**Florida Code**

<table>
<thead>
<tr>
<th>SECTION 13-600 ADMINISTRATION</th>
</tr>
</thead>
</table>

**13-600.0 Methods of Compliance**

Method A, the Whole Building Performance Method. Applicable prescriptive requirements described in Sections 601 through 612 shall also be met.

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**13-600.1.ABC Prescriptive Requirements.**  
Section number followed by the combined number and letters ".1.ABC" indicates these Basic Prescriptive Requirements

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**13-600.3.ABC.2 Code Compliance Certification.** The building's owner, the owner's architect, or other authorized agent legally designated by the owner shall certify to the building official that the building is in compliance with Chapter 13 of the Florida Building Code, Building prior to receiving the permit to begin construction or renovation.

All Subchapter 6 compliance calculations and certifications shall be made using the 600 series forms or the FLA/RES computer program printout for the climate zone in which the building will be constructed.

If, during the building construction or renovation, alterations are made in the design, materials, or equipment which would diminish the energy performance of the building, an amended copy of the compliance certification shall be submitted to the building department agency by the building owner or his legally authorized agent on or before the date of final inspection.

The certified compliance form shall be made a part of the plans and specifications submitted for permitting the building.

**13-600.3.ABC.3.1 EPL Display Card.** The building official shall require that an Energy Performance Level (EPL) Display Card be completed and certified by the builder to be accurate and correct before final approval of a residential building for occupancy. The EPL Display Card contains information indicating the energy performance level and efficiencies of components installed in a dwelling unit. The EPL Display Card shall be included as an addendum to the sales contract for both presold and non-presold residential buildings in
accordance with Section 553.9085, *Florida Statutes*.

13-600.3.ABC.3.2 Form 600D-04 (Desuperheater, Heat Recovery Unit Water Heater Efficiency Certification). This form shall be submitted when credit is being taken for water heating with a *Heat Recovery Unit*. The form is used to demonstrate that the Net Superheat Recovery is equal to or greater than the 50 percent minimum required to obtain credit. The form shall be affixed to the Heat Recovery Unit by the manufacturer.

**Exception:** If the Heat Recovery Unit is listed in the current *ARDM Directory of Certified Refrigerant Desuperheater Heat Recovery Unit Water Heaters* as meeting the net heat recovery minimum and the unit bears the ARDM label signifying compliance with this Code, the label shall serve as a certification in place of Form 600D-04.

13-600.3.A Forms Used for Method A Compliance. *Form 600A-04* or a printout of the FLA/RES-04 computer program shall be used to demonstrate code compliance by Method A, the Whole Building Performance Method. The correct form for the location where the residence will be built or a printout of the FLA/RES-04 computer program for the appropriate climate zone shall be submitted to the building department to demonstrate compliance by Sub-chapter 6 before a building permit is issued. Signatures on this form by persons authorized under the provisions of section 600.3.ABC.2 shall constitute certification of code compliance by Method A of this subchapter.

13-600.3.B Forms Used for Method B Compliance. *Form 600B-04* shall be completed and submitted to the building department to demonstrate that all Prescriptive Requirements have been met. *Form 600B-04* contains the compliance packages used to demonstrate code compliance by Method B of Subchapter 6, the Component Prescriptive Method. A completed and signed form specific to the location where the residence will be built shall be submitted to the building department to obtain a building permit. Signatures on this form by persons authorized under the provisions of section 600.3.ABC.2 shall constitute certification of code compliance by Method B of this subchapter.

*Form 600B-04 shall remain on file at the building department.*

13-600.3.C Forms Used for Method C Compliance. *Form 600C-04* shall be completed and submitted to the building department to demonstrate that all Prescriptive Requirements have been met for buildings complying with the code by Method C, the Limited Applications Prescriptive Method. *Form 600C-04* contains the requirements for code compliance for additions of 600 sq.ft. or less, for renovations, for building systems, and for site-added components of manufactured buildings and manufactured homes. A completed and signed form specific to the location where the residence will be built shall be submitted.
to the building department to obtain a building permit. Signatures on this form by persons authorized under the provisions of section 600.3.ABC.2 shall constitute certification of code compliance by Method C of this subchapter.
*Form 600C-04 shall remain on file at the building department.*

**13-600.4 Reporting.** A copy of the front page of the 600 series form submitted to demonstrate code compliance shall be sent by the Building Department to the Department of Community Affairs on a quarterly basis for reporting purposes.

### Appendix C to Chapter 13:

**13-C1.2 Building envelope, insulation.**

All R-values referenced in this chapter refer to the R-values of the added insulation only. The R-values of structural building materials such as framing members, concrete blocks or gypsum board shall not be included. Insulation levels shall be achieved with insulation products tested and rated according to the procedures recognized by the Federal Trade Commission (FTC) in 16 CFR Part 460.

See Section 13-104.4.3 for compliance requirements pertaining to insulation installed in locations where the R-value is not readily apparent or the FTC label is not affixed to the installed product.

- **13-C1.2.1** When installing two layers of bulk or board insulation, the R-values of each material may be added together for a total R-value. When installing two separate reflective insulation products in layers, the total R-value of the system shall have been achieved by testing under FTC regulations, 16 CFR Part 460.

- **13-C1.2.2** Insulation that has been compressed to 85-percent or less of the manufacturer’s rated thickness for the product shall use the R-values given in Table 13-6C-1 for selecting a multiplier. These values are to be used except where data developed by an independent testing laboratory is provided and approved by the Florida Building Commission.

- **13-C1.2.3** The thermal insulation materials listed below shall comply with the requirements of their respective ASTM standard specification and shall be installed in accordance with their respective ASTM installation practice.

### Section 102

**Materials, Systems and Equipment**

**102.1 Identification.** Materials, systems and equipment shall be identified in a manner that will allow determination of compliance with the applicable provisions of this code.

**102.1.1 Building thermal envelope insulation.** An R-value identification mark shall be applied by the manufacturer to each piece of building thermal insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and R-value of insulation installed in each element of the building thermal envelope. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled R-value, installed density, coverage area and number of bags installed shall be listed on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and R-value of installed thickness shall be listed on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

**102.1.1.1** See opposite FL section 13-604.

**102.2 Installation.** All material, systems and equipment shall be installed in accordance with the manufacturer’s installation instructions and the *International Building Code*.

**102.2.1 Protection of exposed foundation insulation.** Insulation applied to the exterior of basement walls, crawlspace walls and perimeter of slab-on-grade floors shall have a rigid, opaque and
weather-resistant covering to prevent the degradation of the insulation’s thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (153 mm) below grade.

| 13-102.1 Efficiency and maintenance information. An operating and maintenance manual shall be provided to the building owner for all commercial buildings. The manual shall include basic data relating to the design, operation and maintenance of HVAC systems and equipment. Required routine maintenance actions shall be clearly identified. Where applicable, HVAC controls information such as diagrams, schematics, control sequence descriptions, and maintenance and calibration information shall be included. Operations manuals shall be available for inspection by the building official upon request. See Sections 413.1.ABC.2.2 and 410.1.ABC.4.2. |
| 102.3 Maintenance Information. Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title of publication number for the operation and maintenance manual for that particular model and type of product. |

| SECTION 13-601 FENESTRATIONS (GLAZING) |
| 13-601.1 Prescriptive Requirements |
| 13-601.1.ABC Basic Prescriptive Requirements for Methods A, B and C |
| 13-601.1.ABC.1 Glazing Types. Windows shall contain at least the minimum efficiency glazing type certified to be in compliance with the code. U-factors (thermal transmittances) or Solar Heat Gain Coefficient (SHGC) for glazed fenestration products shall be determined in accordance with National Fenestration Rating Council 100, Procedure for Determining Fenestration Product U-factors or National Fenestration Rating Council 200: Procedures for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence by an accredited, independent laboratory and labeled and certified by the manufacturer. When a manufacturer has not determined U-factor or SHGC in accordance with NFRC 100 or 200 for a particular product line, compliance with the building envelope requirements of this code shall be determined by assigning such products default U-factor or SHGC in accordance with Table 601.1.ABC.1. Product features must be verifiable for the product to qualify for the default value associated with those features. Where the existence of a particular feature cannot be determined with reasonable certainty, the product shall not receive credit for that feature. Where a composite of materials from two different product types are used, the product shall be assigned the higher U-factor or SHGC. Glazing in doors shall be considered fenestrations. |
| 102.1.3 Fenestration product rating. U-factor of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled U-factor shall be assigned a default U-factor from table 102.1.3(1) or 102.1.3(2). The solar heat gain coefficient (SHGC) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory and labeled and certified by the manufacturer. Products lacking such a labeled SHGC shall be assigned a default SHGC from table 102.1.3(3). |
### Table 13-601.1.ABC.1
**DEFAULT WINDOW ENERGY VALUES FOR RESIDENTIAL APPLICATIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>U-factor</th>
<th>Solar Heat Gain Coefficient (SHGC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single pane clear</td>
<td>1.30</td>
<td>0.75</td>
</tr>
<tr>
<td>Single pane tint</td>
<td>1.30</td>
<td>0.64</td>
</tr>
<tr>
<td>Double pane clear</td>
<td>0.87</td>
<td>0.66</td>
</tr>
<tr>
<td>Double pane tint</td>
<td>0.87</td>
<td>0.55</td>
</tr>
</tbody>
</table>

