

Michigan Energy Code Training and Implementation Program

*1.0 Hour Residential Program Course Number 16132
2009 Michigan Uniform Energy Code*



MICHIGAN STATE
UNIVERSITY



**School of Planning, Design
& Construction**

Michigan State University
East Lansing, Michigan

Project Support

Prepared by the **School of Planning, Design and Construction at Michigan State University**. Oversight provided by MSU faculty and the **Center for Construction Project Performance Assessment and Improvement (C2P2ai)**.

Funding provided by Michigan Department of Energy, Labor & Economic Growth, U.S. Department of Energy and the American Recovery and Reinvestment Act of 2009 with assistance from the Michigan Bureau of Energy Systems (BES) and Bureau of Construction Codes (BCC)



MICHIGAN STATE
UNIVERSITY



MEEA
Midwest Energy Efficiency Alliance



Project Objectives

To train **building officials, inspectors, home builders, subcontractors, suppliers, engineers and architects** in the revised Michigan energy code for the purpose of:

1. Increasing understanding
2. Improving compliance
3. Reducing administrative time
4. Improving customer relationships

Building Energy Codes Program

Date visited: 3/14/2011

- ABOUT BECP
- WHY BUILDING ENERGY CODES
- RELATED LINKS

Search energycodes.gov

EERE Information Center

Take Our Website Survey

Less Energy. Less Cost. Less Carbon.

LEARN MORE ABOUT...

Measuring Compliance

Compliance Evaluation

BROWSE...

Publications

Events Calendar

Job/Internship Opportunities

QUICKLINKS FOR...

Architects/Engineers
/Designers

Builders/Contractors

Code Enforcement Officials

State & Local Code Adopters

Codes Advocates

Students

FOLLOW US!



DOWNLOAD THE CODE:

Digital copies of the
ASHRAE Standard
90.1-2007 (I-P Edition)
and the 2009 International
Energy Conservation Code®
are now available!

Get Your Copy Now!

>> Learn More



To learn more about a featured item, click on the corresponding image.



Status of Energy Codes



Solutions & Help Center



Software & Tools



Building Energy
Codes University



RESIDENTIAL
Energy Codes



COMMERCIAL
Energy Codes

POWER TOOLS

Status Helpline

Desktop Tools

REScheck COMcheck

Online Tools

REScheck COMcheck

RECENT UPDATES

2010 Building Energy Codes Annual
Report Released
posted 03.04.2011

Store + Score Application Released
posted 03.04.2011

DOE proposed changes to IgCC PV
2.0
revised 03.10.2011

CODES IN THE NEWS

Notice of Public Meeting: Presenting
and Receiving Comments to DOE
Proposed Changes to the IgCC
posted 03.10.2011

A Chance Encounter with the
Massachusetts Stretch Energy
Code
Source: New Buildings Institute, 03.02.2011

Energy Efficiency key to Zero
Energy Commercial Buildings
Source: Energy Saving Association,
02.21.2011

Michigan Code Status

LEARN MORE....

[Status of State Energy Codes](#)

[State-Level Technical Assistance](#)

[Status of State-Level Technical Assistance Requests](#)

[State-Level Technical Assistance Sample](#)

[State-Level Technical Assistance Reports](#)

[Energy Efficiency Partnerships](#)

[DOE Building Technologies Application Centers](#)

ALSO ON THIS WEBSITE...

[Status of Codes](#)

[Solutions & Help Center](#)

[Software & Tools](#)

[Building Energy Codes University](#)

[Publications](#)

[Events Calendar](#)



Status of State Energy Codes

Michigan

as of 2011-03-09

Do you know of updates to the information on this page?
If so, please [let us know!](#)

CURRENT NEWS

The energy code in Michigan has been finalized. The new code will be the 2009 International Energy Conservation Code for residential dwellings and ASHRAE 90.1-2007 for commercial buildings. The code will go into effect in March 2011.

RESIDENTIAL

Residential Code	2009 IECC
MI Amendments Approved Compliance Tools	Can use REScheck
MI-Specific Research	Impacts of the 2009 IECC for Residential Buildings in the State of Michigan (BECF Report, Sept. 2009)
Approximate Stringency	As stringent as the 2009 IECC
Effective Date	March 1, 2011

DOE Determination/State Certification

COMMERCIAL

Commercial Code	ASHRAE 90.1-2007
MI Amendments MI-Specific Research	Impacts of Standard 90.1-2007 for Commercial Buildings in the State of Michigan (BECF Report, Sept. 2009)
Approved Compliance Tools	Can use COMcheck
Approximate Stringency	As stringent as ASHRAE 90.1-07
Effective Date	March 1, 2011

DOE Determination/State Certification

POWER TOOLS

Status Helpline

Desktop Tools

REScheck COMcheck

Online Tools

REScheck COMcheck

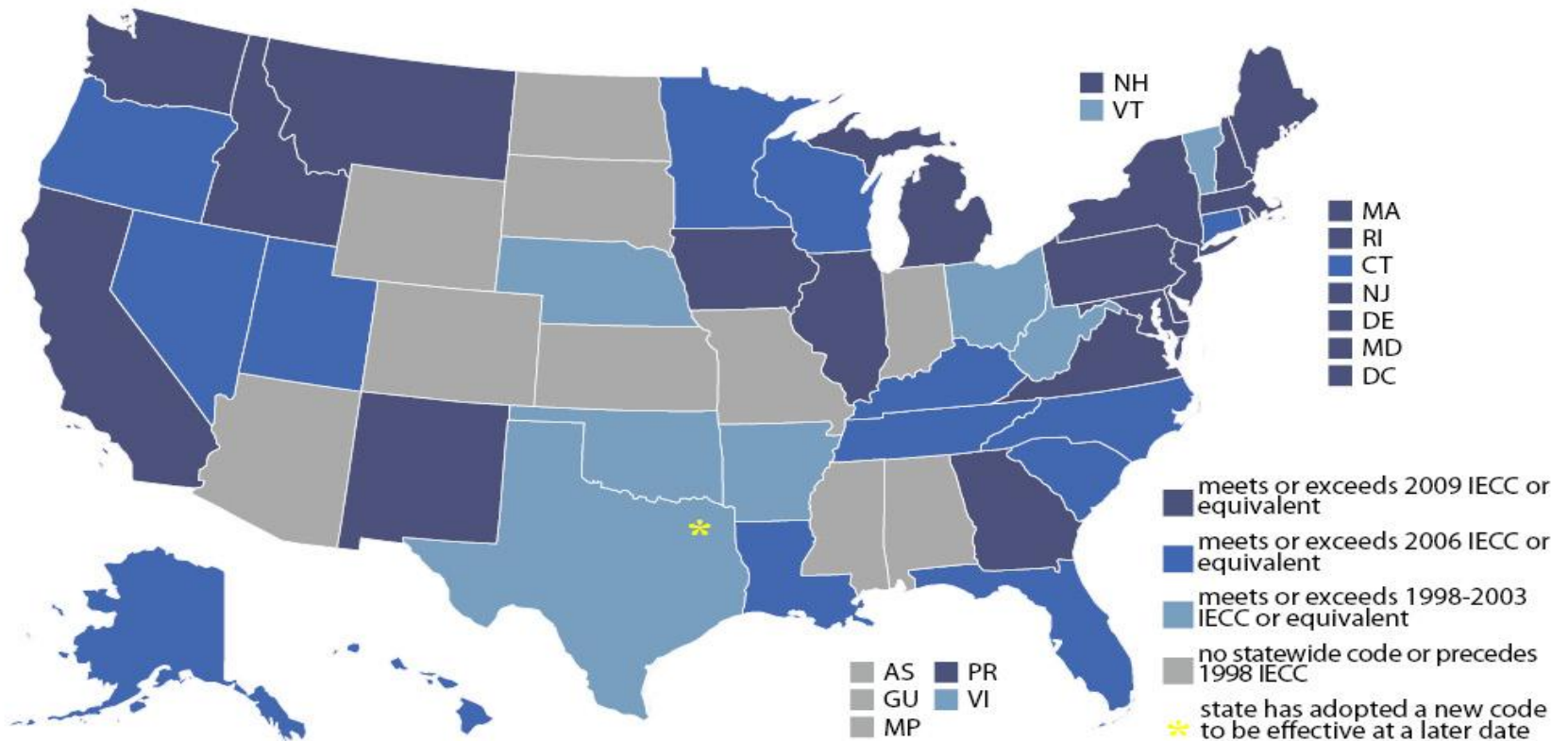
CUSTOMIZED MAPS

[Commercial Status at-a-glance](#)
[Residential Status at-a-glance](#)
[State Compliance Activities](#)
[States that can use REScheck](#)
[States that can use COMcheck](#)
[Commercial Energy Code Adoption Activity](#)
[Residential Energy Code Adoption Activity](#)
 [Download all maps!](#)

Code Status: Residential



Residential State Energy Code Status AS OF MARCH 9, 2011



BCAP Dedicated to the adoption, implementation, and advancement of building energy codes
Get all the most up-to-date code status maps and other valuable resources at www.bcap-ocean.org

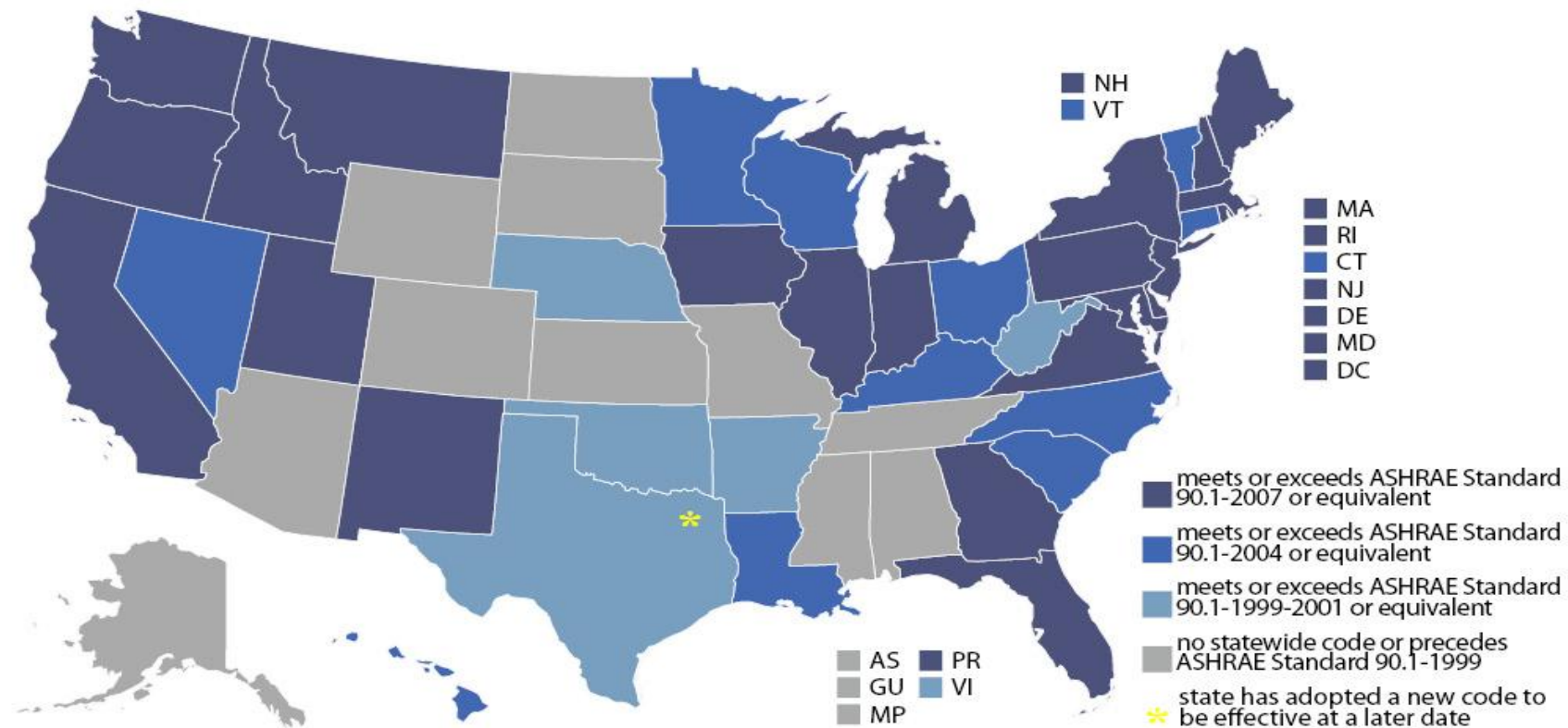
<http://bcap-ocean.org/code-status-residential>

Date visited: 2/11/2011

Code Status: Commercial



Commercial State Energy Code Status AS OF MARCH 9, 2011



BCAP Dedicated to the adoption, implementation, and advancement of building energy codes

Get all the most up-to-date code status maps and other valuable resources at www.bcap-ocean.org

<http://bcap-ocean.org/code-status-commercial>

Date visited: 2/11/2011

Michigan Code Status



OCEAN Online Code Environment & Advocacy Network

Home | About | Getting Started **SIGN UP** **LOGIN**

Follow Us On

LIBRARY TOPICS **CODE STATUS** COMMUNITY TOOLS BLOG

Search **GO**

User Login

Username: *

Password: *

LOGIN

[Create new account](#)

[Request new password](#)

Home > 2009 Michigan Uniform Energy Code Effective March 9, 2011

2009 Michigan Uniform Energy Code Effective March 9, 2011

Posted in [Adoption](#), [Commercial](#), [Implementation](#), [Michigan](#), [Michigan Uniform Energy Code](#), [MUEC](#), [Residential](#) on November 15, 2010 by Paul Karrer

Rules to update the 2009 Michigan Uniform Energy Code (MUEC), Part 10 (Residential) and Part 10a (Commercial) were filed with the Secretary of State on November 8 and will be effective March 9, 2011. The rules will adopt the 2009 IECC with Michigan amendments and ASHRAE Standard 90.1-2007 (the MUEC is currently based on the 2003 IRC and ASHRAE 90.1-1999). The new codes were originally approved on July 20 by the Department of Energy, Labor & Economic Growth (DELEG) Bureau of Construction Codes.

