

MINNESOTA ENERGY CODE COMPLIANCE COLLABORATIVE
2015 Minnesota Residential Energy Code (MR 1322) SIGNIFICANT CHANGES
INCLUDING CODE COMMENTARY (July 15, 2015 Update)

Note: *The following information contains simplified explanations of significant changes to the 2012 International Energy Conservation Code (Residential Provisions) adopted with Minnesota Amendments on February 14, 2015, along with commentary explaining the intent of selected sections for clear understanding of the code. The commentary is advisory only.*

R103 Construction Documents. Include the following:

- A. Insulation materials and R values
- B. Fenestration U factors and SHGCs
- C. Area-weighted U factor and SHGC calculations
- D. Mechanical system design criteria
- E. Mechanical and service water heating system and equipment types, sizes and efficiencies.
- F. Equipment and system control
- G. Fan motor horsepower and controls
- H. Duct sealing, and the location and insulation of ducts and pipes
- I. Lighting fixture schedule with wattage and control narrative
- J. Air sealing details

R202 Building thermal envelope (definition). The basement walls, exterior walls, floor, roof and any other building elements that enclose conditioned space or provides a boundary between conditioned space and exempt or unconditioned space.

R202 COMMENTARY: *The boundary is typically considered to be the interior air barrier, such as gypsum board used for a wall or ceiling.*

R202 High-efficacy lamps (definition). Lamps with a minimum efficacy of:

1. 60 lumens per watt for lamps over 40 watts;
2. 50 lumens per watt for lamps over 15 watts to 40 watts;
3. 40 lumens per watt for lamps 15 watts or less.

R302.1 Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F for heating and minimum of 75°F for cooling.

R303.1 Building thermal envelope insulation. The insulation installer shall provide a certification listing the type, manufacturer and R-value of insulation installed, including sprayed polyurethane foam (SPF) insulation. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

R401.3 Certificate. Include the following on or in the electrical distribution panel:

- A. Date the certificate is installed
- B. Dwelling address
- C. Residential contractor name and contractor license number
- D. Homeowner name, if acting as the general contractor
- E. Predominant installed R-values and location
- F. Type of insulation installed in or on ceiling/roof, walls, rim/band joist, foundation, slab, basement wall, crawl space wall or floor, and ducts outside conditioned spaces
- G. U-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration
- H. Results of any required duct system and building envelope air leakage testing
- I. Types, input ratings, manufacturers, model numbers and efficiencies of heating, cooling and service water heating equipment
- J. Structure's calculated heat loss, cooling load and heat gain
- K. Mechanical ventilation type, location and capacity
- L. Buildings designated continuous and total ventilation rates
- M. Type, size and location of any make-up air system
- N. Location or future location of radon fan

Table R402.1.1 Insulation and Fenestration Requirements by Component. Insulation and fenestration requirements for Climate Zone 6 (southern zone):	
Window maximum U factor: 0.32	Wood frame wall insulation: R-20
Attic ceiling: R-49	Wood frame wall option: R-13 with R-5 continuous
Attic vaulted ceiling: R-38 (if R-49 not possible)	Basement wall insulation: R-15
Floor insulation: R-30	Crawl space insulation: R-15
Slab insulation (on foundation wall): R-10	Rim joist insulation: R-20
Table R402.1.1 Insulation and Fenestration Requirements by Component. Insulation and fenestration requirements for Climate Zone 7 (northern zone):	
Window maximum U factor: 0.32	Wood frame wall insulation: R-21
Attic ceiling minimum R value: R-49	Mass wall: R-19/21 (See Table R402.1.1 for info)
Attic vaulted ceiling: R-38 (if R-49 not possible)	Basement wall insulation: R-15
Floor insulation: R-38	Crawl space insulation: R-15
Slab insulation (on foundation wall): R-10	Rim joist insulation: R-21
R402.1.1 Insulation, waterproofing and fenestration. Concrete and block foundation walls shall be waterproofed according to the following when required by Section R406.2 of the MN Residential Code, MR 1309:	
<ol style="list-style-type: none"> 1. Waterproofing shall extend from the top interior wall edge, across the top of the wall, and down the exterior wall face to the top of the footing. 2. If walls are exposed to the exterior environment, the waterproofing system shall have a rigid, opaque, and weather-resistant protective covering that shall extend a minimum of 6 inches below grade. 	
R402.1.1 COMMENTARY: <i>Waterproofing shall be installed when required by Section R406.2 of the MN Residential Code and dampproofing is no longer allowed.</i>	
R402.1.1.1 through R402.1.1.8. Specific requirements for basement wall insulation similar to the previous residential energy code.	
R402.2.8 Basement walls. An alternative to the minimum basement wall insulation of R-15 allows a minimum exterior insulation of R-10 if the tested air leakage rate required in R402.4.1.2 does not exceed 2.6 air changes per hour and the total square feet between the finished grade and the top of each foundation wall does not exceed 1.5 multiplied by the total lineal feet of each foundation wall that encloses conditioned space.	
R402.4.1.1 Installation. The components of the building thermal envelope shall be installed according to Table R402.4.1.1 Air Barrier and Insulation Installation.	
R402.4.1.1 COMMENTARY: <i>The sealing methods between dissimilar materials shall allow for differential expansion and contraction. The building thermal envelope shall also include a Class I or II vapor retarder on the interior side of a frame wall cavity per Section R702.7 of the MN Residential Code. Sheet polyethylene is Class I and kraft-faced fiberglass batt is Class II. Class of other materials shall be based on the manufacturer's certified testing or a tested assembly.</i>	

