2021 International Energy Conservation Code (IECC)

Chapter 1 [CE] (Amended) Scope and Administration

Section C105.2.6 Final inspection.

The building shall have a final inspection and not be occupied until approved.

Chapter 4 [CE] (Amended) Commercial Energy Efficiency

Section C402.5.5 Rooms containing fuel-burning appliances.

In Climate Zones 3 through 8, where combustion air is supplied through openings in an exterior wall to a room or space containing a space-conditioning fuel-burning appliance, one of the following shall apply:

1. The room or space containing the appliance shall be located outside of the building thermal envelope.

2. The room or space containing the appliance shall be enclosed and isolated from conditioned spaces inside the building thermal envelope. Such rooms shall comply with all of the following:
   - 2.1. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be insulated to be not less than equivalent to the insulation requirement of below-grade walls as specified in Table C402.1.3 or C402.1.4.
   - 2.2. The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be sealed in accordance with Section C402.5.1.1.
   - 2.3. The doors into the enclosed room or space shall be fully gasketed.
   - 2.4. Water lines and ducts in the enclosed room or space shall be insulated in accordance with Section C403.
   - 2.5. Where an air duct supplying combustion air to the enclosed room or space passes through conditioned space, the duct shall be insulated to an R-value of not less than R-8.

Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.

2. Fireplaces and stoves complying with Sections 901 through 905 of the International Mechanical Code, and Section 2111.14 of the International Building Code.

C405.11 Automatic receptacle control.

The following ~~shall~~ may have automatic receptacle control complying with Section C405.11.1:

1. At least 50 percent of all 125V, 15- and 20-amp receptacles installed in enclosed offices, conference rooms, rooms used primarily for copy or print functions, breakrooms, classrooms and individual workstations, including those installed in modular partitions and module office workstation systems.

2. At least 25 percent of branch circuit feeders installed for modular furniture not shown on the construction documents.

Section C405.11.1 Automatic receptacle control function.

Automatic receptacle controls shall comply with the following:

1. Either split controlled receptacles shall be provided with the top receptacle controlled, or a controlled receptacle shall be located within 12 inches of each uncontrolled receptacle.

2. One of the following methods shall be used to provide control:
    2.1. A scheduled basis using a time-of-day operated control device that turns receptacle power off at specific programmed times and can be programmed separately for each day of the week. The control device shall be configured to provide an independent schedule for each portion of the building of not more than 5,000 square feet and not more than one floor. The occupant shall be able to manually override an area for not more than 2 hours. Any individual override switch shall control the receptacles of not more than 5,000 feet.
    2.2. An occupant sensor control that shall turn off receptacles within ~~20~~ 120 minutes of all occupants leaving a space.
    2.3. An automated signal from another control or alarm system that shall turn off receptacles within ~~20~~ 120 minutes after determining that the area is unoccupied.
3. All controlled receptacles shall be permanently marked in accordance with NFPA 70 and be uniformly distributed throughout the space.

4. Plug-in devices shall not comply.

Exceptions: Automatic receptacle controls are not required for the following:

1. Receptacles specifically designated for equipment requiring continuous operation (24 hours per day, 365 days per year).

2. Spaces where an automatic control would endanger the safety or security of the room or building occupants.

3. Within a single modular office workstation, noncontrolled receptacles are permitted to be located more than 12 inches, but not more than 72 inches from the controlled receptacles serving that workstation.

Chapter 2 [RE] (Amended) Definitions

Framing Factor.

The fraction of the total building component area that is structural framing.

Chapter 4 [RE] (Amended) Residential Energy Efficiency

~~**Section R401.2.5 (N1101.13.5) Additional energy efficiency.**~~

TABLE R402.1.2 (N1102.1.2) MAXIMUM ASSEMBLY U-FACTORS[a] AND FENESTRATION REQUIREMENTS

CLIMATE ZONE	FENESTRATION U-FACTOR[b]	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC[d,e]	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR[b]	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
1	0.50	0.75	0.25	0.035	0.084	0.197	0.064	0.360	0.477
2	0.40	0.65	0.25	0.030	0.084	0.165	0.064	0.360	0.477
3	0.32	0.55	0.25	0.030	0.060	0.098	0.047	0.091	0.136
4 except Marine	0.30	0.55	0.40	0.026	0.060	0.098	0.047	0.059	0.065
5 and Marine 4	0.30	0.55	NR	0.026	0.051	0.082	0.033	0.050	0.055
6	0.30	0.55	NR	0.026	0.045	0.060	0.033	0.050	0.055
7 and 8	0.30	0.55	NR	0.026	0.045	0.057	0.028	0.050	0.055