A web link will be added to the Bureau's web site at www.michigan.gov/bcc, via the Codes and Standards Order Form to allow customers to purchase the code book directly from the International Code Council (ICC) for \$38.00. Books are now available.

[More Information: MUEC: Residential & Commercial | Bureau of Construction Codes](#)

BCAP Michigan Code Status

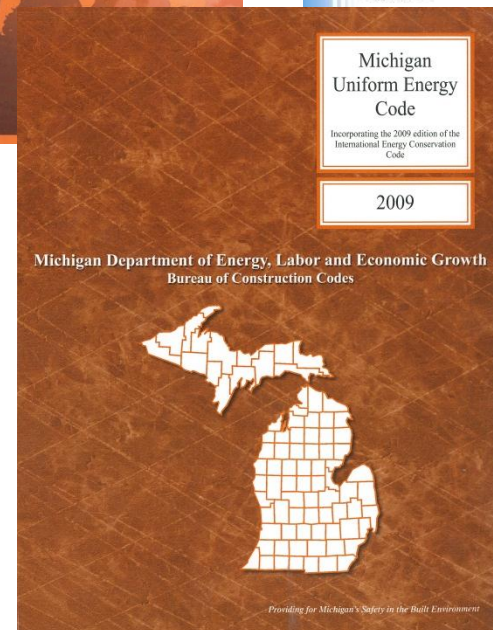
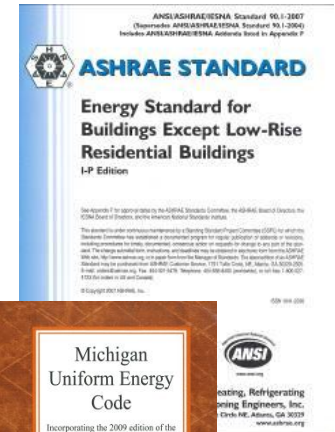
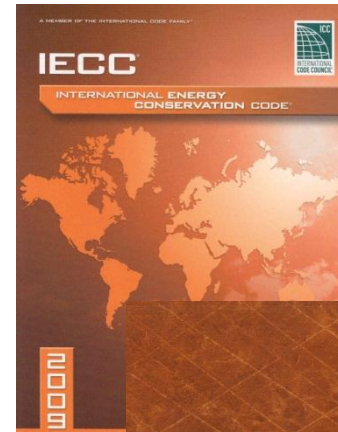
<http://bcap-ocean.org/news/2010/november/15/2009-michigan-uniform-energy-code-effective-march-9-2011>

2009 Michigan Uniform Energy Code (MUEC)

Michigan Department of Labor & Economic Growth
Bureau of Construction Codes



Providing for Michigan's Safety in the Built Environment



2009 Michigan Uniform Energy Code (MUEC)

DEPARTMENT OF ENERGY, LABOR, AND ECONOMIC GROWTH

DIRECTOR'S OFFICE

CONSTRUCTION CODE

Filed with the Secretary of State on November 8, 2010

PART 10

MICHIGAN UNIFORM ENERGY CODE

R 408.31059 Applicable code.

Rule 1059. The provisions of the international energy conservation code, 2009 edition, except for sections 102.1.1, 107.2 to 107.5, 301.2, 301.3, 402.3.2, 501.1, to 506.6.2 and Tables 303.1.3(3), 502.1.2, 502.2(1), 502.2(2), 502.3, 502.4.4, 503.2.3(1), 503.2.3(2), 503.2.3(3), 503.2.3(4), 503.2.3(5), 503.2.3(6), 503.2.3(7), 503.2.8, 503.2.10.1(1), 503.2.10.1(2), 503.3.1(1), 503.3.1(2), 504.2, 505.5.2, 505.6.2(1), 505.6.2, 505.6.2(2), 506.5.1(1), 506.5.1(2), 506.5.1(3), 506.5.1(4), and 506.6.1(5) govern the energy efficiency for the design and construction of residential buildings and, with exceptions noted, the international energy conservation code is adopted by reference in these rules. All references to the international building code, international residential code, international energy conservation code, international electrical code, international existing building code, international mechanical code, and international plumbing code mean the Michigan building code, Michigan residential code, Michigan uniform energy code, Michigan electrical code, Michigan rehabilitation code for existing buildings, Michigan mechanical code, and Michigan plumbing code respectively. -The Michigan uniform energy code is available for inspection or purchase at the Okemos office of the Michigan Department of Energy, Labor and Economic Growth, Bureau of Construction Codes, 2501 Woodlake Circle, Okemos, Michigan 48864, at a cost as of the time of adoption of these rules of \$38.00 or may be purchased from the International Code Council, 500 New Jersey Avenue, N.W., 6th Floor, Washington, D.C. 20001.

2009 MUEC Prescriptive Approach

Training Module



MICHIGAN STATE
UNIVERSITY



MEEA
Midwest Energy Efficiency Alliance

**School of Planning, Design
& Construction**

Michigan State University
East Lansing, Michigan

New for the 2009 MUEC

- No longer allows for mechanical system trade-offs
- Drops the Abbreviated Report Form N1107.1
- Requires 50% of the lighting to be high efficacy (refer to definition section)
- Slight modifications to R-values for walls and ceilings
- Adds rigor to air barrier and air sealing requirements
- Adds rigor to inspection criteria
- Above-code programs, such as HERS and Energy Star, not clear

New for the 2009 MUEC

- Michigan amendments are primarily administrative in nature changing the title of the code from the International Energy Conservation Code (IECC) to the Michigan Uniform Energy Code (MUEC)
- Eliminated references to requirements which do not apply to Michigan, such as:
 - Climate zones 1-4
 - SHGC references
- There are some minor technical amendments, such as:
 - Recessed light fixtures installed in insulated ceilings
 - Reductions in R-value for full insulation over wall double-top plate
 - Reroofing under certain limited circumstances

Demonstrate Compliance

Prescriptive

Trade-off

Performance

“Prescriptive Packages Approach”

“Trade-off Approach” (UA)

“Performance Approach”

Residential Data Collection Checklist
2009 International Energy Conservation Code
Climate Zone 3

Date: _____ Name of Evaluator(s): _____

Building Name & Address: _____ Conditioned Floor Area: _____ sq'

Building Contact Name: _____ Phone: _____ Email: _____

Compliance Approach: Prescriptive (IECC 1.2 or IECC 1.3) UA Trade-off (IECC 1.4) Building Performance (IECC 1.5)

Site: _____ Jurisdiction: _____

Building Type: 1- and 2-Family Detached 3- and 4-Family Medium-Density Multifamily Multifamily

Project Type: New Construction Renovation

Item Number	Description	Code Value	Verified Value			Complies
			Y	N	N/A	
F01 402.2.8, 303.2f	Foundation Inspection Slab edge insulation R-value installed per manufacturer's instructions.	Unheated: R-5 Heated: R-5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F02 402.2.8f	Slab edge insulation depth/length	Heated: 2 R	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F03 402.2.1, 303.2f	Basement wall exterior insulation R-value installed per manufacturer's instructions.	R-5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F04 402.2.7f	Basement wall exterior insulation depth	10 R, or to basement floor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F05 402.2.9, 303.2f	Crawl space wall insulation R-value installed per manufacturer's instructions.	R-5 (crawl) or R-10 (cavity)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F06 403.8f	Show melt controls		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F07 402.2.1f	Insulation protection		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

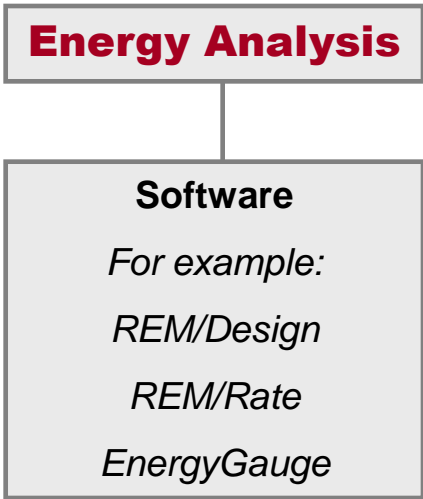
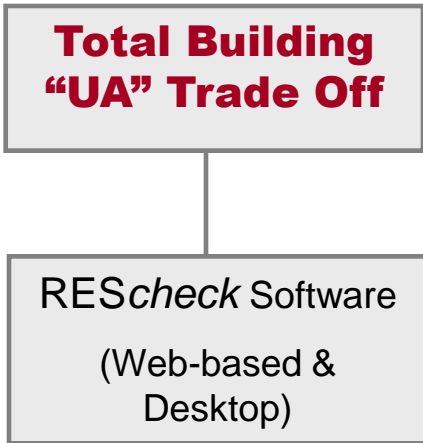
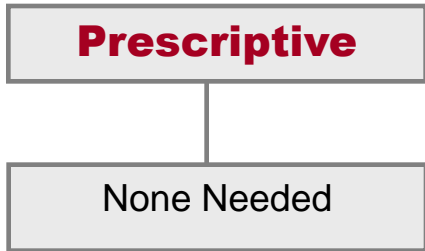
Additional Comments: _____



REScheck™



Code Compliance Software Tools



Residential Data Collection Checklist
2009 International Energy Conservation Code
Check Sheet 2

Date: _____ Name of Evaluator: _____
 Building Name & Address: _____ Coordinated Floor Area: _____ SF
 Building Contact: Name: _____ Phone: _____ Email: _____
 Compliance Approach: Prescriptive (402.1.2 or 402.1.3) UA Trade-Off (402.1.4) Building Performance (402.1.5)

Site: _____ Jurisdiction: _____
 Building Type: 1- and 2-Family, Detached 3- and 4-Family, Detached 3- and 4-Family, Attached Other _____

Item Number	Description	Risk Number	Foundation Inspection Code Value	Verified Value	Complies		
					Y	N	N/A
F011	Slab edge insulation R-value installed per manufacturer's instructions.	402.2.8	Unrated R-0		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F02	Slab edge insulation depth/length	402.2.8F	Required: 2 R.	R=_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F03	Basement wall exterior insulation R-value. Installed per manufacturer's instructions.	402.1.1, 402.2.7	R-0	R=_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F04	Basement wall exterior insulation depth	402.2.7F	10 R. or to basement floor	R=_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F05	Crawl space wall insulation R-value. Installed per manufacturer's instructions.	402.2.9, 402.2.7	R-5 (cont.) R-12 (cavity)	R=_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F06	Snow melt controls	403.6F			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F07	Insulation protection	403.2.1F			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional Comments: _____



Structure of the 2009 MUEC Residential

Based on IECC 2009 with Michigan Amendments

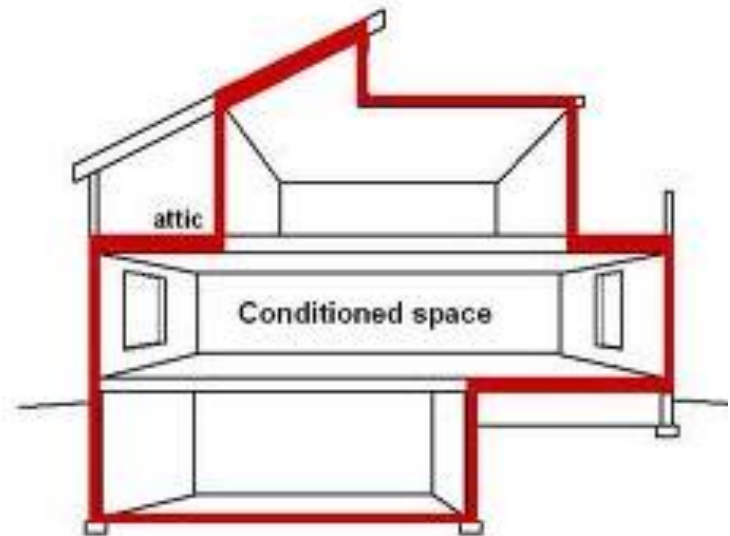
- **Chapter 1: Administration, Scope, and Application**
 - Some MI amendments
- **Chapter 2: Definitions**
 - Mostly untouched, but with amendments to the definition of ‘building’ and ‘code/building officials’
- **Chapter 3: Climate Zones**
 - Largely replaced by MI amendments adjusting climate zones
- **Chapter 4: Residential Energy Efficiency**
 - Some detailed MI amendments
- **Chapter 5: Commercial Energy Efficiency**
 - Replaced by ASHRAE 90.1—2007
- **Chapter 6: Reference Standards**

Overview of Residential Code Requirements

- Focus is on building envelope
 - Ceilings, walls, windows, floors, foundations
 - Sets insulation levels and window U-factors
 - Infiltration control—caulk and seal to prevent air leaks
- Ducts—seal and insulate
- Limited space heating, air conditioning, and water heating requirements
 - Federal law sets most equipment efficiency requirements, not the I-codes
- No appliance requirements
- Lighting equipment—50% of lamps to be high-efficacy lamps

Space Conditioning

Any non-conditioned space that is altered to become conditioned space shall be required to be brought into full compliance with this code



<http://resourcecenter.pnl.gov/cocoon/morf/ResourceCenter/graphic/231>

Chapter 1: Administration

Part 1: Scope and Application

Section 101: Scope and General Requirements

- Defines scope of the energy code
- Application:
 - New buildings
 - *101.4.1: Existing Buildings*
 - *101.4.2: Historic Buildings*
 - *101.4.3: Additions, Alterations, Renovations, and Repairs*
 - *101.4.4: Changes in Use/occupancy*
 - *101.4.5: Changes in Space conditioning*
 - *101.4.6: Mixed Occupancies*

Chapter 1: Administration

101.4.3: Additions, Alterations, Renovations, Repairs:

- Conform as relates to new construction
- Unaltered portions do not need to comply
- Additions can comply alone or in combination with existing building

Exceptions:

