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 dwelling units ~~buildings~~s 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 N1100C 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. Replacement of either the outdoor unit or indoor unit in a split air conditioning system constitutes a replacement of that system, not a repair.

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, B or C 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 C 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 prescriptive requirements contained in Section N1100.C.3 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.A.5.2.1.

N1108.0.8 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 C 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 three 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 1101 through 1113 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 and additions. Using this method, a residence shall ~~would~~ meet or exceed all requirements for the list of minimum component requirements.

Exceptions: 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.

N1100.1.3 Method C, Limited Applications Prescriptive Method. This is a prescriptive code compliance method for residential additions of 600 square feet (56 m^2) or less, renovations to existing residential buildings; heating, cooling, and water heating systems of existing buildings; and site-added components of manufactured homes and manufactured buildings. To comply by this method, all energy-related components or systems being installed or changed in the addition or 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 2008~~7~~ 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.

[Add vertical lines to Figure N1100.2.2 as per Figure 13-1 in the FBC-B]

FIGURE N1100.2.2
CODE COMPLIANCE CHART

OWNER (OR DESIGNATED AGENT) CERTIFIES COMPLIANCE USING FORMS 1100A, 600A, 1100B OR 1100C

FINAL INSPECTION OF BUILDING TO CODE COMPLIANCE SUBMITTAL

FORMS FOR SINGLE FAMILY RESIDENTIAL MAY BE COMPLETED BY ANY KNOWLEGABLE PERSON

PERMIT GRANTED

BUILDING OFFICIAL CHECKS FORM SUBMITTED, PLACES IT IN PERMIT FILE

COPY OF FORM IS FILED WITH DCA ON A QUARTERLY BASIS PER SECTION N1100.5

PERMIT REVISED

ANY CHANGES MADE TO ENERGY-RELATED ASPECTS OF THE BUILDING THAT WOULD DIMINISH THE ENERGY PERFORMANCE OF A BUILDING REQUIRE SUBMITTAL OF A REVISED FORM

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 2008~~7~~ 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~~7~~ (EG USA Fla/Res computerized printout)
or	Form 600A-08~~7~~ (hand calculation)
Method B compliance	Form 1100B-07
Method C compliance	Form 1100C-07

N1100.3.1 Form 1100D-08~~7~~ (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 50 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-07.