R402.4.1.2 Building thermal envelope testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 3 air changes per hour. Testing shall be conducted with a blower door at a pressure of 50 Pascals (0.2 inches w.g.) Where required by the code official, testing shall be conducted by an approved third party. A written report of 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.
2. Dampers shall be closed.
3. Interior doors shall be open.
4. Exterior doors for HRVs and ERVs shall be closed.
5. Heating and cooling systems shall be turned off.
6. Supply and return registers shall be fully open.

R402.4.1.2 COMMENTARY: *Blower door testing should follow the RESNET Standard for Performance Testing, found in Chapter 8, Section 802 of the RESNET Mortgage Industry National Home Energy Rating System Standards. Recommended training and certification for the party conducting the testing to include one of the following:*

- *RESNET Home Energy Raters (HERS) Certificate*
- *Building Performance Institute (BPI) Building Analyst, Energy Auditor, Infiltration and Duct Leakage Certificate, Quality Control Inspector*
- *Interstate Renewable Energy Council (IREC) Energy Auditor*
- *Southface Institute Duct and Envelope Tester (DET) Certificate*
- *Dunwoody Residential Energy Auditor*

R403.1.1 Programmable thermostat. Where the primary heating system is a forced-air furnace, a programmable thermostat is required.

R403.2.2 Duct sealing. Ducts, air handlers, and filter boxes shall be sealed. Joints and seams shall comply with Section 603.9 of the IMC. **Exception:** Air-impermeable spray foam products shall be permitted to be applied without additional joint seals.

R403.2.2 COMMENTARY: *Although this exception infers that duct joints, seams and connections are not required to be sealed, as a practical issue they shall be sealed per IMC 603.9 to ensure that dissimilar materials allow for differential expansion and contraction. In addition, a thermal barrier per Section R316.4 of the MN Residential Code and Section 2603.4 of the MN Building Code is required so that an ignition barrier is provided between the foam plastic and the interior of the building. Duct tightness testing should follow the RESNET Standard for Performance Testing, found in Chapter 8, Section 802 of the RESNET Mortgage Industry National Home Energy Rating System Standards. Recommended training and certification for the party conducting the testing to include one of the following:*

- *RESNET Home Energy Raters (HERS) Certificate*
- *Building Performance Institute (BPI) Energy Auditor, Infiltration and Duct Leakage Certificate, Quality Control Inspector*
- *Interstate Renewable Energy Council (IREC) Energy Auditor*
- *Southface Institute Duct and Envelope Tester (DET) Certificate*

IMC 603.9 Duct sealing. All joints, longitudinal and transverse seams and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, liquid sealants or tapes. Closure systems used to seal ductwork listed and labeled in accordance with UL 181A shall be marked “181A-P” for pressure-sensitive tape, “181A-M” for mastic, or “UL181A-H” for heat-sensitive tape. Closure systems used to seal flexible air ducts and flexible air connectors shall comply with UL 181B and shall be marked “181B-FX” for pressure-sensitive tape or “181B-M” for mastic. Closure systems used to seal metal ductwork shall be installed in accordance with the manufacturer’s installation instructions. Pressure-sensitive tape shall not be used as the primary sealant on ducts, unless it has been certified to comply with UL 181A or UL 181B by a nationally recognized testing laboratory. Unlisted duct tape is not permitted as a sealant on any duct.

IMC 603.9 COMMENTARY: *Although a listed duct tape may comply with the sealing requirements of this section, in order to comply with the tightness tests specified in Section R403.2.2, typically duct mastic listed to UL181A-M or UL181B-M will be required on all joints, seams and connections, and it shall be installed liberally with a minimum thickness of approximately 1/16 inch. For metal ducts that are not required to comply with the tightness test, pressure-sensitive tape listed to UL181A-P or UL181B-FX for cold weather applications will typically be allowed if it is installed according to commonly-accepted industry practices.*

R403.2.2 (#1) Duct tightness postconstruction test. Total leakage shall be less than or equal to 4 cfm per 100 square feet of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. across the entire system, including the air handler enclosure. All register boots shall be taped or sealed.