- Storm windows over existing fenestration
- Glass only replacements
- Exposed, existing ceiling, wall or floor cavities if already filled with insulation
- Where existing roof, wall or floor cavity isn't exposed
- Reroofing for roofs where neither sheathing nor insulation exposed
 - Insulate above or below the sheathing
 - Roofs without insulation in the cavity
 - Sheathing or insulation is exposed



Chapter 1: Administration

101.4.3: Exceptions to Meeting Thermal Building Envelope Provisions:

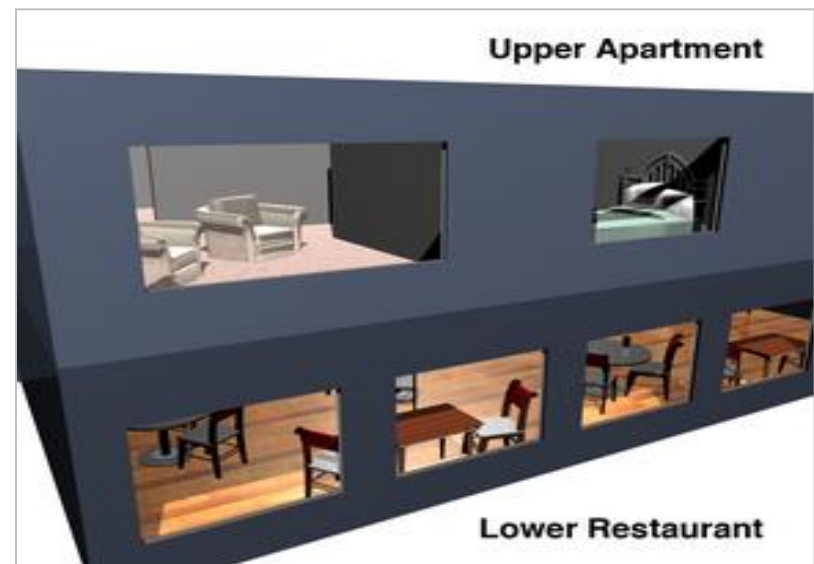
- Very low energy use buildings ($<3.4 \text{ Btu/h-ft}^2$ or 1 watt/ft^2)
- Buildings (or portions of) that are neither heated nor cooled
- Existing buildings (Section 101.4.1)
 - Electrical power, lighting, and mechanical systems still apply
- Buildings designated as historic (Section 101.4.2)



Chapter 1: Administration

101.4.6: Mixed-use Occupancies:

- Treat the residential occupancy under the applicable residential code
- Treat the commercial occupancy under the commercial code



Chapter 1: Administration

101.5: compliance

Meet the provisions of chapter 4

- 101.5.1: Computer Simulations
- 101.5.2: Low Energy Buildings
 - Exempted if less than 3.4 BTH/hr sf² and buildings without conditioned spaced

Chapter 1: Administration

Section 102: Alternate Materials—Method of Construction, Design, or Insulating Systems

Not intended to prevent materials, methods, design, or insulating systems not specifically prescribed provided the method has been improved by the code official as meeting the intent

Chapter 1: Administration

Section 103: Construction Documents

Construction documents, special inspections, structural programs, other data shall meet:

- Submitted in one or more sets with each application for permit
- Prepared by or under direct supervision of a registered design professional when required by 1980 PA 299
- Building official authorized to require additional construction documents for special conditions

Chapter 1: Administration

103.2: Information on Construction Documents:

Beyond standard plan and detail information for the energy code, documents must show insulation materials, R-values, fenestration U factors, area-weighted U factors, mechanical system design criteria, mechanical and service water heating system and equipment types, sizes and efficiency, duct sealing, duct and pipe insulation, lighting fixture schedule with wattage and controls, air sealing details (see 103.2 for comprehensive list)

Chapter 1: Administration

Sec103: Construction Documents

- *103.3 through 103.5*: Discussion of approvals

Chapter 1: Administration

Section 104: Inspections

- Language similar to IRC provisions

Section 105: Validity

Section 106: Reference Standards

- Refers reader to Chapter 6

Section 107: Fees (amended by MI)

Section 108: Stop Work Order

- Similar to IRC

Section 109: Board of Appeals

- Similar to IRC (amended by MI)

Chapter 2: Definitions

- Largely untouched, but with amendments to definition of 'building' and 'code/building officials'
- Michigan definition of 'Building' excludes agricultural structures not used for retail business
- 'Building Official' references R408.30499

Chapter 3: Climate Zones

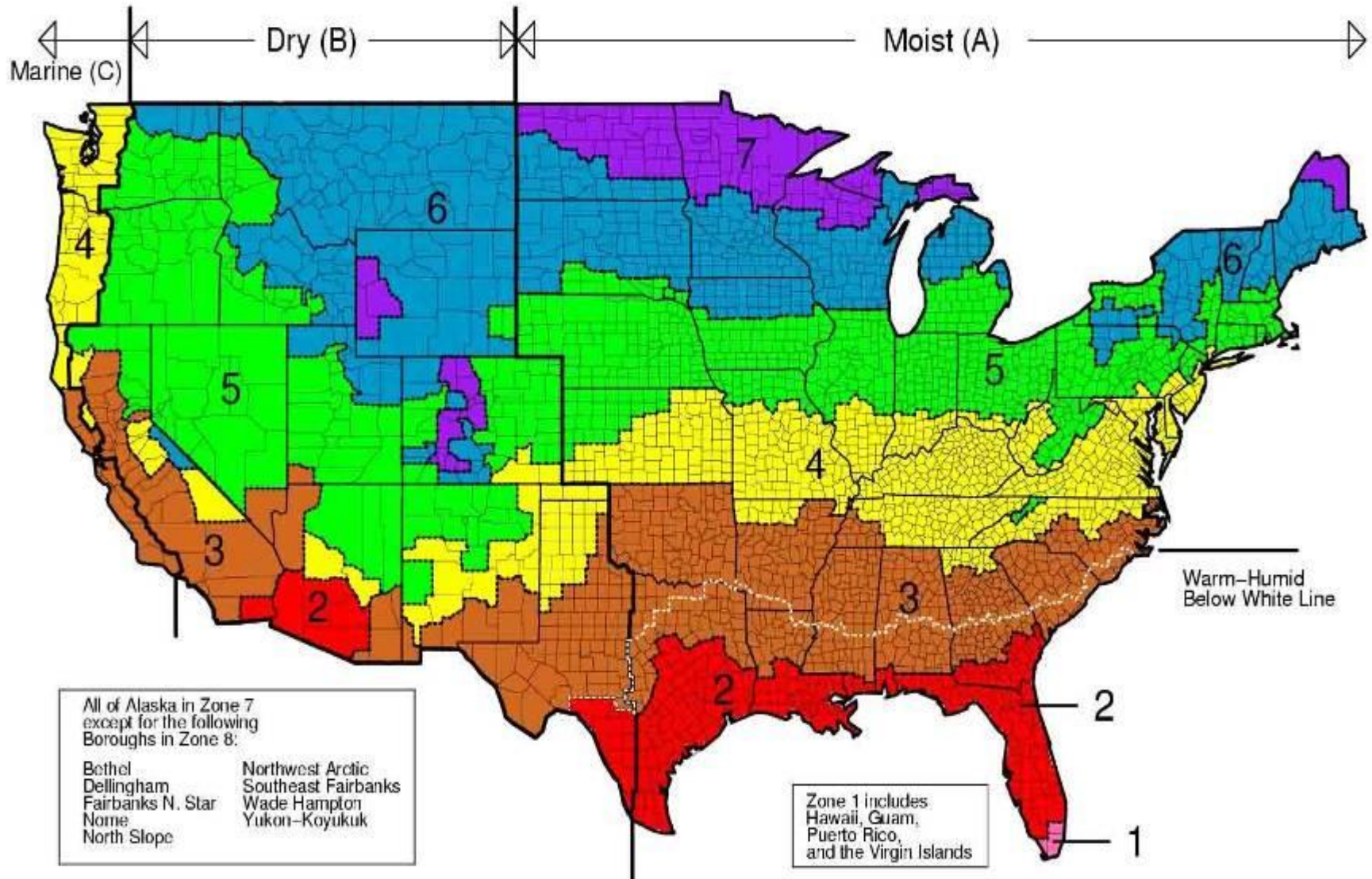
Section 301: Climate Zones

- Replaced by MI amendments adjusting climate zones
- Climate zones taken from figures 301.1, 301.1A and Table 301.1

Presenter's Note: Some counties are now in new climate zones— Upper Peninsula now includes 6A and 7 and some counties have moved to (6A) from former Zone 2

Presenter's Note: The 2003 MUEC is based upon climate zones 1, 2 and 3. The new MUEC re-labels these as 5A, 6A and 7.

U.S. Climate Zones—2009 IECC



2009 MUEC Climate Zones

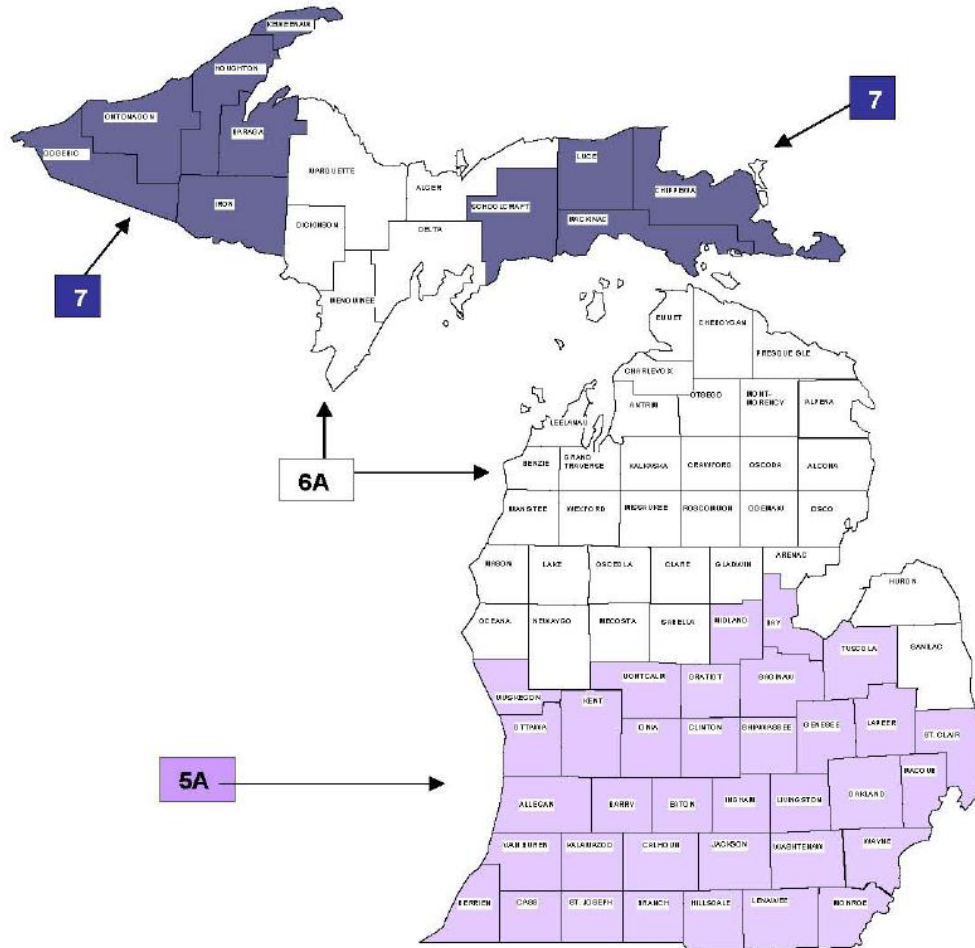
The State of Michigan is divided into 3 climate zones:

Climate Zone Definitions

Zone Number	Thermal Criteria	
	IP Units	SI Units
5A	$5400 < \text{HDD}65^{\circ}\text{F} \leq 7200$	$3000 < \text{HDD}18^{\circ}\text{C} \leq 4000$
6A	$7200 < \text{HDD}65^{\circ}\text{F} \leq 9000$	$4000 < \text{HDD}18^{\circ}\text{C} \leq 5000$
7	$9000 < \text{HDD}65^{\circ}\text{F} \leq 12600$	$5000 < \text{HDD}18^{\circ}\text{C} \leq 7000$

For SI: $^{\circ}\text{C} = [(^{\circ}\text{F}) - 32] / 1.8$

Figure 301.1A: Climate Zones



2009 Michigan Uniform Energy Code
Figure 301.1a

Table 301.1: Climate Zones by County

Table 301.1
Climate Zones by County

Zones		
5A	6A	7
Allegan	Alcona	Baraga
Barry	Alger	Chippewa
Bay	Alpena	Gogebic
Berrien	Antrim	Houghton
Branch	Arenac	Iron
Calhoun	Benzie	Keweenaw
Cass	Charlevoix	Luce
Clinton	Cheboygan	Mackinac
Eaton	Clare	Ontonagon
Genesee	Crawford	Schoolcraft
Gratiot	Delta	
Hillsdale	Dickinson	
Ingham	Emmet	
Ionia	Gladwin	
Jackson	Grand Traverse	
Kalamazoo	Huron	
Kent	Iosco	
Lapeer	Isabella	
Lenawee	Kalkaska	
Livingston	Lake	
Macomb	Leelanau	
Midland	Manistee	
Monroe	Marquette	
Montcalm	Mason	
Muskegon	Mecosta	
Oakland	Menominee	
Ottawa	Missaukee	
Saginaw	Montmorency	
Shiawassee	Newaygo	
St. Clair	Oceana	
St. Joseph	Ogemaw	
Tuscola	Osceola	
Van Buren	Oscoda	
Washtenaw	Otsego	
Wayne	Presque Isle	
	Roscommon	
	Sanilac	
	Wexford	

Key: A – Moist. Absence of moisture designation indicates moisture regime is irrelevant.