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

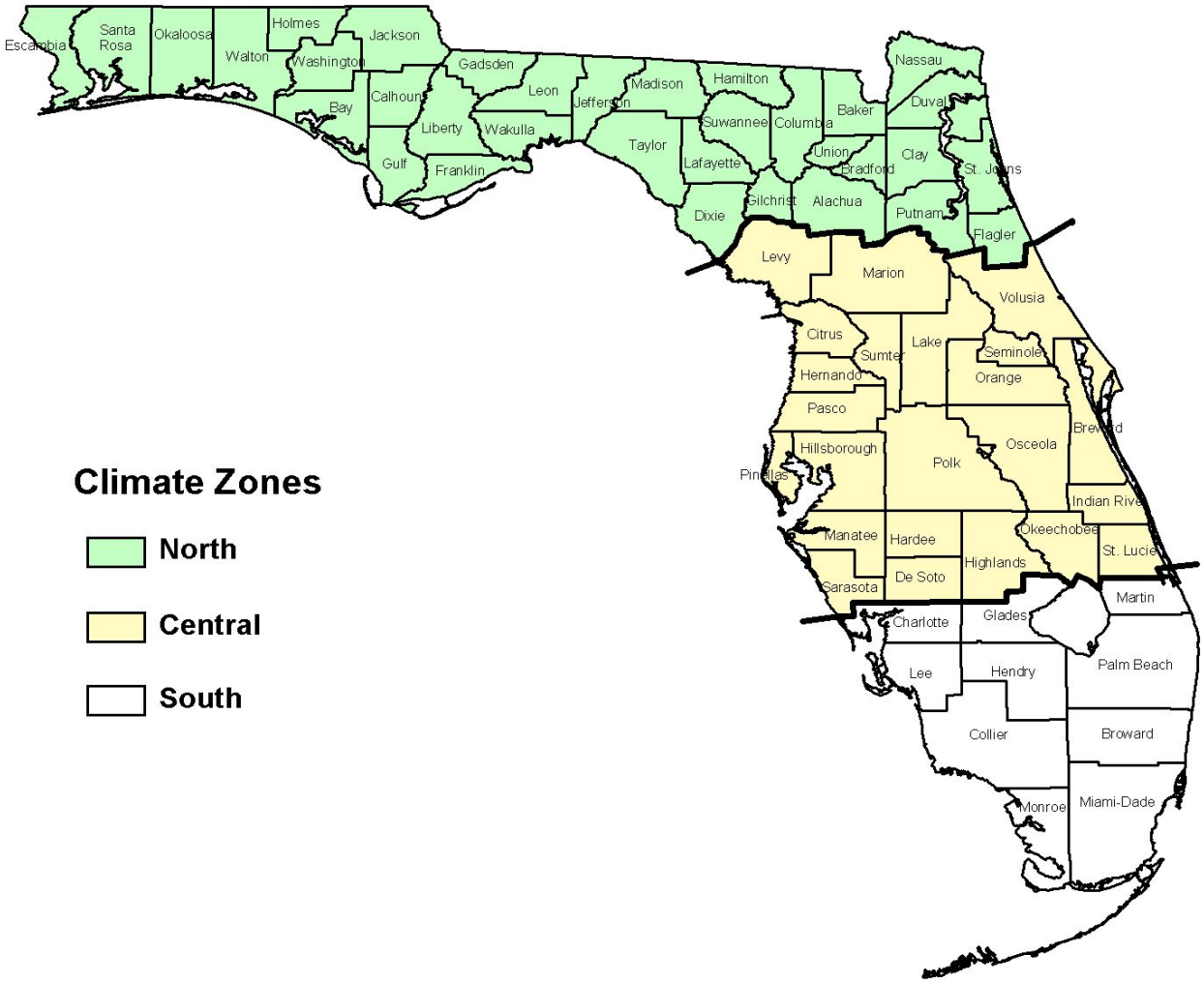

FIGURE N1100.4
CLIMATE ZONES

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.
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 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.ABC.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 non-metal duct, the air barrier is the non-porous 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 C36, 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 air flow between the interior spaces of a building and the outdoors and the planes of primary air flow 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, non-porous 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. Include 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. 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) 10CFR 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 one degree Fahrenheit. 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 Standard 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. That volume of a structure which is either mechanically heated, cooled, or both heated and cooled by direct means. Spaces within the thermal envelope that are not directly conditioned shall be considered buffered unconditioned space. Such spaces may include, but are not limited to, mechanical rooms, stairwells, and unducted spaces beneath roofs and between floors. Air leakage into dropped ceiling cavities does not constitute conditioned space. See “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) non-swinging: 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 non-metal 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 non-metal duct to other sections of flexible non-metal 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. Ductwork located on the conditioned side of the envelope insulation and constructed in such a manner that any leakage will be discharged into the conditioned space. 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 blackbody 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 one (1) inch water gauge, when all air inlets, air outlets and condensate drain port(s), when present, are sealed at an air pressure of one (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 in. 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 NON-METAL 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 ft 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 ft. 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/ft2·°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 stand-by 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 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 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 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 forty square feet between zones.

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

NONAUTOMATIC. See “MANUAL”.

NON-DEPLETABLE 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”.

NON-SWINGING 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.

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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. A 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%) by infrared radiation.

RATED R-VALUE OF INSULATION. The thermal resistance of the insulation alone as specified by the manufacturer in units of h·ft2·°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 1-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.

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.

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

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° 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 Wh).

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 in. thick clear, double-strength glass. Shading coefficient, as used herein, does not include interior, exterior, or integral shading devices.

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.

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.

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 in. 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, or indirectly conditioned space 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).
(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 – means 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, and

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 $3^{o}F$ ($1.7^{o}C$) in the stack gas temperature for units equipped with integral draft diverters, or not more than $5^{o}F$ ($2.8^{o}C$) 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% 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 – means 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-0nly 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 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 multifamily 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° 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 h.p.

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 ".ABC" indicates these Mandatory requirements (i.e., requirements that shall be met by buildings complying by either Method A, B or C) in Sections N1100 through N1113. Requirements specific to Method A, B or C (i.e., ".B" is specific to Method B) shall be met when complying with the code by that method. Prescriptive requirements for Methods B or C 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-0807 produced by the EnergyGauge USA Fla/Res 20080807 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 compliance 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 20080807 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.ABC.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.ABC.3.2A, N1107.ABC.3.2B, N1107.ABC.3.2D, N1108.ABC.3.2E and N1108.ABC.3.2F. Existing residential equipment not meeting the efficiencies in Tables N1107.ABC.3.2A, N1107.ABC.3.2B, N1107.ABC.3.2D, N1108.ABC.3.2E, and N1108.ABC.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-07. 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.C Requirements specific to Method C. Requirements specific to Method C are included in the text under the applicable building component section. Compliance is by Form 1100C-07. This compliance method provides a list of requirements that must be met or exceeded, if applicable, for additions of 600 square feet or less, renovations (see definition), and site-installed components of manufactured homes and manufactured buildings.

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

N1100.C.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.ABC Mandatory requirements for Methods A, B and C.

N1101.ABC.1 Window efficiencies. Windows shall have no higher U-factor or Solar Heat Gain 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.ABC.2 Window infiltration. Windows shall meet the minimum air infiltration requirements of Section N1106.ABC.1.1.

N1101.ABC.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 Solar Heat Gain Coefficient (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 bottom ~~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 Percentage of glass. The percentage of window area to conditioned floor area shall not exceed 16 percent.