### 13-601.1.ABC.2 Window Infiltration
Windows shall meet the minimum air infiltration requirements of Section 606.1.

### 13-601.1.ABC.3 Overhangs
Non-permanent shading devices such as canvas awnings shall not be considered overhangs. Permanently attached wood and metal awnings may be considered overhangs.

### 13-601.1.A Prescriptive Requirements Specific to Method A
Windows shall meet the air infiltration requirements in Section 606.1.

### 13-601.1.B Prescriptive Requirements Specific to Method B
All glass, including sliding glass doors and glass in exterior doors which has an area one-third or more of the total door area, shall meet the criteria in Sections 601.1.B.1 through 601.1.B.3 for the Compliance Package chosen on Table 6B-1 of Form 600B and the air infiltration requirements in Section 606.1.2.

### 13-601.1.B.3 Overhang
All glass areas shall be under at least the length of overhang specified on Table 6B-1 of Form 600B for the Compliance Package chosen. The overhang length (OH) prescribed in the package shall represent the distance the roof or soffit projects out horizontally from the face of the glass.

**Exceptions:**
1. Glass on the gabled ends of a house.

Louvers and other exterior shading devices which are adjustable shall be treated as overhangs. Slats shall be arranged so no solar radiation penetrates the overhang during the cooling season.

### Table 102.1.2(1)
**DEFAULT GLAZED FENESTRATION U-FACTOR**

<table>
<thead>
<tr>
<th>FRAME TYPE</th>
<th>SINGLE PANE</th>
<th>DOUBLE PANE</th>
<th>SKYLIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal</td>
<td>1.2</td>
<td>0.8</td>
<td>2.00</td>
</tr>
<tr>
<td>Metal with Thermal Break</td>
<td>1.1</td>
<td>0.65</td>
<td>1.90</td>
</tr>
<tr>
<td>Non-metal or metal clad</td>
<td>0.95</td>
<td>0.55</td>
<td>1.75</td>
</tr>
<tr>
<td>Glazed Block</td>
<td></td>
<td></td>
<td>0.60</td>
</tr>
</tbody>
</table>

### Table 102.1.2(2)
**DEFAULT DOOR U-FACTOR**

<table>
<thead>
<tr>
<th>DOOR TYPE</th>
<th>U-FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Un-insulated Metal</td>
<td>1.20</td>
</tr>
<tr>
<td>Insulated Metal</td>
<td>0.60</td>
</tr>
<tr>
<td>Wood</td>
<td>0.50</td>
</tr>
<tr>
<td>Insulated, non-metal edge, max. 45% glazing, any glazing double pane</td>
<td>0.35</td>
</tr>
</tbody>
</table>

### Table 102.1.2(3)
**DEFAULT GLAZED FENESTRATION SHGC**

<table>
<thead>
<tr>
<th>SINGLE GLAZED</th>
<th>DOUBLE GLAZED</th>
<th>GLAZED BLOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Tinted</td>
<td>0.7</td>
<td>0.6</td>
</tr>
</tbody>
</table>
402.6 Maximum fenestration $U$-factor and SHGC. (Mandatory). The area weighted average maximum fenestration $U$-factor permitted using trade-offs from Section 402.1.4 or Section 404 shall be 0.48 in zones 4 and 5 and 0.40 in zones 6 through 8 for vertical fenestration, and 0.75 in zones 4 through 8 for skylights. The area weighted average maximum fenestration SHGC permitted using trade-offs from Section 404 in Zones 1 through 3 shall be 0.50.

402.2.3 Mass walls. Mass walls for the purposes of this Chapter shall be considered walls of concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth) and solid timber/logs. The provisions of Section 402.1.1 for mass walls shall be applicable when at least 50 percent of the required insulation $R$-value is on the exterior of, or integral to, the wall. Walls that do not meet this criterion for insulation placement shall meet the wood frame wall insulation requirements of Section 402.1.1.

Exception: For walls that do not meet the criterion for insulation placement, the minimum added insulation $R$-value shall be permitted to be:
1. $R$-value of 4 in Climate Zone 1.
2. $R$-value of 6 in Climate Zone 2.
3. $R$-value of 8 in Climate Zone 3.

402.2.4 Steel-frame ceilings, walls and floors. Steel frame ceilings, walls and floors shall meet the insulation requirements of Table 402.2.4 or shall meet the $U$-factor requirements in Table 402.1.3. The calculation of the $U$-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

402.2.6 Basement walls. Walls associated with conditioned basements shall be insulated from the top of the basement wall down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Sections 402.1.1 and 402.2.5.

**SECTION 602 WALLS**

13-602.1 Prescriptive Requirements

13-602.1.ABC Basic Prescriptive Requirements for Methods A, B and C

13-602.1.ABC.1 Wall Insulation. Walls shall be insulated to at least the level certified to be in compliance with this code.

Insulation R-values claimed shall be in accordance with the criteria described in Section 1.2 of Appendix C of this chapter.

13-602.1.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.

13-602.1.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.

13-602.1.ABC.2 Wall Infiltration. Walls shall meet the minimum air infiltration requirements of Section 606.1.

13-602.1.A Prescriptive Requirements Specific to Method A.

13-602.1.A.1 Walls considered *lightweight concrete block* in Method A shall have an aggregate density of no greater than 105 pounds per cubic foot.

13-602.1.A.2 Walls considered *polystyrene bead aggregate block* in Method A shall be composed of at least 60 percent polystyrene beads by volume, and shall achieve at least an R-8 insulation value when tested to ASTM C236.
SECTION 13-603
DOORS

402.2.10 Prescriptive Requirements

13-603.1.ABC Basic Prescriptive Requirements For Methods A, B and C

13-603.1.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.

13-603.1.ABC.2 Door Infiltration. Doors shall meet the minimum air infiltration requirements for doors contained in Section 606.1.ABC.1.

SECTION 13-604
CEILINGS

13-604.1 Prescriptive Requirements.

13-604.1.ABC Basic Prescriptive Requirements for Methods A, B and C

13-604.1.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 1.2 of Appendix C of this chapter.

13-604.1.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” or where the distance from any point of 30” minimum clearance out to the ceiling surface in the roof eave area that is to be insulated is greater than 10 feet.

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

102.1.1 Blown or sprayed roof/ceiling insulation. The thickness of blown in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 square feet (28 m²) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) in height. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed R-value shall be listed on certification provided by the insulation installer.

102.1.2 Insulation mark installation. Insulation materials shall be installed such that the manufacturer’s R-value mark is readily observable upon inspection

402.2.1 Ceilings with attic spaces. When Section 402.1.1 would require R-38 in the ceiling, R-30 shall be deemed to satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Similarly R-38 shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves.
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.

In that portion of the attic floor to receive blown insulation, reference marks or rules shall be placed within every 6’ to 10’ 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 code 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.

13-604.1.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.

13-604.1.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 610.1.ABC.3.6.

13-604.1.ABC.2 Ceiling Infiltration. Ceilings shall meet the minimum air infiltration requirements of Section 606.1.

NA

402.2.2 Ceilings without attic spaces. Where Section 402.1.1 would require insulation levels above R-30 and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation for such roof/ceiling assemblies shall be R-30. This reduction of insulation from the requirements of Section 402.1.1 shall be limited to 500 square feet (46 m²) of ceiling area.