Chapter 3: Climate Zones

Section 302: Design Conditions

Maximum 72°F heating
Minimum 75°F cooling

Chapter 3: Climate Zones

Section 303: Material Systems and Equipment

303.1: Identification

- Material systems and equipment must be identified in a manner that will allow determination of compliance

303.1.1: Building Thermal Envelope and Insulation

- Identification mark must be applied by the manufacturer to each piece of thermal envelope insulation 12” or greater in width
- Alternatively, the insulation installer shall provide a certification listing the type, manufacturer, and R-value of insulation
- For blown or sprayed insulation, the initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags shall be listed on the certification
- For sprayed polyurethane foam insulation, installed thickness of areas covered, and R-values of installed thickness shall be listed on the certification. Installer must sign, date and post the certification in a conspicuous location

Chapter 3: Climate Zones

303.1.1: Blow or sprayed roof ceiling insulation

- Thickness of blown and/or sprayed insulation shall be written in inches on markers that are installed at least one for every 300 sf throughout the attic space
- Marker shall be affixed to trusses or joists and marked with a minimum initial installed thickness with numbers a minimum of 1 inch in height



Chapter 3: Climate Zones

Section 303: Material Systems and Equipment

303.1.2: Insulation Mark Installation

- Insulating material shall be installed such that manufacturer's R-value mark is readily observable upon inspection

Presenter's Note: Because of increased emphasis on compliance, many jurisdictions will go to insulation inspections

Chapter 3: Climate Zones

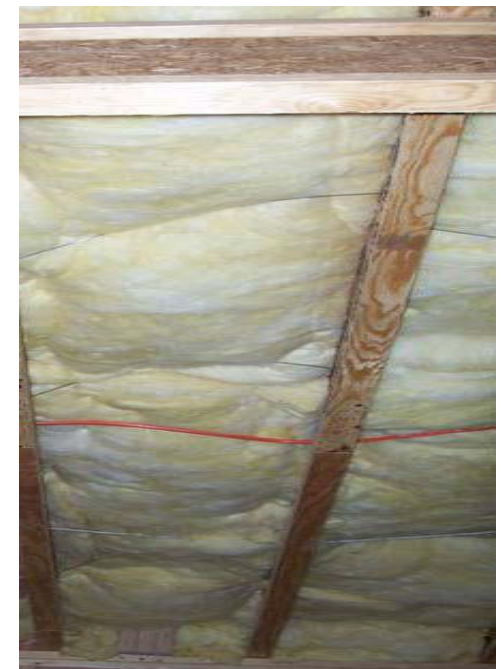
303.1.4: Insulation Product Rating

- R-value must be determined in accordance with CFR Title 16 Part 460, May 31st, 2005 at mean temperature 75°F

Chapter 3: Climate Zones

303.1.4: Insulation Product Rating

- New labeling requirements for fixed wall insulation
 - Compressing cotton, polyester, fiberglass, or mineral wool batts
 - Must have labeling on batt for compressed R-value
- Currently information is on packaging material per FTC requirements



Chapt 3: Climate Zones

303.1.3: Fenestration Product Rating

- U factors of fenestration products (windows, doors, and skylights) shall be determined in accordance with NFRC 100, labeled and certified
- Product lacking such certification must use default values from Table 303.1.3 (1), 303.1.3 (2)
- For example: a vinyl clad wood double-glazed window without certification would have to use the default U value of 0.55 from Table 303.1.3 (1)

Chapter 3: Climate Zones

303.1.3: Fenestration Product Rating

- Michigan has added an exception for computer simulations by independent NFRC certified laboratories as an alternative for use of the default values from Tables 303.1.1(1) and 303.1.3(2)

Chapter 3: Climate Zones

303.2: Installation

- Must be installed in accordance with manufacturer's instructions
- Must be installed in accordance with International Building Code (IBC)

Presenter's Note: MBC and MRC

Chapter 4: Residential Energy Efficiency

401.1: Scope

- Applies to residential buildings
- Commercial buildings covered under the commercial code based on ASHRAE 90.1—2007 (excludes low-rise residential up to 3 stories)

Section 401: General

401.1: Scope:

- IRC only for single-family, duplex, and townhouses
- IECC has all low-rise (1-3 stories) houses, condos, and apartments [R-2, R-3, R-4], but not hotels/motels [R-1]
- All buildings that are not “residential” by definition are “commercial”

Includes repairs, alterations, and additions

e.g., window replacements



Section 401: General

401.2: Compliance

Projects must comply with certain mandatory provisions

- *401.2.4: Air Leakage*
- *402.5: Maximum U values: Fenestration*
- *403.1: Controls*
- *403.2.2: Duct Sealing*
- *403.2.3: Building Cavities*
- *403.3 through 403.9: referred to as mandatory*
- Must comply with either:
 - Prescriptive (402.1 – 402.3, 403.2.1 and 404.1)
 - Performance (Section 405)

Section 401: General

401.3: Certificate

- Permanently posted on the electrical distribution panel
- Don't cover or obstruct the visibility of other required labels
- Includes the following:
 - R-values of insulation installed for the thermal building envelope including ducts outside conditioned spaces
 - U-factors for fenestration
 - HVAC efficiencies and types
 - SWH equipment

Section 401: General

401.3: Certificate (continued)

- If a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed
 - Certificate lists gas-fired unvented room heater, electric furnace or baseboard electric heater
- No efficiency listed for the above systems

Section 402: Building Thermal Envelope

402.1: General Prescriptive

- 402.1.1: Insulation and Fenestration Criteria
- Additions

TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT ^a U-FACTOR	CEILING R-Value	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^f	FLOOR R-VALUE	BASEMENT ^b WALL R-VALUE	SLAB ^c R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
5A	0.35	0.60	38	20 or 13 + 5 ^e	13/17	30 ^d	10/13	10, 2ft	10/13
6A	0.35	0.60	49	20 or 13 + 5 ^e	15/19	30 ^d	15/19	10, 4ft	10/13
7	0.35	0.60	49	21	19/21	38 ^d	15/19	10, 4ft	10/13

a. The fenestration *U*-factor column excludes skylights.

b. The first *R*-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.

c. R-5 shall be added to the required slab edge *R*-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less, in zones 1-3 for heated slabs.

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

e. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25% or less of the exterior, R-5 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.

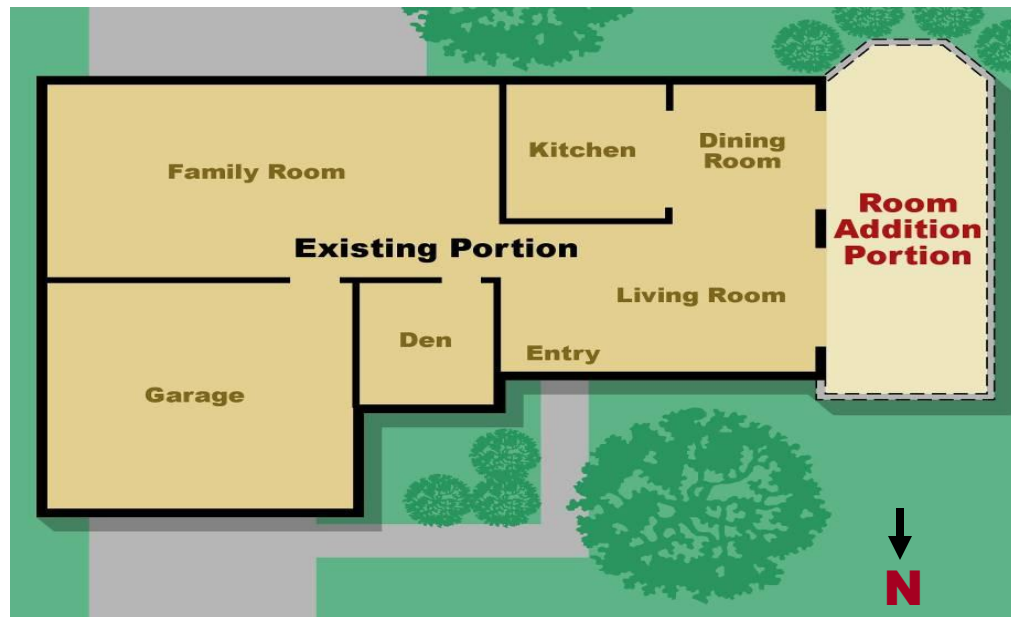
f. The second *R*-value applies when more than half the insulation is on the interior.

From DELEG Construction Code Part 10 Michigan Uniform Energy Code

Section 402: Building Thermal Envelope

Additions:

- Treat as a stand-alone building
- Additions must meet the prescriptive requirements in Table 402.1.1



Section 402: Building Thermal Envelope

402.1.2: R-value Computation

- Insulation components only
- Do not include other building materials or air films

Section 402: Building Thermal Envelope

402.1.3: U-Factor Alternative

- Maximum U-factors from Table 402.1.3

Table 402.1.3
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 ^d	Crawl Space Wall U-Factor ^c
5A	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6A	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7	0.35	0.60	0.026	0.057	0.057	0.026	0.050	0.065

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 the same as the frame wall U-factor in Zones 5 to 7.

c. Basement wall U-factor requirements shown in Table 402.1.3 include wall construction and interior air films, but exclude soil conductivity and exterior air films.

d. Foundation U-factor requirements shown in Table 402.1.3 include wall construction and interior air films, but exclude soil conductivity and exterior air films. U-factors for determining code compliance in accordance with section 402.1.4 (total UA alternative) of section 405 (simulated performance alternative) shall be modified to include soil conductivity and exterior air films.

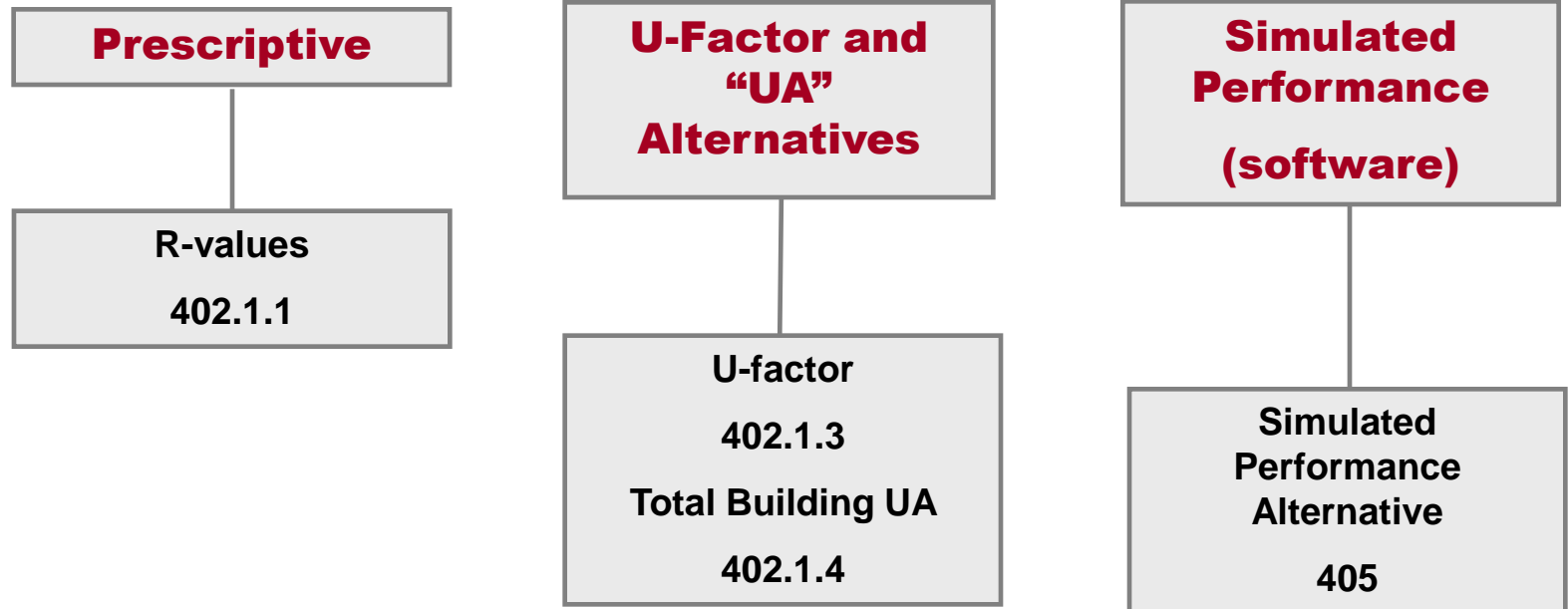
From DELEG Construction Code Part 10 Michigan Uniform Energy Code

Section 402: Building Thermal Envelope

402.1.4: Total UA Alternative

- Use ASHRAE calculation methods
- Includes all building construction, including air films

Demonstrate Compliance: 3 Options



Section 402: Building Thermal Envelope

402.2.1: Ceilings with Attic Spaces

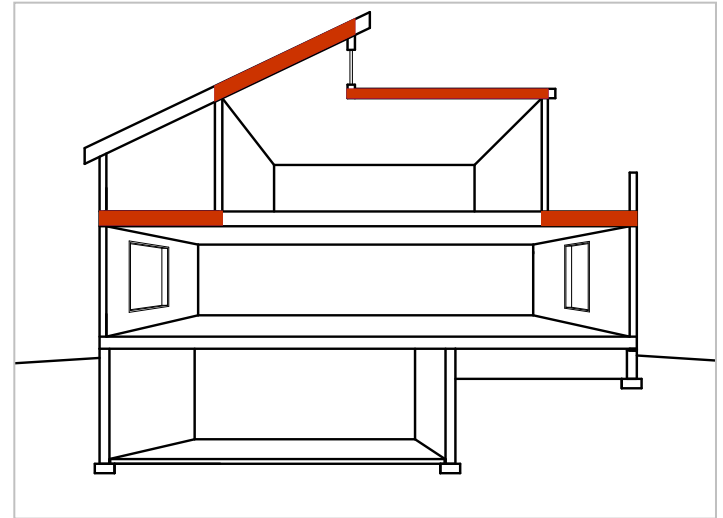
- Raised-heel trusses (energy trusses) are allowed to reduce insulation values in climate zones 6 and 7, not in CZ 5
- R-38 is now required in CZ 5

