SECTION 13-600
ADMINISTRATION

13-600.1 Methods of compliance, Scope. This chapter provides three Methods by which residential dwelling units ~~buildings~~ may be brought into compliance with this code.

13-600.1.1 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 Appendix C shall be followed. Applicable requirements described in Sections 13-601 through 13-613 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.

13-600.1.1.1 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 Appendix C(2). 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.

13-600.1.2. 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 14 ~~16~~ percent glass to floor area
3. electric resistance heat

13-600.1.3. 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.

13-600.2 Forms. Code compliance by this subchapter 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 2007 computerized printout, accompanied by a copy of the front page of the form as provided in Section 13-105.0, shall be submitted to the building department to demonstrate compliance with this code before a building permit is

issued.

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

13-600.3 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 13-601 through 13-613. 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 Appendix 13-C for building material properties, testing and installation shall be followed.

13-600.A Requirements specific to Method A.

13-600.A.1 General. Requirements specific to Method A are included in the text under the applicable building component section. Compliance is by Form 1100A-07 produced by the EnergyGauge USA Fla/Res computer program. The Method A calculation shall result in either a PASS or FAIL status. For a building to pass, the total energy score calculated for the As-Built house shall be less than or equal to the total energy score calculated for the Baseline house. The baseline features and calculation procedures contained in Section 13-613 and in Appendix 13-C 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.

13-600.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 13-C, Section C1.2, contains general rules for insulation that shall be followed.

13-600.A.1.2 Areas. Areas used in the calculation shall be the actual net areas for each component determined from the plans and specifications of the building to be constructed.

13-600.A.2 Energy loads. Energy loads for Method A compliance are provided in the Energy Gauge USA Fla/Res computer program.

13-600.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.

13-600.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.

13-600.A.5 Additions.

13-600.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.

13-600.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 13-600.A.5.2.1 contains restrictions which shall apply if the entire building is used to demonstrate compliance.

13-600.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 13-607.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 13-607.ABC.3.2A, 13-607.ABC.3.2B, 13-607.ABC.3.2D, 13-608.ABC.3.2E and 13-608.ABC.3.2F. Existing residential equipment not meeting the efficiencies in Tables 13-607.ABC.3.2A, 13-607.ABC.3.2B, 13-607.ABC.3.2D, 13-608.ABC.3.2E, and 13-608.ABC.3.2F shall utilize the cooling or heating system efficiencies provided in Tables 13-6C-16 to 13-6C-17 of Appendix 13-C.
5. Any nonvertical roof glass shall be calculated as horizontal glazing.

13-600.A.6 Multiple-family occupancies.

13-600.A.6.1 Common conditioned spaces. Common conditioned spaces occurring in multiple family buildings that are not part of specific tenancy units, such as corridors, lobbies, recreation rooms, offices, etc., shall be calculated using one of the following procedures.

1. No energy use calculation is required for common areas if less than 5 percent of the building area is used for such common areas.
2. Corridors, lobbies and similar areas shall be calculated using subchapter 13-4.
3. Nonresidential occupancies within a multiple family structure such as cafeterias, offices, and gyms shall be calculated in accordance with subchapter 13-4.

13-600.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 1100B-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 the 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.

13-600.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.

13-600.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.

13-600.C.2 Renovations. Requirements shall apply only to those components or systems being repaired or replaced.

13-600.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 13-601
FENESTRATIONS (GLAZING)

13-601.ABC Mandatory requirements for Methods A, B and C.

13-601.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 C2.1.1 in Appendix 13-C of this chapter. Glazing in doors shall be considered fenestrations. See Section 13-104.4.5.

13-601.ABC.2 Window infiltration. Windows shall meet the minimum air infiltration requirements of Section 13-606.1.

13-601.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.

13-601.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.

13-601.A.1 Glass orientation. Glazing shall be considered in the Method A calculation by orientation of all windows and skylights.

13-601.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 13-C2.1.1 of Appendix 13-C of this chapter.

13-601.A.3 Glass overhangs. Overhang effect is measured in Energy Gauge USA Fla/Res by Overhang Separation, which is the vertical measure of the distance from the top of a window to the bottom of the overhang. The overhang for adjustable exterior shading devices shall be determined at its most extended position.

