofitted or replaced. Existing buildings permitted after March 15, 1979, as unconditioned space to which comfort conditioning is added shall be considered additions and shall be brought into full compliance with this code.

N1100.0.8.2 Nonexempt existing buildings. Existing buildings not exempt from the provisions of this code for either the entire building or an addition to the building that are unable to meet one or more current prescriptive code minimum requirements may be exempt from those minimum requirements if the entire building is brought into compliance with Section N1100.A.5.2.

N1100.1 Methods of compliance. This chapter provides two methods by which residential buildings may be brought into compliance with this code.

N1100.1.1 Method A, the Whole Building Performance Method. This is a performance-based code compliance method which considers energy use for the whole building, both for the envelope and its major energy-consuming systems. Under this method, energy loads are calculated for the energy-consuming elements of an As-Built house and simultaneously for a Baseline house of the same configuration. The As-Built normalized modified energy loads shall be less than the Baseline energy loads to comply with this code. Applicable performance criteria in Subappendix B to Appendix G shall be followed. Applicable requirements described in Sections N1101 through N1113 shall also be met.

Method A may be applied to demonstrate code compliance for new residential construction, both single-family detached and multiple-family attached structures, and to additions to existing residential buildings. Existing buildings not exempt from this code may be brought into compliance by this method.

N1100.1.1.1 As an alternative to the computerized Compliance Method A, the Alternate Residential Point System Method hand calculation, Alternate Form 600A, may be used. All requirements specific to this calculation are located in Subappendix C to Appendix G. Buildings complying by this alternative shall meet all mandatory requirements of this chapter. Computerized versions of the Alternate Residential Point System Method shall not be acceptable for code compliance.

N1100.1.2 Method B, the Component Prescriptive Method. This is a prescriptive code compliance method for residences of three stories or less; additions; renovations to existing residential buildings; new heating, cooling and water heating systems in existing buildings; and site-added components of manufactured homes and manufactured buildings. Using this method, a residence would meet or exceed all applicable requirements for the list of minimum component requirements.

Exception: Method B shall not be applied in new construction, including additions, that incorporates the following:

1. Skylights.
2. Windows with greater than 16-percent glass to floor area.
3. Electric resistance heat.

N1100.1.2.1 Renovations. To comply with this method, all energy-related components or systems being installed or changed in the renovation shall meet the minimum prescriptive levels listed for that component.

N1100.2 Certification of compliance.

N1100.2.1 Code compliance preparation: Single-family residential, duplexes, townhouses. No license or registration is required to prepare the code compliance form for single-family residential, duplexes and townhouses. The person preparing the compliance form shall certify that the plans and specifications covered by the form, or amendments thereto, are in compliance with Chapter 11 of the *Florida Building Code, Residential*.

N1100.2.2 Code compliance certification. The building's owner, the owner's architect, or other authorized agent legally designated by the owner shall certify to the building official that the building is in compliance with Chapter 11 of the *Florida Building Code, Residential*, prior to receiving the permit to begin construction or renovation and shall comply with the following and Figure N1100.2.2:

1. All Chapter 11 compliance calculations and certifications shall be made using the 1100 series forms applicable to the compliance method used or the EnergyGauge USA Fla/Res computer program printout for the climate zone in which the building will be constructed.
2. If, during the building construction or renovation, alterations are made in the design, materials, or equipment which would diminish the energy performance of the building, an amended copy of the compliance certification shall be submitted to the building department agency by the building owner or his or her legally authorized agent on or before the date of final inspection.
3. The certified compliance form shall be made a part of the plans and specifications submitted for permitting the building.

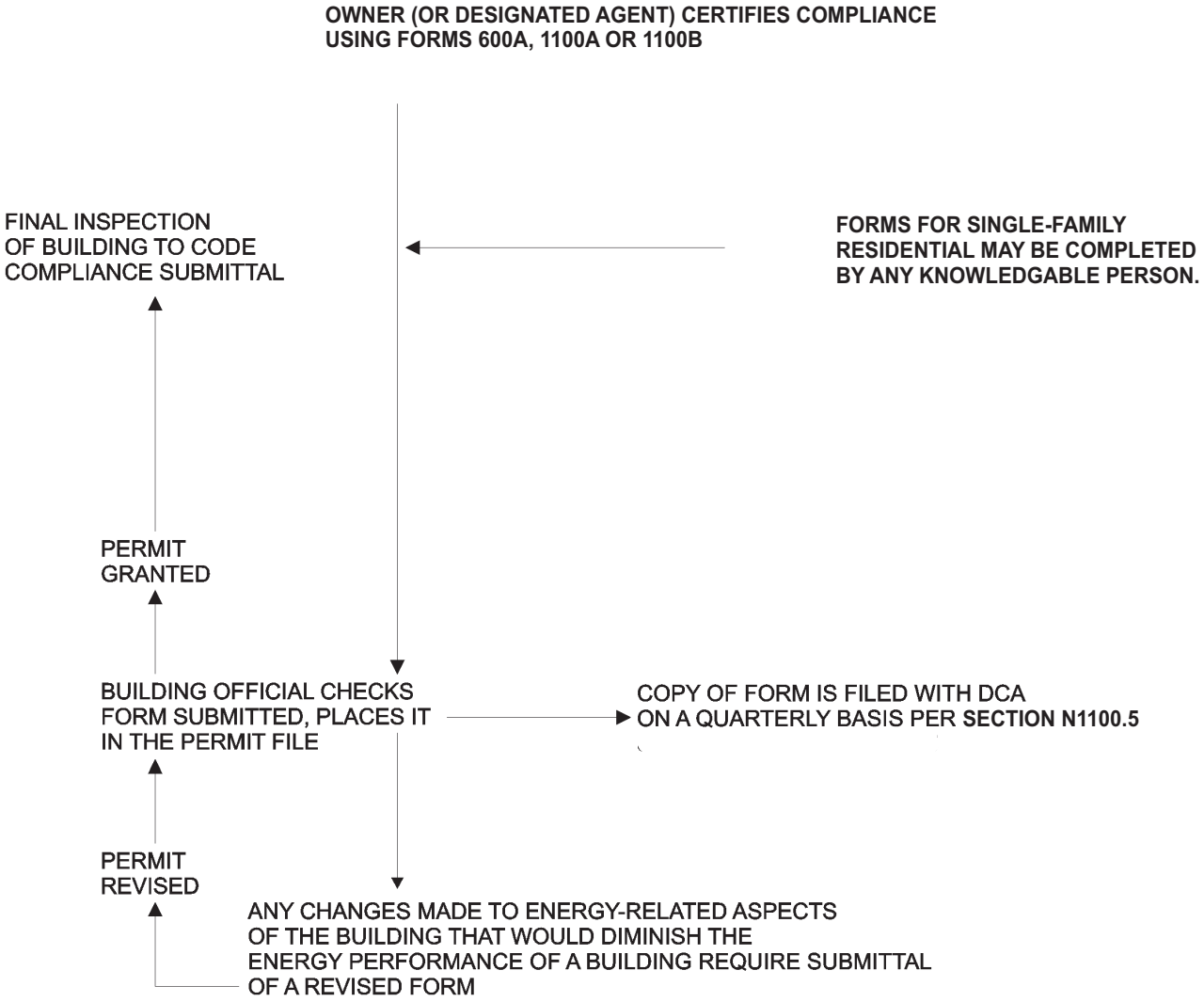


FIGURE N1100.2.2
CODE COMPLIANCE CHART

N1100.3 Forms. Code compliance by this chapter shall be demonstrated by completing and submitting to the building official the appropriate forms described below before a building permit is issued. An original form or EnergyGauge USA Fla/Res computerized printout, accompanied by a copy of the front page of the form as provided in Section N1100.4, shall be submitted to the building department to demonstrate compliance with this code before a building permit is issued.

Method A compliance	Form 1100A-08 (EG USA Fla/Res computerized printout)
or	Form 600A-08 (hand calculation)
Method B compliance	Form 1100B-08

N1100.3.1 Form 1100D-08 (desuperheater, heat recovery unit water heater efficiency certification). This form shall be submitted when water heating with a heat recovery unit is installed. The form is used to demonstrate that the net superheat recovery is equal to or greater than the 30 percent minimum required to obtain credit. The form shall be affixed to the heat recovery unit by the manufacturer.

Exception: If the heat recovery unit is listed in the current *ARDM Directory of Certified Refrigerant Desuperheater Heat Recovery Unit Water Heaters* as meeting the net heat recovery minimum and the unit bears the ARDM label signifying compliance with this code, the label shall serve as a certification in place of Form 1100D-08.

N1100.3.2 Availability. Forms may be found in Subappendix D of Appendix G or online at www.floridabuilding.org. The EnergyGauge USA Fla/Res computer program may be found online at www.energygauge.com.

N1100.4 Climate zones. The code compliance form used shall be specific to the climate zone in which the building will be located. See Figure N1100.4 or Subappendix A of Appendix G for climate zone locations.

North Florida	Climate zones 1, 2, 3
Central Florida	Climate zones 4, 5, 6
South Florida	Climate zones 7, 8, 9

N1100.5 Reporting. A copy of the front page of the form submitted to demonstrate code compliance shall be sent by the building department to the Department of Community Affairs on a quarterly basis for reporting purposes.

N1100.6 Information cards required.

N1100.6.1 EPL display card. The building official shall require that an energy performance level (EPL) display card be completed and certified by the builder to be accurate and correct before final approval of a residential building for occupancy. The EPL display card contains information indicating the energy performance level and efficiencies of components installed in a dwelling unit. The EPL display card shall be included as an addendum to the sales contract for both presold and nonpresold residential buildings in accordance with Section 553.9085, *Florida Statutes*.

N1100.6.2 HVAC efficiency card. The building official shall require that a completed HVAC efficiency card signed by a representative of the heating and cooling equipment contractor be posted in a prominent location on the cabinet of the indoor air handler or furnace of each heating or heating and cooling system installed in the building at the time of installation. Where single package units are installed, the card shall be posted on the unit itself. The card shall be durable, readable and shall contain the following information:

1. Manufacturer's name(s);
2. Brand name(s);
3. Model numbers of the furnace, compressor unit, and air handler (and evaporator coil, if the air handler can be equipped with more than one coil) for each system installed;
4. Efficiency ratings of the combined equipment for each system actually installed;
5. Name and address of the heating and or cooling company installing the equipment;
6. Signature line and date line, preceded by the statement, "With the authorization of the installing contractor I certify that the information entered on this card accurately represents the system installed."
7. Signature line and date line, preceded by the statement, "As the building official or the representative of the building official I certify that the information entered on this card accurately represents the system installed."

Exceptions:

1. If the information required above has been previously submitted and is included on the plans required at the building site, the HVAC efficiency card need not be provided. However, the plans shall be signed by a representative of the heating and cooling company installing the equipment and shall be available for inspection by building inspectors and by prospective buyers until the time of title transfer.
2. The Federal Trade Commission's energy guide label may be used to fulfill this requirement.

N1100.6.3 Insulation certification card. In cases where the *R*-value of insulation installed in either walls, ceilings or floors is not readily apparent, the local building official shall require that an *R*-value certification card signed by the insulation contractor be posted in a prominent location at the time of installation. The card shall contain, at a minimum, the following information:

1. Insulation manufacturer's name;
2. Insulation type;
3. *R*-value of insulation installed;
4. Thickness of insulation installed;
5. Location of insulation installed;
6. Indication that the installation has been checked and does not block attic ventilation.

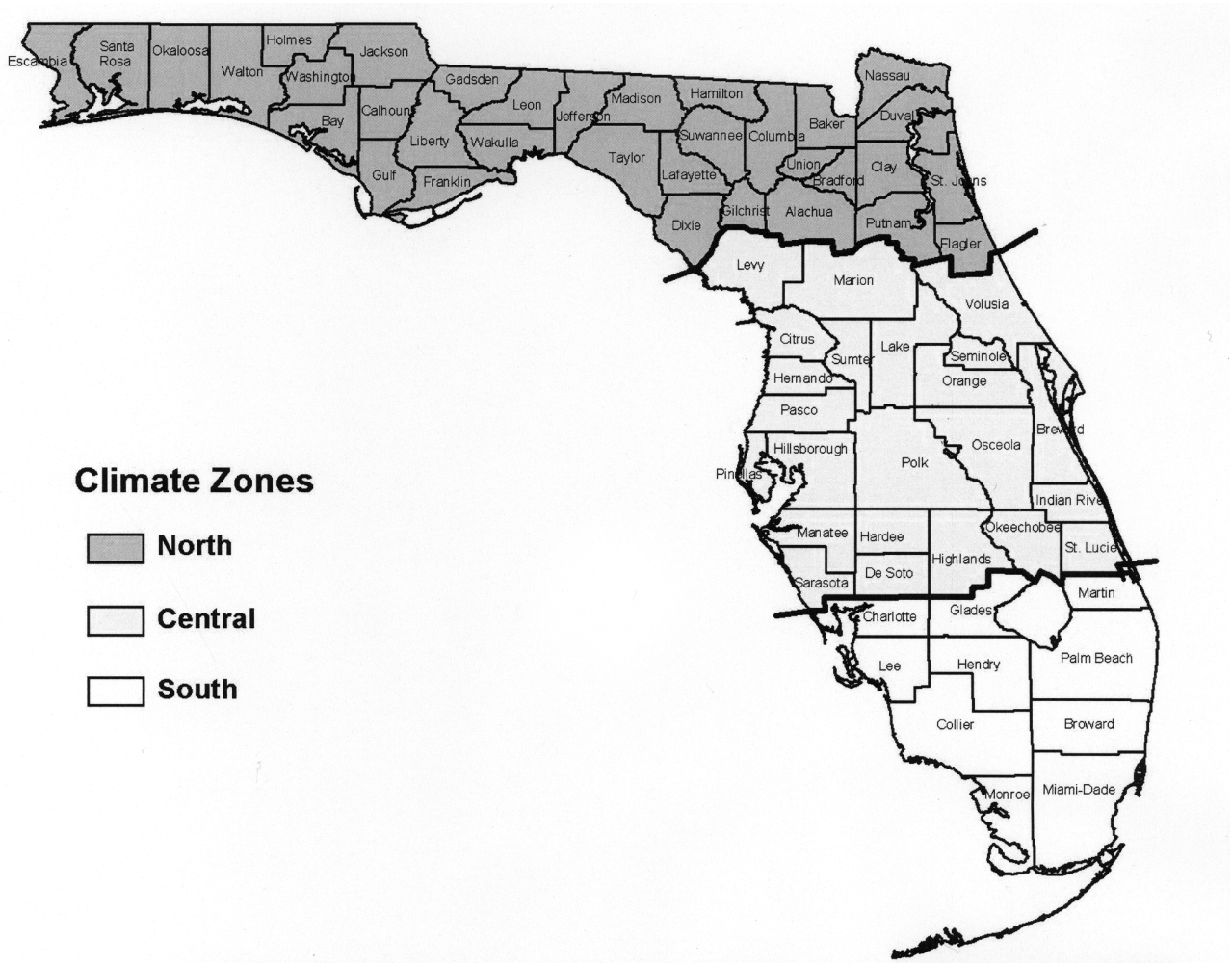


FIGURE N1100.4
CLIMATE ZONES

7. Name and address of the contractor installing the insulation;
8. Date of installation.

N1100.6.4 Energy guide labels. Energy guide labels required by the U.S. Federal Trade Commission for heating and cooling systems, water heaters and other appliances covered by federal law shall remain on those appliances until time of title transfer.

N1100.6.5 Window label. *U*-factors (thermal transmittances) or Solar Heat Gain Coefficient (SHGC) for glazed fenestration products shall be determined in accordance with NFRC 100, *Procedure for Determining Fenestration Product U-factors*, or NFRC 200, *Procedures for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence*, by an accredited, independent laboratory and labeled and certified by the manufacturer. See Section N1101.AB.1.

N1100.7 Definitions, general.

N1100.7.1 Application of terms. For the purpose of this code, certain abbreviations, terms, phrases, words, and their derivatives, shall be construed as set forth in this chapter.

N1100.7.2 Words not defined. Words not defined herein shall have the meanings stated in the *Webster's Ninth New Collegiate Dictionary*, as revised.

N1100.7.3 Definitions.

ADDITION. An extension or increase in conditioned floor area or height of a building or structure.

ADJACENT WALL, CEILING or FLOOR. A wall, ceiling or floor of a structure that separates conditioned space from enclosed but unconditioned space, such as an unconditioned attached garage, storage or utility room.

AEROSOL SEALANT. A closure product for duct and plenum systems, which is delivered internally to leak sites as aerosol particles using a pressurized air stream.

AFUE (ANNUAL FUEL UTILIZATION EFFICIENCY). The ratio of annual output energy to annual input energy including any non-heating season pilot input loss.

AIR BARRIER. Relating to air distribution systems, a material object(s) which impedes or restricts the free movement of air under specified conditions. For fibrous glass duct, the air barrier is its foil cladding; for flexible nonmetal duct, the air barrier is the nonporous core; and for sheet metal duct and air handling units, the air barrier is the metal in contact with the air stream. For mechanical closets, the air barrier may be a uniform panelized material such as gypsum wall board which meets ASTM C 36, or it may be a membrane which alone acts as an air barrier which is attached to a panel, such as the foil cladding of fibrous glass duct board.

Relating to the building envelope, air barriers comprise the planes of primary resistance to airflow between the interior spaces of a building and the outdoors and the planes of primary airflow resistance between adjacent air zones of a building, including planes between adjacent conditioned and unconditioned air spaces of a building. To be classed as an air barrier, a building plane must be substantially leak free; that is, it shall have an air leakage rate not greater than 0.5 cfm/ft^2 when subjected to an air pressure gradient of 25 pascal. In general, air barriers are made of durable, nonporous materials and are sealed to adjoining wall, ceiling or floor surfaces with a suitable long-life mastic. House wraps and taped and sealed drywall may constitute an air barrier but dropped acoustical tile ceilings (T-bar ceilings) may not. Batt insulation facings and asphalt-impregnated fiberboard and felt paper are not considered air barriers.

AIR CONDITIONING. The process of treating air to control its temperature, humidity, cleanliness and distribution to meet requirements of the conditioned space.

AIR DISTRIBUTION SYSTEMS. Includes all building elements (duct systems, air handling units, cavities of the building structure and mechanical closets) through which air is delivered to or from the conditioned spaces.

AIR DUCT. A passageway for conducting air to or from heating, cooling, air conditioning, or ventilating equipment, but not including the plenum. For material requirements see local mechanical codes.

AIR-HANDLING UNIT. The fan unit of a furnace and the fan-coil unit of a split-system, packaged air conditioner or heat pump.

AIR INFILTRATION. See "Infiltration."

ANNUAL FUEL UTILIZATION EFFICIENCY (AFUE). Efficiency descriptor of the ratio of annual output energy to annual input energy as developed in accordance with the requirements of U.S. Department of Energy (DOE) 10 CFR Part 430.

AS-BUILT. Building components to be actually installed in a structure. In some cases, this may be a worst-case condition. See "Worst Case."

ATTIC. An enclosed unconditioned space located immediately below an uninsulated roof and immediately above the ceiling of a building. For the roof to be considered insulated, roof insulation shall be at least the value required to meet Section N1104.ABC.1. See "Under Attic"; "Roof."

ATTIC RADIANT BARRIER. See "Radiant Barrier."

AUTHORITY HAVING JURISDICTION. The agency or agent responsible for enforcing this standard.

AUTOMATIC. Self-acting, operating by its own mechanism when actuated by some nonmanual influence, such as a change in current strength, pressure, temperature, or mechanical configuration.

BASELINE. Building component performance target or the total building performance target which is compared with the As-Built building performance.

BEDROOM. Any residential room which has an area of 70 square feet or more and a clothes storage closet, and is not part of the common living area. For the purposes of this code, the number of "main" bedrooms for homes of

three bedrooms or more is the total number of bedrooms less one. In one and two bedroom homes, all bedrooms are "main" bedrooms.

BTU (British Thermal Unit). The standard unit for measuring heat energy, such as the heat content of fuel. It is the amount of heat energy necessary to raise the temperature of one pound of water 1° F. 1 BTU per minute = 17.6 watts (1 Btu per hour = 3.412 watts).

BTU. Per kilowatt hour.

BUILDING. Any structure that includes provision for any of the following or any combination of the following: a space heating system, a space cooling system, or a service water heating system. For each purpose of this code each portion of a building separated from other portions by a rated fire wall shall be considered as a separate building. The term "building" shall be construed as if followed by the words "or part thereof."

BUILDING CONSTRUCTION. Any new building or structure or addition to any existing building or structure.

BUILDING ENVELOPE. The exterior plus the semi-exterior portions of a building. For the purposes of determining building envelope requirements, the classifications are defined as follows:

(a) building envelope, exterior: the elements of a building that separate conditioned spaces from the exterior.

(b) building envelope, semi-exterior: the elements of a building that separate conditioned space from unconditioned space or that enclose semiheated spaces through which thermal energy may be transferred to or from the exterior, or to or from unconditioned spaces, or to or from conditioned spaces.

BUILDING OFFICIAL. The officer or other designated representative authorized to act on behalf of the authority having jurisdiction.

BUILDING SYSTEMS. See "System."

CLERESTORY. That part of a building that rises clear of the roofs or other parts and whose walls contain windows for lighting the interior.

COEFFICIENT OF PERFORMANCE (COP) – COOLING. The ratio of the rate of heat removal to the rate of energy input, in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.

COEFFICIENT OF PERFORMANCE (COP) – (HEAT PUMP)—HEATING. Heating: the ratio of the rate of heat delivered to the rate of energy input, in consistent units, for a complete heat pump system, including the compressor and, if applicable, auxiliary heat, under designated operating conditions.

COMBUSTION APPLIANCE, DIRECT VENT. A system consisting of: (1) an appliance for indoor installation; (2) combustion air connections between the appliance and the outdoor atmosphere; (3) flue gas connections between the appliance and the vent cap; and, (4) vent cap for installation outdoors, supplied by the manufacturer and constructed so that all air for combustion is obtained from the outdoor atmosphere and all flue gases are discharged to the outdoor atmosphere.

COMFORT CONDITIONING. Treating air to control its temperature, relative humidity, cleanliness, and distribution to meet the comfort requirements of the occupants of the conditioned space.

COMFORT ENVELOPE. The area on a psychrometric chart enclosing all those conditions described as being comfortable in Figure 1, ASHRAE 55, *Thermal Environmental Comfort Conditions for Human Occupancy.*

COMMON CEILING. The ceiling/floor assembly separating conditioned tenancies, one above the other.

COMMON WALL. A wall separating conditioned tenancies, one next to the other.

CONDITIONED FLOOR AREA. The horizontal projection (outside measurements) of that portion of space which is conditioned directly or indirectly by an energy-using system. See "Floor Area"; "Gross Floor Area."

CONDITIONED SPACE. See "Space, (a) conditioned space." *

CONTROL DEVICE. A specialized device used to regulate the operation of equipment.

CONVENTIONAL ATTIC. Traditionally, the space directly below the roof and above the ceiling of the upper story of a building.

DEAD BAND. The range of values within which a sensed variable can vary without initiating a change in the controlled process.

DESIGN PROFESSIONAL. An architect or engineer licensed to practice in accordance with applicable state licensing laws.

DOOR. All operable opening areas (which are not fenestration) in the building envelope, including swinging and roll-up doors, fire doors, and access hatches. Doors that are more than one-half glass are considered fenestration. (See "Fenestration.") For the purposes of determining building envelope requirements, the classifications are defined as follows:

(a) Nonswinging: roll-up, sliding, and all other doors that are not swinging doors.

(b) Swinging: all operable opaque panels with hinges on one side and opaque revolving doors.

DOOR AREA. Total area of the door measured using the rough opening and including the door slab and the frame. See "Fenestration Area."

DRAWBAND. A fastener which surrounds and fastens a duct fitting with either the inner lining or the outer jacket of flexible ducts. Tension ties, clinch bands, draw ties, and straps are considered drawbands.

DUCT FITTING. Couplings that join sections of ducting together or to other air distribution system components. When used to join sections of flexible nonmetal duct, duct fittings are typically metal or other rigid material and have a raised bead or indented groove against which the drawband is secured. *Terminal fittings* join ducting to supply outlets and return inlets at the end of the distribution system and include register and return boots and register and return boxes. *Intermediate fittings* join flexible nonmetal duct to other sections of flexible nonmetal duct, to sections of other types of ducting, and to mechanical equipment and include collars, take-offs, tap-ins, sleeves, and the supply and return ends of air handlers and furnaces. See "Integral Flange Duct Collar Fitting."

DUCTS IN CONDITIONED SPACE. For ductwork to qualify as being in conditioned space, it shall be located interior to both the thermal envelope and the pressure envelope of the building. These spaces shall not require supply or return outlets. See Appendix G (B), Section B5.1.

DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation.

EFFECTIVE AIR SPACE EMITTANCE. The radiation heat transfer property E of an air space determined by the emissivity of the surfaces bounding that air space.

EFFICIENCY. Performance at specified rating conditions.

EFFICIENCY, HVAC SYSTEM. The ratio of useful energy output (at the point of use) to the energy input in consistent units for a designated time period, expressed in percent.

EMISSIVITY. The ratio of the total radiant flux emitted by a body to that emitted by an ideal black body at the same temperature.

EMITTANCE. The ratio of the radiant heat flux emitted by a specimen to that emitted by a black body at the same temperature and under the same conditions.

ENCLOSED SPACE. A volume substantially surrounded by solid surfaces such as walls, floors, roofs, and openable devices such as doors and operable windows.

ENCLOSED SUPPORT PLATFORM. A framed enclosure located inside or outside the conditioned space, which supports a furnace or central heating/air conditioning air handler and which may contain and protect a return duct section of the air distribution system.

ENCLOSURE. The case or housing of an apparatus, or the fence or walls surrounding an installation, to prevent personnel from accidentally contacting energized parts or protect equipment from physical damage.

ENERGY. The capacity for doing work. It takes a number of forms that may be transformed from one into another such as thermal (heat), mechanical (work), electrical, and chemical. Customary measurement units are British thermal units (Btu).

ENERGY EFFICIENCY RATIO (EER). The ratio of net cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions. See "Coefficient Of Performance (COP)—Cooling."

ENERGY FACTOR (EF). A measure of water heater overall efficiency.

ENERGY MANAGEMENT SYSTEM. A control system designed to monitor the environment and the use of energy in a facility and to adjust the parameters of local control loops to conserve energy while maintaining a suitable environment.

ENERGY PERFORMANCE LEVEL. An indicator of the energy-related performance of a building, including, but not limited to, the levels of insulation, the amount and type of glass, and the HVAC and water heating system efficiencies.

EQUIPMENT. Devices for comfort conditioning, or service water heating including, but not limited to, furnaces, boilers, air conditioners, heat pumps, chillers, water heaters, or other devices or installations.

EXISTING BUILDING. A building or portion thereof that was previously occupied or approved for occupancy by the authority having jurisdiction.

EXISTING EQUIPMENT. Equipment previously installed in an existing building.

EXISTING SYSTEM. A system or systems previously installed in an existing building.

EXTERIOR BUILDING ENVELOPE. See "Building Envelope."

EXTERIOR WALL. A wall of a structure that is exposed to outdoor climate conditions and which forms a boundary between a conditioned and an outdoor space. See "Adjacent Wall."

FACTORY-SEALED AIR-HANDLING UNIT. A furnace, or an air conditioner or heat pump fan-coil unit which is certified by its manufacturer to withstand, without leakage, an air pressure of 1 inch water gauge, when all air inlets, air outlets and condensate drain port(s), when present, are sealed at an air pressure of 1 inch water gauge with no greater than 2 design CFM discharge.

FENESTRATION. All areas (including the frames) in the building envelope that let in light, including windows, plastic panels, clerestories, skylights, glass doors that are more than one-half glass, and glass block walls. (See "Building Envelope" and "Door.")

(a) Skylight: a fenestration surface having a slope of less than 60 degrees from the horizontal plane. Other fenestration, even if mounted on the roof of a building, is considered vertical fenestration.

(b) Vertical fenestration: all fenestration other than skylights. Trombe wall assemblies, where glazing is installed within 12 inches (305 mm) of a mass wall, are considered walls, not fenestration.

FENESTRATION AREA. Total area of the fenestration measured using the rough opening and including the glazing, sash, and frame. For doors where the glazed vision area is less than 50 percent of the door area, the fenestration area is the glazed vision area. For all other doors, the fenestration area is the door area. See "Door Area."

FENESTRATION, VERTICAL. See "Fenestration"; "Skylight."

FIREWALL. Fire-resistant wall, having protective openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.

FLEXIBLE NONMETAL DUCT. A type of flexible air duct comprised of a wire-reinforced core (usually plastic), an insulation layer and an outer jacket (usually a durable reinforced plastic).

FLOOR, ENVELOPE. That lower portion of the building envelope, including opaque area and fenestration, that has conditioned or semiheated space above and is horizontal or tilted at an angle of less than 60 degrees from horizontal but excluding slab-on-grade floors. For the purposes of determining building envelope requirements, the classifications are defined as follows:

(a) Mass floor: a floor with a heat capacity that exceeds (1) 7 Btu/ft^2 × °F or (2) 5 Btu/ft^2 × °F provided that the floor has a material unit mass not greater than 120 lb/ft^3.

(b) Steel joist floor: a floor that (1) is not a mass floor and (2) that has steel joist members supported by structural members.

(c) Wood-framed and other floors: all other floor types, including wood joist floors. (See "Building envelope," "Fenestration," "Opaque area," and "Slab-on-grade floor").

FLOOR AREA, GROSS. The sum of the floor areas of the spaces within the building including basements, mezzanine and intermediate-floored tiers, and penthouses with headroom height of 7.5 feet (2286 mm) or greater. It is measured from the exterior faces of exterior walls or from the centerline of walls separating buildings, but excluding covered walkways, open roofed-over areas, porches and similar spaces, pipe trenches, exterior terraces or steps, chimneys, roof overhangs, and similar features.

(a) Gross building envelope floor area: the gross floor area of the building envelope, but excluding slab-on-grade floors.

(b) Gross conditioned floor area: the gross floor area of conditioned spaces.

(c) Gross lighted floor area: the gross floor area of lighted spaces.

(d) Gross semiheated floor area: the gross floor area of semiheated spaces. (See "Building envelope," "Floor," "Slab-on-grade floor," and "Space.")

FLUE DAMPER. A device in the flue outlet or in the inlet of or upstream of the draft control device of an individual, automatically operated, fossil fuel-fired appliance that is designed to automatically open the flue outlet during appliance operation and to automatically close the flue outlet when the appliance is in a standby condition.

FOSSIL FUEL. Fuel derived from a hydrocarbon deposit such as petroleum, coal, or natural gas derived from living matter of a previous geologic time.

FUEL. A material that may be used to produce heat or generate power by combustion.

GASKETING. A compressible, resilient elastic packing, made of foam rubber or of a synthetic foam polymer. A gasket is distinct from the components being joined and must be capable of closing all air leakage pathways between the air barriers of the joint and of creating an air-tight seal.

GLAZING. Sunlight-transmitting fenestration, including the area of sash, curbing or other framing elements, that enclose conditioned space. Glazing includes the area of sunlight-transmitting fenestration assemblies in walls bounding conditioned basements.

GRADE. The finished ground level adjoining a building at all exterior walls.

GROSS FLOOR AREA. The sum of the floor areas of the conditioned spaces including basements, mezzanine and intermediate-floored tiers and penthouses of headroom height 7.5 feet (2286 mm) or greater. It is measured from the exterior faces of exterior walls or from the centerline of walls separating buildings.

GROSS ROOF AREA. See "Roof Area, Gross."

GROSS WALL AREA. See Wall Area, Gross."

HEAT. The form of energy that is transferred by virtue of a temperature difference or a change in the state of a material.

HEAT CAPACITY (HC): The amount of heat necessary to raise the temperature of a given mass 1°F. Numerically, the sum of the products of the mass per unit area of each individual material in the roof, wall, or floor surface multiplied by its individual specific heat (Btu/ft^2 × °F).

HEAT PUMP. A mechanical refrigeration-cycle system which has been designed to accomplish space heating, water heating or both and, when the evaporator and condenser effects are reverse, may be used for space air conditioning or water chilling.

HEAT TRAP. A device or arrangement of the hot water piping leaving the water heater, constructed to counteract the convective forces of the heated water (thermosyphoning) during standby periods.

HEATED BUILDING. Any building with heating equipment installed at the time of construction, or designed for the future installation of heating equipment, using electricity or fossil fuels.

HEATED SLAB. A floor, usually constructed of concrete, that has heat energy supplied into the slab to provide heating to an interior space.

HEATED SPACE. See "Space."

HEATING SEASONAL PERFORMANCE FACTOR (HSPF). The total heating output of a heat pump during its normal annual usage period for heating (in Btu) divided by the total electric energy input during the same period.

HISTORIC. A building or space that has been specifically designated as historically significant by the adopting authority or is listed in The National Register of Historic Places or has been determined to be eligible for listing by the U.S. Secretary of the Interior.

HOME INSULATION. Any material, mainly insulation, used to retard the flow of heat through the building envelope that is tested and labeled with an installed *R*-value as required by the Federal Trade Commission rules, 16 U.S. Code of Federal Regulations (CFR) Part 460.

HUMIDISTAT. An automatic control device used to maintain humidity at a fixed or adjustable set point.

HVAC. Heating, ventilating and air conditioning.

HVAC SYSTEM. The equipment, distribution systems, and terminals that provide, either collectively or individually, the processes of heating, ventilating, or air conditioning to a building or portion of a building.

INDIRECTLY CONDITIONED SPACE. See "Space."

INDOOR. Within the conditioned building envelope.

INFILTRATION. The uncontrolled inward air leakage through cracks and crevices in any building element and around windows and doors of a building caused by pressure differences across these elements due to factors such as wind, inside and outside temperature differences (stack effect), and imbalance between supply and exhaust air systems.

INFILTRATION BARRIER. A product or system designed to limit the free passage of air through a building envelope component (wall, ceiling or floor). Such products and systems are sealed together to form a continuous barrier against air infiltration.

INSULATION. Material mainly used to retard the flow of heat. See "Home Insulation."

INSULATION BAFFLE. A device installed at the eave of an attic to prevent insulation from blocking the air flow channel between the soffits and attic.

INSULATION CHUTE. See "Insulation Baffle."

INSULATION DAMS. A flexible device used between rafters at the eave line of roof systems that holds loose fill insulation away from soffit ventilation areas and prevents blockage of natural ventilation flow.

INTEGRAL-FLANGE DUCT COLLAR FITTING. A type of duct collar fitting having a flange that is secured to and sealed to the cylinder or sleeve of the fitting. A function of this flange is to provide a surface which can be sealed to rigid ductboard.

KILOWATT (kW). The basic unit of electric power, equal to 1000 W.

KNEE WALLS. Vertical walls which separate conditioned space from the attic.

LABELED. Devices, appliances, assemblies or materials included in a list published by an approved testing laboratory, inspection agency or other organization concerned with product evaluation that maintains periodic inspection of production of listed equipment, appliances, assemblies or material, and whose listing states either that the equipment, appliances, assemblies, or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

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

MANUAL (NONAUTOMATIC). Requiring personal intervention for control. Nonautomatic does not necessarily imply a manual controller, only that personal intervention is necessary. See "Automatic."

MANUFACTURED BUILDING. A closed structure, building assembly, or system of subassemblies, which may include structural, electrical, plumbing, heating, ventilating, or other service systems manufactured for installation or erection, with or without other specified components, as a finished building or as part of a finished building, which shall include, but not be limited to, residential, commercial, institutional, storage, and industrial structures.

MANUFACTURED HOME. As defined by the U.S. Department of Housing and Urban Development, residential units constructed in accordance with Federal Mobile Construction and Safety Standards, pursuant to 42 USC 55.5401, et. seq. and 24 CFR 3282 and 3283.

MANUFACTURER. The company engaged in the original production and assembly of products or equipment or a company that purchases such products and equipment manufactured in accordance with company specifications.

MASS FLOOR. See "Floor."

MASS WALL. See "Wall."

MASTIC. A thick, pliable substance that adheres well to specific materials and is used for sealing different building components together. Mastics are often used in conjunction with fibrous or mesh fabric.

MASTIC RIBBONS. Malleable, putty-like packings which are used in applications akin to those of gasketing; but, they do not have elasticity of gasketing. Such mastics contain nearly 100-percent solids, require no curing in air, and are used without reinforcing fabric.

MECHANICAL CLOSET. For the purposes of this code, a closet used as an air plenum which contains the blower unit or air handler of a central air-conditioning or heating unit.

MECHANICAL COOLING. Reducing the temperature of a gas or liquid by using vapor compression, absorption, desiccant dehumidification combined with evaporative cooling, or another energy-driven thermodynamic cycle. Indirect or direct evaporative cooling alone is not considered mechanical cooling.

MECHANICAL EQUIPMENT PLENUM CHAMBER. In an air distribution system, that part of the casing, or an air chamber furnace, to or from which the air duct system delivers conditioned air.

MECHANICAL HEATING. Raising the temperature of a gas or liquid by use of fossil fuel burners, electric resistance heaters, heat pumps, or other systems that require energy to operate.

MECHANICAL VENTILATION. The process of supplying or removing air by mechanical means to or from any space.

MULTIPLE-FAMILY RESIDENCE. Any residential dwelling unit that is attached to another such unit by a common wall, ceiling or floor such as a duplex, townhouse, condominium or similar unit, regardless of ownership.

MULTI-ZONE SYSTEM(S). One or more HVAC system(s) designed to supply conditioned air to more than one independently serviced area of a building. Each zone must have separate thermostats and be separated by walls or closable doors not exceeding 40 square feet between zones.

NEW ENERGY. Energy, other than recovered energy, used for the purpose of heating or cooling. See "Energy."

NONAUTOMATIC. See "Manual."

NONDEPLETABLE ENERGY SOURCES. Sources of energy derived from incoming solar radiation, including photo-synthetic processes, wind, waves, and tides, lake or pond thermal differences and energy derived from the internal heat of the earth, including nocturnal thermal exchanges.

NONRECIRCULATING SYSTEM. A domestic or service hot water distribution system that is not a recirculating system.

NONRENEWABLE ENERGY. Energy derived from a fossil fuel source.

NONRESIDENTIAL. All occupancies other than residential. See "Residential."

NONSWINGING DOOR. See "Door."

OCCUPANCY. The purpose for which a building, or part thereof, is used or intended to be used. For the purposes of determining changes of occupancy for this code, the occupancy shall be considered the major occupancy group designations established by the locally adopted building code.

OPAQUE. All areas in the building envelope, except fenestration and building service openings such as vents and grilles. (See "Building envelope" and "Fenestration.")

OPERABLE APERTURE AREAS. Areas of windows, sliding glass doors and screened entry doors that provide access to incoming breezes in their fully extended open position.

ORIENTATION. The direction an envelope element faces, i.e., the direction of a vector perpendicular to and pointing away from the surface outside of the element.

OVERHANG HEIGHT. The vertical measure of the distance from the bottom of a window to the bottom of the overhang.

OVERHANG LENGTH. The horizontal measure of how far a window overhang projects out from the glass surface.

OVERHANG SEPARATION. The vertical measure of the distance from the top of a window to the bottom of an overhang.

PACKAGED TERMINAL AIR CONDITIONER (PTAC). A factory selected wall sleeve and separate unencased combination of heating and cooling components, assemblies, or sections. It may include heating capability by hot water, steam, or electricity and is intended for mounting through the wall to serve a single room or zone.

PACKAGED TERMINAL HEAT PUMP (PTHP). A PTAC capable of using the refrigerating system in a reverse cycle or heat pump mode to provide heat.

PERMANENTLY INSTALLED. Equipment that is fixed in place and is not portable or movable.