Exception: 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.2 Glass type. All glass shall have U-factors and SHGC no higher than those listed from Table 11B-1 on Form 1100B.

N1101.C Requirements specific to Method C.

N1101.C.1 Additions. All glazing in residential additions complying by Method C shall meet the minimum criteria given on Table 11C-2 of Form 1100C for new glazing installed in the addition. All new glazing shall meet the overhang (OH) and the Solar Heat Gain Coefficient (SHGC) criteria of one of the alternative requirement sets in Table 11C-2 on Form 1100C 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 solar heat gain coefficient requirements listed on Table 11C-2 of Form 1100C when reinstalled as part of the addition.

N1101.C.1.1 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.C.1.2 Between range calculation. In cases where an overhang length or solar heat gain coefficient falls between two glass percentage ranges and the glass type is the same throughout the addition, the specific glass percentage allowed may be determined by using the following equations:

Overhang (OH):

$$\text{Glass \% Allowed} = \text{Low \%} + (\text{High \%}) - (\text{Low \%}) \times \frac{[OH_{Installed} - OH_{Low\%}]}{OH_{High\ \%} - OH_{Low\%}}$$

Glass Glass Glass

Solar heat Gain Coefficient (SHGC):

$$\text{Glass \% Allowed} = \text{Low \%} + (\text{High \%}) - (\text{Low \%}) \times \frac{[SHGC_{Installed} - SHGC_{Low\%}]}{SHGC_{High\ \%} - SHGC_{Low\%}}$$

Glass Glass Glass

N1101.C.2 Renovations. New windows installed in renovations may be of any glass type and solar heat gain coefficients 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.ABC Mandatory requirements for Methods A, B and C.

N1102.ABC.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.ABC.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.ABC.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.ABC.2 Wall infiltration. Walls shall meet the minimum air infiltration requirements of Section N1106.ABC.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.C Requirements specific to Method C.

N1102.C.1 Additions. All walls shall be insulated to the minimum R-value given on Table 11C-1 of Form 1100C for the type of construction used in the addition.

N1102.C.1.1 Frame walls. The minimum insulation level installed in wood or metal frame walls shall be R-11 for 2 by 4 inch (51 mm by 102 mm) walls and R-19 for 2 by 6 inch (51 mm by 152 mm) walls.

N1102.C.1.2 Concrete or masonry walls. The minimum R-value of insulation added to exterior and adjacent masonry walls shall be the value listed on Form 1100C.

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

N1102.C.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.C.3 requirements for ducts located in marriage walls of multiple unit manufactured homes and buildings.

SECTION N1103
DOORS

N1103.ABC Mandatory requirements for Methods A, B and C.

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

SECTION N1104
CEILINGS

N1104.ABC Mandatory requirements for Methods A, B and C.

N1104.ABC.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.ABC.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.ABC.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.ABC.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.ABC.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.ABC.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.ABC.3.6.

N1104.ABC.2 Ceiling infiltration. Ceilings shall meet the minimum air infiltration requirements of Section N1106.ABC.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 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.ABC.1. Either a sheet type or spray applied interior radiation control coating (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.

FIGURE N1104.A.3
ACCEPTABLE ATTIC RADIANT BARRIER CONFIGURATIONS
[No change to table]

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. 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 option. The unvented attic 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.C Requirements specific to Method C.

N1104.C.1 Additions. All roof/ceilings shall be insulated to the minimum R-value given on Table 11C-1 of Form 1100C for the type of construction used in the addition.

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

SECTION N1105
FLOORS

N1105.ABC Mandatory requirements for Methods A, B and C.

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

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

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

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.C Requirements specific to Method C.

N1105.C.1 Additions. All floors shall be insulated to the minimum R-value given on Table 11C-1 of Form 1100C for the type of construction used.

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

SECTION N1106
AIR INFILTRATION

N1106.ABC Mandatory requirements for Methods A, B and C. 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.ABC.1 Infiltration levels allowed.

N1106.ABC.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.ABC.1.1. These rates shall be determined from tests conducted at a pressure differential of 1.567 pound per square foot (8kg/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.ABC.1.2.

N1106.ABC.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.ABC.1.2.1 through N1106.ABC.1.2.5.

N1106.ABC.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.ABC.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.ABC.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.ABC.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 airtight 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.ABC.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 inch (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.ABC.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.ABC.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.ABC.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 air flow 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.ABC Mandatory requirements For Methods A, B and C.

N1107.ABC.1 Equipment Sizing. A cooling and heating load calculation shall be performed on the building and shall be attached to the Form 1100 or 600 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 sizing in excess of the capacity limitations in Section N1107.ABC.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.ABC.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.ABC.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 sensible 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.ABC.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.ABC.2 Controls. Each mechanical supply and exhaust ventilation system shall be equipped with a readily accessible switch or other means for shut off or volume reduction and shut off 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.ABC.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.ABC.2.2 Control setback and shutoff. The thermostat required in Section N1107.ABC.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.ABC.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.ABC.3 Equipment performance standards.