13-601.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.

13-601.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 13-601.B.1 through 13-601.B.3.

13-601.B.1 Percentage of glass. The percentage of glass area to conditioned floor area shall not exceed 14 ~~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.

13-601.B.2 Glass type. All glass shall have a maximum U-factor~~s~~ of 0.40 and

a Solar Heat Gain Coefficients no higher than 0.30 ~~those listed from Table 11B-1 on Form 1100B~~.

13-601.C Requirements specific to Method C.

13-601.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.

13-601.C.1.1 Glazing area. The maximum percentage of glass 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.

13-601.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

13-601.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 13-C.2.1.1 in Appendix 13-C of this chapter. 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 13-602
WALLS

13-602.ABC Mandatory requirements for Methods A, B and C.

13-602.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 13-C1.2 of Appendix 13-C.

13-602.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.

13-602.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.

13-602.ABC.2 Wall infiltration. Walls shall meet the minimum air infiltration requirements of Section 13-606.ABC.

13-602.A Requirements specific to Method A.

13-602.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.

13-602.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 for the compliance package chosen in accordance with the criteria in Section 13-C1.2 of Appendix 13-C.

13-602.C Requirements specific to Method C.

13-602.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.

13-602.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.

13-602.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.

13-602.C.2 Renovations. Minimum insulation levels installed in renovated walls shall be not less than those specified in Section 13-602.C.1. These requirements apply only to those walls being renovated.

13-602.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 13-610.C.3 requirements for ducts located in marriage walls of multiple unit manufactured homes and buildings.

SECTION 13-603
DOORS

13-603.ABC Mandatory requirements for Methods A, B and C.

13-603.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.

13-603.ABC.2 Door infiltration. Doors shall meet the minimum air infiltration requirements for doors contained in Section 13-606.ABC.1.1.

13-603.A Requirements specific to Method A.

13-603.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.

13-603.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 13-601 unless the glass is less than one-third of the area of the door.

SECTION 13-604
CEILINGS

13-604.ABC Mandatory requirements for Methods A, B and C.

13-604.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 C1.2 of Appendix 13-C of this chapter.

13-604.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).

13-604.1.1.1 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.

13-604.1.1.2 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.

13-604.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.

13-604.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 13-610.ABC.3.6.

13-604.ABC.2 Ceiling infiltration. Ceilings shall meet the minimum air infiltration requirements of Section 13-606.1.

13-604.A Requirements specific to Method A.

13-604.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.

13-604.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.

13-604.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 13-604.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 13-604.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 2309.7 of the *Florida Building Code, Building*.
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 13-604.A.3
ACCEPTABLE ATTIC RADIANT BARRIER CONFIGURATIONS
[No change to figure]

13-604.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.

13-604.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.

13-604.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 for the compliance package chosen.

13-604.C Requirements specific to Method C.

13-604.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.

13-604.C.2 Renovations. Minimum insulation levels installed in renovated roofs/ceilings shall be not less than those specified in Section 13-604.C.1. These requirements apply only to roofs/ceilings that are being renovated.

SECTION 13-605
FLOORS

13-605.ABC Mandatory requirements for Methods A, B and C.

13-605.ABC.1 Floor Insulation. Insulation R-values claimed shall be in accordance with the criteria described in Section C1.2 of Appendix 13-C of this chapter.

13-605.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.

13-605.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.

13-605.ABC.2 Floor infiltration. Floors shall meet the minimum air infiltration requirements of Section 13-606.

13-605.A Requirements specific to Method A.

13-605.A.1 Floor types. Floors 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.

13-605.B Requirements specific to Method B. All floors shall be insulated to the minimum R-value given on Table 11B-1 of Form 1100B

13-605.C Requirements specific to Method C.

13-605.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.

13-605.C.2 Renovations.

Minimum insulation levels installed in renovated floors shall be not less than those specified on Table 11C-1 of Form 1100C for only the floors that are being renovated.

SECTION 13-606
AIR INFILTRATION

13-606.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.