PLENUM. A compartment or chamber to which one or more ducts are connected, that forms a part of the air distribution system, and that is not used for occupancy or storage. A plenum often is formed in part or in total by portions of the building.

POOL. Any structure, basin, or tank containing an artificial body of water for swimming, diving, or recreational bathing. The term includes, but is not limited to, swimming pool, whirlpool, spa, hot tub.

POOL COVER. Sheet of material, typically plastic, designed to cover the water which may prevent water or heat loss through convection, radiation and evaporation.

POSITIVE INDOOR PRESSURE. A positive pressure condition within a conditioned space caused by bringing in more outside air than the amount of air that is exhausted and/or lost through air leakage.

POST OR PIER CONSTRUCTION. Raised wood floor supported above grade on posts or piers with unenclosed space beneath.

PRESSURE ENVELOPE. The primary air barrier of a building; that part of the envelope that provides the greatest resistance to air flow to or from the building.

PRESSURE-SENSITIVE TAPE. Tape used for sealing duct system components and air barriers which adheres when pressure is applied and is not heat activated.

PRIMARY LIVING AREA. A family room or great room, or a living room if no family room or great room is present. Formal living rooms, where a family room or great room is present, dining rooms and kitchens are not considered primary living areas.

RADIANT BARRIER SYSTEM (RBS). A building construction consisting of a low emittance (normally 0.1 or less) surface (usually aluminum foil) bounded by an open air space. An RBS is used for the sole purpose of limiting heat transfer by radiation and is not specifically intended to reduce heat transfer by convection or conduction.

RADIANT HEATING SYSTEM. A heating system that transfers heat to objects and surfaces within the heated space primarily (greater than 50 percent) by infrared radiation.

RATED *R*-VALUE OF INSULATION. The thermal resistance of the insulation alone as specified by the manufacturer in units of $h \cdot ft^2 \cdot °F/Btu$ at a mean temperature of 75°F. Rated *R*-value refers to the thermal resistance of the added insulation in framing cavities or insulated sheathing only and does not include the thermal resistance of other building materials or air films. See "Thermal Resistance."

READILY ACCESSIBLE. Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc. In public facilities, accessibility may be limited to certified personnel through locking covers or by placing equipment in locked rooms.

RECIRCULATING SYSTEM. A domestic or service hot water distribution system that includes a closed circulation circuit designed to maintain usage temperatures in hot water pipes near terminal devices (e.g., lavatory faucets, shower heads) in order to reduce the time required to obtain hot water when the terminal device valve is opened. The motive force for circulation is either natural (due to water density variations with temperature) or mechanical (recirculation pump).

REFLECTANCE. The ratio of the light reflected by a surface to the light incident upon it.

RENOVATION. Any structural repair, reconstruction or restoration to a structure, the costs of which equals or exceeds, over a one-year period, a cumulative total of 30 percent of the assessed value of the structure when that value is assessed, either:

1. Before the improvement or repair is started; or
2. Before the damage occurred, if the structure has been damaged.

For the purposes of this code, renovation occurs when the first alteration of any wall, ceiling, floor, or other structural part or mechanical system of the building commences, whether or not that alteration affects the external dimensions of the structure.

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

REPLACEMENT. The installation of part or all of an existing mechanical or electrical system in an existing building.

RESET. Automatic adjustment of the controller set point to a higher or lower value.

RESIDENTIAL. Spaces in buildings used primarily for living and sleeping. Residential spaces include, but are not limited to, dwelling units, hotel/motel guestrooms, dormitories, nursing homes, patient rooms in hospitals, lodging houses, fraternity/sorority houses, hostels, prisons, and fire stations.

RESISTANCE, ELECTRIC. The property of an electric circuit or of any object used as part of an electric circuit that determines for a given circuit the rate at which electric energy is converted into heat or radiant energy and that has a value such that the product of the resistance and the square of the current gives the rate of conversion of energy.

RETROFIT. Modification of existing equipment or systems to incorporate improved performance of operation.

ROOF. The upper portion of the building envelope, including opaque areas and fenestration, that is horizontal or tilted at an angle of less than 60 degrees from horizontal. For the purposes of determining building envelope requirements, the classifications are defined as follows:

(a) Attic and other roofs: all other roofs, including roofs with insulation entirely below (inside of) the roof structure (i.e., attics, cathedral ceilings, and single-rafter ceilings), roofs with insulation both above and below the roof structure, and roofs without insulation but excluding metal building roofs.

(b) Metal building roof: a roof that is constructed with (a) a metal, structural, weathering surface, (b) has no ventilated cavity, and (c) has the insulation entirely below deck (i.e., does not include composite concrete and metal deck construction nor a roof framing system that is separated from the superstructure by a wood substrate) and

whose structure consists of one or more of the following configurations: metal roofing in direct contact with the steel framing members or (2) insulation between the metal roofing and the steel framing members or (3) insulated metal roofing panels installed as described in (1) or (2).

(c) Roof with insulation entirely above deck: a roof with all insulation (1) installed above (outside of) the roof structure and (2) continuous (i.e., uninterrupted by framing members).

(d) Single-rafter roof: a subcategory of attic roofs where the roof above and the ceiling below are both attached to the same wood rafter and where insulation is located in the space between these wood rafters.

ROOF AREA, GROSS. The area of the roof measured from the exterior faces of walls or from the centerline of party walls. See "Roof"; "Wall."

ROOF ASSEMBLY. All components of the roof/ceiling envelope through which heat flows, thereby creating building heat loss or gain, where such assembly is exposed to outdoor air and encloses a conditioned space. The gross area of a roof assembly consists of the total interior surface of such assembly, including skylights exposed to the conditioned space.

ROOM AIR CONDITIONER. An encased assembly designed as a unit to be mounted in a window or through a wall, or as a console. It is designed primarily to provide direct delivery of conditioned air to an enclosed space, room, or zone. It includes a prime source of refrigeration for cooling and dehumidification and a means for circulating and cleaning air. It may also include a means for ventilating and heating.

SEAL or SEALING – AIR DUCT. The use of closure products either welds, mastic, mastic plus embedded fabric, adhesives, caulking, gaskets, pressure sensitive tapes, heat-activated tapes or combinations thereof as allowed by specific sections of this code, to close cracks, joints, seams, and other openings in the air barriers of air duct, air-handling units, and plenum chambers for the purpose of preventing air leakage. No joint of opening from which a closure product is absent shall be considered sealed unless considered otherwise in specific cases identified by this code. Closeness of fit between mated parts alone shall not be considered a seal.

SEASONAL COEFFICIENT OF PERFORMANCE – COOLING (SCOPC). The total cooling output of an air conditioner during its normal annual usage period for cooling divided by the total electric energy input during the same period in consistent units (analogous to the SEER but for IP or other consistent units).

SEASONAL COEFFICIENT OF PERFORMANCE—HEATING (SCOPH). The total heating output of a heat pump during its normal annual usage period for heating divided by the total electric energy input during the same period in consistent units (analogous to the HSPF but for IP or other consistent units).

SEASONAL ENERGY EFFICIENCY RATIO (SEER). The total cooling output of an air conditioner during its normal annual usage period for cooling (in Btu) divided by the total electric energy input during the same period (in W_h).

SERVICE WATER HEATING. Heating water for domestic or commercial purposes other than space heating and process requirements.

SETBACK. Reduction of heating (by reducing the set point) or cooling (by increasing the set point) during hours when a building is unoccupied or during periods when lesser demand is acceptable.

SET POINT. Point at which the desired temperature (°F) of the heated or cooled space is set.

SHADING COEFFICIENT (SC). The ratio of solar heat gain at normal incidence through glazing to that occurring through $^1/_8$-inch thick clear, double-strength glass. Shading coefficient, as used herein, does not include interior, exterior, or integral shading devices.

SINGLE-FAMILY RESIDENCE. Detached residential building suited for tenancy by one family unit.

SINGLE PACKAGE VERTICAL AIR CONDITIONER (SPVAC). A type of air-cooled small or large commercial package air conditioning and heating equipment; factory assembled as a single package having its major components arranged vertically, which is an encased combination of cooling and optional heating components; it intended for exterior mounting on, adjacent interior to, or through an outside wall; and is powered by single or three-phase current. It may contain separate indoor grille(s), outdoor louvers, various ventilation options, indoor free air discharge, ductwork, wall plenum or sleeve. Heating components may include electrical resistance, steam, hot water, gas or no heat but may not include reverse cycle refrigeration as a heating means.

SINGLE PACKAGE VERTICAL HEAT PUMP (SPVHP). An SPVAC that utilizes reverse cycle refrigeration as its primary heat source, with secondary supplemental heating by means of electrical resistance, steam, hot water or gas.

SINGLE-RAFTER ROOF. See "Roof."

SINGLE-ZONE SYSTEM. An HVAC system serving a single HVAC zone.

SINGLE ASSEMBLY. A roof and ceiling structure that is constructed as one unit with no attic space in between.

SITE-INSTALLED COMPONENTS AND FEATURES. Equipment, materials, measures, practices and features which are affixed to a new manufactured home at its first set-up that are not initially installed by the manufacturer.

SITE-RECOVERED ENERGY. Waste energy recovered at the building site that is used to offset consumption of purchased fuel or electrical energy supplies.

SITE-SOLAR ENERGY. Thermal, chemical, or electrical energy derived from direct conversion of incident solar radiation at the building site and used to offset consumption of purchased fuel or electrical energy supplies. For the purposes of applying this standard, site-solar energy shall not include passive heat gain through fenestration systems.

SKYLIGHT. See "Fenestration."

SKYLIGHT WELL. The shaft from the skylight to the ceiling.

SLAB-ON-GRADE FLOOR. That portion of a slab floor of the building envelope that is in contact with the ground and that is either above grade or is less than or equal to 24 inches (610 m) below the final elevation of the nearest exterior grade.

(a) Heated slab-on-grade floor: a slab-on-grade floor with a heating source either within or below it.

(b) Unheated slab-on-grade floor: a slab-on-grade floor that is not a heated slab-on-grade floor.

SOLAR ENERGY SOURCE. Source of thermal, chemical, or electrical energy derived from direct conversion of incident solar radiation at the building site.

SOLAR ENERGY SYSTEM. A complete set of coordinated components, which may be comprised of collectors, piping, pumps, heat exchangers, photovoltaic (PV) arrays, wiring, controls, power converters, and applicable storage, the design of which is intended to convert and utilize incident solar radiation to either heat water for hot water or space conditioning needs or to produce photovoltaic (PV) power for electrical needs.

SOLAR HEAT GAIN COEFFICIENT (SHGC). The ratio of the solar heat gain entering the space through the fenestration area to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space. See "Fenestration area."

SPACE. An enclosed space within a building. The classifications of spaces are as follows for the purpose of determining building envelope requirements:

(a) Conditioned space: a cooled space, heated space, indirectly conditioned space or unvented attic assembly defined as follows:

(1) Cooled space: an enclosed space within a building that is cooled by a cooling system whose sensible output capacity exceeds 5 Btu/h·ft^2 of floor area.

(2) Heated space: an enclosed space within a building that is heated by a heating system whose output capacity relative to the floor area is greater than or equal than 5 Btu/h × ft^2.

(3) indirectly conditioned space: an enclosed space within a building that is not a heated space or a cooled space, which is heated or cooled indirectly by being connected to adjacent space(s), provided (a) the product of the *U*-factor(s) and surface area(s) of the space adjacent to connected space(s) exceeds the combined sum of the product of the *U*-factor(s) and surface area(s) of the space adjoining the outdoors, unconditioned spaces, and to or from semiheated spaces (e.g., corridors) or (b) that air from heated or cooled spaces is intentionally transferred (naturally or mechanically) into the space at a rate exceeding 3 air changes per hour (ACH) (e.g., atria).

(4) Unvented attic assembly: as defined in Section R806.4. These spaces shall not require supply or return outlets.

(b) Semiheated space: an enclosed space within a building that is heated by a heating system whose output capacity is greater than or equal to 3.4 Btu/h·ft^2 of floor area but is not a conditioned space.

(c) Unconditioned space: an enclosed space within a building that is not a conditioned space or a semiheated space. Crawl spaces, attics, and parking garages with natural or mechanical ventilation are not considered enclosed spaces.

SPACE CONSTRAINED PRODUCT. A central air conditioner or heat pump:

1) That has rated cooling capabilities no greater than 30,000 Btu/h;

2) That has an outdoor or indoor unit having at least two overall exterior dimensions or an overall displacement that:

a. Is substantially smaller than those of other units that are either currently usually installed in site-built single family homes, and of a similar cooling and, if heat pump, heating capacity; and

b. If increased, would certainly result in a considerable increase in the usual cost of installation or would certainly result in a significant loss in the utility of the product to the consumer.

3) Is of a product type that was available for purchase in the United States as of December 1, 2000.

SPACE PERMITTING – INSULATION. Where an enclosed space exists in which insulation can be placed without the creation of space for that purpose only; e.g., dropped ceiling below a floor deck or space between joists.

SPLIT SYSTEM. Air-conditioning system or heat pump with compressor and air handler in separate cabinets with the compressor typically located exterior to conditioned space.

STACK LOSSES. Unused heat energy escaping through a flue or chimney to the outdoors in a combustion heating system.

STEADY-STATE CONDITIONS (for gas- or oil-fired heating equipment). Equilibrium conditions as indicated by temperature variations of not more than 3°F (1.7°C) in the stack gas temperature for units equipped with integral draft diverters, or not more than 5°F (2.8°C) in flue gas temperature for units equipped with draft hoods, barometric draft regulators, or direct vent systems, in three successive temperature readings taken 15 minutes apart.

STEM WALL CONSTRUCTION. A type of raised floor system consisting of a wood floor supported above grade by a continuous stem wall around its perimeter.

STRUCTURE. That which is built or constructed.

SUN SPACE. A totally enclosed, unconditioned space which is built substantially of glass, attached to the conditioned space of the building, and designed primarily for winter space heating.

SUPPLEMENTARY HEAT. Heat provided, generally electric resistance heat, to make up the difference between heat provided by the refrigeration cycle of a heat pump and that required to meet the heating load at low temperatures. Supplementary heat shall not be construed as the heat required to provide 100-percent backup in case of system failure.

SWINGING DOOR. See "Door."

SYSTEM. A combination of equipment and auxiliary devices (e.g., controls, accessories, interconnecting means, and terminal elements) by which energy is transformed so it performs a specific function such as HVAC, service water heating, or lighting.

SYSTEM, EXISTING. A system or systems previously installed in an existing building.

THERMAL BLOCK. A collection of one or more HVAC zones grouped together for simulation purposes. Spaces need not be contiguous to be combined within a single thermal block.

THERMAL EFFICIENCY. For the purposes of this code, thermal efficiency shall be defined as included in the American National Standard Institute, Inc. standard ANSI Z 21.10.3.

THERMAL RESISTANCE (*R*-VALUE). The reciprocal of the time rate of heat flow through a unit area induced by a unit temperature difference between two defined surfaces of material or construction under steady-state conditions. Units of R are h·ft2·°F/Btu.

THERMAL ENVELOPE. The primary insulation layer of a building; that part of the envelope that provides the greatest resistance to heat flow to or from the building.

THERMAL MASS. Materials with mass heat capacity and surface area capable of affecting building loads by storing and releasing heat as the interior and/or exterior temperature and radiant conditions fluctuate.

THERMAL MASS WALL INSULATION POSITION.

1. Exterior Insulation Position—a wall having all or nearly all of its mass exposed to the room air with the insulation on the exterior of that mass.
2. Integral Insulation Position—a wall having mass exposed to both room and outside air with substantially equal amounts of mass on the inside and outside of the insulation layer.
3. Interior Insulation Position—a wall not meeting either of the above definitions, particularly a wall having most of its mass external to an insulation layer.

THERMOSTAT. An automatic control device used to maintain temperature at a fixed or adjustable set point.

THROUGH-THE-WALL AIR CONDITIONER and HEAT PUMP. A central air conditioner or heat pump that is designed to be installed totally or partially within a fixed-size opening in an exterior wall, and:

1. Is manufactured prior to January 23, 2010;
2. Is not weatherized;
3. Is clearly and permanently marked for installation-only through an exterior wall;
4. Has a rated cooling capacity no greater than 30,000 Btu/h;
5. Exchanges all of its outdoor air across a single surface of the equipment cabinet; and
6. Has a combined outdoor air exchange area of less than 800 square inches (split systems) or less than 1,210 square inches (single packaged systems) as measured on the surface described in Item 5) above.

TINTED. As applied to fenestration: bronze, green, blue, or gray coloring that is integral with the glazing material. Tinting does not include surface-applied films such as reflective coatings, applied either in the field or during the manufacturing process.

TOWNHOUSE. A single-family dwelling unit constructed in a series or group of attached units with property lines separating such units. For the purpose of this code, townhouses shall be considered multiple-family dwellings.

TRANSFER GRILLE. A louvered or perforated covering for an opening in an air passage through a wall or door allowing transport of return air from a separated conditioned space of a building to the space containing the air distribution system's primary return.

UNCONDITIONED SPACE. See "Space."

UNDER ATTIC. Location of ceiling area in residential occupancies where the roof assembly and ceiling assembly are separated by a continuous ventilated unconditioned space spanning the ceiling area. Scissors truss

structures are considered under attic where a ventilated air space is provided.

UNENCLOSED SPACE. A space that is not an enclosed space.

UNITARY COOLING EQUIPMENT. One or more factory-made assemblies that normally include an evaporator or cooling coil and a compressor and condenser combination. Units that perform a heating function are also included.

UNITARY HEAT PUMP. One or more factory-made assemblies that normally include an indoor conditioning coil, compressor(s), and an outdoor refrigerant-to-air coil or refrigerant-to-water heat exchanger. These units provide both heating and cooling functions.

VENT DAMPER. A device intended for installation in the venting system of an individual, automatically operated, fossil fuel-fired appliance in the outlet or downstream of the appliance draft control device, which is designed to automatically open the venting system when the appliance is in operation and to automatically close off the venting system when the appliance is in a standby or shutdown condition.

VENTILATION. The process of supplying or removing air by natural or mechanical means to or from any space. Such air is not required to have been conditioned.

VENTILATION AIR. That portion of supply air which comes from outdoors, plus any cleaned recirculated air to maintain the desired quality of air within a designated space.

WALL. That portion of the building envelope, including opaque area and fenestration, that is vertical or tilted at an angle of 60 degrees from horizontal or greater. This includes above and below-grade walls, between floor spandrels, peripheral edges of floors, and foundation walls. For the purposes of determining building envelope requirements, the classifications are defined as follows:

(a) Above-grade wall: a wall that is not a below-grade wall.

(b) Below-grade wall: that portion of a wall in the building envelope that is entirely below the finish grade and in contact with the ground.

(c) Mass wall: a wall with a heat capacity exceeding (1) 7 Btu/ft^2 × °F or (2) 5 Btu/ft^2 × °F provided that the wall has a material unit weight not greater than 120 lb/ft^3.

(d) Metal building wall: a wall whose structure consists of metal spanning members supported by steel structural members (i.e., does not include spandrel glass or metal panels in curtain wall systems).

(e) Steel-framed wall: a wall with a cavity (insulated or otherwise) whose exterior surfaces are separated by steel framing members (i.e., typical steel stud walls and curtain wall systems).

(f) Wood-framed and other walls: all other wall types, including wood stud walls.

WALL AREA, GROSS. The area of the wall measured on the exterior face from the top of the floor to the bottom of the roof.

WATER HEATER. Vessel in which water is heated and is withdrawn for use external to the system.

WATT. The electrical unit of power or rate of doing work. One watt = 0.00134 hp.

WHOLE HOUSE FAN. A mechanical ventilation system usually installed in the ceiling of a residence which is used to exhaust air from the interior of a building to an attic space with sufficient venting area to transfer the air to the outside.

WING WALLS. An architectural projection which is designed to create positive pressure over one window and negative over another that redirects natural winds in through windows or doors.

WORST CASE. A unit of a residential structure with the same general layout and percent windows which generates the highest As-Built energy score in a Method A calculation procedure. In general, the worst-case unit will have the largest amount of glass facing east and west (primary orientation) and south (secondary orientation).

ZONE, HVAC. A space or group of spaces within a building with heating and cooling requirements that are sufficiently similar so that desired conditions (e.g. temperature) can be maintained throughout using a single sensor (e.g. thermostat or temperature sensor).

N1100.8 Types of requirements. Mandatory requirements shall be met for all buildings. The section number followed by the combined number and letters ".AB" indicates these mandatory requirements (i.e., requirements that shall be met by buildings complying by either Method A or B) in Sections N1100 through N1113. Requirements specific to Method A or B (i.e., ".B" is specific to Method B) shall be met when complying with the code by that method. Prescriptive requirements for Method B may be more stringent than the basic prescriptive requirements and shall supersede them. General requirements contained in Subappendix B of Appendix G for building material properties, testing and installation shall be followed.

N1100.A Requirements specific to Method A.

N1100.A.1 General. Requirements specific to Method A are included in the text under the applicable building component section. Compliance is by Form 1100A-08 produced by the EnergyGauge USA Fla/Res computer program. The Method A calculation shall result in either a PASS or FAIL status. For a building to pass, the total energy score calculated for the As-Built house shall be less than or equal to the total energy score calculated for the Baseline house. The baseline features and calculation procedures contained in Section N1113 and in Subappendix B of Appendix G shall be used to demonstrate code compliance of the building design for residential buildings complying by Method A. Except where prescribed elsewhere, efficiencies described in the Method A calculation submittal to demonstrate com-

pliance with this code shall be the minimum level installed for each component.

N1100.A.1.1 Insulation *R*-values. *R*-values used for the insulation level installed shall be the *R*-value of the added insulation only. Appendix G, Section B1.2, contains general rules for insulation that shall be followed.

N1100.A.1.2 Areas. Areas used in the calculation shall be the actual areas for each component determined from the plans and specifications of the building to be constructed.

N1100.A.2 Energy loads. Energy loads for Method A compliance are as provided by the EnergyGauge USA Fla/Res computer program.

N1100.A.3 Residences not heated or not cooled. Residences that are heated or cooled, but not both, shall complete both summer and winter calculations. If an addition or part of an addition is claimed to be exempt from the code because it will be neither heated nor cooled, the exempt area shall be fully separated from the conditioned area by walls or doors.

N1100.A.4 Worst-case calculations. Residential occupancies that are identical in configuration, square footage, and building materials may comply with the code by performing a worst-case calculation using compliance Method A. A worst-case calculation generates the highest As-Built energy score in a Method A calculation. When submitting worst-case calculations, copies of Form 1100A shall be submitted or referenced with each set of plans, dependent on the requirements of the building department.

N1100.A.5 Additions.

N1100.A.5.1 Additions complying alone. Additions to existing buildings shall follow the same Method A calculation procedure as new construction with the following qualifications:

1. Calculations shall be conducted using only the components of the addition itself, including those preexisting components which separate the addition from unconditioned spaces.
2. Heating and cooling system loads shall be equal to the Baseline system loads unless new equipment is installed to replace existing equipment or to service the addition specifically.
3. Water heating is not included in the calculation unless a supplemental water heater is installed, an existing water heater is replaced, or an alternative water heater (gas, solar, HRU, dedicated heat pump) is installed.

N1100.A.5.2 Additions unable to comply alone. Additions may comply with the code requirements for the addition alone or by demonstrating that the entire building, including the addition, complies with the code requirements for new buildings using compliance Method A. Section N1100.A.5.2.1 contains restrictions which shall apply if the entire building is used to demonstrate compliance.

N1100.A.5.2.1 Assumptions for existing building efficiencies. The following restrictions apply if the entire building is used to demonstrate code compliance:

1. The owner shall demonstrate to the building department's satisfaction that all *R*-values and equipment efficiencies claimed are present. If the building was built after 1980, the original energy code submittal may be used to demonstrate efficiencies.
2. If it is apparent from inspection that no insulation is present in the existing walls, floors or ceilings, or if inspection is not possible, an *R*-value of zero (0) shall be used for that component in the calculation. If as part of the addition and renovation project, insulation or equipment in the existing structure is upgraded, the new values may be used in the calculation.
3. If, upon inspection, insulation is found but the *R*-value is unknown, then an *R*-value shall be determined by an energy audit utilizing current acceptable practice based on insulation thickness, density and type.
4. Equipment efficiencies shall be demonstrated, either from manufacturer's literature or certified equipment directories, or by the procedure provided in Section N1107.AB.3 based on system capacity and total on-site energy input. Equipment to be added shall meet the applicable minimum equipment efficiency from Tables N1107.AB.3.2A, N1107.AB.3.2B, N1107.AB.3.2D, N1108.AB.3.2E and N1108.AB.3.2F. Existing residential equipment not meeting the efficiencies in Tables N1107.AB.3.2A, N1107.AB.3.2B, N1107.AB.3.2D, N1108.AB.3.2E, and N1108.AB.3.2F shall utilize the cooling or heating system efficiencies provided in Tables B4.1.1A and B4.1.1B of Appendix G.
5. Any nonvertical roof glass shall be calculated as horizontal glazing.

N1100.B Requirements specific to Method B. Requirements specific to Method B are included in the text under the applicable building component section. Compliance is by Form N1100B-08. This compliance method provides a list of requirements that must be met or exceeded. Any practice, system, or rating for which the energy performance determined from compliance Method A meets or exceeds the energy performance of the prescribed practice or system in the same climate zone may be used to comply with Method B requirements. No substitutions or variations less energy efficient than the established levels and standards listed for each component type shall be permitted. No components or systems shall be installed with efficiencies less than the mandatory requirements for that component or system.

N1100.B.1 Additions. Requirements shall apply only to building components and equipment being added to an

addition or replaced in an existing building to service an addition. Existing components or systems in a residence need not meet the requirements. Substitutions or variations that are less energy efficient than the prescribed efficiency levels and standards listed shall not be permitted.

N1100.B.2 Renovations. Requirements shall apply only to those components or systems being repaired or replaced.

N1100.B.3 Manufactured homes and manufactured buildings. Requirements specified for manufactured homes and manufactured buildings shall be met for all site-installed components and features of such buildings at the time of first setup. Complete code compliance shall be demonstrated for manufactured buildings.

SECTION N1101
FENESTRATIONS (GLAZING)

N1101.AB Mandatory requirements for Methods A or B.

N1101.AB.1 Window efficiencies. Windows shall have no higher *U*-factor or Solar Heat Gas Coefficient (SHGC) than that certified to be in compliance with the code. Unlabeled windows shall use the default *U*-factor and SHGC criteria of Section B2.1.1 in Appendix G. Glazing in doors shall be considered fenestrations. See Section N1100.6.5.

N1101.AB.2 Window infiltration. Windows shall meet the minimum air infiltration requirements of Section N1106.AB.1.1.

N1101.AB.3 Overhangs. Nonpermanent shading devices such as canvas awnings shall not be considered overhangs. Permanently attached wood and metal awnings may be considered overhangs.

N1101.A Requirements specific to Method A. The type of window to be installed shall have properties at least as efficient as the window(s) used to calculate Form 1100A. Window performance criteria are as contained in the EnergyGauge USA Fla/Res computer program.

N1101.A.1 Glass orientation. Glazing shall be considered in the Method A calculation by orientation of all windows and skylights.

N1101.A.2 Glass types. Glazing shall be considered by its *U*-factor and its SHGC, or, if unlabeled, default values shall be assumed as per Section B2.1.1 of Appendix G.

N1101.A.3 Glass overhangs. Overhang effect is measured in EnergyGauge USA Fla/Res by overhang separation, which is the vertical measure of the distance from the top of a window to the bottom of the overhang. The overhang for adjustable exterior shading devices shall be determined at its most extended position.

N1101.A.4 Glass areas. All glazing areas of a residence, including windows, sliding glass doors, glass in doors, skylights, etc., shall include the manufacturer's frame area in the total window area. Window measurements shall be as specified on the plans and specifications for the residence.

Exception: When a window in existing exterior walls is enclosed by an addition, an amount equal to the area of this window may be subtracted from the glazing area for the addition for that overhang and orientation.

N1101.B Requirements specific to Method B. All glass in residential buildings complying by Method B, including sliding glass doors and glass in exterior doors that has an area one-third or more of the total door area shall meet the criteria in Sections N1101.B.1 through N1101.B.2.

N1101.B.1 General.

N1101.B.1.1 Percentage of glass. The percentage of window area to conditioned floor area shall not exceed 16 percent.

Exceptions:

1. When glass in existing exterior walls is being removed or enclosed by an addition, an amount equal to the total area of this glass may be subtracted from the total glass area prior to determining the installed glass percentage.
2. Additions of 600 square feet (56 m^2) or less.

N1101.B.1.2 Glass type. All glass shall have *U*-factors and SHGC no higher than those listed from Table 11B-1 on Form 1100B.

N1101.B2 Additions of 600 square feet (56 m^2) or less. All new glazing in residential additions of 600 square feet (56 m^2) complying by Method B shall meet the minimum criteria given on Form 1100B for new glazing installed in the addition. All new glazing shall meet the *U*-factor and the Solar Heat Gain Coefficient (SHGC) criteria on Form 1100B for the type of glass and the percentage of glass to floor area categories on the form for glass installed in the addition. Glass windows and doors that were previously located in an existing exterior wall that is being removed or enclosed by an addition do not have to comply with the overhang and SHGC requirements listed on Form 1100B when reinstalled as part of the addition.

N1101.B.2.1 Glazing area. The maximum percentage of window to floor area allowed for additions of 600 square feet (56 m^2) or less shall be 50 percent. The total glazing area calculated shall include the areas of windows, sliding glass doors, all areas which exceed one-third the area of the door in which they are located, and double the area of all skylights or other nonvertical roof glass. When glass in existing exterior walls is being removed or enclosed by an addition, an amount equal to the total area of this glass may be subtracted from the total glass area prior to determining the installed glass percentage.

N1101.B.3 Renovations. New windows installed in renovations may be of any glass type and SHGC where glass areas are under an overhang of at least 2 feet (610 mm) whose lower edge does not extend further than 8 feet (2438 mm) from the overhang. Glass areas that do not meet this criteria shall be either single-pane tinted, double-pane clear, or double-pane tinted in accordance with Table B.2.1.1 in Appendix G. All skylights or nonvertical glass shall be double paned or single paned with a diffuser.

Exception: These requirements apply only to glass that is being replaced.

SECTION N1102
WALLS

N1102.AB Mandatory requirements for Methods A or B.

N1102.AB.1 Wall insulation. Walls shall be insulated to at least the level certified to be in compliance with this code on the code compliance form. Insulation *R*-values claimed shall be in accordance with the criteria described in Section B1.2 of Appendix G.

N1102.AB.1.1 Common walls. Walls common to two separate conditioned tenancies shall be insulated to a minimum of R-11 for frame walls, and to R-3 on both sides of common masonry walls.

N1102.AB.1.2 Walls considered ceiling area. Wall areas that separate conditioned living space from unconditioned attic space (such as attic knee walls, walls on cathedral ceilings, skylight chimney shafts, gambrel roofs, etc.) shall be considered ceiling area and have a minimum insulation value of R-19.

N1102.AB.2 Wall infiltration. Walls shall meet the minimum air infiltration requirements of Section N1106.AB.1.2.1.

N1102.A Requirements specific to Method A.

N1102.A.1 Wall types. Walls entered into the EnergyGauge USA Fla/Res program shall be identified in sufficient detail for the building official to determine whether their characteristics are adequately represented on the form submitted for code compliance.

N1102.B Requirements specific to Method B. Walls shall be either frame or masonry construction, including face brick, to comply with this method. All exterior and adjacent walls shall be insulated to the minimum *R*-value given on Table 11B-1 of Form 1100B in accordance with the criteria in Section B1.2 of Appendix G.

N1102.B.1 Additions. All walls shall be insulated to the minimum *R*-value given on Form 1100B for the type of construction used in the addition.

N1102.B.2 Renovations. Minimum insulation levels installed in renovated walls shall be not less than those specified in Section N1102.B.1. These requirements apply only to those walls being renovated.

N1102.B.3 Manufactured homes and manufactured buildings. Marriage walls between sections of double wide or multiple units shall be sealed with long-life caulk or gasketing and shall be mechanically fastened in accordance with the manufacturer's instructions. See also the Section N1110.B.4 requirements for ducts located in marriage walls of multiple unit manufactured homes and buildings.

SECTION N1103
DOORS

N1103.AB Mandatory requirements for Methods A or B.

N1103.AB.1 Door types allowed. All exterior and adjacent doors other than glass doors shall be solid core wood, wood panel, or insulated doors. Hollow core doors shall not be used in either exterior or adjacent walls. Doors may have glass sections.

N1103.AB.2 Door infiltration. Doors shall meet the minimum air infiltration requirements for doors contained in Section N1106.AB.1.1.

N1103.A Requirements specific to Method A.

N1103.A.1 Door types. Doors shall be identified as either exterior or adjacent, based on the type of wall in which they are located, and in sufficient detail for the building official to determine whether their characteristics are adequately represented on the form submitted for code compliance.

N1103.A.2 Door area determination. Door areas shall be determined from the measurements specified on the plans for each exterior and adjacent door. All sliding glass doors and glass areas in doors shall be included in the glazing calculation and meet the requirements of Section N1101 unless the glass is less than one-third of the area of the door. Door area entry into the EnergyGauge USA Fla/Res computer program shall meet the requirements of Appendix G, Section B2.3.

SECTION N1104
CEILINGS

N1104.AB Mandatory requirements for Methods A or B.

N1104.AB.1 Ceiling insulation. Ceilings shall have an insulation level of at least R-19, space permitting. For the purposes of this code, types of ceiling construction that are considered to have inadequate space to install R-19 include single assembly ceilings of the exposed deck and beam-type and concrete deck roofs. Such ceiling assemblies shall be insulated to at least a level of R-10. Ceiling insulation *R*-values claimed shall be in accordance with the criteria described in Section B1.2 of Appendix G.

N1104.AB.1.1 Ceilings with blown-in insulation. Ceilings with a rise greater than 5 and a run of 12 (5 over 12 pitch) shall not be insulated with blown-in insulation. Blown-in (loose fill) insulation shall not be used in sections of attics where the distance from the top of the bottom chord of the trusses, ceiling joists or obstructions (such as air-conditioning ducts) to the underside of the top chord of the trusses at the ridge is less than 30 inches (762 mm) or where the distance from any point of 30 inches (762 mm) minimum clearance out to the ceiling surface in the roof eave area that is to be insulated is greater than 10 feet (3048 mm).

N1104.AB.1.1.1 Insulation dams. In every installation of blown-in (loose fill) insulation, insulation dams (for installations up to R-19 only); or insulation chutes, insulation baffles, or similar devices (for installations over R-19) shall be installed in such a manner so as to restrict insulation from blocking natural ventilation at the roof eave area to the attic space. Such devices shall be installed in spaces between all

rafters of the roof structure and shall extend from the eave plate line to the attic area. In all cases, including the use of batt insulation, the insulation shall not be installed so as to block natural ventilation flow.

N1104.AB.1.1.2 Reference marks. In that portion of the attic floor to receive blown insulation, reference marks or rules shall be placed within every 6 feet to 10 feet (1829 mm to 3048 mm) throughout the attic space. The reference marks shall show the height to which the insulation must be placed in order to meet the planned insulation level. Such marks shall be used by the building official to verify the claimed insulation level. The reference marks or rules may be placed on truss webs or other appropriate roof framing members. Each reference mark or rule shall be visible from at least one attic access point.

N1104.AB.1.2 Common ceilings/floors. Wood, steel and concrete ceilings/floors common to separate conditioned tenancies shall be insulated to a minimum R-11, space permitting.

N1104.AB.1.3 Roof decks over dropped ceiling plenum. Roof decks shall be insulated to R-19 if the space beneath it will be used as a plenum of the air distribution system. Plenums shall meet all criteria of Section N1110.AB.3.6.

N1104.AB.2 Ceiling infiltration. Ceilings shall meet the minimum air infiltration requirements of Section N1106.AB.1.2.3.

N1104.A Requirements specific to Method A.

N1104.A.1 Ceiling types. Ceilings entered into the EnergyGauge USA Fla/Res program shall be identified in sufficient detail for the building official to determine whether their characteristics are adequately represented on the form submitted for code compliance.

N1104.A.2 Walls considered ceiling area. Wall areas that separate conditioned living space from unconditioned attic space (such as attic knee walls, walls on cathedral ceilings, skylight chimney shafts, gambrel roofs, etc.) shall be considered ceiling area. Such areas shall be included in calculations of ceiling area and shall have a minimum insulation value of R-19.

N1104.A.3 Installation criteria for homes claiming the radiant barrier option. The radiant barrier or interior radiation control coating (IRCC) options may be claimed in the EnergyGauge USA Fla/Res computer program where the radiant barrier system is to be installed in one of the configurations depicted in Figure N1104.A.3 and the following conditions are met:

1. It shall be fabricated over a ceiling insulated to a minimum of R-19 with conventional insulation and shall not be used as a means to achieve partial or whole compliance with the minimum attic insulation level of R-19 prescribed in Section N1104.AB.1. Either a sheet type or spray applied IRCC may be used.
2. If the radiant barrier material has only one surface with high reflectivity or low emissivity it shall be facing downward toward the ceiling insulation.
3. The attic airspace shall be vented in accordance with Section R806 of this code.
4. The radiant barrier system shall conform to ASTM C 1313, *Standard Specification for Sheet Radiant Barriers for Building Construction Applications*, or ASTM C 1321, *Standard Practice for Installation and Use of Interior Radiation Control Coating Systems (IRCCS) in Building Construction* as appropriate for the type of radiant barrier to be installed. The operative surface shall have an emissivity not greater than 0.06 for sheet radiant barriers or 0.25 for interior radiation control coatings as demonstrated by independent laboratory testing according to ASTM C 1371.
5. The radiant barrier system (RBS) shall conform with ASTM C 1158, *Use and Installation of Radiant Barrier Systems (RBS) in Building Constructions for Sheet Radiant Barriers*, or ASTM C 1321, *Standard Practice for Installation and Use of Interior Radiation Control Coating Systems (IRCCS) in Building Construction* for IRCC systems.
6. The radiant barrier shall be installed so as to cover gable ends without closing off any soffit, gable or roof ventilation.

N1104.A.4 Installation criteria for homes claiming the cool roof option. The cool roof option may be claimed in the EnergyGauge USA Fla/Res computer program where the roof to be installed has a tested solar reflectance of greater than 4 percent when evaluated in accordance with ASTM methods E 903, C 1549, E 1918 or CRRC Method #1. In cases where the roof materials have not been tested, the reflectance for the As-Built home shall be assumed to be 4 percent. Emittance values provided by the roofing manufacturer in accordance with ASTM C 1371 shall be used when available. In cases where the appropriate data are not known, emittance shall be the same as the Baseline home. Testing of a qualifying sample of the roofing material shall be performed by an approved independent laboratory with these results provided by the manufacturer.

N1104.A.5 Installation criteria for homes using the unvented attic assembly option. The unvented attic assembly option may be used in EnergyGauge USA Fla/Res if the criteria in Section R806.4 have been met. *

N1104.B Requirements specific to Method B. All ceilings separating conditioned and unconditioned spaces shall be insulated to at least the minimum *R*-value given in Table 11B-1 of Form 1100B.

N1104.B.1 Additions. All roof/ceilings shall be insulated to the minimum *R*-value given on Form 1100B for the type of construction used in the addition. *

N1104.B.2 Renovations. Minimum insulation levels installed in renovated roofs/ceilings shall be not less than those specified in Section N1104.B.1. These requirements apply only to roofs/ceilings that are being renovated.