Presenter's note: the code is silent on whether raised-heel trusses would be required in CZ 5, however it is a 'best practice' (BCC will have to determine)

Section 402: Building Thermal Envelope

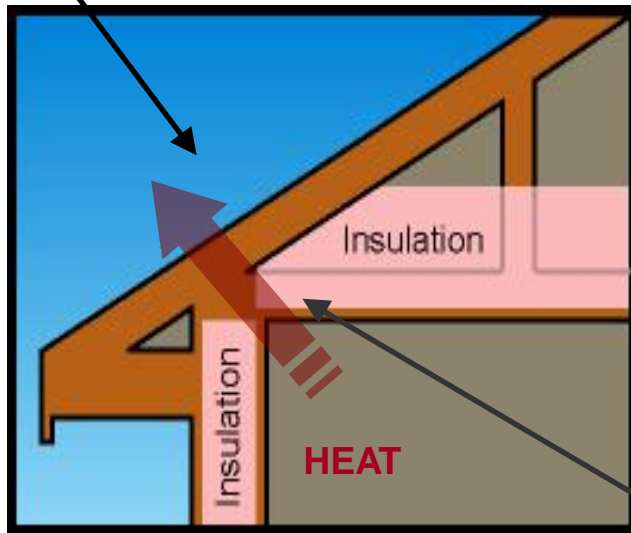
Ceilings:

- Requirements based on:
 - Assembly type
 - Continuous insulation
 - Insulation between framing
- Meet or exceed R-values



Standard Roof Truss

Possibility of ice dam formations



Ceiling insulation code requirements assume standard truss systems

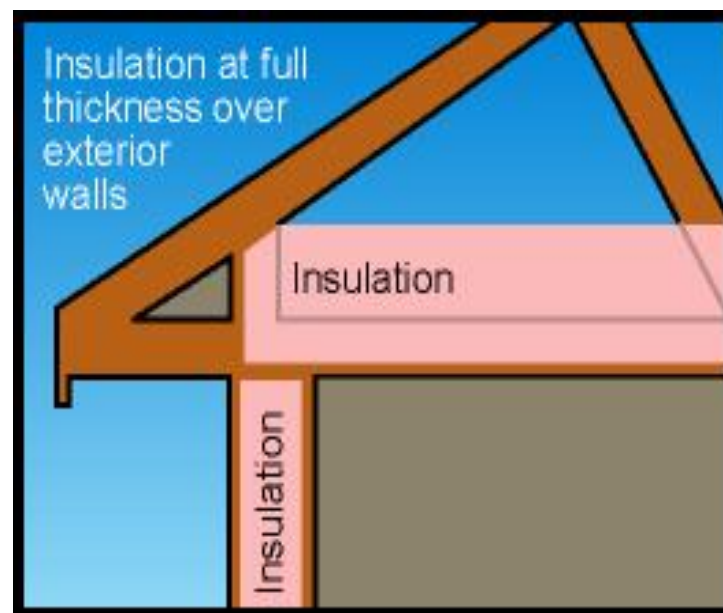
Cold corners contribute to condensation and mold growth

Raised Heel Truss (Energy Truss)



Raised Heel/Energy Truss credit if insulation is full height over exterior wall (*Prescriptive*)

- R-38 instead of R-49



Section 402: Building Thermal Envelope

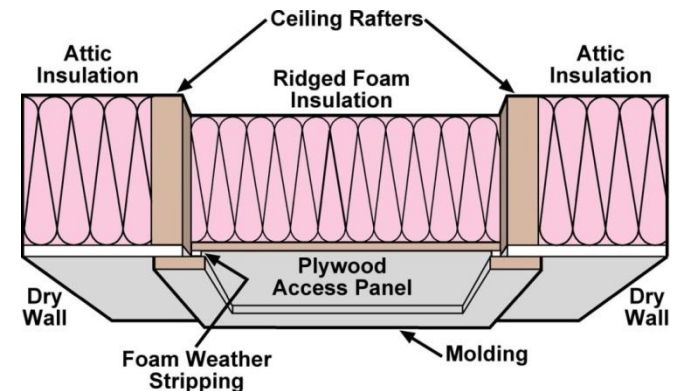
402.2.2: Ceilings without Attic Spaces

- Examples:
 - Raftered
 - Some cathedrals without attics, etc.
- Minimum R-30 (maximum 500 sf or 20% of total insulated ceiling, whichever is less)
- Shall not apply to U-factor alternative approach

Section 402: Building Thermal Envelope

402.2.3: Access Hatches and Doors

- Full ceiling insulation thickness
- Weather-stripped



Presenter's note: May require special product or rigid board insulation—new thinking on details



Section 402: Building Thermal Envelope

402.2.4: Mass Walls

- Defines mass walls as concrete, concrete block, ICF, masonry cavity, brick (other than brick veneer), earth, solid timber/logs
- This definition applies when using Table 402.1.1



Section 402: Building Thermal Envelope

Mass Walls:

- Type:
 - Concrete block, concrete, insulated concrete form (ICF), masonry cavity, brick (other than brick veneer), earth, and solid timber/logs
- Provisions:
 - At least 50% of the required R-value must be on the exterior or integral to the wall
 - When more than half the insulation is on the interior, climate zones 5-7 require the same insulation values as above-grade walls

Section 402: Building Thermal Envelope

402.2.5: Steel-frame Ceilings, Walls and Floors

- Steel-frame buildings must meet insulation requirements of Table 402.2.5 or must meet assembly U-factor requirements of Table 402.1.3
- Must use continuous insulation over the framing members

Section 402: Building Thermal Envelope

Steel-frame

- Table 402.2.5
 - Addresses steel-frame ceiling, wall, and floor insulation required R-values

Section 402: Building Thermal Envelope

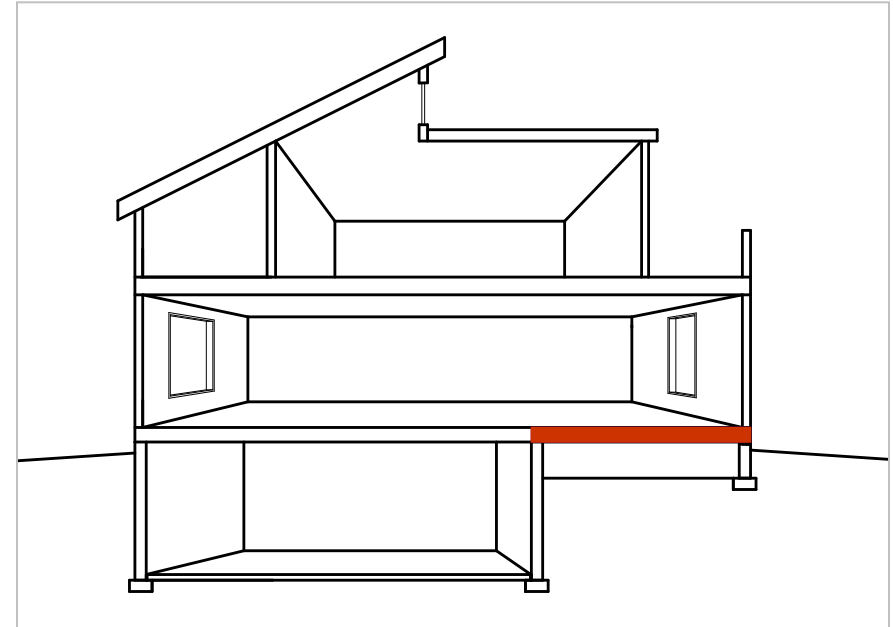
402.2.6: Floors

- Floor insulation, when required, must be in permanent contact with the underside of the subfloor decking

Section 402: Building Thermal Envelope

Floors over unconditioned space—unheated basement, crawlspace or outdoor air

Climate Zones	R-Value
4c-6	30
7-8	38



Insulation must maintain permanent contact with underside of subfloor

Exception: Climate Zones 4c-8
R-19 permitted if cavity completely filled

Section 402: Building Thermal Envelope

402.2.7: Basement Walls

- Insulate basements from the top of the wall from 10 ft. below grade or to the basement floor, whichever is less
- Unconditioned basements shall also meet this requirement, unless the floor overhead is insulated

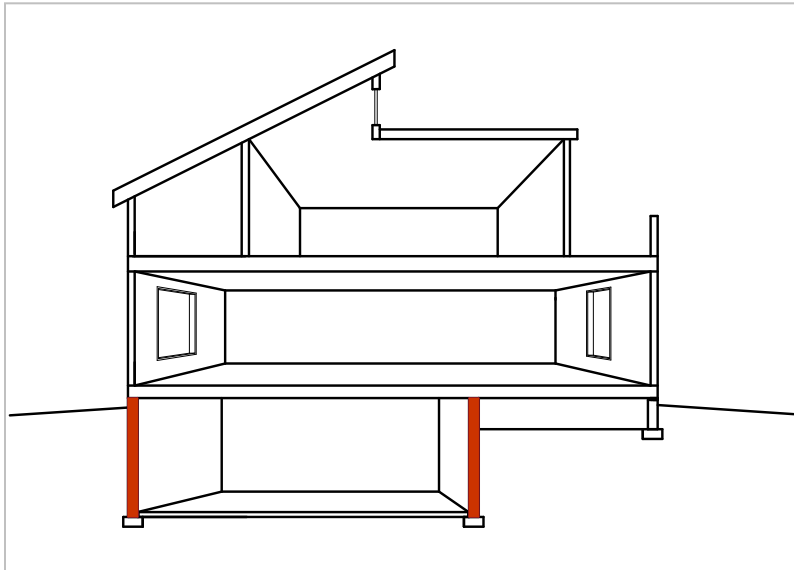
303.2.1: Protection of Exposed Foundation Insulation

- Requires exterior foundation insulation to have a rigid, opaque, weather-resistant protective covering
- Must extend 6" below grade

Section 402: Building Thermal Envelope

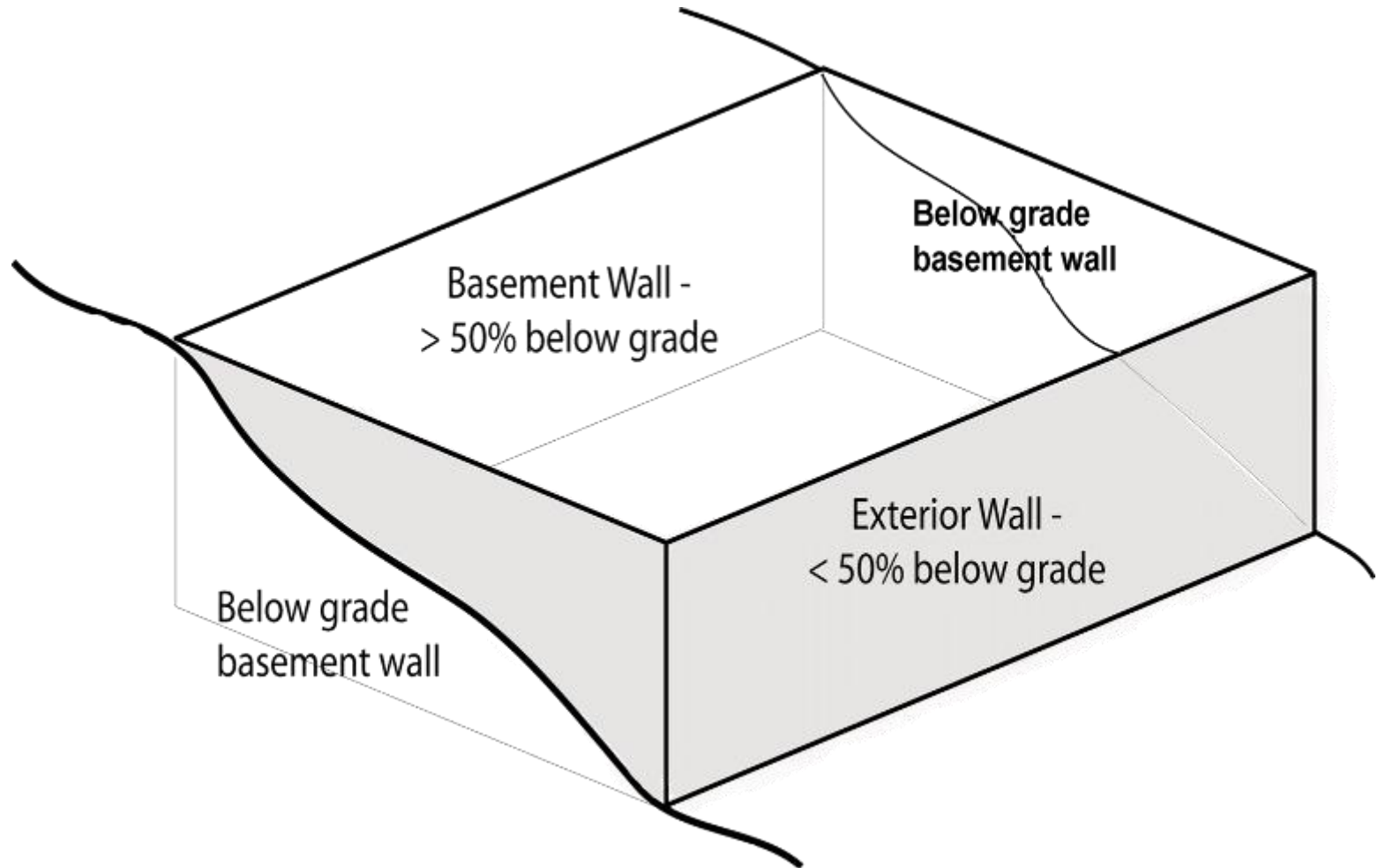
Below-grade Wall: $\geq 50\%$ below grade

Climate Zones	R-Value
4-5	10/13
6-8	15/19



Insulated from top of basement wall down to 10 ft below grade or basement floor, whichever is less

Defining Below-Grade Walls



Section 402: Building Thermal Envelope

402.2.8: Slab-on-grade Floors

- Insulate in accordance with Table 402.1.1
- Insulation shall extend from top of slab on outside or inside of foundation wall
- R-5 shall be added when slabs are heated, such as radiant floor slabs

