

4101:8-11-01 Energy efficiency.

[Comment: When a reference is made within this rule to a federal statutory provision, an industry consensus standard, or any other technical publication, the specific date and title of the publication as well as the name and address of the promulgating agency are listed in rule 4101:8-44-01 of the Administrative Code. The application of the referenced standards shall be limited and as prescribed in section 102.5 of rule 4101:8-1-01 of the Administrative Code.]

SECTION 1101 GENERAL

1101.1 Scope. This chapter regulates the energy efficiency for the design and construction of buildings regulated by this code. *Buildings in R-3 occupancies shall comply with Chapter 13 of the Ohio Building Code for energy efficiency.*

Exception: Portions of the building envelope that do not enclose conditioned space are exempt from thermal envelope provisions of this chapter.

1101.2 Compliance. Compliance shall be demonstrated by meeting the requirements of *one of the following options:*

- 1. The “International Energy Conservation Code”; or*
- 2. Sections 1101 through 1104 of this chapter; or*
- 3. Section 1105 – “The Ohio Home Builder’s Association (OHBA) Alternative Energy Code Option”.*

Climate zones from Figure 1101.2 or Table 1101.2 shall be used in determining the applicable requirements from this chapter.

1101.2.1 Warm humid counties. *Deleted.*

1101.2.2 Modification to International Energy Conservation Code. *The following changes shall be made to the International Energy Conservation Code:*

- 1. Table 402.4.2- Delete the last row.*
- 2. Table 402.4.2- First row, second column, delete “Air-permeable insulation is inside of an air barrier.”*
- 3. Section 402.4.3 shall read “**Fireplaces.** New wood- burning fireplaces shall have doors or tight-fitting flue dampers and outdoor combustion air. If using tight-fitting doors on factory-built fireplaces listed and labeled in*

accordance with UL 127, the doors shall be tested and listed for the fireplace.”

4. Section 403.9 – Delete section and all subsections.

1101.3 Identification. Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this chapter.

1101.4 Building thermal envelope insulation. An R-value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation 12 inches (305 mm) or more wide. 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 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 area covered and R-value of installed thickness shall be listed on the certificate. The insulation installer shall sign, date and post the certificate in a conspicuous location on the job site.

1101.4.1 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 ft² (28 m²) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) high. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed R-value shall be listed on the certificate provided by the insulation installer.

1101.4.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer’s R-value mark is readily observable upon inspection.

1101.5 Fenestration product rating. U-factors 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 Tables 1101.5(1) and 1101.5(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 1101.5(3).

1101.6 Insulation product rating. The thermal resistance (R-value) of insulation shall be determined in accordance with the CFR Title 16, Part 460, in units of $h \cdot ft^2 \cdot ^\circ F/Btu$ at a mean temperature of 75°F (24°C).

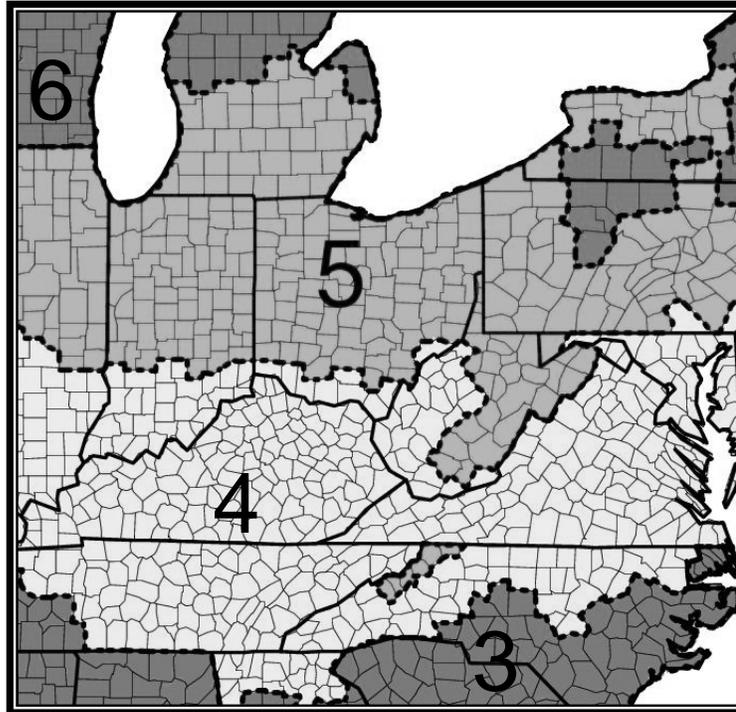
1101.7 Installation. All materials, systems and equipment shall be installed in accordance with the manufacturer's installation instructions and the provisions of this code.

1101.7.1 Protection of exposed foundation insulation. Insulation applied to the exterior of basement walls, crawl space walls, and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective 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 (152 mm) below grade.

1101.8 Above code programs. *Deleted.*

1101.9 Certificate. A permanent certificate shall be posted on or in the electrical distribution panel. The certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall be completed by the builder or registered design professional. The certificate shall list the predominant R-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawlspace wall and/or floor) and ducts outside conditioned spaces; U-factors for fenestration; and the solar heat gain coefficient (SHGC) of fenestration. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace and/or baseboard electric heater is installed in the residence, the certificate shall list "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be listed for gas-fired unvented room heaters, electric furnaces or electric base board heaters.