N1107.ABC.3.1 Equipment ratings. Equipment efficiency ratings shall be obtained from a nationally recognized certification program directory, or 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. 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 (648m^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.ABC.3.1.1 Equipment efficiency verification. Equipment covered under the Federal Energy Policy Act of 1992 (EPACT) shall comply with U.S. Department of Energy certification requirements. For other equipment, if a certification program exists for a product covered in Tables N1107.ABC.3.2A, N1107.ABC.3.2B and N1107.ABC.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.ABC.3.2A, N1107.ABC.3.2B and N1107.ABC.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.ABC.3.2.

N1107.ABC.3.2 Minimum efficiencies for cooling equipment. Equipment shown in Tables N1107.ABC.3.2A, N1107.ABC.3.2B and N1107.ABC.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.ABC.3.2A, N1107.ABC.3.2B and N1107.3.2D does not preclude use of such equipment. Equipment not listed in Tables N1107.ABC.3.2A, N1107.ABC.3.2B and N1107.ABC.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.ABC.3.2A, N1107.ABC.3.2B and N1107.ABC.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.ABC.3.2A Air Conditioners and Condensing Units
TABLE N1107.ABC.3.2B Heat Pumps
TABLE N1107.ABC.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.ABC.3.3C and Tables 13-407.ABC.3.2G through 13-407.ABC.3.2J of the *Florida Building Code, Building*.

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

Equipment Type	Size Category	Heating Section Type	Sub-Category 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 After 1/1/10: 11.2 EER	ARI 340/360
		All other	Split System and Single Package	10.1 EER After 1/1/10: 11.0 EER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.7 EER After 1/1/10: 11.0 EER	
		All other	Split System and Single Package	9.5 EER After 1/1/10: 10.8 EER	
	≥240,000 Btu/h and <760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.5 EER, 9.7IPLV After 1/1/10: 10.0 EER	
		All other	Split System and Single Package	9.3 EER,9.5 IPLV After 1/1/10: 9.8 EER	
	≥760,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.2EER, 9.4 IPLV After 1/1/10: 9.7 EER	
		All other	Split System and Single Package	9.0 EER, 9.2IPLV After 1/1/10: 9.5 EER	
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	ARI 340/360

		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	
		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	

[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 air-conditioners <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.ABC.3.2B
ELECTRICALLY OPERATED UNITARY AND APPLIED HEAT PUMPS – MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type	Size Category	Heating Section Type	Sub-Category 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 After 1/1/10: 11.0 EER	
		All other	Split System and Single Package	9.9 EER After 1/1/10: 10.8 EER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.3 EER After 1/1/10: 10.6 EER	ARI 340/360
		All other	Split System and Single Package	9.1 EER After 1/1/10: 10.4 EER	

	≥240,000 Btu/h	Electric Resistance (or None)	Split System and Single Package	9.0 EER 9.2 IPLV After 1/1/10: 9.5 EER	
		All other	Split System and Single Package	8.8 EER 9.0 IPLV After 1/1/10: 9.3 EER	
Through-the Wall, Air-cooled	≤30,000 Btu/h[3]	All	Split System	10.9 SEER After 1/1/10: 12.0 SEER	ARI 210/240
			Single Package	10.6 SEER After 1/1/10: 12.0 SEER	
Small-Duct High-Velocity, Air cooled	<65,000 Btu/h[3]	All	Split system	11.0 SEER	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 < 65,000 ~~135,000~~ Btu/h	All	86°F Entering Water	12.0 EER	
	≥65,000 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	3.2 COP After 1/1/10: 3.3 COP	ARI 340/360
			17°F db/15°F wb Outdoor Air	2.2 COP	
	≥135,000 Btu/h (Cooling Capacity)		47°F db/43°F wb Outdoor Air	3.1 COP After 1/1/10: 3.2 COP	
			17°F db/15°F wb Outdoor Air	2.0 COP	

Through-the Wall, Air-cooled, heating mode)	≤30,000 ~~<65,000~~ Btu/h[3] (Cooling Capacity)		Split System	7.1 HSPF After 1/1/10: 7.4 HSPF	
			Single Package	7.0 HSPF After 1/1/10: 7.4 HSPF	ARI 210/240
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, heap pumps	<65,000 Btu/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	

[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 N1107.ABC.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),	7,000 ≥Btu/h <8,000	95°F db Outdoor Air	9.4 EER	

Replacements[2]	8,000 ≤Btu/h < 9,000	[Based on capacity at lower range using EER= 10.9 – (0.213 x Cap/1000)][3]	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),	7,000 ≥Btu/h <8,000	47°F db Outdoor Air	2.72 COP	