13-606.ABC.1 Infiltration levels allowed.

13-606.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 13-606.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 13-606.ABC.1.2.

TABLE 13-606.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

13-606.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 13-606.ABC.1.2.1 through 13-606.ABC.1.2.5.

13-606.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 13-C3.4 of Appendix 13-C of this chapter.

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.

13-606.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.

13-606.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.

13-606.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.

13-606.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.

13-606.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 *Florida Building Code, Fuel Gas.*

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.

13-606.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.

13-606.A Requirements specific to Method A-

13-606.A.1 Infiltration loads. Infiltration loads shall be determined from the EnergyGauge USA Fla/Res computer program. Infiltration performance criteria shall be found in Section C3 in Appendix 13-C of this code.

13- 606.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 13-607
SPACE COOLING SYSTEMS

13-607.ABC Mandatory requirements For Methods A, B and C.

13-607.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

13-607.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 13-202.

13-607.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 13-607.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.

13-607.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.

13-607.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).

13-607.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.

13-607.ABC.2.2 Control setback and shutoff. The thermostat required in Section 13-607.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.

13-607.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.

13-607.ABC.3 Equipment performance standards.

13-607.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 Subchapter 13-3 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.

13-607.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 13-607.ABC.3.2A through 13-607.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 13-607.ABC.3.2A through 13-607.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 13-607.ABC.3.2.

13-607.ABC.3.2 Minimum efficiencies for cooling equipment.

Equipment shown in Tables 13-607.ABC.3.2A,13-607.ABC.3.2B and 13-607.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 13-607.ABC.3.2A,13-607.ABC.3.2B and 13-607.ABC.3.2D does not preclude use of such equipment. Equipment not listed in Tables 13-607.ABC.3.2A, 13-607.ABC.3.2B and 13-607.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 13-607.ABC.3.2A, 13-607.ABC.3.2B and 13-607.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 13-607.ABC.3.2A, Air Conditioners and Condensing Units.
Table 13-607.ABC.3.2B, Heat Pumps
Table13-607.ABC.3.2D, Packaged 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 subchapter, 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.

TABLE 13-607.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] Subchapter 13-3 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 13-607.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	
			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	ARI 340/360
			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] Subchapter 13-3 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 13-607.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), Replacements[2]	7,000 ≥Btu/h <8,000	95°F db Outdoor Air [Based on capacity at lower range using EER= 10.9 – (0.213 x Cap/1000)][3]	9.4 EER	
	8,000 ≤Btu/h < 9,000		9.2 EER	
	9,000 ≤Btu/h < 10,000		9.0 EER	
	10,000 ≤Btu/h < 11,000		8.8 EER	
	11,000 ≤Btu/h < 12,000		8.6 EER	
	12,000 ≤Btu/h < 13,000		8.3 EER	
	13,000 ≤Btu/h < 14,000		8.1 EER	
	14,000 ≤Btu/h < 15,000		7.9 EER	
	>15,000 Btu/h		7.7 EER	
PTHP (Cooling Mode), New Construction	7,000 ≥Btu/h <8,000	95°F db Outdoor Air [Based on capacity at lower range using EER= 12.3 – (0.213 x Cap/1000)][3]	10.8 EER	
	8,000 ≤Btu/h < 9,000		10.6 EER	
	9,000 ≤Btu/h < 10,000		10.4 EER	
	10,000 ≤Btu/h < 11,000		10.2 EER	
	11,000 ≤Btu/h < 12,000		10.0 EER	
	12,000 ≤Btu/h < 13,000		9.7 EER	
	13,000 ≤Btu/h < 14,000		9.5 EER	
	14,000 ≤Btu/h < 15,000		9.3 EER	
	>15,000 Btu/h		9.1 EER	
PTHP (Cooling Mode), Replacements[2]	7,000 ≥Btu/h <8,000	95°F db Outdoor Air [Based on capacity at lower range using	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	EER= 10.8 – (0.213 x Cap/1000)][3]	8.7 EER	
	11,000 ≤Btu/h < 12,000		8.5 EER	
	12,000 ≤Btu/h < 13,000		8.2 EER	
	13,000 ≤Btu/h < 14,000		8.0 EER	
	14,000 ≤Btu/h < 15,000		7.8 EER	
	>15,000 Btu/h		7.6 EER	
PTHP (Heating Mode), New Construction	7,000 ≥Btu/h <8,000	47°F db Outdoor Air [Based on capacity at lower range using COP= 3.2 – (0.026 x Cap/1000)][3]	3.02 COP	
	8,000 ≤Btu/h < 9,000		2.99 COP	
	9,000 ≤Btu/h < 10,000		2.97 COP	
	10,000 ≤Btu/h < 11,000		2.94 COP	
	11,000 ≤Btu/h < 12,000		2.91 COP	
	12,000 ≤Btu/h < 13,000		2.89 COP	
	13,000 ≤Btu/h < 14,000		2.86 COP	
	14,000 ≤Btu/h < 15,000		2.84 COP	
	>15,000 Btu/h		2.81 COP	
PTHP (Heating Mode), Replacements[2]	7,000 ≥Btu/h <8,000	47°F db Outdoor Air [Based on capacity at lower range using COP= 2.9 – (0.026 x Cap/1000)][3]	2.72 COP	
	8,000 ≤Btu/h < 9,000		2.69 COP	
	9,000 ≤Btu/h < 10,000		2.67 COP	
	10,000 ≤Btu/h < 11,000		2.64 COP	
	11,000 ≤Btu/h < 12,000		2.61 COP	
	12,000 ≤Btu/h < 13,000		2.59 COP	
	13,000 ≤Btu/h < 14,000		2.56 COP	
	14,000 ≤Btu/h < 15,000		2.54 COP	
	>15,000 Btu/h		2.51 COP	
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] Subchapter 13-3 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.