**FIGURE 1101.2
CLIMATE ZONES**



**TABLE 1101.2
CLIMATE ZONES BY STATE AND COUNTIES**

OHIO
Zone 5 except
Zone 4
Adams
Brown
Clermont
Gallia
Hamilton
Lawrence
Pike
Scioto
Washington

**TABLE 1101.5(1)
DEFAULT GLAZED FENESTRATION U-FACTORS**

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			Single	Double
Metal	1.2	0.8	2	1.3
Metal with thermal break	1.1	0.65	1.9	1.1
Nonmetal or metal clad	0.95	0.55	1.75	1.05
Glazed block	0.6			

**TABLE 1101.5(2)
DEFAULT DOOR U-FACTORS**

DOOR TYPE	U-FACTOR
Uninsulated metal	1.2
Insulated metal	0.6
Wood	0.5
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

**TABLE 1101.5(3)
DEFAULT GLAZED FENESTRATION SHGC**

SINGLE GLAZED		DOUBLE GLAZED		GLAZED BLOCK
Clear	Tinted	Clear	Tinted	
0.8	0.7	0.7	0.6	0.6

SECTION 1102 BUILDING THERMAL ENVELOPE

1102.1 Insulation and fenestration criteria. The building thermal envelope shall meet the requirements of Table 1102.1 based on the climate zone specified in Table N1101.2.

1102.1.1 R-value computation. Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component R-value. The manufacturer's settled R-value shall be used for blown insulation. Computed R-values shall not include an R-value for other building materials or air films.

1102.1.2 U-factor alternative. An assembly with a U-factor equal to or less than that specified in Table 1102.1.2 shall be permitted as an alternative to the R-value in Table 1102.1.

1102.1.3 Total UA alternative. If the total building thermal envelope UA (sum of U-factor times assembly area) is less than or equal to the total UA

resulting from using the U-factors in Table 1102.1.2, (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table 1102.1. The UA calculation shall be done using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. The SHGC requirements shall be met in addition to UA compliance.

**TABLE 1102.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^b	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
4	0.35	0.60	NR	38	13	5/10	19	10/13	10, 2 ft	10/13
5	0.35	0.60	NR	38	20 or 13 + 5 ^h	13/17	30 ^e	10/13	10, 2 ft	10/13

- a. R-values are minimums. U-factors and solar heat gain coefficient (SHGC) are maximums. R-19 batts compressed in to nominal 2 x 6 framing cavity such that the R-value is reduced by R-1 or more shall be marked with the compressed batt R-value in addition to the full thickness R-value.
- b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
- c. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
- d. R-5 shall be added to the required slab edge R-values for heated slabs.
- e. *Deleted.*
- f. *Deleted.*
- g. Or insulation sufficient to fill the framing cavity, R-19 minimum.
- h. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25% or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25% of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.
- i. The second R-value applies when more than half the insulation is on the interior of the mass wall.
- j. *Deleted.*

1102.2 Specific insulation requirements.

1102.2.1 Ceilings with attic spaces. When Section 1102.1 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. This reduction shall not apply to the U-factor alternative approach in Section 1102.1.2 and the Total UA alternative in Section 1102.1.3.

1102.2.2 Ceilings without attic spaces. Where Section 1102.1 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 1102.1 shall be limited to 500 square feet (46 m²) or twenty per cent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the U-factor alternative approach in Section 1102.1.2 and the Total UA alternative in Section 1102.1.3.

1102.2.3 Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment which 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.

1102.2.4 Mass walls. Mass walls, for the purposes of this chapter, shall be considered above-grade 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.

1102.2.5 Steel-frame ceilings, walls and floors. Steel-frame ceilings, walls and floors shall meet the insulation requirements of Table 1102.2.5 or shall meet the U-factor requirements in Table 1102.1.2. The calculation of the U-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

Exception: *Deleted.*

1102.2.6 Floors. Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

1102.2.7 Basement walls. Exterior 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 1102.1 and 1102.2.6.

1102.2.8 Slab-on-grade floors. Slab-on-grade floors with a floor surface less than 12 inches below grade shall be insulated in accordance with Table 1102.1. 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 1102.1 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. Slab-edge insulation is not required in jurisdictions designated by the *building* official as having a very heavy termite infestation.

**TABLE 1102.1.2
EQUIVALENT U-FACTORS^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
4	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065

- a. Nonfenestration U-factors shall be obtained from measurement, calculation or approved *referenced publications approved in accordance with this code*.
- b. When more than half the insulation is on the interior, the mass wall U-factors shall be a maximum of 0.10 in zone 4 and the same as the frame wall U-factor in zone 5.
- c. Deleted.