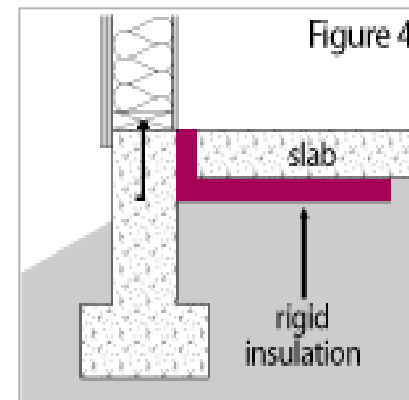
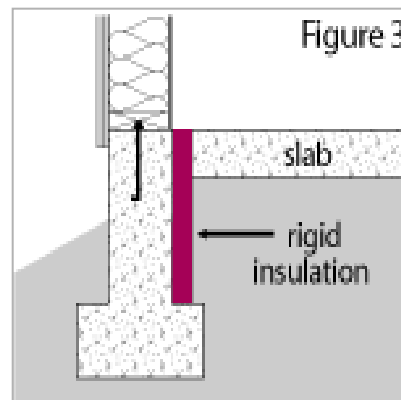
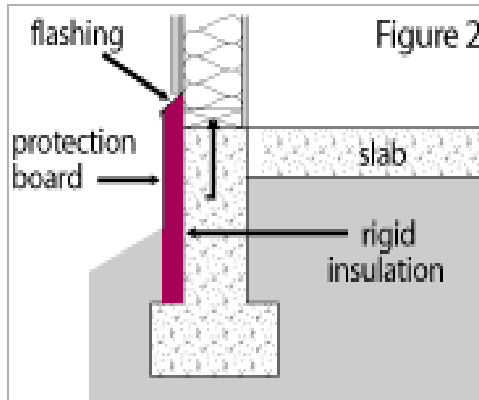
Presenter's note: May be a typographical error in footnote C—BCC needs to clarify

Section 402: Building Thermal Envelope

Slab Edge Insulation:

Slabs with a floor surface < 12 inches below grade

- R-10 (typically 2 inches) insulation in Zones 5 and above
- Downward from top of slab a minimum of 24" (Zones 5) and 48" (Zones 6 and 7)
- Insulation can be vertical or extend horizontally under the slab or out from the building (must be under 10 inches of soil)



Presenter's note:
Horizontal insulation is not approved for commercial construction

Slab Edge Insulation



Section 402: Building Thermal Envelope

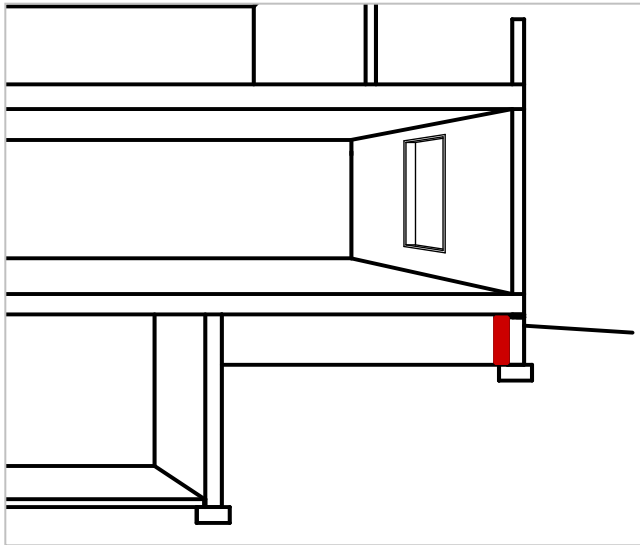
402.2.9: Crawl Space Walls

- As an alternative to insulating the floor above, crawl space walls may be insulated
- See Table 402.1.1
- Exposed earth floors must have a vapor retarder

Crawlspace Wall Insulation

Unvented Crawlspace

- Space should be mechanically vented or conditioned (See Section R408 of the IRC)
- Cover exposed earth with a continuous Class I vapor retarder



Vapor Retarders

- **Vapor Retarder Class:** A measure of the ability of a material or assembly to limit the amount of moisture that passes through that material or assembly.
 - Vapor retarder class shall be defined using the desiccant method with Procedure A of ASTM E-96 as follows:
 - Class I: 0.1 perm or less
 - Class II: $0.1 < \text{perm} < 1.0$ perm
 - Class III: $1.0 < \text{perm} < 10$ perm
- **Material vapor retarder class:** The vapor retarder class shall be based on the manufacturers certified testing or a tested assembly.
 - The following shall be deemed to meet the class specified:
 - Class I: Sheet polyethylene, non-perforated aluminum foil
 - Class II: Kraft faced fiberglass batts or low perm paint (paint with $0.1 < \text{perm} < 1.0$)
 - Class III: Latex or enamel paint
- **Class III vapor retarders:** Class III vapor retarder shall be permitted where any one of the conditions in Table 402.5.1 are met.

Vented & Unvented Crawlspace

Vented Crawlspace Requirements:

- The raised floor over the crawlspace must be insulated.
- A vapor retarder may be required as part of the floor assembly.
- Ventilation openings must exist that are equal to at least 1 square foot for each 150 square feet of crawlspace area and be placed to provide cross-flow (*IRC 408.1, may be less if ground vapor retarder is installed*).
- Ducts in crawlspace must be sealed and have R-8 insulation.

Unvented Crawlspace Requirements:

- The crawlspace ground surface must be covered with an approved vapor retarder (*e.g., plastic sheeting*).
- Crawlspace walls must be insulated to the R-value requirements specific for crawlspace walls (*IECC Table 402.1.1*).
- Crawlspace wall insulation must extend from the top of the wall to the inside finished grade and then 24" vertically or horizontally.
- Crawlspace must be mechanically vented (*1 cfm exhaust per 50 square feet*) or conditioned (*heated and cooled as part of the building envelope*).

Section 402: Building Thermal Envelope

402.2.10: Masonry Veneer

- Insulation not required on the brick ledge



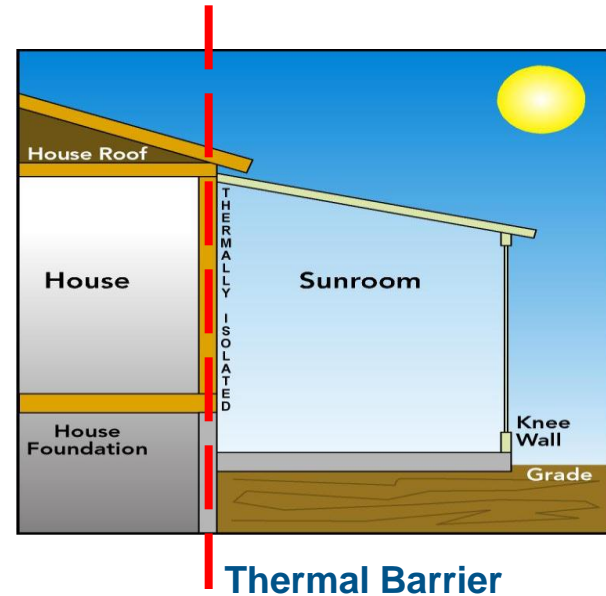
Section 402: Building Thermal Envelope

402.2.11: Sunrooms

Less stringent insulation
R-value and glazing
U-factor requirements

Sunroom definition:

- Glazing area >40% glazing of gross exterior wall and roof area
- Separate heating or cooling system or zone
- Must be thermally isolated (closeable doors or windows to the rest of the house)



Section 402: Building Thermal Envelope

402.2.11: Thermally Isolated Sunroom Insulation

- Minimum ceiling insulation value shall be R-25 for climate zones 5-7
- Minimum wall value shall be R-13 (all zones)
- New or existing walls, windows, and doors separating sunroom from conditioned space shall meet the building thermal envelope requirements

402.3.5: Thermally Isolated Sunroom U-factor

- Windows and door maximum U-factor of 0.5
- Skylight maximum U-factor of 0.75

Section 402: Building Thermal Envelope

402.3: Fenestration (Prescriptive)

402.3.1: U-factor

- Can use area-weighted averages to satisfy U-factor requirements

402.3.2: SHGC Requirements

- Deleted by Michigan

Presenter's note: SHGC still required for commercial



Section 402: Building Thermal Envelope

402.5: Maximum Fenestration U-factor (Mandatory)

- Maximum U-factors for fenestration is 0.48 in CZ 5 and 0.40 in CZ 6 and 7
- Maximum values when using any of the tradeoff approaches 402.1.4 total UA alternative or computer simulations 405

Presenter's Note: Input from later section

Section 402: Building Thermal Envelope

402.3.3: *Glazed Fenestration Exemption*

- Exemption for up to 15 square feet from Table 402.1.1 (does not apply if U-factor alternative approach or total UA alternative are used)

402.3.4: *Opaque Door Exemption*

- One side-hinged opaque door assembly up to 24 square feet is exempt from Table 402.1.1 (does not apply if U-factor alternative approach or total UA alternative are used)



Fenestration

An area weighted average of fenestration can be used to satisfy U-factor & SHGC requirements

- Area-weighted average U-factor is subject to hard limits, even in trade-offs
- NFRC rated and certified

Exceptions:

- SHGC does not apply to residential in Michigan

ENERGY STAR® Qualified
In All 50 States



World's Best Window Co.
Millennium 2000+
Vinyl-Cad Wood Frame
Double-Glazing • Argon-Fill • Low E
Product Type: Vertical Slider
(per NFRC 100-51)

ENERGY PERFORMANCE RATINGS

U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.35	0.32

ADDITIONAL PERFORMANCE RATINGS

Visible Transmittance	Air Leakage (U.S./I-P)
0.51	0.2

Manufacturer certifies that these ratings conform to applicable NFRC procedures for determining window product performance. NFRC ratings are determined in a test set of environmental conditions and in specific product size. Consult manufacturer's literature for other product performance information.
www.nfrc.org

Section 402: Building Thermal Envelope

402.3.6: Replacement Fenestration

- When replacing total windows, must meet U-factor requirements of Table 402.1.1



Section 402: Building Thermal Envelope

Presenter's Note: Air leakage requirements are much more elaborate and specific than under previous code

402.4: Air Leakage (Mandatory)

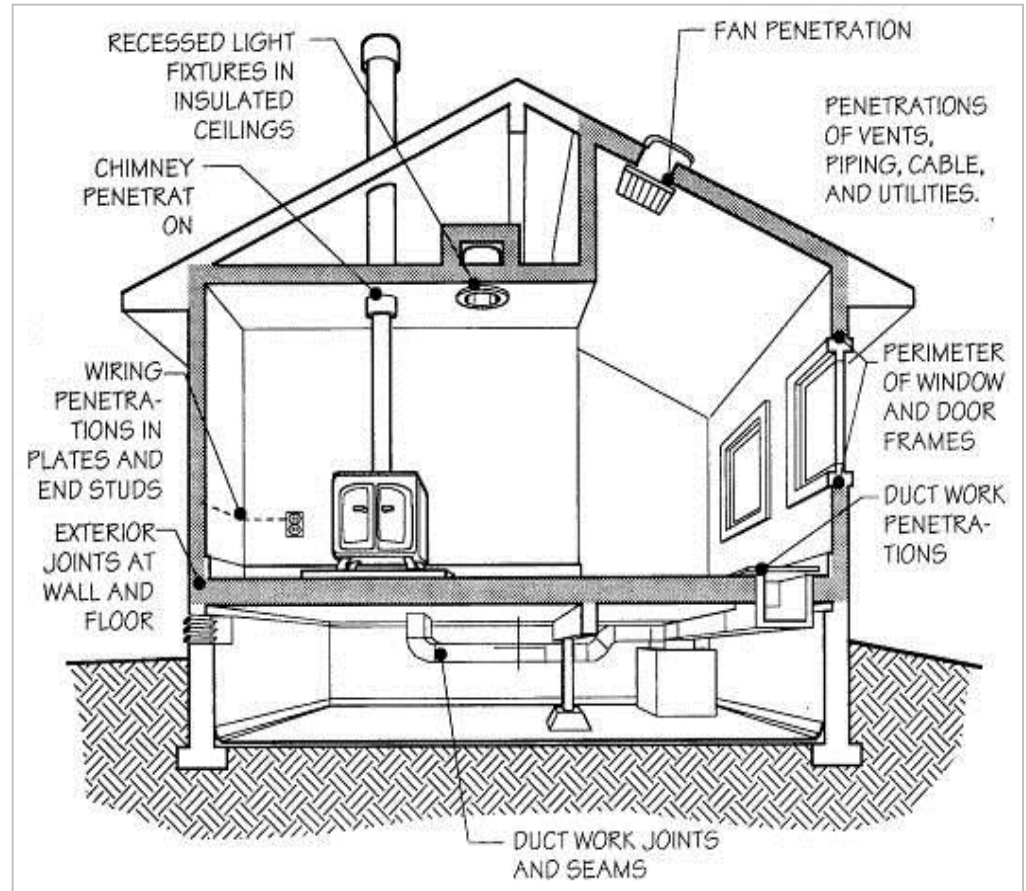
402.4.1: Building Thermal Envelope

- Twelve specific locations:
 - Typical areas, such as doors, windows, utility penetrations
 - Some special areas, such as: common walls between dwelling units, behind tubs and showers on exterior walls, attic access openings
 - See Section 402.4.1 for specific list

Section 402: Building Thermal Envelope

Typical air infiltration locations:

- Windows and doors
- Between sole plates
- Floors and exterior wall panels
- Plumbing
- Electrical
- Service access doors or hatches
- Recessed light fixtures
- Rim joist junction



Section 402: Building Thermal Envelope

Air Leakage:

- Sealed with caulking materials or
- Closed with gasketing systems
- Joints and seams sealed or taped or covered with a moisture vapor-permeable wrapping material



Section 402: Building Thermal Envelope

402.4.2: Air Sealing and Insulation

- Must be demonstrated by one of the following:
 - Testing option (blower door)
 - Visual inspection option

402.4.2.1: Testing option (blower door):

- Maximum 7 ACH at 50 Pa (1 psf)
- Refer to 402.2.1 for specific testing requirements

Presenter's Note: Earlier versions of IECC 2009 listed 33.5 psf—corrected to 1 psf in later versions



Section 402: Building Thermal Envelope

402.4.2.2: Visual Inspection Option

- Requires compliance with Table 402.4.2 and verification
- Building Official may require independent third party inspection

Section 402: Building Thermal Envelope

Visual inspection component criteria

- Table 402.4.2
 - Air barrier and insulation inspection checklist
 - Provides criteria for components
 - Air barrier and thermal barrier
 - Ceiling/attic
 - Walls
 - Windows and doors
 - Rim joists
 - Floors
 - Etc.

