

CONFIDENTIAL
FOR DISCUSSION PURPOSES ONLY

PART 1—INTENT AND APPLICATION

SECTION N1101 SCOPE AND GENERAL REQUIREMENTS

N1101.1 Intent. This chapter shall regulate the design and construction of buildings for the economical and efficient use and conservation of energy and the preservation of affordability by meeting the cost-effective standards of the Stille-DeRossett-Hale Single State Construction Code Act (Act 230 of 1972). This chapter is intended to provide flexibility to permit the use of innovative approaches, materials, and techniques to achieve this objective.

N1101.2 Applicability. Where, in any specific case, different sections of this chapter specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

N1101.3 Mixed residential and commercial buildings. Where a building includes both residential building and commercial building portions, each portion shall be separately considered and meet the applicable provisions of the Michigan Energy Code—Commercial Provisions or Chapter 11 of the Michigan Residential Code. The compliance approach is at the discretion of the building owner and the owner’s designer. Buildings undergoing alteration, repair, change of occupancy or addition must also comply with Chapter 11.

N1101.4.1 Compliance materials. The code official shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this chapter.

SECTION N1102 ALTERNATIVE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT

N1102.1 General. The provisions of this chapter are not intended to require or prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this chapter. The code official shall have the authority to approve an alternative material, design, or method of construction upon application of the owner or the owner’s authorized agent. The code official shall first find that the proposed design is satisfactory and complies with the intent of the provisions of this chapter, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this chapter for strength, effectiveness, fire resistance, durability, and safety. Where the alternative material, design or method of construction is not approved, the code official shall respond to the applicant, in writing, stating the reasons why the alternative was not approved.

N1102.1.1 Above code programs. The code official or other authority having jurisdiction shall be permitted to deem a national or state energy-efficiency program to exceed the energy efficiency required by this chapter. Buildings approved in writing by such an energy-efficiency program shall be considered to be in compliance with this chapter. Compliance with the Silver Rating of the ICC 700 National Green Building Standard-2020 or its successor standard shall automatically be deemed to meet the requirement of Chapter 11. Compliance with Energy Star V3.1 revision 11 or subsequent versions shall automatically be deemed to meet the requirements of Chapter 11.

SECTION N1103 CONSTRUCTION DOCUMENTS

N1103.1 General. Construction documents, technical reports and other supporting data required by Chapter 11 shall be submitted in one or more sets or, where allowed by the code official, in a digital format with each application for a permit. The code official is authorized to require necessary technical reports to be prepared by approved third party inspection company personnel meeting the requirements of Section N1104.

Exception: The code official is authorized to waive the requirements for construction documents or other

supporting data if the code official determines they are not necessary to confirm compliance with this chapter.

N1103.2 Information on construction documents. Construction documents shall be drawn to scale on suitable material. Electronic media documents are permitted to be submitted where approved by the code official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include the following as applicable:

1. Energy compliance path
2. Insulation materials and their R-values.
3. Fenestration U-factors.
4. Area-weighted U-factor.
5. Mechanical system design criteria.
6. Mechanical and service water-heating systems and equipment types, sizes, and efficiencies.
7. Equipment and system controls.
8. Duct sealing, duct and pipe insulation and location.
9. Air sealing details.

N1103.2.1 Building thermal envelope depiction. The building thermal envelope shall be represented on the construction documents.

N1103.3 Examination of documents. The code official shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this chapter and other pertinent laws or ordinances.

N1103.3.1 Approval of construction documents. When the code official issues a permit where construction documents are required, the construction documents shall be endorsed in writing and stamped "Reviewed for Chapter 11 Compliance." Such approved construction documents shall not be changed, modified, or altered without authorization from the code official. Work shall be done in accordance with the approved construction documents.

One set of construction documents so reviewed shall be retained by the code official. The other set shall be returned to the applicant, kept at the site of work and shall be open to inspection by the code official or a duly authorized representative.

N1103.3.2 Previous approvals. This chapter shall not require changes in the construction documents, construction, or designated occupancy of a structure for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith and has not been abandoned.

N1103.3.3 Phased approval. The code official shall have the authority to issue a permit for the construction of part of an energy conservation system before the construction documents for the entire system have been submitted or approved, provided adequate information, and detailed statements have been filed complying with all pertinent requirements of this chapter. The holders of such permit shall proceed at their own risk without assurance that the permit for the entire energy conservation system will be granted.

N1103.4 Amended construction documents. Work shall be installed in accordance with the approved construction documents, and any changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.

**SECTION N1104
APPROVED THIRD PARTY INSPECTION COMPANY**

N1104.1 Approved third party inspection company. The code official is authorized to accept reports of third-party inspection companies not affiliated with the building design or construction under this chapter, provided that such companies are approved as to qualifications and reliability relevant to the building components and systems that they are inspecting or testing, and approval is granted prior to issuance of the building permit.

N1104.2 Independence. An approved third-party inspection company shall be an independent business identity. The company shall perform its duties in accordance with the scope of delegated responsibilities established by the code official. The company shall disclose to the code official any conflicts of interest. The company shall acknowledge in writing that it is only authorized to work within the scope of delegated responsibilities.

N1104.3 Equipment. An approved third-party inspection company shall have adequate equipment to perform inspections and tests required by the code official and this chapter. All testing equipment shall be periodically calibrated as required by the manufacturer, testing standards used in this chapter, or certifications held by the approved third-party inspection company.

N1104.5 Delegated authority. Where approved, a third-party inspection company shall have the authority to perform delegated inspections as allowed by MCL 125.1509 and determine compliance or noncompliance of work with approved construction documents.

N1104.6 Approved third party inspection company reporting. An approved third-party inspection company shall keep records of delegated inspections, tests, and compliance documentation required by this chapter. The company shall submit reports of delegated inspections and tests to the code official and to the owner or owner's representative. Reports shall indicate the compliance determination for the inspected or tested work based on the approved construction document. A final report documenting required delegated inspections and tests, and correction of any discrepancies noted in the inspections or tests, shall be submitted, with other required compliance documentation, at a time required by the code official.

N1104.7 Personnel. Personnel assigned by an approved third-party inspection company to perform inspections and testing shall be trained or credentialed and documentation of training or credentials shall be available to code official upon request.

SECTION N1105 REFERENCED STANDARDS

N1105.1 Referenced codes and standards. The codes and standards referenced in this chapter shall be those indicated in Chapter 11, and such codes and standards shall be considered as part of the requirements of this chapter only to the explicitly prescribed extent of each such reference and as further regulated in Sections N1105.1.1 and N1105.1.2.

N1105.1.1 Conflicts. Where conflicts occur between provisions of this chapter and referenced codes and standards, the provisions of this chapter shall apply. Where conflicts occur between this chapter and the manufacturer's written instructions for installation or use the manufacturer's written instructions shall take precedence.

N1105.1.2 Provisions in referenced codes and standards. Where the extent of the explicit reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard.

N1105.2 Application of references. References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section, or provision of this chapter.

DEFINITIONS

SECTION N1106 GENERAL

N1106.1 Meanings. Unless stated otherwise, the following words and terms in this chapter shall have the meanings indicated in this chapter.

N1106.2 Interchangeability. Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural includes the singular.

N1106.3 Terms not defined. Terms not defined by this chapter shall have ordinarily accepted meanings such as the context implies. Terms that are not defined in this chapter but are defined in the Michigan Building Code, Michigan Fire Code, Michigan Fuel Gas Code, Michigan Mechanical Code, Michigan Plumbing Code, or the Michigan Residential Code shall have the meanings ascribed to them in those codes.

SECTION N1107 GENERAL DEFINITIONS

ABOVE-GRADE WALL. A wall more than 50 percent above grade and enclosing conditioned space. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

ACCESSIBLE. Admitting close approach as a result of not being guarded by locked doors, elevation, or other effective means (see "Readily accessible").

ADDITION. An extension or increase in the conditioned space floor area, number of stories or height of a building or structure.

AIR BARRIER. One or more materials joined together in a continuous manner to restrict or prevent the passage of air through the building thermal envelope and its assemblies.

ALTERATION. Any construction, retrofit or renovation to an existing structure other than repair or addition. Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type, or purpose of the original installation.

APPROVED. Acceptable to the code official.

APPROVED COMPANY. An established and recognized company that is regularly engaged in conducting tests furnishing inspection services, or furnishing product certification, where such company has been approved by the code official.

AUTOMATIC. Self-acting, operating by its own mechanism when actuated by some impersonal influence.