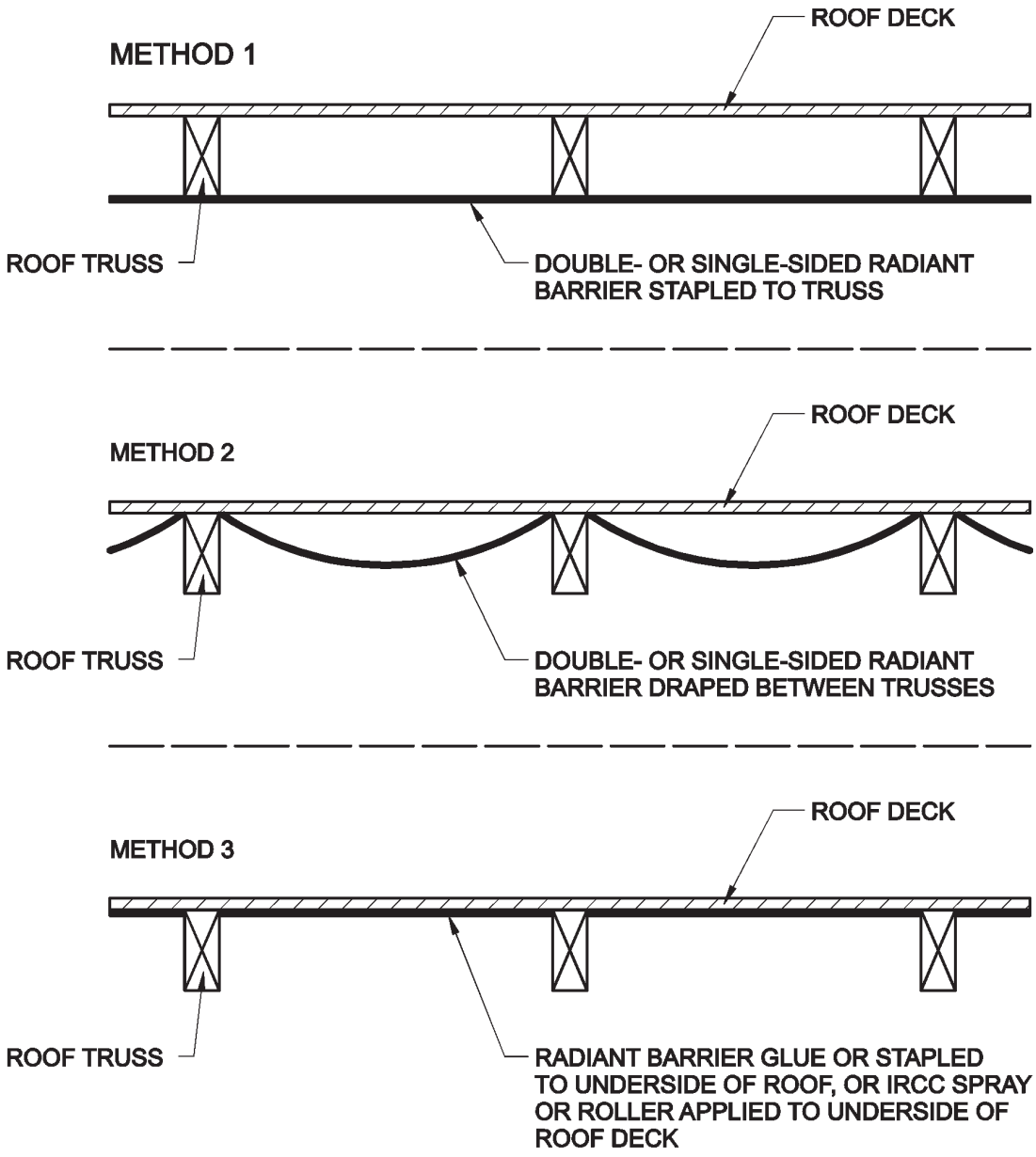


FIGURE N1104.A.3
ACCEPTABLE ATTIC RADIANT BARRIER CONFIGURATIONS

SECTION N1105
FLOORS

N1105.AB Mandatory requirements for Methods A or B.

N1105.AB.1 Floor Insulation. Insulation *R*-values claimed shall be in accordance with the criteria described in Section B1.2 of Appendix G.

N1105.AB.1.1 Common floors. Wood, steel and concrete floors/ceilings common to two separate conditioned tenancies in multiple-family applications shall be insulated to a minimum of R-11, space permitting.

N1105.AB.1.2 Slab-on-grade. For insulated slab-on-grade floors, the exposed vertical edge of the slab shall be covered with exterior slab insulation extending from the top of the slab down to at least the finished grade level. Extending the insulation to the bottom of the footing or foundation wall is recommended.

N1105.AB.2 Floor infiltration. Floors shall meet the minimum air infiltration requirements of Section N1106.AB.

N1105.A Requirements specific to Method A.

N1105.A.1 Floor types. Floors shall be identified in sufficient detail for the building official to determine whether their characteristics are adequately represented on the form submitted for code compliance.

N1105.B Requirements specific to Method B. All floors shall be insulated to the minimum *R*-value given on Table 11B-1 of Form 1100B.

N1105.B.1 Additions. All floors shall be insulated to the minimum *R*-value given on Form 1100B for the type of construction used.

N1105.B.2 Renovations. Minimum insulation levels installed in renovated floors shall be not less than those specified on Form 1100B for only the floors being renovated.

SECTION N1106
AIR INFILTRATION

N1106.AB Mandatory requirements for Methods A or B. Buildings shall be constructed and sealed in such a way as to prevent excess air infiltration.

Caution: Caution should be taken to limit the use of materials and systems which produce unusual or excessive levels of indoor air contaminants.

N1106.AB.1 Infiltration levels allowed.

N1106.AB.1.1 Exterior doors and windows. Exterior doors and windows shall be designed to limit air leakage into or from the building envelope. Manufactured doors and windows shall have air infiltration rates not exceeding those shown in Table N1106.AB.1.1. These rates shall be determined from tests conducted at a pressure differential of 1.567 pound per square foot (8 kg/m^2), which is equivalent to the impact pressure of a 25 mph wind. Compliance with the criteria of air leakage shall be determined by testing to AAMA/WDMA/101/I.S. 2 or ASTM E 283, as appropriate. Site-constructed doors and windows shall be sealed in accordance with Section N1106.AB.1.2.

N1106.AB.1.2 Exterior joints or openings in the envelope. Exterior joints, cracks, or openings in the building envelope that are sources of air leakage shall be caulked gasketed, weatherstripped or otherwise sealed in accordance with the criteria in Sections N1106.AB.1.2.1 through N1106.AB.1.2.5.

N1106.AB.1.2.1 Exterior and adjacent walls. Exterior and adjacent walls shall be sealed at the following locations:

1. Between windows and doors and their frames;
2. Between windows and door frames and the surrounding wall;
3. Between the foundation and wall assembly sill-plates;
4. Joints between exterior wall panels at changes in plane, such as with exterior sheathing at corners and changes in orientation;
5. Openings and cracks around all penetrations through the wall envelope such as utility services and plumbing;
6. Between the wall panels and top and bottom plates in exterior and adjacent walls. In frame construction, the crack between exterior and adjacent wall bottom plates and floors shall be sealed with caulking or gasket material. Gypsum board or other wall paneling on the interior surface of exterior and adjacent walls shall be sealed to the floor; and
7. Between walls and floor where the floor penetrates the wall.
8. Log walls shall meet the criteria contained in Section B3.4 of Appendix G.

Exception: As an alternative to Items 1 through 7 above for frame buildings, an infiltration barrier may be installed in the exterior and adjacent walls. The infiltration barrier shall provide a continuous air barrier from the foundation to the top plate of the ceiling of the house, and shall be sealed at the foundation, the top plate, at openings in the wall plane (windows, doors, etc.), and at the seams between sections of infiltration barrier material. When installed on the interior side of the walls, such as with insulated face panels with an infiltration barrier, the infiltration barrier shall be sealed at the foundation or subfloor.

TABLE N1106.AB.1.1
ALLOWABLE AIR INFILTRATION RATES

Frame Type	Windows (cfm per square foot of window area)	Doors (cfm per square foot of door area)	
		Sliding	Swinging
Wood	0.3	0.3	0.5
Aluminum	0.3	0.3	0.5
PVC	0.3	0.3	0.5

N1106.AB.1.2.2 Floors. Penetrations and openings in raised floors, greater than or equal to $^1/_8$ inch (3 mm) in the narrowest dimension, shall be sealed unless backed by truss or joist members against which there is a tight fit or a continuous air barrier.

Exception: Where an infiltration barrier is installed in the floor plane of a house with raised floors, the infiltration barrier shall create a continuous air barrier across the entire floor area, and shall be sealed at the perimeter, at openings in the floor plane (grilles, registers, crawl space accesses, plumbing penetrations, etc.), and at seams between sections of infiltration barrier material.

N1106.AB.1.2.3 Ceilings. Ceilings shall be sealed at the following locations:

1. Between walls and ceilings.
2. At penetrations of the ceiling plane of the top floor of the building (such as chimneys, vent pipes, ceiling fixtures, registers, open shafts, or chases) so that air flow between the attic or unconditioned space and conditioned space is stopped.
3. Large openings, such as shafts, chases soffits, opening around chimneys, and dropped ceiling

spaces (such as above kitchen cabinets, bathroom vanities, shower stalls, and closets), shall be sealed with an air-tight panel or sheeting material and sealed to adjacent top plates (or other framing members) so that a continuous air barrier separates the spaces below and above the ceiling plane.

4. Gaps between ceiling gypsum board and the top plate shall be sealed with a sealant to stop air flow between the attic and the interior of wall cavities.
5. The attic access hatch, if located in the conditioned space, shall have an airtight seal.

Exception: Where an infiltration barrier is installed in the ceiling plane of the top floor of the house, the infiltration barrier shall: create a continuous air barrier across the entire ceiling plane, be continuous across the tops of interior and exterior walls, and be sealed at the perimeter, at openings in the ceiling plane (grilles, registers, attic accesses, plumbing penetrations, vent pipes, chimneys, etc.), and at seams between sections of infiltration barrier material.

N1106.AB.1.2.4 Recessed lighting fixtures. Recessed lighting fixtures installed in ceilings that abut an attic space shall meet one of the following requirements:

1. Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the unconditioned space.
2. Type IC or non-IC rated, installed inside a sealed box [minimum of ½-inch-thick (12.7 mm)] gypsum wall board, preformed polymeric vapor barrier, or other air-tight assembly manufactured for this purpose and maintaining required clearances of not less than ½-inch-thick (12.7 mm) from combustible material and not less than 3 inches (76 mm) from insulation material.
3. Type IC rated, with no more than 2.0 cfm (.00094 m^3/s) air movement from the conditioned space to the ceiling cavity when measured in accordance with ASTM E 283. The fixture shall be tested at 75 Pa and shall be labeled.

N1106.AB.1.2.5 Multiple-story houses. In multiple-story houses, the perimeter of the floor cavity (created by joists or trusses between floors) shall have an air barrier to prevent air flow between this floor cavity and outdoors or buffer zones of the house (such as a space over the garage).

1. Air-tight panels, sheathing, or sheeting shall be installed at the perimeter of the floor cavity. The panels, sheathing, or sheeting material shall be sealed to the top plate of the lower wall and the bottom plate of the upper wall by mastic or other adhesive caulk, or otherwise bridge from the air barrier of the upper floor to the air barrier of the lower floor.
2. Joints between sections of panels, sheathing, or sheeting shall be sealed.
3. All fireplaces and wood stoves shall have flue dampers.

N1106.AB.1.3 Additional infiltration requirements. The following additional requirements shall be met:

1. All exhaust fans vented to the outdoors shall have dampers. This does not apply to combustion devices with integral exhaust ductwork, which shall comply with the Chapter 24 of this code.
2. All combustion space heaters, furnaces, and water heaters shall be provided with adequate combustion air. Such devices shall comply with NFPA or the locally adopted code.

   Caution: Caution should be taken to limit the use of materials and systems which produce unusual or excessive levels of indoor air contaminants.

N1106.AB.1.4 Apertures or openings. Any apertures or openings in walls, ceilings or floors between conditioned and unconditioned space (such as exits in the case of hydrostatic openings in stairwells for coastal buildings) shall have dampers which limit airflow between the spaces.

N1106.A Requirements specific to Method A.

N1106.A.1 Infiltration. Infiltration loads shall be determined from the EnergyGauge USA Fla/Res computer program. Infiltration performance criteria shall be found in Section B3 in Appendix G of this code.

N1106.A.2 Infiltration area. The area to be considered in the Infiltration calculation of Method A shall be the total conditioned floor area of the building.

SECTION N1107
SPACE COOLING SYSTEMS

N1107.AB Mandatory requirements for Methods A or B.

N1107.AB.1 Equipment sizing. A cooling and heating load calculation shall be performed on the building and shall be attached to the Form 1100 submitted when application is made for a building permit, or in the event the mechanical permit is obtained at a later time, the calculation shall be submitted with the application for the mechanical permit. HVAC sizing calculations shall account for the directional orientation of the building for which the load is calculated; worst-case sizing calculations shall not be permitted. Cooling and heating design loads, for the purpose of sizing HVAC equipment and designing HVAC systems, shall be determined for the dwelling spaces (typically rooms or zones) served by each piece of equipment in accordance with ACCA Manual J, ACCA Manual N, or the ASHRAE *Cooling and Heating Load Calculation Manual, Second Edition*. This code does not allow designer safety factors, provisions for future expansion or other factors which affect equipment siz-

ing in excess of the capacity limitations in Section N1107.AB.1.1. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems. The engineered ventilation requirement of the various procedures shall not be used as an infiltration rate when estimating infiltration loads.

Exceptions:

1. Where mechanical systems are designed by an engineer registered in the state of Florida, the engineer has the option of submitting a signed and sealed summary sheet in lieu of the complete sizing calculation(s).Such summary sheet shall include the following (by zone):

   Project name/owner

   Project address

   Sizing method used

   Area in square feet

   Outdoor dry bulb used

   Total heating required with outside air

   Outdoor wet bulb used

   Total sensible gain

   Relative humidity

   Total latent gain

   Indoor dry bulb

   Total cooling required with outside air

   Grains water (difference)

2. Systems installed in existing buildings not meeting the definition of "Renovation" in Section N1100.7.

N1107.AB.1.1 Cooling equipment capacity. Cooling-only equipment shall be selected so that its total capacity is not less than the calculated total load but not more than 1.15 times greater than the total load calculated according to the procedure selected in Section N1107.AB.1, or the closest available size provided by the manufacturer's product lines. The corresponding latent capacity of the equipment shall not be less than the calculated latent load.

The published value for ARI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacturer's expanded performance data shall be used to select cooling-only equipment. This selection shall be based on the outdoor design dry bulb temperature for the load calculation (or entering water temperature for water-source equipment), the blower cfm provided by the expanded performance data, the design value for entering wet bulb temperature and the design value for entering dry bulb temperature.

Design values for entering wet bulb and dry bulb temperature shall be for the indoor dry bulb and relative humidity used for the load calculation and shall be adjusted for return side gains if the return duct(s) is installed in an unconditioned space.

The manufacturer and model number of the outdoor and indoor units (if split system) shall be submitted along with the sensible and total cooling capacities at the design conditions described herein.

Exceptions:

1. Attached single- and multiple-family residential equipment sizing may be selected so that its cooling capacity is less than the calculated total load but not less than 80 percent of that load.
2. When signed and sealed by a Florida-registered engineer, in attached single- and multiple-family units, the capacity of equipment may be sized in accordance with good design practice.

N1107.AB.1.2 Extra capacity required for special occasions. Residences requiring excess cooling or heating equipment capacity on an intermittent basis, such as anticipated additional loads caused by major entertainment events, shall have equipment sized or controlled to prevent continuous space cooling or heating within that space by one or more of the following options:

1. A separate cooling or heating system is utilized to provide cooling or heating to the major entertainment areas.
2. A variable capacity system sized for optimum performance during base load periods is utilized.

N1107.AB.2 Controls. Each mechanical supply and exhaust ventilation system shall be equipped with a readily accessible switch or other means for shutoff or volume reduction and shutoff when ventilation is not required. Automatic or manual dampers installed for the purpose of shutting off ventilation systems shall be designed with tight shutoff characteristics to minimize air leakage.

Exception: Manual dampers for outdoor air intakes may be used for single- and multiple-family residential buildings or for fan system capacities of less than 5,000 cfm (2.4 m^3/s).

N1107.AB.2.1 Zoning for temperature control. In one- and two-family dwellings, at least one thermostat for regulation of space temperature shall be provided for each separate HVAC system or zone.

N1107.AB.2.2 Control setback and shutoff. The thermostat required in Section N1107.AB.2.1, or an alternate means including, but not limited to, a switch or clock, shall provide a readily accessible manual or automatic means for reducing the energy required for heating and cooling during periods of nonuse or reduced need including, but not limited to, unoccupied periods or sleeping hours.

N1107.AB.2.3 Humidity control. Where a humidistat is used for comfort dehumidification, it shall be capable of being set to prevent the use of fossil fuel or electricity to reduce humidities below 60 percent.

N1107.AB.3 Equipment performance standards.

N1107.AB.3.1 Equipment ratings. Equipment efficiency ratings shall be obtained from a nationally recog-

nized certification program directory, or from a manufacturer's rating certified to be in compliance with an approved U. S. Department of Energy (DOE) or Air-conditioning and Refrigeration Institute (ARI) rating procedure. Equipment efficiencies shall be based on the standard rating conditions contained in the test standard referenced in Chapter 43 that is appropriate for that equipment. The procedure for determining the integrated part-load value (IPLV) for a piece of equipment shall be the one provided in the appropriate ARI test standard for the type of equipment referenced. Minimum ratings for products covered under the National Appliance Energy Conservation Act of 1987 shall be those determined for Region IV and used for the Federal Trade Commission's required appliance labeling.

Cooling system efficiencies shall be rated as follows:

1. Central air-conditioning equipment under 65,000 Btu/h (312 m^3/kw) capacity, both split-system and single-package equipment, single or three phase, shall be rated with a seasonal energy efficiency ratio (SEER).
2. Packaged terminal air conditioners and heat pumps shall be rated with an energy efficiency ratio (EER).
3. Room air conditioners shall be rated by an energy efficiency ratio (EER).
4. Central air-conditioning equipment over 65,000 Btu/h (312 m^3/kw) shall be rated with an energy efficiency ratio (EER).
5. Water-cooled and evaporatively cooled central systems under 135,000 Btu/h (648 m^3/kw) shall be rated with an energy efficiency ratio (EER).
6. Large capacity air-cooled, evaporatively cooled and water source unitary air-conditioning systems may also be rated with an IPLV.
7. Heat-operated cooling equipment and gas-driven heat pumps shall be rated with a COP cooling.

N1107.AB.3.1.1 Equipment efficiency verification. Equipment covered under the Federal Energy Policy Act of 1992 (EPACT) shall comply with U.S. D.O.E. certification requirements. For other equipment, if a certification program exists for a product covered in Tables N1107.AB.3.2A, N1107.AB.3.2B and N1107.AB.3.2D, and it includes provisions for verification and challenge of equipment efficiency ratings, then the product shall be either listed in the certification program or, alternatively, the ratings shall be verified by an independent laboratory test report. If no certification program exists for a product covered in Tables N1107.AB.3.2A, N1107.AB.3.2B and N1107.AB.3.2D, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Where components such as indoor or outdoor coils from different manufacturers are used, a Florida-registered engineer shall specify component efficiencies whose combined efficiency meets the minimum equipment efficiency requirements in Section N1107.AB.3.2.

N1107.AB.3.2 Minimum efficiencies for cooling equipment. Equipment shown in Tables N1107.AB.3.2A, N1107.AB.3.2B and N1107.AB.3.2D shall meet the minimum performance for that equipment at the specified rating conditions when tested in accordance with the specified test procedure. Omission of minimum performance requirements for equipment not listed in Tables N1107.AB.3.2A, N1107.AB.3.2B and N1107.3.2D does not preclude use of such equipment. Equipment not listed in Tables N1107.AB.3.2A, N1107.AB.3.2B and N1107.AB.3.2D has no minimum performance requirements. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements, unless otherwise exempted by footnotes in the table. However, equipment covered under the Federal Energy Policy Act of 1992 (EPACT) shall have no minimum efficiency requirements for operation at minimum capacity or other than standard rating conditions. Equipment used to provide water heating functions as part of a combination system shall satisfy all stated requirements for the appropriate space heating or cooling category.

Tables N1107.AB.3.2A, N1107.AB.3.2B and N1107.AB.3.2D contain the minimum efficiency requirements for equipment covered by this section of the code. The tables are organized to cover the following types of equipment:

Table N1107.AB.3.2A, Air Conditioners and Condensing Units

Table N1107.AB.3.2B, Heat Pumps

Table N1107.AB.3.2D, Packed Terminal and Room Air Conditioners and Heat Pumps

Exception: Existing mechanical systems undergoing alteration need not meet the minimum equipment efficiencies of this section except to preserve the original approval or listing of the equipment.

Where water chillers and cooling towers are installed in residential buildings complying by this chapter, minimum efficiency ratings shall be as found in Table 13-407.AB.3.2.1C, Table 13-407.AB.3.2.1G and Tables 13-407.AB.3.2.2H through 13-407.AB.3.2.2J of the *Florida Building Code, Building*.

N1107.A Requirements specific to Method A.

N1107.A.1 Cooling systems. The impact of cooling system efficiency in the energy performance calculation shall be determined for air conditioners based on the appropriate efficiency rating for the system to be installed from the EnergyGauge USA Fla/Res computer program.

N1107.A.2 Additions. Space cooling may be provided by existing or newly installed equipment. Systems in operation before the construction of the addition shall be considered existing systems and shall comply with criteria in Section N1100.A.5. New systems may be replacements of existing equipment or equipment installed to condition only the addition.

TABLE N1107.AB.3.2A
ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency[2]	Test Procedure[1]
Air Conditioners, Air Cooled	<65,000 Btu/h[3]	All	Split System	13.0 SEER	ARI 210/240
			Single Package	13.0 SEER	
	≥65,000 Btu/h and <135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	10.3 EER	
		All other	Split System and Single Package	10.1 EER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.7 EER	ARI 340/360
		All other	Split System and Single Package	9.5 EER	
	≥240,000 Btu/h and <760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.5 EER , 9.7 IPLV	
		All other	Split System and Single Package	9.3 EER, 9.5 IPLV	
	≥760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.2 EER, 9.4 IPLV	
		All other	Split System and Single Package	9.0 EER, 9.2 IPLV	
Through-the-Wall, Air Cooled	≤30,000 Btu/h[3]	All	Split System	10.9 SEER	ARI 210/240
			Single Package	10.6 SEER	
Small-Duct High-Velocity, Air Cooled	<65,000 Btu/h[3]	All	Split System or Single Package	11.0 SEER	ARI 210/240
Space Constrained Products, Air Conditioners	<65,000 Btu/h[3]	All	Split System or Single Package	12.0 SEER[4]	ARI 210/240
Air Conditioners, Water and Evaporatively Cooled	<65,000 Btu/h	All	Split System and Single Package	12.1 EER	ARI 210/240
	≥65,000 Btu/h and <135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.5 EER	
		All other	Split System and Single Package	11.3 EER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER	ARI 340/360
		All other	Split System and Single Package	10.8 EER	
	≥240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	11.0 EER, 10.3 IPLV	
		All other	Split System and Single Package	10.8 EER, 10.1 IPLV	
Condensing Units, Air Cooled	≥135,000 Btu/h			10.1 EER, 11.2 IPLV	ARI 365
Condensing Units, Water or Evaporatively Cooled	≥135,000 Btu/h			13.1 EER,13.1 IPLV	

For SI: 1 Btu/h = .2931 W.

1. Chapter 43 contains a complete specification of the reference test procedure, including the referenced year version of the test procedure.
2. IPLVs are only applicable to equipment with capacity modulation.
3. Single-phase, air-cooled air-conditioners less than 65,000 Btu/h are regulated by NAECA. SEER values are those set by NAECA.
4. As granted by U.S. Department of Energy letter of exception, specific to individual companies. SDHV products without a letter of exception shall have the same efficiency as air-cooled air conditioners.

TABLE N1107.AB.3.2B
ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS – MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency[2]	Test Procedure[1]
Air Cooled (Cooling Mode)	<65,000 Btu/h[3]	All	Split System	13.0 SEER	ARI 210/240
			Single Package	13.0 SEER	
	≥65,000 Btu/h and <135,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	10.1 EER	
		All other	Split System and Single Package	9.9 EER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.3 EER	ARI 340/360
		All other	Split System and Single Package	9.1 EER	
	≥240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.0 EER 9.2 IPLV	
		All other	Split System and Single Package	8.8 EER 9.0 IPLV	
Through-the-Wall, Air Cooled (Cooling Mode)	≤30,000 Btu/h[3]	All	Split System	10.9 SEER	ARI 210/240
			Single Package	10.6 SEER	
Small-Duct High-Velocity, Air Cooled, Cooling Mode	<65,000 Btu/h[3]	All	Split System	11.0 SEER[4]	ARI 210/240
Water Source (Cooling Mode)	<17,000 Btu/h	All	86°F Entering Water	11.2 EER	ISO-13256-1
	≥17,000 Btu/h and <135,000 Btu/h	All	86°F Entering Water	12.0 EER	
Groundwater Source (Cooling Mode)	<135,000 Btu/h	All	59°F Entering Water	16.2 EER	
Ground Source (Cooling Mode)	<135,000 Btu/h	All	77°F Entering Water	13.4 EER	
Air Cooled (Heating Mode)	<65,000 Btu/h[3] (Cooling Capacity)		Split System	7.7 HSPF	ARI 210/240
			Single Package	7.7 HSPF	
	≥65,000 Btu/h and <135,000 Btu/h (Cooling Capacity)		47°F db/43°F wb Outdoor Air 17°F db/15°F wb Outdoor Air	3.2 COP 2.2 COP	
	≥135,000 Btu/h (Cooling Capacity)		47°F db/43°F wb Outdoor Air 17°F db/15°F wb Outdoor Air	3.1 COP 2.0 COP	ARI 340/360
Through-the-Wall (Air Cooled, Heating Mode)	≤30,000 Btu/h[3] (Cooling Capacity)		Split System	7.1 HSPF	ARI 210/240
			Single Package	7.0 HSPF	
Small-Duct High-Velocity (Air Cooled, Heating Mode)	<65,000 Btu/h[3] (Cooling Capacity)		Split System or Single Package	6.8 HSPF[4]	ARI 210/240
Space Constrained Products, Heat Pumps	<65,000Btu/h[3]		Split System or Single Package	7.4 HSPF	ARI 210/240
Water-Source (Heating Mode)	<135,000 Btu/h (Cooling Capacity)		68°F Entering Water	4.2 COP	ISO-13256-1
Groundwater Source (Heating Mode)	<135,000 Btu/h (Cooling Capacity)		50°F Entering Water	3.6 COP	
Ground Source (Heating Mode)	<135,000 Btu/h (Cooling Capacity)		32°F Entering Water	3.1 COP	

For SI: 1 Btu/h = .2931W, °C = [(°F) - 32]/1.8

1. Chapter 43 contains a complete specification of the reference test procedure, including the referenced year version of the test procedure.
2. IPLVs and Part Load rating conditions are only applicable to equipment with capacity modulation.
3. Single-phase, air-cooled heat pumps <65,000 Btu/h are regulated by NAECA. SEER and HSPF values are those set by NAECA.
4. As granted by U.S. Department of Energy letter of exception, specific to individual companies. SDHV products without a letter of exception shall have the same efficiency as air-cooled air-conditioners.

TABLE 1107.AB.3.2D
ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS, PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS, SINGLE-PACKAGE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS, AND ROOM AIR CONDITIONERS HEAT PUMPS — MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type	Size Category	Subcategory or Rating Condition	Minimum Efficiency[1]	Test Procedure[2]
PTAC (Cooling Mode), New Construction	7,000 ≥Btu/h <8,000	95°F db Outdoor Air [Based on capacity at lower range using EER= 12.5 – (0.213 x Cap/1000)][3]	11.0 EER	ARI 310/380
	8,000 ≤Btu/h < 9,000		10.8 EER	
	9,000 ≤Btu/h < 10,000		10.6 EER	
	10,000 ≤Btu/h < 11,000		10.4 EER	
	11,000 ≤Btu/h < 12,000		10.2 EER	
	12,000 ≤Btu/h < 13,000		9.9 EER	
	13,000 ≤Btu/h < 14,000		9.7 EER	
	14,000 ≤Btu/h < 15,000		9.5 EER	
	>15,000 Btu/h		9.3 EER	
PTAC (Cooling Mode), Replacements[2]	7,000 ≥Btu/h <8,000	95°F db Outdoor Air [Based on capacity at lower range using EER= 10.9 – (0.213 x Cap/1000)][3]	9.4 EER	
	8,000 ≤Btu/h < 9,000		9.2 EER	
	9,000 ≤Btu/h < 10,000		9.0 EER	
	10,000 ≤Btu/h < 11,000		8.8 EER	
	11,000 ≤Btu/h < 12,000		8.6 EER	
	12,000 ≤Btu/h < 13,000		8.3 EER	
	13,000 ≤Btu/h < 14,000		8.1 EER	
	14,000 ≤Btu/h < 15,000		7.9 EER	
	>15,000 Btu/h		7.7 EER	
PTHP (Cooling Mode), New Construction	7,000 ≥Btu/h <8,000	95°F db Outdoor Air [Based on capacity at lower range using EER= 12.3 – (0.213 x Cap/1000)][3]	10.8 EER	
	8,000 ≤Btu/h < 9,000		10.6 EER	
	9,000 ≤Btu/h < 10,000		10.4 EER	
	10,000 ≤Btu/h < 11,000		10.2 EER	
	11,000 ≤Btu/h < 12,000		10.0 EER	
	12,000 ≤Btu/h < 13,000		9.7 EER	
	13,000 ≤Btu/h < 14,000		9.5 EER	
	14,000 ≤Btu/h < 15,000		9.3 EER	
	>15,000 Btu/h		9.1 EER	
PTHP (Cooling Mode), Replacements[2]	7,000 ≥Btu/h <8,000	95°F db Outdoor Air [Based on capacity at lower range using EER= 10.8 – (0.213 x Cap/1000)][3]	9.3 EER	
	8,000 ≤Btu/h < 9,000		9.1 EER	
	9,000 ≤Btu/h < 10,000		8.9 EER	
	10,000 ≤Btu/h < 11,000		8.7 EER	
	11,000 ≤Btu/h < 12,000		8.5 EER	
	12,000 ≤Btu/h < 13,000		8.2 EER	
	13,000 ≤Btu/h < 14,000		8.0 EER	
	14,000 ≤Btu/h < 15,000		7.8 EER	
	>15,000 Btu/h		7.6 EER	
PTHP (Heating Mode), New Construction	7,000 ≥Btu/h <8,000	47°F db Outdoor Air [Based on capacity at lower range using COP= 3.2 – (0.026 x Cap/1000)][3]	3.02 COP	
	8,000 ≤Btu/h < 9,000		2.99 COP	
	9,000 ≤Btu/h < 10,000		2.97 COP	
	10,000 ≤Btu/h < 11,000		2.94 COP	
	11,000 ≤Btu/h < 12,000		2.91 COP	
	12,000 ≤Btu/h < 13,000		2.89 COP	
	13,000 ≤Btu/h < 14,000		2.86 COP	
	14,000 ≤Btu/h < 15,000		2.84 COP	
	>15,000 Btu/h		2.81 COP	
PTHP (Heating Mode), Replacements[2]	7,000 ≥Btu/h <8,000	47°F db Outdoor Air [Based on capacity at lower range using COP= 2.9 – (0.026 x Cap/1000)][3]	2.72 COP	
	8,000 ≤Btu/h < 9,000		2.69 COP	
	9,000 ≤Btu/h < 10,000		2.67 COP	
	10,000 ≤Btu/h < 11,000		2.64 COP	
	11,000 ≤Btu/h < 12,000		2.61 COP	
	12,000 ≤Btu/h < 13,000		2.59 COP	
	13,000 ≤Btu/h < 14,000		2.56 COP	
	14,000 ≤Btu/h < 15,000		2.54 COP	
	>15,000 Btu/h		2.51 COP	

(continued)

TABLE 1107.AB.3.2D – continued
ELECTRICALLY OPERATED PACKAGED TERMINAL AIR CONDITIONERS, PACKAGED TERMINAL HEAT PUMPS, SINGLE-PACKAGE VERTICAL AIR CONDITIONERS, SINGLE-PACKAGE VERTICAL HEAT PUMPS, ROOM AIR CONDITIONERS, AND ROOM AIR CONDITIONERS HEAT PUMPS — MINIMUM EFFICIENCY REQUIREMENTS

SPVAC (Cooling Mode)	All Capacities	95°F db/75°F wb Outdoor Air	8.6 EER	ARI 390
SPVHP (Cooling Mode)	All Capacities	95°F db/75°F wb Outdoor Air	8.6 EER	
SPVHP (Heating Mode)	All Capacities	47°F db/43°F wb Outdoor Air	2.7 COP	
Room Air Conditioners with Louvered Sides	8,000 <Btu/h		9.7 EER	ANSI/AH AM RAC-1
	>8,000 <14,000 Btu/h		9.8 EER	
	>14,000 <20,000 Btu/h		9.7 EER	
	>20,000 Btu/h		8.5 EER	
Room Air Conditioners, without Louvered Sides	<8,000 Btu/h		9.0 EER	
	>8,000 Btu/h		8.5 EER	
Room Air Conditioner Heat Pumps with Louvered Sides	<20,000 Btu/h		9.0 EER	
	>20,000 Btu/h		8.5 EER	
Room Air Conditioner Heat Pumps without Louvered Sides	<14,000 Btu/h		8.5 EER	
	>14,000 Btu/h		8.0 EER	
Room Air Conditioner, Casement only	All Capacities		8.7 EER	
Room Air Conditioner, Casement-Slider	All Capacities		9.5 EER	

For SI: 1Btu/h = .2931W, °C = [(°F) - 32]/1.8

1. Chapter 43 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
2. Replacement units must be factory labeled as follows: “MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY; NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS.” Replacement efficiencies apply only to units with existing sleeves less than 16 inches (406 mm) high and less than 42 inches (1067 mm) wide.
3. Cap means the rated cooling capacity of the product in Btu/h. If the unit’s capacity is less than 7,000 Btu/h, use 7,000 Btu/h in the calculation. If the unit’s capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculation.

N1107.A.3 Existing equipment. Minimum efficiencies for existing equipment shall be assumed from Tables B4.1.1A and B4.1.1B in Appendix G-B by the age of the unit unless documentation is available to demonstrate a higher efficiency.

N1107.A.4 Multiple systems. Where two or more systems of the same type are installed with different levels of efficiency serving different parts of the dwelling, a capacity-weighted performance rating shall be used to determine compliance.

N1107.A.5 Installation criteria for homes using the cross ventilation option. The cross ventilation option may be used in the EnergyGauge USA Fla/Res computer program if the criteria in Section B4.1.3 of Appendix G-B have been met.

N1107.A.6 Installation criteria for homes using the whole house fan option. The whole house fan option may be used in the EnergyGauge USA Fla/Res computer program if the criteria in Section B4.1.4 of Appendix G-B have been met.

N1107.B Requirements specific to Method B.

N1107.B.1 Equipment efficiencies. Houses complying by Method B shall meet the cooling equipment efficiencies in Section N1107.AB.3.2.

N1107.B.2 Additions. Where cooling equipment is to be installed in an addition, the requirements of Section N1107.B shall be met only when equipment is installed to specifically serve the addition or is being installed in conjunction with the construction of the addition.

N1107.B.3 Renovations. Minimum efficiencies for cooling equipment to be added or replaced in renovations shall not be less than those specified in Section N1107.AB.3.2.

N1107.B.4 Manufactured homes and manufactured buildings. Minimum efficiencies for site-installed cooling equipment in manufactured homes shall not be less than those specified in Section N1107.AB.3.2.

N1107.B.5 Building systems. Newly manufactured cooling systems installed in existing buildings shall meet minimum requirements for that system in Section N1107.AB.3.2. See Section N1100.1.2.

SECTION N1108
SPACE HEATING SYSTEMS

N1108.AB Mandatory requirements for Methods A or B.

N1108.AB.1 Equipment sizing. An HVAC equipment sizing calculation shall be performed on the building in accordance with the criteria in Section N1107.AB.1 and shall be attached to the Form 1100 submitted when application is made for a building permit. This code does not allow designer safety factors, provisions for future expansion or other factors which affect equipment sizing in excess of the capacity limitations in Sections N1108.AB.1.1 through N1108.AB.1.4. System sizing calculations shall not include loads due to intermittent local mechanical ventilation such as standard kitchen and bathroom exhaust systems. The engineered ventilation requirement of this code shall not be used as an infiltration rate when estimating infiltration load.

N1108.AB.1.1 Heat pumps. Heat pump sizing shall be based on the cooling requirements as calculated according to Section N1107.AB.1 and the heat pump total cooling capacity shall not be more than 1.15 times greater than the design cooling load even if the design heating load is 1.15 times greater than the design cooling load. The published value for ARI total capacity is a nominal, rating-test value and shall not be used for equipment sizing. Manufacturer's expanded performance data shall be used to determine heat pump cooling capacity. This selection shall be based on the outdoor design dry bulb temperature for the load calculation (or entering water temperature for water-source equipment), the blower cfm provided by the expanded performance data, the design value for entering wet bulb temperature and the design value for entering dry bulb temperature.

The design values for entering wet bulb temperature shall be for the indoor dry bulb and relative humidity used for the load calculation and shall be adjusted for return side gains if the return duct(s) is installed in an unconditioned space.

Capacity at the design heating temperature may be determined by interpolation or extrapolation of manufacturers' performance data, as allowed by the manufacturer, if these data are not available for the design temperature. The auxiliary capacity plus refrigeration cycle heating capacity shall not exceed 120-percent of the calculated heating requirements at the 99-percent design dry bulb temperature.

The manufacturer and model number of the outdoor and indoor units (if split system) shall be submitted along with the sensible and total cooling capacities at the design conditions described herein.

N1108.AB.1.2 Electric resistance furnaces. Electric resistance furnaces shall be sized within 4 kW of the design requirements calculated according to the procedure selected in Section N1107.AB.1.

N1108.AB.1.3 Fossil fuel heating equipment. The capacity of fossil fuel heating equipment with natural draft atmospheric burners shall not be less than the design load calculated in accordance with Section N1108.AB.1.

N1108.AB.1.4 Extra capacity required for special occasions. Residences requiring excess heating capacity on an intermittent basis shall comply with Section N1107.AB.1.2.

N1108.AB.2 Controls. Requirements specified for controls in Section N1107.AB.2 shall apply for space heating systems. Lowering thermostat set points to reduce energy consumption of heating systems shall not cause energy to be expended to reach the reduced setting.

N1108.AB.2.1 Heat pump auxiliary heat control. Heat pumps equipped with internal electric resistance heaters shall have controls that prevent supplemental heater operation when the heating load can be met by the heat pump alone during both steady-state operation and

setback recovery. Supplemental heater operation is permitted during outdoor coil defrost cycles. Two means of meeting this requirement are (1) a digital or electronic thermostat designed for heat pump use that energizes auxiliary heat only when the heat pump has insufficient capacity to maintain setpoint or to warm up the space at a sufficient rate or (2) a multi-stage space thermostat and an outdoor air thermostat wired to energize auxiliary heat only on the last stage of the space thermostat and when outside air temperature is less than 40°F (4°C).

Exception: Heat pumps whose minimum efficiency is regulated by NAECA and whose HSPF rating both meets the requirements shown in Table N1107.AB.3.2B and includes all usage of internal electric resistance heating.

N1108.AB.3 Equipment performance standards.