Replacements[2]	8,000 ≤Btu/h < 9,000	[Based on capacity at lower range using COP= 2.9 – (0.026 x Cap/1000)][3]	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	
Room Air Conditioners with Louvered Sides	<6,000 Btu/h		9.7 SEER	ANSI/AHAM RAC-1
	≥6,000 <8,000 Btu/h		9.7 EER	
	≥8,000<14,000Btu/h		9.8 EER	
	≥14,000<20,000Btu/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 and <20,000 Btu/h		8.5 EER	
	≥20,000 Btu/h		8.5 EER	
Room Air Conditioner Heat Pumps with Louvered Sides	<20,000 Btu/h ≥20,000 Btu/h		9.0 EER 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	

SPVAC (Cooling Mode)	~~All Capacities~~ <65,000 Btu/h	95°F db/75°F wb Outdoor Air	~~8.6 EER~~ 9.0 EER	ARI 390
	>=65,000 Btu/h and <135,000 Btu/h	95°F db/75°F wb Outdoor Air	8.9 EER	
	>=135,000 Btu/h and <240,000Btu/h	95°F db/75°F wb Outdoor Air	8.6 EER	
SPVHP (Cooling Mode)	~~All Capacities~~ <65,000 Btu/h	95°F db/75°F wb Outdoor Air	~~8.6 EER~~ 9.0 EER	
	>=65,000 Btu/h and <135,000 Btu/h	95°F db/75°F wb Outdoor Air	8.9 EER	
	>=135,000 Btu/h and <240,000Btu/h	95°F db/75°F wb Outdoor Air	8.6 EER	
SPVHP (Heating Mode)	~~All Capacities~~ <65,000 Btu/h	47°F db/43°F wb Outdoor Air	~~2.7 COP~~ 3.0 COP	
	>=65,000 Btu/h and <135,000 Btu/h	47°F db/43°F wb Outdoor Air	3.0 COP	
	>=135,000 Btu/h and <240,000Btu/h	47°F db/43°F wb Outdoor Air	2.9 COP	
SPVAC (Cooling Mode)	< 19kW	35.0°C db/ 23.9°C wb Outdoor air	2.64 COP	
	>=19 kW and <40 kW	35.0°C db/ 23.9°C wb Outdoor air	2.61 COP	
	<=40 kW and < 70 Btu/h	35.0°C db/ 23.9°C wb Outdoor air	2.52 COP	
SPVHP (Cooling Mode)	< 19kW	35.0°C db/ 23.9°C wb Outdoor air	2.64 COP	
	>=19 kW and <40 kW	35.0°C db/ 23.9°C wb Outdoor air	2.61 COP	
	<=40 kW and < 70 Btu/h	35.0°C db/ 23.9°C wb Outdoor air	2.52 COP	
SPVHP (Heating Mode)	< 19kW	8.3°C db /6.1°C wb Outdoor Air	3.0 COP	
	>=19 kW and <40 kW	8.3°C db /6.1°C wb Outdoor Air	3.0 COP	
	<=40 kW and < 70 Btu/h	8.3°C db /6.1°C wb Outdoor Air	2.9 COP	

[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 in. high and less than 42 in. 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 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 N1107.A.5. New systems may be replacements of existing equipment or equipment installed to condition only the addition.

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. The new effective efficiency rating shall be calculated by Equation B4.1.2 in Appendix G-B.

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 following cooling equipment efficiencies:

1. All central cooling systems of less than 65,000 Btu/h capacity shall have a SEER equal to or greater than the prescribed value on Table 11B-1 of Form 1100B.
2. Packaged terminal air conditioners (PTACs), packaged terminal heat pumps (PTHPs), room air conditioners, and equipment not covered by U.S. Department of Energy (DOE) rules shall have an EER equal to the prescribed SEER level on Table 11B-1 of Form 1100B.

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.C Requirements specific to Method C.

N1107.C.1 Additions. All new air conditioners installed in additions complying by Method C shall meet the minimum efficiencies in Section N1107.ABC.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.

N1107.C.2 Renovations. Minimum efficiencies for cooling equipment to be added or replaced in renovations shall not be less than those specified in Section N1107.ABC.3.2.

N1107.C.3 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.ABC.3.2.

N1107.C.4 Building systems. Newly manufactured cooling systems installed in existing buildings shall meet minimum requirements for that system in Section N1107.ABC.3.2. See Section N1100.1.2.

SECTION N1108
SPACE HEATING SYSTEMS

N1108.ABC Mandatory requirements for Methods A, B, and C.

N1108.ABC.1 Equipment Sizing. An HVAC equipment sizing calculation shall be performed on the building in accordance with the criteria in Section N1107.ABC.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.ABC.1.1 through N1108.ABC.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.ABC.1.1 Heat Pumps. Heat pump sizing shall be based on the cooling requirements as calculated according to Section N1107.ABC.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% 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.ABC.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.ABC.1.

N1108.ABC.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.ABC.1.