BASEMENT WALL. A wall 50 percent or more below grade and enclosing conditioned space.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy, including any mechanical systems, service water heating systems and electric power and lighting systems located on the building site and supporting the building.

BUILDING SITE. An area of land on which a building or a group of buildings is in the process of being built or altered.

BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floors, ceiling, roofs, and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to fixtures and back to the water-heating equipment.

CLIMATE ZONE. A geographical region based on climatic criteria as specified in this chapter.

CODE OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this chapter, or a duly authorized representative.

COMMERCIAL BUILDING. For this chapter, all buildings that are not included in the definition of “Residential building.”

CONDITIONED FLOOR AREA. The horizontal projection of the floors associated with the conditioned space.

CONDITIONED SPACE. An area, room or space that is enclosed by, but not within the building thermal envelope and that is directly heated and cooled or indirectly heated and cooled. Spaces are indirectly heated and cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls floors or ceilings, or where they contain uninsulated ducts, piping or other sources of heating or cooling.

CONTINUOUS AIR BARRIER. A combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope.

CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior, or is integral to any opaque surface, of the building envelope.

COST-EFFECTIVE. Cost-effective means, using the existing energy efficiency standards and requirements as the base of comparison, the economic benefits of the proposed energy efficiency standards and requirements will exceed the economic costs of the requirements of the proposed rules based upon an incremental multiyear analysis that meets all of the following requirements:

- (i) Considers the perspective of a typical first-time home buyer.
- (ii) Considers benefits and costs over a 7-year time period.
- (iii) Does not assume fuel price increases in excess of the assumed general rate of inflation.
- (iv) Ensures that the buyer of a home who would qualify to purchase the home before the addition of the energy efficient standards will still qualify to purchase the same home after the additional cost of the energy-saving construction features.

(v) Ensures that the costs of principal, interest, taxes, insurance, and utilities will not be greater after the inclusion of the proposed cost of the additional energy-saving construction features required by the proposed energy efficiency rules than under the provisions of the existing energy efficiency rules.

CRAWL SPACE WALL. The opaque portion of a wall that encloses a crawl space and is partially or totally below grade.

DUCT. A tube or conduit utilized for conveying air. The air passages of self-contained systems are not to be construed as air ducts.

DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

ELECTRIC VEHICLE (EV) CAPABLE SPACE. A vehicle space with electrical panel space and load capacity to support a branch circuit and necessary raceways, both underground and/or surface mounted, to support EV charging.

ENERGY ANALYSIS. A method for estimating the annual energy use of the proposed design and standard reference design based on estimates of energy use.

ENERGY COST. The total estimated annual cost for purchased energy for the building functions regulated by this chapter, including applicable demand charges.

ERI REFERENCE DESIGN. A version of the rated design that meets the minimum requirements of the 2006 International Energy Conservation Code.

EXTERIOR WALL. Walls including both above-grade walls and basement walls.

FENESTRATION. Products classified as either vertical fenestration or skylights.

FENESTRATION PRODUCT, SITE-BUILT. A fenestration designed to be made up of field-glazed or field-assembled units using specific factory cut or otherwise factory- formed framing and glazing units

HABITABLE SPACE. For the purpose of determining the need for a design professional's seal on construction documents under Article 20 of Act 299 of 1980, "habitable space" means space in a building used for living, sleeping, eating, or cooking. Habitable space does not include a heater or utility room, a crawl space, a basement, an attic, a garage, an open porch, a balcony, a terrace, a court, a deck, a bathroom, a toilet room, a closet, a hallway, a storage space, and other similar spaces not used for living, sleeping, eating, or cooking.

HEATED SLAB. Construction in which the heating elements, hydronic tubing, or hot air distribution system is in contact with, or placed within or under, the slab.

HIGH-EFFICACY LIGHT SOURCES. Any lamp with an efficacy of not less than 65 lumens per watt or luminaires with an efficacy of not less than 45 lumens per watt'

HISTORIC BUILDING. Any building or structure that is one or more of the following:

1. Listed or certified as eligible for listing by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, in the National Register of Historic Places.
2. Designated as historic under an applicable state or local law.
3. Certified as a contributing resource within a National Register-listed, state-designated or locally designated historic district.

INFILTRATION. The uncontrolled inward air leakage into a building caused by the pressure effects of wind or the effect of differences in the indoor and outdoor air density or both.

INSULATED SIDING. A type of continuous insulation with manufacturer-installed insulating material as an integral part of the cladding product having an R-value of not less than R-2.

LABELED. Equipment, materials, or products to which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, approved agency or other organization concerned with product evaluation that maintains periodic inspection of the production of such labeled items and whose labeling indicates either that the equipment, material, or product meets identified standards or has been tested and found suitable for a specified purpose.

LISTED. Equipment, materials, products or services included in a list published by an organization acceptable to the code official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose.

MANUAL. Capable of being operated by personal intervention (see "Automatic").

OPAQUE DOOR. A door that is not less than 50-percent opaque in surface area.

PROPOSED DESIGN. A description of the proposed building used to estimate annual energy use for determining compliance based on total building performance.

RATED DESIGN. A description of the proposed building used to determine the simulated performance design or the energy rating index.

READILY ACCESSIBLE. Capable of being reached quickly for operation, renewal or inspection without requiring those to whom ready access is necessary to climb over or remove obstacles or to resort to portable ladders or access equipment.

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

REROOFING. The process of recovering or replacing an existing roof covering.

RESIDENTIAL BUILDING. Detached one- and two-family dwellings and townhouses as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof covering, underlayment, and roof deck, and can also include a thermal barrier, an ignition barrier, insulation, or a vapor retarder.

ROOF RECOVER. The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

ROOF REPLACEMENT. The process of removing the total existing roof covering, repairing any damaged substrate and installing a new roof covering.

R-VALUE (THERMAL RESISTANCE). The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \cdot ft^2 \cdot ^\circ F/Btu$) [$m^2 \cdot K/W$].

SERVICE WATER HEATING. Supply of hot water for purposes other than heating.

SOLAR HEAT GAIN COEFFICIENT (SHGC). The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation that is then reradiated, conducted or convected into the space.

STANDARD REFERENCE DESIGN. A version of the proposed design that meets the minimum requirements of this chapter and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

SUNROOM. A one-story structure attached to a dwelling with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.

THERMAL ISOLATION. Physical and space conditioning separation from conditioned spaces. The conditioned spaces shall be controlled as separate zones for heating and cooling or conditioned by separate equipment.

THERMOSTAT. An automatic control device used to maintain temperature at a fixed or adjustable setpoint.

U-FACTOR (THERMAL TRANSMITTANCE). The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films ($Btu/h \cdot ft^2 \cdot ^\circ F$) [$W/(m^2 \cdot K)$].

VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

VENTILATION AIR. That portion of supply air that comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

WHOLE HOUSE MECHANICAL VENTILATION SYSTEM. An exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

ZONE. A space or group of spaces within a building with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained throughout using a single controlling device.

**SECTION N1108
CLIMATE ZONES**

N1107.1 General. Climate zones listed below shall be used for determining the applicable requirements from this chapter.

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

**SECTION N1109
DESIGN CONDITIONS**

N1109 Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F (22°C) for heating and minimum of 75°F (24°C) for cooling.

**SECTION N1110
MATERIALS, SYSTEMS AND EQUIPMENT**

N1110.1 Identification. Materials, systems, and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this chapter.

N1110.1.1 Building thermal envelope insulation. An R-value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation that is 12 inches (305 mm) or greater in width. Alternatively, the insulation installers shall provide a certification that indicates the type, manufacturer and R-value of insulation installed in each element of the building thermal envelope. For blown-in or sprayed fiberglass, cellulose insulation and sprayed polyurethane foam (SPF), the initial installed thickness, settled thickness, settled R- value, installed density, coverage area installed in each element of the building thermal envelope. For insulated siding, the R-value shall be on a label on the product’s package and shall be indicated on the certification. The insulation installer shall sign, date, and post the certification in a conspicuous location on the job site.

Exception: For roof insulation installed above the deck, the R-value shall be labeled as required by the material standards in Table R906.2 of the Michigan Residential Code, as applicable.

N1110.1.1.1 Blown-in or sprayed roof and ceiling insulation. The thickness of blown-in or sprayed fiberglass and cellulose roof and ceiling insulation shall be written in inches (mm) on markers that are installed at not less than one for every 300 square feet (28 m2) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers not less than 1 inch (25 mm) in height. Each marker shall face the attic access opening.