**TABLE 1102.2.5
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION (R-VALUE)**

WOOD FRAME R-VALUE REQUIREMENT	COLD-FORMED STEEL EQUIVALENT R-VALUE ^a
Steel Truss Ceilings^a	
R-30	R-38 or R-30 + 3 or R-26 + 5
R-38	R-49 or R-38 + 3
R-49	R-38 + 5
Steel Joist Ceilings^b	
R-30	R-38 in 2 x 4 or 2 x 6 or 2 x 8 R-49 in any framing
R-38	R-49 in 2 x 4 or 2 x 6 or 2 x 8 or 2 x 10
Steel Framed Wall	
R-13	R-13 + 5 or R15 + 4 or R-21 + 3 or R-0 + 10
R-19	R-13 + 9 or R-19 + 8 or R-25 + 7
R-21	R-13 + 10 or R-19 + 9 or R-25 + 8
Steel Joist Floor	
R-13	R-19 in 2 x 6 R-19 + R-6 in 2 x 8 or 2 x 10
R-19	R-19 + R-6 in 2 x 6 R-19 + R-12 in 2 x 8 or 2 x 10

For SI: 1 inch = 25.4 mm.

- 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.

1102.2.9 Crawl space walls. As an alternative to insulating floors over crawl spaces, insulation of crawl space walls shall be permitted when the crawl space is not vented to the outside. Crawl space wall insulation shall be permanently fastened to the wall and extend downward from the floor to the finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610 mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder. All joints of the vapor retarder shall overlap by 6 inches (152 mm) and be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches (152 mm) up the stem wall and shall be attached to the stem wall.

1102.2.10 Masonry veneer. Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.

1102.2.11 Thermally isolated sunroom insulation. The minimum ceiling insulation R-values shall be R-19 in zones 1 through 4 and R-24 in zone 5. The minimum wall R-value shall be R-13 in all zones. New wall(s) separating the sunroom from conditioned space shall meet the building thermal envelope requirements.

1102.3 Fenestration.

1102.3.1 U-factor. An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements.

1102.3.2 Glazed fenestration SHGC. An area-weighted average of fenestration products more than 50 percent glazed shall be permitted to satisfy the solar heat gain coefficient (SHGC) requirements.

1102.3.3 Glazed fenestration exemption. Up to 15 square feet (1.4 m²) of glazed fenestration per dwelling unit shall be permitted to be exempt from U-factor and SHGC requirements in Section 1102.1. This exemption shall not apply to the U-factor alternative approach in Section 1102.1.2 and the Total UA alternative in Section 1102.1.3.

1102.3.4 Opaque door exemption. One side-hinged opaque door assembly up to 24 square feet (2.22 m²) in area is exempted from the U-factor requirement in Section 1102.1.1. This exemption shall not apply to the U-factor alternative approach in Section 1102.1.2 and the Total UA alternative in Section 1102.1.3.

1102.3.5 Thermally isolated sunroom U-factor. For zones 4 through 8 the maximum fenestration U-factor shall be 0.50 and the maximum skylight U-factor shall be 0.75. New windows and doors separating the sunroom from conditioned space shall meet the building thermal envelope requirements.

1102.3.6 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for U-factor and solar heat gain coefficient (SHGC) in Table 1102.1.

1102.4 Air leakage.

1102.4.1 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, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material.

1. All joints, seams and penetrations.
2. Site-built windows, doors and skylights.
3. Openings between window and door assemblies and their respective jambs and framing.
4. Utility penetrations.
5. Dropped ceilings or chases adjacent to the thermal envelope.
6. Knee walls.
7. Walls and ceilings separating the garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.
9. Common walls between dwelling units.
10. Attic access openings.
11. Rim joists junction.
12. Other sources of infiltration.

1102.4.2 Air sealing and insulation. Building envelope air tightness and insulation installation shall be demonstrated to comply with one of the following options given by Section 1102.4.2.1 or 1102.4.2.2.

1102.4.2.1 Testing option. Tested air leakage is less than 7 ACH when tested with a blower door at a pressure of 50 pascals (0.007 psi). Testing shall occur after rough in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation and combustion appliances.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed;
2. Dampers shall be closed, but not sealed; including exhaust, intake, makeup air, back draft, and flue dampers;
3. Interior doors shall be open;
4. Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling system(s) shall be turned off;
6. HVAC ducts shall not be sealed; and
7. Supply and return registers shall not be sealed.

1102.4.2.2 Visual inspection option. The items listed in Table 1102.4.2, applicable to the method of construction, are field verified.

1102.4.3 Fireplaces. New wood-burning fireplaces shall have ~~gasketed~~ doors or tight-fitting flue dampers and outdoor combustion air. If using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace.

1102.4.4 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cubic foot per minute per square foot [$1.5(\text{L/s})/\text{m}^2$], and swinging doors no more than 0.5 cubic foot per minute per square foot [$2.5(\text{L/s})/\text{m}^2$], when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/ A440 by an *approved agency*, and listed and labeled by the manufacturer.

Exception: Site-built windows, skylights and doors.

1102.4.5 Recessed lighting. Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and labeled as meeting ASTM E 283 when tested at 1.57 ~~psi~~ psf (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

1102.5 Maximum fenestration U-factor and SHGC. The area-weighted average maximum fenestration U-factor permitted using trade-offs from Section 1102.1.3 shall be 0.48 in Zones 4 and 5 for vertical fenestration, and 0.75 in Zones 4 through 8 for skylights.