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

N1108.ABC.2 Controls. Requirements specified for controls in Section N1107.ABC.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.ABC.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 thermo-stat 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^{o} F (4^{o} C).

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

N1108.ABC.3 Equipment performance standards.

N1108.ABC.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.ABC.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.ABC.3.1.1.

N1108.ABC.3.2 Minimum efficiencies for heating equipment. Tables N1107.ABC.3.2B, N1107.ABC.3.2D, N1108.ABC.3.2E and N1108.ABC.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.ABC.3.2B, Heat Pumps.
Table N1107.ABC.3.2D, Packaged Terminal Air Conditioners and Heat Pumps.
Table N1108.ABC.3.2E, Furnaces, Duct Furnaces and Unit Heaters.
Table N1108.ABC.3.2F, Gas- and Oil-Fired Boilers.

N1108.ABC.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.ABC.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.

TABLE N1108.ABC.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[5]	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~~9~~
Warm Air Unit Heaters, Gas-Fired	All Capacities	Maximum Capacity[5]	80% E_c[7,8]	ANSI Z83.8
Warm Air Unit Heaters, Oil-Fired	All Capacities	Maximum Capacity[5]	80% E_c[7,8]	UL 731

[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] Minimum and maximum ratings as provided for and allowed by the unit's controls.
[~~5~~4] Combination units not covered by NAECA (3 phase power or cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating.
[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.
[8] As of August 8, 2008, according to the Energy Policy Act of 2005, units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an automatic flue damper. A vent damper is an acceptable alternative to a flue damper for those unit heaters where combustion air is drawn from the conditioned space.

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

Equipment Type[1]	Subcategory or Rating Condition	Size Category (Input)	Minimum Efficiency[2,3]	Efficiency as of 3/2/2010	Test Procedure
Boilers, hot water	Gas-fired	<300,000 Btu/h	80% AFUE	80% AFUE	10 CFR Part 430
		≥300,000 Btu/h and ≤2,500,000 Btu/h[4]	75% E_t	80% E_t	10 CFR Part 431
		>2,500,000 Btu/h[1]	80% E_c	82% E_c	
	Oil-fired[5]	<300,000 Btu/h	80% AFUE	80% AFUE	10 CFR Part 430
		≥300,000 Btu/h and ≤2,500,000 Btu/h[4]	78% E_t	82% E_t	10 CFR Part 431
		>2,500,000 Btu/h[1]	83% E_c	84% E_c	
Boilers, steam	Gas-fired	<300,000 Btu/h	75% AFUE	75% AFUE	10 CFR Part 430
	Gas-fired—all, except natural draft	≥300,000 Btu/h and ≤2,500,000 Btu/h[4]	75% E_t	79% E_t	10 CFR Part 431
		>2,500,000 Btu/h[1]	80% E_c	79% E_t	
	Gas-fired—natural draft	≥300,000 Btu/h and ≤2,500,000 Btu/h[4]	75% E_t	77% E_t	
		>2,500,000 Btu/h[1]	80% E_c	77% E_t	
	Oil-fired[5]	<300,000 Btu/h	80% AFUE	80% AFUE	10 CFR Part 430
		≥300,000 Btu/h and ≤2,500,000 Btu/h[4]	78% E_t	81% E_t	10 CFR Part 431
		>2,500,000 Btu/h[1]	83% E_c	81% E_t	

[1] These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.
[2] E_c =combustion efficiency (100% less flue losses). See reference document for detailed information.
[3] E_t = thermal efficiency. See reference document for detailed information.
[4] Maximum capacity – minimum and maximum ratings as provided for and allowed by the unit's controls.
[5] Includes oil-fired (residual).

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.

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. The new effective efficiency rating shall be calculated by Equation B4.1.2 in Appendix G-B.

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. Where heating equipment is to be installed in an addition, these requirements 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.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.C Requirements specific to Method C.

N1108.C.1 Additions. New heating equipment to be added or replaced in small additions complying by Method C shall meet the minimum efficiencies in Section N1108.ABC.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.C.2 Renovations. Minimum efficiencies for heating equipment to be added or replaced in renovations shall not be less than those specified in Section N1108.ABC.3.2.

N1108.C.3 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.ABC.3.2.

N1108.C.4 Building systems. Newly manufactured heating systems installed in existing buildings shall meet the minimum requirements for that system in Section N1108.ABC. See Section N1100.1.2 for exceptions.

SECTION N1109
VENTILATION SYSTEMS

N1109.ABC Mandatory requirements for Methods A, B and C.

N1109.ABC.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 make-up air shall be provided to conditioned space from attics, crawlspaces, 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.