N1110.1.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer’s R-value mark is readily observable at inspection. For insulation materials that are installed without an observable R-value mark, such as blown or draped products, an insulation certificate complying with N1110.1.1 shall be left by the insulation installer certifying the installed R-value of the insulation material. The insulation installer shall sign, date, and post the certification in a conspicuous location on the job site.

N1110.1.3 Fenestration product rating. U-factors of fenestration products such as windows, doors and skylights shall be determined in accordance with NFRC 100.

Exception: Where required, garage door U-factors shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105. U-factors shall be determined 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 Table N1110.1.3(1) or N1110.1.3(2).

**TABLE
N1110.1.3(1)
DEFAULT GLAZED
WINDOW,
WINDOW,**

GLASS DOOR AND SKYLIGHT U-FACTORS

FRAME TYPE	WINDOW AND GLASS DOOR		SKYLIGHT	
	Single pane	Double pane	Single	Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
Glazed Block	0.60			

TABLE N1110.1.3(2) DEFAULT OPAQUE DOOR U-FACTORS

Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, not exceeding 45% glazing, any glazing double pane	0.35

N1110.1.4 Insulation product rating. The thermal resistance, R-value, of insulation shall be determined in accordance with Part 460 of US-FTC CFR Title 16 in units of $h \cdot ft^2 \cdot ^\circ F/Btu$ at a mean temperature of 75°F (24°C).

N1110.2 Installation. Materials, systems, and equipment shall be installed in accordance with the manufacturer’s instructions and the Michigan Residential Code, as applicable.

N1110.3 Protection of exposed foundation insulation. Insulation applied to the exterior of basement walls, crawl space walls and the perimeter of slab-on-grade floors shall have a rigid, opaque, and weather-resistant protective covering to prevent the degradation of the insulation’s thermal performance. The protective covering shall cover the exposed exterior insulation and extend not less than 6 inches (153 mm) below grade.

N1110.4 Maintenance information. Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

**Section N1111
Residential Energy Efficiency**

N1111.1 Compliance. Projects shall comply with one of the following:

1. Section N1111 through N1114 (Prescriptive Compliance/Total UA Option.
2. Section N1115 (Performance Compliance Option) and the “Mandatory” provisions of Sections N1111 through N1114.
3. Section N1116 (Energy Ratings Index Compliance Option) and the “Mandatory” provisions of Sections N1111 through N1114.

N1111.2 Certificate. (MANDATORY) A permanent certificate shall be completed by the builder or other approved party and posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building. Where located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels. The certificate shall indicate the predominant R-values of insulation installed in or on ceilings, roofs, walls, foundation components such as slabs, basement walls, crawl space walls and floors and ducts outside conditioned spaces; U-factors of and the results from any required building envelope air leakage testing performed on the building. Where there is more than one value for each component, the certificate shall indicate the value covering the largest area. The certificate shall indicate the types and efficiencies of heating, cooling, and service water heating equipment. Where a gas-fired unvented room heater, electric furnace or baseboard electric heater is installed in the residence, the certificate shall indicate “gas-fired unvented room heater,” “electric furnace” or “baseboard electric heater,” as appropriate. An efficiency shall not be indicated for gas-fired unvented room heaters, electric furnaces, and electric base- board heaters.

SECTION N1112
BUILDING THERMAL ENVELOPE

N1112.1 General. The building thermal envelope shall comply with the requirements of Sections N1112.1.1 through N1112.1.5.

Exceptions:

1. The following low-energy buildings, or portions thereof, separated from the remainder of the building by building thermal envelope assemblies complying with this section shall be exempt from the building thermal envelope provisions of Section N1112.
 - 1.1. Those with a peak design rate of energy usage less than 3.4 Btu/h • ft² (10.7 W/m²) or 1.0 watt/ft² of floor area for space-conditioning purposes.
 - 1.2. Those that do not contain conditioned space.
 - 1.3. Log homes designed in accordance with MCL 125.1513 if all of the following requirements are met:
 - (a) The log walls have a minimum average wall thickness of 5 inches or greater.
 - (b) The log walls comply with the international code council standard on the design and construction of log structures, ICC 400-2022 or other successor standard.
 - (c) The area weighted average U-factor for fenestration products in the log walls is a maximum of 0.31.
 - (d) All energy efficiency requirements of this act and rules promulgated under this act applicable to components other than log walls are met.
 - (e) The building heating equipment is qualified under the energy star program jointly operated by the United States department of energy and the United States environmental protection agency as provided for in 10 CFR part 430 or the building heating equipment meets or exceeds the following United States department of energy ratings:
 - (i) For a gas furnace, an annual fuel utilization efficiency (AFUE) of 90.
 - (ii) For an oil furnace, an annual fuel utilization efficiency (AFUE) of 85.
 - (iii) For a boiler, an annual fuel utilization efficiency (AFUE) of 85.
 - (iv) For a split system air source heat pump, an 8.2 heating seasonal performance factor (HSPF).
 - (v) For a closed loop water-to-air geothermal heat pump, an energy efficiency rating of 14.1 and a coefficient of performance of 3.3.
 - (vi) For an open loop water-to-air geothermal heat pump, an energy efficiency rating of 16.2 and a coefficient of performance of 3.6.
 - (vii) For a closed loop water-to-water geothermal heat pump, an energy efficiency rating of 15.1 and a coefficient of performance of 3.0.
 - (viii) For an open loop water-to-water geothermal heat pump, an energy efficiency rating of 19.1 and a coefficient of performance of 3.4.
 - (ix) For a direct geothermal exchange, an energy efficiency rating of 15.0 and a coefficient of performance of 3.5

N1112.1.1 Vapor retarder. Wall assemblies in the building thermal envelope shall comply with the vapor retarder requirements of Section 601.3 of the Michigan Residential Code.

N1112.1.2 Insulation and fenestration criteria. The building thermal envelope shall meet the requirements of Table N1112.1.2, based on the climate zone specified N1108.1.

**TABLE N1112.1.2
INSULATION AND FENESTRATION REQUIREMENTS BY
COMPONENT^a**

NR = Not Required.

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
5	0.30	0.55	NR	49	20 or 13+5 ^f	13/17	30 ^g	15ci or 13+5 ci	10ci, 4 ft	15ci or 19 or 13+5 ci
6	0.30	0.55	NR	49	20 or 13+5 ^f	15/20	30 ^g	15ci or 13+5 ci	10ci, 4 ft	15ci or 19 or 13&5 ci

For SI: 1 foot = 304.8 mm.

- a. R-values are minimums. U-factors are maximums. Where insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall be not less than the R-value specified in the table.
- b. The fenestration U-factor column excludes skylights..
- c. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation on the interior of the basement wall. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. Alternatively, compliance with "15/19" shall be R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home.
- d. R-5 insulation shall be provided under the full slab area of a heated slab in addition to the required slab edge insulation R-value for slabs, as indicated in the table. The slab edge insulation for heated slabs shall not be required to extend below the slab.
- e. Alternatively, insulation sufficient to fill the framing cavity and providing not less than an R-value of R-19.
- f. The first value is cavity insulation, the second value is continuous insulation. Therefore, as an example, "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
- g. Mass walls shall be in accordance with Section N1112.2.5. The second R-value applies where more than half of the insulation is on the interior of the mass wall.

N1112.1.3 R-value alternative. Assemblies with R-value of insulation materials equal to or greater than that specified in Table N1112.1.2 shall be an alternative to the U-factor in Table N1112.1.2. when combined with Section N1111.2.

N1112.1.4 R-value computation. Insulation material used in layers, such as framing cavity insulation or continuous insulation, shall be summed to compute the corresponding component R-value. The manufacturer's settled R-value shall be used for blown-in insulation. Computed R-values shall not include an R-value for other building materials or air films. Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table N1112.2, the manufacturer's labeled R-value for the insulated siding shall be reduced by R-0.6.

N1112.1.5 U-factor alternative. An assembly with a U-factor equal to or less than that specified in Table N1112.2.3 shall be an alternative to the R-value in Table N1112.1.2.

N1112.1.6 Total UA alternative. Where the total building thermal envelope UA, the sum of U-factor times assembly area, is less than or equal to the total UA resulting from multiplying the U-factors in Table N1112.2.3 by the same assembly area as in the proposed building, the building shall be considered to be in compliance with Table 1114.2.

TABLE N1112.2.3 EQUIVALENT U-FACTORS^a

	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
5	0.30	0.55	0.026	0.060	0.082	0.033	0.050	0.055
6	0.30	0.55	0.026	0.060	0.060	0.033	0.050	0.055

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

bMass walls shall be in accordance with Section N1112.2.5. Where more than half the insulation is on the interior, the mass wall U-factors shall not exceed 0.065 in Climate Zone 5 and 0.057 in Climate Zone 6.