SECTION 1103 SYSTEMS

1103.1 Controls. At least one thermostat shall be installed for each separate heating and cooling system.

1103.1.1 Programmable thermostat. Where the primary heating system is a forced air furnace, at least one thermostat per dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F (13°C) or up to 85°F (29°C). The thermostat shall initially be programmed with a heating temperature set point no higher than 70°F (21°C) and a cooling temperature set point no lower than 78°F (26°C).

1103.1.2 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.

1103.2 Ducts.

1103.2.1 Insulation. Supply ducts in attics shall be insulated to a minimum of R-8. All other ducts shall be insulated to a minimum of R-6.

Exception: Ducts or portions thereof located completely inside the building thermal envelope.

1103.2.2 Sealing. Ducts, air handlers, filter boxes and building cavities used as ducts shall be sealed. Joints and seams shall comply with Section M1601.4. Duct tightness shall be verified by either of the following:

1. Post-construction test: Leakage to outdoors shall be less than or equal to 8 cfm (3.78 L/s) per 100 ft² (9.29 m²) of conditioned floor area or a total leakage less than or equal to 12 cfm (5.66 L/s) per 100 ft² (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer's air handler end closure. All register boots shall be taped or otherwise sealed during the test.
2. Rough-in test: Total leakage shall be less than or equal to 6 cfm (2.83 L/s) per 100 ft² (9.29 m²) of conditioned floor area when tested at a pressure differential of 0.1 inch w.g. (25 Pa) across the roughed in system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 4 cfm (1.89 L/s) per 100 ft² (9.29 m²) of conditioned floor area.

Exception: Duct tightness test is not required if the air handler and all ducts are located within conditioned space.

1103.2.3 Building cavities. Building framing cavities shall not be used as supply ducts.

1103.3 Mechanical system piping insulation. Mechanical system piping capable of carrying fluids above 105°F (40°C) or below 55°F (13°C) shall be insulated to a minimum of R-3.

1103.4 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.

1103.5 Mechanical ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

**TABLE 1102.4.2
AIR BARRIER AND INSULATION INSPECTION**

COMPONENT	CRITERIA
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. Breaks or joints in the air barrier are filled or repaired. Air-permeable insulation is not used as a sealing material. Air permeable insulation is inside of an air barrier.
Ceiling/attic	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed. Attic access (except unvented attic), knee wall door, or drop down stair is sealed.
Walls	Corners and headers are insulated. Junction of foundation and sill plate is sealed.
Windows and doors	Space between window/door jambs and framing is sealed.
Rim joists	Rim joists are insulated and include an air barrier.
Floors (including above garage and cantilevered floors)	Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of floor.
Crawlspace walls	Insulation is permanently attached to walls. Exposed earth in unvented crawlspaces is covered with Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.
Narrow cavities	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
Garage separation	Air sealing is provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures are airtight, IC rated and sealed to drywall. Exception—fixtures in conditioned space.
Plumbing and wiring	Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
Electrical/phone box on exterior wall	Air barrier extends behind boxes or air sealed type boxes are installed.
Common wall	Air barrier is installed in common wall between dwelling units.
HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
Fireplace	Fireplace walls include an air barrier.

1103.6 Equipment sizing. Heating and cooling equipment shall be sized as specified in Section M1401.3.

1103.7 Snow melt system controls. Snow-and ice-melting systems supplied through energy service to the building shall include automatic controls capable of shutting off the system when the pavement temperature is above 50°F (10°C) and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F (5°C).

1103.8 Pools. ~~Where regulations are adopted and enforced by the local jurisdiction, residential swimming pools shall be provided with energy conserving measures in accordance with Sections 1103.8.1 through 1103.8.3 Deleted.~~

1103.8.1 Pool heaters. ~~All pool heaters shall be equipped with a readily accessible on off switch to allow shutting off the heater without adjusting the thermostat setting. Pool heaters fired by natural gas or LPG shall not have continuously burning pilot lights. Deleted.~~

1103.8.2 Time switches. ~~Time switches that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on swimming pool heaters and pumps. Deleted.~~

Exceptions:-

- ~~1. Where public health standards require 24 hour pump operation.~~
- ~~2. Where pumps are required to operate solar and waste heat recovery pool heating systems.~~

1103.8.3 Pool covers. ~~Heated pools shall be equipped with a vapor retardant pool cover on or at the water surface. Pools heated to more than 90°F (32°C) shall have a pool cover with a minimum insulation value of R-12. Deleted.~~

**SECTION 1104
LIGHTING SYSTEMS**

1104.1 Lighting equipment. A minimum of 50 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps.

**SECTION 1105
OHIO HOME BUILDERS ASSOCIATION (OHBA) ALTERNATIVE
ENERGY CODE OPTION**

1105.1 General

1105.1.1 Scope. *This section provides an alternative set of requirements for regulating the energy efficiency for the design and construction of new buildings regulated by this code. Buildings in R-3 occupancies shall comply with Chapter 13 of the Ohio Building Code for energy efficiency.*

Exception: *Portions of the building envelope that do not enclose conditioned space are exempt from thermal envelope provisions of this*

section.

