

APA-1
07/04

**TRANSMITTAL SHEET FOR
NOTICE OF INTENDED ACTION**

Control No. _____ Department or Agency Alabama Department of Economic and Community Affairs

Rule No. 305-2-4-.10

Rule Title: Residential Energy Code

_____ New XX Amend _____ Repeal _____ Adopt by Reference

Would the absence of the proposed rule significantly harm or endanger the public health, welfare, or safety? NO

Is there a reasonable relationship between the state's police power and the protection of the public health, safety, or welfare? NO

Is there another, less restrictive method of regulation available that could adequately protect the public? NO

Does the proposed rule have the effect of directly or indirectly increasing the costs of any goods or services involved and, if so, to what degree? NO

Is the increase in cost, if any, more harmful to the public than the harm that might result from the absence of the proposed rule? NO

Are all facets of the rulemaking process designed solely for the purpose of, and so they have, as their primary effect, the protection of the public? YES

Does the proposed rule have an economic impact? NO

If the proposed rule has an economic impact, the proposed rule is required to be accompanied by a fiscal note prepared in accordance with subsection (f) of Section 41-22-23, Code of Alabama 1975.

Certification of Authorized Official

I certify that the attached proposed rule has been proposed in full compliance with the requirements of Chapter 22, Title 41, Code of Alabama 1975, and that it conforms to all applicable filing requirements of the Administrative Procedure Division of the Legislative Reference Service.

Signature of certifying officer *Carla Kennedy Smith*

Date 8/22/16

(DATE FILED)
(STAMP)

APA-2
07/04

ALABAMA DEPARTMENT OF ECONOMIC AND COMMUNITY AFFAIRS
ALABAMA ENERGY AND RESIDENTIAL CODES BOARD

NOTICE OF INTENDED ACTION

RULE NO. & TITLE:

305-2-4-.10 "Residential Energy Code"

INTENDED ACTION: Amend Rule

SUBSTANCE OF PROPOSED ACTION: The Alabama Energy and Residential Codes Board, under the Alabama Department of Economic and Community Affairs, proposes to amend rule 305-2-4-.10, "Residential Energy Code."

TIME, PLACE, MANNER OF PRESENTING VIEWS:

A session for oral comment will be held on Thursday, September 15, 2016, from 9:00 am until 10:00 am, at the Alabama Center for Commerce, 401 Adams Avenue, Room 342, 36104.

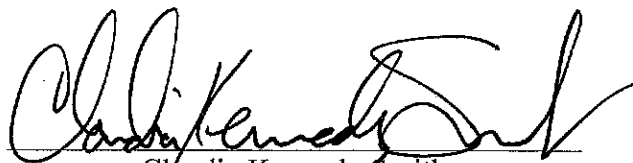
All interested parties may present their views in writing to Heather Goggin, ADECA Energy Division, P.O. Box 5690, Montgomery, AL 36103-5690. All comments must be received by the end of business on Wednesday, October 5, 2016.

FINAL DATE FOR COMMENT AND COMPLETION OF NOTICE:

October 5, 2016

CONTACT PERSON AT AGENCY:

Heather Goggin, ADECA Energy Division
401 Adams Avenue, Suite 560
Montgomery, AL 36104
(334) 242-5290 - Codes.Board@adeca.alabama.gov



Claudia Kennedy Smith
Alabama Department of Economic and
Community Affairs, General Counsel

305-2-4-.10 RESIDENTIAL ENERGY CODE. The 2015 International Energy Conservation Code (IECC) as modified below.

(1) **IECC CHAPTER 1 SCOPE AND ADMINISTRATION.**

(a) **SECTION R101 SCOPE AND GENERAL REQUIREMENTS.**

1. **R101.1 Title.** This code shall be known as the International Energy Conservation Code of Alabama, and shall be cited as such. It is referred to herein as "this code."

2. **R101.5.1 Compliance materials.** The Alabama Energy and Residential Codes Board shall approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

(b) **SECTION R102 ALTERNATIVE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT.**

1. **R102.1.1 (N1101.4) Above code programs.** The Alabama Building and Energy Codes Board or other authority having jurisdiction shall be permitted to deem a national, state or local energy efficiency program to exceed the energy efficiency required by this code. Buildings approved in writing by such an energy efficiency program shall be considered in compliance with this code. The requirements identified as "mandatory" in Chapter 4 shall be met.