N1112.1.7. UA Calculation The UA calculation shall be performed using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials.

N1112.2 Thermal distribution system. The thermal distribution system shall meet one of the following efficiencies:

1. 100 percent of ducts and air handlers located completely inside the building thermal envelope.
2. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the building thermal envelope.
3. 100 percent of duct thermal distribution system located in *conditioned space*.

N1112.3 Specific insulation requirements. In addition to the requirements of Section N1111.1, insulation shall meet the specific requirements of Sections N1112.5.1 through N1112.5.13.

N1112.3.1 Ceilings with attic spaces. Where Section N1111.1 requires R-38 insulation in the ceiling, installing R-30 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section N1111.4.2 requires R-49 insulation in the ceiling, installing R-38 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-49 insulation 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 N1112.4 and the Total UA alternative in Section N1112.1.5.

N1112.3.2 Ceilings without attic spaces. Where Section N1112.1.2 requires insulation R-values greater than R-30 in the ceiling and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation R-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section N1112.1.2 shall be limited to 500 square feet (46 m²) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the U-factor alternative approach in Section N1112.1.4 and the Total UA alternative in Section 1114.1.5.

N1112.3.3 Eave baffle. For air-permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material.

N1112.3.4 Access hatches and doors. Access hatches and doors from conditioned to unconditioned spaces such as attics and crawl spaces shall be insulated to the same R-value required by Table N1112.1.2 for the wall or ceiling in which they are installed.

Exceptions:

1. Vertical doors providing access from conditioned spaces to unconditioned spaces that comply with the fenestration requirements of Table N1112.2.3 based on the applicable climate zone specified in Section 1108.

N1112.3.5 Mass walls. Mass walls, where used as a component of the building thermal envelope, shall be one of the following:

1. Above-ground walls of concrete block, concrete, insulated concrete form, masonry cavity, brick but not brick veneer, adobe, compressed earth block, rammed earth, solid timber, or solid logs.
2. Any wall having a heat capacity greater than or equal to 6 Btu/ft² • °F (123 kJ/m² • K).

N1112.3.6 Steel-frame ceilings, walls, and floors. Steel-frame ceilings, walls, and floors shall comply with the insulation requirements of Table N1112.2.6 or the U-factor requirements of Table N1112.1.4. The calculation of the U-factor for a steel-frame envelope assembly shall use a series-parallel path calculation method.

TABLE N1112.2.6 STEEL-FRAME CEILING, WALL AND FLOOR INSULATION R-VALUES

WOOD FRAME R-VALUE REQUIREMENT	COLD-FORMED STEEL-FRAME 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 × 4 or 2 × 6 or 2 × 8 R-49 in any framing
R-38	R-49 in 2 × 4 or 2 × 6 or 2 × 8 or 2 × 10
Steel-Framed Wall, 16 inches on center	
R-13	R-13 + 4.2 or R-21 + 2.8 or R-0 + 9.3 or R-21 + 3.1
R-13 + 3	R-0 + 11.2 or R-13 + 6.1 or R-19 + 5.0 or R-21 + 4.7
R-20	R-0 + 14.0 or R-13 + 8.9 or R-19 + 7.8 or R-19 + 6.2 or R-21 + 7.5
R-20 + 5	R-13 + 12.7 or R-19 + 11.6 or R-21 + 11.3 or R-25 + 10.9
R-21	R-0 + 14.6 or R-13 + 9.5 or R-19 + 8.4 or R-21 + 8.1 or R-25 + 7.7
Steel Framed Wall, 24 inches on center	
R-13	R-0 + 9.3 or R-13 + 3.0
R-13 + 3	R-0 + 11.2 or R-13 + 4.9 or R-19 + 3.5 or R-21 + 3.1
R-20	R-0 + 14.0 or R-13 + 7.7 or R-19 + 6.3 or R-21 + 5.9
R-20 + 5	R-13 + 11.5 or R-19 + 10.1 or R-21 + 9.7 or R-25 + 9.1
R-21	R-0 + 14.6 or R-13 + 8.3 or R-19 + 6.9 or R-21 + 6.5 or R-25 + 5.9
Steel Joist Floor	
R-13	R-19 in 2 × 6, or R-19 + 6 in 2 × 8 or 2 × 10

R-19	R-19 + 6 in 2 × 6, or R-19 + 12 in 2 × 8 or 2 × 10
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- a. The first value is cavity insulation R-value, the second value is continuous insulation R-value. Therefore, for example, “R-30+3” means R-30 cavity insulation plus R-3 continuous insulation.
- b. Insulation exceeding the height of the framing shall cover the framing.

N1112.3.7 Walls with partial structural sheathing. Where Section N1112.1.2 requires continuous insulation on exterior walls and structural sheathing covers 40 percent or less of the gross area of all exterior walls, the required continuous insulation R-value shall be permitted to be reduced by an amount necessary, but not more than R-3 to result in a consistent total sheathing thickness on areas of the walls covered by structural sheathing. This reduction shall not apply to the U-factor alternative in Section R41114.1.4 and the Total UA alternative in Section N1112.1.5

N1112.3.8 Floors. Floor framing-cavity insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.

Exception: As an alternative, the floor framing-cavity insulation shall be in contact with the topside of sheathing or continuous insulation installed on the bottom side of floor framing where combined with insulation that meets or exceeds the minimum wood frame wall R-value in Table N1112.1.2 and that extends from the bottom to the top of all perimeter floor framing members.

N1112.3.9 Basement 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 comply with this requirement except where the floor overhead is insulated in accordance with Sections N1112.1.2 and N1112.2.8.

N1112.3.10 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 N1112.1.2. The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended the distance provided in Table N1112.1.2 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 not less than 10 inches (254 mm) of soil. The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut at a 45-degree (0.79 rad) angle away from the exterior wall. Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation.

N1112.3.11 Crawl space walls. As an alternative to insulating floors over crawl spaces, crawl space walls shall be insulated provided that the crawl space is not vented to the outdoors. Crawl space wall insulation shall be permanently fastened to the wall and shall extend downward from the floor to the finished grade elevation and then vertically or horizontally for not less than 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 Michigan Residential Code. 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 not less than 6 inches (153 mm) up stem walls and shall be attached to the stem walls.

N1112.3.12 Masonry veneer. Insulation shall not be required on the horizontal portion of a foundation that supports a masonry veneer.

N1112.3.13 Sunroom and heated garage insulation. Sunrooms and heated garages enclosing conditioned space shall meet the insulation requirements of this chapter.

Exception: For sunrooms and heated garages with thermal isolation, and enclosing conditioned space, the following exceptions to the insulation requirements of this chapter shall apply:

1. The minimum ceiling insulation R-values shall be R-24 in Climate Zones 5, and 6.
2. The minimum wall insulation R-value shall be R-13 in all climate zones. Walls separating a sunroom with a thermal isolation from conditioned space shall comply with the building thermal envelope requirements of this chapter.

N1112.4 Fenestration. In addition to the requirements of Section N1112, fenestration shall comply with Sections N1112.4.1 through N1112.4.5.

N1112.4.1 U-factor.

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

N1112.4.2 Glazed fenestration exemption. Not greater than 15 square feet (1.4 m²) of glazed fenestration per dwelling unit shall be exempt from the U-factor requirements in Table N1112.1.2. This exemption shall not apply to the Total UA alternative in N1112.1.5.

N1112.4.3 Opaque door exemption. One side-hinged opaque door assembly not greater than 24 square feet (2.22 m²) in area shall be exempt from the U-factor requirement in Section N1112.1.2. This exemption shall not apply to the U-factor alternative in Section N1112.1.4 and the Total UA alternative in Section N1112.1.5.

Exception: In Climate Zones 5, and 6, for sunrooms with thermal isolation and enclosing conditioned space, the fenestration U-factor shall not exceed 0.45 and the sky- light U-factor shall not exceed 0.70.

N1112.4.4 Sunroom and heated garage fenestration Regardless of the compliance option chosen, the building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections N1112.4.1 through N1112.4.5.

N1112.5 Air leakage. The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections N1112.5.1 through N1112.5.5

N1112.5.1 Building thermal envelope. The building thermal envelope shall comply with Sections N1112.4.1.1 and N1112.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

N1112.5.1.1 Installation. The components of the building thermal envelope as indicated in Table N1112.22 shall be installed in accordance with the manufacturer’s instructions and the criteria indicated in Table N1112.22, as applicable to the method of construction. Where required by the code official, an approved third party shall inspect all components and verify compliance.