N1108.AB.3.1 Equipment ratings. Equipment efficiency ratings shall be obtained from a nationally recognized certification program directory, from a manufacturer's rating certified to be in compliance with an approved Department of Energy (DOE) or Air-conditioning and Refrigeration Institute (ARI) rating procedure. Equipment efficiencies shall be based on the standard rating conditions contained in the test standard referenced in Chapter 43 that is appropriate for that equipment. Minimum ratings for products covered under the National Appliance Energy Conservation Act of 1987 shall be those determined for Region IV and used for the Federal Trade Commission's required appliance labeling.

N1108.AB.3.1.1 Mix-matched equipment. Ratings for unitary central heat pump systems less than 65,000 Btu/h, using evaporator/(condenser) coils manufactured by independent companies, shall meet all requirements of Section N1107.AB.3.1.1.

N1108.AB.3.2 Minimum efficiencies for heating equipment. Tables N1107.AB.3.2B, N1107.AB.3.2D, N1108.AB.3.2E and N1108.AB.3.2F contain the minimum efficiency requirements for equipment covered by this section of the code. The tables are organized to cover the following types of equipment:

Table N1107.AB.3.2B, Heat Pumps

Table N1107.AB.3.2D, Packaged Terminal Air Conditioners and Heat Pumps

Table N1108.AB.3.2E, Furnaces, Duct Furnaces and Unit Heaters

Table N1108.AB.3.2F, Gas- and Oil-Fired Boilers

N1108.AB.3.2.1 Gas and oil-fired furnaces. Gas-fired and oil-fired forced air furnaces with input ratings >225,000 Btu/h shall also have an intermittent ignition or interrupted device (IID) and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for furnaces where combustion air is drawn from the conditioned space. All furnaces with input ratings >225,000 Btu/h, including electric furnaces, that are not located within the conditioned space shall have jacket losses not exceeding 0.75 percent of the input.

N1108.AB.3.2.2 Central electric furnaces. Central electric furnaces greater than 10 kW shall be divided into at least two stages and controlled by an outdoor thermostat, multistage indoor thermostat, or combinations thereof.

N1108.A Requirements specific to Method A.

N1108.A.1 Heating systems. The impact of heating system efficiency in the energy performance calculation shall be determined for the type of heating system to be installed based on its efficiency rating from the EnergyGauge USA Fla/Res computer program.

TABLE N1108.AB.3.2E
WARM AIR FURNACES AND COMBINATION WARM AIR FURNACES/AIR-CONDITIONING UNITS, WARM AIR DUCT FURNACES AND UNIT HEATERS. MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type	Size Category	Subcategory or Rating Condition	Minimum Efficiency[1]	Test Procedure[2]
Warm Air Furnace, Gas-Fired	<225,000 Btu/h	Maximum Capacity[4]	78% AFUE or ;80% E_t[4]	DOE 10 CFR, Part 430 or ANSI Z 21.47
	≥225,000 Btu/h		80% E_c[3]	ANSI Z21.47
Warm Air Furnace, Oil-Fired	<225,000 Btu/h	Maximum Capacity[4]	78% AFUE or ;80% E_t[4]	DOE 10 CFR, Part 430 or UL 727
	≥225,000 Btu/h		81% E_t[6]	UL 727
Warm Air Duct Furnaces, Gas-Fired	All Capacities	Maximum Capacity[5]	80% E_c[7]	ANSI Z83.8
Warm Air Unit Heaters, Gas-Fired	All Capacities	Maximum Capacity[5]	80% E_c[7]	ANSI Z83.8
Warm Air Unit Heaters, Oil-Fired	All Capacities	Maximum Capacity[5]	80% E_c[7]	UL 731

For SI: 1 Btu/h = .2931 W.

1. E_t = thermal efficiency. See test procedure for detailed discussion.
2. Chapter 43 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
3. E_c = combustion efficiency. Units must also include an IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
4. Combination units not covered by NAECA (three-phase power or cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating.
5. Minimum and maximum ratings as provided for and allowed by the unit's controls.
6. E_t = thermal efficiency. Units must also include an IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
7. E_c = combustion efficiency (100% less flue losses). See test procedure for detailed discussion.

TABLE N1108.AB.3.2F
GAS- AND OIL-FIRED BOILERS MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type[4]	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency[1]	Test Procedure[2]
Boilers, Gas-Fired	<300,000 Btu/h	Hot water	80% AFUE	DOE 10 CFR Part 430
		Steam	75% AFUE	
	≥300,000 Btu/h and <2,500,000	Maximum Capacity[3]	75% E_t[1]	H.I. Htg Boiler Std.
	>2,500,000 Btu/h[4]	Hot Water	80% E_c	
	>2,500,000 Btu/h[4]	Steam	80% E_c	
Boilers, Oil-Fired	<300,000 Btu/h		80% AFUE	DOE 10 CFR Part 430
	≥300,000 Btu/h and ≤250,000,000 Btu/h	Maximum Capacity[3]	78% E_t[1]	H.I. Htg Boiler Std.
	>2,500,000 Btu/h[4]	Hot Water	83% E_c	
	>2,500,000 Btu/h[4]	Steam	83% E_c	
Oil-Fired (Residual)	≥300,000 Btu/h and ≤250,000,000 Btu/h	Maximum Capacity[3]	78% E_t[1]	H.I. Htg Boiler Std.
	>2,500,000 Btu/h[4]	Hot Water	83% E_c	
	>2,500,000 Btu/h[4]	Steam	83% E_c	

For SI: 1 Btu/h = .2931 W.

1. E_t = thermal efficiency. See reference documents for detailed information.
2. Chapter 43 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
3. Minimum and maximum ratings as provided for and allowed by the unit's controls.
4. These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers, and to all package boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.

N1108.A.2 Additions. Space heating may be provided by existing or newly installed equipment. Systems in operation before the construction of the addition shall be considered existing systems. New systems may be replacements of existing equipment or equipment installed to condition only the addition.

N1108.A.3 Multiple systems. Where two or more systems of the same type are installed with different levels of efficiency serving different parts of the dwelling, a capacity-weighted performance rating shall be used to determine compliance.

N1108.B Requirements specific to Method B. Space heating systems are categorized as electric or gas and oil. Heating equipment shall meet the applicable minimum efficiencies listed on Table 11B-1 of Form 1100B.

N1108.B.1 Electric space heating. Electric resistance heating systems shall not be used when complying by Method B.

N1108.B.2 Gas, oil and instantaneous (tankless) water heaters used for space heating. Gas and oil heating systems may be installed. Gas instantaneous (tankless) water heaters that meet the requirements established for such equipment by this code may be installed.

N1108.B.3 Additions. New heating equipment to be added or replaced in additions complying by Method B shall meet the minimum efficiencies in Section N1108.AB.3.2. Minimum equipment efficiencies shall be met only when equipment is installed to specifically serve the addition or is being installed in conjunction with the construction of the addition.

N1108.B.4 Renovations. Minimum efficiencies for heating equipment to be added or replaced in renovations shall not be less than those specified in Section N1108.AB.3.2.

N1108.B.5 Manufactured homes and manufactured buildings. Minimum efficiencies for site-installed heating equipment in manufactured homes shall not be less than those specified in Section N1108.AB.3.2.

N1108.B.6 Building systems. Newly manufactured heating systems installed in existing buildings shall meet the minimum requirements for that system in Section N1108.AB. See Section N1100.1.2 for exceptions.

SECTION N1109
VENTILATION SYSTEMS

N1109.AB Mandatory requirements for Methods A or B.

N1109.AB.1 Buildings operated at positive indoor pressure. Residential buildings designed to be operated at a positive indoor pressure or for mechanical ventilation shall meet the following criteria:

1. The design air change per hour minimums for residential buildings in ASHRAE 62, *Ventilation for Acceptable Indoor Air Quality*, shall be the maximum rates allowed for residential applications.
2. No ventilation or air-conditioning system makeup air shall be provided to conditioned space from attics, crawl spaces, attached enclosed garages or outdoor spaces adjacent to swimming pools or spas.
3. If ventilation air is drawn from enclosed space(s), then the walls of the space(s) from which air is drawn shall be insulated to a minimum of R-11 and the ceiling shall be insulated to a minimum of R-19, space permitting, or R-10 otherwise.

SECTION N1110
AIR DISTRIBUTION SYSTEMS

N1110.AB Mandatory requirements for Methods A or B.

N1110.AB.1 Air distribution system sizing and design. All air distribution systems shall be sized and designed in accordance with recognized engineering standards such as ACCA Manual D or other standards based on the following:

1. Calculation of the supply air for each room shall be based on the greater of the heating load or sensible cooling load for that room.
2. Duct size shall be determined by the supply air requirements of each room, the available static pressure and the total equivalent length of the various duct runs.
3. Friction loss data shall correspond to the type of material used in duct construction.

N1110.AB.2 Air distribution system insulation requirements. All air distribution system components which move or contain conditioned air, including but not limited to, air filter enclosures, air ducts and plenums located in or on buildings shall be thermally insulated in accordance with the requirements of Sections N1110.AB.2.1 through N1110.AB.2.3.

N1110.AB.2.1 Insulation required. The minimum installed thermal resistance (*R*-value) for air distribution system components shall be as specified in Table N1110.AB.2.1.

Exception: Air distribution system component insulation (except where required to prevent condensation) is not required in the following cases:

1. Within conditioned space.
2. Exhaust air ducts.
3. Factory-installed plenums, casings, or ductwork furnished as a part of HVAC equipment tested and rated in accordance with Section N1107.AB.3 or N1108.AB.3.

TABLE N1110.AB.2.1
MINIMUM INSULATION LEVELS
AIR DISTRIBUTION SYSTEM COMPONENTS[1]

Location	R-Value
On roof	R-6
Exterior of building	R-6
Attic with ceiling insulation	R-6
Between conditioned floors[2]	R-4.2
Enclosed attached garages	R-4.2
Unconditioned basement	R-4.2
Vented crawl space	R-4.2

1. See Section N1110.AB.3.5, Air-handling units.
2. Except where perimeter walls to the between floor space are insulated.

N1110.AB.2.2 R-value determination. All duct insulation and factory-made ducts shall be labeled with *R*-values based on flat sections of insulation only at installed thickness and excluding any air film resistance. The thermal resistance (*R*) shall be determined using the relationship $R = t/k$ where t (inches) is the installed thickness and k (Btu-in/hr $\times$ ft^2°F) is the measured apparent thermal conductivity at 75°F (24°C) mean temperature and at installed thickness tested in accordance with ASTM C 518 or ASTM C 177. The installed thickness of duct insulation used to calculate *R*-values shall be determined as follows:

1. Duct board, duct liner and factory-made rigid ducts not normally subjected to compression shall use the nominal insulation thickness.
2. Duct wrap shall have an assumed installed thickness of 75 percent of nominal thickness (25-percent compression).
3. Factory-made flexible air ducts shall have the installed thickness and calculated *R*-values determined in accordance with Paragraph 3.4 of the *ADC Standard, Flexible Duct Performance & Installation Standards*.

N1110.AB.2.3 Condensation control. Additional insulation with vapor barrier shall be provided where the minimum duct insulation requirements of Section N1110.AB.2 are determined to be insufficient to prevent condensation.

N1110.AB.2.4 Fibrous glass duct liner. Fibrous glass duct liner shall be fabricated and installed in accordance with the provisions of the NAIMA *Fibrous Glass Duct Liner Standard*.

N1110.AB.3 Air distribution system construction and installation. 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.

N1110.AB.3.0 General. 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.

N1110.AB.3.0.1 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).

N1110.AB.3.0.2 Sealing. Air distribution system components shall be sealed with approved closure systems.

N1110.AB.3.0.3 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 N1110.AB.3; (2) inspection; and (3) cleaning and maintenance. A minimum of 4 inches (102 mm) is considered sufficient space around air-handling units.

Exception: Retrofit or replacement units not part of a renovation are exempt from the minimum clearance requirement.

N1110.AB.3.0.4 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.

N1110.AB.3.0.5 Surface preparation. The surfaces upon which closure products are to be applied shall be clean and dry in accordance with the manufacturer's installation instructions.

N1110.AB.3.0.6 Approved mechanical attachments. Approved mechanical attachments for air distribution system components include screws, rivets, welds, interlocking joints crimped and rolled, staples, twist in (screw attachment), and compression systems created by bend tabs or screw tabs and flanges or by clinching straps. Mechanical attachments shall be selected to be appropriate to the duct system type.

N1110.AB.3.0.7 Approved closure systems. The following closure systems and materials are approved for air distribution construction and sealing for the applications and pressure classes prescribed in Sections N1110.AB.3.1 through N1110.AB.3.8:

1. Metal closures.
    a. Welds applied continuously along seams or joints through which air could leak.
    b. Snaplock seams, and grooved, standing, double-corner, single-corner and Pittsburgh-lock seams, as defined by SMACNA, as well as all other rolled mechanical seams. All seams shall be rolled or crimped
2. Factory-made flexible air ducts shall have the installed thickness and calculated *R*-values determined in accordance with Paragraph 3.4 of the *ADC Standard, Flexible Duct Performance & Installation Standards*.
3. Gasketing, which achieves a 25/50 flame spread/smoke-density-development rating under ASTM E 84 or UL 723, provided that it is used only between mated surfaces which are mechanically fastened with sufficient force to compress the gasket and to fill all voids and cracks through which air leakage would otherwise occur.
4. Mastic closures. Mastics shall be placed over the entire joint between mated surfaces. Mastics shall not be diluted. Approved mastics include the following:
    a. Mastic or mastic-plus-embedded fabric systems applied to fibrous glass ductboard that are listed and labeled in accordance with UL 181A, Part III.
    b. Mastic or mastic-plus-embedded fabric systems applied to nonmetal flexible duct that are listed and labeled in accordance with UL 181B, Part II.
    c. Mastic ribbons, which achieve a 25/50 flame spread/smoke-density-development rating under ASTM E 84 or UL 723, provided that they may be used only in flange-joints and lap-joints, such that the mastic resides between two parallel surfaces of the air barrier and that those surfaces are mechanically fastened.
5. Tapes. Tapes shall be applied such that they extend not less than 1 inch onto each of the mated surfaces and shall totally cover the joint. When used on rectangular ducts, tapes shall be used only on joints between parallel rigid surfaces and on right angle joints. Approved tapes include the following:
    a. Pressure-sensitive tapes.
        1) Pressure-sensitive tapes applied to fibrous glass ductboard that are listed and labeled in accordance with UL 181A, Part I.
        2) Pressure-sensitive tapes applied to nonmetal flexible duct that are listed and labeled in accordance with UL 181B, Part I.
    b. Heat-activated tapes applied to fibrous glass ductboard that are listed and labeled in accordance with UL 181A, Part II.
6. Aerosol sealant. Such sealants shall be installed by manufacturer-certified installers following manufacturer instructions and shall achieve 25/50 flame spread/smoke-density-development ratings under ASTM E 84 or UL 723.

N1110.AB.3.1 Metal duct, rigid and flexible. All transverse joints, longitudinal seams and duct wall penetration of ducts and joints with other air distribution system components shall be mechanically attached and sealed using approved closure systems for that pressure class specified in Section N1110.AB.3.1.1 or N1110.AB.3.1.2.

N1110.AB.3.1.1 Pressures less than 1-inch water gauge, approved closure systems. The following closure systems are approved for rigid metal duct designed to be operated at pressures less than 1-inch w.g. when they conform to the approved closure and mechanical attachment requirements of Section N1110.AB.3.0:

1. Continuous welds.
2. Snaplock seams, and grooved, standing, double-corner, single-corner and Pittsburgh-lock seams and all other rolled mechanical seams.

3. Mastic, mastic-plus-embedded fabric, or mastic ribbons.
4. Gaskets.
5. Pressure-sensitive tape.

N1110.AB.3.1.2 Pressures 1-inch water gauge or greater, approved closure systems. The following closure systems are approved for rigid metal duct designed to be operated at pressures 1-inch w.g. or greater and flexible duct when they conform to the approved closure and mechanical attachment requirements of Section N1110.AB.3.0:

1. Continuous welds.
2. Mastic or mastic-plus-embedded fabric systems.
3. Gaskets.

N1110.AB.3.1.3 High pressure duct systems. High pressure duct systems designed to operate at pressures greater than 3-inch water gauge (4-inch water gauge pressure class), shall be tested in accordance with the SMACNA *HVAC Air Duct Leakage Test Manual*. The tested duct leakage class, at a test pressure equal to the design duct pressure class rating, shall be equal to or less than Leakage Class 6. Leakage testing may be limited to representative sections of the duct system but in no case shall such tested sections include less than 25 percent of the total installed duct area for the designated pressure class.

N1110.AB.3.2 Fibrous glass duct, rigid. All rigid fibrous glass ducts and plenums shall be constructed and erected in accordance with the provisions of the NAIMA *Fibrous Glass Duct Construction Standards*.

All joints, seams and duct wall penetrations including, but not limited to, the joints between sections of duct and between duct and other distribution system components shall be mechanically attached and sealed using approved closure systems as specified in Section N1110.AB.3.2.1.

N1110.AB.3.2.1 Approved closure systems. The following closure systems are approved for rigid fibrous glass ducts when they conform to the approved closure and mechanical attachment requirements of Section N1110.AB.3.0:

1. Heat-activated tapes.
2. Pressure-sensitive tapes.
3. Mastics or mastic-plus-embedded fabric systems.

N1110.AB.3.2.2 Mechanical fastening. Attachments of ductwork to air-handling equipment shall be by mechanical fasteners. Where access is limited, two fasteners on one side shall be acceptable when installed in accordance with Section N1110.AB.3.0.6.

N1110.AB.3.3 Flexible duct systems, nonmetal. Flexible nonmetal ducts shall be joined to all other air distribution system components by either terminal or intermediate fittings. All duct collar fittings shall have a minimum $^5/_8$ inch (16 mm) integral flange for sealing to other components and a minimum 3-inch (76 mm) shaft for insertion into the inner duct core.

Flexible ducts having porous inner cores shall not be used.

Exception: Ducts having a nonporous liner between the porous inner core and the outer jacket. Fastening and sealing requirements shall be applied to such intermediate liners.

All joints of flexible ducts to fittings and fittings to other air distribution system components shall be mechanically attached and sealed as specified in Sections N1110.AB.3.3.1 through N1110.AB.3.3.6.

N1110.AB.3.3.1 Duct core to duct fitting, mechanical attachment. The reinforced core shall be mechanically attached to the duct fitting by a drawband installed directly over the wire-reinforced core and the duct fitting. The duct fitting shall extend a minimum of 2 inches (51 mm) into each section of duct core. When the flexible duct is larger than 12 inches (303 mm) in diameter or the design pressure exceeds 1-inch water gauge, the drawband shall be secured by a raised bead or indented groove on the fitting.

N1110.AB.3.3.2 Duct core to duct fitting, approved closure systems. The reinforced lining shall be sealed to the duct fitting using one of the following sealing materials which conforms to the approved closure and mechanical attachment requirements of Section N1110.AB.3.0:

1. Gasketing.
2. Mastic, mastic-plus-embedded fabric, or mastic ribbons.
3. Pressure-sensitive tape.
4. Aerosol sealants, provided that their use is consistent with UL 181.

N1110.AB.3.3.3 Duct outer jacket to duct collar fitting. The outer jacket of a flexible duct section shall be secured at the juncture of the air distribution system component and intermediate or terminal fitting in such a way as to prevent excess condensation. The outer jacket of a flexible duct section shall not be interposed between the flange of the duct fitting and the flexible duct, rigid fibrous glass duct board, or sheet metal to which it is mated.

N1110.AB.3.3.4 Duct collar fitting to rigid duct, mechanical attachment. The duct collar fitting shall be mechanically attached to the rigid duct board or sheet metal by appropriate mechanical fasteners, either screws, spin-in flanges, or dovetail flanges.

N1110.AB.3.3.5 Duct collar fitting to rigid duct, approved closure systems. The duct collar fitting's integral flange shall be sealed to the rigid duct board or sheet metal using one of the following closure systems/materials which conforms to the approved clo-

sure and mechanical attachment standards of Section N1110.AB.3.0:

1. Gasketing.
2. Mastic or mastic-plus-embedded fabric systems.
3. Mastic ribbons when used to attach a duct collar to sheet metal.
4. Pressure-sensitive tape.
5. Aerosol sealants, provided that their use is consistent with UL 181.

N1110.AB.3.3.6 Flexible duct installation and support. Flexible ducts shall be configured and supported so as to prevent the use of excess duct material, prevent duct dislocation or damage, and prevent constriction of the duct below the rated duct diameter in accordance with the following requirements:

1. Ducts shall be installed fully extended. The total extended length of duct material shall not exceed 5 percent of the minimum required length for that run.
2. Bends shall maintain a center line radius of not less than one duct diameter.
3. Terminal devices shall be supported independently of the flexible duct.
4. Horizontal duct shall be supported at intervals not greater than 5 feet (1524 mm). Duct sag between supports shall not exceed $^1/_2$ inch (12.7 mm) per foot of length. Supports shall be provided within $1^1/_2$ feet (38 mm) of intermediate fittings and between intermediate fittings and bends. Ceiling joists and rigid duct or equipment may be considered to be supports.
5. Vertical duct shall be stabilized with support straps at intervals not greater than 6 feet (1829 mm).
6. Hangers, saddles and other supports shall meet the duct manufacturer's recommendations and shall be of sufficient width to prevent restriction of the internal duct diameter. In no case shall the material supporting flexible duct that is in direct contact with it be less than $1^1/_2$ inches (38 mm) wide.

N1110.AB.3.4 Terminal and intermediate fittings. All seams and joints in terminal and intermediate fittings, between fitting subsections and between fittings and other air distribution system components or building components shall be mechanically attached and sealed as specified in Section N1110.AB.3.4.1 or N1110.AB.3.4.2.

N1110.AB.3.4.1 Fittings and joints between dissimilar duct types, approved closure systems. Approved closure systems shall be as designated by air distribution system component material type in Section N1110.AB.3.

Exception: When the components of a joint are fibrous glass duct board and metal duct, including collar fittings and metal equipment housings, the closure systems approved for fibrous glass duct shall be used.

N1110.AB.3.4.2 Terminal fittings and air ducts to building envelope components, approved closure systems. Terminal fittings and air ducts which penetrate the building envelope shall be mechanically attached to the structure and sealed to the envelope component penetrated and shall use one of the following closure systems/materials which conform to the approved closure and mechanical application requirements of Section N1110.AB.3.0:

1. Mastics or mastic-plus-embedded fabrics.
2. Gaskets used in terminal fitting/grille assemblies which compress the gasket material between the fitting and the wall, ceiling or floor sheathing.

N1110.AB.3.5 Air-handling units. All air-handling units shall be mechanically attached to other air distribution system components. Air-handling units located outside the conditioned space shall be sealed using approved closure systems conforming to the approved closure and mechanical application requirements of Section N1110.AB.3.1.

N1110.AB.3.5.1 Approved closure systems. Systems conforming to the product and application standards of Section N1110.AB.3.0 may be used when sealing air-handling units.

N1110.AB.3.5.2 Air-handling units in attics. Air-handling units shall be allowed in attics if the following conditions are met:

1. The service panel of the equipment is located within 6 feet (1829 mm) of an attic access.
2. A device is installed to alert the owner or shut the unit down when the condensation drain is not working properly.
3. The attic access opening is of sufficient size to replace the air handler.
4. A notice is posted on the electric service panel indicating to the homeowner that the air handler is located in the attic. Said notice shall be in all capitals, in 16-point type, with the title and first paragraph in bold:

NOTICE TO HOMEOWNER

A PART OF YOUR AIR-CONDITIONING SYSTEM, THE AIR HANDLER, IS LOCATED IN THE ATTIC. FOR PROPER, EFFICIENT, AND ECONOMIC OPERATION OF THE AIR-CONDITIONING SYSTEM, YOU MUST ENSURE THAT REGULAR MAINTENANCE IS PERFORMED.
YOUR AIR-CONDITIONING SYSTEM IS

EQUIPPED WITH ONE OR BOTH OF THE FOLLOWING: (1) A DEVICE THAT WILL ALERT YOU WHEN THE CONDENSATION DRAIN IS NOT WORKING PROPERLY OR (2) A DEVICE THAT WILL SHUT THE SYSTEM DOWN WHEN THE CONDENSATION DRAIN IS NOT WORKING. TO LIMIT POTENTIAL DAMAGE TO YOUR HOME, AND TO AVOID DISRUPTION OF SERVICE, IT IS RECOMMENDED THAT YOU ENSURE PROPER WORKING ORDER OF THESE DEVICES BEFORE EACH SEASON OF PEAK OPERATION.

N1110.AB.3.6 Cavities of the building structure. Cavities in framed spaces, such as dropped soffits and walls, shall not be used to deliver air from or return air to the conditioning system unless they contain an air duct insert which is insulated in accordance with Section N1110.AB.2 and constructed and sealed in accordance with the requirements of Section N1110.AB.3 appropriate for the duct materials used.

Exception: Return air plenums.

N1110.AB.3.6.1 Cavities designed for air transport such as mechanical closets, chases, air shafts, etc., shall be lined with an air barrier and sealed in accordance with Section N1110.AB.3.7 and shall be insulated in accordance with Section N1110.AB.2.

N1110.AB.3.6.2 Building cavities which will be used as return air plenums shall be lined with a continuous air barrier made of durable nonporous materials. All penetrations to the air barrier shall be sealed with a suitable long-life mastic material.

Exception: Surfaces between the plenum and conditioned spaces from which the return/mixed air is drawn.

N1110.AB.3.6.3 Building cavities beneath a roof deck that will be used as return air plenums shall have an insulated roof with the insulation having an *R*-value of at least R-19.

N1110.AB.3.7 Mechanical closets. The interior surfaces of mechanical closets shall be sheathed with a continuous air barrier as specified in Section N1110.AB.3.7.1 and shall be sealed with approved closure systems as specified in Section N1110.AB.3.7.2. All joints shall be sealed between air barrier segments and between the air barriers of walls and those of the ceiling, floor and door framing. All penetrations of the air barrier including, but not limited to, those by air ducts, plenums, pipes, service lines, refrigerant lines, electrical wiring, and condensate drain lines shall be sealed to the air barrier with approved closure systems.

Exception: Air passageways into the closet from conditioned space that are specifically designed for return air flow.

Through-wall, through-floor and through-ceiling air passageways into the closet shall be framed and sealed to form an air-tight passageway using approved air duct materials and approved closure systems.

Duct penetrations through any part of the ceiling, walls or floor of a mechanical closet shall have sufficient space between surrounding ceiling, walls or floor and any duct or plenum penetration to allow for sealing of the penetration and inspection of the seal.

Clothes washers, clothes dryers, combustion water heaters and atmospheric combustion furnaces shall not be located in mechanical closets used as return air plenums.

N1110.AB.3.7.1 Approved air barriers. The following air barriers are approved for use in mechanical closets:

1. One-half-inch-thick (12.7 mm) 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.

N1110.AB.3.7.2 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 N1110.AB.3.2.1 for fibrous glass ductboard.
3. A suitable long-life caulk or mastic compliant with the locally adopted mechanical code for all applications.

N1110.AB.3.8 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 N1110.AB.3 and insulated according to the requirements of Section N1110.AB.2.

1. 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.
2. 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.
3. 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 accor-

dance with Section N1110.AB.3.2 or N1110.AB.3.1, respective to the duct type used.

N1110.A Requirements specific to Method A.

N1110.A.1 Duct types. Duct systems shall include both supply and return air sections and shall be described in sufficient detail to allow the building official to determine code compliance. The impact of air distribution system efficiency in the energy performance calculation shall be determined from the EnergyGauge USA Fla/Res computer program in accordance with Section N1113 of this code.

N1110.A.2 Installation criteria for homes claiming the tested duct option. The tested duct option may be claimed in the EnergyGauge USA Fla/Res computer program where the air distribution system is tested in accordance with ASHRAE 152, in which case measured duct air leakage values shall be used. Tested duct leakage shall be determined and documented by a Certified Class 1 Florida Rater.

N1110.A.3 Installation criteria for homes claiming the factory-sealed air-handling unit option. The factory-sealed air-handling unit option may be claimed in the EnergyGauge USA Fla/Res computer program if the unit has been tested and certified by the manufacturer to have achieved a 2 percent or less leakage rate at 1-inch water gauge when all air inlets, air outlets and condensate drain port(s), when present, are sealed at an air pressure of 1-inch water gauge with no greater than 2-percent design cubic foot per minute discharge.

N1110.B Requirements specific to Method B.

N1110.B.1 Ducts installed. All ducts shall be insulated to at least the level required by Table 11B-1 on Form 1100B. All ducts and air handlers shall be either located in conditioned space or tested by a Class 1 BERS rater to be leak free according to the criteria in Section N1110.A.2 of the *Florida Building Code, Residential.*

N1110.B.2 Additions. New ducts that are installed to serve an addition shall either be insulated to R-6 or be installed in conditioned space as designated on Form 1100B.

Exception: Only new or replacement ducts installed as part of the addition shall meet this requirement.

N1110.B.3 Renovations. Replacement duct systems that are not in conditioned space shall be insulated to levels specified in Section N1110.B.1.

Exception: Only new or replacement ducts installed as part of the renovation shall meet this requirement.

N1110.B.4 Manufactured homes and manufactured buildings. Site-installed components and features of the air distribution system(s) of manufactured homes shall be insulated, constructed, sealed and supported in accordance with the requirements of Sections N1110.AB.2 and N1110.AB.3. The duct connection between the air distribution systems of separate units of multiple unit manufactured homes and buildings shall be installed, sealed and inspected according to the provisions of this code.

Manufactured homes and buildings having interior furnaces and site-installed single package air conditioners which share the same supply registers shall have an automatic backflow damper installed between the air conditioning unit and the factory-installed duct to prevent the functioning of return grilles as supply registers and to prevent the forced passage of conditioned air through inactive air handlers when another system is in operation.

N1110.B.5 Building systems. Newly manufactured air distribution system components installed in existing buildings shall meet the minimum requirements for air distribution systems contained in Sections N1110.AB.2 through N1110.AB.3.8, as appropriate. See Section N1100.1.2 for exceptions.

SECTION N1111
PIPING

N1111.AB Mandatory requirements for Methods A or B.

N1111.AB.1 Piping insulation. All piping installed to service buildings and within buildings, including the vapor line of HVAC refrigerant piping, shall be thermally insulated in accordance with Table N1111.AB.1 except as stated herein (for service water heating systems, see Section N1112.AB.5).

Exception: Piping insulation is not required in the following cases:

1. Piping installed within HVAC equipment.
2. Piping containing fluid at temperatures between 55°F and 120°F (13°C to 49°C).
3. Piping within the conditioned space.
4. Piping within basements or unvented crawl spaces (plenums) having insulated walls.

N1111.AB.1.1 Other insulation thicknesses. Insulation thickness in Table N1111.AB.1 are based on insulation having thermal resistance in the range of 4.0 to 4.6°F $\times$ ft^2 $\times$ h/Btu. per inch of thickness on a flat surface at a mean temperature of 75°F (24°C).

Minimum insulation thickness shall be increased for materials having *R*-values less than 4.0°F $\times$ ft^2 $\times$ h/Btu.in. or may be reduced for materials having *R*-values greater than 4.6°F $\times$ ft^2 $\times$ h/Btu.in. as follows:

1. For materials with thermal resistivity greater than R-4.6, the minimum insulation thickness may be reduced as follows:

New minimum thickness =

$$\frac{4.6 \times \text{Table N1111.AB.1 Thickness}}{\text{Actual Resistivity}}$$

2. For material with thermal resistivity less than R-4.0, the minimum insulation thickness shall be increased as follows:

New minimum thickness =

$$\frac{4.0 \times \text{Table N1111.AB.1 Thickness}}{\text{Actual Resistivity}}$$

TABLE N1111.AB.1
MINIMUM PIPE INSULATION

Piping System Types	Fluid Temperature Range°F	Runouts[2] (inches)	Insulation for Pipe < 1"	Thickness Sizes[1] 1.25 - 2"
HEATING SYSTEMS				
Steam and hot water				
Low pressure/temp.	201 - 250	1.0	1.5	1.5
Low temperature	120 - 200	0.5	1.0	1.0
Steam condensate (for feed water)	Any	1.0	1.0	1.5
COOLING SYSTEMS	40 - 55	0.5	0.5	0.75
Chilled water, refrigerant or brine[3]	Below 40	1.0	1.0	1.50

For SI: 1 inch = 25.4 mm, °C = [(°F)-32]/1.8

1. For piping larger than 1 inch diameter and exposed to outdoor ambient temperatures, increase thickness by 0.5 inch.
2. Runouts to individual thermal units (not exceeding 12 feet in length).
3. The required minimum thicknesses do not consider water vapor transmission and condensation. Additional insulation, vapor retarders, or both, may be required to limit water vapor transmission and condensation.

SECTION N1112
WATER HEATING SYSTEMS

N1112.AB Mandatory requirements for Methods A or B.

N1112.AB.1 Sizing. Reserved.

N1112.AB.2 Controls.

N1112.AB.2.1 Storage water heater temperature controls.

N1112.AB.2.1.1 Automatic controls. Service water heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use. The minimum temperature setting range shall be from 100°F to 140°F (38°C to 60°C).

N1112.AB.2.1.2 Shut down. A separate switch or a clearly marked circuit breaker shall be provided to permit the power supplied to electric service systems to be turned off. A separate valve shall be provided to permit the energy supplied to the main burner(s) of combustion types of service water heating systems to be turned off.

N1112.AB.2.2 Heat traps. Storage water heaters not equipped with integral heat traps and having vertical pipe risers shall have heat traps installed on both the inlets and outlets. External heat traps shall consist of either a commercially available heat trap or a downward and upward bend of at least 3½ inches (89 mm) in the hot water distribution line and cold water line located as close as possible to the storage tank.

N1112.AB.2.3 Swimming pool and spa temperature controls.

N1112.AB.2.3.1 On-off switch required. All pool and spa heaters shall be equipped with an on-off switch mounted for easy access to allow the heater to be shut off without adjusting the thermostat setting and to allow restarting without relighting the pilot light.

N1112.AB.2.3.2 Covers required. Spas and heated swimming pools shall be equipped with a cover designed to minimize heat loss.

Exception: Outdoor pools deriving over 70 percent of the energy for heating from nondepletable on-site-recovered sources computed over an operating season are exempt from this requirement.

N1112.AB.2.3.3 Time clocks on private pools. Time clocks shall be installed on private pools so that the pump can be set to run during off-peak electric demand periods and can be set for the minimum time necessary to maintain the water in a clear and sanitary condition in keeping with applicable health standards.

Exceptions: Pumps connected to swimming pool solar water heating systems or any pool legally considered a public pool.

N1112.AB.2.3.4 Pool heater efficiency. All gas- and oil-fired pool heaters when tested in accordance with ANSI Z 21.56 shall have a minimum thermal efficiency of 78 percent.

Heat pump pool heaters shall be tested in accordance with ARI 1160, Table 2, Standard Rating Conditions-Low Air Temperature, and shall have a minimum COP of 4.0. Test reports from independent laboratories are required to verify procedure compliance. *

N1112.AB.2.4 Showers. Showers used for other than safety reasons shall be equipped with flow control devices to limit the water discharge to a maximum of 2.50 gpm (.16 L/S) per shower head at a distribution pressure of 80 psig (552 kPa) when tested in accordance with the procedures of ANSI A112.18.1M. Flow-restricting inserts used as a component part of a showerhead shall be mechanically retained at the point of manufacture.

N1112.AB.3 Equipment performance standards.

N1112.AB.3.1 Electric water heater efficiencies.

N1112.AB.3.1.1 Storage capacities of 120 gallons or less. All automatic electric storage water heaters having a storage capacity of 120 gallons (454 L) or less and an input rating of 12 kw or less shall, when tested in accordance with the DOE Uniform Test Method for Measuring the Energy Consumption of Water Heaters, Appendix E to Subpart B, 10 CFR Part 430, meet the performance minimums listed in Table N1112.AB.3.

N1112.AB.3.1.2 Storage capacities greater than 120 gallons. Performance minimums for electric storage water heaters with capacities greater than 120 gallons (454 L) or an input rate greater than 12 kw shall have a standby loss of .30+27/*VT* percent/hour or less, where *VT* is the tested storage volume in gallons and tested in accordance with ANSI test method Z21.10.3.

N1112.AB.3.2 Gas- and oil-fired water heater efficiencies.

N1112.AB.3.2.1 Tanks with input ratings of 75,000 Btu/h or less (gas) or 105,000 Btu/h or less (oil). All gas- and oil-fired automatic storage water heaters with capacities of 100 gallons or less and an input rating of 75,000 Btu/h or less (gas) or 105,000 Btu/h or less (oil) shall, when tested in accordance with the DOE Uniform Test Method for Measuring the Energy Consumption of Water Heaters, Appendix E to Subpart B, 10 CFR Part 430, meet the performance minimums listed in Table N1112.AB.3.

N1112.AB.3.2.2 Tanks with input ratings greater than 75,000 Btu/h (gas) or greater than 105,000 Btu/h (oil). All gas-fired storage water heaters with input ratings greater than 75,000 Btu/h but less than or equal to 155,000 Btu/h, and all oil-fired storage water heaters with input ratings greater than 105,000 Btu/h but less than or equal to 155,000 Btu/h, shall have a steady-state combustion efficiency E_t of .78 or less and a standby loss of 1.30+114/VT (in percent/hour) or less, where VT is the tested storage volume in gallons. All gas- and oil-fired storage water heaters with input ratings greater than 155,000 Btu/h shall have a steady-state combustion efficiency E_t of .78 or more and a standby loss of 1.30+95/VT, where VT is the tested storage volume in gallons.

N1112.AB.3.2.3 Gas instantaneous or tankless water heaters. All gas-fired instantaneous (tankless) water heaters that a) initiate heating based on sensing water flow, b) are designed to deliver water at a controlled temperature of less than 180°F (82°C), c) have an input less than 200,000 Btu/h (210 MJ/h), d) have a manufacturer's specified storage capacity of less than 2 gallons (7.6 liters) and, e) have either a fixed or variable burner input shall, when tested in accordance with the DOE Uniform Test Method for Measuring the Energy Consumption of Water Heaters, Appendix E to Subpart B, Title 10 CFR 430, meet the performance minimums established in Title 10 CFR 430.32, *Energy and Water Conservation Standards and Effective Dates*.

N1112.AB.3.3 Unfired storage tanks. All unfired storage tanks shall have a standby loss of 6.5 Btu/h/ft^2 or less, based on an 80°F (27°C) water-air temperature difference.

N1112.AB.3.4 Solar water heating systems. Solar systems for domestic hot water production are rated by the annual solar energy factor of the system. The solar energy factor of a system shall be determined from the Florida Solar Energy Center Directory of Certified Solar Systems. Solar collectors shall be tested in accordance with ISO 9806, *Test Methods for Solar Collectors*, and SRCC TM-1, *Solar Domestic Hot Water System and Component Test Protocol*. Collectors in installed solar water heating systems should meet the following criteria:

1. Be installed with a tilt angle between 10 degrees and 40 degrees of the horizontal; and
2. Be installed at an orientation within 45 degrees of true south.

N1112.AB.3.5 Combination service water heating and space heating equipment. Service water heating equipment used to provide additional functions (e.g. space heating) as part of a combination (integrated) system shall comply with minimum performance requirements for water heating equipment. For combined gas storage tank water heating and space heating systems tested to ANSI/ASHRAE 124, the EF used shall be the effective water heating efficiency (CA_{ef}) listed for the appliance by the GAMA. For combined gas instantaneous (tankless) water heating and space heating systems, the EF used shall be determined in accordance with the DOE Uniform Test Method for Measuring the Energy Consumption of Water Heaters, Appendix E to Subpart B, Title 10 CFR 430.