1105.1.2 Compliance. *Compliance shall be demonstrated by meeting the requirements of this section, known as the OHBA Alternative Code. The applicant shall choose to comply with either Compliance Path #1 or Compliance Path #2 and shall demonstrate compliance with all applicable requirements of that one chosen path. The chosen path shall be identified on the construction documents. The requirements in this section are in lieu of the requirements found in Sections 1101 through 1104.*

1105.1.3 Identification. *Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this section.*

1105.1.4 Building thermal envelope insulation. *An R-value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation 12 inches (305 mm) or more wide. 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 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 area covered and R-value of installed thickness shall be listed on the certificate. The insulation installer shall sign, date and post the certificate in a conspicuous location on the job site.*

1105.1.4.1 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 ft² (28 m²) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) high. Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed R-value shall be listed on the certificate provided by the insulation installer.*

1105.1.4.2 Insulation mark installation. *Insulating materials shall be installed such that the manufacturer's R-value mark is readily observable upon inspection.*

1105.1.5 Fenestration product rating. *U-factors 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 Tables 1105.1.5(1) and 1105.1.5(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 1105.1.5(3).

1105.1.6 Insulation product rating. The thermal resistance (R-value) of insulation shall be determined in accordance with the CFR Title 16, Part 460, in units of $h \cdot ft^2 \cdot ^\circ F/Btu$ at a mean temperature of 75°F (24°C).

1105.1.7 Installation. All materials, systems and equipment shall be installed in accordance with the manufacturer's installation instructions and the provisions of this code.

1105.1.7.1 Protection of exposed foundation insulation. Insulation applied to the exterior of basement walls, crawl space walls, and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective 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 (152 mm) below grade.

1105.1.8 Certificate. A permanent certificate shall be posted on or in the electrical distribution panel. The certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall be completed by the builder or registered design professional. The certificate shall list the predominant R-values of insulation installed in or on ceiling/roof, walls, foundation (slab, basement wall, crawlspace wall and/or floor) and ducts outside conditioned spaces; U-factors for fenestration; and the solar heat gain coefficient (SHGC) of fenestration. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace and/or baseboard electric heater is installed in the residence, the certificate shall list "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be listed for gas-fired unvented room heaters, electric furnaces or electric base board heaters.

**TABLE 1105.1.5(1)
DEFAULT GLAZED FENESTRATION U-FACTORS**

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			Single	Double
Metal	1.2	0.8	2	1.3
Metal with thermal break	1.1	0.65	1.9	1.1

<i>Nonmetal or metal clad</i>	0.95	0.55	1.75	1.05
<i>Glazed block</i>	0.6			

**TABLE 1105.1.5(2)
DEFAULT DOOR U-FACTORS**

DOOR TYPE	U-FACTOR
<i>Uninsulated metal</i>	1.2
<i>Insulated metal</i>	0.6
<i>Wood</i>	0.5
<i>Insulated, nonmetal edge, max 45% glazing, any glazing double pane</i>	0.35

**TABLE 1105.1.5(3)
DEFAULT GLAZED FENESTRATION SHGC**

SINGLE GLAZED		DOUBLE GLAZED		GLAZED BLOCK
<i>Clear</i>	<i>Tinted</i>	<i>Clear</i>	<i>Tinted</i>	
0.8	0.7	0.7	0.6	0.6

1105.2 Building thermal envelope.

1105.2.1 Insulation and fenestration criteria. *The building thermal envelope shall meet the requirements of either Compliance Path #1 or Compliance Path #2 of Table 1105.2.1*

1105.2.1.1 R-value computation. *Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component R-value. The manufacturer's settled R-value shall be used for blown insulation. Computed R-values shall not include an R-value for other building materials or air films.*

1105.2.1.2 U-factor alternative. *An assembly with a U-factor equal to or less than that specified in Table 1105.2.1.2 shall be permitted as an alternative to the corresponding compliance path R-value in Table 1105.2.1.*

1105.2.1.3 Total UA alternative. *If the total building thermal envelope UA (sum of U-factor times assembly area) is less than or equal to the total UA resulting from using the U-factors in Table 1105.2.1.2, (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table 1105.2.1. The UA calculation shall be done using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. The SHGC requirements shall be met in addition to UA compliance.*

**TABLE 1105.2.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

	FENESTRATION U-FACTOR^b	SKYLIGHT^b U-FACTOR	GLAZED FENESTRATION SHGC^{b,e}	CEILING R- VALUE	WOOD FRAME WALL R- VALUE	MASS WALL R- VALUEⁱ	FLOOR R- VALUE	BASEMENT^c WALL R- VALUE	SLAB^d R- VALUE AND DEPTH	CRAWL SPACE^c WALL R- VALUE
<i>Compliance Path #1</i>	0.32	0.60	NR	49	15 or 13 + 3 ^h	13/17	30 ^g	10/13 (minimum 4 feet)	10, 2 ft	10/13
<i>Compliance Path #2</i>	0.32	0.60	NR	49	13	13/17	30 ^g	10/13 (minimum 4 feet)	10, 2 ft	10/13

a. R-values are minimums. U-factors and solar heat gain coefficient (SHGC) are maximums. R-19 batts compressed in to nominal 2 x 6 framing cavity such that the R-value is reduced by R-1 or more shall be marked with the compressed batt R-value in addition to the full thickness R-value.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

c. "10/13" means R-10 continuous insulated sheathing on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.