**TABLE N1112.5.1.1
AIR BARRIER AND INSULATION INSTALLATION^a**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop-down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.

Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	—
Rim joists	Rim joists shall include an air barrier.	Rim joists shall be insulated.

Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation, or, in the case where the air barrier is on the underside of the floor, along the thermal barrier on the unconditioned side.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, drywall, or continuous insulation installed on the underside of floor framing; and shall extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Crawl space insulation, where provided instead of floor insulation, shall be permanently attached to the walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Air Barrier shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required R-value.
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	—
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring	—	In exterior walls, batt insulation shall be cut neatly to fit around wiring and plumbing, or insulation, that on installation readily conforms to available space, shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes or air-sealed boxes shall be installed.	—
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	—
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	—

- a. Inspection of log walls shall be in accordance with the provisions of MCL 125.1513f.
- b. Air barrier and insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

N1112.5.1.2 Testing. The building or dwelling unit shall be tested for air leakage. When testing individual dwelling units, an air leakage rate not exceeding 0.30 cubic feet per minute per square foot [0.008 m³/(s x m²) of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 00.2 inch w.g. (50 Pa), shall be permitted in climate zones 5 & 6.

The results of the test shall be signed by the party conducting the test and provided to the code official. Testing

shall be performed at any time after creation of all penetrations of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures.
2. Dampers including exhaust, intake, makeup air, back-draft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures.
3. Interior doors, where installed at the time of the test, shall be open.
4. Exterior or interior terminations for continuous ventilation systems shall be sealed.
5. Heating and cooling systems, where installed at the time of the test, shall be turned off.
6. Supply and return registers, where installed at the time of the test, shall be fully open.

Mechanical ventilation shall be provided in accordance with Section M1505 of the Michigan Residential Code or with other approved means of ventilation.

Exceptions:

1. Additions and alterations are exempt from the requirements of N1112.5.1.2. Additions and alterations shall meet the requirements of Table N1112.4.1.1.

2. Exception: For heated, attached private garages and heated, detached private garages accessory to one- and two-family dwellings and townhouses not more than three stories above grade plane in height, building envelope tightness and insulation installation shall be considered acceptable where the items in Table N1114.4.1.1, applicable to the method of construction, are field verified. Where required by the code official, an approved third party independent from the installer shall inspect both air barrier and insulation installation criteria. Heated, attached private garage space and heated, detached private garage space shall be thermally isolated from all other habitable, conditioned spaces in accordance with Sections N1112.3.13 and R402.3.5, as applicable.

N1112.5.1.3 Leakage rate The building or dwelling unit shall have an air leakage rate not more than 3 air changes per hour in Climate Zones 5 and 6, when tested in accordance with Section N1112.5.1.2.

N1112.5.2 Fireplaces. New wood-burning fireplaces shall have tight-fitting flue dampers or doors, and outdoor combustion air. Where using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace.

N1112.5.3 Fenestration air leakage. Windows, skylights and sliding glass doors shall have an air infiltration rate of not greater than 0.3 cfm per square foot (1.5 L/s/m²), and for swinging doors, not greater than 0.5 cfm per square foot (2.6 L/s/m²), when tested in accordance with NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and listed and labeled by the manufacturer.

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

N1112.5.4 Recessed lighting. Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. Recessed luminaires shall be IC-rated and labeled as having an air leakage rate of not greater than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E283 at a pressure differential of 1.57 psf (75 Pa). Recessed luminaires shall be sealed with a gasket or caulked between the housing and the interior wall or ceiling covering.

N1112.5.5 Electrical and communication outlet boxes (air-sealed boxes).

Where air-sealed boxes are required by Table N1112.4.1.1, electrical and communication outlet boxes shall comply with all of the following:

1. be tested in accordance with NEMA OS 4, Requirements for Air-Sealed Boxes for Electrical and Communication Applications, and shall
2. have an air leakage rate of not greater than 2.0 cubic feet per minute (0.944 L/s) at a pressure differential of 1.57 psf (75 Pa).
3. be marked "NEMA OS 4" or "OS 4" in accordance with NEMA OS 4 and,

4. be installed per the manufacturer's instructions and with any supplied components required to achieve compliance with NEMA OS 4.

N1112.6 Maximum fenestration U-factor. (MANDATORY) The area-weighted average maximum fenestration U-factor permitted using tradeoffs from Section N1112.1.5 or N1112 shall be 0.48 in Climate Zone 5 and 0.40 in Climate Zone 6.

SECTION N1113 SYSTEMS

N1113.1 Controls. (MANDATORY) Not less than one thermostat shall be provided for each separate heating and cooling system.

N1113.1.1 Programmable thermostat. The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature setpoints at different times of the day. This thermostat shall include the capability to setback or temporarily operate the system to maintain zone temperatures of not less than 55°F (13°C) to not greater than 85°F (29°C). The thermostat shall be programmed initially by the manufacturer with a heating temperature setpoint of not greater than 70°F (21°C) and a cooling temperature setpoint of not less than 78°F (26°C).

N1113.1.2 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.

N1113.2 Ducts. Ducts and air handlers shall be installed in accordance with Sections N1113.3.1 through N1113.3.7.

N1113.3.1 Insulation. Supply and return ducts in attics shall be insulated to an R-value of not less than R-8 for ducts 3 inches (76 mm) in diameter and larger and not less than R-6 for ducts smaller than 3 inches (76 mm) in diameter. Supply and return ducts in other portions of the building shall be insulated to not less than R-6 for ducts 3 inches (76 mm) in diameter and not less than R-4.2 for ducts smaller than 3 inches (76 mm) in diameter.

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

N1113.3 Ducts located in conditioned space.

For ductwork to be considered inside a conditioned space, it shall comply with one of the following:

1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.

2. Ductwork in ventilated attic spaces shall be buried within ceiling insulation in accordance with Section N1113.4 and all of the following conditions shall exist:

2.1. The air handler is located completely within the continuous air barrier and within the building thermal envelope.

2.2. The ceiling insulation R-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation R-value, less the R-value of the insulation on the duct.

3. Ductwork in floor cavities located over unconditioned space shall comply with all of the following:

3.1. A continuous air barrier installed between unconditioned space and the duct.

3.2. A minimum R-19 insulation installed in the cavity width separating the duct from unconditioned space.

4. Ductwork located within exterior walls of the building thermal envelope shall comply with the following:

4.1. A continuous air barrier installed between unconditioned space and the duct.

4.2. Minimum R-10 insulation installed in the cavity width separating the duct from the outside sheathing.

4.3. The remainder of the cavity insulation shall be fully insulated to the drywall side.

N1113.4 Ducts buried within ceiling insulation.

Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. The supply and return ducts shall have an insulation R-value not less than R-8.

2. At all points along each duct, the sum of the ceiling insulation R-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than R-19, excluding the R-value of the duct insulation.

Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

N1113.5 Effective R-value of deeply buried ducts.

Where using the Total Building Performance Compliance Option in accordance with N1116, sections of ducts that are installed in accordance with N1113.4 located directly on or within 5.5 inches (140 mm) of the ceiling, surrounded with blown-in attic insulation having an R-value of R-30 or greater and located such that the top of the duct is not less than 3.5 inches (89 mm).

N1113.6 Sealing (MANDATORY) Ducts, air handlers and filter boxes shall be sealed. Joints and seams shall comply with the Michigan Residential Code.

N1113.7 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of not greater than 2 percent of the design airflow rate when tested in accordance with ASHRAE 193.

N1113.3.2.2 Building cavities. (Mandatory) Building framing cavities shall not be used as ducts or plenums.

N1113.4 Mechanical system piping insulation. (MANDATORY) Mechanical system piping capable of carrying fluids greater than 105°F (41°C) or less than 55°F (13°C) shall be insulated to an R-value of not less than R-3.

N1113.4.1 Protection of piping insulation. Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance and wind. The protection shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall be prohibited.

N1113.5 Service hot water systems. Energy conservation measures for service hot water systems shall be in accordance with Sections N1113.5.1 through N1113.5.4.

N1113.5.1 Heated water circulation and temperature maintenance systems. (MANDATORY) Heated water circulation systems shall be in accordance with Section N1112.5.1.1. Heat trace temperature maintenance systems shall be in accordance with Section N1112.5.1.2. Automatic controls, temperature sensors and pumps shall be accessible. Manual controls shall be readily accessible.