(c) **SECTION R103 CONSTRUCTION DOCUMENTS.**

~~1. R103.1 General.~~

~~Construction documents and other supporting data shall be submitted in one or more sets with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the code official is authorized to require necessary construction documents to be prepared by a registered design professional or other certified persons.~~

Exception: ~~The code official is authorized to waive the requirements for construction documents or other supporting data if the code official determines they are not necessary to be submitted.~~

~~2. N1101.5 (R103.2) Information on construction documents.~~

~~Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when approved by the building official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, as applicable:~~

- ~~1. Insulation materials and their R-values.~~
- ~~2. Fenestration U-factors and SHGCs where applicable.~~
- ~~3. Area-weighted U-factor and SHGC calculations.~~
- ~~4. Mechanical system design criteria.~~
- ~~5. Mechanical and service water heating system and equipment types, sizes and efficiencies.~~
- ~~6. Equipment and system controls.~~
- ~~7. Duct sealing, duct and pipe insulation and location.~~
- ~~8. Air sealing details.~~

~~3. 1. R103.3 Review of documents.~~

~~The code official shall review the accompanying construction documents and shall identify the type of energy building construction method to be used as described in this code.~~

~~4. R103.3.1 Submittal of construction documents.~~

~~When the code official issues a permit where construction documents are submitted, the construction documents shall not be changed, modified or altered without re-submittals having been prepared and notification to the code official. Work shall be done in accordance with the submitted construction documents.~~

~~One set of construction documents shall be retained by the code official for records.~~

~~5. R103.3.2 Previous submittals.~~

~~This code shall not require changes in the construction documents, construction or designated occupancy of a structure for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith within 180 days after the effective date of this code and has not been abandoned.~~

~~6. R103.3.3 Phased submittals.~~

~~The code official shall have the authority to issue a permit for the construction of part of an energy conservation system before~~

~~the construction documents for the entire system have been submitted, provided adequate information and detailed statements have been filed complying with all pertinent requirements of this code. The holders of such permit shall proceed at their own risk without assurance that the permit for the entire energy conservation system will be granted.~~

~~7. 2. R103.4 Amended construction documents.~~

~~Changes made during construction that are not in accordance to submitted construction documents shall be resubmitted to the code official as an amended set of construction documents.~~

~~8. R103.5 Retention of construction documents.~~

~~One set of submitted construction documents shall be retained by the code official for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws.~~

~~(e) (d) SECTION R104 INSPECTIONS~~

~~1. R104.2.1 Footing and foundation inspection. Section Deleted~~

~~2. R104.2.4 Mechanical rough-in inspection. Inspections at mechanical rough-in shall verify compliance as required by the code and approved plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding R-value, system air leakage control, dampers, whole-house ventilation and minimum fan efficiency.~~

~~**Exception:** Systems serving multiple dwelling units shall be inspected in accordance with Section C104.2.4.~~

~~(2) CHAPTER 2 DEFINITIONS.~~

~~(a) SECTION R202 GENERAL DEFINITIONS.~~

~~1. SEMI CONDITIONED SPACE. An unfinished area of the dwelling such as the attic or crawl space that is insulated as to limit or prevent air infiltration and maintain consistent temperatures commensurate with those inside the thermal envelope. within the building thermal envelope.~~

~~2. PROJECTION FACTOR. The ratio of the horizontal depth of an overhang, eave, or permanently attached shading device, divided by the distance measured vertically from the bottom of the fenestration glazing to the underside of the overhang, eave, or permanently attached shading device.~~

(3) CHAPTER 3 GENERAL REQUIREMENTS.

~~(a) SECTION R301 CLIMATE ZONES.~~

~~1. R301.3 International climate zones. Section Deleted~~

~~2. R301.4 Tropical climate zone. Section Deleted~~

~~(b) SECTION R302 DESIGN CONDITIONS.~~

~~1. R302.1 (N1101.9) Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 70°F (22° C) for heating and minimum of 75°F (24° C) for cooling.~~

~~(c) (a) SECTION R303 MATERIALS, SYSTEMS AND EQUIPMENT.~~

~~1. R303.2.1 (N1101.11.1) Protection of exposed foundation insulation. Section deleted~~

(4) CHAPTER 4 RESIDENTIAL ENERGY EFFICIENCY.