TABLE N1112.AB.3
MINIMUM PERFORMANCE STANDARDS
WATER HEATING EQUIPMENT: FIRED STORAGE WATER HEATER MINIMUM ENERGY FACTORS (EF)

	TANK VOLUME (GALLONS)								
TYPE / VOLUME	20	30	40	50	65	75	80	100	120
ELECTRIC: Up to 120 gallon or 12kW input	.94	.93	.92	.90	.88	—	.86	.84	.81
GAS: Up to 100 gallon or 75,000 Btu/h input	.63	.61	.59	.58	.55	.53	—	.48	—
OIL: Up to 50 gallon or 75,000 Btu/h input	—	.53	.51	.50	—	—	—	—	—

Combination systems utilizing a storage tank water heater as the heat source for space heating purposes with input ratings of 105,000 Btu/h (360 m^3/kW) or less shall utilize a water heater listed by GAMA. Changeouts of burners or heating elements to increase capacity shall not be made unless the unit has been listed at that capacity by GAMA.

Combination systems utilizing a storage tank water heater as the heat source for space heating purposes with input ratings greater than 105,000 Btu/h (360 m^3/kW) shall comply with the criteria of Section 13-412.AB.3.4, Subchapter 13-4 of the *Florida Building Code, Building*.

N1112.AB.4 Pumps. Circulating hot water systems shall be arranged so that the circulating pump(s) can be conveniently turned off (automatically or manually) when the hot water system is not in operation.

N1112.AB.5 Piping insulation. Circulating hot water systems [including piping for waste heat recovery systems (HRUs)] shall be insulated with insulation of at least ½ inch (12.7 mm) minimum thickness with a thermal conductivity no greater than 0.28 Btu/in./h × ft^2°F.

Pipe insulation buried underground shall be as specified by the manufacturer for underground use.

N1112.A Requirements specific to Method A.

N1112.A.1 Water heating system energy loads. Energy loads for service water heating systems shall be based on the appropriate efficiency rating for the system to be installed from the EnergyGauge USA Fla/Res computer program.

N1112.A.2 Additions. Water heating shall be considered in Method A calculations if any of the following conditions are met.

1. Existing systems are replaced during construction;
2. Additional water heaters are installed; or
3. A gas, solar, HRU or dedicated heat pump is installed to gain calculation credits.

N1112.A.3 Installation criteria for homes claiming the heat recovery unit (HRU) option. The heat recovery unit option may be claimed in the EnergyGauge USA Fla/Res computer program for installation of a waste heat recovery unit (HRU) on either an air conditioner or a heat pump where the heat recovery unit has a minimum net useful heat exchange effect of 30 percent and meets the following criteria:

1. The net useful heat exchange effect shall be demonstrated by either a Form 1100D prominently displayed on the unit with test results clearly visible for inspection or by an ARDM certified refrigerant desuperheater seal affixed to the unit. See Section N1100.3.1 for a description of Form 1100D and Appendix G-D and for a copy of the form.
2. The net useful heat exchange effect shall have been determined by an independent laboratory testing to the standard rating conditions specified in Florida Standard FL-1 (see Appendix G-E).
3. If more than one air conditioning system is installed in a residence and only one HRU is installed, energy load shall be based on the gallon capacity of the water heater to which it is coupled and the total capacity of the water heaters in the residence. In such case, the HRU shall be attached to the system serving the daytime primary living areas (family room, living room, kitchen, dining room and adjacent bedrooms and bathrooms).

N1112.A.4 Installation criteria for homes claiming the dedicated heat pump option. The dedicated heat pump option may be claimed in the EnergyGauge USA Fla/Res computer program for a dedicated heat pump (also known as a heat pump water heater) installed either with a tank (an integral unit) or without tank (add on to another water heater) based on the COP of the system on which it is installed. No minimum rating is required for this equipment.

N1112.B Requirements specific to Method B. New water heating equipment installed in buildings complying by Method B shall meet the minimum efficiencies given in Section N1112.AB.3 and Table N1112.AB.3.

Exception: Existing water heating systems in an addition or renovation that will not be replaced.

SECTION N1113
CALCULATIONAL PARAMETERS SPECIFIC TO COMPLIANCE METHOD A

N1113.A Method A compliance simulation and end-use load determination. Except as specified by this Section, the Baseline Home and As-Built Home shall be configured and analyzed using identical methods and techniques. The Baseline totals for Method A code compliance developed in accordance with the criteria in Sections N1113.A.1 and N1113.A.2 shall be adjusted by a factor of 0.85 to make the code 15 percent more stringent than the "2007" code Baseline features.

N1113.A.1 Home specification. The Baseline Home and As-Built Home shall be configured and analyzed as specified by Table N1113.A.1-1.

TABLE N1113.A.1-1
SPECIFICATIONS FOR BASELINE AND AS-BUILT HOMES

Building Component	Baseline Home	As-Built Home
Above-grade walls:	Type: wood-frame Gross area: same as As-Built Home U-Factor: 0.082 Solar absorptance = 0.75 Emittance = 0.90	Same as As-Built Home Same as As-Built Home Same as As-Built Home Same as As-Built Home Same as As-Built Home
Conditioned basement walls:	Type: same as As-Built Home Gross area: same as As-Built Home U-Factor: 0.36 with the insulation layer on the interior side of walls	Same as As-Built Home Same as As-Built Home Same as As-Built Home
Floors over unconditioned spaces:	Type: wood frame Gross area: same as As-Built Home U-Factor: 0.064	Same as As-Built Home Same as As-Built Home Same as As-Built Home
Ceilings:	Type: wood frame Gross area: same as As-Built Home U-Factor: 0.035	Same as As-Built Home Same as As-Built Home Same as As-Built Home
Roofs:	Type: composition shingle on wood sheathing Gross area: same as As-Built Home Solar absorptance = 0.75 Emittance = 0.90	Same as As-Built Home Same as As-Built Home Same as As-Built Home Same as As-Built Home
Attics:	Type: vented with aperture = 1 ft^2 per 300 ft^2 ceiling area	Same as As-Built Home
Foundations:	Type: same as As-Built Home Gross area: same as As-Built Home *R*-value: 0	Same as As-Built Home Same as As-Built Home Same as As-Built Home
Crawl spaces:	Type: vented with net free vent aperture = 1ft^2 per 150 ft^2 of crawl space floor area.	Same as the As-Built Home, but not less net free ventilation area than the Baseline Home unless an approved ground cover in accordance with Section R408.3 of this code is used, in which case, the same net free ventilation area as the As-Built Home down to a minimum net free vent area of 1 ft^2 per 1,500 ft^2 of crawl space floor area.
Doors:	Area: 40 ft^2 Orientation: North U-factor: 0.75	Same as As-Built Home Same as As-Built Home
Glazing: (a)	Total area (b) = 18% of conditioned floor area Orientation: equally distributed to four (4) cardinal compass orientations (N, E, S, & W) U-factor: 0.75 SHGC: 0.40 Interior shade coefficient: Summer = 0.70 Winter = 0.85 External shading: none	Same as As-Built Home Same as As-Built Home Same as As-Built Home Same as As-Built Home Same as Baseline Home (c) Same as As-Built Home
Skylights:	None	Same as As-Built Home
Thermally isolated sunrooms:	None	Same as As-Built Home

TABLE N1113.A.1-1 – continued
SPECIFICATIONS FOR BASELINE AND AS-BUILT HOMES

Air exchange rate:	Specific Leakage Area (SLA) (d) = 0.00036 (assuming no energy recovery)	For residences that are not tested, the same as the Baseline Home. For residences with mechanical ventilation systems and with envelope leakage tested in accordance with ASHRAE 119, Section 5.1, the measured air exchange rate (e) combined with the As-Built mechanical ventilation rate (f) where such mechanical ventilation rate shall not be less than 0.01 x CFA + 7.5 x (Nbr + 1)
Mechanical ventilation:	None, except where a mechanical ventilation system is specified by the As-Built Home, in which case: Annual vent fan energy use: kWh/yr = 0.03942*CFA + 29.565* (N_{br} + 1) (per dwelling unit) where: CFA = conditioned floor area N_{br} = number of bedrooms	Same as As-Built Home Same as As-Built Home
Internal gains:	Gain = 17,900 + 23.8*CFA + 4104*N_{br} (Btu/day per dwelling unit)	Same as Baseline Home
Internal mass:	An internal mass for furniture and contents of 8 pounds per square foot of floor area	Same as Baseline Home, plus any additional mass specifically designed as a thermal storage element (g) but not integral to the building envelope or structure
Structural mass:	For masonry floor slabs, 80% of floor area covered by R-2 carpet and pad, and 20% of floor directly exposed to room air For masonry basement walls, same as As-Built Home, but with insulation located on the interior side of the walls For other walls, for ceilings, floors, and interior walls, wood frame construction	Same as As-Built Home Same as As-Built Home Same as As-Built Home
Heating systems: (h), (i)	Fuel type: same as As-Built Home Efficiencies: Electric: air source heat pump with prevailing federal minimum efficiency Nonelectric furnaces: natural gas furnace with prevailing federal minimum efficiency Nonelectric boilers: natural gas boiler with prevailing federal minimum efficiency Capacity: sized in accordance with Section N1107.AB.1 of this code	Same as As-Built Home(i) Same as As-Built Home Same as As-Built Home Same as As-Built Home Same as As-Built Home
Cooling systems: (h), (k)	Fuel type: Electric Efficiency: in accordance with prevailing federal minimum standards Capacity: sized in accordance with Section N1107.AB.1 of this code	Same as As-Built Home(k) Same as As-Built Home Same as As-Built Home

TABLE N1113.A.1-1 – continued
SPECIFICATIONS FOR BASELINE AND AS-BUILT HOMES

Service water heating systems: (h) (m)	Fuel type: same as As-Built Home	Same as As-Built Home(m)
	Efficiency: in accordance with prevailing federal minimum standards	Same as As-Built Home
	Use (gal/day): $30*N_{du} + 10*N_{br}$ where N_{du} = number of dwelling units	Same as Baseline Home
	Tank temperature: 120°F	Same as Baseline Home
Thermal distribution systems:	A thermal distribution system efficiency (DSE) of 0.80 shall be applied to both the heating and cooling system efficiencies.	Using As-Built duct locations and a DSE of 0.88, except when tested in accordance with ASHRAE 152 (n), in which case measured duct air leakage values shall be used
Thermostat:	Type: manual	Type: Same as As-Built Home
	Temperature set points: Cooling temperature set point = 78°F; Heating temperature set point = 68°F	Temperature setpoints; same as the Baseline Home, except when programmable thermostats are installed.

NOTES:

(a) Glazing shall be defined as sunlight-transmitting fenestration, including the area of sash, curbing or other framing elements, that enclose conditioned space. Glazing includes the area of sunlight-transmitting fenestration assemblies in walls bounding conditioned basements. For doors where the sunlight-transmitting opening is less than one-third of the door area, the glazing area of the sunlight transmitting opening shall be used. For all other doors, the glazing area shall be the rough frame opening area for the door, including the door and the frame.

(b) For homes with conditioned basements and for multiple-family attached homes the following formula shall be used to determine total window area:

$A_F = 0.18 \times A_{FL} \times F_A \times F$

where:

A_F = Total fenestration area.

A_{FL} = Total floor area of directly conditioned space.

F_A = (Above-grade thermal boundary gross wall area) / (above-grade boundary gross wall area + 0.5 x below-grade boundary gross wall area).

F = (Above-grade thermal boundary gross wall area) / (above-grade thermal boundary gross wall area + common gross wall area) or 0.75, whichever is greater.

and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any portion of a thermal boundary wall not in contact with soil.

Below-grade boundary wall is any portion of a thermal boundary wall in soil contact.

Common wall is the total wall area of walls adjacent to another conditioned living unit, not including common foundation and attic walls.

(c) For fenestrations facing within 15 degrees of due south that are directly coupled to thermal storage mass, the winter interior shade coefficient shall be permitted to increase to 0.95 in the As-Built Home.

(d) Where leakage area (L) is defined in accordance with Section 5.1 of ASHRAE 119 and where:

$SLA = L / CFA$ (where L and CFA are in the same units).

Hourly calculations using the procedures given in the *ASHRAE Handbook of Fundamentals*, Chapter 27, page 27.21, equation 40 (Sherman-Grimsrud model) using Shelter Class 4 shall be used to determine the air exchange rate resulting from infiltration.

(e) Tested envelope leakage shall be determined in accordance with Section 5.1 of ASHRAE 119 and documented by a Certified Class 1 Florida Rater. Either hourly calculations using the procedures given in the *ASHRAE Handbook of Fundamentals*, Chapter 27, page 27.21, equation 40 (Sherman-Grimsrud model) using Shelter Class 4 shall be used to determine the air exchange rates resulting from infiltration.

(f) The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with equation 43 of *ASHRAE Handbook of Fundamentals* page 27.23.

(g) Thermal storage element shall mean a component not normally part of the floors, walls, or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase change containers. A thermal storage element must be in the same room as fenestration that faces within 15 degrees of due south, or must be connected to such a room with pipes or ducts that allow the element to be actively charged.

(h) For an As-Built Home with multiple heating, cooling, or water heating systems using different fuel types, the fuel type of the heating and cooling system serving the greatest floor area and the fuel type of the hot water system having the greatest capacity shall be used for the compliance calculation. For the Baseline Home, the prevailing federal minimum efficiency shall be assumed except that the efficiencies given in Table N1113.A.1-1(a) below will be assumed when:

1) A type of device not covered by NAECA is found in the As-Built Home;
2) The As-Built Home is heated by electricity using a device other than an air source heat pump; or
3) The As-Built Home does not contain one or more of the required HVAC equipment systems.

TABLE N1113.A.1-1(A)
DEFAULT BASELINE HOME
HEATING AND COOLING EQUIPMENT EFFICIENCIES [i),(k),(m),(n)]

As-Built Home Fuel	Function	Baseline Home Device
Electric	Heating	7.7 HSPF air source heat pump
Nonelectric warm air furnace or space heater	Heating	78% AFUE gas furnace
Nonelectric boiler	Heating	80% AFUE gas boiler
Any type	Cooling	13 SEER electric air conditioner

(i) For an As-Built Home without a proposed heating system, a heating system with the prevailing federal minimum efficiency shall be assumed for both the Baseline Home and As-Built Home. For electric heating systems, the prevailing federal minimum efficiency air-source heat pump shall be selected.

(k) For an As-Built Home without a proposed cooling system, an electric air conditioner with the prevailing federal minimum efficiency shall be assumed for both the Baseline Home and the As-Built Home.

(m) For an As-Built Home with a nonstorage type water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency and with the same fuel as the proposed water heater shall be assumed for the Baseline Home. For an As-Built Home without a proposed water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency with the same fuel as the predominant heating fuel type shall be assumed for both the rated and Baseline Homes.

(n) Tested duct leakage shall be determined and documented by a Certified Class 1 Florida Rater.

N1113.A.2 Calculation of end-use energy loads for code compliance determination.

N1113.A.2.1 The energy loads for heating, cooling and hot water in the As-Built Home shall be normalized to account for the differences in improvement potential that exist across equipment types using the following formula in accordance with the paper "The HERS Rating Method and the Derivation of the Normalized Modified Loads Method," Research Report No. FSEC-RR-54-00, Florida Solar Energy Center.

$nMEUL = REUL * (nEC\_x / EC\_r)$

where:

nMEUL = Normalized modified end-use loads (for heating, cooling or hot water) as computed using EnergyGauge USA.

REUL = Baseline Home End Use Loads (for heating, cooling or hot water) as computed using EnergyGauge USA Fla/Res.

EC_r = estimated Energy Consumption for Baseline Home's end uses (for heating, including auxiliary electric consumption, cooling or hot water) as computed using EnergyGauge USA Fla/Res.

and where:

$nEC\_x = (a * EEC\_x - b) * (EC\_x * EC\_r * DSE\_r) / (EEC\_x * REUL)$

where:

nEC_x = normalized Energy Consumption for As-Built Home's end uses (for heating, including auxiliary electric consumption, cooling or hot water) as computed using EnergyGauge USA Fla/Res.

EC_r = Estimated energy consumption for Baseline Home's end uses (for heating, including auxiliary electric consumption, cooling or hot water) as computed using EnergyGauge USA Fla/Res.

EC_x = Estimated energy consumption for the As-Built Home's end uses (for heating, including auxiliary electric consumption, cooling or hot water) as computed using EnergyGauge USA Fla/Res.

EEC_x = Equipment efficiency coefficient for the As-Built Home's equipment, such that the energy consumption per unit load in like units as the load, and as derived from the manufacturer's equipment performance rating (MEPR) such that 1.0 / MEPR for AFUE, COP or EF ratings, or such that EEC_x equals 3.413 / MEPR for HSPF, EER or SEER ratings.

DSE_r = REUL/EC_r * EEC_r. For simplified system performance methods, DSE_r equals 0.80 for heating and cooling systems. However, for detailed modeling of heating and cooling systems, DSE_r may be less than 0.80 as a result of part load performance degradation, coil air flow degradation, improper system charge and auxiliary resistance heating for heat pumps. Except as otherwise provided by these standards, where detailed systems modeling is employed, it must be applied equally to both the reference and the As-Built Homes.

EEC_r = Equipment efficiency coefficient for the Baseline Home's equipment, such that EEC_r equals the energy consumption per unit load in like units as the load, and as derived from the manufacturer's equipment performance rating (MEPR) such that 1.0 / MEPR for AFUE, COP or EF ratings, or such that EEC_r equals 3.413 / MEPR for HSPF, EER or SEER ratings.

REUL = Baseline Home end-use loads (for heating or cooling) as computed using EnergyGauge USA Fla/Res.

and where:

the coefficients a and b are as defined by Table N1113.A.2-1 below:

TABLE N1113.A.2-1 COEFFICIENTS A AND B

Fuel type and End Use	a	b
Electric space heating	2.2561	0
Fossil fuel* space heating	1.0943	0.4043
Biomass space heating	0.8850	0.4047
Electric air conditioning	3.8090	0
Electric water heating	0.9200	0
Fossil fuel* water heating	1.1877	1.0130

*Such as natural gas, LP, fuel oil

N1113.A.2.2 Following normalization of the heating, cooling and hot water energy consumptions for the As-Built Home as specified in Section N1113.A.2.1 above, the Baseline Home's total reference end use loads for heating, cooling and hot water (*REULtot*) shall be compared with the proposed As-Built Home's total normalized modified end-use loads for heating, cooling and hot water (*nMEULtot*). If the total normalized modified loads of the proposed As-Built Home (*nMEULtot*) are equal to or less than the total reference loads of the Baseline Home (*REULtot*), the proposed As-Built home complies with this code.

Doorstops or door closers shall not be installed to obtain this clearance.

M1409.3 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 be installed only when listed as part of a listed and labeled appliance.
3. A manual shut off valve shall be installed ahead of all controls.

M1409.4 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 M1410
VENTED ROOM HEATERS

M1410.1 General. Vented room heaters shall be tested in accordance with ASTM E 1509, UL 896 or UL 1482 and installed in accordance with their listing, the manufacturer's installation instructions and the requirements of this code.

M1410.2 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.

SECTION M1411
HEATING AND COOLING EQUIPMENT

M1411.1 Approved refrigerants. Refrigerants used in direct refrigerating systems shall conform to the applicable provisions of ANSI/ASHRAE 34.

M1411.2 Refrigeration coils in warm-air furnaces. Where a cooling coil is located in the supply plenum of a warm-air furnace, the furnace blower shall be rated at not less than 0.5-inch water column (124 Pa) static pressure unless the furnace is listed and labeled for use with a cooling coil. Cooling coils shall not be located upstream from heat exchangers unless listed and labeled for such use. Conversion of existing furnaces for use with cooling coils shall be permitted provided the furnace will operate within the temperature rise specified for the furnace.

M1411.3 Condensate disposal. Condensate from all cooling coils or evaporators shall be conveyed from the drain pan outlet to an approved place of disposal. Condensate shall not discharge into a street, alley or other areas where it would cause a nuisance.

M1411.3.1 Auxiliary and secondary drain systems. In addition to the requirements of Section M1411.3, a secondary drain or auxiliary drain pan shall be required for each cooling or evaporator coil where damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping. Such piping shall maintain a minimum horizontal slope in the direction of discharge of not less than $^1/_8$ unit vertical in 12 units horizontal (1-percent slope). Drain piping shall be a minimum of $^3/_4$-inch (19 mm) nominal pipe size. One of the following methods shall be used:

1. An auxiliary drain pan with a separate drain shall be installed under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a minimum depth of 1.5 inches (38 mm), shall not be less than 3 inches (76 mm) larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Metallic pans shall have a minimum thickness of not less than 0.0276-inch (0.7 mm) galvanized sheet metal. Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm).
2. A separate overflow drain line shall be connected to the drain pan provided with the equipment. This overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection. As an alternative to a separate drain line, a water-level detection device that will shut off the equipment served prior to overflow of the pan shall be provided. The water-level detection device shall connect to the drain pan at a higher level than the primary drain connection. *
3. An auxiliary drain pan without a separate drain line shall be installed under the coils on which condensate will occur. This pan shall be equipped with a water level detection device conforming to UL 508 that will shut off the equipment served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.

M1411.3.1.1 Water level monitoring devices. On down-flow units and all other coils that have no secondary drain and no means to install an auxiliary drain pan, a water-level monitoring device shall be installed inside the primary drain pan. This device shall shut off the

equipment served in the event that the primary drain becomes restricted. Externally installed devices and devices installed in the drain line shall not be permitted

M1411.3.2 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 $^3/_4$-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.

M1411.4 Auxiliary drain pan. Category IV condensing appliances shall have an auxiliary drain pan where damage to any building component will occur as a result of stoppage in the condensate drainage system. These pans shall be installed in accordance with the applicable provisions of Section M1411.3.

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

M1411.5 Insulation of refrigerant piping. Piping and fittings for refrigerant vapor (suction) lines shall be insulated with insulation having a thermal resistivity of at least R-4 and having external surface permeance not exceeding 0.05 perm [2.87 ng/(s · m^2 · Pa)] when tested in accordance with ASTM E 96.

SECTION M1412
ABSORPTION COOLING EQUIPMENT

M1412.1 Approval of equipment. Absorption systems shall be installed in accordance with the manufacturer's installation instructions.

M1412.2 Condensate disposal. Condensate from the cooling coil shall be disposed of as provided in Section M1411.3.

M1412.3 Insulation of piping. Refrigerant piping, brine piping and fittings within a building shall be insulated to prevent condensation from forming on piping.

M1412.4 Pressure-relief protection. Absorption systems shall be protected by a pressure-relief device. Discharge from the pressure-relief device shall be located where it will not create a hazard to persons or property.

SECTION M1413
EVAPORATIVE COOLING EQUIPMENT

M1413.1 General. Cooling equipment that uses evaporation of water for cooling shall be installed in accordance with the manufacturer's installation instructions. Evaporative coolers shall be installed on a level platform or base not less than 3 inches (76 mm) above the adjoining ground and secured to prevent displacement. Openings in exterior walls shall be flashed in accordance with Section R703.8.

M1413.2 Protection of potable water. The potable water system shall be protected from backflow in accordance with the provisions in Section P2902.

SECTION 1414
FIREPLACE STOVES

M1414.1 General. Fireplace stoves shall be listed, labeled and installed in accordance with the terms of the listing. Fireplace stoves shall be tested in accordance with UL 737.

M1414.2 Hearth extensions. Hearth extensions for fireplace stoves shall be installed in accordance with the listing of the fireplace stove. The supporting structure for a hearth extension for a fireplace stove shall be at the same level as the supporting structure for the fireplace unit. The hearth extension shall be readily distinguishable from the surrounding floor area.

SECTION M1415
MASONRY HEATERS

M1415.1 General. Masonry heaters shall be constructed in accordance with Section R1002.

CHAPTER 15
EXHAUST SYSTEMS

SECTION M1501
GENERAL

M1501.1 Outdoor discharge. The air removed by every mechanical exhaust system shall be discharged to the outdoors. Air shall not be exhausted into an attic, soffit, ridge vent or crawl space.

Exception: Whole-house ventilation-type attic fans that discharge into the attic space of dwelling units having private attics shall be permitted.

SECTION M1502
CLOTHES DRYER EXHAUST

M1502.1 General. Dryer exhaust systems shall be independent of all other systems, and shall convey the moisture to the outdoors.

Exception: This section shall not apply to listed and labeled condensing (ductless) clothes dryers.

M1502.2 Duct termination. Exhaust ducts shall terminate on the outside of the building. Exhaust duct terminations shall be in accordance with the dryer manufacturer's installation instructions. Exhaust ducts shall terminate not less than 3 feet (914 mm) in any direction from openings into buildings. Exhaust duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination.

M1502.3 Duct size. The diameter of the exhaust duct shall be as required by the clothes dryer's listing and the manufacturer's installation instructions.

M1502.4 Transition ducts. Transition ducts shall not be concealed within construction. Flexible transition ducts used to connect the dryer to the exhaust duct system shall be limited to single lengths, not to exceed 8 feet (2438 mm) and shall be listed and labeled in accordance with UL 2158A.

M1502.5 Duct construction. Exhaust ducts shall be constructed of minimum 0.016-inch-thick (0.4 mm) rigid metal ducts, having smooth interior surfaces with joints running in the direction of air flow. Exhaust ducts shall not be connected with sheet-metal screws or fastening means which extend into the duct.

M1502.6 Duct length. The maximum length of a clothes dryer exhaust duct shall not exceed 25 feet (7620 mm) from the dryer location to the wall or roof termination. The maximum length of the duct shall be reduced 2.5 feet (762 mm) for each 45-degree (0.8 rad) bend and 5 feet (1524 mm) for each 90-degree (1.6 rad) bend. The maximum length of the exhaust duct does not include the transition duct.

Exceptions:

1. Where a clothes dryer booster fan is installed and listed and labeled for the application, the maximum length of the exhaust duct, including any transition duct, shall be permitted to be in accordance with the booster fan manufacturer's installation instructions. Where a clothes dryer booster fan is installed and not readily accessible from the room in which the dryer is located, a permanent identifying label shall be placed adjacent to where the exhaust duct enters the wall. The label shall bear the words, "This dryer exhaust system is equipped with a remotely located booster fan."
2. Where the make and model of the clothes dryer to be installed is known and the manufacturer's installation instructions for the dryer are provided to the building official, the maximum length of the exhaust duct, including any transition duct, shall be permitted to be in accordance with the dryer manufacturer's installation instructions.
3. Where large-radius 45-degree (0.8 rad) and 90-degree (1.6 rad) bends are installed, determination of the equivalent length of clothes dryer exhaust duct for each bend by engineering calculation in accordance with the ASHRAE Fundamentals Handbook shall be permitted.

SECTION M1503
RANGE HOODS

M1503.1 General. Range hoods shall discharge to the outdoors through a single-wall duct. The duct serving the hood shall have a smooth interior surface, shall be air tight and shall be equipped with a backdraft damper. Ducts serving range hoods shall not terminate in an attic or crawl space or areas inside the building.

Exception: Where installed in accordance with the manufacturer's installation instructions, and where mechanical or natural ventilation is otherwise provided, listed and labeled ductless range hoods shall not be required to discharge to the outdoors.

M1503.2 Duct material. Single-wall ducts serving range hoods shall be constructed of galvanized steel, stainless steel or copper.

Exception: Ducts for domestic kitchen cooking appliances equipped with down-draft exhaust systems shall be permitted to be constructed of schedule 40 PVC pipe provided that the installation complies with all of the following:

1. The duct shall be installed under a concrete slab poured on grade; and
2. The underfloor trench in which the duct is installed shall be completely backfilled with sand or gravel; and
3. The PVC duct shall extend not more than 1 inch (25 mm) above the indoor concrete floor surface; and
4. The PVC duct shall extend not more than 1 inch (25 mm) above grade outside of the building; and

5. The PVC ducts shall be solvent cemented.

M1503.3 Kitchen exhaust rates. Where domestic kitchen cooking appliances are equipped with ducted range hoods or down-draft exhaust systems, the fans shall be sized in accordance with Section M1507.3.

SECTION M1504
INSTALLATION OF MICROWAVE OVENS

M1504.1 Installation of microwave oven over a cooking appliance. The installation of a listed and labeled cooking appliance or microwave oven over a listed and labeled cooking appliance shall conform to the terms of the upper appliance's listing and label and the manufacturer's installation instructions. The microwave oven shall conform to UL 923.

SECTION M1505
OVERHEAD EXHAUST HOODS

M1505.1 General. Domestic open-top broiler units shall be provided with a metal exhaust hood, not less than 28 gage, with $^1/_4$ inch (6 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 backdraft 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 M1506
EXHAUST DUCTS

M1505.1 Ducts. Where exhaust duct construction is not specified in this chapter, such construction shall comply with Chapter 16.

SECTION M1507
MECHANICAL VENTILATION

M1507.1 General. Where toilet rooms and bathrooms are mechanically ventilated, the ventilation equipment shall be installed in accordance with this section.

M1507.2 Recirculation of air. Exhaust air from bathrooms and toilet rooms shall not be recirculated within a residence or to another dwelling unit and shall be exhausted directly to the outdoors. Exhaust air from bathrooms and toilet rooms shall not discharge into an attic, crawl space or other areas inside the building.

M1507.3 Ventilation rate. Ventilation systems shall be designed to have the capacity to exhaust the minimum air flow rate determined in accordance with Table M1507.3.

TABLE M1507.3
MINIMUM REQUIRED EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS

AREA TO BE VENTILATED	VENTILATION RATES
Kitchens	100 cfm intermittent or 25 cfm continuous
Bathrooms—Toilet Rooms	Mechanical exhaust capacity of 50 cfm intermittent or 20 cfm continuous

For SI: 1 cubic foot per minute = 0.0004719 m^3/s.

CHAPTER 16
DUCT SYSTEMS

SECTION M1601
DUCT CONSTRUCTION

M1601.1 Duct design. Duct systems serving heating, cooling and ventilation equipment shall be fabricated in accordance with the provisions of this section and ACCA Manual D or other approved methods.

M1601.1.1 Duct insulation. See Section N1110.ABC.2 for duct insulation requirements.

M1601.1.2 Underground ducts. Underground duct systems shall be constructed of approved concrete, clay, metal or plastic. The maximum duct temperature for plastic ducts shall not be greater than 150°F (66°C). Metal ducts shall be protected from corrosion in an approved manner or shall be completely encased in concrete not less than 2 inches (51 mm) thick. Nonmetallic ducts shall be installed in accordance with the manufacturer's installation instructions. Plastic pipe and fitting materials shall conform to cell classification 12454-B of ASTM D 1248 or ASTM D 1784 and external loading properties of ASTM D 2412. All ducts shall slope to an accessible point for drainage. Where encased in concrete, ducts shall be sealed and secured prior to any concrete being poured. Metallic ducts having an approved protective coating and nonmetallic ducts shall be installed in accordance with the manufacturer's installation instructions.

M**1601.1.2.1 Slope.** Reserved.

M1601.1.2.2 Sealing. Reserved.

M1601.1.2.3 Plastic ducts and fittings. Reserved.

M1601.2 Flexible air ducts and flexible air connectors, general. Flexible air ducts, both metallic and nonmetallic, shall comply with Sections M1601.2.1, M1601.2.2, M1601.2.5, and M1601.2.7. Flexible air connectors, both metallic and nonmetallic, shall comply with Sections M1601.2.3 through M1601.2.7

M1601.2.1 Flexible air ducts. Flexible air ducts, both metallic and nonmetallic, shall be tested in accordance with UL 181. Such ducts shall be listed and labeled as Class 0 or Class 1 flexible air ducts and shall be installed in accordance with Section M1307.

M1601.2.2 Duct length. Flexible air ducts shall not be limited in length.

M1601.2.3 Flexible air connectors. Flexible air connectors, both metallic and nonmetallic, shall be tested in accordance with UL 181. Such connectors shall be listed and labeled as Class 0 or Class 1 flexible air connectors and shall be installed in accordance with Section M1307.

M1601.2.4 Connector length. Flexible air connectors shall be limited in length to 14 feet (4267 mm).

M1601.2.5 Air temperature. The design temperature of air to be conveyed in flexible air ducts and flexible air connectors shall be less than 250°F (121°C).

M1601.2.6 Flexible air duct and air connector clearance. Flexible air ducts and air connectors shall be installed with a minimum clearance to an appliance as specified in the appliance manufacturer's installation instructions.

M1601.2.7 Penetrations prohibited. Flexible air ducts and flexible air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any wall, floor or ceiling.

M1601.3 Duct installation, 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.

M1601.3.1 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).

M1601.3.2 Sealing. Air distribution system components shall be sealed with approved closure systems.

M1601.3.3 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 M1601.3 of this code; 2) inspection; and 3) cleaning and maintenance. A minimum

of 4 inches (102 mm) is considered sufficient space around air handling units.

Exception: Retrofit or replacement units not part of a renovation are exempt from the minimum clearance requirement.

M1601.3.4 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.

M1601.3.5 Surface preparation. The surfaces upon which closure products are to be applied shall be clean and dry in accordance with the manufacturer's installation instructions.

M1601.3.6 Approved mechanical attachments. Approved mechanical attachments for air distribution system components include screws, rivets, welds, interlocking joints crimped and rolled, staples, twist in (screw attachment), and compression systems created by bend tabs or screw tabs and flanges or by clinching straps. Mechanical attachments shall be selected to be appropriate to the duct system type.

M1601.3.7 Approved closure systems. Closure system materials, including adhesives when used, shall have a flame spread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating not over 50 when tested in accordance with the ASTM E 84. The following closure systems and materials are approved for air distribution construction and sealing for the applications and pressure classes prescribed in Sections M1601.4 through Sections M1601.11:

1. Metal closures.
   a. Welds applied continuously along metal seams or joints through which air could leak.
   b. Snaplock seams, and grooved, standing, double-corner, and Pittsburgh-lock seams as defined by SMACNA, as well as all other rolled mechanical seams. All seams shall be rolled or crimped.
2. Gasketing, which achieves a 25/50 flame spread, smoke density development rating under ASTM E 84 or UL 723, provided that it is used only between mated surfaces which are mechanically fastened with sufficient force to compress the gasket and to fill all voids and cracks through which air leakage would otherwise occur.
3. Mastic closures. Mastic shall be placed over the entire joint between mated surfaces. Mastics shall not be diluted. Approved mastics include the following:
   a. Mastic or mastic plus embedded fabric systems applied to fibrous glass ductboard that are listed and labeled in accordance with UL 181A, Part III.
   b. Mastic or mastic plus embedded fabric systems applied to nonmetal flexible duct that are listed and labeled in accordance with the 181B, Part II.
   c. Mastic ribbons, which achieve a 25/50 flame spread, smoke density development rating under ASTM E 84 or UL 723, provided that they may be used only in flange-joints and lap-joints, such that the mastic resides between two parallel surfaces of the air barrier and that those surfaces are mechanically fastened.
4. Tapes. Tapes shall be applied such that they extend not less than 1 inch (25 mm) onto each of the mated surfaces and shall totally cover the joint. When used on rectangular ducts, tapes shall be used only on joints between parallel rigid surfaces and on right angle joints. Approved tapes include the following:
   a. Pressure-sensitive tapes.
      1) Pressure-sensitive tapes applied to fibrous glass ductboard that are listed and labeled in accordance with UL 181A, Part I.
      2) Pressure-sensitive tapes applied to nonmetal flexible duct that are listed and labeled in accordance with UL 181B, Part I.
   b. Heat-activated tapes applied to fibrous glass ductboard that are listed and labeled in accordance with UL 181A, Part II.
5. Aerosol sealant. Such sealants shall be installed by manufacturer-certified installers following manufacturer instructions and shall achieve 25/50 flame spread/smoke density development ratings under ASTM E 84 or UL 723.

M1601.3.8 Flood hazard areas. See Section R323.

M1601.3.9 Condensation. Provisions shall be made to prevent the formation of condensation on the exterior of any duct.

TABLE M1601.5
GAGES OF METAL DUCTS AND PLENUMS USED FOR HEATING OR COOLING

TYPE OF DUCT	SIZE (inches)	MINIMUM THICKNESS (inch)	EQUIVALENT GALVANIZED SHEET GAGE	APPROXIMATE ALUMINUM B & S GAGE
Round ducts and enclosed rectangular ducts	14 or less over 14	0.013 0.016	30 28	26 24
Exposed rectangular ducts	14 or less over 14	0.016 0.019	28 26	24 22

For SI: 1 inch = 25.4 mm.

CHAPTER 26
GENERAL PLUMBING REQUIREMENTS

SECTION P2601
GENERAL

P2601.1 Scope. The provisions of this chapter shall govern the installation of plumbing not specifically covered in other chapters applicable to plumbing systems. The installation of plumbing, appliances, equipment and systems not addressed by this code shall comply with the applicable provisions of the *Florida Building Code, Plumbing*.

P2601.2 Connection. Plumbing fixtures, drains and appliances used to receive or discharge liquid wastes or sewage shall be connected to the sanitary drainage system of the building or premises in accordance with the requirements of this code. This section shall not be construed to prevent indirect waste systems.

P2601.3 Floodplain management construction standards. This code specifically defers to the authority granted to local government by Title 44 CFR, sections 59 and 60. This code is not intended to supplant or supercede local ordinances adopted pursuant to that authority, nor are local floodplain management ordinances to be deemed amendments to the code.

SECTION P2602
INDIVIDUAL WATER SUPPLY AND SEWAGE DISPOSAL

P2602.1 General. The water-distribution and drainage system of any building or premises where plumbing fixtures are installed shall be connected to a public water supply or sewer system, respectively, if available. When either a public water-supply or sewer system, or both, are not available, or connection to them is not feasible, an individual water supply or individual (private) sewage-disposal system, or both, shall be provided.

P2602.2 Flood-resistant installation. In areas prone to flooding as established by Table R301.2(1):

1. Water supply systems shall be designed and constructed to prevent infiltration of floodwaters.
2. Pipes for sewage disposal systems shall be designed and constructed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

SECTION P2603
STRUCTURAL AND PIPING PROTECTION

P2603.1 General. In the process of installing or repairing any part of a plumbing and drainage installation, the finished floors, walls, ceilings, tile work or any other part of the building or premises that must be changed or replaced shall be left in a safe structural condition in accordance with the requirements of the building portion of this code.

P2603.2 Drilling and notching. Wood-framed structural members shall not be drilled, notched or altered in any manner except as provided in Sections R502.2.6, R602.1.3.1, R602.2.7, R802.2.6 and R802.2.6.1. Holes in cold-formed steel-framed load-bearing members shall only be permitted in accordance with Sections R506.2, R603.2 and R804.2. In accordance with the provisions of Sections R603.3.4 and R804.3.5 cutting and notching of flanges and lips of cold-formed steel-framed load-bearing members shall not be permitted.

P2603.2.1 Protection against physical damage. In concealed locations, where piping, other than cast-iron or galvanized steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1.5 inches (38 mm) from the nearest edge of the member, the pipe shall be protected by shield plates. Protective shield plates shall be a minimum of 0.062-inch-thick (1.6 mm) steel, shall cover the area of the pipe where the member is notched or bored and shall extend a minimum of 2 inches (51 mm) above sole plates and below top plates.

P2603.3 Breakage and corrosion. Pipes passing through or under walls shall be protected from breakage. Pipes passing through concrete or cinder walls and floors, cold-formed steel framing or other corrosive material shall be protected against external corrosion by a protective sheathing or wrapping or other means that will withstand any reaction from lime and acid of concrete, cinder or other corrosive material. Sheathing or wrapping shall allow for expansion and contraction of piping to prevent any rubbing action. Minimum wall thickness of material shall be 0.010 inch (0.254 mm). *

Exception: Sleeving is not required for installation of CPVC into concrete or similar material.

P2603.3.1 Penetration. Protective sleeves around piping penetrating concrete slab-on-grade floors shall not be of cellulose-containing materials. If soil treatment is used for subterranean termite protection, the sleeve shall have a maximum wall thickness of 0.010 inch (0.254 mm), and be sealed within the slab using a noncorrosive clamping device to eliminate the annular space between the pipe and the sleeve. No termiticides shall be applied inside the sleeve.