13-607.A Requirements specific to Method A.

13-607.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.

13-607.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 13-600.A.5.2.1. New systems may be replacements of existing equipment or equipment installed to condition only the addition.

13-607.A.3 Existing equipment. Minimum efficiencies for existing equipment shall be assumed from Tables 13-C4.1.1 in Appendix 13-C by the age of the unit unless documentation is available to demonstrate a higher efficiency.

13-607.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 13-C4.1.2 in Appendix 13-C.

13-607.A.5 Installation criteria for homes using the cross ventilation option. The cross ventilation option may be used in EnergyGauge USA Fla/Res computer program if the criteria in Section 13-C4.1.3 of Appendix 13-C have been met.

13-607.A.6 Installation criteria for homes using the whole house fan option. The whole house fan option may be used in EnergyGauge USA Fla/Res if the criteria in Section 13-C4.1.4 have been met.

13-607.B Requirements specific to Method B. 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.

13-607.B.1 Additions. Where cooling equipment is to be installed in an addition, the requirements of Section 13-607.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.

13-607.C Requirements specific to Method C.

13-607.C.1 Additions. All new air conditioners installed in additions complying by Method C shall meet the minimum efficiencies in Section 13-607.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.

13-607.C.2 Renovations. Minimum efficiencies for cooling equipment to be added or replaced in renovations shall not be less than those specified in Section 13-607.ABC.3.2.

13-607.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 13-607.ABC.3.2.

13-607.C.4 Building systems. Newly manufactured cooling systems installed in existing buildings shall meet minimum requirements for that system in Section 13-607.ABC (see also Section 13-101.6).

SECTION 13-608
SPACE HEATING SYSTEMS

13-608.ABC Mandatory requirements for Methods A, B, and C.

13-608.ABC.1 Equipment Sizing. An HVAC equipment sizing calculation shall be performed on the building in accordance with the criteria in Section 13-607.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 13-608.ABC.1.1 through 13-608.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.

13-608.ABC.1.1 Heat Pumps. Heat pump sizing shall be based on the cooling requirements as calculated according to Section 13-607.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.

13-608.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 13-607.ABC.1.

Section 13-608.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 13-608.ABC.1.

13-608.ABC.1.4 Extra capacity required for special occasions. Residences requiring excess heating capacity on an intermittent basis shall comply with Section 13-607.ABC.1.2.

