

# 2015 Michigan Residential Code Chapter 11

Michigan Energy Code

## Michigan Energy Code

#### 2015 IECC Code Book



#### Michigan Energy Code Book



### Michigan Energy Code Options

#### Pathways to Choose From

- Prescriptive Path
  - ✤ R-Value (Table N1102.1.1)
  - ✤ U-factor (Table N1102.1.3)
  - Total UA (Table N1102.1.3) (REScheck)
- Performance Path (REM/rate)
  - Simulated Performance Alternative
  - Energy Rating Index (ERI)



#### Michigan Energy Code

# Whether you go the Prescriptive Path or Performance Path, <u>MANDATORY requirements</u> <u>must be fulfilled</u>

## Building Thermal Envelope

The Prescriptive Pathways, which include the R-value, Ufactor or Total UA alternatives are based on the Building Thermal Envelope

The Prescriptive Pathways do not include such items as furnace AFUE efficiency, A/C SEER ratings, DHW efficiency ratings, lighting, and appliances



#### Michigan Energy Code Options



## Prescriptive Path (R-value)

Thermal Envelope shall meet requirements of this Table

	TABLE R 402.1.1								
	INSC	LATION AND	TENESINA	WOOD				SLAB <sup>d</sup>	CRAWL
				FRAME				R-	SPACE
				WALL	MASS	FLOOR	<b>BASEMENT</b> <sup>c</sup>	VALUE	WALL
CLIMATE	FENESTRATION	SKYLIGHT <sup>▶</sup>	CEILING	R-	WALL R-	R-	WALL	AND	R-
ZONE	U-FACTOR	U-FACTOR	R-Value	VALUE	VALUE <sup>g</sup>	VALUE	R-VALUE	DEPTH	VALUE
5A	0.32	0.55	38	20 or 13 + 5 <sup>f</sup>	13/17	30e	10/13	10, 2ft	15/19
6A	0.32	0.55	49	20 or 13 + 5 <sup>f</sup>	15/20	30 <sup>e</sup>	15/19	10, 4ft	15/19
7	0.32	0.55	49	$20 \text{ or } 13 \\ + 5^{\text{f}}$	19/21	38e	15/19	10, 4ft	15/19

a. R-values are minimums. U-factors are maximums. When 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 not be less than the R-values specified in the table.

b. The fenestration U-factor column excludes skylights.

c. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" may be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation 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. Or insulation sufficient to fill the framing cavity, R-19 minimum.

f. First value is cavity insulation, second is continuous insulation or insulated siding, so "13 + 5" means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers 40 % or less of the exterior, continuous insulation R-value may be reduced by no more than R-3 in the locations where structural sheathing is used – to maintain a consistent total sheathing thickness. g. The second R-value applies when more than half the insulation is on the interior of the mass wall.

21

.35 .60

15/19

## Prescriptive Path (U-factor or Total UA)

Table R402.1.3								
	Equivalent U-Factors <sup>a</sup>							
Climate	Fenestration	Skylight	Ceiling	Frame	Mass wall	Floor	Basement	Crawl
Zone	U-Factor	U-Factor	U-Factor	Wall	U-Factor <sup>b</sup>	U-Factor	Wall	Space
				U-Factor			U-Factor	Wall
								U-Factor
5A	0.32	0.55	0.030	0.057	0.082	0.033	0.059	0.055
6A	0.32	0.55	0.026	0.057	0.060	0.033	0.050	0.055
7	0.32	0.55	0.026	0.057	0.057	0.028	0.050	0.055

a. Nonfenestration 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 0.065 in zone 5 and marine 4, and 0.057 in zones 6 and 7.

An assembly (example is a frame wall) with a U-factor  $\leq$  to that specified in this table shall be permitted as an alternative to the R-value Table

If the total building thermal envelope UA is  $\leq$  to the total UA using the U-factors in this table, then the building is in compliance with the R-value Table

UA allows insulation in 1 part of the building to make up for less in another, thus a little trade-off

### Key or Mandatory Provisions

#### Whichever Pathway is chosen <u>Mandatory Provisions must be met</u>

- 1. Permanent certificate posted on or in the electrical panel
- 2. Air Leakage
  - a. Table N1102.4.1.1 Air Barrier & Insulation Installation (page 447)
  - b. Blower Door- No more than 4 ACH50 in Zone 5
    - i. Home to be in normal state during test and all appliances should be turned off

## **Key Provisions**

#### 2009 IECC Certificate

Building Envelope	Building Envelope Insulation					
Ceiling Flat						
Vaulted Ceiling						
Above Grade Walls						
Foundation Walls	Foundation Walls					
Exposed Floor	Exposed Floor					
Slab	Under	Perimeter				
Infiltration						
Duct						
Duct Leakage to Outs	side					
Window Data	U-Factor	SHGC				
Window						
Mechanical Equip	ment					
HEAT :						
COOL :						
DHW :						

Signature \_



# Key Provisions Table N1102.4.1.1 (page 447)

TABLE R402.4.1.1				
AIR BARRIER AND INSU	LATION INSTALLATION			
COMPONENT	CRITERIA <sup>a</sup>			
Air barrier and thermal barrier	A continuous air barrier shall be installed in the			
	building envelope.			
	Exterior thermal envelope contains a continuous air			
	barrier.			
	Breaks or joints in the air barrier shall be sealed.			
	Air-permeable insulation shall not be used as a			
	sealing material.			
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be			
	aligned with the insulation and any gaps in the air			
	barrier sealed.			
	Access openings, drop down stair, or knee wall doors			
	to unconditioned attic spaces shall be sealed.			
Walls	Corners and headers shall be insulated and the			
	junction of the foundation and sill plate shall be			
	sealed.			