402.2.10 Thermally isolated sunroom insulation. The minimum ceiling insulation R-values shall be R-19 in zones 1 through 4 and R-24 in zones 5 though 8. The minimum wall R-value shall be R-13 in all zones. New wall(s) separating a sunroom from conditioned space shall meet the building thermal envelope requirements.
Note: Steel wall framing is treated with its own set of energy performance multipliers in compliance Method A. It is not allowed in compliance Method B.

402.2.4 Steel-frame ceilings, walls and floors. Steel frame ceilings, walls and floors shall meet the insulation requirements of Table 402.2.4 or shall meet the U-factor requirements in Table 402.1.3. The calculation of the U-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

<table>
<thead>
<tr>
<th>TABLE 402.2.4 STEEL-FRAME CEILING, WALL AND FLOOR INSULATION (R-VALUE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOOD FRAME R-VALUE REQUIREMENT</td>
</tr>
<tr>
<td>Steel Truss Ceilingsb</td>
</tr>
<tr>
<td>R-30</td>
</tr>
<tr>
<td>R-38</td>
</tr>
<tr>
<td>R-49</td>
</tr>
<tr>
<td>Steel Joist Ceilingsb</td>
</tr>
<tr>
<td>R-30</td>
</tr>
<tr>
<td>R-38</td>
</tr>
<tr>
<td>Steel Framed Wall</td>
</tr>
<tr>
<td>R-13</td>
</tr>
<tr>
<td>R-19</td>
</tr>
<tr>
<td>R-21</td>
</tr>
<tr>
<td>Steel Joist Floor</td>
</tr>
<tr>
<td>R-13</td>
</tr>
<tr>
<td>R-19</td>
</tr>
</tbody>
</table>

a. Cavity insulation R-value is listed first, followed by continuous insulation R-value.
b. Insulation exceeding the height of the framing shall cover the framing.

SECTION 13-605 FLOORS

13-605.1 Prescriptive Requirements

13-605.1.ABC Basic Prescriptive Requirements For Methods A, B and C

13-605.1.ABC.1 Floor Insulation. Insulation R-values claimed shall be in accordance with

402.2.5 Floors. Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

402.2.7 Slab-on-grade floors. Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table 402.1.1. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table 402.1.1 by any
the criteria described in Section 1.2 of Appendix C of this chapter.

13-605.1.ABC.1 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.

13-605.1.ABC.1.1 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.

13-605.1.ABC.2 Floor Infiltration. Floors shall meet the minimum air infiltration requirements of Section 606.1.

13-605.1.A Prescriptive Requirements Specific to Method A

13-605.1.A.1 Floor Vent Area. In raised floors supported by stem walls with under floor insulation, the vent area for the subfloor space shall not exceed 1 square foot per 150 square feet of floor area when utilizing the stem wall with under floor insulation multipliers.

In raised floors supported by stem walls with stem wall insulation, the vent area for the subfloor space shall not exceed 1/10 square foot of open vent area per 150 square feet of floor area when utilizing the stem wall with stem wall insulation multipliers. A continuous vapor barrier shall be applied over the ground under the floor.

SECTION 13-606
AIR INFILTRATION

13-606.1.ABC.1 Infiltration Levels Allowed.

13-606.1.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 606.1.ABC.1.1. These rates shall be determined from tests conducted at a pressure differential of 1.567 lb/ft², 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/NWWDA 101/I.S.2 or ASTM E283, as appropriate. Site-constructed doors and windows shall be sealed in accordance with Section 606.1.ABC.1.2.

402.4 Air leakage. (Mandatory)

402.4.2 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m²), and swinging doors no more that 0.5 cfm per square foot (2.6L/s/m²), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer.

Exceptions: Site-built windows, skylights and doors.
<table>
<thead>
<tr>
<th>Frame Type</th>
<th>Windows (cfm per square foot of window area)</th>
<th>Doors (cfm per square foot of door area)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sliding</td>
<td>Swinging</td>
</tr>
<tr>
<td>Wood</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Aluminum</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>PVC</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>

13-606.1.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 606.1.ABC.1.2.1 through 606.1.ABC.1.2.5.

13-606.1.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 4.2 of Appendix C of this chapter.

Exception: As an alternative to 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 building thermal envelope.

402.4.1 Building thermal envelope. The building thermal envelope shall be durably sealed to limit infiltration. The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The following shall be caulked, gasketed, weather stripped or otherwise sealed with an air barrier material, suitable film or solid material:
1. All joints, seams and penetrations.
2. Site-built windows, door and skylights.
3. Openings between window and door assemblies and their respective jambs and framing.
5. Dropped ceiling or chases adjacent to the thermal envelope.
7. Walls and ceilings separating a garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.
9. Common walls between dwelling units.
10. Other sources of infiltration.
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.

**13-606.1.ABC.1.2.2 Floors.** Penetrations and openings in raised floors, greater than or equal to 1/8 inch 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 (grills, registers, crawl space accesses, plumbing penetrations, etc.), and at seams between sections of infiltration barrier material.

**13-606.1.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 (grills, registers, attic accesses, plumbing penetrations, vent pipes, chimneys, etc.), and at seams between sections of infiltration barrier material.

**13-606.1.ABC.1.2.5 Multi-story Houses.** In multi-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. Airtight 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.

13-606.1.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 NFPA 54 or the locally adopted code.
2. All combustion space heaters, furnaces, and water heaters shall be provided with adequate combustion air. Such devices shall comply with NFPA or the locally adopted code.
CAUTION: Caution should be taken to limit the use of materials and systems which produce unusual or excessive levels of indoor air contaminants.

13-606.1.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.

13-606.1.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” thick 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” from combustible material and not less than 3” from insulation material.
3. Type IC rated, with no more than 2.0 cfm air movement from the conditioned space to the ceiling cavity when measured in accordance with ASTM E283. The fixture shall be tested at 75 Pa and shall be labeled.

402.4.3 Recessed lighting. Recessed luminaries installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces by being:
1. IC-rated and labeled with enclosures that are sealed or gasketed to prevent air leakage to the ceiling cavity or unconditioned space; or
2. Located inside an airtight sealed box with clearances of at least 0.5 inch (12.7mm) from combustible material and 3 inches (76 mm) from insulation.
13-607.1 Prescriptive Requirements
13-607.1.ABC Basic Prescriptive Requirements For Methods A, B and C

13-607.1.ABC.1 Equipment Sizing. An HVAC sizing calculation shall be performed on the building and shall be attached to the Form 600 submitted when application is made for a building permit, or in the event the mechanical permit is obtained at a later time, the sizing calculation shall be submitted with the application for the mechanical permit. Cooling and heating design loads, for the purpose of sizing HVAC systems, shall be determined for each zone within a dwelling 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 607.1.ABC.1.1. System sizing calculations shall not include loads created by local intermittent mechanical ventilation such as standard kitchen and bathroom exhaust systems.

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 sq.ft.
   - Outdoor dry bulb used
   - Outdoor wet bulb used
   - Relative humidity
   - Total heating required with outside air
   - Total sensible gain
   - Total latent gain
   - Total cooling required with outside air
   - Indoor dry bulb
   - Grains water (difference)

2. Systems installed in existing buildings not meeting the definition of renovation in Section 202.

13-607.1.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 115 percent of the design total load calculated according to the procedure selected in Section 607.1.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.

Exceptions:
1. Attached single- and multiple-family residential equipment sizing may be selected so that its cooling capacity is less than the calculated total load but not less than 80% 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.

13-607.1.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.

13-607.1.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 shut-off characteristics to minimize air leakage.

Exception: Manual dampers for outdoor air intakes may be used for single-family and multifamily residential buildings or for fan system capacities of less than 5000 cfm.

13-607.1.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.

13-607.1.ABC.2.2 Control Setback and Shut-off. The thermostat required in Section 607.1.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 non-use or reduced need including, but not limited to, unoccupied periods or sleeping hours.

13-607.1.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.

403.1 Controls. At least one thermostat shall be provided for each separate heating and cooling system.
### 13-607.1.ABC.3 Equipment Performance Standards

#### 13-607.1.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 Sub-chapter 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 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 shall be rated with an *Energy Efficiency Ratio* (EER).
5. Water-cooled and evaporatively cooled central systems under 135,000 Btu/h 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 *Integrated Part-Load Value* (IPLV).
7. Heat-operated cooling equipment and gas-driven heat pumps shall be rated with a *Coefficient of Performance* (COP)-cooling.