13-608.ABC.2 Controls. Requirements specified for controls in Section 13-607.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.

13-608.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 thermostat designed for heat pump use that energizes auxiliary heat only when the heat pump has insufficient capacity to maintain setpoint or to warm up the space at a sufficient rate or (2) a multi-stage space thermostat and an outdoor air thermostat wired to energize auxiliary heat only on the last stage of the space thermostat and when outside air temperature is less than 40^{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 13-607.ABC.3.2B and includes all usage of internal electric resistance heating.

13-608.ABC.3 Equipment performance standards.

13-608.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

Subchapter 13-3 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.

13-608.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 13-607.ABC.3.1.1.

13-608.ABC.3.2 Minimum efficiencies for heating equipment. Tables 13-607.ABC.3.2B, 13-607.ABC.3.2D, 13-608.ABC.3.2E and 13-608.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 13-607.ABC.3.2B, Heat Pumps.

Table 13-607.ABC.3.2D, Packaged Terminal Air Conditioners and Heat Pumps.

Table 13-608.ABC.3.2E, Furnaces, Duct Furnaces and Unit Heaters.

Table 13-608.ABC.3.2F, Gas- and Oil-Fired Boilers.

13-608.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.

13-608.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 13-608.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] Subchapter 13-3 contains a complete specification of the referenced test procedure, including

the referenced year version of the test procedure.
[3] E_c = combustion efficiency. Units must also include an IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
[4] Combination units not covered by NAECA (3 phase power or cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating.
[5] Minimum and maximum ratings as provided for and allowed by the unit's controls.
[6] E_t = thermal efficiency. Units must also include an IID, have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
[7] E_c = combustion efficiency (100% less flue losses). See test procedure for detailed discussion.
[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 13-608.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).

13-608.A Requirements specific to Method A.

13-608.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.

13-608.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.

13-608.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 13-C4.1.2 in Appendix 13-C.

13-608.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.

13-608.B.1 Electric space heating. Electric resistance heating systems shall not be used when complying by Method B.

13-608.B.2 Gas instantaneous (tankless) water heaters used for space heating. Gas instantaneous (tankless) water heaters that meet the requirements established for such equipment by this code may be installed.

13-608.C Requirements specific to Method C.

13-608.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 13-608.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.

13-608.C.2 Renovations. Minimum efficiencies for heating equipment to be added or replaced in renovations shall not be less than those specified in Section 13-608.ABC.3.2.

13-608.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 13-608.ABC.3.2.

13-608.C.4 Building systems. Newly manufactured heating systems installed in existing buildings shall meet the minimum requirements for that system in Section 13-608.ABC (see Section 13-101.6 for exceptions).

SECTION 13-609
VENTILATION SYSTEMS

13-609.ABC Mandatory requirements for Methods A, B and C.

13-609.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.

13-609.ABC.2.1 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 13-610
AIR DISTRIBUTION SYSTEMS

13-610.ABC Mandatory requirements for Methods A, B and C.

13-610.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.

13-610.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 13-610.ABC.2.1 through 13-610.ABC.2.3.

13-610.ABC.2.1 Insulation required. The minimum installed thermal resistance (R-value) for air distribution system components shall be as specified in Table 13-610.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 13-607.ABC.3 or 13-608.ABC.3.

TABLE 13-610.ABC.2.1
MINIMUM INSULATION LEVELS
AIR DISTRIBUTION SYSTEM COMPONENTS[1]

[No change to table]

13-610.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.ft^2°F) is the measured apparent thermal conductivity at 75°F (24°C) mean temperature and at installed thickness tested in accordance with ASTM C 518 or ASTM C 177.

The installed thickness of duct insulation used to calculate R-values shall be determined as follows:

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

13-610.ABC.2.3 Condensation control. Additional insulation with vapor barrier shall be provided where the minimum duct insulation requirements of Section 13-610.ABC.2 are determined to be insufficient to prevent condensation.

13-610.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.

13-610.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.

13-610.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.

13-610.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).

13-610.ABC.3.0.2 Sealing. Air distribution system components shall be sealed with approved closure systems.