Section 402: Building Thermal Envelope

402.4.3: Fireplaces

- New wood-burning fireplaces shall have gasketed doors and outdoor combustion air



Section 402: Building Thermal Envelope

402.4.4: Fenestration Air Leakage

- Maximum infiltration rate of 0.3 cfm/sf for sliding doors
- Maximum rate of 0.5 cfm/sf for swinging doors
- NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440
- Must be listed and labeled
- Site-built windows, skylights and doors are *exempt* from the leakage test

Section 402: Building Thermal Envelope

Recessed Lighting Fixtures:

- Type IC rated and labeled in a sealed or gasketed enclosure
- Type IC rated and labeled as meeting ASTM E 283
- Sealed with a gasket or caulk between the housing and interior wall or ceiling covering
- Michigan provides for installation of a non-IC-rated fixture in a fire-rated box with insulation over



Section 402: Building Thermal Envelope

402.5: Maximum Fenestration U-factor (Mandatory)

Presenter's Note: Covered under earlier fenestration discussion

Section 403: Systems

Equipment *efficiency*
set by Federal law,
not the energy code



Section 403: Systems

Mandatory Requirements:

- Controls
- Heat pump supplementary heat
- Ducts
 - Sealing
 - Insulation (*Prescriptive*)
- HVAC piping insulation
- Circulating hot water systems
- Ventilation
- Equipment sizing
- Systems serving multiple dwelling units
- Snow melt controls
- Pools

Section 403: Systems

403.1: Controls (Mandatory)

- At least one thermostat for each separate heating and cooling system

403.1.1: Programmable Thermostat

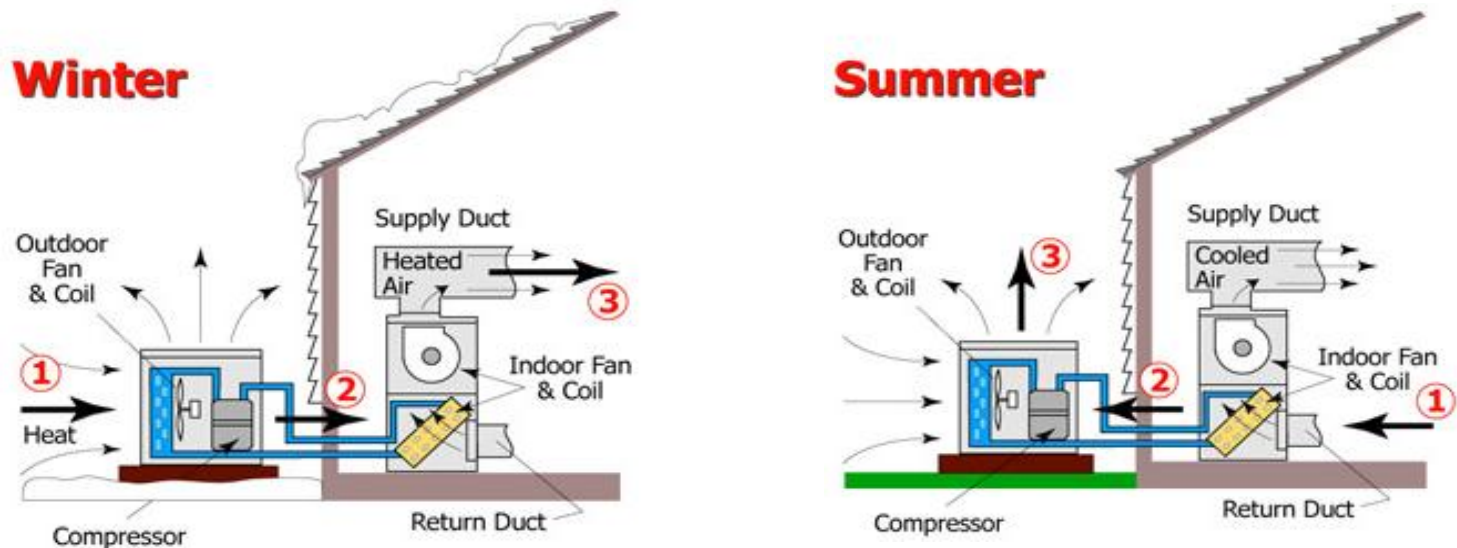
- For forced-air furnaces, at least one programmable thermostat
 - Daily schedule
 - Different temperature set points
 - Temperature setback
 - Initial settings of 70°F heating and 78°F cooling



Section 403: Systems

403.1.2: Heat Pump Supplementary Heat (Mandatory)

- If heat pump is capable of meeting the load, supplementary electric resistance heat is prohibited, *except* during defrost



<http://www.sprinterheating.com/how-heat-pump-works.php> Date visited: 12/15/2010

Section 403: Systems

403.2: Ducts

403.2.1: Insulation (Prescriptive)

- Supply ducts in attics must have R-8 insulation
- All other ducts must have R-6 insulation
- Exception: ducts located completely inside building thermal envelope

Presenter's Note: Highly recommend full envelope insulation over attic ductwork



Section 403: Systems

403.2.2: Sealing (Mandatory)

- All ducts, air handlers, filter boxes and building cavities used as ducts must be sealed in accordance with the Michigan Residential Code (M1604.1)
- Joints of ducts shall be sealed with tapes, mastics, liquid sealants, gasketing, or other approved closure systems

Presenter's Note: BCC will need to confirm based on MRC 2009 (IRC 2009). No duct tape.



Section 403: Systems

Duct Insulation and Sealing :

403.2.1: Insulation (Prescriptive)

- Ducts outside the building envelope: R-8
- All other ducts: R-6

403.2.2: Sealing (Mandatory)

- Joints and seams shall comply with IRC, Section M1601.4.1
- Building framing cavities shall not be used as supply ducts



Residential HVAC: Duct Location

- Ducts in *un-conditioned* space:



- Ducts in *conditioned* space:



Section 403: Systems

- For piping carrying fluids above 105°F or below 55°F, must be insulated to minimum of R-3

Section 403: Systems

403.3: Mechanical System Piping Insulation (Mandatory)

- R-3 required on HVAC systems
 - *Exception: Piping that conveys fluids between 55 and 105°F*
- R-2 required on
 - All circulating domestic hot water systems
 - Systems also require a readily accessible manual switch

Michigan exceptions:

- Factory-installed piping within HVAC equipment
- Run-out piping 4 ft or less



Section 403: Systems

403.5: Mechanical Ventilation (Mandatory)

- Outdoor intakes and exhaust must have automatic or gravity dampers



Section 403: Systems

403.6: Equipment Sizing (Mandatory)

- Heating and cooling equipment must be *sized* in accordance with the International Residential Code
- Load calculations determine the proper capacity (size) of equipment
 - Goal is big enough to ensure comfort but no bigger
- Calculations shall be performed in accordance with ACCA Manual J or other approved methods

Presenter's Note: Should refer to MRC, not IRC



Section 403: Systems

403.7: Systems Serving Multiple Dwelling Units (Mandatory)

Presenter's Note: Michigan has deleted sections 503 and 504—BCC to verify

Section 403: Systems

403.8: Snow Melt Systems (Mandatory)

Snow- and ice-melting system controls

- pavement temperature $> 50^{\circ}\text{F}$ and no precipitation is falling and when the outdoor temperature is $> 40^{\circ}\text{F}$



Section 403: Systems

403.9: Pools (Mandatory)

- Pools shall be provided with energy conserving features
 - Pool heater requirements
 - Time switch requirements
 - Pool cover requirements



<http://www.iccsafe.org/store/pages/doeregistration.aspx> Date visited: 12/15/2010

[http://www.fillionassociates.com/products - pool cover systems.htm](http://www.fillionassociates.com/products_pool_cover_systems.htm)

Date visited: 11/30/2010

Section 404: Electrical Power and Lighting

404.1: Lighting Equipment

Minimum of 50% of lamps shall be high efficacy

- T8 or smaller diameter
 - > 40 watts: 60 lumens per watt
 - 15-40 watts: 50 lumens per watt
 - < 15 watts: 40 lumens per watt

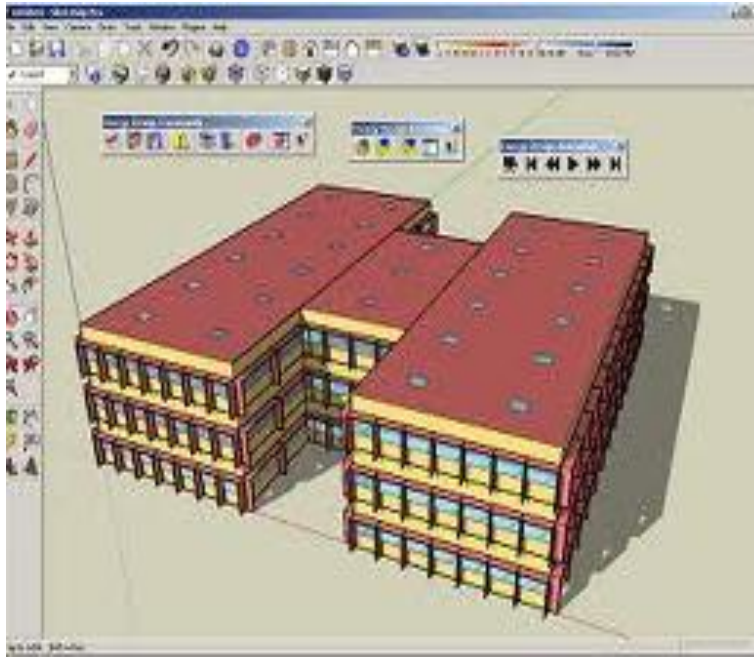
Section 405: Simulated Performance Alternative (Performance)

- Provides for computer simulation as an alternative to the prescriptive approach
- Requires computer software with specified capabilities (local official may approve other tools)
- Includes both envelope and equipment
- Allows greatest flexibility—credits features such as:
 - High efficiency furnaces, air-conditioners, etc.
 - Tight ducts (must be leak tested) or hydronic systems
 - Exterior shading, favorable orientation, thermal mass, SHGC, etc.
- Section 405 specifies “ground rules”
 - These will generally be “hidden” in compliance software calculation algorithms
 - Very similar ground rules are used in home federal tax credits and ENERGY STAR Home guidelines

Simulated Performance Alternative

Software Options:

http://www.nrel.gov/buildings/energy_analysis.html





Q + A

MICHIGAN STATE
UNIVERSITY

Compliance and Implementation Tools

Training Module



MICHIGAN STATE
UNIVERSITY



MEEA
Midwest Energy Efficiency Alliance

**School of Planning, Design
& Construction**

Michigan State University
East Lansing, Michigan



What Does This Mean to *Me*?

ARRA 2009 = American Recovery and Reinvestment Act of 2009 (The Recovery Act)

Target Codes:

- Residential: 2009 IECC
- Commercial: ASHRAE 90.1-2007

90% compliance within 8 years

One time demonstration of 90% compliance required



Compliance Evaluation

Residential Data Collection Checklist

2009 International Energy Conservation Code
Climate Zone 3

Date: _____ Name of Evaluator(s): _____

Building Name & Address: _____ Conditioned Floor Area: _____ ft²

Building Contact: Name: _____ Phone: _____ Email: _____

Compliance Approach: Prescriptive (402.1.2 or 402.1.3) UA Trade-Off (402.1.4) Building Performance (405)

State: _____ Jurisdiction: _____

Building Type: 1- and 2-Family, Detached: Single Family

Multifamily: Apartment

Project Type: New Construction Addition to existing building

Item Number ¹	Pre-Inspection/Plan Review	Code Value	Verified Value
PR1 [103.2] ¹	Construction drawings and documentation submitted and available. Documentation sufficiently demonstrates energy code compliance.		
PR2 [403.6] ²	HVAC loads calculations: Heating system size(s): Cooling system size(s):		kBtu: _____ kBtu: _____

Additional Comments: _____

Item Number	Pre-Inspection/Plan Review
PR1 [103.2] ¹	<p>Documentation. Determine if a complete set of plans/construction drawings, specifications, and energy code compliance documentation is available in the building department. If there is no building department or the locality does not conduct plan review, this information should be obtained from the registered design professional or builder having responsibility for the project. If documentation indicating a trade-off or performance approach is not provided, a prescriptive approach must be assumed for verifying compliance. Construction documents should sufficiently demonstrate energy code compliance, including but not limited to the following information:</p> <ul style="list-style-type: none"> • The location and R-values of insulation materials • U-factors and SHGC values for windows, doors, skylights, and other fenestration products • Information related to duct and piping location, insulation type and R-value, and means of sealing <p>Under the assumption that only state or local government with a responsible enforcement and/or permitting agency are included in compliance evaluations, plans and documentation are expected to be held by the responsible agency. If this is not the case, mark this code requirement and the next (PR1 and PR2) as non-compliant, unless there is another entity responsible for enforcement identified (e.g. utility, contractor licensing board, etc.) in which case they should be contacted to review PR1 and PR2 information.</p>
PR2 [403.6] ²	<p>HVAC Load Calculations. Verify that HVAC load calculations have been completed and submitted. Verify the methodology used in the load calculations. List the resultant heating and/or cooling loads as applicable in the Verified Value column.</p>



Building Energy Codes Resource Guide: *Code Officials Edition*

View or download:

<http://www.energycodes.gov/publications/resourceguides/>

- Plan review and inspection resources
- REScheck and COMcheck reference guides
- Case studies
- Sample checklists



- Download the PDF or flip through the online version
- Register for automatic updates



PNNL Survey:

- Better understand compliance rates
- Jurisdictional practices
- Identify training needs
- Attempt to coordinate best practices with measured compliance rates
- Confidential results



Taking a Pulse of Building Efficiency Evaluating compliance will help identify energy-saving code provisions that aren't being successfully implemented in buildings. This will allow less energy to "slip through the cracks"—lowering both costs to building owners and greenhouse gas emissions.



