

DEPARTMENT OF ENERGY, LABOR AND ECONOMIC GROWTH
DIRECTOR'S OFFICE
CONSTRUCTION CODE

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These rules take effect March 9, 2011

(By authority conferred on the director of the department of energy, labor, and economic growth by section 4 of 1972 PA 230. MCL 125.1504, and Executive Reorganization Order Nos. 2003-1 and 2008-20, MCL 445.2011 and MCL 445.2025)

R 408.31059, R 408.31060, R 408.31061, R 408.31062, R 408.31063, R 408.3164, R 408.31065, R 408.31066, R 408.31069, and R 408.31070, of the Michigan Administrative Code are amended, and R 408.31060a, R 408.31060b, R 408.31060c, R 408.31060d, R 408.31060e, and R 408.31063a are added to the Code as follows:

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.

R 408.31060 Scope; requirements.

Rule 1060. Sections 101.1, 101.2, 101.3, 101.4.3, and 101.4.4 of the code are amended to read as follows:

101.1. Title. This code shall be known and cited as the "Michigan Uniform Energy Code." It is referred to herein as "this code."

101.4.3. Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof, shall meet both of the following requirements:

- (1) Conform to the provisions of this code as they relate to new construction without requiring the unaltered portion or portions of the existing building system to comply with this code.
- (2) Not create an unsafe or hazardous condition or overload existing building systems. An addition

shall be deemed to comply with this code if the addition alone complies or if the existing building and addition comply with this code as a single building.

Exceptions: the following need not comply provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Glass only replacements in an existing sash and frame.
3. Existing ceiling, wall, or floor cavities exposed during construction provided that these cavities are filled with insulation.
4. Construction where the existing roof, wall, or floor cavity is not exposed.
5. Reroofing for roofs where neither the sheathing nor the insulation is exposed. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a conditioned space from the exterior shall not be removed.
7. Alterations that replace less than 50% of the luminaries in a space, provided that such alterations do not increase the installed interior lighting power.
8. Alterations that replace only the bulb and ballast within the existing luminaries in a space provided that the alteration does not increase the installed interior lighting power.
9. An existing detached 1-and 2-family dwelling, other than replacement fenestration as provided by section 402.3.6.
10. A detached 1-and 2-family dwelling that is moved into or within a jurisdiction. A home manufactured pursuant to the Michigan premanufactured unit rules that is shipped for initial installation or initial assembly and installation on a building site shall not be considered a moved building.

101.4.4 Change in occupancy or use. Spaces undergoing a change in occupancy that would result in an increase in demand of either fossil fuel or electrical energy shall comply with this code.

R 408.31060a Construction documents.

Rule 1060a. Section 103.1 of the code is amended to read as follows:

103.1 Submittal documents. Construction documents, section inspection and structural programs, and other data shall meet both of the following requirements:

- (1) Submitted in 1 or more sets with each application for a permit.
- (2) Prepared by, or under the direct supervision of, a registered design professional when required by 1980 PA 299, MCL 339.101 to 339.2721.

Where special conditions exist, the building official is authorized to require additional construction documents to be prepared by a registered design professional.

Section 401 - General

R408.31061 Compliance.

401.2 Compliance. Projects shall comply with Sections 401, 402.4, 402.5, and 403.1, 403.2.2, 403.2.3, and 403.3 through 403.9 (referred to as the mandatory provisions) and either:

1. Sections 402.1 through 402.3, 403.2.1 and 404.1 (prescriptive); or
2. Section 405 (performance).

R 408.31061 Certificate.

Rule 1061. Section 401.3 of the code is amended to read as follows:

401.3 Certificate. A permanent certificate shall be posted on or in the electrical distribution panel, and shall meet all of the following:

(a) Be affixed or attached so it does not cover or obstruct the visibility of the circuit directory label, service disconnect label, or other required labels.

(b) Be completed by the builder or registered design professional.

(c) 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 and U-factors for fenestration. If there is more than 1 value for each component, then the certificate shall list the value covering the largest area.

(d) List the types of efficiencies of heating, cooling and service water heating equipment.

(e) If a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed in the residence, then the certificate shall list “gas-fired unvented room heater,” as appropriate. An efficiency shall not be listed for gas-fired unvented room heaters, electric furnaces, or electric baseboard heaters.

Section 402 – Building Thermal Envelope

R408.31065

402.1.1 Insulation and fenestration criteria. The building thermal envelope shall meet the requirements of the Table 402.1.1 based on the climate zone specified in Chapter 3.