N1109.ABC.2 Balanced return air. Restricted return air occurs in buildings when returns are located in central zones and closed interior doors impede air

flow to the return grill or when ceiling spaces are used as return plenums and fire walls restrict air movement from one portion of the return plenum to another. Provisions shall be made in both residential and commercial buildings to avoid unbalanced air flows and pressure differentials caused by restricted return air. Pressure differentials across closed doors where returns are centrally located shall be limited to 0.01 inch WC (2.5 pascals) or less. Pressure differentials across fire walls in ceiling space plenums shall be limited to 0.01 inch WC (2.5 pascals) by providing air duct pathways or air transfer pathways from the high pressure zone to the low zone.

Exceptions:

1. Transfer ducts may achieve this by increasing the return transfer one and one-half times the cross-sectional area (square inches) of the supply duct entering the room or space it is serving and the door having at least an unrestricted 1-inch (25 mm) undercut to achieve proper return air balance.
2. Transfer grilles shall use 50 square inches (.03 m2) (of grille area) to 100 cfm (.05 m3/s) (of supply air) for sizing through-the-wall transfer grilles and using an unrestricted 1-inch (25 mm) undercutting of doors to achieve proper return air balance.
3. Habitable rooms only shall be required to meet these requirements for proper balanced return air excluding bathrooms, closets, storage rooms and laundry rooms, except that all supply air into the master suite shall be included.

SECTION N1110
AIR DISTRIBUTION SYSTEMS

N1110.ABC Mandatory requirements for Methods A, B and C.

N1110.ABC.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.ABC.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.ABC.2.1 through N1110.ABC.2.3.

N1110.ABC.2.1 Insulation required. The minimum installed thermal resistance (R-value) for air distribution system components shall be as specified in Table N1110.ABC.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.ABC.3 or N1108.ABC.3.

TABLE N1110.ABC.2.1
MINIMUM INSULATION LEVELS
AIR DISTRIBUTION SYSTEM COMPONENTS[1]
[No change to table]

N1110.ABC.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.ft2°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.ABC.2.3 Condensation control. Additional insulation with vapor barrier shall be provided where the minimum duct insulation requirements of Section N1110.ABC.2 are determined to be insufficient to prevent condensation.

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

N1110.ABC.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.ABC.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.ABC.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.ABC.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.ABC.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.ABC.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.ABC.3.1 through N1110.ABC.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.ABC.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.ABC.3.1.1 or Section N1110.ABC.3.1.2.

N1110.ABC.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.ABC.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.ABC.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.ABC.3.0:

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

N1110.ABC.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.ABC.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.ABC.3.2.1.

N1110.ABC.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.ABC.3.0:

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

N1110.ABC.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.ABC.3.0.6.

N1110.ABC.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.ABC.3.3.1 through N1110.ABC.3.3.6.

N1110.ABC.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.ABC.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.ABC.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.ABC.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.ABC.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.ABC.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 closure and mechanical attachment standards of Section N1110.ABC.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.ABC.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 ½ inch (12.7 mm) per foot of length. Supports shall be provided within 1½ 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 1½ inches (38 mm) wide.

N1110.ABC.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.ABC.3.4.1 or N1110.ABC.3.4.2.

N1110.ABC.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.ABC.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.ABC.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.ABC.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.ABC.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.ABC.3.1.

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

N1110.ABC.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.ABC.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.ABC.2 and constructed and sealed in accordance with the requirements of Section N1110.ABC.3 appropriate for the duct materials used.

Exception: Return air plenums.

N1110.ABC.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.ABC.3.7 and shall be insulated in accordance with Section N1110.ABC.2.

N1110.ABC.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.ABC.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.ABC.3.7 Mechanical closets. The interior surfaces of mechanical closets shall be sheathed with a continuous air barrier as specified in Section N1110.ABC.3.7.1 and shall be sealed with approved closure systems as specified in Section N1110.ABC.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.ABC.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.ABC.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.ABC.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.ABC.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.ABC.3 and insulated according to the requirements of Section N1110.ABC.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 accordance with Section N1110.ABC.3.2 or Section N1110.ABC.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 Standard 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.

N1110.C Requirements specific to Method C.

N1110.C.1 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 Table11C-1 of Form 1100C.

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

N1110.C.2 Renovations. Replacement duct systems that are not in conditioned space shall be insulated to levels specified in Section N1110.C.1.

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

N1110.C.3 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.ABC.2 and N1110.ABC.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.C.4 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.ABC.2 through N1110.ABC.8, as appropriate. See Section N1100.1.2 for exceptions.

SECTION N1111
PIPING

N1111.ABC Mandatory Requirements for Methods A, B and C.

N1111.ABC.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.ABC.1 except as stated herein (for service water heating systems, see Section N1112.ABC.5.

Exceptions: 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.

TABLE N1111.ABC.1
MINIMUM PIPE INSULATION
[No change to table]

N1111.ABC.1.1 Other insulation thicknesses.