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

b. Mass walls shall be in accordance with Section R402.2.5. Where more than half the insulation is on the interior, the mass wall U-factors shall not exceed 0.17 in Climate Zone 1, 0.14 in Climate Zone 2, 0.12 in Climate Zone 3, 0.087 in Climate Zone 4 except Marine, 0.065 in Climate Zone 5 and Marine 4, and 0.057 in Climate Zones 6 through 8.

c. In warm-humid locations as defined by Figure R301.1 and Table R301.1, the basement wall U-factor shall not exceed 0.360.

d. The SHGC column applies to all glazed fenestration.

Exception: In Climate Zones 0 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

e. There are no SHGC requirements in the Marine Zone.

f. A maximum U-factor of 0.32 shall apply in Marine Climate Zone 4 and Climate Zones 5 through 8 to vertical fenestration products installed in buildings located either:

1. Above 4,000 feet in elevation above sea level, or
2. In windborne debris regions where protection of openings is required by Section R301.2.1.2. of the International Residential Code.

TABLE R402.1.3 (N1102.1.3) INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION U-FACTOR[b]	SKYLIGHT[b] U-FACTOR	GLAZED FENESTRATION SHGC[b,e]	CEILING R-FACTOR	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE[i]	FLOOR R-VALUE	BASEMENT[c] WALL R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE[c] WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13 + 5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13 + 5[h]	8/13	19	10/13	10, 2ft	10/13
5 and Marine 4	0.30	0.55	NR	49	23 or 13 + 7.5[h] or 20 + 3.8[h]	13/17	30[g]	15/19	10, 4ft or 15, 3ft	15/19
6	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

For SI: 1 foot = 304.8 mm.

NR = Not Required.

a. R-values are minimums. U-factors and SHGC are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not 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: In Climate Zones 1 through 3, skylights shall be permitted to be excluded from glazed fenestration SHGC requirements provided that the SHGC for such skylights does not exceed 0.30.

c. “10/13” means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. “15/19” means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation on the interior of the basement wall. Alternatively, compliance with “15/19” shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.

d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-value for slabs. as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.

e. There are no SHGC requirements in the Marine Zone.
f. Basement wall insulation shall not be required in warm-humid locations as defined by Figure R301.1 and Table R301.1.
g. Alternatively, insulation sufficient to fill the framing cavity providing not less than an R-value of R-19.
h. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
i. Mass walls shall be in accordance with Section R402.2.5. The second R-value applies where more than half of the insulation is on the interior of the mass wall.

R403.3.5 (N1103.3.5) Duct testing (Mandatory).

Ducts shall be pressure tested to determine air leakage by one of the following methods:

1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure if installed at the time of the test. Registers shall be taped or otherwise sealed during the test.

2. Postconstruction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. Registers shall be taped or otherwise sealed during the test.

Exceptions:

1. A duct air-leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.

2. A duct air-leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.

A written report of the results of the test shall be signed by the party conducting the test and provided to the building official.

R403.3.6 (N1103.3.6) Duct leakage (Prescriptive).

The total leakage of the ducts, where measured in accordance with Section R403.3.5, shall be as follows:

1. Rough-in test: The total leakage shall be less than or equal to 4 cubic feet per minute per 100 square feet of conditioned floor area where the air handler is installed at the time of the test. Where the air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute per 100 square feet of conditioned floor area.

2. Postconstruction test: Total leakage shall be less than or equal to 4 cubic feet per minute per 100 square feet of conditioned floor area.

R403.3.7 (N1103.3.7) Building cavities (Mandatory).
Building framing cavities shall not be used as supply ducts.

R403.5.1.1 (N1103.5.1.1) Circulation systems.
Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermosyphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water. The controls shall limit the temperature of the water entering the cold water piping to not greater than 104ºF.

Exception: Where the entire hot water piping system (both supply and return) are insulated with a minimum R3 insulation, the stated controls shall not be required.

R404.1 (N1104.1) Lighting equipment (Mandatory).
Not less than 90 percent of the permanently installed lighting fixtures shall contain only high-efficacy lamps.