~~(a) SECTION R401 GENERAL.~~

~~1. R401.2.1 (N1101.2.1) Tropical zone. Section Deleted~~

~~(b) (a) SECTION R402 BUILDING THERMAL ENVELOPE~~

~~1. R402.1.6 Insulation and fenestration requirements by component. (Mandatory). All R-values and associated U-factors including SHGC for fenestration, skylights, glazed fenestration, ceiling, and wood frame walls in tables R402.1.2 (N1102.1.2) and R402.1.4 (N1102.1.4) shall be mandatory.~~

~~2. R402.2.2.1 (N1102.2.2.1) Semi-conditioned attics. Where table N1102.1.1 (R402.1.1) requires R-30 or Table N1102.1.3 (R402.1.3) requires a U-factor of 0.035, Sprayed Polyurethane Foam (SPF) an air impermeable insulation installed to the roof deck with a U-factor of 0.05 or R-value of R-20 shall be deemed equivalent to the provisions in N1102.2.2 (R402.2.2).~~

~~3. R402.2.4 (N1102.2.4) Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weather-stripped and~~

insulated to a level in accordance with the following insulation values:

Hinged vertical doors shall have a maximum U-Factor of U-0.20 (R-5 minimum)

1. Hatches/scuttle hole covers shall have a maximum U-Factor of U-0.05 (R-19 minimum) and;
2. Pull down stairs shall have a maximum U-Factor of U-0.20 with a minimum of 75 percent of the panel area having (R-5 minimum) insulation.

Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed R-value of the loose fill insulation.

~~3.~~ 4. **R402.2.10 (N1102.2.10) Slab on grade floors.** Section Deleted

~~4.~~ 5. **R402.2.11 (N1102.2.11) Crawl space walls.** As an alternative to insulating floors over crawl spaces, crawl space walls shall be permitted to be insulated when the crawl space is not vented to the outside. The band joist shall be insulated and air sealed in accordance with Table N1102.4.1.1 (R402.4.1.1). A 3 inch (76mm) inspection/view strip shall be provided immediately below the floor joists to permit inspections for termites. Crawl space wall insulation shall be permanently fastened to the wall and extend downward from the bottom of the inspection/view strip to within 9 inches (229mm) of the finished interior grade adjacent to the foundation wall. Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder in accordance with Section R408 of the International Residential Code. All joints of the vapor retarder shall overlap by 6 inches (153 mm) and shall extend up the stem wall not less than 6 inches (153mm) and shall be attached to the stem wall.

~~5.~~ 6. **R402.3.2.1 (N1102.3.2.1) Glazed fenestration SHGC exception.** ~~In Climate Zones 2 and 3, permanently shaded vertical fenestration shall be permitted to satisfy the SHGC requirements. The projection factor of an overhang, eave, or permanently attached shading device shall be greater than or equal to the value listed in table N1102.2.3.1 for the appropriate orientation. The minimum projection shall extend beyond each side of the glazing a minimum of 12 inches (0.3m).~~

~~Each orientation shall be rounded to the nearest cardinal orientation (+/- 45 degrees or 0.79 rad) for purposes of calculations and demonstrating compliance. Where applicable, glazed fenestration SHGC exception shall be as referenced in section C402.4.3.~~

~~6.~~ **7. R402.4.1.1 (N1102.4.1.1) Installation (Mandatory).**

The components of the building thermal envelope as listed in Table R402.4.1.1 (Table N1102.4.1.1) shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table R402.4.1.1 (Table N1102.4.1.1), as applicable to the method of construction.

~~7.~~ **8. R402.4.1.2 (N1102.4.1.2) Testing (Mandatory).**

The building or dwelling unit shall be tested and verified as having an air leakage rate not exceeding 5 air changes per hour. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Testing shall be performed at any time after creation of all penetrations of the building thermal envelope. During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weather-stripping or other infiltration control measures;
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
3. Interior doors, if installed at the time of the test, shall be open;
4. Exterior doors for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

~~8. R402.4.5 (N1102.4.5) Recessed lighting.~~ Recessed luminaries installed in the building thermal envelope shall be installed sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaries shall be IC rated and labeled as having an air leakage rate not more than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E-283 at a 1.57 psf (75 Pa) pressure differential. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

~~(e)~~ **(b) SECTION R403 SYSTEMS.**

1. R403.1.1 (N1103.1.1) Programmable thermostat. Section Deleted

2. R403.9 (N1103.9) Snow melt system controls. Section Deleted

3. R403.10 (N1103.10) Residential pools and permanent residential spas. Section Deleted

(i) R403.10.1 (N1103.10.1) Residential pools and permanent residential spas. Heaters. Section Deleted

(ii) R403.10.2 (N1103.10.2) Heaters. Time Switches. Section Deleted

(iii) R403.10.3 (N1103.10.3) Time Switches. Covers. Section Deleted

~~(iv) R403.10.4 (N1103.10.4) Covers. Section Deleted~~

4. R403.11 (N1103.11) Portable spas. Section Deleted

5. R403.12 (N1103.12) Residential pools and permanent residential spas. Section Deleted

~~(d)~~ (c) SECTION R404 ELECTRICAL POWER AND LIGHTING SYSTEMS.