d. R-5 shall be added to the required slab edge R-values for heated slabs.

e. Deleted.

f. Deleted.

g. Or insulation sufficient to fill the framing cavity, R-19 minimum.

h. "13+3" means R-13 cavity insulation plus R-3 insulated sheathing. If structural sheathing covers 25% or less of the exterior, insulating sheathing is not required where structural sheathing is used.

i. The second R-value applies when more than half the insulation is on the interior of the mass wall.

j. Deleted.

1105.2.2 Specific insulation requirements.

1105.2.2.1 Ceilings with attic spaces. When Section 1105.2.1 would require R-49 in the ceiling, 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. This reduction shall not apply to the U-factor alternative approach in Section 1105.2.1.2 and the Total UA alternative in Section 1105.2.1.3.

1105.2.2.2 Ceilings without attic spaces. Where Section 1105.2.1 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 1105.2.1 shall be limited to 500 square feet (46 m²) or twenty per cent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the U-factor alternative approach in Section 1105.2.1.2 and the Total UA alternative in Section 1105.2.1.3.

1105.2.2.3 Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be

weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment which 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.

1105.2.2.4 Mass walls. *Mass walls, for the purposes of this section, shall be considered above-grade 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.*

1105.2.2.5 Steel-frame ceilings, walls and floors. *Steel-frame ceilings, walls and floors shall meet the insulation requirements of Table 1105.2.2.5 or shall meet the U-factor requirements in Table 1105.2.1.2. The calculation of the U-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.*

Exception: *Deleted.*

1105.2.2.6 Floors. *Floor insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.*

1105.2.2.7 Basement walls. *Exterior 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, unless otherwise as specified in Table 1105.2.1.~~ Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Sections 1105.2.1 and 1105.2.2.6.*

1105.2.2.8 Slab-on-grade floors. *Slab-on-grade floors with a floor surface less than 12 inches below grade shall be insulated in accordance with Table 1105.2.1. 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 1105.2.1 by any combination of vertical insulation, insulation extending under the slab or insulation extending protected by pavement or by a minimum of 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. Slab-edge*

insulation is not required in jurisdictions designated by the building official as having a very heavy termite infestation.

**TABLE 1105.2.1.2
EQUIVALENT U-FACTORS^a**

	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U- FACTOR	FRAME WALL U- FACTOR	MASS WALL U- FACTOR^b	FLOOR U- FACTOR	BASEMENT WALL U- FACTOR	CRAWL SPACE WALL U- FACTOR
<i>Compliance Path #1</i>	0.32	0.60	0.026	0.077	0.082	0.033	0.059 (minimum 4 feet)	0.065
<i>Compliance Path #2</i>	0.32	0.60	0.026	0.082	0.082	0.033	0.059 (minimum 4 feet)	0.065

- a. Nonfenestration U-factors shall be obtained from measurement, calculation or approved referenced publications approved in accordance with this code.*
- b. When more than half the insulation is on the interior, the mass wall U-factors shall be the same as the frame wall U-factor.*
- c. Deleted.*

**TABLE 1105.2.2.5
STEEL-FRAME CEILING, WALL AND FLOOR INSULATION (R-VALUE)**

WOOD FRAME R-VALUE REQUIREMENT	COLD-FORMED STEEL EQUIVALENT R-VALUE^a
<i>Steel Truss Ceilings^a</i>	
R-30	R-38 or R-30 + 3 or R-26 + 5
R-38	R-49 or R-38 + 3
R-49	R-38 + 5
<i>Steel Joist Ceilings^b</i>	
R-30	R-38 in 2 x 4 or 2 x 6 or 2 x 8 R-49 in any framing
R-38	R-49 in 2 x 4 or 2 x 6 or 2 x 8 or 2 x 10
<i>Steel Framed Wall</i>	
R-13	R-13 + 5 or R15 + 4 or R-21 + 3 or R-0 + 10
R-15 or R-13+3	R-0 + 11.2 or R-13 + 6.1 or R-15 + 5.7 or R-19 + 5.0 or R-21 + 4.7
R-19	R-13 + 9 or R-19 + 8 or R-25 + 7
R-21	R-13 + 10 or R-19 + 9 or R-25 + 8
<i>Steel Joist Floor</i>	
R-13	R-19 in 2 x 6, R-19 + 6 in 2 x 8 or 2 x 10
R-19	R-19 + 6 in 2 x 6, R-19 + 12 in 2 x 8 or 2 x 10
R-30	R-19 + 6 in 2 x 6, R-19 + 12 in 2 x 8 or 2 x 10

For SI: 1 inch = 25.4 mm.