P2603.4 Sleeves. Annular spaces between sleeves and pipes shall be filled or tightly caulked as approved by the building official. Annular spaces between sleeves and pipes in fire-rated assemblies shall be filled or tightly caulked in accordance with the building portion of this code.

P2603.5 Pipes through footings or foundation walls. Any pipe that passes under a footing or through a foundation wall shall be provided with a relieving arch; or there shall be built into the masonry wall a pipe sleeve two pipe sizes greater than the pipe passing through.

P2603.6 Freezing. Where the design temperature is less than 32°F (0°C), a water, soil or waste pipe shall not be installed out-

side of a building, in attics or crawl spaces, or be concealed in outside walls in any location subjected to freezing temperatures, unless adequate provision is made to protect it from freezing by insulation or heat or both. A water service pipe shall be installed not less than 12 inches (305 mm) deep or less than 6 inches (152 mm) below the frost line.

P2603.6.1 Sewer depth. Reserved.

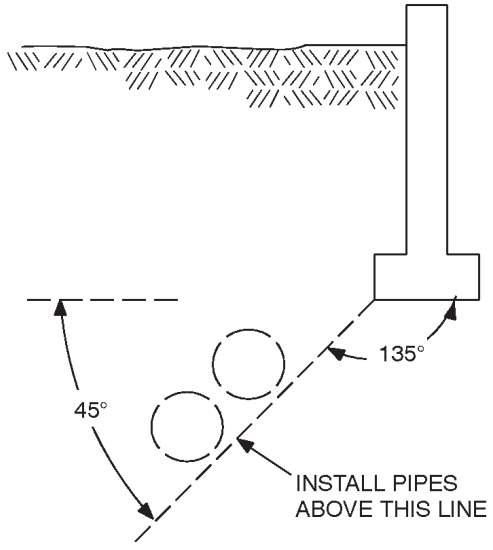
SECTION P2604
TRENCHING AND BACKFILLING

P2604.1 Trenching and bedding. Where trenches are excavated such that the bottom of the trench forms the bed for the pipe, solid and continuous load-bearing support shall be provided between joints. Where over-excavated, the trench shall be backfilled to the proper grade with compacted earth, sand, fine gravel or similar granular material. Piping shall not be supported on rocks or blocks at any point. Rocky or unstable soil shall be over-excavated by two or more pipe diameters and brought to the proper grade with suitable compacted granular material.

P2604.2 Common trench. See Section P2904.4.2.

P2604.3 Backfilling. Backfill shall be free from discarded construction material and debris. Backfill shall be free from rocks, broken concrete and frozen chunks until the pipe is covered by at least 12 inches (305 mm) of tamped earth. Backfill shall be placed evenly on both sides of the pipe and tamped to retain proper alignment. Loose earth shall be carefully placed in the trench in 6-inch (152 mm) layers and tamped in place.

P2604.4 Protection of footings. Trenching installed parallel to footings shall not extend below the 45-degree (0.79 rad) bearing plane of the bottom edge of a wall or footing (see Figure P2604.4).



For SI: 1 degree = 0.018 rad.

FIGURE P2604.4
PIPE LOCATION WITH RESPECT TO FOOTINGS

SECTION P2605
SUPPORT

P2605.1 General. Piping shall be supported in accordance with the following:

1. Piping shall be supported to ensure alignment and prevent sagging, and allow movement associated with the expansion and contraction of the piping system.
2. Piping in the ground shall be laid on a firm bed for its entire length, except where support is otherwise provided.
3. Hangers and anchors shall be of sufficient strength to maintain their proportional share of the weight of pipe and contents and of sufficient width to prevent distortion to the pipe. Hangers and strapping shall be of approved material that will not promote galvanic action. Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees (0.79 rad) for pipe sizes 4 inches (102 mm) and larger.
4. Piping shall be supported at distances not to exceed those indicated in Table P2605.1.

SECTION P2606
WATERPROOFING OF OPENINGS

P2606.1 General. Roof and exterior wall penetrations shall be made water tight. Joints at the roof, around vent pipes, shall be made water tight by the use of lead, copper or galvanized iron flashings or an approved elastomeric material. Counterflashing shall not restrict the required internal cross-sectional area of any vent.

SECTION P2607
WORKMANSHIP

P2607.1 General. Valves, pipes and fittings shall be installed in correct relationship to the direction of the flow. Burred ends shall be reamed to the full bore of the pipe.

SECTION P2608
MATERIALS EVALUATION AND LISTING

P2608.1 Identification. Each length of pipe and each pipe fitting, trap, fixture, material and device used in a plumbing system shall bear the identification of the manufacturer.

P2608.2 Installation of materials. All materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved. In the absence of such installation procedures, the manufacturer's installation instructions shall be followed. Where the requirements of referenced standards or manufacturer's installation instructions do not conform to the minimum provisions of this code, the provisions of this code shall apply.

P2608.3 Plastic pipe, fittings and components. All plastic pipe, fittings and components shall be third-party certified as conforming to NSF 14.

P2608.4 Third-party testing and certification. All plumbing products and materials shall comply with the referenced standards, specifications and performance criteria of this code and shall be identified in accordance with Section P2608.1. Where required by Table P2608.4, plumbing products and materials shall either be tested by an approved third-party testing agency or certified by an approved third-party certification agency.

P2608.5 Water supply systems. Water service pipes, water distribution pipes and the necessary connecting pipes, fittings, control valves, faucets and all appurtenances used to dispense water intended for human ingestion shall be evaluated and listed as conforming to the requirements of NSF 61.

TABLE P2605.1
PIPING SUPPORT

PIPING MATERIAL	MAXIMUM HORIZONTAL SPACING (feet)	MAXIMUM VERTICAL SPACING
ABS pipe	4	10[b]
Aluminum tubing	10	15
Brass pipe	10	10
Cast-iron pipe	5[a]	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
Cross-linked polyethylene (PEX) pipe	2.67 (32 inches)	10[b]
Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX-AL-PEX) pipe	2.67 (32 inches)	4[b]
CPVC pipe or tubing (1 inch in diameter and smaller)	3	10[b]
CPVC pipe or tubing ($1^1/_4$ inch in diameter and larger)	4	10[b]
Lead pipe	Continuous	4
PB pipe or tubing	2.67 (32 inches)	4
Polyethylene/aluminum/polyethylene (PE-AL-PE) pipe	2.67 (32 inches)	4[b]
Polypropylene (PP) pipe or tubing 1 inch and smaller	2.67 (32 inches)	10[b]
Polypropylene (PP) pipe or tubing, $1^1/_4$ inches and larger	4	10[b]
PVC pipe	4	10[b]
Stainless steel drainage systems	10	10[b]
Steel pipe	12	15

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. Midstory guide for sizes 2 inches and smaller.

TABLE P2608.4
PRODUCTS AND MATERIALS REQUIRING THIRD-PARTY TESTING AND THIRD-PARTY CERTIFICATION

PRODUCT OR MATERIAL	THIRD-PARTY CERTIFIED	THIRD-PARTY TESTED
Backflow prevention devices	Required	—
Plumbing appliance	Required	—
Plumbing fixtures	—	Required
Potable water supply system components and potable water fixture fittings	Required	—
Sanitary drainage and vent system components	Plastic pipe, fittings, and pipe related components	All others
Special waste system components	—	Required
Storm drainage system components	Plastic pipe, fittings, and pipe related components	All others
Subsoil drainage system components	—	Required
Waste fixture fittings	Plastic pipe, fittings, and pipe related components	All others
Water distribution system safety devices	Required	—

CHAPTER 27
PLUMBING FIXTURES

SECTION P2701
FIXTURES, FAUCETS AND FIXTURE FITTINGS

P2701.1 Quality of fixtures. Plumbing fixtures, faucets and fixture fittings shall be constructed of approved materials, shall have smooth impervious surfaces, shall be free from defects and concealed fouling surfaces, and shall conform to the standards cited in this code. Plumbing fixtures shall be provided with an adequate supply of potable water to flush and keep the fixtures in a clean and sanitary condition without danger of backflow or cross connection.

SECTION P2702
FIXTURE ACCESSORIES

P2702.1 Plumbing fixtures. Plumbing fixtures, other than water closets, shall be provided with approved strainers.

P2702.2 Waste fittings. Waste fittings shall conform to ASME A112.18.2, ASTM F 409, CSA B125 or to one of the standards listed in Table P3002.1(1) for above-ground drainage and vent pipe and fittings.

P2702.3 Plastic tubular fittings. Plastic tubular fittings shall conform to ASTM F 409 listed in Table P2701.1.

P2702.4 Carriers for wall-hung water closets. Carriers for wall-hung water closets shall conform to ASME A112.6.1 or ASME A112.6.2.

SECTION P2703
TAIL PIECES

P2703.1 Minimum size. Fixture tail pieces shall be not less than $1^1/_2$ inches (38 mm) in diameter for sinks, dishwashers, laundry tubs, bathtubs and similar fixtures, and not less than $1^1/_4$ inches (32 mm) in diameter for bidets, lavatories and similar fixtures.

SECTION P2704
ACCESS TO CONNECTIONS

P2704.1 General. Slip joints shall be made with an approved elastomeric gasket and shall be installed only on the trap outlet, trap inlet and within the trap seal. Fixtures with concealed slip-joint connections shall be provided with an access panel or utility space at least 12 inches (305 mm) in its smallest dimension or other approved arrangement so as to provide access to the slip connections for inspection and repair.

SECTION P2705
INSTALLATION

P2705.1General. The installation of fixtures shall conform to the following:

1. Floor-outlet or floor-mounted fixtures shall be secured to the drainage connection and to the floor, where so designed, by screws, bolts, washers, nuts and similar fasteners of copper, brass or other corrosion-resistant material.
2. Wall-hung fixtures shall be rigidly supported so that strain is not transmitted to the plumbing system.
3. Where fixtures come in contact with walls and floors, the contact area shall be water tight.
4. Plumbing fixtures shall be usable.
5. The centerline of water closets or bidets shall not be less than 15 inches (381 mm) from adjacent walls or partitions or not less than 15 inches (381 mm) from the centerline of a bidet to the outermost rim of an adjacent water closet. There shall be at least 21 inches (533 mm) clearance in front of the water closet, bidet or lavatory to any wall, fixture or door.
6. The location of piping, fixtures or equipment shall not interfere with the operation of windows or doors.
7. In areas prone to flooding as established by Table R301.2(1), plumbing fixtures shall be located or installed in accordance with Section R323.1.5.
8. Integral fixture-fitting mounting surfaces on manufactured plumbing fixtures or plumbing fixtures constructed on site, shall meet the design requirements of ASME A112.19.2 or ASME A112.19.3.

SECTION P2706
WASTE RECEPTORS

P2706.1 General. Every waste receptor shall be of an approved type. Plumbing fixtures or other receptors receiving the discharge of indirect waste pipes shall be shaped and have a capacity to prevent splashing or flooding and shall be readily accessible for inspection and cleaning. Waste receptors and standpipes shall be trapped and vented and shall connect to the building drainage system. A removable strainer or basket shall cover the waste outlet of waste receptors. Waste receptors shall be installed in ventilated spaces. Waste receptors shall not be installed in bathrooms or in any inaccessible or unventilated space such as a closet. Ready access shall be provided to waste receptors.

Exception: Open hub waste receptors shall be permitted in the form of a hub or pipe extending not less than 1 inch (25 mm) above a water-impervious floor, and are not required to have a strainer.

P2706.2 Standpipes. Standpipes shall extend a minimum of 18 inches (457 mm) and a maximum of 42 inches (1067 mm) above the trap weir. Access shall be provided to all standpipe traps and drains for rodding.

P2706.2.1 Laundry tray connection. A laundry tray waste line is permitted to connect into a standpipe for the automatic clothes washer drain. The standpipes shall not be less than 30 inches (762 mm) as measured from the crown weir. The outlet of the laundry tray shall be a maximum horizontal distance of 30 inches (762 mm) from the standpipe trap.

TABLE P2701.1
PLUMBING FIXTURES, FAUCETS AND FIXTURE FITTINGS

MATERIAL	STANDARD
Air gap fittings for use with plumbing fixtures, appliances and appurtenances	ASME A112.1.3
Bathtub/whirlpool pressure-sealed doors	ASME A112.19.15
Diverters for faucets with hose spray anti-syphon type, residential application	ASSE 1025
Enameled cast-iron plumbing fixtures	ASME A112.19.1M, CSA B45.2
Floor drains	ASME A112.6.3
Floor-affixed supports for off-the-floor plumbing fixtures for public use	ASME A112.6.1M
Framing-affixed supports for off-the-floor water closets with concealed tanks	ASME A112.6.2
Handheld showers	ASSE 1014
Home laundry equipment	ASSE 1007
Hose connection vacuum breaker	ASSE 1052
Hot water dispensers, household storage type, electrical	ASSE 1023
Household dishwashing machines	ASSE 1006
Household disposers	ASSE 1008
Hydraulic performance for water closets and urinals	ASME A112.19.6
Individual pressure balancing valves for individual fixture fittings	ASSE 1066
Individual shower control valves anti-scald	ASSE 1016, CSA B125
Macerating toilet systems and related components	ASME A112.3.4
Nonvitreous ceramic plumbing fixtures	ASME A112.19.9M, CSA B45.1
Plastic bathtub units	ANSI Z124.1, CSA B45.1
Plastic lavatories	ANSI Z124.3, CSA B45.5
Plastic shower receptors and shower stall	ANSI Z124.2, CSA B45.5
Plastic sinks	ANSI Z124.6, CSA B45.5
Plastic water closet bowls and tanks	ANSI Z124.4, CSA B45.5
Plumbing fixture fittings	ASME A112.18.1M, CSA B125
Plumbing fixture waste fittings	ASME A112.18.2, ASTM F 409, CSA B125
Porcelain-enameled formed steel plumbing fixtures	ASME A112.19.4M, CSA B45.3
Pressurized flushing devices for plumbing fixtures	ASSE 1037
Specification for copper sheet and strip for building construction	ASTM B 370
Stainless steel plumbing fixtures (residential)	ASME A112.19.3M, CSA B45.4
Temperature-actuated, flow reduction valves to individual fixture fittings	ASSE 1062
Thermoplastic accessible and replaceable plastic tube and tubular fittings	ASTM F 409
Trench drains	ASME A112.6.3
Trim for water closet bowls, tanks and urinals	ASME A112.19.5
Vacuum breaker wall hydrant—frost-resistant, automatic-draining type	ASSE 1019
Vitreous china plumbing fixtures	ASME A112.19.2M
Wall-mounted and pedestal-mounted, adjustable and pivoting lavatory and sink carrier systems	ASME A112.19.12
Water closet flush tank fill valves	ASSE 1002, CSA B125
Whirlpool bathtub appliances	ASME A112.19.7M

CHAPTER 28
WATER HEATERS

SECTION P2801
GENERAL

P2801.1 Required. Each dwelling shall have an approved automatic water heater or other type of domestic water-heating system sufficient to supply hot water to plumbing fixtures and appliances intended for bathing, washing or culinary purposes. Storage tanks shall be constructed of noncorrosive metal or shall be lined with noncorrosive material.

P2801.2 Installation. Water heaters shall be installed in accordance with this chapter and Chapters 20 and 24.

P2801.3 Location. Water heaters and storage tanks shall be located and connected to provide access for observation, maintenance, servicing and replacement.

P2801.4 Prohibited locations. Water heaters shall be located in accordance with Chapter 20.

P2801.5 Required pan. Where water heaters or hot water storage tanks are installed above the ground floor space, or in attics or ceiling areas, or within the habitable space, the tank or water heater shall be installed in a galvanized steel or other metal pan of equal corrosion resistance having a minimum thickness of 24 gage, 0.0276 inch (0.70 mm). Electric water heaters shall be installed in a metal pan as herein required or in a high-impact plastic pan of at least 0.0625 inch (1.59 mm) thickness.

P2801.5.1 Pan size and drain. The pan shall be not less than $1^1/_2$ inches (38 mm) deep and shall be of sufficient size and shape to receive all dripping or condensate from the tank or water heater. The pan shall be drained by an indirect waste pipe having a minimum diameter of $^3/_4$ inch (19 mm). Piping for safety pan drains shall be of those materials listed in Table P2904.5.

P2801.5.2 Pan drain termination. The pan drain shall extend full-size and terminate over a suitably located indirect waste receptor or shall extend to the exterior of the building and terminate not less than 6 inches (152 mm) and not more than 24 inches (610 mm) above the adjacent ground surface.

P2801.6 Water heaters installed in garages. Water heaters shall be installed in accordance with the manufacturer's installation instructions which shall be available on the job site at the time of inspection.

P2801.7 Water heater seismic bracing. Reserved.

SECTION P2802
WATER HEATERS USED FOR SPACE HEATING

P2802.1 Protection of potable water. Piping and components connected to a water heater for space heating applications shall be suitable for use with potable water in accordance with Chapter 29. Water heaters that will be used to supply potable water shall not be connected to a heating system or components previously used with nonpotable-water heating appliances. Chemicals for boiler treatment shall not be introduced into the water heater.

P2802.2 Temperature control. Where a combination water heater-space heating system requires water for space heating at temperatures exceeding 140°F (60°C), a master thermostatic mixing valve complying with ASSE 1017 shall be installed to temper the water to a temperature of 140°F (60°C) or less for domestic uses.

SECTION P2803
RELIEF VALVES

P2803.1 Relief valves required. Appliances and equipment used for heating water or storing hot water shall be protected by:

1. A separate pressure-relief valve and a separate temperature-relief valve; or
2. A combination pressure- and temperature-relief valve.

P2803.2 Rating. Relief valves shall have a minimum rated capacity for the equipment served and shall conform to ANSI Z 21.22.

P2803.3 Pressure relief valves. Pressure-relief valves shall have a relief rating adequate to meet the pressure conditions for the appliances or equipment protected. In tanks, they shall be installed directly into a tank tapping or in a water line close to the tank. They shall be set to open at least 25 psi (172 kPa) above the system pressure but not over 150 psi (1034 kPa). The relief-valve setting shall not exceed the tanks rated working pressure.

P2803.4 Temperature relief valves. Temperature-relief valves shall have a relief rating compatible with the temperature conditions of the appliances or equipment protected. The valves shall be installed such that the temperature-sensing element monitors the water within the top 6 inches (152 mm) of the tank. The valve shall be set to open at a maximum temperature of 210°F (99°C).

P2803.5 Combination pressure-/temperature-relief valves. Combination pressure-/temperature-relief valves shall comply with all the requirements for separate pressure- and temperature-relief valves.

P2803.6 Installation of relief valves. A check or shutoff valve shall not be installed in the following locations:

1. Between a relief valve and the termination point of the relief valve discharge pipe;
2. Between a relief valve and a tank; or
3. Between a relief valve and heating appliances or equipment.

P2803.6.1 Relief outlet waste. The outlet of a pressure, temperature or other relief valve shall not be directly connected to the drainage system.

P2803.6.1.1 Discharge. The relief valve shall discharge full size to a safe place of disposal such as the floor, water heater pan, outside the building or an indirect waste receptor. The discharge pipe shall not have any trapped sections and shall have a visible air gap or air gap fitting located in the same room as the water heater. The discharge shall be installed in a manner that does not cause personal injury to occupants in the immediate area or structural damage to the building.

* **P2803.6.1.2 Requirements for discharge piping.** The discharge piping serving a pressure relief valve, temperature relief valve or combination thereof shall:

1. Not be directly connected to the drainage system.
2. Discharge through an air gap located in the same room as the water heater.
3. Not be smaller than the diameter of the outlet of the valve served and shall discharge full size to the air gap.
4. Serve a single relief device and shall not connect to piping serving any other relief device or equipment.
5. Discharge to the floor, to the water heater pan, to an indirect waste receptor or to the outdoors. Where discharging to the outdoors in areas subject to freezing, discharge piping shall be first piped to an indirect waste receptor through an air gap located in a conditioned area.
6. Discharge in a manner that does not cause personal injury or structural damage.
7. Discharge to a termination point that is readily observable by the building occupants.
8. Not be trapped.
9. Be installed so as to flow by gravity.
10. Not terminate more than 6 inches (152 mm) above the floor or waste receptor.
11. Not have a threaded connection at the end of such piping.
12. Not have valves or tee fittings.
13. Be constructed of those materials listed in Section P2904.5 or materials tested, rated and approved for such use in accordance with ASME A112.4.1.

TABLE P2902.3.1
MINIMUM AIR GAPS

FIXTURE	MINIMUM AIR GAP	
	Away from a wall[a] (inches)	Close to a wall (inches)
Effective openings greater than 1 inch	Two times the diameter of the effective opening	Three times the diameter of the effective opening
Lavatories and other fixtures with effective opening not greater than $^1/_2$ inch in diameter	1	1.5
Over-rim bath fillers and other fixtures with effective openings not greater than 1 inch in diameter	2	3
Sink, laundry trays, gooseneck back faucets and other fixtures with effective openings not greater than $^3/_4$ inch in diameter	1.5	2.5

For SI: 1 inch = 25.4 mm.

a. Applicable where walls or obstructions are spaced from the nearest inside edge of the spout opening a distance greater than three times the diameter of the effective opening for a single wall, or a distance greater than four times the diameter of the effective opening for two intersecting walls.

P2902.5.2 Heat exchangers. Heat exchangers using an essentially toxic transfer fluid shall be separated from the potable water by double-wall construction. An air gap open to the atmosphere shall be provided between the two walls. Heat exchangers utilizing an essentially nontoxic transfer fluid shall be permitted to be of single-wall construction.

P2902.5.3 Lawn irrigation systems. The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric-type vacuum breaker, a pressure-type vacuum breaker or a reduced pressure principle backflow preventer. A valve shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system, the potable water supply shall be protected against backflow by a reduced pressure principle backflow preventer.

P2902.5.4 Connections to automatic fire sprinkler systems. The potable water supply to automatic fire sprinkler systems shall be protected against backflow by a double check-valve assembly or a reduced pressure principle backflow preventer.

Exception: Where systems are installed as a portion of the water distribution system in accordance with the requirements of this code and are not provided with a fire department connection, isolation of the water supply system shall not be required.

P2902.5.4.1 Additives or nonpotable source. Where systems contain chemical additives or antifreeze, or where systems are connected to a nonpotable secondary water supply, the potable water supply shall be protected against backflow by a reduced pressure principle backflow preventer. Where chemical additives or antifreeze is added to only a portion of an automatic fire sprinkler or standpipe system, the reduced pressure principle backflow preventer shall be permitted to be located so as to isolate that portion of the system.

P2902.5.5 Solar systems. The potable water supply to a solar system shall be equipped with a backflow preventer with intermediate atmospheric vent complying with ASSE 1012 or a reduced pressure principle backflow preventer complying with ASSE 1013. Where chemicals are used, the potable water supply shall be protected by a reduced pressure principle backflow preventer.

Exception: Where all solar system piping is a part of the potable water distribution system, in accordance with the requirements of the *Florida Building Code, Plumbing*, and all components of the piping system are listed for potable water use, cross-connection protection measure shall not be required.

P2902.6 Access. Backflow prevention devices shall be accessible for inspection and servicing.

SECTION P2903
WATER-SUPPLY SYSTEM

P2903.1 Water supply system design criteria. The water service and water distribution systems shall be designed and pipe sizes shall be selected such that under conditions of peak demand, the capacities at the point of outlet discharge shall not be less than shown in Table P2903.1. Table P2903.2b shall be permitted to be used to size the water service or water distribution system.

TABLE P2903.1
REQUIRED CAPACITIES AT POINT OF OUTLET DISCHARGE

FIXTURE AT POINT OF OUTLET	FLOW RATE (gpm)	FLOW PRESSURE (psi)
Bathtub	4	8
Bidet	2	4
Dishwasher	2.75	8
Laundry tub	4	8
Lavatory	2	8
Shower	3	8
Shower, temperature controlled	3	20
Sillcock, hose bibb	5	8
Sink	2.5	8
Water closet, flushometer tank	1.6	15
Water closet, tank, close coupled	3	8
Water closet, tank, one-piece	6	20

For SI: 1 gallon per minute = 3.785 L/m,
1 pound per square inch = 6.895 kPa.

P2903.2 Maximum flow and water consumption. The maximum water consumption flow rates and quantities for all plumbing fixtures and fixture fittings shall be in accordance with Table P2903.2.

TABLE P2903.2
MAXIMUM FLOW RATES AND CONSUMPTION FOR PLUMBING FIXTURES AND FIXTURE FITTINGS[b]

PLUMBING FIXTURE OR FIXTURE FITTING	PLUMBING FIXTURE OR FIXTURE FITTING
Lavatory faucet	2.2 gpm at 60 psi
Shower head[a]	2.5 gpm at 80 psi
Sink faucet	2.2 gpm at 60 psi
Water closet	1.6 gallons per flushing cycle

For SI: 1 gallon per minute = 3.785 L/m,
1 pound per square inch = 6.895 kPa.

a. A handheld shower spray is also a shower head.

b. Consumption tolerances shall be determined from referenced standards.

P2903.3 Minimum pressure. Minimum static pressure (as determined by the local water authority) at the building entrance for either public or private water service shall be 40 psi (276 kPa).

P2903.3.1 Maximum pressure. Maximum static pressure shall be 80 psi (551 kPa). When main pressure exceeds 80 psi (551 kPa), an approved pressure-reducing valve conforming to ASSE 1003 shall be installed on the domestic water branch main or riser at the connection to the water-service pipe.

P2903.4 Thermal expansion control. A means for controlling increased pressure caused by thermal expansion shall be installed where required in accordance with Sections P2903.4.1 and P2903.4.2.

TABLE P2903.2b
MINIMUM WATER SERVICE SIZE[a]

NO. OF FIXTURE UNITS FLUSH TANK WC[b]	DIAMETER OF WATER PIPE[c]	RECOMMENDED METER SIZE (inches) [d]	APPROX. PRESSURE LOSS METER + 100' PIPE (psi)[e]	NO. OF FIXTURE UNITS FLUSH VALVE WC[b]
18	3/4	5/8	30	–
19-55 –	1 1	1 1	30 30	– 9
56-85 –	1 1/4 1 1/4	1 1	30 30	– 10-20
86-225 –	1 1/2 1 1/2	1 1/2 1 1/2	30 30	– 21-77
226-350 –	2 2	1 1/2 1 1/2	30 30	– 78-175
351-550 –	2 2	2 2	30 30	– 176-315
551-640 –	2 1/2 2 1/2	2 2	30 30	– 316-392
641-1340 –	3 3	3 3	22 22	– 393-940

a. Table is applicable for both copper and plastic water piping.

b. See Table P3004.1 for fixture unit values.

c. Minimum water service shall be 3/4" to control valve.

d. All secondary submeters and backflow assemblies shall be at least the same size as the line in which they are installed.

e. Table based on minimum water main pressure of 50 psi.

CHAPTER 33
GENERAL REQUIREMENTS

SECTION E3301
GENERAL

E3301.1 Applicability. The provisions of NFPA 70, *National Electrical Code Requirements* shall establish the general scope of the electrical system and equipment requirements of this code.

SECTION E3302
BONDING METAL FRAMING MEMBERS

E3302.1 Metal framing members. Metal framing members shall be bonded to the equipment grounding conductor for the circuit that may energize the framing and be sized in accordance with Table 250.122 of the *National Electric Code*. For the purpose of this section, a grounded metal outlet box attached to the framing shall be permitted.

SECTION E3303
CROSS REFERENCES

E3303.1 Cross references. See Table E3303.

TABLE E3303
CROSS REFERENCES DEFINING ELECTRICAL REQUIREMENTS OF THE FLORIDA BUILDING CODE

Florida Building Code—Building			
Section		**Section**	
Chapter 1	Administration	Chapter 9	Fire Protection Systems
101	General	901	General
102	Applicability	902	Definitions
105	Permits	903	Automatic Sprinkler Systems
106	Construction Documents	904	Alternative Automatic Fire-Extinguishing Systems
107	Temporary Structures and Uses	907	Fire Alarm and Detection Systems
108	Fees	908	Emergency Alarm Systems
109	Inspections	909	Smoke Control Systems
111	Service Utilities	910	Smoke and Heat Vents
		911	Fire Command Center
Chapter 2	Definitions		
202	Definitions	Chapter 10	Means of Egress
		1006	Means of Egress Illumination and Signs
Chapter 3	Use and Occupancy Classification	1008	Doors, Gates and Turnstiles
302	Classification	1033	Day Care
306	Factory Group F		
307	High -Hazard Group H		
311	Storage Group S		
Chapter 4	Special Detailed Requirement		
	Based on Use and Occupancy		
402	Covered Mall Buildings		
403	High-Rise Buildings		

(continued)

TABLE E3303—continued
Florida Building Code—Building—continued

Section		Section	
Chapter 4	Special Detailed Requirement	Chapter 11	Florida Accessibility Code For Building Construction
(continued)	Based on Use and Occupancy		Part A
404	Atriums	11-3	Miscellaneous Instructions and Definitions
405	Underground Buildings	11-4	Accessible Elements and Spaces: Scope and Technical Requirements
406	Motor-Vehicle-Related Occupancies	11-9	Accessible Transient Lodging
407	Group I-2		Part B
408	Group I-3	5	Guidelines
409	Motion Picture Projection Rooms		
412	Aircraft-Related Occupancies	Chapter 12	
414	Hazardous Materials	1205	Lighting
415	Groups H-1, H-2, H-3, H-4 and H-5		
419	Hospitals	Chapter 13	Energy Efficiency
420	Nursing Homes	13-101	Scope
421	Ambulatory Surgical Centers	Subchapter	
423	State Requirements for Educational	13-2	Definitions
	Facilities	13-3	Referenced Standards and Organizations
424	Swimming Pools and Bathing Places	13-4	Commercial Building Compliance Methods
	(Public and Private)	13-6	Residential Building Compliance Methods
425	Public Lodging Establishments	Appendix 13-B	Supplemental Information for Subchapter 13-4
426	Public Food Service Establishments		
427	Mental Health Programs	Chapter 26	Plastic
428	Manufactured Buildings	2606	Light-Transmitting Plastics
431	Transient Public lodging Establishments	2611	Light-Transmitting Plastic Interior Signs
435	Control of Radiation Hazards	2612	High-Velocity Hurricane Zones—Plastics
436	Day Care Occupancies		
		Chapter 27	Electrical
Chapter 7	Fire-Resistance-Rated Construction	2701	General
712	Penetrations	2702	Emergency and Standby Power Systems
714	Fire-Resistance Rating of Structural Members		
715	Opening Protective	Chapter 30	Elevators and Conveying Systems
716	Ducts and Air Transfer Openings	3003	Emergency Operations
		3005	Conveying Systems
		3006	Machine Rooms
		3011	Alterations to Electric and Hydraulic
			Elevators and Escalators
		Chapter 31	Special Construction
		3102	Membrane Structures
		3108	Radio and Television Towers
		3112	Lighting, Mirrors, Landscaping
		Chapter 33	
		3306	Protection of Pedestrians
		3310	Exits
		Chapter 35	Referenced Standards

(continued)

TABLE E3303—continued Florida Building Code—Residential			
Section		Section	
Chapter 3	Building Planning	Chapter 24	Fuel Gas
R303	Light, Ventilation and Heating	G2403 (202)	General Definitions
R313	Smoke Alarms	G2410 (309)	Electrical
R317	Dwelling Unit Separation	G2411 (310)	Electrical Bonding
		G2440 (615)	Sauna Heaters
Chapter 8	Roof -Ceiling Construction		
R808	Insulation Clearance	Chapter 33	General Requirements Electrical
		E3301	General Requirements Electrical
Chapter 13	General Mechanical System		
	Requirements	Chapter 43	Referenced Standards
M1303	Labeling of Equipment		
M1305	Appliance Access		
Florida Building Code—Existing			
Section		Section	
Chapter 3	Classification of Work	Chapter 9	Additions
305	Alterations-Level 3	904	General
		901	Smoke Alarms in Occupancy
Chapter 4	Repairs		Groups R-3 and R-4
401	General		
408	Electrical	Chapter 11	Relocated or Moved Buildings
		1102	Requirements
Chapter 5	Alterations-Level 1		
508	Electrical	Chapter 12	Compliance Alternatives
		1201	General
Chapter 6	Alterations-Level 2		
608	Electrical	Chapter 14	Referenced Standards
Chapter 8	Change of Occupancy	Appendix B	Standard for Rehabilitation
808	Electrical		
811	Other Requirements		
Florida Building Code—Mechanical			
Section		Section	
Chapter 3	General Regulations	Chapter 9	Specific Appliances, Fireplaces and Solid Fuel-Burning Equipment
301	General	912	Infrared Radiant Heaters
306	Access and Service Space	917	Cooking Appliances
		918	Forced-Air Warm-Air Furnaces
Chapter 5	Exhaust Systems	924	Stationary Fuel Cell Power Plants
502	Required Systems	927	Residential Electric Duct Heaters
503	Motors and Fans	928	Vented Residential Floor Furnaces
504	Clothes Dryer Exhaust		
509	Fire Suppression Systems		
513	Smoke Control Systems		

(continued)

TABLE E3303—continued
Florida Building Code—Mechanical

Section		Section	
Chapter 6	Duct Systems	Chapter 10	Boilers, Water Heaters and
601	General		Pressure Vessels
602	Plenums	1001	General
606	Smoke Detection System Control	1004	Boilers
607	Ducts and Air Transfer Openings	1006	Safety and Pressure Relief Valves
			And Controls
Chapter 8	Chimneys and Vents		
801	General	Chapter 11	Refrigeration
804	Direct-Vent, Integral Vent and	1104	System Application Requirements
	Mechanical Draft System	1105	Machinery Room, General Requirements
		1106	Machinery Room, Special Requirements
		Chapter 15	Referenced Standards

Florida Building Code—Plumbing

Section		**Section**	
Chapter 6	Water Supply and Distribution	Part II	Design Criteria
601	General	I.	Control Valves
612	Well Pumps and Tanks used for Private		
	Potable Water Systems	Part IV	Materials
		H.	Low Voltage Wiring
Chapter 11	Storm Drainage	I.	Irrigation Controllers
1113	Sumps and Pumping Systems	J.	Pumps and Wells
Chapter 13	Referenced Standards	Part V	Installation
		E.	Low Voltage Wire Installation
Appendix F	Proposed Construction Building Codes	F.	Hydraulic Control Tubing
	For Turf and Landscape Irrigation		
	Systems		

Florida Building Code—Fuel Gas

Section		**Section**	
Chapter 2	Definitions	Chapter 6	Specific Appliances
		627	Air Conditioning Equipment
Chapter 3	General Regulations	630	Infrared Radiant Heaters
306	Access and Service Space		
309	Electrical	Chapter 7	Gaseous Hydrogen Systems
310	Electrical Bonding	703	General Requirements
		706	Location of Gaseous Hydrogen Systems
Chapter 4	Gas Piping Installations		
413	Compressed Natural Gas Motor Vehicle	Chapter 8	Referenced Standards
	Fuel-Dispensing Stations		

* This table is provided only as a tool to assist the construction industry as a general guide. Users should review all sections of the code in order to determine specific applicable electrical requirements.

SECTION E3304
GFCI PROTECTION

E3304.1 NFPA 70 - 08: National Electric Code, Article 680 (Swimming Pools, Fountains, and Similar Installation), Section 680.22(B), GFCI Protection, is amended to read as follows:

(B) GFCI Protection. Outlets supplying pool pump motors from branch circuits with short-circuit and ground-fault protection rated 15 or 20 amperes, 125 volt or 240 volt, single phase, whether by receptacle or direct connection, shall be provided with ground-fault circuit-interrupter protection for personnel.

Exception: One-and two-family dwellings.

SECTIONS E3305—E3307
RESERVED

Part IX—Referenced Standards

CHAPTER 43
REFERENCED STANDARDS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standard shall be as specified in Section R102.4.