R 408.3106e Climate Zones. **Antrim County – 6A**

Rule 1060e. Section 301.1 and Tables 301.1 and 301.3(2) of the code are amended and Figure 301.1a is added to the code to read as follows:

301.1 General. Climate zones from figures 301.1, 301.1a or table 301.1 shall be used in determining the applicable requirements of this code.

402.1.2 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.

402.1.3 U-factor alternative. An assembly with a U-factor equal to or less than that specified in Table 402.1.3 shall be permitted as an alternative to the R-value in Table 402.1.1.

402.1.4 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 402.1.3 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table 402.1.1. The UA calculation shall be done using a method consistent with ASHRAE handbook of Fundamentals and shall include the thermal bridging effects of framing materials.

R408.31063a

402.2 Specific insulation requirements (Prescriptive)

402.2.1 Ceilings with attic spaces. When section 402.1.1 would require R-49 in the ceiling, R-38 shall 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 402.1.3 and the total UA alternative in section 402.1.4.

R 408.31062 Fenestration product rating.

Rule 1062. Section 303.1.3 of the code is amended to read as follows:

303.1.3 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 the Table 303.1.3(1) or 303.1.3(2).

Exception: Computer simulations by independent NFRC certified laboratories or approval under section 21 of 1972 PA 230, MCL 125.1521 are considered in compliance with this section.

R 408.31063 Insulation and fenestration criteria.

Rule 1063. Insulation and fenestration criteria. Table 402.1.1 of the code is amended to read as follows:

**TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR (a)	CEILING R-Value	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE (f)	FLOOR R-VALUE	BASEMENT WALL R-VALUE (b)	SLAB R-VALUE AND DEPTH ©	CRAWL SPACE WALL R-VALUE ©
5A	0.35	0.60	38	20 or 13 + 5(e)	13/17	30(d)	10/13	10.2 ft.	10/13
6A	0.35	0.60	49	20 or 13 + 5(e)	15/19	30(d)	15/19	10.4 ft.	10/13
7	0.35	0.60	49	21	19/21	38(d)	15/19	10.4 ft.	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 requirements.
- 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.

R 408.31065 Equivalent U-Factors.

Rule 1065. Section 402.1.4 and table 402.1.3 of the code are amended to read as follows:

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 ©
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
7A	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-factor 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.

R 408.31063a Specific insulation requirements (prescriptive)

Rule 1063a Section 402.2.1 and 402.2.11 of the code are amended to read as follows:

402.2.1 Ceiling with attics spaces. When section 402.1.1 would require R-49 in the ceiling, R-38 shall satisfy the requirement for R-49 wherever the full height of the 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 402.1.3 and the total UA alternative in section 402.1.4.

402.2.2 Ceiling without attic spaces. Where Section 402.1.1 would require insulation levels above R-30 and 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 402.1.1 shall be limited to 500 square feet (46 m²) or 20 percent of the total insulated ceiling areas, whichever is less. This reduction shall not apply to the U-factor alternative approach in Section 402.1.3 and the total UA alternative in Section 402.1.4.

402.2.3 Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weather-stripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed R-value of the loose fill insulation.

402.2.4 Mass walls. Mass walls for the purpose 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.

R408.31070 Steel-frame ceilings, walls and floors.

Rule 1070. Section 402.2.5 of code are amended to read as follows:

402.2.5 Steel-frame ceiling, walls, and floors. Steel-frame ceiling, walls, and floors shall meet the insulation requirements of table 402.2.5 or shall meet the U-factor requirements in table 402.1.3. The calculation of the U-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

TABLE 402.2.5 STEEL-FRAME CELING, WALL AND FLOOR INSULATION (R-VALUE)	
WOOD FRAME R-VALUE REQUIREMENT	COLD-FORMED STELL EQUIVALENT R-VALUE(a)
Steel Truss Ceilings(b)	
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 R-15 + 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 + 6 in 2 x 8 or 2 x 10
R-19	R-19 in 2 x 6 R-19 + 12 in 2 x 8 or 2 x 10

- 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.

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

402.2.7 Basements walls. 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 402.1.1 and 402.2.6.

402.2.8 Slab-on-grade floors. Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table 402.1.1. The insulation shall extend downward from the top of slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table 402.1.1 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 cut at a 45-degree (0.79 rad) angle away from the exterior wall. Slab-edge insulation is not required in jurisdiction designated by the code official as having a very heavy termite infestation.

402.2.9 Crawl Space walls. As an alternative to insulating floors over crawl spaces, crawl space walls shall be permitted to be insulated when the crawl space is not vented to the outside. 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 in accordance with the International Building Code. All joints of the vapor retarder shall overlap by 6 inches (153 mm) and be sealed or taped. The edges of the vapor retarder shall extend at least 6 inches (153 mm) up the stem wall and shall be attached to the stem wall.