R404.1.1 (N1104.1.1) Lighting equipment (Mandatory).
Fuel gas lighting systems shall not have continuously burning pilot lights.

~~**Section R404.1.2 (N1104.1.2) Fuel gas lighting equipment.**~~
~~**Section R404.2 (N1104.2) Interior lighting controls.**~~
~~**Section R404.3 (N1104.3) Exterior lighting controls.**~~

TABLE R405.2 (N1105.2) REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

TABLE N1105.2 (R405.2)
REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION[a]	TITLE
General	
~~N1101.13.5~~	~~Additional energy efficiency~~
N1101.14	Certificate
Building Thermal Envelope	
N1102.1.1	Vapor retarder
N1102.2.3	Eave baffle
N1102.2.4.1	Access hatches and doors
N1102.2.10.1	Crawl space wall insulation installation
N1102.4.1.1	Installation
N1102.4.1.2	Testing
N1102.5	Maximum fenestration *U*-factor and SHGC
Mechanical	
N1103.1	Controls
N1103.3, including N1103.3.1, except Sections N1103.3.2, N1103.3.3 and N1103.3.6	Ducts
N1103.4	Mechanical system piping insulation
N1103.5.1	Heated water circulation and temperature maintenance systems
N1103.5.3	Drain water heat recovery units
N1103.6	Mechanical ventilation
N1103.7	Equipment sizing and efficiency rating
N1103.8	Systems serving multiple dwelling units
N1103.9	Snow melt system controls
N1103.10	Energy consumption of pools and spas
N1103.11	Portable spas
N1103.12	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
N1104.1	Lighting equipment
N1104.2	Interior lighting controls

a. Reference to a code section includes all the relative subsections except as indicated in the table.

R405.3.2 (N1105.3.2) Compliance report.

Compliance software tools shall generate a report that documents that the proposed design complies with Section R405.4 (N1105.4). A compliance report on the proposed design shall be submitted with the application for the building permit. Upon completion of the building, a compliance report based on the as-built condition of the building shall be submitted to the code official before a certificate of occupancy is issued. Batch sampling of buildings to determine energy code compliance for all buildings in the batch shall be prohibited.

Compliance reports shall include information in accordance with Sections R405.4.2.1 (N1105.4.2.1) and R405.4.2.2 (N1105.4.2.2). Where the proposed design of a building could be built on different sites where the cardinal orientation of the building on each site is different, compliance of the proposed design for the purposes of the application for the building permit

shall be based on the worst-case orientation, worst-case configuration, worst-case building air leakage and worst-case duct leakage. Such worst-case parameters shall be used as inputs to the compliance software for energy analysis.

R405.3.2.1 (N1105.3.2.1) Compliance report for permit application.
A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other building site identification.

2. A statement indicating that the proposed design complies with Section R405.4 (N1105.4).

3. An inspection checklist documenting the building component characteristics of the proposed design as indicated in Table R405.4.2(1) (N1105.4.2(1)). The inspection checklist shall show results for both the standard reference design and the proposed design with user inputs to the compliance software to generate the results.

4. A site-specific energy analysis report that is in compliance with Section R405.4 (N1105.4).

5. The name of the individual performing the analysis and generating the report.

6. The name and version of the compliance software tool.

R405.3.2.2 (N1105.3.2.2) Compliance report for certificate of occupancy.
A compliance report submitted for obtaining the certificate of occupancy shall include the following:

1. Building street address, or other building site identification.

2. Declaration of the total building performance path on the title page of the energy report ~~and the title page of the building plans~~.

3. A statement, bearing the name of the individual performing the analysis and generating the report, indicating that the as-built building complies with Section R405.3 (N1105.3).

4. The name and version of the compliance software tool.

5. A site-specific energy analysis report that is in compliance with Section R405.3 (N1105.3).

6. A final confirmed certificate indicating compliance based on inspection, and a statement indicating that the confirmed rated design of the built home complies with Section R405.3 (N1105.3). The certificate shall report the energy features that were confirmed to be in the home, including component-level insulation R-values or U-factors; results from any required duct system and building envelope air leakage testing; and the type and rated efficiencies of the heating, cooling, mechanical ventilation and service water heating equipment installed.

7. Where on-site renewable energy systems have been installed, the certificate shall report the type and production size of the installed system.