AA

Aluminum Association
900 19th Street N.W., Suite 300
Washington, DC 20006

Standard reference number	Title	Referenced in code section number
ADM 1–00	Aluminum Design Manual, Specifications for Aluminum Structures, Allowable Stress Design, Building, Load and Resistance Factor Design, Commentary on Allowable Stress Design, Commentary on Building Load and Resistance Factor, Material Properties, Design Aids and Illustrative Examples of Design	R4406.1.2

AAF

Aluminum Association of Florida, Inc
3165 McCrory Place, Suite 185
Orlando, FL 32803

Standard reference number	Title	Referenced in code section number
AAF—07-1	Guide to Aluminum Construction in High Wind Areas 2007-1	2002.4.1

AAMA

American Architectural Manufacturers Association
1827 Walden Office Square, Suite 550
Schaumburg, IL 60173

Standard reference number	Title	Referenced in code section number
101/I.S2—97	Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors	R613.3.3.1, R613.3.3.2, R4410.2.3.2.1
101/I.S2/NAFS—02	Voluntary Performance Specification for Windows, Skylights and Glass Doors	R308.6.9, R613.3.1, 613.3.2, R4410.2.3.2.1, R4412.1.2
AAMA/WDMA/CSA 101/I.S. 2/A440—05	Specifications for Windows, Doors and Unit Skylights	R308.6.9, R613.3.1, R613.3.1.1, R613.3.2, R613.4, R613.8.1, N1106.ABC.1.1, R4410.2.3.2.1
203—98	Procedural Guide for the Window Inspection and Notification System	R4410.2.3.2.6
450—06	Voluntary Performance Rating Method for Mulled Fenestration Assemblies	R613.7.1, R613.7.1.2, R613.7.1.3
501—94	Methods of Test for Exterior Walls	R4410.2.3.2.1
506—06	Voluntary Specifications for Hurricane Impact and Cycle Testing of Fenestration Products	R301.2.1.2
800–05	Voluntary Specifications and Test Methods for Sealants	R613.8.1, R616.2.2
812-04	Voluntary Practice for Assessment of Single Component Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations	R613.8.1, R616.2.2
1302—76	Voluntary Specifications for Forced-entry Resistant Aluminum Prime Windows	R4410.2.3.2.1
1402—86	Standard Specifications for Aluminum Siding, Soffit and Fascia	R703.12.3
1600/I.S. 7—00	Voluntary Specifications for Skylights	R4412.1.2
AAMA/NPEA/NSA 2100—02	Voluntary Specifications for Sunrooms	R301.2.1.1.2

ACCA

Air Conditioning Contractors of America
2800 Shirlington Road, Suite 300
Arlington, VA 22206

Standard reference number	Title	Referenced in code section number
ACCA Manual D-1995	Residential Duct Systems	N1110.AB.1
* ACCA Manual J-2003	Residential Load Calculation, Eighth Edition with posted updates/errata	N1107.AB.1

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48333

Standard reference number	Title	Referenced in code section number
117	Standard Tolerances for Concrete Construction and Materials	R4405.2.2
224.3R—95	Joint in Concrete Construction (Reapproved 2001)	R506.2.5
315	Manual of Standard Practice for Detailing Reinforced Concrete Structures	R4405.2.2
318-05	Building Code Requirements for Structural Concrete	R402.2, R404.1, Table R404.1.1(5), R404.4, R404.4.6.1, Table R404.4(1), Table R404.4(2), Table R404.4(3), Table R404.4(4), Table R404.4(5) R611.1, Table R611.3(1), Table R611.7(1), Table R611.7(2), Table R611.7(3), Table R611.7(4), Table R611.7(5), Table R611.7(6), Table R611.7(7), Table R611.7(9), Table R611.7(10), R611.7.1.1, Table R611.7.4, R612.1, R4405.8.5.5
* 332-05	Requirements for Residential Concrete Construction	R404.1, Table R404.1.1(5)
347	Recommended Practice for Concrete Formwork	R4405.2.2, R4405.7.1.1
506	Recommended Practice for Shotcreting	R4405.2.2
506.2	Building Code Requirements for Masonry Structures	R4405.2.2, R4405.11.1.2, R4405.11.8.1
530—05	Building Code Requirements for Masonry Structures	R404.1, R606.1, R606.1.1, R606.12.1, R606.12.2.2.1, R606.12.2.2.2, R606.12.3.1, Table R703.4, R4407.3.3
530.1—05	Specifications for Masonry Structures	R404.1, R606.1, R606.1.1, R606.12.1, R606.12.2.2.1, R606.12.2.2.2, R606.12.3.1, R4403.7.8, R4407.5.1

ADC

Air Diffusion Council
1000 E. Woodfield Road, Suite 102
Schaumburg, IL 60173-5921

Standard reference number	Title	Referenced in code section number
* ADC 2003	Flexible Duct Performance & Installation Standards, Fourth Edition	N1110.AB.2.2

AFPA

American Forest and Paper Association
111 19th Street, NW, Suite 800
Washington, DC 20036

Standard reference number	Title	Referenced in code section number
NDS—05	National Design Specification (NDS) for Wood Construction with 2005 Supplement	R404.2.2, R502.2, Table R503.1, R602.2, R802.2, R4404.7.1.8.1, R4409.1.4.7, R4409.2.4.1, 1.3, R4409.6.17.2.1.3, R4409.6.17.2.1.5
AFPA—01	Design Values for Wood Construction	R4409.1.4.7, R4409.6.17.2.2.1
AFPA—87	All-Weather Wood Foundation System, Design, Fabrication, Installation Manual	R4409.1.4.7
AFPA—92	Wood Structural Design Data	R4409.1.4.7
AFPA—93	Working stresses for Joists and Rafters	R4409.1.4.7
AFPA—93	Span Tables for Joists and Rafters	R502.2.2, R802.2.2, R802.2.3, R4409.1.4.7, R4409.4.1.1
T.R. No. 7—87	Basic Requirements for Permanent Wood Foundation System	R401.1, R4409.1.4.7
WCD 1—01	Wood Construction Data No. 1, Details for Conventional Wood Frame Construction	R4409.1.4.7
WCD 4—03	Wood Construction Data number 4, Plank and Beam Framing for Residential Building	R4409.1.4.7
WCD 5—04	Wood Construction Data No. 5, Heavy Timber Construction Details	R4409.1.4.7
WCD 6—01	Wood Construction Data No.6, Design of Wood Frame structures for Permanence	R4409.1.4.7, R4409.13.2.11

AFPA - continued

WFCM—01	Wood Frame Construction Manual for One- and Two-family Dwellings	R301.2.1.1, 404.1.4, R614.2.5, R614.3.1, R802.2, R4409.1.4.7

AHA

American Hardboard Association
1210 West Northwest Highway
Palatine, IL 60067

Standard reference number	Title	Referenced in code section number
A135.4—04	Basic Hardboard	Table R602.2(1), R4409.1.4.1
A135.5—04	Prefinished Hardboard Paneling	R702.5, R4409.1.4.1
A135.6—98	Hardboard Siding	Table R703.4, R4409.1.4.1
IB Spec. No. 1	Recommended Product and Application Specification-Structural Insulating Roof Deck	R4409.1.4.1
IB Spec. No. 2	Recommended Product and Application Specification-½ inch Fiberboard Nail-Base Sheathing	R4409.1.4.1
IB Spec. No. 3	Recommended Product and Application Specification-½ inch Intermediate Fiberboard Sheathing	R4409.1.4.1

AHAM

Association of Home Appliance Manufacturers
20 North Wacker Drive
Chicago, IL 60606

Standard reference number	Title	Referenced in code section number
ANSI/AHAM RAC1—03	Room Air Conditioners	Table 1107.AB.3.2D

AHRI

Air-Conditioning, Heating and Refrigeration Institute
Suite 500
2111 Wilson Boulevard
Arlington, VA 22201

Standard reference number	Title	Referenced in code section number
ARI Std. 210/240—2006	Unitary Air-Conditioning and Air-Source Heat Pump Equipment	Tables N1107.AB.3.2A, N1107.AB.3.2B
ARI Std. 310/380—2004	Packaged Terminal Air-Conditioners and Heat Pumps	Tables N1107.AB.3.2D
ARI Std. 340/360—2004	Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment	Tables N1107.AB.3.2A, N1107.AB.3.2B
ARI Std. 365—2002	Commercial and Industrial Unitary Air-Conditioning Condensing Units	Table N1107.AB.3.2A
ARI Std. 390—2003	Single Packaged Vertical Air Conditioners and Heat Pumps	Table N1107.AB.3.2D
ARI Std. 1160—2004	Performance Rating of Heat Pump Pool Heaters	N1112.AB.2.3.4

AISC

American Institute of Steel Construction
One East Wacker Drive Suite 3100
Chicago, IL 60601-2001

Standard reference number	Title	Referenced in code section number
AISC	Detailing for Steel Construction	R4408.1.3
AISC	Engineering for Steel Construction	R4408.1.3
AISC	Iron and Steel Beams 1873 to 1952	R4408.1.3
AISC	Plastic Design in Steel	R4408.1.3
AISC	Plastic Design of Braced Multistory Steel Frames	R4408.1.3
AISC	Serviceability Design Considerations for Low Rise Buildings	R4408.1.3
AISC	Simple Shear Connection, ASD	R4408.1.3
AISC	Simple Shear Connection, LRFD	R4408.1.3
AISC	Torsional Analysis of Steel Members	R4408.1.3
AISC	Manual of Steel Construction, Allowable Stress Design	R4408.1.3
AISC	Manual of Steel Construction, Allowable Stress Design LRFD	R4408.1.3

AISI

American Iron and Steel Institute
1140 Connecticut Ave, Suite 705
Washington, DC 20036

Standard reference number	Title	Referenced in code section number
AISI	Design Manual for Structural Tubing	R4408.1.3
AISI	Designing Fire Protection for Steel Trusses	R4408.1.3
AISI	Designing Fire Protection for Steel Columns	R4408.1.3
AISI	Fire Resistant Steel Frame Construction	R4408.1.3
AISI	Fire Safe Structural Steel A Design	R4408.1.3
AISI	Specifications for Design of Light Gage Cold Formed Stainless Structural Members	R4408.1.3
AISI	Specification for the Criteria for Structural Application of Steel Cables for Buildings	R4408.1.3
AISI/COFS/PM—2001	Standard for Cold formed Steel Framing— Prescriptive Method for One- and Two- family dwellings	R301.1, R301.2.1.1, R301.2.2.4.1, R301.2.2.4.5, R404.1.4, R804.1.3
AISI/COFS/PM	Supplement 2004	R404.1.4.2
Header—04	Standard for Cold-formed Steel Framing-Header Design	R603.6
PM–2001	Standard for Cold-formed Steel Framing-Prescriptive Method for One- and Two-family Dwellings (including 2004 Supplement)	R301.1.1, R301.2.1.1(4), R301.2.2.4.1, R301.2.2.4.5
SGO4-5	Standard for Cold formed Steel Framing Truss Design	R804.1.3
SGO4-6	Standard for Cold formed Steel Framing Header Design	R603.6
SGO3-3	Cold Formed Steel Design Manual	R4408.1.3
SG 971—96	Specification for the Design of Cold Form Steel Structures	R4408.1.3
Truss—04	Standard for Cold-formed Steel Framing-Truss Design	R804.1.3

AITC

American Institute of Timber Construction
7012 S. Revere Parkway, Suite 140
Englewood, CO 80112

Standard reference number	Title	Referenced in code section number
AITC 104	Typical Construction Details	R4408.1.4.2
AITC 106	Code of Suggested Practices	R4409.1.4.2
AITC 108	Standard for Heavy Timber Construction.	R4409.1.4.2
AITC 109	Standard for Preservative Treatment for Structural Glued Laminated Timber	R4409.1.4.2
AITC 110	Standard Appearance Grades for Structural Glued Laminate Timber	R4409.1.4.2
AITC 112	Standard for Tongue and Groove Heavy Timber Roof Decking	R4409.1.4.2
AITC 113	Standard for Dimensions of Glued Laminated Structural Members	R4409.1.4.2
AITC 117	Standard Specification for Structural Glued Laminated Timber of Softwood Species	R4409.1.4.2
AITC 119	Standard Specifications for Hardwood Glued Laminated Timber	R4409.1.4.2
AITC A 190.1—02	Structural Glued Laminated Timber	R502.1.1.5, R602.1.1.2, R802.1.5, R4409.1.4.2,R4409.2.11
TR No. 7	Calculation of Fire Resistance of Glued Laminated Timber	R4409.1.4.2

ANSI

American National Standards Institute
25 West 43rd Street, Fourth Floor
New York, NY 10036

Standard reference number	Title	Referenced in code section number
A41.1	Building Code Requirements for Masonry.	R4407.2.1.1, R4407.4.2.8
A41.2	Building Code Requirements for Reinforced Masonry	R4407.2.1.1
A42.1	Standard Specification for Gypsum Plastering.	R4411.2.1.1
A42.4	Standard Specification for Interior Lathing and Furring	R4411.1
A97.1	Specification for the Application and Finishing of Gypsum Wallboard	R4411.4.2
A108.1A—99	Installation of Ceramic Tile in the Wet-set Method, with Portland Cement Mortar.	R702.4.1
A108.1B—99	Installation of Ceramic Tile, Quarry Tile on a Cured Portland Cement Mortar Setting Bed with Dry-set or Latex-Portland Mortar.	R702.4.1
A108.4—99	Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-setting Epoxy Adhesive.	R702.4.1
A108.5—99	Installation of Ceramic Tile with Dry-set Portland Cement Mortar or Latex-Portland Cement Mortar	R702.4.1
A108.6—99	Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-setting and -grouting Epoxy	R702.4.1

AISI - continued

A108.11—99	Interior Installation of Cementitious Backer Units	R702.4.1
A112.18.1M—99	Finished and Rough Brass Plumbing Fixture Fittings	N1108.A.3.5, N1112.AB.2.4
A118.1—99	American National Standard Specifications for Dry-set Portland Cement Mortar	R702.4.1
A118.3—99	American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-setting and Grouting Epoxy and Water Cleanable Tile-setting Epoxy Adhesive	R702.4.1
A136.1—99	American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile	R702.4.1
A137.1—88	American National Standard Specifications for Ceramic Tile	R702.4.1
A208.1—99	Particleboard	R503.3.1, R605.1
LCI–97	Interior Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing –with Addenda LC 1a-1999 and LC 1b-2001	G2414.5.3
Z21.1—03	Household Cooking Gas Appliances–with Addenda Z21.1a-2003 and Z21.1b-2003	G2447.1
Z21.5.1—02	Gas Clothes Dryers–Volume I–Type I Clothes Dryers–with Addenda Z21.5.1a-2003	G2438.1
Z21.8–94(R2002)	Installation of Domestic Gas Conversion Burners	G2443.1
Z21.10.1—04	Gas Water Heaters–Volume I–Storage, Water Heaters with Input Ratings of 75,000 Btu per hour or Less	G2448.1
Z21.11.2—02	Gas-fired Room Heaters–Volume II–UNvented Room Heaters–with Addenda Z21.11.2a-2003	G2445.1
Z21.13—04	Gas-fired Low-Pressure Steam and Hot Water Boilers	G2452.1
Z21.15—97(R2003)	Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves –with Addenda Z21.15a-2001 (R2003)	G2420.1.1
Z21.22—99(R2003)	Relief Valves for Hot Water Supply Systems–with Addenda Z21.22a-2000 (R2003) and 21.22b-2001 (R2003)	P2803.2
Z21.24—97	Connectors for Gas Appliances	G2422.1
Z21.40.1—96(R2002)	Gas-fired Heat Activated Air Conditioning and Heat Pump Appliances–with Z21.40.1a-97(R2002)	G2449.1
Z21.40.2—96(R2002)	Gas-fired Work Activated Air Conditioning and Heat Pump Appliances (Internal Combustion) –with Addenda Z21.40.2a-1997 (R2002)	G24491
Z21.40.4—96 (with Addenda 1)	Performance Testing and Rating of Gas-Fired, Air-Conditioning and Heat Pump Appliances	N1107.A.1
Z21.42–93(R2002)	Gas-fired Illuminating Appliances	G2450.1
Z21.47—03	Gas-fired Central Furnaces	R617.1, G2442.1
Z21.47a—04	Gas-Fired Central Furnaces	Table N1108.AB.3.2E
Z21.50—03	Vented Gas Fireplaces–with Addenda Z21.50a-2003	G2434.1
Z21.56—2006	Gas-Fired Pool Heaters	N1112.AB.2.3.1
Z21.56—01	Gas-fired Pool Heaters–with Addenda Z21.156a-2004 and Z21.56b–2004	R616.1, G2441.1
Z21.58—95(R2002)	Outdoor Cooking Gas Appliances–with Addenda Z21.58a-1998(R2002) and Z21.58b-2002	R622.1, G2447.1
Z21.60—03	Decorative Gas Appliances for Installation in Solid Fuel Burning Fireplaces–with Addenda Z21.60a-2003	G2432.1
Z21.69—02	Connectors for Movable Gas Appliances with Addenda Z21.69a–2003	G2422.1
Z21.75/CSA 6.27—01	Connectors for Outdoor Gas Appliances	G2422.1
Z21.80—03	Line Pressure Regulators	G2421.1
Z21.83—98	Fuel Cell Power Plants	M1903.1
Z21.84—02	Manually-listed, Natural Gas Decorative Gas Appliances for Installation in Solid Fuel Burning Fireplaces –with Addenda Z21.84a-2003	G2432.1, G2432.2
Z21.86—04	Gas-fired Vented Space Heating Appliances	G2436.1, G2437.1, G2446.1
Z21.88—02	Vented Gas Fireplace Heaters–with Addenda A21.88a-2003 and Z21.88b–2004	G2435.1
Z21.91—01	Ventless Firebox Enclosures for Gas-fired Unvented Decorative Room Heaters	G2445.7.1
Z83.6—90(R1998)	Gas-fired Infrared Heaters	G2442.1, G2449.1, G2451.1
Z83.8—02	Gas-fired Unit Heaters and Gas-fired Duct Furnaces–with Addenda Z83.8a-2003	G2444.1
Z83.8/CGA 2.6—06	Gas Unit Heaters and Gas-Fired Duct Furnaces	Table N1108.AB.3.2E
Z97.1—84(R1994)	Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test (Reaffirmed 1994)	R308.3, R4403.7.3.6.3, R4410.2.1.4, R4410.2.1.6
Z124.1—95	Plastic Bathtub Units	Table P2701.1
Z124.2—95	Plastic Shower Receptors and Shower Stalls	Table P2701.1
Z124.3—95	Plastic Lavatories	Table P2701.1, P2711.1, P2711.2
Z124.4—96	Plastic Water Closet Bowls and Tanks	Table P2701.1, P2712.1
Z124.6—97	Plastic Sinks	Table P2701.1

APA

APA–The Engineered Wood Association
7011 South 19th
Tacoma, WA 98466

Standard reference number	Title	Referenced in code section number
V910	Plywood Folded Plate, Laboratory Report 21	R4409.1.4.3
L350	Design/Construction Guide Diaphragms.	R4409.1.4.3
PRP108	Performance Standards and Policies for Structural Use Panels	R4409.1.4.3, R4409.2.1.2
B840	303 Siding Manufacturing Specifications	R4409.1.4.3
E30—03	Engineered Wood Construction Guide	R803.2.3, R4409.1.4.3
H815	Plywood Design Specification Design and Fabrication of All Plywood Beams	R4409.1.4.3
S811	Plywood Design Specification Design and Fabrication of Plywood Curved Panels	R4409.1.4.3
S812	Plywood Design Specification Design and Fabrication of Plywood Lumber Beams	R4409.1.4.3
U813	Plywood Design Specification Design and Fabrication of Plywood Stressed Skin Panels	R4409.1.4.3
U814	Plywood Design Specification Design and Fabrication of Plywood Sandwich Panels	R4409.1.4.3
Y510J	Plywood Design Specification	R4409.1.4.3

APSP

Association of Pool and Spa Professionals
2111 Eisenhower Avenue
Alexandria, VA 22314

Standard reference number	Title	Referenced in code section number
* ANSI/NSPI 3—99	American National Standard for Permanently Installed Residential Spas	R4101.6.1
ANSI/NSPI 4—99	American National Standard for Aboveground/On ground Residential Swimming Pools.	R4101.6.1
ANSI/NSPI 5—03	American National Standard for Residential In ground Swimming Pools	R4101.6.1
ANSI/NSPI 6—99	American National Standard for Portable Spas	R4101.6.1
ANSI/APSP 7—06	American National Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs, and Catch Basins	R4101.6.1, R4101.6.3, R4101.6.6

ARDM

Association of Refrigerant Desuperheater Manufacturers, Inc
c/o Doucette Industries
4151 112 Terrace N
Clearwater, FL 33762

Standard reference number	Title	Referenced in code section number
ARDM-88	Residential Heat Recovery Installation Guide, First Edition	N1100.3.3

ASCE

American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, VA 20191

Standard reference number	Title	Referenced in code section number
3—91	Specifications for the Design and Construction of Composite Slabs and Commentary on Specifications for the Design and Construction of Composite Slabs	R4405.2.3, R4408.1.3
5—05	Building Code Requirements for Masonry Structures	R404.1, R606.1, R606.1.1, R606.2.2, R606.11.1, R606.11.2.2.1, R606.11.2.2.2, R606.11.3.1, R4403.7.8
6—05	Specifications for Masonry Structures	R404.1, R606.1, R606.1.1, R606.12.1, R606.12.2.2.1, R606.12.2.2.2, R606.12.3.1
7—05	Minimum Design Loads for Buildings and Other Structures	Figure 301.2(4), R301.2.1.1, R301.2.1.1.2, R301.2.1.4, Table R611.3(1), Table R611.7.4, R4402.3.4, R4403.1.3, R4403.4.1, R4403.4.2, R4403.7.3.8, R4403.7.8, R4403.8, R4403.9, R4403.10, R4403.12, Table R4403.15.4, R4403.16.1
8—02	Specifications for the Design of Cold Formed Stainless Steel Structural members	R4408.1.3
11—99	Guidelines for Structural Condition Assessment of Existing Buildings	R4405.2.3, R4406.1.2, R4408.1.3
32—01	Design and Construction of Frost Protected Shallow Foundations	R403.1.4.1, R4406.1.2

ASHRAE

American Society of Heating, Refrigerating
and Air-Conditioning Engineers, Inc.
1791 Tullie Circle, NE
Atlanta, GA 30329

Standard reference number	Title	Referenced in code section number
34—2004	Designation and Safety Classification of Refrigerants	M1411.1
ANSI/ASHRAE Std. 93-1986 (RA91)	Methods of Testing to Determine the Thermal Performance of Solar Collectors	N1112.AB.3.4 *
ANSI/ASHRAE 119-1988 (RA 94)	Air Leakage Performance for Detached Single-Family Residential Buildings	Table N1113A.1-1
ANSI/ASHRAE 124-1991	Methods of Testing for Rating Combination Space-Heating and Water-Heating Appliances	N1108.A.2.5, Appendix G C4.3.2.1
ANSI/ASHRAE 137—1995 (RA2001)	Methods of Testing for Efficiency of Space-conditioning/Water-Heating Appliances That Include a Desuperheater Water Heater	Appendix G C6.2.2.3
ANSI/ASHRAE 152—2004	Method of Test for Determining the Design and Seasonal Efficiencies of Residential Thermal Distribution Systems	Table N1113A.1-1
ASHRAE—2005	ASHRAE Fundamentals Handbook—2005	N1100.7.3, Table N1113A.1-1
ASHRAE, 1998	Cooling and Heating Load Calculation Principles	N1107.AB.1 *

ASME

American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Standard reference number	Title	Referenced in code section number
A17.1—2004	Safety Code for Elevators	R323.1
A18.1—2003	Safety Standard for Platforms and Stairway Chair Lifts	R323.2
A112.1.2—1991(R2002)	Air Gaps in Plumbing Systems	P2902.3.1, Table P2902.3
A112.1.3—2000	Air Gap Fittings for Use with Plumbing Fixtures, Appliances, and Appurtenances	Table P2701.1, P2902.3.1
A112.3.1—93	Performance Standard and Installation Procedures for Stainless Steel Drainage Systems for Sanitary, Storm and Chemical Applications Above and Below Ground	Table P3002.1(1), Table P3002.1(2), P3002.2, P3002.3
A112.3.4—2000	Macerating Toilet Systems and Related Components	Table P2701.1, P3007.2.1
A112.4.1—1993(R2002)	Water Heater Relief Valve Drain Tubes	P2803.6.2
A112.4.3—1999	Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System	P3003.19, P3003.4.5
A112.6.1M—1997(R2002)	Floor Affixed Supports for Off-the-floor Plumbing Fixtures for Public Use	P2702.4, Table P2704.1
A112.6.2—2000	Framing-Affixed Supports for Off-the-floor Water Closets with Concealed Tanks	Table P2701.1, P2702.4
A112.6.3—2001	Floor and Trench Drains	Table P2701.1
A112.18.1—2003	Plumbing Fixture Fittings	Table P2701.1, P2708.4, P2722.1, P2902.2
A112.18.2—2002	Plumbing Fixture Waste Fittings	Table P2701.1, P2702.2 *
A112.18.3M—2002	Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings	P2708.4, P2722.3
A112.18.6—2003	Flexible Water Connectors	P2904.7
A112.19.1M—1994(R1999)	Enameled Cast Iron Plumbing Fixtures—with 1998 and 2000 Supplements	Table P2701.1, P2711.1
A112.19.2—2003	Vitreous China Plumbing Fixtures—and Hydraulic Requirements for Water Closets and Urinals	Table P2701.1, P2705.1, P2711.1, P2712.1, P2712.2
A112.19.3M—2000	Stainless Steel Plumbing Fixtures (Designed for Residential Use)—with 2002 Supplement	Table P2701.1, P2705.1, P2711.1
A112.19.4M—1994(R1999)	Porcelain Enameled Formed Steel Plumbing Fixtures—with 1998 and 2000 Supplements	Table P2701.1, P2711.1
A112.19.5—1999	Trim for Water-closet Bowls, Tanks, and Urinals	Table P2701.1 *
A112.19.6—1995	Hydraulic Performance Requirements for Water Closets and Urinals	Table P2701.1, P2712.1, P2712.2
A112.19.7M—1995	Whirlpool Bathtub Appliances	Table P2701.1
A112.19.9M—1991(R2002)	Non-vitreous Ceramic Plumbing Fixtures—with 2002 Supplement	Table P2701.1, P27.11.1, P2712.1
A112.19.12—2000	Wall Mounted and Pedestal Mounted, Adjustable and Pivoting Lavatory and Sink Carrier Systems	Table P2701.1, P2711.4, P2714.2
A112.19.13—2001	Electrohydraulic Water Closets	P2712.9
A112.19.15—2001	Bathtub/Whirlpool Bathtubs with Pressure Sealed Doors	Table P2701.1, P2713.2
B1.20.1—1983(R2001)	Pipe Threads, General Purpose (Inch)	G2414.9, P3003.3.3, P3003.5.3, P3003.10.4, P3003.12.1, P3003.14.3
B16.3—1998	Malleable Iron Threaded Fittings Classes 150 and 300	Table P2904.6, R4413.2.7
B16.4—1998	Gray-iron Threaded Fittings Classes 125 and 250	Table P2904.6, R4413.2.7
B16.9—2003	Factory-made Wrought Steel Buttwelding Fittings	Table P2904.6, R4413.2.7
B16.11—2001	Forged Fittings, Socket-welding and Threaded	Table P2904.6, R4413.2.7
B16.12—1998	Cast Iron Threaded Drainage Fittings	Table P2904.6, R4413.2.7
B16.15—1985(R1994)	Cast Bronze Threaded Fittings	Table P2904.6, R4413.2.7

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B16.18—2001	Cast Copper Alloy Solder Joint Pressure Fittings	Table P2904.6, R4413.2.7
B16.22—2001	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	Table P2904.6, R4413.2.7
B16.23—2002	Cast Copper Alloy Solder Joint Drainage Fittings (DWV)	Table P2904.6, R4413.2.7
B16.26—1988	Cast Copper Alloy Fittings for Flared Copper Tubes	Table P2904.6, R4413.2.7
B16.28—1994	Wrought Steel Buttwelding Short Radius Elbows and Returns	Table P2904.6, R4413.2.7
B16.29—2001	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-DWV	Table P2904.6 , R4413.2.7
B16.32	Cast Copper Alloy Solder Joint Fittings for Solvent Drainage Systems	Table R4413.2.7
B16.33—2002	Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 psig (Sizes $^1/_2$ through 2)	G2420.1.1
B16.44—01	Manually Operated Metallic Gas Valves For Use in House Piping Systems	Table G2420.1.1
B36.10M—2000	Welded and Seamless Wrought-steel Pipe	G2414.4.2
BPVC—2004	ASME Boiler and Pressure Vessel Code (Sections I, II, IV, V, VI & IX)	M2001.1.1, G2452.1
CSD-1—2002	Controls and Safety Devices for Automatically Fired Boilers	M2001.1.1, G2452.1

ASSE

American Society of Sanitary Engineering
28901 Clemens Road, Suite A
Westlake, OH 44145

Standard reference number	Title	Referenced in code section number
1001—02	Performance Requirements for Atmospheric Type Vacuum Breakers	Table P2902.3, P2902.3.2
1002—99	Performance Requirements for Antisiphen Fill Valves (Ballcocks) for Gravity Water Closet Flush Tank	Table P2701.1, Table P2902.3, P2902.4.1
1003—01	Performance Requirements for Water Pressure Reducing Valves	P2903.3.1
1006—89	Performance Requirements for Residential Use Dishwashers	Table P2701.1
1007—92	Performance Requirements for Home Laundry Equipment	Table P2701.1
1008—89	Performance Requirements for Household Food Waste Disposer Units	Table P2701.1
1010—96	Performance Requirements for Water Hammer Arresters	P2903.5
1011—93	Performance Requirements for Hose Connection Vacuum Breakers	Table P2902.3, P2902.3.2
1012—02	Performance Requirements for Backflow Preventers with Intermediate Atmospheric Vent	Table P2902.3 P2902.3.3, P2902.5.1, P2902.5.5
1013—99	Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers	Table P2902.3, P2902.5.5, P2902.5.1, P2902.5.5
1014—90	Performance Requirements for Hand-held Shower	Table P2701.1
1015—99	Performance Requirements For Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies	Table P2902.3, P2902.3.6
1016—96	Performance Requirements for Individual Thermostatic, Pressure Balancing and Combination Control Valves for Bathing Facilities	Table P2701.1, P2708.3, P2722.2
1017—99	Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems	P2802.2
1019—97	Performance Requirements for Wall Hydrants, Freezeless, Automatic Automatic Draining, Anti-backflow Types	Table P2701.1, Table P2902.3
1020—98	Performance Requirements for Pressure Vacuum Breaker Assembly	Table P2902.3, P2902.3.4
1023—79	Performance Requirements for Hot Water Dispensers Household Storage Type Electrical	Table P2701.1
1024—04	Performance Requirements for Dual Check Valve Type Backflow Preventers	Table P2902.3
1025—78	Performance Requirements for Diverters for Plumbing Faucets with Hose Spray, Anti-siphon Type, Residential Applications	Table P2701.1
1035—02	Performance Requirements for Laboratory Faucet Backflow Preventers	Table P2902.3, P2902.3.2
1037—90	Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures	Table P2701.1
1047—99	Performance Requirements for Reduced Pressure Detector Fire Protection Backflow Prevention Assemblies	P2902.3.5, Table P2902.3
1048—99	Performance Requirements for Double Check Detector Fire Protection Backflow Prevention Assemblies	P2902.3.6, Table P2902.3
1050—02	Performance Requirements for Stack Air Admittance Valves for Sanitary Drainage Systems	P3114.1
1051—02	Performance Requirements for Individual and Branch Type Air Admittance Valves for Plumbing Drainage Systems	P3114.1
1052—93	Performance Requirements for Hose Connection Backflow Preventers	Table P2701.1, Table P2902.3, P2902.3.2
1056—01	Performance Requirements for Spill Resistant Vacuum	Table P2902.3, P2902.3.4
1062—97	Performance Requirements for Temperature Actuated, Flow Reduction Valves to Individual Fixture Fittings	Table P2701.1, P2724.1
1066—97	Performance Requirements for Individual Pressure Balancing Valves for Individual Fixture Fittings	Table P2701.1, P2722.4
1070—04	Performance Requirements for Water Temperature Limiting Devices	P2713.3, P2721.2

ASTM

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428

Standard reference number	Title	Referenced in code section number
A 6/A6M—04a	Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling	R4408.1.3
A 29/A29M	Specification for Steel bars, Carbon and Alloy, Hot Wrought, General Requirements	R4404.11.1
A 36/A 36M—04	Specification for Carbon Structural Steel.	R606.15
A 53/A 53M—02	Specification for Pipe, Steel, Black and Hot-dipped, Zinc-coated Welded and Seamless	Table M2101.1, G2414.4.2, Table P2904.4.1, Table P2904.5, Table P3002.1(1). Table R4413.3.2
A 74—04	Specification for Cast Iron Soil Pipe and Fittings	Table P3002.1(1), Table P3002.1(2), Table P3002.2 Table R4413.2.2, Table R4413.2.3, Table R4413.2.4, Table R4413.2.5
A 82—02	Specification for Steel Wire, Plain for Concrete Reinforcement	R606.9.10
A 106—04	Specification for Seamless Carbon Steel Pipe for High Temperature Service.	Table M2101.1, G2414.4.2
A 126—04	Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings	Table P3002.1(1)
A 153—03	Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.	R319.3, Table R606.15.1
A 167—99	Specification for Stainless and Heat-resisting Chromium-nickel Steel Plate, Sheet, and Strip	R606.15, Table R606.15.1
A 197/A197M—00	Specification for Cupola Malleable Iron.	Table P3002.1
A 240—04	Standard Specification for Chromium and Chromium-nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications	Table R905.10.3(1)
A 254—97(2002)	Specification for Copper Brazed Steel Tubing	Table M2101.1, G2414.5.1
A 306	Carbon Steel Bars Subject to Mechanical Property Requirements.	R4404.11.1
A 307—03	Specification for Carbon Steel Bolts and Studs 60,000 PSI Tensile Strength	Table R611.9
A 312/A 312M—04a	Specification for Seamless and Welded Austenitic Stainless Steel Pipes	Table P2904.4.1, Table P2904.5, Table P2904.6, P2904.11.2
A 325—94	Specification for High Strength Bolts for Structural Steel Joints	R4408.1.3
A 361	Specification for Steel Sheet Zinc Coated (Withdrawn)	R4409.6.17.1.1
A 377—03	Index of Specification for Ductile Iron Pressure Pipe	Table P2904.4
A 416—99	Specification for Steel Strand, Uncoated Seven Wire for Prestressed Concrete	R4405.4.4.2
A 421/A421M—98	Specification for Uncoated Stress Relieved Steel Wire for Prestressed Concrete	R4405.4.4.2
A 446	Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality.	R4405.12.4.4
A 463/A 463M—02a	Standard Specification for Steel Sheet, Aluminum-coated by the Hot-Dip Process	Table R905.10.3(2)
A 490—93	Specification for Heat Treated Steel Structural Bolts	R4408.1.3
A 510M—03	Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel	R606.15
A 525—87	Specification for Steel Sheet Zinc coated (Galvanized) Steel Wire	Table R606.9.10.1, R4405.12.4.4, R4408.1.3, R4411.4.2, R4411.4.5.1, R4411.4.5.4, M1601.1.1
A 539—99	Specification for Electronic-resistance-welded Coiled Steel Tubing for Gas and Fuel Oil Lines.	M2202.1, G2414.5.1
A 611	Standard Specification for Structural Steel (SS), Sheet, Carbon, Coil Rolled	R4404.10.1.5.3, R4405.12.4.4
A 615/A 0615M—04a	Specification for Deformed and Plain Billet-steel Bars for Concrete Reinforcement	R404.4.6.1, R611.6.2, R4405.2.2, R4405.2.4, R4405.4.4.6
A 617	Standard Specification for Axle Steel Reformed and Plain Bars for Concrete Reinforcement.	R4405.4.4.6
A 641/A 0641M—03	Specification for Zinc-coated (Galvanized) Carbon Steel Wire	Table R606.15.1
A 653/A 0653M—04a	Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-iron Alloy-coated (Galvanized) by the Hot-dip Process.	R505.2.1, R505.2.3, R603.2.1, R603.2.3, Table R606.15.1, R804.2.1, R804.2.3, Table 905.4.4, Table R905.10.3(1), M1601.1.1, R4409.6.17.2.2.7
A 706/A 706/M—04a	Specification for Low-alloy Steel Deformed and Plain Bars for Concrete Reinforcement	R404.4.6.1, R611.6.2, R4405.4.4
A 722/A 722M—98	Specification for Uncoated High Strength Steel Bar for Prestressing Concrete	R4405.4.4.2
A 755/A 755M—01 (2003)	Specification for Steel Sheet, Metallic Coated by the Hot-dip Process and Prepainted by the Coil-coating Process for Exterior Exposed Building Products.	Table R905.10.3(2)
A 767/A 767M—00b	Specification for Zinc Coated (Galvanized) Steel Bars for Concrete Reinforcement	R4405.4.4.6, R4405.8.5.5
A 775/A 775M—01	Specification for Epoxy Coated Steel Reinforcing Bars	R4405.4.4.6
A 778—01	Specification for Welded Unannealed Austenitic Stainless Steel Tubular Products	Table P2904.4, Table P2904.5, Table P2904.6
A 792/A 792M—03	Specification for Steel Sheet, 55% Aluminum-zinc Alloy-coated by the Hot-dip Process.	R505.2.1, R603.2.1, R603.2.3, R804.2.1, R804.2.3
A 875/A 875M—02a	Specification for Steel Sheet, Zinc-5%, Aluminum Alloy-coated by the Hot-dip Process.	R505.2.1, R505.2.3, R603.2.1, R603.2.1, R603.2.3, R804.2.1, R804.2.3, Table R905.10.3
A 888—04	Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Application.	Table R4413.2.2, Table R4413.2.3, Table R4413.2.4, Table R4413.2.5, Table R4413.2.7

ASTM - continued

*	A 924/A 924M—04	Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process R4409.6.17.2.2.7
	A 951—02	Specification for Masonry Joint Reinforcement. R606.15
	A 996/A 996M—04	Specifications for Rail-Steel and Axel-Steel Deformed Bars for Concrete Reinforcement R404.4.6.1, R611.6.2
	A 1003/A 1003M—00	Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-formed Framing Members R505.2.1, R603.2.1, R804.2.1
	B 32—03	Specification for Solder Metal. P3003.10.3, P3003.11.3
	B 42—02e01	Specification for Seamless Copper Pipe, Standard Sizes . . . . . Table M2101.1, G2413.5.2, Table P2904.5, Table P3002.1(1)
	B 43—98(2004)	Specification for Seamless Red Brass Pipe, Standard Sizes . . . . . Table M2101.1, G2413.5.2, Table P2904.4, Table P2904.5, Table P3002.1(1), Table R4413.2.2
	B 75—02	Specification for Seamless Copper Tube . . . . . Table M2101.1, Table P2904.4, Table P2904.5, Table P3002.1(1), Table P3002.1(2), Table P3002.2
	B 88—03	Specification for Seamless Copper Water Tube . . . . . Table M2101.1, G2414.5.2, Table P2904.4, Table P2904.5, Table P3002.1, Table P3002.2, Table R4413.2.2, Table R4413.2.3, Table R4413.2.4
	B 101—02	Specification for Lead-Coated Copper Sheet and Strip for Building Construction . . . . . Table R905.10.3(1)
	B 135—02	Specification for Seamless Brass Tube . . . . . Table M2101.1
	B 209—04	Specification for Aluminum and Aluminum-alloy Sheet and Plate . . . . . Table 905.10.3(1)
	B 227—04	Specification for Hard-drawn Copper-clad Steel Wire R606.9.10
	B 251—02e01	Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube. . . Table M2101.1, Table P2904.4.1, Table P2904.5, Table R4413.2.2, Table R4413.2.3, Table R4413.2.4
	B 280—02	Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service. G2414.5.2
	B 302—02	Specification for Threadless Copper Pipe, Standard Sizes . . . . . Table M2101.1, Table P2904.5, Table P3002.1(1), Table R4413.2.2
	B 306—02	Specification for Copper Drainage Tube (DWV). . . . . Table M2101.1, Table P3002.1, Table P3002.2, Table P3002.2, Table R4413.2.2, Table R4413.2.4
	B 370—03	Specification for Copper Sheet and Strip for Building Construction . . . . . Table R905.4.4, Table R905.10.3(1), Table P2701.1, R905.4.4
	B 447—02	Specification for Welded Copper Tube . . . . . Table P2904.4, Table P2904.5
	B 633—98e01	Specification for Electrodeposited Coatings of Zinc on Iron and Steel. R505.2.4, R603.2.4, R804.2.4
	B695—00	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel R319.3
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AWS

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Standard reference number	Title	Referenced in code section number
A5.8—04	Specifications for Filler Metals for Brazing and Braze Welding	P3003.5.1, P3003.10.1, P3003.11.1
B2.1	Standard Welding Procedure and Performance Qualification	R4408.1.3
C5.4	Recommended Welding Practice for Stud Welding	R4408.1.3
D1.1	Structural Welding Code Steel	R4408.1.3
D1.2	Structural Welding Code Aluminum	R4406.1.3
D1.3	Structural Welding Code Sheet Metal	R4408.1.3
D1.4	Structural Welding Code Reinforcing Steel	R4405.4.4, R4405.8.4.8, R4407.2.1.1, R4408.1.3
D9.1	Specification for Welding of Sheet Metal	R4408.1.3
D10.9	Standard for Qualification of Welding Procedures and Welders for Piping and Tubing	R4408.1.3

AWPA

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Standard reference number	Title	Referenced in code section number
C1—00	All Timber Products—Preservative Treatment by Pressure Processes	R902.2
C1—100	All Timber Products—Preservative Treatment by Pressure Processes	R902.2
C2—01	Lumber, Timbers, Bridge Ties and Mine Ties — Preservative Treatment by Pressure Processes	R319.1, R323.1.7, Table R905.8.5, R4409.1.4.5
C3—99	Piles — Preservative Treatment by Pressure Processes	R319.1, R323.1.7, R4404.7.1.3, R4409.1.4.5
C4—99	Poles — Preservative Treatment by Pressure Processes	R319.1, R323.1.7, R4409.1.4.5
C5—03	Posts—Pressure Treatment by Pressure Processes	R4409.1.4.5
C6—99	Crossties and Switch Ties Preservative Treatment by Pressure Processes	R4409.1.4.5, R4409.21.9
C7—96	Western Red Cedar, Northern White Cedar & Alaska yellow Cedar Poles Preservative Treatment of Incised Pole Butts by the Thermal process (Withdrawn)	R4409.1.4.5
C8—96	Western Red & Alaska Yellow Cedar Poles Preservative Treatment by the Full Length Thermal process (Withdrawn)	R4409.1.4.5
C9—03	Plywood — Preservative Treatment by Pressure Processes	R319.1, R323.1.7, R4409.1.4.5
C10—96	Lodgepole Pine Poles Preservative Treatment by the Full Length Thermal Process.	R4409.1.4.5
C11—01	Wood Blocks for Floors & Platforms Pressure Treatment by the Pressure Process	R4409.1.4.5
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C16—03	Wood used on Farms Pressure Treatment	R4409.1.4.5
C18—99	Standard for Pressure Treated Material in Marine Construction	R319.1, R323.1.7, R4409.1.4.5
C20—99	Structural Lumber—Fire retardant Treatment by Pressure Processes	R4409.1.4.5
C22—96	Lumber and Plywood for Permanent Wood Foundations— Preservative Treatment by Pressure Processes	R319.1, R323.1.7, R402.1.2, R504.3, R4409.1.4.5
C23—03	Round Poles and Posts Used in Building Construction— Preservative Treatment by Pressure Processes	R319.1, R323.1.7, R4409.1.4.5
C25—03	Sawn Crossarms Pressure Treatment	R4409.1.4.5
C26—57	Crossarms Non Pressure Treatment	R4409.1.4.5
C28—99	Standard for Preservative Treatment by Pressure Process of Structural Glued Laminated Members and Laminations Before Gluing	R4409.1.4.5
C29—01	Lumber to be used for the Harvesting Storage and Transportation of Food Stuffs Preservative Treatment by Pressure Processes	R4409.1.4.5
C33—00	Standard for Preservative Treatment of Structural Composite Lumber by Pressure Processes	R324.1
M1—01	Standard for the Purchase of Treated Wood Products	R4404.7.1.4
M2—01	Standard for the Inspection of Wood Products Treated with Preservatives	R4404.7.1.4
M4—02	Standard for the Care of Preservative Treated Wood Products	R319.1.1, R4404.7.1.4, R4409.1.4.5
U1—04	USE CATEGORY SYSTEM: User Specification for Treated Wood Except Section 6 Commodity Specification H	R319.1, R324.1.7, R402.1.2, R504.3, Table R905.8.5