	The junction of the top plate and top of exterior walls shall be sealed. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier. Knee walls shall be sealed.
Windows, skylights and doors	The space between window/door jambs and framing and skylights and framing shall be sealed.
Rim joists	Rim joists shall be insulated and include the air barrier.
Floors (including above-garage, and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.
Crawl space walls	Where provided in lieu of floor insulation, insulation shall be permanently attached to the crawlspace walls. Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.
Narrow cavities	Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air tight, IC rated, and sealed to the drywall.
Plumbing and wiring	Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	Exterior walls adjacent to showers and tubs shall be insulated and the air barrier installed separating them from the showers and tubs.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.
HVAC register boots	HVAC register boots that penetrate building thermal envelope shall be sealed to the subfloor or drywall.
Fireplace	An air barrier shall be installed on fireplace walls.



- 3. Fireplaces- New wood-burning masonry fireplaces shall have tight fitting flue dampers and outdoor combustion air
- 4. Fenestration air leakage
  - a. Windows, skylights, sliding glass doors- no more than .3 cfm/sq ft
  - b. Swinging doors- no more than .5 cfm/sq ft
- 5. Recessed lighting shall be IC rated and labeled at not more than 2.0 cfm air leakage rate at 75 Pa
  - a. They shall be sealed with a gasket or caulk
- 6. Maximum (area weighted avg) vertical fenestration U-factor in zone 5 is .48 when using the Total UA or Simulated Performance Alternatives. Maximum of .75 for skylights

#### 7. Controls

- a. At least 1 thermostat shall be provided for each separate heating & cooling system
- b. Heat pumps with backup electric resistance heat shall have controls that prevent backup heat operation when heat pump compressor can meet demand

#### 8. Ducts

- a. Ducts, air handlers, and filter boxes shall be sealed
- b. Duct tightness testing
  - i. Post Construction- Total leakage or leakage to outside to be less than or equal to 4 cfm/100 sq ft
  - ii. Rough-in test- Total leakage less than or equal to 4 cfm/100 sq ft (with air handler) 3 cfm (no air handler)
  - iii. Testing not required when located within the thermal envelope

- iv. Building framing cavities shall not be used as ducts or plenums
- 9. Whole-house Mechanical ventilation
  - a. Outdoor air intakes and exhausts shall have automatic or gravity dampers
  - b. Can be exhaust, supply, or combination of both
  - c. Local exhaust or supply fans qualify
  - d. Outdoor air ducts connected to the return side of the air handler shall qualify
  - e. Manual override controls shall be installed

<b>Continuous Whole House Mechanical Ventilation Airflow Rates</b>							
	(Table M1507.3.3(1))						
Dwolling Unit Floor	Number of Bedrooms						
Aroa (soft)	0 to 1	2 to 3	4 to 5	6 to 7	>7		
Area (Sqrt)	Airflow in CFM						
< 1,500	30	45	60	75	90		
1,501 - 3,000	45	60	75	90	105		
3,001 - 4,500	60	75	90	105	120		
4,501 - 6,000	75	90	105	120	135		
6,001 - 7,500	90	105	120	135	150		
> 7,500	105	120	135	150	165		

#### **10. Equipment Sizing**

- a) ACCA Manual S and Manual J
- 11. Lighting equipment
  - a) A minimum of 75% of permanently installed lighting fixtures shall be high-efficacy

#### Michigan Energy Code Options



#### Simulated Performance Path

Along with the Thermal Building Envelope, this alternative includes heating, cooling, and service water heating

This Alternative Path requires that the proposed home has an annual energy cost that is less than or equal to the annual energy cost of the standard reference design (imaginary home that is the same size and shape, and which adheres to the mandatory provisions and the specifications listed in table N1105.5.2(1) on pg. 453)

#### Michigan Energy Code Options



#### Energy Rating Index Compliance Path (new)

This Path uses an Energy Rating Index (ERI) for analysis
Like the Simulated Performance Path, this Path references the home to be built to a standard reference design (imaginary home)

The standard reference design is designed to where it meets the minimum (prescriptive) requirements of the 2006 International Energy Conservation Code (IECC)

Along with the Thermal Building Envelope, this alternative includes heating, cooling, service water heating, lighting, and appliances for analysis

### Energy Rating Index Compliance Path



Maximum Ene	ergy Rating Index
Climate Zone	Energy Rating Index
1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

#### Energy Rating Index Compliance Path

In 2014, 146,000 homes were analyzed with a HERS Index Score across the United States

The average score for these homes was 63

In 2014, 2,026 homes were analyzed in Michigan

The average score in Michigan for that year was 60

For a home to pass the new Michigan Energy Code using this Path, a score of 55 or less (in zone 5) would have to be achieved

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# Thank You

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