13-610.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 13-610.ABC.3 of this code; (2) inspection; and (3) cleaning and maintenance. A minimum of 4 inches (102 mm) is considered sufficient space around air-handling units.

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

13-610.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.

13-610.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.

13-610.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.

13-610.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 13-610.ABC.3.1 through 13-610.ABC.3.8:

1. Metal closures.
   a. Welds applied continuously along metal seams or joints through which air could leak.
   b. Snaplock seams, and grooved, standing, double-corner, 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. Gasketing, which achieves a 25/50 flame spread/smoke-density-development rating under ASTM E 84 or UL 723, provided that it is used only between mated surfaces which are mechanically fastened with sufficient force to compress the gasket and to fill all voids and cracks through which air leakage would otherwise occur.

3. Mastic closures. 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.

4. 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.

5. Aerosol sealant. Such sealants shall be installed by manufacturer-certified installers following manufacturer instructions and shall achieve 25/50 flame spread/smoke-density-development ratings under ASTM E 84 or UL 723.

13-610.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 13-610.ABC.3.1.1 or Section 13-610.ABC.3.1.2.

13-610.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 13-610.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.

13-610.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 13-610.ABC.3.0:

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

13-610.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.

13-610.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 13-610.ABC.3.2.1.

13-610.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 13-610.ABC.3.0:

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

13-610.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 13-610.ABC.3.0.6.

13-610.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 13-610.ABC.3.3.1 through 13-610.ABC.3.3.6.

13-610.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.

13-610.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 13-610.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.

13-610.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.

13-610.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.

13-610. 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 13-610.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.

13-610.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.

13-610.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 13-610.ABC.3.4.1 or 13-610.ABC.3.4.2.

13-610.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 13-610.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.

13-610.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 13-610.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.

13-610.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 13-610.ABC.3.1.

13-610.ABC.3.5.1 Approved closure systems. Systems conforming to the product and application standards of Section 13-610.ABC.3.0 may be used when sealing air-handling units.

13-610.ABC.3.5.2 Air-handling units. 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.

13-610.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 13-610.ABC.2 and constructed and sealed in accordance with the requirements of Section 13-610.ABC.3 appropriate for the duct materials used.

Exception: Return air plenums.

13-610.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 13-610.ABC.3.7 and shall be insulated in accordance with Section 13-610.ABC.2.

13-610.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.

13-610.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.

13-610.ABC.3.7 Mechanical closets. The interior surfaces of mechanical closets shall be sheathed with a continuous air barrier as specified in Section 13-610.ABC.3.7.1 and shall be sealed with approved closure systems as specified in Section 13-610.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.

13-610.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.

13-610.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 13-610.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.

13-610.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 13-610.ABC.3. and insulated according to the requirements of Section 13-610.ABC.2.

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

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

Through-wall, through-floor and through-ceiling penetrations into the duct section shall contain a branch duct which is fabricated of rigid fibrous glass duct board or rigid metal and which extends to and is sealed to both the duct section and the grille side wall surface. The branch duct shall be fabricated and attached to the duct insert in accordance with Section 13-

610.ABC.3.2 or 13-Section 610.ABC.3.1, respective to the duct type used.

13-610.A Requirements specific to Method A.

13-610.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.

13-610.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 Standard152, 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.

13-610.B Requirements specific to Method B.

13-610.B.1 Ducts installed. All ducts shall be insulated to at least the level required by Table 11B-1 on Form 1100B. Ducts and air handling units shall either be installed inside conditioned space or shall be tested to meet the criteria for the tested duct option in Section 13-610.A.2.

13-610.C Requirements specific to Method C.

13-610.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 Table 11C-1 of Form 1100C.

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

13-610.C.2 Renovations. Replacement duct systems that are not in conditioned space shall be insulated to levels specified in Section 13-610.C.1.

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

13-610.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 13-610.ABC.2 and 13-610.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.

13-610.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 13-610.ABC.2 through 13-610.ABC.8, as appropriate. See Section 13-101.6 for exceptions.

SECTION 13-611
PIPING

13-611.ABC Mandatory Requirements for Methods A, B and C.