AWWA

American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

Standard reference number	Title	Referenced in code section number
C104—98	Standard for Cement-Mortar Lining for Ductile-iron Pipe and Fittings for Water	P2904.4
C110—98	Standard for Ductile-iron and Gray-iron Fittings, 3 Inches through 48 Inches, for Water	Table P2904.6, Table P3002.3, Table R4413.2.7
C115—99	Standard for Flanged Ductile-iron Pipe with Ductile-iron or Gray-iron Threaded Flanges	Table P2904.4
C151/A21.51—02	Standard for Ductile-iron Pipe, Centrifugally Cast, for Water	Table P2904.4
C153—00	Standard for Ductile-iron Compact Fittings for Water Service	Table P2904.6.1
C510—00	Double Check Valve Backflow Prevention Assembly	Table P2902.3
C511—00	Reduced-Pressure Principle Backflow Prevention Assembly	Table P2902.3, P2902.3.5, P2902.5.1

CGSB

Canadian General Standards Board
Place du Portage 111, 6B1
11 Laurier Street
Gatineau, Quebec, Canada KIA 1G6

Standard reference number	Title	Referenced in code section number
37-GP—52M—(1984)	Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric	R905.12.2, R4402.4.2.4
37-GP—56M—(1980)	Membrane, Modified Bituminous, Prefabricated and Reinforced for Roofing—with December 1985 Amendment	Table R905.11.2
CAN/CGSB-37.54—95	Polyvinyl Chloride Roofing and Waterproofing Membrane	R905.13.2

CISPI

Cast Iron Soil Pipe Institute
5959 Shallowford Road, Suite 419
Chattanooga, TN 37421

Standard reference number	Title	Referenced in code section number
301—04	Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications	Table P3002.1, Table P3002.2, Table R4413.2.2, Table R4413.2.3, Table R4413.2.4, Table R4413.2.5
310—04	Standard Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications	Table P3002.1, Table P3002.2, P3003.6.3

CPSC

Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814-4408

Standard reference number	Title	Referenced in code section number
16 CFR Part 1201— (1977)	Safety Standard for Architectural Glazing	R308.1.1, R308.3, R4410.2.1.3, R4410.2.3.1.2, R4410.2.4.2
16 CFR Part 1209— (1979)	Interim Safety Standard for Cellulose Insulation	R316.3
16 CFR Part 1404— (1979)	Cellulose Insulation	R316.3

CRRC

Cool Roof Rating Council
1738 Excelsior Avenue
Oakland, CA 94602

Standard reference number	Title	Referenced in code section number
CRRC-1—2006	CRRC-1 Product Rating Program	N1104.A.4

CSA

Canadian Standards Association
5060 Spectrum Way, Suite 100
Mississauga, Ontario, Canada L4W 5N6

Standard reference number	Title	Referenced in code section number
CSA Requirement 3—88	Manually Operated Gas Valves for Use in House Piping Systems	Table G2420.1.1
8—93 (Revision 1, 1999)	Requirements for Gas Fired Log Lighters for Wood Burning Fireplaces —with Revisions through January 1999	G2433.1
0325.0—92	Construction Sheathing (Reaffirmed 1998)	R503.2.1
0437-Series—93	Standards on OSB and Waferboard (Reaffirmed 2001)	R503.2.1, R803.2.1
A 257.1M—03	Nonreinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe and Fittings	Table R4413.2.4
|| A 257.2M—03	Reinforced Circular Concrete Culvert, Storm Drain, Sewer Pipe and Fittings	P3002.2, Table R4413.2.4
A 257.3M—92	Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings Using Rubber Gaskets. *	P3003.7
|| 101/I.S.2/A440—05	Specifications for Windows, Doors and Unit Skylights	R308.6.9, R613.4, N1106.AB.1.1
B45.1—02	Ceramic Plumbing Fixtures	Table P2701.1, P2711.1, P2712.1
B45.2—02	Enameled Cast Iron Plumbing Fixtures	Table 2701.1, P2711.1
B45.3—02	Porcelain Enameled Steel Plumbing Fixtures	Table P2701.1, Table P2702.2, P2711.1
B45.4—02	Stainless Steel Plumbing Fixtures	Table P2701.1, P2711.1, P2712.1
B45.5—02	Plastic Plumbing Fixtures	Table P2701.1, P2711.2, P2712.1
B45.9—02	Macerating Systems and Related Components	P3007.1, P3007.2.1
B64.1.1—01	Vacuum Breakers, Atmospheric Type (PVB)	Table P2902.2, P2902.2
B64.1.2—01	Vacuum Breakers, Pressure Type (PVB)	Table P2902.2, P2902.2
B64.2—01	Vacuum Breakers, Hose Connection Type (HCVB)	Table P2902.2, P2902.2.2
B64.2.1—01	Vacuum Breakers, Hose Connection Type (HCVB) with Manual Draining Feature	Table P2902.2, P2902.2.2
B64.2.1.1—01	Vacuum Breakers, Hose Connection Dual Check Type (HCDVB)	Table P2902.2, P2902.2.2
B64.2.2—01	Vacuum Breakers, Hose Connection Type (HCVB) with Automatic Draining Feature	Table P2902.2, P2902.2
B64.3—01	Backflow Preventers, Dual Check Valve type with Atmospheric Port (DCAP)	Table P2902.2, P2902.2.2, P2902.2.3, P2902.4.1
B64.4—01	Blackflow Preventers, Reduced Pressure Principle Type (RP)	Table P2902.2, P2902.2.3, P2902.2.5, P2902.4.1
B64.4.1—01	Backflow Preventers, Reduced Pressure Principle Type for Fire Systems (RPF)	Table P2902.2, P2902.2.5
B64.5—01	Backflow Preventers, Double Check Valve Type (DCVA)	Table P2902.2, P2902.2.6
B64.5.1—01	Backflow Preventers, Double Check Valve Type for Fire Systems (DCVAF)	Table P2902.2, P2902.2.6
B64.7—01	Vacuum Breakers, Laboratory Faucet Type (LFVB)	Table P2902.2, P2902.2.2
B125—01	Plumbing Fittings	Table P2701.1, P2702.2, P2708.3, P2722.1, P2722.2, P2722.3
|| B 125.1—05	Plumbing Supply Fittings	Table P2902.2.2, P2902.3.1, P3003.3.5
B137.1—02	Polyethylene Pipe, Tubing and Fittings for Cold Water Pressure Services	Table P2904.4, Table P2904.6
B137.2—02	PVC Injection-moulded Gasketed Fittings for Pressure Applications	Table P2904.6, Table R4413.2.7
B137.3—02	Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications	Table P2904.4, P3003.9.2, P3003.14.2
B137.5—02	Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications	Table P2904.4, Table P2904.5, Table P2904.6
B137.6—02	CPVC Pipe, Tubing and Fittings For Hot and Cold Water Distribution Systems	Table P2904.4, Table P2904.5, Table 2904.6
B137.8—02	Polybutylene (PB) Piping for Pressure Applications	Table 2904.4, Table P2904.5, Table 2904.6
B137.9—02	Polyethylene/Aluminum/Polyethylene Composite Pressure-Pipe Systems	Table 2904.4.1
B137.10—02	Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene Composite Pressure-Pipe Systems	Table P2904.4.1, Table P2904.5, Table M2101.1
B137.11—02	Polypropylene (PP-R) Pipe and Fittings for Pressure Applications	Table P2904.4.1, Table 2904.5, Table P2904.6
B181.1—02	ABS Drain, Waste and Vent Pipe and Pipe Fittings.	Table P3002.1, Table R4413.2.2, Table R4413.2.3
B181.2—02	PVC Drain, Waste and Vent Pipe and Pipe Fittings	Table R4413.2.2, Table R4413.2.3
B181.3—02	Polyolefin Laboratory Drainage Systems	Table R4413.2.2, Table R4413.2.3
B182.2—02	PVC Sewer Pipe and Fittings (PSM Type)	Table R4413.2.4, Table R4413.2.5
B182.4—02	Profile PVC Sewer Pipe & Fittings.	Table R4413.2.4, Table R4413.2.5
B602—02	Mechanical Couplings for Drain, Waste and Vent Pipe and Sewer Pipe	P3003.3.1, P3003.6.3, P3003.7, P3003.8.1, P3003.14.1, P3003.15, P3003.17
LC3—00	Appliance Stands and Drain Pans	P2801.5
CAN/CSA A257.3M—92	Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings Using Rubber Gaskets	P3003.3.5
CAN/CSA B64.1.1—01	Vacuum Breakers, Atmospheric Type (AVB)	Table P2902.2, P2902.2.2
CAN/CSA B64.2—01	Vacuum Breakers, Hose Connection Type (HCVP)	Table P2902.2, P2902.2.2
CAN/CSA B64.2.2—01	Vacuum Breakers, Hose Connection Type (HCVP) with Automatic Draining Feature	Table P2902.2, P2902.2.2
CAN/CSA B64.3—01	Backflow Preventers, Dual Check Valve Type with Atmospheric Port (DCAP)	Table P2902.2, P2902.2.3, P2902.4.1
CAN/CSA B64.4—01	Backflow Preventers, Reduced Pressure Principle Type (RP)	Table P2902.2, P2902.2.5

CSA—continued

CAN/CSA B137.9—99	Polyethylene/Aluminum/Polyethylene Composite Pressure Pipe Systems	Table P2904.4.1
CAN/CSA B137.10M—02	Crosslinked Polyethylene/Aluminum/Polyethylene Composite Pressure Pipe Systems	Table P2904.4.1, Table P2904.5, Table M2101.1

CSSB

Cedar Shake & Shingle Bureau
515 116th Avenue, NE, Suite 275
Bellevue, WA 98004-5294

Standard reference number	Title	Referenced in code section number
CSSB—97	Grading and Packing Rules for Western Red Cedar Shakes and Western Red Shingles of the Cedar Shake and Shingle Bureau	R702.6, R703.5, Table R905.7.4, Table R905.8.5

DASMA

Door and Access Systems Manufacturers Association International
1300 Summer Avenue
Cleveland, OH 44115-2851

Standard reference number	Title	Referenced in code section number
ANSI/DASMA 108—05	Standard Method for Testing Sectional Garage Doors and Rolling Doors: Determination of Structural Performance Under Uniform Static Air Pressure Difference	R613.4.1, R613.4.2
ANSI/DASMA 115—05	Standard Method for Testing Garage Doors and Rolling Doors: Determination of Structural Performance Under Missile Impact and Cyclic Wind Pressure	R301.2.1.2

DOC/ NIST

United States Department of Commerce
100 Bureau Drive Stop 3460
Gaithersburg, MD 20899

Standard reference number	Title	Referenced in code section number
CS 236	Mat Formed Particleboard	R4409.1.4.6, R4409.2.1.6
PS 1—95	Construction and Industrial Plywood	R404.2.1, Table R404.2.3, R503.2.1, R604.1, R803.2.1, R404.21, Table R404.2.3, R503.2.1, R604.1, R803.2.1, R4409.1.4.6, R4409.2.1.2
PS 2—92	Performance Standard for Wood–based Structural–use Panels	R404.2.1, Table R404.2.3, R503.2.1, R604.1, R803.2.1, R404.21, Table R404.2.3, R503.2.1, R604.1, R803.2.1, R4409.1.4.6, R4409.2.1.2
PS 20—99	American Softwood Lumber Standard	R404.2.1, R502.1.1, R602.1.1, R802.1.1, Table R404.2.3, R503.2.1, R604.1, R803.2.1, R4409.1.4.6, R4409.2.1.8
PS 56	Structural Glued Laminated Timber	R4409.1.4.6

DOE

United States Department of Energy
c/o Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402-9325

Standard reference number	Title	Referenced in code section number
DOE, 10 CFR, Part 430 Subpart B, App. E-1998	Uniform Test Method for Measuring the Energy Consumption of Water Heaters	Table N1108.AB.3.2F, Subpart B, App. E-1998, N1112.AB.3.1.1, N1112.AB.3.2.1
DOE, 10 CFR, Part 430 Subpart B, App. M	Uniform Test Method for Measuring the Energy Consumption of Central Air Conditioners	N1107.AB.3.1
DOE, 10 CFR, Part 430 Subpart B, App N-1998	Uniform Test Method for Measuring the Energy Consumption of Furnaces	Table N1108.AB.3.2E
DOE, 10 CFR, Part 430 Subpart B, App O-1998	Uniform Test for Measuring the Energy Consumption of Vented Home Heating Equipment	N1100.7.3
EPACT, 1992 42 USC 6831	Energy Policy Act of 1992 et seq. Public Law 102-486.	N1107.AB.3.2
NAECA, 1987	National Appliance Energy Conservation Act of 1987	Tables N1107.AB.3.2A, N1107.AB.3.2B, N1108.AB.3.2E

DOL/OSHA

Department of Labor
Occupational Safety and Health Administration
Frances Perkins Building
200 Constitution Avenue, NW
Washington, D.C. 20210

Standard reference number	Title	Referenced in code section number
29 CFR 1910	General Industry Occupational Health & Safety Standards	R4403.7.3
29 CFR 1926 650(P)	Excavation Safety Act	R4404.1.1

DOTn

Department of Transportation
400 Seventh St. S.W.
Washington, DC 20590

Standard reference number	Title	Referenced in code section number
14 CFR Part 150 (2005)	Airport Noise Compatibility Planning, Federal Aviation Administration	R325
49 CFR, Parts 192.281(e) and 192.283 (b)	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards	G2414.6.1

FCPA

Florida Concrete & Products Association, Inc.
3030 Dade Avenue
Orlando, Florida 32804

Standard reference number	Title	Referenced in code section number
FCPA—97	Guide to Concrete Masonry Residential Construction in High Wind Areas	R301.2.1.1

FEMA

Federal Emergency Management Agency
500 C Street, SW
Washington, DC 20472

Standard reference number	Title	Referenced in code section number
CFR 44	Emergency Management and Assistance	
Part 59	59 Criteria for Land Management Use, General Provisions	R301.2.4, M1401.5, P2601.3
Part 60	60 Criteria for Land Management Use, Flood Plain Management Regulation	R301.2.4, M1401.5, P2601.3

Florida Codes

Florida Building Commission
c/o Florida Department of Community Affairs
Building Codes and Standards
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100

Standard reference number	Title	Referenced in code section number
Ch. 11 FBC-B—07	Ch. 11 Florida Building Code, Building (Florida Accessible Code for Building Construction)	101.4.8, 104.11.3 201.5, 403.1.1, 406.2.2, 412.1.6, 423.10.2.8.7, 423.27.4, 423.28.2.4, 427.1.4.1.1.3, 427.1.4.4.1, 427.1.4.4.2, 1003.3.4, 1003.5.3, 1007.1, 1008.1, 1009.5.3, 1009.11.8, 1009.14, 1010.1, 1010.8, 1010.9, 1208.2, 3001.3
Ch. 13 FBC-B—07	Ch. 13 Florida Building Code, Building (Energy Efficiency)	101.4.7, 201,6, 1202.3.2, 1301.1.1, 1403.2
Ch. 27 FBC-B—07	Ch. 27 Florida Building Code, Building (Electrical Systems)	101.4.1, 102.2.6, 107.3, 414.5.4, 414.9.2.8.1 415.9.2.8, 419.3.8.3, 419.3.8.8, 419.3.14.2, 419.3.14.4, 419.3.15.2, 420.3.19.3, 420.3.19.5, 420.3.20.2, 420.3.20.3, 421.3.9.3, 421.3.9.5, 421.3.10.10, 423.25.5, 423.25.5.2, 424.1.4.1, 424.1.6.5.16.4.1, 424.1.6.5.1, 424.1.9.8.5, 424.2.16, 425.3.5, 426.3.5, 427.1.4.1.5, 603.1.3, 904.3.1, 907.1.3, 907.5, 907.9.3, 909.11, 909.12.1, 909.16.3, 1006.2.3.4, 1006.2.4, 1205.4.1, 1405.10.4, 2701.1, 2702.1
FEBC—07	Florida Existing Building Code	101.2. 1009.3
FPC—07	Florida Fire Prevention Code	101.4.6, 102.6, 201.3, 307.2, Table 307.7(1), Table 307.7(2), 307.9, Table 307.7(1), Table 307.7(2), 307.9, 308.2, 308.3, 404.2,406.5.1, 406.5.2, 406.6.1, 410.3.6, 411.1, 412.4.1, 413.1, 414.1.1, 414.1.2, 414.1.2.1, 414.2.4, Table 414.2.4, 414.3, 414.5, 414.5.1, Table 414.5.1, 414.5.2, 414.5.4, 414.5.5, 414.6, 415.1, 415.3, 415.3.1, Table 415.3.1, Table 415.3.2, 415.7, 415.7.1, 415.7.1.4, 415.7.2, 415.7.2.3, 415.7.2.5, 415.7.2.7, 415.7.2.8,415.7.2.9,

FLORIDA CODES - continued

FLORIDA CODES - continued

TAS 201 . . . . . .202, 1609.1.4
TAS 202 . . . . . .R613.3.1, R613.4.2, 1609.1.4, 1008.1.6, 1714.5.2.1, 1714.5.2.1.1, 1714.5.3, 1714.6
TAS 203 . . . . . .202, 1609.1.4
TAS 301 . . . . . .1515.1.3

FM

Factory Mutual Global Research
Standards Laboratories Department
1151 Boston Providence Turnpike
Norwood, MA 02062

Standard reference number	Title	Referenced in code section number
4450—(1989)	Approval Standard for Class 1 Insulated Steel Deck Roofs—with Supplements through July 1992	R906.1, R4412.1.3.2.5.2
4470—(1992)	Approval Standard for Class 1 Roof Covers	R4402.2.1, R4402.4.1.1, R4402.4.2.4
4880—(2001)	American National Standard for Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies, Plastic Interior Finish Materials, Plastic Exterior Building Panels, Wall/Ceiling Coating Systems, Interior or Exterior Finish Systems	R314.4, R314.6, R4412.1.3.1.4

FRSA

Florida Roofing, Sheet Metal and Air-Conditioning Contractors Association, Inc.
411 Metric Avenue
Winter Park, Florida 32793

Standard reference number	Title	Referenced in code section number
FRSA/TRI 07320/8—05	Concrete and Clay Roof Tile Installation Manual, Fourth Edition	R905.3, R905.3.3, R905.3.7.1

FS

Federal Specification
941 Jefferson Davis Highway, Suite 104
Arlington, VA 22202

Standard reference number	Title	Referenced in code section number
TT P 1536A (1975)	Federal Specification for Plumbing Fixture Setting Compound	P3003.4.5
TTC 555B	Test Specification for Wind Driven Rain Infiltration Resistance	R4402.12.6.3.1

FSEC

Florida Solar Energy Center
1679 Clearlake Road
Cocoa, FL 32922-5703

Standard reference number	Title	Referenced in code section number
FSEC-RR-54—00	"The HERS Rating Method and the Derivation of the Normalized Modified Loads Method", October 11, 2000, Fairey, P., J. Tait, D. Goldstein, D. Tracey, M. Holtz, and R. Judkoff. Available online at: http://www2.fsec.ucf.edu/en/publications/html/FSEC-RR-54-00/index.htm.	N1113.A.2.1
** 2008	Energy Gauge USA Fla/Res	N1100.2, N1100.A.1, N1100.A.2, N1101.A, N1101.A.3, N1102.A.1, N1104.A.1, N1105.A.1, N1106.A.1, N1107.A.1, N1108.A.1, N1110.A.1, N1110.A.2, N1112.A.1, N1113.A.2

FTC

U.S. Federal Trade Commission
Sixth Street and Pennsylvania Avenue, N.W.
Washington, DC 20580

Standard reference number	Title	Referenced in code section number
FTC, 16 CFR, Part 460, Amended Effective 4/29/96	FTC Labeling and Advertising of Home Insulation	N1100.7, Appendix G B1.2

FWC

Florida Wood Council
P.O. Drawer 1076
Mount Dora, Florida 32757-1076

Standard reference number	Title	Referenced in code section number
1997	Guide to Wood Construction in High Wind Areas	R301.2.1.1

GA

Gypsum Association
810 First Street, Northeast, Suite 510
Washington, DC 20002-4268

Standard reference number	Title	Referenced in code section number
GA-253—99	Recommended Standard Specification for the Application of Gypsum Sheathing	Table R602.2(1)

GAMA

Gas Appliance Manufacturers Association
P.O. Box 9245
Arlington, VA 22209

Standard reference number	Title	Referenced in code section number
GAMA	Consumer's Directory of Certified Efficiency Ratings for Water Heating Equipment	Table N1112.AB.3.5, Appendix G C4.3.1.3

HI

Hydronics Institute
P.O. Box 218
Berkeley Heights, NH 07922

Standard reference number	Title	Referenced in code section number
H.I., HBS 86—1989	Testing and Rating Standard for Heating Boilers	Tables N1108.AB.3.2F

HPVA

Hardwood Plywood & Veneer Association
1825 Michael Faraday Drive
Reston, Virginia 20190-5350

Standard reference number	Title	Referenced in code section number
HP-1—2000	The American National Standard for Hardwood and Decorative Plywood	R702.5

HUD

U.S. Dept. Housing and Urban Development
451 7th Street S.W.
Washington, DC 20410

Standard reference number	Title	Referenced in code section number
HUD, 24 CFR 3282-3283	Manufactured Home Procedural and Enforcement Regulations	N1100.7
HUD, 42 CFR 70, s. 5401 (24 CFR 3280)	Manufactured Home Construction and Safety Standards	N1100.7
HUD, 42 USC 77, s. 6295	Energy Conservation Standards	N1100.7

ICC

International Code Council
500 New Jersey Ave,, NW, 6th Floor
Washington, D.C. 20001

Standard reference number	Title	Referenced in code section number
IBHS—2005	Guideline for Hurricane Resistant Residential Construction 2005 with errata for the first printing	R301.2.1.1
SSTD 12—99	Standard for Determining the Wind Resistance from Wind-Bourne Debris	R301.2.1.2

ISO

International Standards Organization
1, rue de Varembé, Case postale 56
CH-1211 Geneva 20, Switzerland

Standard reference number	Title	Referenced in code section number
15874—2002	Polypropylene Plastic Piping Systems for Hot and Cold Water Installations	Table M2101.1
ISO 9806 (1994, 1995)	Test Methods for Solar Collectors	
Part 1: December 1, 1994	Thermal Performance of glazed liquid heating collectors including pressure drop	
Part 2:	Qualification test procedures, August 15, 1995.	
* Part 3:	Thermal performance of unglazed liquid heating collectors (sensible heat transfer only) including pressure drop, December 15, 1995.	N1112.AB.3.4
ISO 13256—1 (1998) Part 1	Water-Source Heat Pumps–Testing and Rating for Performance– Water-to-Air and Brine-to-Air Heat Pumps	Table N1107.AB.3.2B

MSS

Manufacturers Standardization Society of the Valve and Fittings Industry
127 Park Street, Northeast
Vienna, VA 22180

Standard reference number	Title	Referenced in code section number
SP-58—93	Pipe Hangers and Supports—Materials, Design and Manufacture	G2418.2

NAAMM

National Association of Architectural Metal Manufacturers
8 South Michigan Avenue
Chicago, IL 60603

Standard reference number	Title	Referenced in code section number
ANSI/NAAMM MBG 5XX	Metal Grating Manual	R4408.1.3

NAIMA

North American Insulation Manufacturers Association
44 Canal Center Plaza, Suite 310
Alexandria, VA 22314

Standard reference number	Title	Referenced in code section number
AH 116 06—02	Fibrous Glass Duct Construction Standards, Fifth Edition	M1601.1.1, M1601.6, M1601.6.2.3
NAIMA 2002	Fibrous Glass Duct Construction Standards, Fifth Edition	N1110.AB.3.2
* NAIMA 2002	Fibrous Glass Duct Liner Standard, Third edition.	N1110.AB.2.4, N1110.AB.3

NCMA

National Concrete Masonry Association
2302 Horse Pen Road
Herndon, VA 20171-3499

Standard reference number	Title	Referenced in code section number
TR 68-A—75	Design and Construction of Plain and Reinforced Concrete Masonry and Basement and Foundation Walls.	R404.1
TR 68B(2001)	Basement Manual Design and Construction Using Concrete Masonry.	R404.1

NFPA

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

Standard reference number	Title	Referenced in code section number
13—02	Installation of Sprinkler Systems	R317.1
31—01	Installation of Oil-burning Equipment	M1801.3.1, M1805.3
58—04	Liquefied Petroleum Gas Code	G2412.2, G2414.6.2
70—08	National Electrical Code	E3301.1, E3301.2, E4201.1, Table E4203.2, E4204.3, E4204.4
72—02	National Fire Alarm Code	R313.1
85—04	Boiler and Construction Systems Hazards Code	G2452.1
101—06	Life Safety Code	R324.1
211—03	Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances	R1002.5
259—03	Test Method for Potential Heat of Building Materials	R314.5.7, R4412.1.3.2.4.4
286—06	Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth	R314.3, R315.4, R314.4, R314.6, R315.4, R4412.1.3.1.4
501—05	Standard on Manufactured Housing	R202
853—03	Standard for the Installation of Stationary Fuel Cell Power Systems	M1903.1

NFRC

National Fenestration Rating Council, Inc.
8484 Georgia Avenue, Suite 320
Silver Spring, MD 20910

Standard reference number	Title	Referenced in code section number
100—2004	Procedure for Determining Fenestration Product U-factors	N1100.6.5, Appendix G B2.1.1
200—2004	Procedure for Determining Fenestration Product Solar Heat Gain Coefficients and Visible Transmittance at Normal Incidence	N1100.6.5, Appendix G B2.1.1, C2.1.4

NRCA

National Roofing Contractors Association
10255 W. Higgins Road, Suite 600
Rosemont, IL 60018

Standard reference number	Title	Referenced in code section number
P 0405	Roofing and Waterproofing Manual, 5th Edition	R4402.2.1

NSF

NSF International
3475 Plymouth Road
Ann Arbor, MI 48105

Standard reference number	Title	Referenced in code section number
14—2003	Plastic Piping System Components and Related Materials	P2608.3, P2907.3
42—2002e	Drinking Water Treatment Units—Anesthetic Effects	P2907.1, P2907.3
44—2004	Residential Cation Exchange Water Softeners	P2907.1, P2907.3
53—2002e	Drinking Water Treatment Units—Health Effects	P2907.1, P2907.3
58—2004	Reverse Osmosis Drinking Water Treatment Systems	P2907.2, P2907.3
61—2003e	Drinking Water System Components—Health Effects	P2608.5, P2722.1, P2903.9.4, P2904.4, P2904.5, P2904.6, P2907.3

RMI/SMA

Rack Manufacturer's Institute/Storage Equipment Manufacturer's Association
(A member of the Material Handling Industry of America)
8720 Red Oak Blvd., Suite 201
Charlotte, NC 28217

Standard reference number	Title	Referenced in code section number
RP1—90	Minimum Requirements for Non Reinforced Black EPDM Rubber Sheets	R905.12.2
RP2—90	Minimum Requirements for Fabric Reinforced Black EPDM Rubber Sheets	R905.12.2
RP3—85	Minimum Requirements for Fabric Reinforced Black Polychloroprene Rubber Sheets	R905.12.2

RCSC

Research Council on Structural Connections
c/o Stanley D. Lindsey & Associates Ltd.
224 Metro Center Blvd., Suite 208
Nashville, TN 37228-1320

Standard reference number	Title	Referenced in code section number
RCSC	Load and Resistance Factor Design Specification for Structural Joints Using A325 and A490 Bolts, 1988	R4408.1.3

SAE

Society of Automotive Engineers
400 Commonwealth Drive
Warrendale, PA 15096

Standard reference number	Title	Referenced in code section number
J 78—(1998)	Steel Self-drilling Tapping Screws	R505.2.4, R603.2.4, R804.2.4

SDI

Steel Deck Institute
P.O. Box 25
Fox River Grove, IL 60021

Standard reference number	Title	Referenced in code section number
MOC1	SDI Manual of Construction with Steel Deck	R4408.1.3
DDP	Deck Damage and Penetrations	R4408.1.3
DDM02	Diaphragm Design Manual	R4408.1.3, R4408.9.4
SDI, LRFD	Design Manual for Composite Beams and Girders with Steel Deck	R4408.1.3
SPD2	Standard Practice Details	R4408.1.3
NO. 30	Steel Deck Institute Design Manual	R4408.1.3

SDI

Steel Door Institute
c/o Wherry Associates
30200 Detroit Road
Cleveland, Ohio 44145 1967

Standard reference number	Title	Referenced in code section number
ANSI A250.13—03	Testing and Rating of Severe Windstorm Resistant Components for Swinging Door Assemblies	R613.4.4.1

SJI

Steel Joist Institute
3127 10th Avenue,
North Myrtle Beach, SC 29577-6760

Standard reference number	Title	Referenced in code section number
SJI	Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders	R4408.1.3

SJI - continued

SJI	Structural Design of Steel Joist Roofs to Resist Ponding Loads, Technical Digest No. 3	R4408.1.3
SJI	Structural Design of Steel Joist Roofs to Resist Uplift Loads, Technical Digest No. 9	R4408.1.3
SJI	Vibration of Steel Joist Concrete Slab Floors, Technical Digest No. 5	R4408.1.3
SJI	Welding of Open Web Steel, Technical Digest No. 8	R4408.1.3
SJI	60 Year Steel Joist Manual	R4408.1.3

SMACNA

Sheet Metal & Air Conditioning Contractors' National Association, Inc.
4201 Lafayette Center Drive
Chantilly, VA 20151-1209

Standard reference number	Title	Referenced in code section number
SMACNA—85	HVAC Air Duct Leakage Test Manual	N1110.AB.3.1.3
SMACNA—95	HVAC Duct Construction Standards–Metal and Flexible	M1601.5
SMACNA—03	Fibrous Glass Duct Construction Standards (2003)	M1601.1.1

SSPC

Society for Protective Coatings
40 24th Street, 6th Floor
Pittsburgh, PA 15222-4656

Standard reference number	Title	Referenced in code section number
SSPC Paint 15	Steel Joist Shop Paint.	R4408.1.3
SSPC/AISC	Guide to the Shop Painting of Structural Steel	R4408.1.3

SPRI

Single-Ply Roofing Institute
77 Rumford Avenue, Suite 3-B
Waltham, MA 02453

Standard reference number	Title	Referenced in code section number
ES 1—98	Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems	R903.3

SRCC

Solar Rating and Certification Corporation
c/o Florida Solar Energy Center
1679 Clearlake Road
Cocoa, FL 32922-5703

Standard reference number	Title	Referenced in code section number
FSEC	Directory of Certified Solar Systems	N1112.AB.3.4
SRCC TM—1	Solar Domestic Hot Water System and Component Test Protocol, December 6, 2002.	N1112.AB.3.4

STI

Steel Tube Institute of North America (Welded Steel Tube Institute, Inc.)
2000 Ponce de Leon, Suite 600
Coral Gables, Florida 33134

Standard reference number	Title	Referenced in code section number
WSTI/STI	Manual of Cold Formed Structural Steel Tube	R4408.1.3

TECO

Timber Company Inc.
2402 Daniels Street
Madison, WI 53704

Standard reference number	Title	Referenced in code section number
PRP 133	Performance Standards and Policies for Structural Use Panels	R4409.1.4.8, R4409.2.1.2

TMS

The Masonry Society
3970 Broadway, Suite 201-D
Boulder, CO 80304

Standard reference number	Title	Referenced in code section number
402—05	Building Code Requirements for Masonry Structures	R404.1, R606.1, R606.1.1, R606.12.1, R606.12.2.2.1, R606.11.2.2.2, R606.12.3.1
602—05	Specification for Masonry Structures	R404.1, R606.1, R606.1.1, R606.12.1, R606.12.2.2.1, R606.12.2.2.2, R606.12.3.1

TPI

Truss Plate Institute
216 N. Lee Street, Suite 312
Alexandria, VA 22314

Standard reference number	Title	Referenced in code section number
BCSI—06	Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate	R502.1.3.2, R802.1.6.3,
WTCA	Connected Wood Trusses	R4409.1.4.9, R4409.6.17.2.4.1, R4409.6.17.2.4.3
TPI 1—02	National Design Standard for Metal plate connected Wood Truss Construction	R502.1.3.1, R502.1.3.2, R802.1.6.2, R802.2.9.1, R4409.1.4.9, R4409.6.17.2.1.1, R4409.6.17.2.2.8

UL

Underwriters Laboratories, Inc.
333 Pfingsten Road
Northbrook, IL 60062

Standard reference number	Title	Referenced in code section number
9—00	Standard for Fire Tests of Window Assemblies	R4407.4.2.12.8
17—94	Vent or Chimney Connector Dampers for Oil-fired Appliances—with Revisions through September 1999	M1802.2.2
58—96	Steel Underground Tanks for Flammable and Combustible Liquids—with Revisions through July 1998	M2201.1
80—96	Steel Tanks for Oil-burner Fuel—with Revisions Through June 2003	M2201.1
103—2001	Factory-built Chimneys for Residential Type and Building Heating Appliances —with Revisions through December 2003	R202, R1005.3, G2430.1
127—99	Factory-built Fireplaces—with Revisions through November 1999	R1001.11, R1004.1, R1004.4, R1005.4, G2445.7
174—04	Household Electric Storage Tank Water Heaters—with Revisions through October 1999	M2005.1
181—05	Standard for Factory-made Air Ducts and Air Connectors	N1110.AB.3.0.7, N1110.AB.3.7.1
181A—05	Closure Systems for Use with Rigid Air Ducts and Air Connectors	N1110.AB.3.0.7
181B—05	Closure Systems for Use with Flexible Air Ducts and Air Connectors	N1110.AB.3.0.7
217—1997	Single and Multiple Station Smoke Alarms—with Revisions Through January 2004	R313.1
325—02	Standard for Door, Drapery, Gate, Louver and Window Operations and Systems —with Revisions through March 2003	R309.6
343—97	Pumps for Oil-Burning Appliances—with Revisions through May 2002	M2204.1
441—96	Gas Vents—with Revisions through December 1999	G2426.1

UL - continued

508—99	Industrial Control Equipment	M1411.3.1
536—97	Flexible Metallic Hose—with Revisions through June 2003	M2202.3
580—94	Test for Uplift Resistance of Roof Assemblies	R4408.1.3, R4408.9.4.6
641—95	Type L, Low-temperature Venting Systems—with Revisions through April 1999	R202, R1001.11.5, M1804.2.4, G2426.1
651—05	Schedule 40 and Schedule 80 Rigid PVC Conduit and Fittings	G2414.6.3
723—03	Standard for Test for Surface Burning Characteristics of Building Materials	N1110.AB.3.0.7
726—98	Oil-fired Boiler Assemblies—with Revisions through January 2001	M2001.1.1, M2006.1, G2425.1
727—06	Standard for Oil-Fired Central Furnaces, with Revisions through January 1999	Table N1108.AB.3.2E
729—03	Oil-fired Floor Furnaces	M1408.1
730—03	Oil-fired Wall Furnaces	M1409.1
731—95	Standard for Oil-Fired Unit Heaters, with revisions through January 1999	Table N1108.AB.3.2E
732—95	Oil-fired Storage Tank Water Heaters—with Revisions through January 1999	M2005.1
737—96	Fireplaces Stoves—with Revisions through January 2000	M1414.1
790—04	Standard Test Methods for Fire Tests of Roof Coverings	R902.1, R4402.2.1, R4402.5.1, R4409.1.4.10, R4402.12.1.2
795—01	Commercial-Industrial Gas Heating Equipment	G2442.1, G2452.1
834—04	Heating, Water Supply, and Power Boilers-Electric	M2001.1.1,
896—93	Oil-burning Stoves—with Revisions through May 2004	M1410.1
923—02	Microwave Cooking Appliances—with Revisions through January 2003	M1504.1
959—01	Medium Heat Appliance Factory-built Chimneys	R1005.6
1040—96	Fire Test of Insulated Wall Construction—with Revisions through June 2001	R314.4, R314.6, R4412.1.3.1.4
1256—02	Fire Test of Roof Deck Construction	R906.1
1261—01	Electric Water Heaters for Pools and Tubs—with Revisions through June 2004	M2006.1
1453—04	Electronic Booster and Commercial Storage Tank Water Heaters	M2005.1
1479—03	Fire Tests of Through-Penetration Firestops	R317.3.1.2
1482—98	Solid-fuel Type Room Heaters—with Revisions through January 2000	M1410.1
1715—97	Fire Test of Interior Finish Material—with Revisions through March 2004	R314.4, R314.6, R4412.1.3.1.4
1738—93	Venting Systems for Gas-burning Appliances, Categories II, III and IV—with Revisions through December 2000	G2426.1
1777—04	Standard for Chimney Liners	R1001.1.8, M1801.3.4, G2425.12, G2425.15.4
1995—98	Heating and Cooling Equipment—with Revisions through August 1999	M1402.1, M1403.1, M1407.1
2017—00	Standard for the General Purpose Signaling Devices and Systems	R4101.17.1.9
ANSI/UL 2034—96	Standard for Single and Multiple Station CO Alarms	R202
UL 2075—04	Gas and Vapor Detector Sensor	R202
2158A—96	Outline of Investigation for Clothes Dryer Transition Duct	M1502.4
2158—97	Standard for Electric Clothes Dryer with Revisions through February 1999	M1501.1

ULC

Underwriters' Laboratories of Canada
7 Crouse Road
Scarborough, Ontario, Canada M1R 3A9

Standard reference number	Title	Referenced in code section number
S 102—1988	Standard Methods for Test for Surface Burning Characteristics of Building Materials and Assemblies—with 2000 Revisions	R316.2

WDMA

Window & Door Manufacturers Association
1400 East Touhy Avenue, Suite 470
Des Plaines, IL 60018

Standard reference number	Title	Referenced in code section number
101/I.S. 2—97	Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors	R613.3
101/I.S.2/NAFS—02	Specifications for Windows, Doors and Unit Skylights	N1106.AB.1.1
101/IS2/A440—05	Specifications for Windows, Doors and Unit Skylights	R308.6.9, R613.4

WPPC

Wood Products Promotional Council
c/o Florida Wood Council
1300 Limit Avenue
Mount Dora, FL 32758

Standard reference number	Title	Referenced in code section number
1997	Guide to Wood Construction in High Wind Areas	R301.2.1.1

WQA

Water Quality Association
4151 Naperville Road
Lisle, IL 60532

Standard reference number	Title	Referenced in code section number
S-200—00	Household and Commercial Water Filters (In-line)	P2907.1
S-300—00	Point-of-Use Reverse Osmosis Drinking Water Systems	P2907.2