#### 13-607.1.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 607.1.ABC.3.2A through 607.1.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 607.1.ABC.3.2A through 607.1.ABC.3.2D, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Products covered in Table 607.1.ABC.3.2G shall have efficiency ratings supported by data furnished by the manufacturer.
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 407.1.ABC.3.2.

### 13-607.1.ABC.3.2 Minimum Efficiencies for Cooling Equipment

**13-607.1.ABC.3.2 Mandatory Provisions** Equipment shown in Tables 607.1.ABC.3.2A through 607.1.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 607.1.ABC.3.2A through 607.1.ABC.3.2D does not preclude use of such equipment. Equipment not listed in Tables 607.1.ABC.3.2A through 607.1.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.

REFER TABLE 607.1.ABC.3.2A APPENDIX A

REFER TABLE 607.1.ABC.3.2B APPENDIX A

### 13-607.1.A Prescriptive Requirements Specific to Method A.

**607.1.A.1 Ceiling Fan Credit.** Houses for which Ceiling Fan Credit is claimed in accordance with the criteria of Section 607.2.1.A.3.1 shall have ceiling fans installed with minimum fan blade diameters of no less than those listed in Table 607.1.A.1 for the size and shape of the room. Multiple smaller fans may be installed in lieu of single large fans based on the equivalence of the room dimensions being served.

Where a *primary living area* is an "L shaped" room and the smaller portion of this area is 8' X 10' or larger, a fan shall be installed in both the larger and smaller portions of the primary living area. This shall not include spaces designed to be dining rooms or dining areas. Areas separated by permanently fixed archways, walls, or dividers shall be considered separate rooms.

| 13-607.1.A | NA |
### TABLE 13-607.1.A.1
FAN SIZING TABLE

<table>
<thead>
<tr>
<th>Longest Wall Length (feet)</th>
<th>Minimum Fan Size (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 12</td>
<td>36</td>
</tr>
<tr>
<td>&gt; 12 - 16</td>
<td>48</td>
</tr>
<tr>
<td>&gt; 16 - 17.5</td>
<td>52</td>
</tr>
<tr>
<td>&gt; 17.5 - 25</td>
<td>56</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>2 fans (minimum of 48 inches each)</td>
</tr>
</tbody>
</table>

13-607.1.A.2 Multizone Practice Credit. Houses for which Multizone Practice Credit is claimed in accordance with the criteria of section 607.2.A.3.2 shall meet the following criteria:

1. A separate thermostatic control shall be provided for each zone which provides independent conditioning.
2. Zones shall be completely separated from one another by walls, ceilings, floor and totally closing doors and shall be configured such that air exchange between them does not exist in a free flow manner. Doors between zones shall not exceed a total of 40 square feet.

**Exceptions:**

a. Where one zone consists of multiple rooms which may be isolated with closeable doors and are served by one air conditioning system, separation criteria may be met by providing separate return air ducts to each room. The common space connecting the rooms shall be part of another zone.

b. Between lower and upper floors in a multiple story home.

3. No zone shall constitute more than 75% of the total conditioned floor area.

13-607.1.A.3 Ventilation Credit.

13-607.1.A.3.1 Cross Ventilation Credit. Houses for which credit is claimed for cross ventilation in accordance with the criteria in section 607.2.A.3.3 shall have provided operable aperture areas totaling a minimum of 12 percent of the floor area of the room for all primary living areas and main bedrooms.

Insect screens shall be provided for all windows and doors to be considered operable aperture area. All screened entry doors and interior doors in the ventilated areas shall be provided with either 1) mechanically attached door stops (or similar devices) to hold the door in an open position or 2) operable louvers.
The total aperture area shall be provided by a minimum of two distinct windows. Each window shall provide not more than 70 (seventy) percent of the total aperture area. The windows (or sliding glass doors) shall be placed in adjacent or opposite walls. The windows may be placed on a single outside wall if wing walls are used.

Where wing walls are included in the building design for ventilation purposes, they shall be placed between windows to create a high-pressure and a low-pressure zone on each window. Wing walls shall extend from the ground to eve height, be located on the windward side of the building, and extend outward from the building a distance at least equal to one-half the width of the window.

NOTE: This technique is effective only for areas which experience significant and continuous winds during the cooling months.

13-607.1.A.3.2 Whole House Fan Credit. Houses for which Whole House Fan Credit is claimed shall have installed a whole house fan sized to provide a minimum of 20 air changes per hour for the entire house. The fan installed shall have a free air CFM rating of at least 3 times the square footage of the conditioned area of the house. To assure adequate air exhaust, the house attic shall have gable, ridge or wind turbine vents whose total opening area is equal to 4 times the ceiling cutout area for the whole house fan. Soffit vents shall not be included in the exhaust vent area.

13-607.1.A.4 Attic Radiant Barrier Credit. Houses for which Attic Radiant Barrier Credit is claimed in accordance with the criteria of Section 607.2.A.3.4 shall have installed a radiant barrier that meets the following criteria:
1. It shall be fabricated over a ceiling insulated to a minimum of R-19 with conventional insulation. The radiant barrier credit 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 604.1.ABC.1. Either a sheet type or spray applied interior radiation control coating (IRCC) may be used.
2. It shall be installed in one of three prescribed configurations or a configuration otherwise approved by the Florida Building Commission. See Figure 607.1.A.4.
3. If the radiant barrier material has only one surface with high reflectivity or low emissivity it shall be facing downward toward the ceiling insulation.
4. The attic airspace shall be vented in accordance with Section 2309.7 of the Florida Building Code.
5. The radiant barrier system shall conform to ASTM C1313, Standard Specification for Sheet Radiant Barriers for Building Construction Applications or ASTM C1321, Standard Practice for Installation and Use of Interior Radiation Control Coating Systems (IRCCS) in Building Construction as appropriate to 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 C1371.


7. The radiant barrier shall be installed so as to cover gable ends without closing off any soffit, gable or roof ventilation.

REFER FIGURE 607.1.A.4 -2 APPENDIX A

13-607.1.A.5 White Roof Credit. Houses for which a White Roof Credit is claimed in accordance with Section 607.2.A.3.6 shall have an installed roof that meets the following criteria:

1. Roof type may only be metal, concrete, tile or single ply membrane for residential construction.
2. Roof must be white with a tested total solar reflectance of 65% or greater when evaluated in accordance with ATM Standard E-903. Roof shall have a surface emissivity of 80% or greater. Testing of a qualifying sample of the roofing material shall be performed by an approved independent laboratory and product labeling commensurate with these results shall be provided by the manufacturer.

13-607.1.B Prescriptive 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 Seasonal Energy Efficiency Ratio (SEER) equal to or greater than the prescribed value on Table 6B-1 of Form 600B for the Compliance Package chosen.
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 Energy Efficiency Ratio (EER) equal to the prescribed SEER level on Table 6B-1 of Form 600B for the Compliance Package chosen.

13-607.2.A.2 Multiple Cooling Systems. Where two or more cooling systems of the same type are installed with different levels of efficiency serving different parts of the house, a single system multiplier may be calculated. To select a multiplier for a dual system, the efficiency ratings for the two systems shall be combined based on the percentage of the total capacity supplied by each system. The new effective efficiency rating shall be calculated by Formula 6-2 in Section 5.2 of Appendix C of this chapter.
13-607.2.A.3 Cooling Credit Multipliers. Cooling Credit Multipliers (CCM) are given for certain technologies which reduce energy used for air conditioning. Cooling credit may be obtained for the options in sections 607.2.A.3.1 through 607.2.A.3.4. Where more than one cooling credit is taken, the multipliers for each option shall be multiplied together to obtain one multiplier.

13-607.2.A.3.1 Ceiling Fans. Ceiling fan credit may be taken if one or more ceiling fans are installed in each of the bedrooms and a minimum of one ceiling fan is installed in all primary living areas (living rooms, family rooms, or great rooms). Prescriptive requirements in Section 607.1.A.1 shall be met. The Cooling Credit Multiplier (CSM) shall be determined from Table 6A-19 on Form 600A. Credit shall not be taken for both ceiling fans and cross ventilation.

13-607.2.A.3.2 Multizone Practice. Multizone credit may be taken if two or more spaces (zones) are completely separated from one another by walls, ceilings, floor and totally closing doors and the prescriptive requirements in Section 607.1.A.2 are met. The multizone credit multiplier shall be determined from Table 6A-19 on Form 600A.