N1113.5.1.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

N1113.5.1.2 Heat trace systems. Electric heat trace systems shall comply with IEEE 515.1 or UL 515. Controls for such systems shall automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

N1113.5.2 Demand recirculation water systems. Demand recirculation water systems shall have controls that comply with both of the following:

1. The controls shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture, or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The controls shall limit the temperature of the water entering the cold water piping to not greater than 104°F (40°C).

N1113.5.3 Hot water pipe insulation. Insulation for hot water piping with a thermal resistance, R-value, of not less than R-3 shall be applied to the following:

1. Piping $\frac{3}{4}$ inch (19.1 mm) and larger in nominal diameter.
2. Piping serving more than one dwelling unit.
3. Piping located outside the conditioned space.
4. Piping from the water heater to a distribution manifold.
5. Piping located under a floor slab.

6. Buried piping.
7. Supply and return piping in recirculation systems other than demand recirculation systems.

N1113.5.4 Drain water heat recovery units. Drain water heat recovery units shall comply with CSA B55.2. Drain water heat recovery units shall be tested in accordance with CSA B55.1. Potable water-side pressure loss of drain water heat recovery units shall be less than 3 psi (20.7 kPa) for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units shall be less than 2 psi (13.8 kPa) for individual units connected to three or more showers.

N1113.6 Mechanical ventilation. (MANDATORY) The building shall be provided with ventilation that complies with the requirements of the Michigan Residential Code or with other approved means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

N1113.6.1 Whole-house mechanical ventilation system fan efficacy. (MANDATORY) Fans used to provide whole-house mechanical ventilation shall meet the efficacy requirements of Table N1113.6.1.

TABLE N1113.6.1

WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM FAN EFFICACY^a

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

For SI: 1 cfm = 28.3 L/min.

N1113.7 Equipment sizing and efficiency rating. (MANDATORY) Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other approved heating and cooling calculation methodologies. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law, Section 10 CFR 430.2. for the geographic location where the equipment is installed.

N1113.8 Systems serving multiple dwelling units. (MANDATORY) Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the 2018 International Energy Conservation Code—Commercial Provisions.

**SECTION N1114
ELECTRICAL POWER AND LIGHTING SYSTEMS**

N1114.1 Lighting equipment. (MANDATORY) Not less than 90 percent of the permanently installed lighting fixture, excluding kitchen appliance lighting fixtures, shall contain only high-efficacy lamps.

N1114.1.1 Lighting equipment. (MANDATORY) Fuel gas lighting systems shall not have continuously burning pilot lights.

N1114.2 EV-capable. (MANDATORY) New one- and two-family dwellings with an attached or detached garage shall be provided with one EV-capable space per dwelling unit.

**SECTION N1115
SIMULATED PERFORMANCE ALTERNATIVE
(PERFORMANCE)**

N1115.1 Scope. This section establishes criteria for compliance using simulated energy performance analysis. Such analysis shall include heating, cooling, mechanical ventilation, and service water heating energy only.

N1115.1.1 Mandatory requirements. Compliance with this section requires that the mandatory provisions identified in Section N1111-N1114 be met. Supply and return ducts not completely inside the building thermal envelope shall be insulated to an R-value of not less than R-6.

N1115.2 Performance-based 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 Data System Prices and Expenditures reports.

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.

N1115.3 Documentation. Documentation of the software used for the performance design and the parameters for the building shall be in accordance with Sections N1115.4.1 through N1115.4.3.

N1115.4.1 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 upon request.

N1115.4.2 Compliance report. Compliance software tools shall generate a report that documents that the proposed design complies with Section N1115.2. A compliance report on the proposed design shall be submitted with the application for the building permit. Upon completion of the building, a compliance report based on the as-built condition of the building shall be submitted to the code official before a certificate of occupancy is issued. Batch sampling of buildings to determine energy code compliance shall be allowed.

Compliance reports shall include information in accordance with Sections N1115.4.2.1 and N1115.4.2.2. Where the proposed design of a building could be built on different sites where the cardinal orientation of the building on each site is different, compliance of the proposed design for the purposes of the application for the building permit shall be based on the worst-case orientation, worst-case configuration, worst-case building air leakage and worst- case duct leakage. Such worst-case parameters shall be used as inputs to the compliance software for energy analysis.

N1115.4.2.1 Compliance report for permit application. A compliance report submitted with the application for building permit shall include the following:

1. Building street address, or other building site identification.
2. A statement indicating that the proposed design complies with Section N1115.3.
3. An inspection checklist documenting the building component characteristics of the proposed design as indicated in Table N1115.5.2(1). The inspection checklist shall show results for both the standard reference design and the proposed design with user inputs to the compliance software to generate the results.
4. A site-specific energy analysis report that is in compliance with Section N1115.3.
5. The name of the individual performing the analysis and generating the report.
6. The name and version of the compliance software tool.

N1115.4.2.2 Compliance report for certificate of occupancy. A compliance report submitted for obtaining the certificate of occupancy shall include the following:

1. Building street address, or other building site identification.
2. A statement indicating that the as-built building complies with Section N1115.3.
3. A certificate indicating that the building passes the performance matrix for code compliance and indicating the energy saving features of the buildings.
4. A site-specific energy analysis report that is in compliance with Section N1115.3.
5. The name of the individual performing the analysis and generating the report.
6. The name and version of the compliance software tool.

N1115.4.3 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 N1115.5.2(1).
3. Documentation of the actual values used in the software calculations for the proposed design.

N1115.5 Calculation procedure. Calculations of the performance design shall be in accordance with Sections N1115.5.1 and N1115.5.2.

N1115.5.1 General. Except as specified by this section, the standard reference design and proposed design shall be configured and analyzed using identical methods and techniques.

N1115.5.2 Residence specifications. The standard reference design and proposed design shall be configured and analyzed as specified by Table N1115.5.2(1). Table N1115.2(1) shall include, by reference, all notes contained in Table N1112.1.2.

TABLE N1115.5.2(1)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
	Type: mass, where the proposed wall is a mass wall; otherwise, wood frame.	As proposed
Above-grade walls	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table N1112.1.4.	As proposed
	Solar absorptance = 0.75.	As proposed
	Emittance = 0.90.	As proposed
Basement and crawl space walls	Type: same as proposed.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table N1112.1.4, with the insulation layer on the interior side of the walls.	As proposed
Above-grade floors	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table N1112.1.4.	As proposed
Ceilings	Type: wood frame.	As proposed
	Gross area: same as proposed.	As proposed
	U-factor: as specified in Table N1112.1.4.	As proposed
Roofs	Type: composition shingle on wood sheathing.	As proposed
	Gross area: same as proposed.	As proposed
	Solar absorptance = 0.75.	As proposed
	Emittance = 0.90.	As proposed
Attics	Type: vented with an aperture of 1 ft ² per 300 ft ² of ceiling area.	As proposed
Foundations	Type: same as proposed.	As proposed
	Foundation wall area above and below grade and soil characteristics: same as proposed.	As proposed
Opaque doors	Area: 40 ft ² .	As proposed
	Orientation: North.	As proposed
	U-factor: same as fenestration as specified Table N1112.1.4.	As proposed
Vertical fenestration other than opaque doors	Total area ^h = a. The proposed glazing area, where the proposed glazing area is less than 15 percent of the conditioned floor area b. 15 percent of the conditioned floor area, where the proposed glazing area is 15 percent or more of the conditioned floor area.	As proposed
	Orientation: equally distributed to four cardinal compass orientations (N, E, S & W).	As proposed
	U-factor: as specified in Table N1112.1.4.	As proposed
	External shading: none.	As proposed
Skylights	None.	As proposed
Thermally isolated sunrooms	None.	As proposed

Air exchange rate	<p>The air leakage rate at a pressure of 0.2 inch w.g. (50 Pa) shall be</p> <p>Climate Zones 5 through 6: 3 air changes per hour.</p> <p>The mechanical ventilation rate shall be in addition to the air leakage rate and shall be the same as in the proposed design, but not greater than</p> $0.01 \times \text{CFA} + 7.5 \times (\text{N}_{\text{br}} + 1)$ <p>where: CFA = conditioned floor area, ft². N_{br} = number of bedrooms.</p> <p>Energy recovery shall not be assumed for mechanical ventilation.</p>	<p>The measured air exchange rate.^a</p> <p>The mechanical ventilation rate^b shall be in addition to the air leakage rate and shall be as proposed.</p>
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(continued)

TABLE N1115.5.2(1)—continued
 SPECIFICATIONS FOR THE STANDARD REFERENCE
 AND PROPOSED DESIGNS
 (continued)