13-611.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 13-611.ABC.1, except as stated herein (for service water heating systems, see Section 13-612.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 13-611.ABC.1
MINIMUM PIPE INSULATION
[No change to table]

13-611.ABC.1.1 Other insulation thicknesses. Insulation thicknesses in Table 13-611.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:

$$\text{New minimum thickness} = \frac{4.6 \times \text{Table 13-611.ABC.1 Thickness}}{\text{Actual Resistivity}}$$

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

$$\text{New minimum thickness} = \frac{4.0 \times \text{Table 13-611.ABC.1 Thickness}}{\text{Actual Resistivity}}$$

SECTION 13-612
WATER HEATING SYSTEMS

13-612.ABC Mandatory requirements for Methods A, B and C.

13-612.ABC.1 Sizing. Blank for numbering consistency.

13-612.ABC.2 Controls.

13-612.ABC.2.1 Storage water heater temperature controls.

13-612.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).

13-612.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.

13-612.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.

13-612.ABC.2.3 Swimming pool and spa temperature controls.

13-612.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.

13-612.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.

13-612.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.

13-612.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.

13-612.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.

13-612.ABC.3 Equipment performance standards.

13-612.ABC.3.1 Electric water heater efficiencies.

13-612.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 13-612.ABC.3.

TABLE 13-612.ABC.3
MINIMUM PERFORMANCE STANDARDS WATER HEATING EQUIPMENT: FIRED STORAGE WATER HEATER MINIMUM ENERGY FACTORS (EF)
[No change to table]

13-612.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.

13-612.ABC.3.2 Gas- and oil-fired water heater efficiencies.

13-612.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 13-612.ABC.3.

13-612.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.

13-612.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.

13-612.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.

13-612.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.

13-612.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 ($360 m^3$/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 ($360 m^3$/kW) shall comply with the criteria of Section 13-412.ABC.3.4, Subchapter 13-4.

13-612.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.

13-612.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.

13-612.A Requirements specific to Method A.

13-612.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.

13-612.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.

13-612.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 as allowed by the compliance package chosen.
Compliance packages which do not allow the use of electric resistance water heating shall not be used for an addition unless a dedicated heat pump, heat recovery unit, or solar system already exists or is being installed in conjunction with the addition.

13-612.B.1 Electric resistance water heating. Electric resistance water heating systems installed shall meet the minimum Energy Factor (EF) in Table 11B-1on Form 1100B.

13-612.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.

13-612.C.1 Additions. All new water heaters installed in an addition shall meet the minimum efficiencies listed in Section 13-612.ABC.3, Table 13-612.ABC.3.2.

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

13-612.C.2 Renovations. Minimum efficiencies for water heating equipment installed in renovations shall be not less than those listed in Table 13-612.ABC.3.2 and Section 13-612.ABC.3.

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

13-612.C.3 Building systems. New water heating systems installed in existing buildings shall meet the minimum requirements for that system in Section 13-612.ABC.

SECTION 13-613
CALCULATIONAL PARAMETERS
SPECIFIC TO COMPLIANCE METHOD A

13-613.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.

13-613.A.1 Home Specification. The Baseline Home and As-Built Home shall be configured and analyzed as specified by Table 13-613.A.1-1.

Table 13-613.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 408.1 of the *Florida Building Code, Residential,* is used, in which case, the same net free ventilation area as the As-Built Home down to a minimum net free vent area of 1 ft^2 per 1,500 ft^2 of 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) = 15 ~~18~~% of conditioned floor area Orientation: equally distributed to four (4) cardinal compass orientations (N,E,S,&W) U-factor: 0.40 ~~0.75~~ SHGC: 0.30 ~~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 13-607.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 13-607.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 0.88 ~~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 13-607.A.2.6 and 13-608.A.2.6 of this code.

Table 13-613.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 13-613.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 13-613.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.

13-613.A.2 Calculation of End Use Energy Loads for Code Compliance Determination.

13-613.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 13-613.A.2-1 below:

Table 13-613.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

13-613.A.2.2 Following normalization of the heating, cooling and hot water energy consumptions for the As-Built Home as specified in Section 13-613.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.