1. R404.1 (N1104.1) Lighting equipment (Mandatory). Not less than 75 percent of the lamps in permanently installed lighting fixtures at the time of inspection shall be high-efficacy lamps or not less than 75 percent of the permanently installed lighting fixtures shall contain only high efficacy lamps.

~~(e)~~ (d) SECTION R405 SIMULATED PERFORMANCE ALTERNATIVE (PERFORMANCE) .

~~1. R405.1 (N1105.1) Scope. This section establishes criteria for compliance using simulated energy performance analysis. Such analysis shall include heating cooling and service water heating energy only. The code official is not~~

~~responsible for verification of compliance for documents submitted under this section.~~

~~2.~~ 1. **R405.3 (N1105.3) Performance-based compliance.**

Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have an annual energy cost that is less than or equal to the annual energy cost of the standard reference design. Energy prices shall be taken from a source such as the Department of Energy, Energy Information Administration's *State Energy Price and Expenditure Report*. *Building officials* shall be permitted to require time-or-use pricing in energy cost calculation.

~~3.~~ 2. **R405.6.2 (N1105.6.2) Specific approval.** Performance analysis tools meeting the applicable provisions of Section R405 shall be permitted to be approved. Tools are permitted to be approved based on meeting a specified threshold. The Alabama Energy and Residential Codes Board shall be permitted to approve tools for a specified application or limited scope.

~~(f)~~ (e) **SECTION R406 ENERGY RATING INDEX COMPLIANCE ALTERNATIVE.**

~~1. R406.1 (N1106.1) Scope.~~ This section establishes criteria for compliance using energy rating index analysis. Such analysis shall include heating cooling and service water heating energy only. The code official is not responsible for verification of compliance for documents submitted under this section.

~~2.~~ 1. **R406.4 (N1106.4) ERI-based compliance.** Compliance based on an ERI analysis requires that the rated design be shown to have an ERI less than or equal to a score of 70 in both zones 2 and 3 when compared to the ERI reference design.

(2) **EFFECTIVE DATE.** For purposes of enforcement, this code shall become effective on October 1, 2016.

TABLE R402.1.2 (N1102.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

| CLIMATE ZONE | FENESTRATION U-FACTOR ^b | SKYLIGHT U-FACTOR ^b | GLAZED FENESTRATION SHGC ^b | CEILING R-VALUE ^c | WOOD FRAME WALL R-VALUE | MASS WALL R-VALUE ^e | FLOOR R-VALUE | BASEMENT WALL R-VALUE ^d | SLAB R-VALUE & DEPTH | CRAWL SPACE WALL R-VALUE ^e |
|--------------|------------------------------------|--------------------------------|---------------------------------------|------------------------------|-------------------------|--------------------------------|---------------|------------------------------------|----------------------|---------------------------------------|
| 2 | 0.65 0.35 ^f | 0.65 0.55 | 0.25 0.27 | 30 | 13 | 4/6 | 13 | 0 | 0 | 0 |
| 3 | 0.50 0.35 ^f | 0.55 0.55 | 0.25 0.27 | 30 | 13 | 5/8 | 19 | 5/13 ^d | 0 | 5/13 |

For SI: 1 foot = 304.8 mm.

- a. R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed R-value of the insulation shall not be less than the R-value specified in the table.
- b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in climate zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
- c. "5/13" means R-5 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
- d. Basement wall insulation is not required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
- e. The second R-value applies when more than half the insulation is on the interior of the mass wall.
- f. Reference R402.2.2.1

TABLE 402.1.4
EQUIVALENT U-FACTORS^a

| Climate Zone | Fenestration U-Factor | Skylight U-Factor | Ceiling U-Factor ^c | Frame Wall U-Factor | Mass Wall U-Factor ^b | Floor U-Factor | Basement Wall U-Factor | Crawl Space Wall U-Factor |
|--------------|-----------------------------|-----------------------------|-------------------------------|---------------------|---------------------------------|----------------|------------------------|---------------------------|
| 2 | 0.65 <u>0.35</u> | 0.75 <u>0.55</u> | 0.035 | 0.084 | 0.165 | 0.064 | 0.360 | 0.477 |
| 3 | 0.50 <u>0.35</u> | 0.65 <u>0.55</u> | 0.035 | 0.084 | 0.141 | 0.047 | 0.360 | 0.135 0.136 |

a. Non-fenestration U-factors shall be obtained from measurement, calculation, or an approved source.