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Mechanical ventilation	Where mechanical ventilation is not specified in the proposed design: None where mechanical ventilation is specified in the proposed design, the annual vent fan energy use, in units of kWh/yr, shall equal: $(1/e_f) \times [0.0876 \times \text{CFA} + 65.7 \times (N_{br} + 1)]$ where: e _f = the minimum exhaust fan efficacy, as specified in Table N1113.6.1, corresponding to a flow rate of $0.01 \times \text{CFA} + 7.5 \times (N_{br} + 1)$ CFA = conditioned floor area, ft ² . N _{br} = number of bedrooms.	As proposed
Internal gains	IGain, in units of Btu/day per dwelling unit, shall equal: 17,900 $+ 23.8 \times \text{CFA} + 4,104 \times N_{br}$ where: CFA = conditioned floor area, ft ² . N _{br} = number of bedrooms.	Same as standard reference design.
Internal mass	Internal mass for furniture and contents: 8 pounds per square foot of floor area.	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element but not integral to the building envelope or structure.
Structural mass	For masonry floor slabs: 80 percent of floor area covered by R-2 carpet and pad, and 20 percent of floor directly exposed to room air.	As proposed
	For masonry basement walls: as proposed, but with insulation as specified in Table N1112.1.4, located on the interior side of the walls.	As proposed
	For other walls, ceilings, floors, and interior walls: wood frame construction.	As proposed
Heating systems ^{d, e}	Fuel type: same as proposed design Efficiencies: Electric: air-source heat pump with prevailing federal minimum standards	As proposed

	Nonelectric furnaces: natural gas furnace with prevailing federal minimum standards Nonelectric boilers: natural gas boiler with prevailing federal minimum standards Capacity: sized in accordance with Section N1113.7	As proposed As proposed As proposed
Cooling systems ^{d, f}	Fuel type: Electric Efficiency: in accordance with prevailing federal minimum standards Capacity: sized in accordance with Section N1113.7	As proposed As proposed As proposed
Service water heating ^{d, e, f, g}	Fuel type: same as proposed design Efficiency: in accordance with prevailing federal minimum standards Use: gal/day = 30 + 10 × Nbr Tank temperature: 120°F	As proposed Same as standard reference Same as standard reference
Thermal distribution systems	Duct insulation: in accordance with Section N1113.3.1. A thermal distribution system efficiency (DSE) of 0.88 shall be applied to both the heating and cooling system efficiencies for all systems other than duct systems. Exception: For nonducted heating and cooling systems that do not have a fan, the standard reference design thermal distribution system efficiency (DSE) shall be 1. For tested duct systems, the leakage rate shall be 4 cfm (113.3 L/min) per 100 ft ² (9.29 m ²) of conditioned floor area at a pressure of differential of 0.1 inch w.g. (25 Pa).	Duct insulation: as proposed. As tested or, where not tested, as specified in Table N1115.5.2(2)
Thermostat	Type: Manual, cooling temperature setpoint = 75°F; heating temperature setpoint = 72°F.	Same as standard reference design.

(continued)

SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

For SI: 1 square foot = 0.93 m², 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m², 1 gallon (US) = 3.785 L,

°C = (°F - 32)/1.8, 1 degree = 0.79 rad.

- a. Where required by the code official, testing shall be conducted by an approved party. Hourly calculations as specified in the ASHRAE Handbook Where required by the code official, testing shall be conducted by an approved party. Hourly calculations as specified in the ASHRAE Handbook of Fundamentals, or the equivalent, shall be used to determine the energy loads resulting from infiltration.
- b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE Handbook of Fundamentals, page 26.24 and the "Whole-house Ventilation" provisions of 2001 ASHRAE Handbook of Fundamentals, page 26.19 for intermittent mechanical ventilation.
- c. Thermal storage element shall mean a component that is not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or phase-change containers. A thermal storage element shall be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south or shall be connected to such a room with pipes or ducts that allow the element to be actively charged.
- d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.
- e. For a proposed design without a proposed heating system, a heating system having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.
- f. For a proposed design home without a proposed cooling system, an electric air conditioner having the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.
- g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater having the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For a proposed design without a proposed water

heater, a 40-gallon storage-type water heater having the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.

h. For residences with conditioned basements, R-2 and R-4 residences, and for townhouses, the following formula shall be used to determine glazing area:

$$AF = A_S \times FA \times F$$

where:

AF = Total glazing area.

A_S = Standard reference design total glazing area.

$FA = (\text{Above-grade thermal boundary gross wall area}) / (\text{above-grade boundary wall area} + 0.5 \times \text{below-grade boundary wall area})$.

$F = (\text{above-grade thermal boundary wall area}) / (\text{above-grade thermal boundary wall area} + \text{common wall area})$ or 0.56, whichever is greater. and where:

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions. Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit. L and CFA are in the same units.

TABLE N1115.5.2(2)
DEFAULT DISTRIBUTION SYSTEM EFFICIENCIES FOR PROPOSED
DESIGNS^a

DISTRIBUTION SYSTEM CONFIGURATION AND CONDITION	FORCED AIR SYSTEMS	HYDRONIC SYSTEMS ^b
Distribution system components located in unconditioned space	—	0.95
Untested distribution systems entirely located in conditioned space ^c	0.88	1
“Ductless” systems ^d	1	—

For SI: 1 cubic foot per minute = 0.47 L/s, 1 square foot = 0.093 m², 1 pound per square inch = 6895 Pa, 1 inch water gauge = 1250 Pa.

- h. Default values in this table are for untested distribution systems, which must still meet minimum requirements for duct system insulation.
- i. Hydronic systems shall mean those systems that distribute heating and cooling energy directly to individual spaces using liquids pumped through closed-loop piping and that do not depend on ducted, forced airflow to maintain space temperatures.
- j. Entire system in conditioned space shall mean that no component of the distribution system, including the air-handler unit, is located outside of the conditioned space.
- k. Ductless systems shall be allowed to have forced airflow across a coil but shall not have any ducted airflow external to the manufacturer’s air-handler enclosure.

N1115.6 Calculation software tools. Calculation software, where used, shall be in accordance with Sections N1113.6.1 through N1113.6.3.

N1115.6.1 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 whole-building (as a single zone) sizing for the heating and cooling equipment in the standard reference design residence in accordance with Section N1113.6.
3. Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating and air-conditioning equipment based on climate and equipment sizing.

4. Printed code official inspection checklist listing each of the proposed design component characteristics from Table N1115.5.2(1) determined by the analysis to provide compliance, along with their respective performance ratings such as R-value, U-factor, HSPF, AFUE, SEER and EF.

N1115.6.2 Specific approval. Performance analysis tools meeting the applicable provisions of Section N1115 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 such tools for a specified application or limited scope.

N1115.6.3 Input values. When calculations require input values not specified by Sections N1102, N1103, N1104 and N1105, those input values shall be taken from an approved source.

SECTION N1116 ENERGY RATING INDEX COMPLIANCE ALTERNATIVE

N1116.1 Scope. This section establishes criteria for compliance using an Energy Rating Index (ERI) analysis.

N1116.2 Mandatory requirements. Compliance with this section requires that the provisions identified in Sections N1111 through N1114 indicated as “Mandatory” be met.

Exception: Supply and return ducts not completely inside the building thermal envelope shall be insulated to an R-value of not less than R-6.

N1116.3 ERI Compliance. Compliance based of the ERI requires that the rated design does not exceed the Maximum ERI of Table N1116.3

N1116.4 Building Thermal Envelope. The proposed total building thermal envelope UA, which is sum of U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table N1112.1.4 multiplied by 1.15 in accordance with Equation 4-1.

$UAP_{\text{Proposed design}} = 1.15 \times UAP_{\text{Prescriptive reference design}}$ (Equation 4-1)

N1116.3.1.2 On-site renewables are not included. Where on-site renewable energy is not included for compliance using the ERI analysis of Section N1116.3, the proposed total building thermal envelope UA, which is sum of U-factor times assembly area, shall be less than or equal to the building thermal envelope UA using the prescriptive U-factors from Table N1112.1.4 multiplied by 1.15 in accordance with Equation 4-1.

N1116.3.1.3 On-site renewables are included.

Where on-site renewable energy is included for compliance using the ERI analysis of N116.3, the building thermal envelope shall be greater than or equal to the levels of efficiency in Table R402.1.2 or Table R402.1.4 of the 2018 International Energy Conservation Code.