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

402.2.11 Thermally isolated sunroom insulation. The minimum ceiling insulation R-values shall be R-24 in zones 5 to 7. The minimum wall R-value shall be R-13 in all zones. New wall or walls separating a sunroom from conditioned space shall meet the building thermal envelope requirements.

R 408.301064 Fenestration.

402.3 Fenestration (Prescriptive).

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

402.3.3 Glazed fenestration exemption. Up to 15 square feet (1.4m²) of glazed fenestration per dwelling unit shall be permitted to be exempt from U-factor requirements in section 402.1.1. This exemption shall not apply to the U-factor alternative approach in section 402.1.3 and the total UA alternative in section 402.1.4.

402.3.6. Replacement fenestration. Where some or all of an existing fenestration unit is replaced with new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for U-factor in table 402.1.1. 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 in Table 402.1.1.

402.4 Air leakage (Mandatory).

402.4.1 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, weather-stripped 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 a garage from conditioned spaces.
8. Behind tubs and showers on exterior walls.
9. Common walls between dwelling units.
10. Attic access openings.
11. Rim joist junction.
12. Other sources of infiltration.

402.4.2 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 402.4.2.1 or 402.4.2.2:

402.4.2.1 Testing option. Building envelope tightness and insulation installation shall be considered acceptable when tested air leakage is less than seven air changes per hour (ACH) when tested with a blower door at a pressure of 50 pascals (1 psf.). 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 ventilations 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.

402.4.2.2 Visual inspection option. Building envelope tightness and insulation installation shall be considered acceptable when the items listed in Table 402.4.2, applicable to the method of construction, are field verified. Where required by the code official, and approved party independent from the installer of the insulation, shall inspect the air barrier and insulation.

Table 402.4.2

Air Barrier and Insulation Inspection Component Criteria

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

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

402.4.4 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m²), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m²), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited independent laboratory and listed and labeled by the manufacturer.

Exceptions: Site-built windows, skylights and doors.

R 408.31069 Recessed lighting.

Rule 1069. Section 402.4.5 of the code is amended to read as follows:

402.4.5 Recessed lighting. When installed in the building thermal envelope, recessed lighting fixtures shall meet 1 of the following requirements:

(a) Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the unconditioned space.

(b) Type IC or non-IC rated, installed inside a sealed box constructed from a minimum 0.5-inch-thick (12.7 mm) gypsum wallboard or constructed from a preformed polymeric vapor barrier, or other airtight assembly manufactured for this purpose, while maintaining required clearances of not less than 0.5 inch (12.7 mm) from combustible material and not less than 3 inches (76 mm) from insulation material.

(c) Type IC rated and admitting not more than 2.0 cubic feet per minute (cfm) (09.11 L/s) of air movement from the conditioned space to the ceiling cavity when tested in accordance with ASTM E283. The lighting fixture shall be tested at 1.57 psi (75 Pa) pressure difference and shall be labeled.

402.5 Maximum fenestration U-factor and SHGC (Mandatory) The area-weighted average maximum fenestration U-factor permitted using trade-offs from Section 402.1.4 or 405 shall be 0.48 in Zones 4 and 5 and 0.40 in Zones 6 through 8 for vertical fenestration, and 0.75 in Zones 4 through 8 for skylights. The area-weighted average maximum fenestration SHGC permitted using trade-offs from Section 405 in Zones 1 through 3 shall be 0.50.

Section 403 - Systems

403.1 Controls (Mandatory). At least one thermostat shall be provided for each separate heating and cooling system.

403.1.1 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).

403.1.2 Heat pump supplementary heat (Mandatory). 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.

403.2 Ducts.

403.2.1 Insulation (Prescriptive). 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.

403.2.2 Sealing (mandatory). All ducts, air handlers, filter boxes, and building cavities used as ducts shall be sealed. Joints and seams shall comply with section M1601.4.1 of the Michigan residential code.

403.2.3 Building cavities (Mandatory). Building framing cavities shall not be used as supply ducts.

403.3 Mechanical system piping insulation (mandatory). Mechanical system piping capable of carrying fluid above 105°F (41°C) or below 55° F (13 °C) shall be insulated to a minimum of R-3.

Exceptions:

1. Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code.
2. Runout piping not exceeding 4 feet (1219 mm) in length and 1 inch (25 mm) in diameter between the control valve and HVAC coil.

403.4 Circulating hot water systems (mandatory). 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.

Exceptions:

1. Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure reference by this code.
2. Runout piping not exceeding 4 feet (1219 mm) in length and 1 inch (25 mm) in diameter between the control valve and HVAC coil.