13-607.2.A.3.3 Ventilation. Ventilation cooling credit may be taken for either cross ventilating a house or by installing a whole house fan, but credit shall not be taken for both. Credit shall not be taken for both cross ventilation and ceiling fans. The prescriptive requirements in Sections 607.1.A.3.1 or 607.1.A.3.2 shall be met for cross ventilation or whole house fans, respectively. Cooling credit for ventilation shall be determined from Table 6A-19 on Form 600A.

13-607.2.A.3.4 Attic Radiant Barriers. Cooling credit may be taken for attic radiant barriers where a radiant barrier system is to be installed in one of the configurations depicted in Figure 6-2 that meets all the prescriptive requirements in Section 607.1.A.4. Cooling credit shall be taken against the ceiling load by multiplying the summer point multiplier for the ceiling configuration and insulation level chosen from Table 6A-4 on Form 600A by a credit multiplier of the following:

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet type radiant barriers</td>
<td>0.70 (all climate zones)</td>
</tr>
<tr>
<td>Interior Radiation Control Coatings</td>
<td>0.849 North Florida</td>
</tr>
<tr>
<td></td>
<td>0.864 Central Florida</td>
</tr>
<tr>
<td></td>
<td>0.865 South Florida</td>
</tr>
</tbody>
</table>

13-607.2.A.3.5 Programmable Thermostats. Cooling credit may be taken for programmable thermostats capable of being set as follows:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>78° F from 3 PM to 9 AM</td>
</tr>
<tr>
<td></td>
<td>83° F from 9 AM to 3 PM</td>
</tr>
</tbody>
</table>
The cooling credit multiplier for this thermostat shall be determined from Table 6A-19 on Form 600A.

**13-607.2.A.3.6 White Roofs.** Cooling credit may be taken for white roofs where a white roof is installed of an approved configuration and solar reflectance. Cooling credit shall be taken against the ceiling load by multiplying the summer point multiplier for the ceiling configuration and insulation level chosen on Form 600A by a credit multiplier of 0.55.

**13-607.2.A.4 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 600.2.A.3.1. New systems may be replacements of existing equipment or equipment installed to condition only the addition. New equipment may qualify for the multizone credit if structural requirements are met as per Section 607.1.A.2.

**13-607.2.A.5 Internal Gains.** Internal gains shall be considered for both the Baseline and As-Built conditions. The multiplier for internal gains shall be determined from Table 6A-6 on Form 600A.

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**SECTION 13-608 SPACE HEATING SYSTEMS**

**13-608.1 Prescriptive Requirements.**

**13-608.1.ABC Basic Prescriptive Requirements for Methods A, B, and C**

**13-608.1.ABC.1 Equipment Sizing.** An HVAC equipment sizing calculation shall be performed on the building in accordance with the criteria in Section 607.1.ABC.1 and shall be attached to the Form 600 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 608.1.ABC.1.1 through 608.1.ABC.1.4. System sizing calculations shall not include loads due to intermittent local mechanical ventilation such as standard kitchen and bathroom exhaust systems.

**13-608.1.ABC.1.1 Heat Pumps.** Heat pump sizing shall be based on the cooling requirements as calculated according to Section 607.1.ABC.1 and the heat pump total cooling capacity shall not be more than 115% of the design cooling load even if the design heating load is greater than 115% of the design cooling load. 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.

**13-608.1.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

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**SECTION 403 SYSTEMS (Mandatory)**

**403.1 Controls.** At least one thermostat shall be provided for each separate heating and cooling system.

**403.6 Equipment sizing.** Heating and cooling equipment shall be sized in accordance with Section M1401.3 of the *International Residential Code.***

**403.1.1 Heat pump supplementary heat.** Heat pumps having supplementary electric-resistance heat shall have controls that, except during defrost, prevent supplemental heat operation when the heat pump compressor can meet the heating load.
### 13-608.1.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 13-608.1.ABC.1.

### 13-608.1.ABC.1.4 Extra Capacity Required For Special Occasions

Residences requiring excess heating capacity on an intermittent basis shall comply with Section 607.1.ABC.1.2.

### 13-608.1.ABC.2 Controls

Requirements specified for controls in Section 607.1.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.

### 13-608.1.ABC.3 Equipment Performance Standards

#### 13-608.1.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 Sub-Chapter 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.

#### 13-608.1.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 607.1.ABC.3.1.1.

#### 13-608.1.ABC.3.2 Minimum Efficiencies for Heating Equipment

Tables 607.1.ABC.3.2B, 607.1.ABC.3.2D, and 608.1.ABC.3.2E through 608.1.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 607.1.ABC.3.2B** Heat Pumps
- **Table 607.1.ABC.3.2D** Packaged Terminal Air Conditioners and Heat Pumps
- **Table 608.1.ABC.3.2E** Furnaces, Duct Furnaces, and Unit Heaters
- **Table 608.1.ABC.3.2F** Gas- and Oil-Fired Boilers

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...
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% of the input.

Refer Table 608.1.ABC.3.2E Appendix A  
Refer Table 608.1.ABC.3.2F Appendix A

13-608.1.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, multi-stage indoor thermostat, or combinations thereof.

13-608.1.A Prescriptive Requirements Specific to Method A.

13-608.1.A.1 Multizone Practice Credit. Houses for which Multizone Practice Credit is claimed in accordance with the criteria of Section 608.2.A.4 shall meet the requirements in Section 607.1.A.2.

13-608.1.A.2 Attic Radiant Barrier Credit. Houses for which Attic Radiant Barrier Credit is claimed in accordance with the criteria of Section 608.2.A.4.1 shall meet all the requirements in Section 607.1.A.3.

13-608.1.A.3 Programmable Thermostat Credit. Houses for which programmable thermostat credit is claimed shall have one or more features on the thermostat which prevent supplemental heat from being automatically engaged.

13-608.2 Performance Calculation Procedures
13-608.2.A Performance Calculation Procedures for Method A

13-608.2.A.1 Types of Heating Systems and Multipliers. Space heating systems are characterized as either heat pumps, electric resistance or combustion. Heat pumps (reverse cycle air-conditioning) can be either electric or gas-driven. Typical combustion systems are natural gas and liquid petroleum gas (propane). Multipliers shall be determined for the type of heating system to be installed and its efficiency rating from Table 6A-17 on Form 600A.

Interpolation of multipliers for efficiencies falling within ranges may be made in accordance with Section 1.3 of Appendix C of this chapter.
13-608.2.A.2 Multiple Heating Systems. Where two or more heating systems of the same type are installed with different levels of efficiency serving different parts of the house, a single system multiplier may be calculated. To select a multiplier for a dual system, the efficiency ratings for the two systems shall be combined based on the percentage of the total capacity supplied by each system. The new effective efficiency rating shall be calculated according to the formula in Section 5.2 of Appendix C of this chapter.

Where two or more dissimilar systems, such as electric and fuel-fired systems, are utilized, separate calculations shall be made for the separate zones of the structure serviced by each.

13-608.2.A.3 Heating Credit Multipliers. Heating Credit Multipliers (HCM) are given for certain technologies which reduce energy use or cost, including natural gas and other fuels. Heating credit may be taken for the options in Sections 608.2.A.3.1 through 608.2.A.3.4. Where more than one heating credit is taken, the multipliers for each option shall be multiplied together to obtain one multiplier.

13-608.2.A.3.1 Attic Radiant Barriers. Attic radiant barrier credit may be taken when an attic radiant barrier is installed which is compliant with all requirements in Section 607.1.A.4. Heating credit shall be taken against the ceiling load by multiplying the winter point multiplier for the ceiling configuration and insulation level chosen from Table 6A-13 on Form 600A by a credit multiplier of the following:

<table>
<thead>
<tr>
<th>Type</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet type radiant barriers</td>
<td>0.85 (all climate zones)</td>
</tr>
<tr>
<td>Interior Radiation Control Coatings</td>
<td>0.912 North Florida</td>
</tr>
<tr>
<td></td>
<td>0.905 Central Florida</td>
</tr>
<tr>
<td></td>
<td>0.899 South Florida</td>
</tr>
</tbody>
</table>

13-608.2.A.3.2 Multizone Practice. Multizone credit may be taken if the prescriptive construction requirements in Section 607.1.A.2 have been met. The heating credit multiplier for multizone systems shall be determined from Table 6A-18 on Form 600A.