b. When more than half the insulation is on the interior, the mass wall u-factors shall be a maximum of 0.14 in Zone 2 and 0.12 in Zone 3.

c. Reference R402.2.2.1

**TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS**

| BUILDING COMPONENT | STANDARD REFERENCE DESIGN | PROPOSED DESIGN |
|---|--|---|
| Glazing ^a | Where applicable, glazed fenestration SHGC exception shall be referenced in section C402.4.3. | As proposed |
| Heating systems ^b | <p>Fuel type: same as proposed design</p> <p>Efficiencies:</p> <p>Electric: air source heat pump with prevailing federal minimum standards</p> <p>Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards</p> <p>Nonelectric boilers: natural gas boiler with prevailing federal minimum standards</p> <p>Capacity: sized in accordance with Section N1103.6</p> | <p>As proposed</p> <p>—</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> |
| Cooling systems ^{b, c, d} | <p>Fuel Type: Electric</p> <p>Efficiency: In accordance with prevailing federal minimum standards</p> <p>Capacity: sized in accordance with Section N1103.6</p> | <p>As proposed</p> <p>As proposed</p> <p>As proposed</p> |
| Service Water Heating ^{b, c, d, e} | <p>Fuel type: same as proposed design</p> <p>Efficiency: In accordance with prevailing federal minimum standards</p> <p>Use: gal/day = 30 10 x Nbr</p> <p>Tank temperature: 120° F</p> | <p>As proposed</p> <p>As proposed</p> <p>Same as standard reference</p> <p>—</p> |

TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

| BUILDING COMPONENT | STANDARD REFERENCE DESIGN | PROPOSED DESIGN |
|--------------------------------|---|-----------------|
| Above-grade walls | Type: mass wall if proposed wall is mass; otherwise wood frame. | As proposed |
| | Gross area: same as proposed | As proposed |
| | U-factor: as specified in Table R402.1.4 | As proposed |
| | Solar absorptance = 0.75 | As proposed |
| | Emittance = 0.90 | As proposed |
| Basement and crawl space walls | Type: same as proposed | As proposed |
| | Gross area: same as proposed | As proposed |
| | U-factor: from Table R402.1.4 (as amended), with insulation layer on interior side of walls | As proposed |
| | | |
| Above-grade floors | Type: wood frame | As proposed |
| | Gross area: same as proposed | As proposed |
| | U-factor: as specified in Table R402.1.4 | As proposed |
| Ceilings | Type: wood frame | As proposed |
| | Gross area: same as proposed | As proposed |
| | U-factor: as specified in Table R402.1.4 | As proposed |
| Roofs | Type: composition shingle on wood sheathing | As proposed |
| | Gross area: same as proposed | As proposed |
| | Solar absorptance = 0.75 | As proposed |
| | Emittance = 0.90 | As proposed |
| Attics | Type: vented with aperture = 1 ft^2 per 300 ft^2 ceiling area | As proposed |
| Foundations | Type: same as proposed | As proposed |
| | Foundation wall area above and below grade and soil characteristics: same as proposed | As proposed |
| Opaque doors | Area: 40 ft^2 | As proposed |
| | Orientation: North | As proposed |
| | U-factor: same as fenestration from Table R402.1.4 | As proposed |

(continued)

TABLE R405.5.2(1)—continued
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