(continued)

TABLE R405.4.2(1) [N1105.4.2(1)] SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

TABLE R405.4.2(1) [N1105.4.2(1)]
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: mass where the proposed wall is a mass wall; otherwise wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table TABLE R402.1.2	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: as specified in TABLE R402.1.2, with the insulation layer on the interior side of the walls.	As proposed
Above-grade floors	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in TABLE R402.1.2	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in TABLE R402.1.2	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 an aperture of 1 ft^2 per 300 ft^2 of 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 as specified in TABLE R402.1.2	As proposed
Vertical fenestration other than opaque doors	Total area[b] = (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 R402.1.2	As proposed
	SHGC: as specified in Table N1102.1.2 except for *climate zones* without an SHGC requirement, the SHGC shall be equal to 0.40.	As proposed
	Interior shade fraction: 0.92-(0.21 × SHGC for the standard reference design).	Interior shade fraction: 0.92-(0.21 × SHGC as proposed)
	External shading: none	As proposed
Skylights	None	As proposed
Thermally isolated sunrooms	None	As proposed

(continued)

TABLE R405.4.2(1) [N1105.4.2(1)]-continued
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Air exchange rate	The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be *Climate Zones* 1 and 2: 5 air changes per hour. *Climate Zones* 3 through 8: 3 air changes per hour. The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than $0.01 \times CFA + 7.5 \times (N_{br} + 1)$ where: CFA = conditioned floor area, ft^2. N_{br} = number of bedrooms. Energy recovery shall not be assumed for mechanical ventilation.	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	Where mechanical ventilation is not specified in the proposed design: None Where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal $(1/e_f) \times [0.0876 \times CFA + 65.7 \times (N_{br}+1)]$ where: e_f = the minimum exhaust fan efficacy, as specified in Table R403.6.1, corresponding to a flow rate of $0.01 \times CFA + 7.5 \times (N_{br}+1)$ CFA = conditioned floor area, ft^2. N_{br} = number of bedrooms.	As proposed
Internal gains	IGain, in units of Btu/day per dwelling unit, shall equal $17,900 + 23.8 \times CFA + 4,104 \times N_{br}$ where: CFA = conditioned floor area, ft^2. N_{br} = number of bedrooms.	Same as standard reference design.
Internal mass	Internal mass for furniture and contents: 8 pounds per square foot of floor area.	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element[c] 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 pad, and 20 percent of floor directly exposed to room air.	As proposed
	For masonry basement walls, as proposed, but with insulation as specified in**TABLE R402.1.3**, located on the interior side of the walls.	As proposed
	For other walls, ceilings, floors, and interior walls: wood frame construction.	As proposed
Heating systems[d, e]	For other than electric heating without a heat pump: as proposed. Where the proposed design utilizes electric heating without a heat pump, the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the IECC—Commercial Provisions. Capacity: sized in accordance with Section N1103.7.	As proposed
Cooling systems[d, f]	As proposed. Capacity: sized in accordance with Section N1103.7.	As proposed
Service water heating[d, e, f, g]	As proposed. Use: same as proposed design.	As proposed Use, in units of gal/day = $30 + (10 \times N_{br})$ where: N_{br} = number of bedrooms.

(continued)

TABLE R405.4.2(1) [N1105.4.2(1)]-continued
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Thermal distribution systems	Duct insulation: in accordance with Section N1103.3.1. 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. **Exception:** For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency (DSE) shall be 1. 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 inch w.g. (25 Pa).	Duct insulation: as proposed. As tested or, where not tested, as specified in **TABLE R405.4.2(2)**.
Thermostat	Type: Manual, cooling temperature setpoint = 75°F; Heating temperature setpoint = 72°F.	Same as standard reference design.

For SI: 1 square foot = 0.93 m^2, 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m^2, 1 gallon (US) = 3.785 L, °C = (°F-32)/1.8, 1 degree = 0.79 rad.

a. Where required by the *building 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. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.

d. 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.

e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.

g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For 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.

h. For residences with conditioned basements, R-2 and R-4 residences, and for 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 × 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.