13-608.2.A.3.3 Natural Gas Furnaces. Natural gas credit may be taken when a natural gas furnace is to be installed. The Heating Credit Multiplier (HCM) shall be determined from Table 6A-18 on Form 600A based on the Annual Fuel Utilization Efficiency (AFUE) rating of the furnace.

13-608.2.A.3.4 LP Gas. LP gas credit may be taken when a liquid petroleum (propane) furnace is to be installed. The Heating Credit Multiplier (HCM) shall be determined from Table 6A-18 on Form 600A based on the Annual Fuel Utilization Efficiency (AFUE) rating of the furnace.
**13-608.2.A.3.5 Hydronic Space Gas Water Heating.** Heating system multipliers to be used for combined gas water and space heating systems shall be those listed for the effective space heating efficiency \( \text{CEF} \) as listed by the Gas Appliance Manufacturer’s Association (GAMA) where the system has been tested to ANSI/ASHRAE 124-1991 or may utilize the heating system credit multipliers for the water heater recovery efficiency and climate zone on Table 6C-12 in section 5.1.2 of Appendix C of this chapter if not so tested.

**13-608.2.A.3.6 Programmable Thermostats.** Heating credit may be taken for programmable thermostats capable of being set as follows:
- **Winter:** 72°F from 7 am - 11 pm
  - 67°F from 11 pm - 7 am

The heating credit multiplier for this thermostat shall be determined from Table 6A-18 on Form 600A. The prescriptive requirements in Section 608.1.A.3 shall be met.

**13-608.2.A.3.7 White Roofs.** A heating multiplier shall be taken when a white roof system is installed which is compliant with all requirements in Section 607.1.A.5. Heating credit shall be taken against the ceiling load by multiplying the winter point multiplier for the ceiling configuration and insulation level chosen on Form 600A by a credit multiplier of 1.044. Credit shall not be taken for both Attic Radiant Barrier and White Roofs in conjunction.

**13-608.2.A.4 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. New equipment may qualify for the multizone credit if structural requirements are met as per Section 607.1.A.2.

**13-608.2.A.5 Infiltration.** Infiltration shall be considered for both the Baseline and As-Built conditions. The multiplier for infiltration shall be determined from Table 6A-15.

**13-608.2.A.6 Internal Gains.** Internal gains shall be considered for both the Baseline and As-Built condition. The multiplier for internal gains shall be determined from Table 6A-15.
SECTION 13-609
VENTILATION SYSTEMS

13-609.1 Prescriptive Requirements

13-609.1.ABC Basic Prescriptive Requirements for Methods A, B and C

13-609.1.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 Standard 62, Ventilation for Acceptable Indoor Air Quality, shall be the maximum rates allowed for residential applications where pressurization is provided.
2. No ventilation or air conditioning system make up air shall be provided to conditioned space from attics, roof tops, crawlspace, attached enclosed garages or outdoor spaces adjacent to swimming pools or spas.
   Exception: Makeup air may be taken from rooftops for multistory multifamily buildings.
3. If ventilation air is drawn from enclosed space(s), then the walls of the space(s) from which air is drawn shall be insulated to a minimum of R-11 and the ceiling shall be insulated to a minimum of R-19, space permitting, or R-10 otherwise.

SECTION 13-610
AIR DISTRIBUTION SYSTEMS

13-610.1 Prescriptive Requirements

13-610.1.ABC Basic Prescriptive Requirements for Methods A, B and C

13-610.1.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.

403.5 Mechanical ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

403.2 Ducts.

403.2.3 Building cavities. Building framing cavities shall not be used as supply ducts.
### 13-610.1.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 610.1.ABC.2.1 through 610.1.ABC.2.3.

#### 13-610.1.ABC.2.1 Insulation Required

The minimum installed thermal resistance (R-value) for air distribution system components shall be as specified in Table 610.1.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 607.1.ABC.3 or 608.1.ABC.3.

#### TABLE 13-610.1.ABC.2.1

**MINIMUM INSULATION LEVELS**

**AIR DISTRIBUTION SYSTEM COMPONENTS**

<table>
<thead>
<tr>
<th>Location</th>
<th>R-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>On roof</td>
<td>R-6</td>
</tr>
<tr>
<td>Exterior of building</td>
<td>R-6</td>
</tr>
<tr>
<td>Attic with ceiling insulation</td>
<td>R-6</td>
</tr>
<tr>
<td>Between conditioned floors²</td>
<td>R-4.2</td>
</tr>
<tr>
<td>Enclosed attached garages</td>
<td>R-4.2</td>
</tr>
<tr>
<td>Unconditioned basement</td>
<td>R-4.2</td>
</tr>
<tr>
<td>Vented crawlspace</td>
<td>R-4.2</td>
</tr>
</tbody>
</table>

¹ See Section 610.1.ABC.3.5, Air Handling Units.
² Except where perimeter walls to the between floor space are insulated.

#### 13-610.1.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 $R = \frac{t}{k}$ where $t$ (inches) is the installed thickness and $k$ (Btu-in/hr ft²°F) is the measured apparent thermal conductivity at 75°F 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:

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### 403.2.1 Insulation

Supply and return ducts shall be insulated to a minimum of R-8. Ducts in floor trusses shall be insulated to a minimum of R-6.

**Exception:** Ducts or portion thereof located completely inside the building thermal envelope.
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% of nominal thickness (25% 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.

13-610.1.ABC.2.3 Condensation Control. Additional insulation with vapor barrier shall be provided where the minimum duct insulation requirements of 610.1.ABC.2 are determined to be insufficient to prevent condensation.

13-610.1.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.

13-610.1.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.

As an alternative to compliance with specific criteria of Sections 610.1.ABC.3.0.4 through 610.1.ABC.3.2.1, 610.1.ABC.3.3.1 through 610.1.ABC.3.3.2, and 610.1.ABC.3.3.6, air ducts and duct systems complying with the applicable requirements of the following standards shall be deemed as meeting the intent of this code. Where these standards do not address the specific closure details of the code, in the manner required by the subsequent sections of this code, the requirements of the code shall govern.

1. SMACNA HVAC Duct Construction Standards, Metal and Flexible.
2. NAIMA Fibrous Glass Duct Construction Standards.
3. ADC Flexible Duct Performance and Installation Standards.
5. UL 181.
6. UL181A: Part I; Part II; Part III.
7. UL 181B: Part I; Part II.

13-610.1.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.
### 13-610.1.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).

### 13-610.1.ABC.3.0.2 Sealing
Air distribution system components shall be sealed with approved closure systems.

### 13-610.1.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 610.1.ABC.3 of this Code 2) inspection and 3) cleaning and maintenance. A minimum of 4" 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.

### 13-610.1.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.

### 13-610.1.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.

### 13-610.1.ABC.3.0.6 Approved Mechanical Attachments
Approved mechanical attachments for air distribution system components include screws, rivets, welds, inter-locking 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.

### 13-610.1.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 610.1.ABC.3.1 through 610.1.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 E84 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 the Standard UL 181A, Part III.

   b. Mastic or mastic plus embedded fabric systems applied to non-metal flexible duct that are listed and labeled in accordance with the Standard UL 181B, Part II.

   c. Mastic ribbons, which achieve a 25/50 Flame Spread/Smoke Density Development rating under ASTM E84 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 the Standard UL181A, Part I.
      2) Pressure-sensitive tapes applied to non-metal flexible duct that are listed and labeled in accordance with the Standard UL 181B, Part I.

   b. Heat-activated tapes applied to fibrous glass ductboard that are listed and labeled in accordance with the Standard 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 E84 or UL 723.

13-610.1.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 610.1.ABC.3.1.1 or Section 610.1.ABC.3.1.2.
13-610.1.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" w.g. when they conform to the approved closure and mechanical attachment requirements of Section 610.1.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.
   5. Pressure-sensitive tape.

13-610.1.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" w.g. or greater and flexible duct when they conform to the approved closure and mechanical attachment requirements of Section 610.1.ABC.3.0:
   1. Continuous welds.
   2. Mastic or mastic-plus-embedded fabric systems.

13-610.1.ABC.3.1.3 High Pressure Duct Systems. High pressure duct systems designed to operate at pressures greater than 3 inches water gauge (4 inches 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.