| BUILDING COMPONENT | STANDARD REFERENCE DESIGN | PROPOSED DESIGN |
|---|--|--|
| Vertical fenestration other than opaque doors | Total area ^g = (a) The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area (b) 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area | As proposed |
| | Orientation: equally distributed to four cardinal compass orientations (N, E, S & W). | As proposed |
| | U-factor: as specified in Table R402.1.4 | As proposed |
| | SHGC: as specified in Table R402.1.2 except that for climates with no requirement (NR) SHGC = 0.40 shall be used. | As proposed |
| | Interior shade fraction: $0.92 - (0.21 \times \text{SHGC for the standard reference design})$ | 0.92 - (0.21 × SHGC as proposed) |
| | External shading: none | As proposed |
| Skylights | None | As proposed |
| Thermally isolated sunrooms | None | As proposed |
| Air exchange rate | Air leakage rate of 5 air changes per hour in climate zones 2 and 3 at a pressure of 0.2 inches w.g (50 Pa). The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$ where: CFA = conditioned floor area N_{br} = number of bedrooms Energy recovery shall not be assumed for mechanical ventilation. | For residences that are not tested, the same air leakage rate as the standard reference design. For tested residences, the measured air exchange rate ^a . The mechanical ventilation rate ^b shall be in addition to the air leakage rate and shall be as proposed. |
| Mechanical ventilation | None, except where mechanical ventilation is specified by the proposed design, in which case: Annual vent fan energy use: $kWh/yr = 0.03942 \times CFA + 29.565 \times (N_{br} + 1)$ where: CFA = conditioned floor area N_{br} = number of bedrooms | As proposed |

(continued)

TABLE R405.5.2(1)—continued
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

| BUILDING COMPONENT | STANDARD REFERENCE DESIGN | PROPOSED DESIGN |
|---------------------------------|---|--|
| Internal gains | $IGain = 17,900 + 23.8 \times CFA + 4104 \times N_{br}$ (Btu/day per dwelling unit) | Same as standard reference design. |
| Internal mass | An internal mass for furniture and contents of 8 pounds per square foot of floor area. | Same as standard reference design, plus any additional mass specifically designed as a thermal storage element but not integral to the building envelope or structure. |
| Structural mass | For masonry floor slabs, 80 percent of floor area covered by R-2 carpet and pac and 20 percent of floor directly exposed to room air. | As proposed |
| | For masonry basement walls, as proposed but with insulation required by Table R402.1.4 located on the interior side of the walls | As proposed |
| | For other walls, for ceilings, floors, and interior walls, wood frame construction | As proposed |
| Heating systems ^{c, d} | Fuel type: same as proposed design | As proposed |
| | Efficiencies: Electric: air-source heat pump with prevailing federal minimum standards | As proposed |
| | Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards | As proposed |
| | Nonelectric boilers: natural gas boiler with prevailing federal minimum standards | As proposed |
| | Capacity: sized in accordance with Section N1103.6 | As proposed |

(continued)

TABLE R405.5.2(1)—continued
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

| BUILDING COMPONENT | STANDARD REFERENCE DESIGN | PROPOSED DESIGN |
|---|---|---|
| Cooling systems ^{c, e} | Fuel Type: Electric Efficiency: In accordance with prevailing federal minimum standards Capacity: sized in accordance with Section N1103.6 | As proposed As proposed As proposed |
| Service water heating ^{c, d, e, f} | Fuel type: same as proposed design Efficiency: In accordance with prevailing federal minimum standards Use: gal/day = 30 10 x Nbr Tank temperature: 120° F | As proposed As proposed Same as standard reference |
| Thermal distribution systems | Duct insulation: From Section R403.2.1 A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies for all systems other than tested duct systems. For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft ² (9.29 m ²) of conditioned floor area at a pressure of differential of 0.1 inches w.g. (25 Pa). | As tested or as specified in Table R405.5.2(2) if not tested. Duct insulation shall be as proposed. |
| Thermostat | Type: Manual, cooling temperature setpoint = 75°F; Heating temperature setpoint = 72°F | Same as standard reference |

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L, °C = (°F-32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the *code official*, testing shall be conducted by an *approved party*. Hourly calculations as specified in the *ASHRAE Handbook of Fundamentals*, or the equivalent shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 *ASHRAE Handbook of Fundamentals*, page 26.24 and the "Whole-house Ventilation" provisions of 2001 *ASHRAE Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.
- c. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- d. For a proposed design without a proposed heating system, a heating system with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- e. For a proposed design home without a proposed cooling system, an electric air conditioner with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- f. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater with the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For the case of a proposed design without a proposed water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.
- g. For residences with conditioned basements, R-2 and R-4 residences and townhouses, the following formula shall be used to determine glazing area:

$$AF = A_s \times FA \times F$$

where:

AF = Total glazing area

A_s = Standard reference design total glazing area.

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

F = (Above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where:

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

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

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

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and CFA are in the same units.

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Statutory Authority: Code of Ala. 1975 §§41-23-80 through 85, as amended

History: **New Rule:** **Filed:** September 30, 2015 **Effective:** November 4, 2015.

Amended: _____; **Effective:** _____.