- 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.*

1105.2.2.9 Crawl space walls. *As an alternative to insulating floors over crawl spaces, insulation of crawl space walls shall be permitted when the crawl space is not vented to the outside. Crawl space wall insulation shall be permanently fastened to the wall and extend downward from the floor to the finished grade level and then vertically and/or horizontally for at least an additional 24 inches (610 mm). Exposed earth in unvented crawl space foundations shall be covered with a continuous Class I vapor retarder. All joints of the vapor retarder shall overlap by 6 inches (152 mm) and be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches (152 mm) up the stem wall and shall be attached to the stem wall.*

1105.2.2.10 Masonry veneer. *Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.*

1105.2.2.11 Thermally isolated sunroom insulation. *The minimum ceiling insulation R-values shall be R-24. The minimum wall R-value shall be R-13. New wall(s) separating the sunroom from conditioned space shall meet the building thermal envelope requirements.*

1105.2.3 Fenestration.

1105.2.3.1 U-factor. *An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements.*

1105.2.3.2 Glazed fenestration SHGC. *An area-weighted average of fenestration products more than 50 percent glazed shall be permitted to satisfy the solar heat gain coefficient (SHGC) requirements.*

1105.2.3.3 Glazed fenestration exemption. *Up to 15 square feet (1.4 m²) of glazed fenestration per dwelling unit shall be permitted to be exempt from U-factor and SHGC requirements in Section 1105.2.1. This exemption shall not apply to the U-factor alternative approach in Section 1105.2.1.2 and the Total UA alternative in Section 1105.2.1.3.*

1105.2.3.4 Opaque door exemption. *One side-hinged opaque door assembly up to 24 square feet (2.22 m²) in area is exempted from the U-factor requirement in Section 1105.2.1. This exemption shall not apply to the U-factor alternative approach in Section 1105.2.1.2 and the Total UA alternative in Section 1105.2.1.3.*

1105.2.3.5 Thermally isolated sunroom U-factor. *The maximum fenestration U-factor shall be 0.50 and the maximum skylight U-factor*

shall be 0.75. New windows and doors separating the sunroom from conditioned space shall meet the building thermal envelope requirements.

1105.2.3.6 Replacement fenestration. *Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for U-factor and solar heat gain coefficient (SHGC) in Table 1105.2.1*

1105.2.4 Air leakage.

1105.2.4.1 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, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material.*

- 1. All joints, seams and penetrations.*
- 2. Site-built windows, doors and skylights.*
- 3. Openings between window and door assemblies and their respective jambs and framing*
- 4. Utility penetrations.*
- 5. Dropped ceilings or chases adjacent to the thermal envelope.*
- 6. Knee walls.*
- 7. Walls and ceilings separating the garage from conditioned spaces.*
- 8. Behind tubs and showers on exterior walls.*
- 9. Common walls between dwelling units.*
- 10. Attic access openings.*
- 11. Rim joists junction.*
- 12. Other sources of infiltration.*

1105.2.4.2 Air sealing and insulation. *Building envelope air tightness and insulation installation shall be demonstrated to comply with Section 1105.2.4.2.1.*

1105.2.4.2.1 Testing. *Tested air leakage is less than 6 ACH when tested with a blower door at a pressure of 50 pascals (0.007 psi). Testing shall occur after rough in and after installation of penetrations of the building envelope, including penetrations for utilities, plumbing, electrical, ventilation and combustion appliances.*

During testing:

- 1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed;*
- 2. Dampers shall be closed, but not sealed; including exhaust, intake, makeup air, back draft, and flue dampers;*
- 3. Interior doors shall be open;*
- 4. Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;*
- 5. Heating and cooling system(s) shall be turned off;*
- 6. HVAC ducts shall not be sealed; and*
- 7. Supply and return registers shall not be sealed.*

This requirement will take effect one year after the effective date of this rule.

1105.2.4.2.1.1 Sampling. *Where groups of seven or more buildings of similar design and construction are completed and are issued occupancy permits during a 120 day period, testing of less than 100 percent, but not less than 1 in 7 or 15 percent, of the buildings from a specific builder and/or contractor or of dwelling units to be tested shall be selected by the code official. If any tested building fails to comply with the maximum air leakage requirement in Section 1105.2.4.2.1 then all buildings shall be tested until a minimum of three consecutive buildings comply from that specific builder and/or contractor before the code official may permit sampling to resume.*

1105.2.4.3 Fireplaces. *New wood-burning fireplaces shall have ~~gasketed~~ doors or tight-fitting flue dampers and outdoor combustion air. If using tight-fitting doors on UL 127 fireplaces, they must be tested and listed for the fireplace.*

1105.2.4.4 Fenestration air leakage. *Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cubic foot per minute per square foot [1.5(L/s)/m²], and swinging doors no more than 0.5 cubic foot per minute per square foot [2.5(L/s)/m²], when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/ A440 by an approved agency, and listed and labeled by the manufacturer.*

Exception: *Site-built windows, skylights and doors.*

1105.2.4.5 Recessed lighting. *Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and labeled as meeting ASTM E 283 when tested at 1.57 ~~psi~~ psf (75 Pa) pressure differential with no more than 2.0 cfm (0.944 L/s) of air movement from the conditioned space to the ceiling cavity. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.*