13-610.1.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 the joints between duct and other distribution system components shall be mechanically attached and sealed using approved closure systems as specified in Section 610.1.ABC.3.2.1.

13-610.1.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 610.1.ABC.3.0:
2. Pressure-sensitive tapes.
3. Mastics or mastic-plus-embedded fabric systems.

13-610.1.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 610.1 ABC.3.0.6.

13-610.1.ABC.3.3 Flexible Duct Systems, Non-Metal. Flexible non-metal 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 integral flange for sealing to other components and a minimum 3 inch shaft for insertion into the inner duct core.

Flexible ducts having porous inner cores shall not be used.

**Exception:** Ducts having a non-porous 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 610.1.ABC.3.3.1 through 610.1.ABC.3.3.6.

13-610.1.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 into each section of duct core. When the flexible duct is larger than 12 inches 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.

13-610.1.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 610.1.ABC.3.0:
1. Gasketing.
3. Pressure-sensitive tape.
4. Aerosol sealants, provided that their use is consistent with UL 181.

13-610.1.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.

13-610.1.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.

13-610.1.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 610.1.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.

13-610.1.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. Duct sag between supports shall not exceed ½ inch per foot of length. Supports shall be provided within 1.5 feet 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.
6. Hangers, saddles and other supports shall meet the duct manufacturer's recommendations and shall be of sufficient width to prevent restriction of the internal duct diameter. In no case shall the material supporting flexible duct that is in direct contact with it be less than 1 ½ inches wide.

13-610.1.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 610.1.ABC.3.4.1 or 610.1.ABC.3.4.2.
13-610.1.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 610.1.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.

13-610.1.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 610.1.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.

13-610.1.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 610.1.ABC.3.1.

13-610.1.ABC.3.5.1 Approved Closure Systems. Systems conforming to the product and application standards of Section 610.1.ABC.3.0 may be used when sealing air handling units.

13-610.1.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 six (6) feet 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.

13-610.1.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 610.1.ABC.2 and constructed and sealed in accordance with the requirements
of Section 610.1.ABC.3 appropriate for the duct materials used.
   Exception: Return air plenums.

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 610.1.ABC.3.7 and shall be
insulated in accordance with Section 610.1.ABC.2.

Building cavities which will be used as return air plenums shall be lined with a continuous
air barrier made of durable non-porous 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.

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.
Mechanical Closets. The interior surfaces of mechanical closets shall be sheathed with a continuous air barrier as specified in Section 610.1.ABC.3.7.1 and shall be sealed with approved closure systems as specified in Section 610.1.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 airtight 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.

**13-610.1.ABC.3.7.1 Approved Air Barriers.** The following air barriers are approved for use in mechanical closets:

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

**13-610.1.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 610.1.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.
### 13-610.1.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 610.1.ABC.3. and insulated according to the requirements of Section 610.1.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 610.1.ABC.3.2 or section 610.1.ABC.3.1, respective to the duct type used.

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### 13-610.1.A Prescriptive Requirements Specific to Method A

#### 13-610.1.A.1 Airtight Duct Credit

Houses for which Airtight Duct Credit is claimed in accordance with the criteria of Section 610.2.A.3 shall have demonstrated that their air distribution system(s) is(are) *substantially leak free*. ‘Substantially leak free’ shall mean distribution system air leakage to outdoors no greater than 3 cfm per 100 square feet of conditioned floor area and distribution system total air leakage to indoors and outdoors no greater than 9 cfm per 100 square feet of conditioned floor area at a pressure differential of 25 Pascal (0.10 in. w.c.) across the entire air distribution system, including the manufacturer’s air handler enclosure. Distribution system total air leakage no greater than 3 cfm per 100 square feet of conditioned floor area at a pressure difference of 25 Pascal across the entire system, including the manufacturer’s air handler enclosure, shall be deemed to meet this requirement without measurement of distribution system air leakage to outdoors.

Substantially leak free air distribution systems shall be certified by means of a test report prepared by a State approved performance tester. A State approved performance tester means a Class 1 Florida Energy Gauge Certified Energy Rater or recognized test and balance agent.
13-610.2 Performance Calculation Procedures.

13-610.2.A Performance Calculation Procedures Specific to Method A

13-610.2.A.1 Duct Types and Multipliers. Duct systems shall include both supply and return air sections and are characterized as being located in either conditioned, attic with radiant barrier, or unconditioned space. Multipliers for the type of duct system and insulation level to be installed shall be determined from Table 6A-7 and 6A-16 on Form 600A. Additional duct multipliers can be found in Tables 6-18, 6-19 and 6-20 in Section 5.4 of Appendix C of this chapter.

Systems having no return air ducts or plenums between the air intake and the air handler, such as those in mechanical closets which communicate with the conditioned space, shall be considered systems with return ducts in conditioned space.

For ductwork to qualify as being in conditioned space, it shall be located on the conditioned side of the envelope insulation and be situated in such a manner that any air leakage will be discharged into the conditioned space.

13-610.2.A.1.1 Multiple Duct Systems. Where parts of the structure are to be served by ductwork of different R-values, or by ducts in conditioned space, the duct calculation shall be performed by one of the following methods.

1. The multiplier for the lowest installed R-value may be used.
2. Each of the duct multipliers for the different R-values may be multiplied by the percent of total duct length which has this insulation rating. The results are then summed. Equation 6-3 in Section 5.4 of Appendix C of this chapter may be used to calculate the new duct multiplier.

13-610.2.A.1.2 Duct Area Determination. An estimate of the linear footage of duct is utilized by the FLA/RES computer program.

13-610.2.A.1.3 Additions. If ducts are added to supply conditioned air to the addition, the Duct Multipliers corresponding to the new duct's R-value shall be used. If conditioning is provided by existing ducts and registers or diffusers, a Duct Multiplier of 1.0 shall be assumed.

13-610.2.A.2 Air Handling Units. Air handler multipliers from Tables 6A-7A and 6A-16A for the summer and winter space conditioning loads, respectively, shall be entered into the As-Built AHU boxes on Form 600A and calculated as part of the cooling and heating loads for the building.
### 13-610.2.A.2.1 Factory-Sealed Air Handling Unit Credit
A Factory-sealed Air Handling Unit Credit Multiplier of 0.95 may be used if the unit has been tested and certified by the manufacturer to have achieved a 2 percent or less leakage rate at 1.0 inch water gauge when all air inlets, air outlets and condensate drain port(s), when present, are sealed at an air pressure of one (1) inch water gauge with no greater than 2% design cfm discharge.

### 13-610.2.A.3 Airtight Duct Credit
An airtight Duct Credit Multiplier of 1.0 may be taken if the duct work has been demonstrated to be ‘substantially leak free’ in accordance with the provisions of Section 610.1.A.1.

## SECTION 13-611
**PIPING**

### 13-611.1 Prescriptive Requirements

#### 13-611.1.ABC Basic Prescriptive Requirements for Methods A, B and C

#### 13-611.1.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 611.1.ABC.1, except as stated herein (for service water heating systems, see Section 612.1.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.
3. Piping within the conditioned space.
4. Piping within basements or unvented crawl spaces (plenums) having insulated walls.

**REFER TABLE 13-611.1.ABC.1 APPENDIX A**

#### 13-611.1.ABC.1 Other Insulation Thicknesses
Insulation thickness in Table 611.1.ABC.1 are based on insulation having thermal resistance in the range of 4.0 to 4.6 °F ft² h/Btu per inch of thickness on a flat surface at a mean temperature of 75°F.

Minimum insulation thickness shall be increased for materials having R-values less than 4.0 °F ft² h/Btu in. or may be reduced for materials having R-values greater than 4.6 °F ft² 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:

### 403.3 Mechanical system piping insulation
Mechanical system piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-2.
New Minimum Thickness = \(4.6 \times \text{Table 611.1.ABC.1 Thickness}
\)

Actual Resistivity

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

New Minimum Thickness = \(4.0 \times \text{Table 611.1.ABC.1 Thickness}
\)

Actual Resistivity

SECTION 13-612
WATER HEATING SYSTEMS

13-612.1 Prescriptive Requirements
13-612.1.ABC Basic Prescriptive Requirements for Methods A, B and C

13-612.1.ABC.2 Controls.

13-612.1.ABC.2.1 Storage Water Heater Temperature Controls.

13-612.1.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.

13-612.1.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.

13-612.1.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 in the hot water distribution line and cold water line located as close as possible to the storage tank.