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

403.6 Equipment sizing (Mandatory). Heating and cooling equipment shall be sized in accordance with Section M1401.3 of the International Residential Code.

403.7 System serving multiple dwelling units (Mandatory). Systems serving multiple dwelling units shall comply with Sections 503 and 504 in lieu of Section 403.

403.8 Snow melt system controls (Mandatory). 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, and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F.

403.9 Pools (Mandatory). Pools shall be provided with energy-conserving measures in accordance with Section 403.9.1 through 403.9.3.

403.9.1 Pool heaters. All pool heaters shall be equipped with a readily accessible on-off switch to allow shutting off the heater with out adjusting the thermostat setting. Pool heaters fired by natural gas or LPG shall not have continuously burning pilot lights.

403.9.2 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.

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.

403.9.3 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.

Exception: Pools deriving over 60 percent of the energy for heating from site-recovered energy or solar energy source.

Section 404 – Electrical Power and Lighting Systems

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

Section 405 – Simulated Performance Alternative (Performance)

405.1 Scope. This section establishes criteria for compliance using simulated energy performance analysis. Such analysis shall include heating, cooling, and service water heating energy only.

405.2 Mandatory requirements. Compliance with this section requires that the mandatory provisions identified in Section 401.2 be met. All supply and return ducts not completely inside the building thermal envelope shall be insulated to a minimum of R-6.

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

Exception: The energy use based on source energy expressed in Btu or Btu per square foot of conditioned floor area shall be permitted to be substituted for the energy cost. The source energy multiplier for electricity shall be 3.16. The source energy multiplier for fuels other than electricity shall be 1.1.

405.4 Documentation.

405.4.1 Compliance software tools. Documentation verifying that the methods and accuracy of the compliance software tools conform to the provisions of this section shall be provided to the code official.

405.4.2 Compliance report. Compliance software tools shall generate a report that documents that the proposed design complies with Section 405.3. The compliance documentation shall include the following information:

1. Address or other identification of the residence;
2. An inspection checklist documenting the building component characteristics of the proposed design as listed in Table 405.5.2(1). The inspection checklist shall show results for both the standard reference design and the proposed design, and shall document all inputs entered by the user necessary to reproduce the results;
3. Name of individual completing the compliance report; and
4. Name and version of the compliance software tool.

Exception: Multiple orientations. When an otherwise identical building model is offered in multiple orientations, compliance for any orientation shall be permitted by documenting that the building meets the performance requirements in each of the four cardinal (north, east, south and west) orientation.

405.4.3 Additional documentation. The Code official shall be permitted to require the following documents;

1. Documentation of the building component characteristics of the standard reference design.
2. A certification signed by the builder providing the building component characteristics of the proposed design as given in Table 405.5.2(1)
3. Documentation of the actual values used in the software calculations for the proposed design.

405.5 Calculation procedure.

405.5.1 General. Except as specified by this section, the standard reference design and proposed design shall be configured and analyzed using identical methods and techniques.

405.5.2 Residence specifications. The standard reference design and proposed design shall be configured and analyzed as specified by Table 405.5.2(1). Table 405.5.2(1) shall include by reference all notes contained in Table 402.1.1.

405.6 Calculation software tools.

405.6.1 Minimum capabilities. Calculation procedures used to comply with this section shall be software tools capable of calculating the annual energy consumption of all building elements that differ between the standard reference design and the proposed design and shall include the following capabilities:

1. Computer generation of the standard reference design using only the input for the proposed design. The calculation procedure shall not allow the user to directly modify the building component characteristics of the standard reference design.
2. Calculation of the whole-building (as a single zone) sizing for the heating and cooling equipment in the standard reference design residence in accordance with Section M1401.3 of the International Residential Code.
3. Calculations that account for the effects of indoor and outdoor temperatures and part-loads ratios on the performance of the heating, ventilating and air-conditioning equipment based on climate and equipment sizing.
4. Printed code official inspection checklist listing each of the proposed design component characteristics from Table 405.5.2(1) determined by the analysis to provide compliance, along with their respective performance ratings (e.g., R-value, U-factor, SHGC, HSPF, APUE, SEER, EF, etc.).

405.6.2 Specific approval. Performance analysis tools meeting the applicable sections of Section 405 shall be permitted to be approved. Tools are permitted to be approved based on meeting a specified threshold for a jurisdiction. The code official shall be permitted to approve tools for a specified application or limited scope.

405.6.3 Input values. When calculations require input values not specified by Section 402, 403, 404, and 405, those input values shall be taken from an approved source.