State Energy Code Jurisdictional Survey

Please review the survey and gather the needed information before continuing.

Questions About Your Jurisdiction

Jurisdictional information

Agency name:

Jurisdiction served:

Other jurisdiction not listed above (please specify):

Estimate of the population served:

REScheck Compliance Software

Training Module



**School of Planning, Design
& Construction**

**MICHIGAN STATE
UNIVERSITY**



MEEA
Midwest Energy Efficiency Alliance

Michigan State University
East Lansing, Michigan

Demonstrate Compliance

Prescriptive

Trade-off

Performance

“Prescriptive Packages Approach”

“Trade-off Approach”

“Performance Approach”

Residential Data Collection Checklist
2009 International Energy Conservation Code
Climate Zone 3

Date: _____ Name of Evaluator(s): _____

Building Name & Address: _____ Conditioned Floor Area: _____ sq'

Building Contact Name: _____ Phone: _____ Email: _____

Compliance Approach: Prescriptive (IECC 1.2 or IECC 1.3) UA Trade-Off (IECC 1.4) Building Performance (IECC 1.5)

Site: _____ Jurisdiction: _____

Building Type: 1- and 2-Family Detached 3- and 4-Family Medium-Density Multifamily Multifamily Other _____

Item Number	Description	Code Value	Verified Value			Complies
			Y	N	N/A	
F01 402.2.8, 303.2f	Foundation Inspection Slab edge insulation R-value installed per manufacturer's instructions.	Unheated: R-5 Heated: R-5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F02 402.2.8f	Slab edge insulation depth/length	Heated: 2 R	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F03 402.2.1, 303.2f	Basement wall exterior insulation R-value installed per manufacturer's instructions.	R-5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F04 402.2.7f	Basement wall exterior insulation depth	10 R, or to basement floor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F05 402.2.9, 303.2f	Crawl space wall insulation R-value installed per manufacturer's instructions.	R-5 (gross) R-1.5 (cavity)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F06 403.8f	Show melt controls		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F07 403.2.1f	Insulation protection		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional Comments: _____



REScheck™



REScheck Web or Desktop Download

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy

Building Energy Codes Program

ABOUT BECP | WHY BUILDING ENERGY CODES | RELATED LINKS

Search energycodes.gov

Less Energy. Less Cost. Less Carbon.

ARE YOU SETTING THE STANDARD? Keep up-to-date on what's happening in the codes world. Read the latest issue! >> Learn More

To learn more about a featured item, click on the corresponding image.

BROWSE...

- Publications
- Events Calendar
- Job/Internship Opportunities

QUICKLINKS FOR...

- Architects/Engineers /Designers
- Builders/Contractors
- Code Enforcement Officials
- State & Local Code Adopters
- Codes Advocates
- Students

FOLLOW US!

- RSS
- Facebook
- YouTube
- Twitter

POWER TOOLS

- REScheck
- Status
- COMcheck
- Helpline

RECENT UPDATES

- Jeffrey A. Johnson Award Announced! posted 07.20.2010
- July 2010 *Setting the Standard* Newsletter Released posted 07.16.2010
- COMcheck 3.8.0 Now Available! posted 07.08.2010

CODES IN THE NEWS

- Notice of Upcoming Funding Opportunity Source: Building Energy Codes Program, 8.11.2010
- EERE Webinar: National Residential Retrofit Guidelines August 11, 2010

Status of Energy Codes

Solutions & Help Center

Software & Tools

Building Energy Codes University

Compliance Report



Generated by REScheck-Web Software Compliance Certificate

Energy Code: 2009 IECC
 Location: East Lansing, Michigan
 Construction Type: Single Family
 Glazing Area Percentage: 18%
 Heating Degree Days: 7228
 Climate Zone: 5

Construction Site:

Owner/Agent:

Designer/Contractor:

Project Information and
Passing Score Displayed

Inventory of Building
Components

Compliance: Passes using UA trade-off

Compliance: Maximum UA: 582 Your UA: 577

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or Door U-Factor	UA
Ceiling: Raised or Energy Truss	2415	38.0	0.0		60
Exterior Wall 1: Wood Frame, 16in. o.c.	911	19.0	0.0		30
Door 1: Solid	40			0.500	20
Window Main: Vinyl Frame, Double Pane	369			0.350	129
Ext. Wall 2 South: Wood Frame, 16in. o.c.	834	19.0	0.0		39
Window 2: Vinyl Frame, Double Pane	149			0.350	52

Inspection Checklist



Generated by REScheck-Web Software
Inspection Checklist

Checklist Allows Code
Official to Verify Individual
Building Components

Ceilings:

- Ceiling: Raised or Energy Truss, R-38.0 cavity Insulation

Comments: _____
Insulation must achieve full height over the plate lines of exterior walls.

Above-Grade Walls:

- Exterior Wall 1: Wood Frame, 16in. o.c., R-19.0 cavity Insulation

Comments: _____

- Ext. Wall 2 South: Wood Frame, 16in. o.c., R-19.0 cavity Insulation

Comments: _____

- Ext. Wall 3 East: Wood Frame, 16in. o.c., R-19.0 cavity Insulation

Comments: _____

- Ext. Wall 4 West: Wood Frame, 16in. o.c., R-19.0 cavity Insulation

Comments: _____

- Knee Wall West: Wood Frame, 16in. o.c., R-19.0 cavity Insulation

Comments: _____

- Knee Wall East: Wood Frame, 16in. o.c., R-19.0 cavity Insulation

Comments: _____

Energy Features Certificate



2009 IECC Energy Efficiency Certificate

Insulation Rating		R-Value	
Ceiling / Roof		38.00	
Wall		19.00	
Floor / Foundation		30.00	
Ductwork (unconditioned spaces):		_____	
Glass & Door Rating		U-Factor	SHGC
Window		0.35	0.15
Door		0.50	NA
Heating & Cooling Equipment		Efficiency	
Heating System:	_____	_____	
Cooling System:	_____	_____	
Water Heater:	_____	_____	

Name: _____ Date: _____

Comments: Bob White

Certificate Posted at Electrical Panel to Identify Primary Building Components

Name of Building Inspector and Date of Final Inspection

FI12 [401.3] ²	Certificate posted
------------------------------	--------------------



COMcheck software also available for commercial projects:

<http://www.energycodes.gov/comcheck/>

The screenshot shows the homepage of the COMcheck website. At the top, it features the U.S. Department of Energy logo and the text 'Energy Efficiency & Renewable Energy'. Below this is a green banner for the 'Building Energy Codes Program'. A navigation menu includes 'ABOUT BECP', 'WHY BUILDING ENERGY CODES', 'RELATED LINKS', and 'HOME'. A search bar is located on the right side. A central banner reads 'Less Energy. Less Cost. Less Carbon.' The main content area is divided into several sections: 'LEARN MORE ABOUT...' with links for Residential, Commercial, and Federal codes; 'ALSO ON THIS WEBSITE...' with links for Status of Codes, Solutions & Help Center, Software & Tools, Building Energy Codes University, Publications, and Events Calendar; 'Commercial Compliance Using COMcheck™' with a description of the software and links to 'Trade-off Approach', 'Prescriptive Approach', and 'Code Enforcement'; and a sidebar on the right with links for 'Download COMcheck Software', 'See What's New in COMcheck', 'Start COMcheck-Web', 'Commercial Online Training/Education', 'States that can use COMcheck for Compliance', 'Known problems in COMcheck', and 'COMcheck Product Archive'.

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy

Building Energy Codes Program

ABOUT BECP | WHY BUILDING ENERGY CODES | RELATED LINKS | HOME

Search energycodes.gov

Less Energy. Less Cost. Less Carbon.

EERE Information Center

LEARN MORE ABOUT...

- Residential Compliance with REScheck™
- Commercial Compliance with COMcheck™
- Federal Building Codes

ALSO ON THIS WEBSITE...

- Status of Codes
- Solutions & Help Center
- Software & Tools
- Building Energy Codes University
- Publications
- Events Calendar

Commercial Compliance Using COMcheck™

The COMcheck materials (software, manual code compliance, and reference guides) simplify and clarify commercial and high-rise residential energy code compliance. Forms and checklists are included for documenting compliance.

Trade-off Approach

The COMcheck software simplifies energy code compliance by offering a flexible computer-based alternative to manual calculations.

The [COMcheck-Web](#) online code compliance tool is the web-based version of the COMcheck desktop software. It performs just like the desktop version but requires no download or installation.

Prescriptive Approach

The [COMcheck Prescriptive Package Generator](#) is a web-based application that allows you to generate your own code-compliant insulation and window packages rather than following pre-defined prescriptive packages.

Code Enforcement

[Inspecting for the Commercial Provisions of the IECC](#) prepared for DOE by the International Conference of Building Officials (ICBO) is another good resource for energy code inspection.

COMcheck

- Download COMcheck Software
- See What's New in COMcheck
- Start COMcheck-Web
- Commercial Online Training/Education
- States that can use COMcheck for Compliance
- Known problems in COMcheck
- COMcheck Product Archive



Q + A

MICHIGAN STATE
UNIVERSITY

Additional Information Resources

Training Module



MICHIGAN STATE
UNIVERSITY



MEEA
Midwest Energy Efficiency Alliance

**School of Planning, Design
& Construction**

Michigan State University
East Lansing, Michigan



U.S. Department of Energy



DOE Homepage: www.energy.gov

- | | |
|--|---|
| <ul style="list-style-type: none"> ● National Security ● Energy Sources ● Energy Efficiency ● Environment ● Energy Prices and Trends ● Science and Technology ● Health ● Safety and Security | <ul style="list-style-type: none"> ● Program Offices ● Staff Offices ● Energy Information Administration ● National Laboratories and Technology Centers ● Operations Offices and Field Organizations |
|--|---|

Building Energy Codes Program

Date visited: 3/14/2011

- ABOUT BECP
- WHY BUILDING ENERGY CODES
- RELATED LINKS

Search energycodes.gov

EERE Information Center

Take Our Website Survey

Less Energy. Less Cost. Less Carbon.

LEARN MORE ABOUT...

- Measuring Compliance
- Compliance Evaluation

BROWSE...

- Publications
- Events Calendar
- Job/Internship Opportunities

QUICKLINKS FOR...

- Architects/Engineers /Designers
- Builders/Contractors
- Code Enforcement Officials
- State & Local Code Adopters
- Codes Advocates
- Students

FOLLOW US!



DOWNLOAD THE CODE:

Digital copies of the ASHRAE Standard 90.1-2007 (I-P Edition) and the 2009 International Energy Conservation Code® are now available!

Get Your Copy Now!

>> Learn More



To learn more about a featured item, click on the corresponding image.



Status of Energy Codes



Solutions & Help Center



Software & Tools



Building Energy Codes University



POWER TOOLS

- Status
- Helpline
- Desktop Tools
 - REScheck
 - COMcheck
- Online Tools
 - REScheck
 - COMcheck

RECENT UPDATES

- 2010 Building Energy Codes Annual Report Released
posted 03.04.2011
- Store + Score Application Released
posted 03.04.2011
- DOE proposed changes to IgCC PV 2.0
revised 03.10.2011

CODES IN THE NEWS

- Notice of Public Meeting: Presenting and Receiving Comments to DOE Proposed Changes to the IgCC
posted 03.10.2011
- A Chance Encounter with the Massachusetts Stretch Energy Code
Source: New Buildings Institute, 03.02.2011
- Energy Efficiency key to Zero Energy Commercial Buildings
Source: Energy Saving Association, 02.21.2011



IECC 2009 Download



People Helping People Build a Safer World™



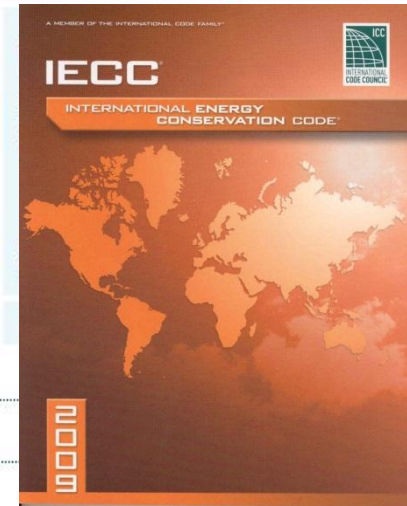
Home | My ICC | Join ICC | Contact Us | Help

- ABOUT ICC
- COMMUNITIES OF INTEREST
- MEMBERSHIP
- CODES, STANDARDS & GUIDELINES
- EDUCATION & CERTIFICATION
- STORE

2012 International Codes®

New Codes for a Changing World

> PREVIEW KEY CHANGES



Need Help?

> Sign In

Navigation

- > 2009 International Codes
- > State and Local Codes
- > eCodes
- > FAX/Mail Order Form
- > Quick Order
- > Shopping Cart
- > Checkout
- > Errata Central

> Store > Free 2009 IECC Download Instructions

Free 2009 IECC Download Instructions

The IECC Free Download offer has expired

However, ICC continues to look for ways to serve our members and customers with other great benefits through strategic alliances with the DOE and others. Thank you for visiting, and check ICC News and website often for new special offerings.

INTERNATIONAL CODE COUNCIL

- > MASTER THE CODE
- > EXCEED EXPECTATIONS

<http://www.iccsafe.org/store/pages/doeregistration.aspx>



END

MICHIGAN STATE
UNIVERSITY