Insulation thickness in Table N1111.ABC.1 are based on insulation having thermal resistance in the range of 4.0 to 4.6°F.ft^2.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.ft^2.h/Btu.in. or may be reduced for materials having R-values greater than 4.6°F.ft^2.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:

$$\text{New minimum thickness} = \frac{\text{4.6 x Table N1111.ABC.1 Thickness}}{\text{Actual Resistivity}}$$

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

$$\text{New minimum thickness} = \frac{\text{4.0 x Table N1111.ABC.1 Thickness}}{\text{Actual Resistivity}}$$

SECTION N1112
WATER HEATING SYSTEMS

N1112.ABC Mandatory requirements for Methods A, B and C.

N1112.ABC.1 Sizing. Blank for numbering consistency.

N1112.ABC.2 Controls.

N1112.ABC.2.1 Storage water heater temperature controls.

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

N1112.ABC.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.ABC.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.ABC.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.ABC.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.

N1112.ABC.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.ABC.3 Equipment performance standards.

N1112.ABC.3.1 Electric water heater efficiencies.

N1112.ABC.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.ABC.3.

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

N1112.ABC.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.ABC.3.

N1112.ABC.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 Et 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 Et of .78 or more and a standby loss of 1.30+95/VT, where VT is the tested storage volume in gallons.

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

[No change to table]

N1112.ABC.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.ABC.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.ABC.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 Standard 9806, Test Methods for Solar Collectors, and SRCC Standard 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.ABC.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 Gas Appliance Manufacturer's Association (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.

Combination systems utilizing a storage tank water heater as the heat source for space heating purposes with input ratings of 105,000 Btu/h (360m^3/kW) or less shall utilize a water heater listed by the Gas Appliance Manufacturer's Association (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 (360m^3/kW) shall comply with the criteria of Section 13-412.ABC.3.4, Subchapter 13-4 of the *Florida Building Code, Building*.

N1112.ABC.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.ABC.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.B Requirements specific to Method B. Water heating systems are categorized as electric resistance, gas and oil and other. Water heating equipment shall meet the applicable minimum efficiencies listed on Table 11B-1 of Form 1100B.

N1112.C Requirements specific to Method C. New water heating equipment installed in small additions and renovations shall meet the minimum efficiencies given on Table 11C-1 of Form 1100C.

N1112.C.1 Additions. All new water heaters installed in an addition shall meet the minimum efficiencies listed in Section N1112.ABC.3, Table N1112.ABC.3.

Exception: Only water heating systems which are being replaced or installed as part of the addition shall meet this requirement.

N1112.C.2 Renovations. Minimum efficiencies for water heating equipment installed in renovations shall be not less than those listed in Table N1112.ABC.3 and Section N1112.ABC.3.

Exception: Only water heating systems which are being replaced or installed as part of the renovation shall meet this requirement.

N1112.C.3 Building systems. New water heating systems installed in existing buildings shall meet the minimum requirements for that system in Section N1112.ABC.

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 = 1ft^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

Crawlspaces:	Type: vented with net free vent aperture = 1ft^2 per 150 ft^2 of crawlspace 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 1ft^2 per 1,500 ft^2 of crawlspace floor area.
Doors:	Area: 40 ft^2 Orientation: North U-factor: 0.75	Same as As-Built Home 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

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 Standard 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:	IGain = 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	Same as As-Built Home
	For masonry basement walls, same as As-Built Home, but with insulation located on the interior side of the walls	Same as As-Built Home
	For other walls, for ceilings, floors, and interior walls, wood frame construction	Same as As-Built Home
Heating systems (h),(i)	Fuel type: same as As-Built Home	Same as As-Built Home (i)
	Efficiencies:	
	Electric: air source heat pump with prevailing federal minimum efficiency	Same as As-Built Home
	Non-electric furnaces: natural gas furnace with prevailing federal minimum efficiency	Same as As-Built Home
	Non-electric boilers: natural gas boiler with prevailing federal minimum efficiency	Same as As-Built Home
	Capacity: sized in accordance with Section N1107.ABC.1 of this code.	Same as As-Built Home
Cooling systems (h),(k)	Fuel type: Electric	Same as As-Built Home (k)
	Efficiency: in accordance with prevailing federal minimum standards	Same as As-Built Home
	Capacity: sized in accordance with Section N1107.ABC.1 of this code.	Same as As-Built Home
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 Standard 152 (n), in which case measured duct air leakage values shall be used.
Thermostat	Type: manual Temperature setpoints: cooling temperature set point = 78 F; heating temperature set point = 68 F	Type: Same as As-Built Home Temperature setpoints: same as the Baseline Home, except when programmable thermostats are used in accordance with Sections N1107.A.2.6 and N1108.A.2.6 of this code.

Table N1113.A.1-1 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 multi-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 Standard 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 Standard 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 applicable system capacities and fuel types shall be weighted in accordance with the loads distribution (as calculated by accepted engineering practice for that equipment and fuel type) of the subject multiple systems. 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
Non-electric warm air furnace or space heater	Heating	78% AFUE gas furnace
Non-electric 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 non-storage 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 EEC_x 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 EEC_x equals 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 EEC_r equals 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.