1105.2.5 Maximum fenestration U-factor and SHGC. *The area-weighted average maximum fenestration U-factor permitted using trade-offs from Section 1105.2.1.3 shall be 0.48 for vertical fenestration, and 0.75 for skylights.*

1105.3 Systems.

1105.3.1 Controls. *At least one thermostat shall be installed for each separate heating and cooling system.*

1105.3.1.1 Programmable thermostat. *Where the primary heating system is a forced air furnace, at least one thermostat per dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. This thermostat shall include the capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F (13°C) or up to 85°F (29°C). The thermostat shall initially be programmed with a heating temperature set point no higher than 70°F (21°C) and a cooling temperature set point no lower than 78°F (26°C).*

1105.3.1.2 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.

1105.3.2 Ducts.

1105.3.2.1 Insulation. Supply ducts in attics shall be insulated to a minimum of R-8. All other ducts shall be insulated to a minimum of R-6.

Exception: Ducts or portions thereof located completely inside the building thermal envelope.

1105.3.2.2 Sealing. Ducts, air handlers, filter boxes and building cavities used as ducts shall be sealed. Joints and seams shall comply with Section M1601.4. Duct tightness shall be verified by either of the following:

1. **Post-construction test:** Post-construction duct tightness shall be verified to meet the values prescribed in Table 1105.3.2.2(a) by testing either the “Leakage to Outdoors” or the “Total Leakage” in accordance with the chosen compliance path. Testing shall be conducted at a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system, including the manufacturer’s air handler end closure. All register boots shall be taped or otherwise sealed during the test.

**TABLE 1105.3.2.2(a)
POST-CONSTRUCTION DUCT TIGHTNESS TESTING**

	Leakage to Outdoors (per 100 ft ² (9.29 m ²) of conditioned floor area)	Total Leakage (per 100 ft ² (9.29 m ²) of conditioned floor area)
Compliance Path #1	≤ 6 cfm (2.83 L/s)	≤ 9 cfm (4.24 L/s)
Compliance Path #2	≤ 4 cfm (1.89 L/s)	≤ 6 cfm (2.83 L/s)

2. **Rough-in test:** Rough-in duct tightness shall be verified to meet the values prescribed in Table 1105.3.2.2(b) by testing the “Total Leakage” in accordance with the chosen compliance path. Testing shall be conducted at a pressure differential of 0.1 inch w.g. (25 Pa) across the roughed in system, including the manufacturer’s air handler enclosure, if installed at the time of the test. All register boots shall be taped or otherwise sealed during the test.

**TABLE 1105.3.2.2(b)
ROUGH-IN DUCT TIGHTNESS TESTING**

	Total Leakage – with air handler installed (per 100 ft ² (9.29 m ²) of conditioned floor area)	Total Leakage – without air handler installed (per 100 ft ² (9.29 m ²) of conditioned floor area)
Compliance Path #1	≤ 6 cfm (2.83 L/s)	≤ 4 cfm (1.89 L/s)
Compliance Path #2	≤ 4 cfm (1.89 L/s)	≤ 3 cfm (1.41 L/s)

Exception: Duct tightness test is not required if the air handler and all ducts are located within conditioned space.

This requirement will take effect one year after the effective date of this rule.

1105.3.2.3 Building cavities. Building framing cavities shall not be used as supply ducts.

1105.3.3 Circulating hot water systems. The first five feet of 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.

1105.3.4 Mechanical ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

1105.3.5 Equipment sizing. Heating and cooling equipment shall be sized as specified in Section M1401.3.

1105.3.6 Snow melt system controls. Snow-and ice-melting systems supplied through energy service to the building shall include automatic controls capable of shutting off the system when the pavement temperature is above 50°F (10°C) and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F (5°C).

~~**1105.3.7 Pools.** Where regulations are adopted and enforced by the local jurisdiction, residential swimming pools shall be provided with energy conserving measures in accordance with Sections 1105.3.7.1 through 1105.3.7.3. Deleted.~~

~~**1105.3.7.1 Pool heaters.** All pool heaters shall be equipped with a readily accessible on-off switch to allow shutting off the heater without adjusting~~

~~the thermostat setting. Pool heaters fired by natural gas or LPG shall not have continuously burning pilot lights. Deleted.~~

~~1105.3.7.2 Time switches. Time switches that can automatically turn off and on heaters and pumps according to a preset schedule shall be installed on swimming pool heaters and pumps. Deleted.~~

~~**Exceptions:-**~~

- ~~1. Where public health standards require 24-hour pump operation.~~
- ~~2. Where pumps are required to operate solar and waste heat recovery pool heating systems.~~

~~1105.3.7.3 Pool covers. Heated pools shall be equipped with a vapor retardant pool cover on or at the water surface. Pools heated to more than 90°F (32°C) shall have a pool cover with a minimum insulation value of R-12. Deleted.~~

~~1105.4 lighting Lighting systems.~~

~~1105.4.1 Lighting equipment. A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps.~~