(continued)

TABLE R406.2 (N1106.2) REQUIREMENTS FOR ENERGY RATING INDEX

TABLE N1106.2 (R406.2)
REQUIREMENTS FOR ENERGY RATING INDEX

SECTION[a]	TITLE
General	
~~N1101.13.5~~	~~Additional efficiency packages~~
N1101.14	Certificate
Building Thermal Envelope	
N1102.1.1	Vapor retarder
N1102.2.3	Eave baffle
N1102.2.4.1	Access hatches and doors
N1102.2.10.1	Crawl space wall insulation installation
N1102.4.1.1	Installation
N1102.4.1.2	Testing
Mechanical	
N1103.1	Controls
N1103.3 except Sections N1103.3.2, N1103.3.3 and N1103.3.6	Ducts
N1103.4	Mechanical system piping insulation
N1103.5.1	Heated water circulation and temperature maintenance systems
N1103.5.3	Drain water heat recovery units
N1103.6	Mechanical ventilation
N1103.7	Equipment sizing and efficiency rating
N1103.8	Systems serving multiple dwelling units
N1103.9	Snow melt system controls
N1103.10	Energy consumption of pools and spas
N1103.11	Portable spas
N1103.12	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
N1104.1	Lighting equipment
N1104.2	Interior lighting controls
N1106.3	Building thermal envelope

a. Reference to a code section includes all of the relative subsections except as indicated in the table.

Section R406.3 (N1106.3) ~~Building thermal envelope~~ [Reserved].
~~Section R406.3.1 (N1106.3.1) On-site renewables~~.
~~Section R406.3.2 (N1106.3.2) On-site renewables~~.

R406.4 (N1106.4) Energy rating index.
The Energy Rating Index (ERI) shall be a numerical integer value that is based on a linear scale constructed such that the ERI reference design has an Index value of 100 and a residential building that uses no net purchased energy has an Index value of 0. Each integer value on the scale shall represent a 1 percent change in the total energy use of the rated design relative to the total energy use of the ERI reference design. The ERI shall consider all energy used in the residential building.

R406.4.1 (N1106.4.1) ERI reference design.
The ERI reference design shall be configured such that it meets the minimum requirements of the 2006 International Energy Conservation Code prescriptive requirements. The proposed residential building shall be shown to have an annual total normalized modified load less than or equal to the annual total loads of the ERI reference design.

R406.7.1 (N1106.7.1) Compliance software tools.
Documentation verifying that the methods and accuracy of the compliance software tools conform to the provisions of this section shall be provided to the code official.

R406.8 (N1106.8) Calculation software tools.
Calculation software, where used, shall be in accordance with Sections R406.8.1 (N1106.8.1) through R406.8.3 (N1106.8.3).

R406.7.1 (N1106.7.1) Minimum capabilities.
Calculation procedures used to comply with this section shall be software tools capable of calculating the ERI as described in Section R406.3 (N1106.3), and shall include the following capabilities:

1. Computer generation of the ERI reference design using only the input for the rated design.

   The calculation procedure shall not allow the user to directly modify the building component characteristics of the ERI reference design.

2. Calculation of whole-building, as a single zone, sizing for the heating and cooling equipment in the ERI reference design residence in accordance with Section R403.7 (N1103.7).

3. Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating and air-conditioning equipment based on climate and equipment sizing.

4. Printed code official inspection checklist listing each of the rated design component characteristics determined by the analysis to provide compliance, along with their respective performance ratings.

R406.7.2 (N1106.7.2) Specific approval.
Performance analysis tools meeting the applicable sections of Section R406 (N1106) shall be approved. Tools are permitted to be approved based on meeting a specified threshold for a jurisdiction. The code official shall approve tools for a specified application or limited scope.

R406.7.3 (N1106.7.3) Input values.
When calculations require input values not specified by Sections R402 (N1102), R403 (N1103), R404 (N1104) and R405 (N1105), those input values shall be taken from an approved source.

~~**R406.7.5 (N1106.7.5) Specific approval.**~~ *(Removed as redundant due to previous action and reorganization).*

~~**R406.7.6 (N1106.7.6) Input values.**~~ *(Removed as redundant due to previous action and reorganization).*

R408.1 (N1108.1) Scope.
This section establishes additional efficiency package options to achieve additional energy efficiency ~~in accordance with Section N1101.13.5~~.

R408.2 (N1108.2) Additional efficiency package options.
Additional efficiency package options ~~for compliance with Section N1101.13.5~~ are set forth in Sections R408.2.1 (N1108.2.1) through R408.2.5 (N1108.2.5).