N1116.4 Energy Rating Index. The Energy Rating Index (ERI) shall be determined in accordance with RESNET/ICC 301 except for buildings covered by the Michigan Residential Code, the ERI Reference Design Ventilation rate shall be in accordance with Equation 4-2

$\text{Ventilation rate, CFM} = (0.01 \text{ total square foot area of house}) + [7.5 (\text{number of bedrooms} + 1)]$ (Equation 4-2)

Energy used to recharge or refuel a vehicle used for transportation shall not be included in the ERI reference design or the rated design. For compliance purposes, any reduction in energy use of the rated design associated with on-site renewable energy shall not exceed 15 percent of the total energy use.

N1116.5 ERI-based compliance. Compliance based on an ERI analysis requires that the rated design be shown to have an ERI less than or equal to the appropriate value indicated in Table N1114.3 when compared to the ERI reference design.

TABLE N1116.3 MAXIMUM ENERGY RATING INDEX

CLIMATE ZONE	ENERGY RATING INDEX ^a
5	55
6	54

N1116.6 Verification by approved third party. Verification of compliance with Section N1116 shall be completed by an approved third party.

N1116.7 Documentation. Documentation of the software used to determine the ERI and the parameters for the residential building shall be in accordance with Sections N1116.6.1 through N1116.6.3.

N1116.7.1 Compliance software tools. Software tools used for determining ERI shall be Approved Software Rating Tools in accordance with RESNET/ICC 301.

N1116.7.2 Compliance report. Compliance software tools shall generate a report that documents that the ERI of the rated design complies with Sections N1116.3 and N1116.4. The compliance documentation shall include the following information:

1. Address or other identification of the residential building.
2. An inspection checklist documenting the building component characteristics of the rated design. The Inspection checklist shall show results for both the ERI reference design and the rated design and shall document all inputs entered by the user necessary to reproduce the results.
3. Name of individual completing the compliance report.
4. Name and version of the compliance software tool.

Exception: Where 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 (north, east, south, and west) cardinal orientations.

N1116.7.3 Additional documentation. The code official shall be permitted to require the following documents:

1. Documentation of the building component characteristics of the ERI reference design.
2. A certification signed by the builder providing the building component characteristics of the rated design.
3. Documentation of the actual values used in the software calculations for the rated design.

N1116.7.4 Specific approval. Performance analysis tools meeting the applicable sections of Section R41118 shall be approved. Documentation demonstrating the approval of performance analysis tools in accordance with Section N1116.6.1 shall be provided.

N1116.7.5 Input values. Where calculations require input values not specified by Sections N1111, N1112, N1113 and N1114, those input values shall be taken from RESNET/ICC 301.

**SECTION N1117
EXISTING BUILDINGS
GENERAL**

N1117.1 Scope. The provisions of this chapter shall control the alteration, repair, addition and change of occupancy of existing buildings and structures.

N1117.1.1 Additions, alterations, or repairs: General. Additions, alterations, or repairs to an existing building, building system or portion thereof shall comply with Section N1112, N1113 or N1114. Unaltered portions of the existing building or building supply system shall not be required to comply with this chapter.

N1117.2 Existing buildings. Except as specified in this chapter, this chapter shall not be used to require the removal, alteration or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this chapter.

N1117.3 Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. **Devices** and systems that are required by this chapter shall be maintained in conformance to the code edition under which installed. The owner or the owner’s authorized agent shall be responsible for the this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

N1117.4 Compliance. Alterations, repairs, additions and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for alterations, repairs, additions and changes of occupancy or relocation, respectively, in this chapter and the Michigan Residential Code

N1117.5 New and replacement materials. Except as otherwise required or permitted by this chapter, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for repairs, provided that hazards to life, health or property are not created. Hazardous materials shall not be used where the code for new construction would not allow their use in buildings of similar occupancy, purpose and location.

N1117.6 Historic buildings. Provisions of this chapter relating to the construction, repair, alteration, restoration and movement of structures, and change of occupancy shall not be mandatory for historic buildings provided that a report has been submitted to the code official and signed by the owner, a registered design professional, or a representative of the State Historic Preservation Office or the historic preservation authority having jurisdiction, demonstrating that compliance with that provision would threaten, degrade or destroy the historic form, fabric or function of the building.

**SECTION N1118
ADDITIONS**

N1118.1 General. Additions to an existing building, building system or portion thereof shall conform to the provisions of this chapter as those provisions relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this chapter. Additions shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this chapter where the addition alone complies, where the existing building and addition comply with this chapter as a single building, or where the building with the addition does not use more energy than the existing building. Additions shall be in accordance with Section N1118.1.1 or N1118.1.2.

N1118.1.1 Prescriptive compliance. Additions shall comply with Sections N1118.1.1.1 through N1118.1.1.4.

N1118.1.1.1 Building envelope. New building envelope assemblies that are part of the addition shall comply with Sections N1112.1, N1112.2, N1112.3.1 through N1112.3.5, and N1112.4.

Exception: Where unconditioned space is changed to conditioned space, the building envelope of the addition shall comply where the Total UA, as determined in Section N1112.1.5, of the existing building and the addition, and any alterations that are part of the project, is less than or equal to the Total UA generated for the existing building.

N1118.1.1.2 Heating and cooling systems. New heating, cooling and duct systems that are part of the addition shall comply with Section R403.

Exception: Where ducts from an existing heating and cooling system are extended to an addition, duct systems with less than 40 linear feet (12.19 m) in unconditioned spaces shall not be required to be tested in accordance with Section N1113.3.3.

N1118.1.1.3 Service hot water systems. New service hot water systems that are part of the addition shall comply with Section N1113.4.

SECTION N1119 ALTERATIONS

N1119.1 General. Alterations to any building or structure shall comply with the requirements of the chapter for new construction. Alterations shall be such that the existing building or structure is not less conforming to the provisions of this chapter than the existing building or structure was prior to the alteration. Alterations to an existing building, building system or portion thereof shall conform to the provisions of this chapter as they relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this. Alterations shall not create an unsafe or hazardous condition or overload existing building systems. Alterations shall be such that the existing building or structure does not use more energy than the existing building or structure prior to the alteration. Alterations to existing buildings shall comply with Sections N1119.1.1 through N1119.2.

N1119.1.1 Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section N1112.1.2 or R402.1.4, Sections N1112.2.1 through N1112.2.13, N1112.3.1, R41114.3.2, N1112.4.3 and N1112.4.5.

Exception: The following alterations shall not be required to comply with the requirements for new construction provided that the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.
3. Construction where the existing roof, wall or floor cavity is not exposed.
4. Roof recover.
5. 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. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided that the chapter does not require the glazing or fenestration assembly to be replaced.

N1119.1.1.1 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for U- factor as specified Table N1112.1.2. Where more than one replacement fenestration unit is to be installed, an area-weighted average of the U-factor, or both of all replacement fenestration units shall be an alternative that can be used to show compliance.

N1119.1.2 Heating and cooling systems. New heating, cooling and duct systems that are part of the alteration shall comply with Section N1115.

Exception: Where ducts from an existing heating and cooling system are extended, duct systems with less than 40 linear feet (12.19 m) in unconditioned spaces shall not be required to be tested in accordance with Section N1113.3.3.

N1119.1.3 Service hot water systems. New service hot water systems that are part of the alteration shall comply with Section N1113.5.

N1119.1.4 Lighting. New lighting systems that are part of the alteration shall comply with Section N1114.1. Exception: Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

N1119.2 Change in space conditioning. Any nonconditioned or low-energy space that is altered to become conditioned space shall be required to be brought into full compliance with this chapter.

Exception: Where the simulated performance option in Section N1115 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 120 percent of the annual energy cost otherwise allowed by Section N1115.3

SECTION N1120 REPAIRS

N1120.1 General. Buildings, structures and parts thereof shall be repaired in compliance with Section N1117.3 and this section. Work on nondamaged components necessary for the required repair of damaged components shall be considered to be part of the repair and shall not be subject to the requirements for alterations in this chapter. Routine maintenance required by Section N1117.3, repairs exempt from permit, and abatement of wear due to normal service conditions shall not be subject to the requirements for repairs in this section.

N1120.2 Application. For the purposes of this chapter, the following shall be considered to be repairs:

1. Glass-only replacements in an existing sash and frame.
2. Roof repairs.
3. Repairs where only the bulb, ballast or both within the existing luminaires in a space are replaced provided that the replacement does not increase the installed interior lighting power.

SECTION N1121 CHANGE OF OCCUPANCY OR USE

N1121.1 General. Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this chapter. Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with this chapter.

Exception: Where the simulated performance option in Section N1115 is used to comply with this section, the annual energy cost of the proposed design is permitted to be 120 percent of the annual energy cost allowed by Section N1115.3.