13-612.1.ABC.2.3 Swimming Pool and Spa Temperature Controls

13-612.1.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.
### 13-612.1.ABC.2.2 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 non-depletable on site-recovered sources computed over an operating season are exempt from this requirement.

### 13-612.1.ABC.2.3 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.

### 13-612.1.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 two and one-half (2.50) gpm per shower head at a distribution pressure of 80 psig 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.

### 13-612.1.ABC.3 Equipment Performance Standards

#### 13-612.1.ABC.3.1 Electric Water Heater Efficiencies

#### 13-612.1.ABC.3.1.1 Storage Capacities Of 120 Gallons Or Less
All automatic electric storage water heaters having a storage capacity of 120 gallons or less and an input rating of 12 kw or less shall, when testes 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 612.1.ABC.3.2.

#### 13-612.1.ABC.3.1.2 Storage Capacities Greater Than 120 Gallons
Performance minimums for electric storage water heaters with capacities greater than 120 gallons or an input rate greater than 12 KW shall have a standby loss of \(0.30 + \frac{27}{V_T}\) percent/hour or less, where \(V_T\) is the tested storage volume in gallons and tested in accordance with ANSI test method Z21.10.3.

#### 13-612.1.ABC.3.2 Gas- and Oil-fired Water Heater Efficiencies

#### 13-612.1.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 612.1.ABC.3.2.

**REFER TABLE 13-612.1.ABC.3.2 APPENDIX A**

13-612.1.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 $E_t$ of .78 or less and a standby loss of $1.30 + 114/V_T$ (in percent/hour) or less, where $V_T$ is the tested storage volume in gallons. All gas- and oil-fired storage water heaters with input ratings greater than 155,000 Btu/h shall have a steady-state combustion efficiency $E_t$ of .78 or more and a standby loss of $1.30 + 95/V_T$, where $V_T$ is the tested storage volume in gallons.

13-612.1.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 water-air temperature difference.


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

13-612.1.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.

Combination systems utilizing a storage tank water heater as the heat source for space heating purposes with input ratings of 105,000 Btu/h (360m$^3$/kW) or less shall utilize a water heater listed by the Gas Appliance Manufacturer’s Association (GAMA). Change outs 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 (360m³/kW) shall comply with the criteria of Section 412.1.ABC.3.4, Subchapter 13-4.

Combination systems utilizing a gas-fired instantaneous (tankless) water heater (defined in Section 13-612.1.ABC.3.2.3) as the heat source for space heating purposes shall comply with the criteria of Section 13-608.2.A.3.5.

13-612.1.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.

13-612.2 Performance Calculation Procedures.

13-612.2.A Performance Calculation Procedures for Method A.

13-612.2.A.1 Water Heater Types and Multipliers. Water heating systems are characterized as electric resistance, natural gas, other fuels (including propane and oil) (with tank), gas instantaneous (tankless), integral heat pump water heater (with tank), or solar water heating systems (with tank). HWM or HWCM for the water heating system to be installed shall be determined from Table 6A-22 or Table 6A-23 on Form 600A based on the EF of the system. 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. See also section 13-C6.1, Service hot water multipliers, Form 600A, supplemental, in Appendix 13-C for additional hot water multipliers.

13-612.2.A.1.1 Multiple Water Heating Systems. Where two or more water heating systems are installed with different levels of efficiency, a single multiplier shall be calculated as per the equation in Section 5.2 of Appendix C of this chapter.

13-612.2.A.2 Water Heater Area Determination. Water heating requirements are estimated based on the number of bedrooms in the residence. Any room which has an area of 70 square feet or more and a clothes storage closet, and is not part of the common living area, shall be considered a bedroom for calculation purposes.
**13-612.2.A.3 Water Heater Credit Multipliers.** *Hot Water Credit Multipliers* (HWCM) may be taken if supplemental water heating systems or alternate systems with a backup water heating system are installed which meet the criteria in Sections 612.2.A.3.1 through 612.2.A.3.3. Hot Water Credit Multipliers shall be determined from Table 6A-23 on Form 600A for the alternate water heating system installed. Both a hot water multiplier (HWM) and a credit multiplier (HWCM) shall be used in the hot water calculation.

Electric resistance or natural gas water heating systems may be installed as backup to alternate water heating systems when the backup equipment meets a minimum efficiency of EF 0.88.

**13-612.2.A.3.1 Waste Heat Recovery Unit.** Credit may be claimed for installation of a waste *heat recovery unit* (HRU) on either an air conditioner or a heat pump where the heat recovery unit meets all the criteria for this section. Credit multipliers shall be determined from Table 6A-23 on Form 600A based on the type of system to which the HRU is attached.

Multiple HRUs on multiple air conditioners are allowed. If more than one air conditioning system is installed in a residence and only one HRU is installed, the HRU shall be attached to the system serving the daytime primary living areas (family room, living room, kitchen, dining room and adjacent bedrooms and bathrooms) to obtain credit.

If the HRU is installed in a residence which has only one water heater, the entire HRU credit may be claimed. If more than one water heater is installed in the residence, credit may be claimed based on the gallon capacity of the water heater to which it is coupled and the total capacity of the water heaters in the residence by entering a calculation for each water heating system as follows:

\[
\text{Gallons With} \quad \text{Total # X HRU \quad X \ HWCM \ X \ HWM = Hot Water Points System #1}
\]

\[
\text{Gallons Without} \quad \text{Total # X HRU \quad X \ 1 \ X \ HWM = Hot Water Points System #2}
\]

\[
\text{Equals = Total Hot Water Points}
\]

To obtain credits under the Code, a storage water heater which meets the minimum performance criteria of Section 612.1.ABC shall be used in conjunction with the HRU. This water heater shall provide service hot water to the water circuit with the most fixtures in the
residence and shall be sized as follows.

1. Two bedroom & up single-family 50 gallon tank min.
2. Two bedroom & up multifamily, and one bedroom single-family 40 gallon tank min.
3. One bedroom multifamily 30 gallon tank min.

To obtain credit, a heat recovery unit shall be tested by an independent testing laboratory under the standard rating conditions specified in Florida Standard FL-1 (see Appendix E of this chapter) and shall have a minimum net useful heat exchange effect of fifty percent. A copy of Form 600D (see Appendix D of this chapter) shall be prominently displayed on the heat recovery unit, with test results clearly visible for inspection through a transparent, weatherproof envelope. An ARDM Certified Refrigerant Desuperheater seal affixed to the unit, clearly visible for inspection, may be substituted for the 600D form. This seal indicates that the unit meets Chapter 13 of the Florida Building Code Building.

13-612.2.A.3.2 Dedicated Heat Pump. These systems are characterized as either an *add-on* to a conventional water heater or as a separate *integral* system. The credit multiplier shall be determined from Table 6A-23 on Form 600A based on the *Energy Factor (EF)* of the system installed.

13-612.2.A.3.3 Integrated Heat Pumps. These systems are characterized as either an *add-on* to a conventional water heater or as a separate integral system. The credit multiplier shall be determined from Table 6A-23 on Form 600A based on the Combined Cooling Performance Factor (CCPF) and the Combined Heating Performance Factor (CHPF) of the system installed. An equivalent Dedicated Heat Pump EF shall be calculated according to:

$$EF = \frac{q_w}{EF_{sep}}$$

$$q_w = q_{(95)CLH} + q_{wos} + \frac{DHR.HLH.C + q_{whs} - q_{(95)CLH} - SEER}{CCPF + DHR.HLH.C - CHPF}$$

where the various terms are defined in ASHRAE Standard 137 and the DOE Waiver granted to NORDYNE and published in the Federal Register Vol. 61, No. 55, Wednesday, March 20, 1996, pages 11395-11400.

13-612.2.A.3.4 Solar Water Heater. These systems are characterized as either an *add-on* to a conventional water heater or as a separate system (with tank). The credit multiplier for an *add-on* solar system (without tank) shall be determined from Table 6A-23 on Form 600A based on the *Energy Factor (EF)* of the system installed.
13-612.2.A.4 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.

13-612.1.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" minimum thickness with a thermal conductivity no greater than 0.28 Btu/in./h·ft²·°F.

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

403.4 Circulating hot water systems. All circulating service hot water piping shall be insulated to at least R-2. Circulating hot water systems shall include an automatic or readily accessible manual switch that can turn off the hot water circulating pump when the system is not in use.