R403.2.2 (#2) Duct tightness rough-in test. Total leakage shall be less than or equal to 4 cfm per 100 square feet of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. across the entire system, including the air handler enclosure. All register boots shall be taped or sealed. If the air handler is not installed at the time of test, total leakage shall be less than or equal to 3 cfm per 100 square feet of conditioned floor area.

R403.2.2 Exception to duct tightness tests. The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope.

R403.2.2 COMMENTARY ON DUCTS LOCATED ABOVE A GARAGE FOR A CONDITIONED BONUS ROOM/BEDROOM: *Typically a supply duct serving a conditioned room above an attached garage would be considered to be located entirely within the building thermal envelope if it complies with the following:*

- 1. Duct joints, seams and connections shall be sealed per IMC 603.9.*
- 2. Duct shall be insulated with minimum R-8 duct insulation and have a vapor retarder (per IMC 604.11) installed without respect to other building envelope insulation.*
- 3. Duct shall be completely located above the floor insulation of minimum R-30.*
- 4. HVAC register boots shall be sealed to the subfloor or drywall.*
- 5a. If the space above the garage ceiling freely communicates with the ceiling cavity of the house, an air and vapor impermeable R-30 building thermal envelope insulation shall be used.*
- 5b. If the space above the garage ceiling is sealed at the junction of the house wall and garage wall with a durable continuous air barrier, creating a sealed six-sided building cavity, then either an air and vapor impermeable, or an air and vapor permeable, R-30 building thermal envelope insulation can be used. However, if an air and vapor permeable R-30 building thermal envelope insulation is used (such as fiberglass or cellulose), the R-8 duct insulation shall be installed in contact with bottom of the floor sheathing and shall be encapsulated with a minimum 1 ½ inch thickness of air and vapor impermeable closed cell spray foam. In addition, all duct joints, seams and connections shall be sealed with duct mastic listed to UL 181A-M or UL181B-M installed liberally with a minimum thickness of approximately 1/16 inch.*

R403.2.2 COMMENTARY ON METAL DUCTS LOCATED IN AN EXTERIOR WALL: *Typically a metal supply duct serving an upper floor located in an exterior wall would be considered to be located entirely within the building thermal envelope if it complies with all of the following:*

- 1. Duct joints, seams and connections shall be sealed with duct mastic listed to UL 181A-M or UL181B-M installed liberally with a minimum thickness of approximately 1/16 inch.*
- 2. Duct shall be installed on the interior side of the frame wall.*
- 3. Air and vapor impermeable insulation shall be installed on the exterior side of the duct with a minimum value of R-13 per Table R402.1.1.*
- 4. Continuous insulation or insulated siding shall be installed on the exterior of the frame wall with a minimum value of R-5 per Table R402.1.1.*

R403.2.2.1 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage rate of not more than 2 percent of the design air flow rate.

R403.2.3 Building cavities. Building framing cavities shall not be used as ducts or plenums.

R403.3 Mechanical system piping insulation. Hydronic and refrigeration system piping fluid above 105°F or below 55°F shall be insulated to a minimum of R-3.

R403.4.2 Hot water pipe insulation. Hot water pipe shall be insulated to a minimum of R-3 in most applications.

R403.5 Mechanical ventilation. The building shall be provided with a balanced mechanical ventilation system that is +/-10% of the system's design capacity and complies with the continuous ventilation requirements (under low capacity) and total ventilation requirements (under high capacity) for dwelling unit ventilation. In addition, the ventilation system shall have the airflow capacity tested so that the air intake is within 10% of the exhaust output and meets the requirements of R403.5.5.

Exception: The balanced system and HRV/ERV system may include exhaust fans to meet the intermittent ventilation rate. Surface mounted fans shall have a maximum 1.0 sone per HVI Standard 915.

R403.5 COMMENTARY: *Exhaust-only ventilation systems are no longer allowed for continuous or total ventilation, however intermittent exhaust-only systems may be used to provide supplemental ventilation with a balanced HRV/ERV system, according to the exception in Section R403.5.5. Typically a smaller HRV/ERV is installed to meet the continuous ventilation rate and an intermittent exhaust fan (with maximum 1.0 sone) is installed to provide supplemental ventilation, resulting in a total ventilation rate complying with Section R403.5.2. All of the installation requirements specified in Sections R403.5.6 through R403.5.17 shall be met when using this strategy. In addition, the pressure equalization requirements (protection against excessive depressurization) of Section 501.4 of the MN Mechanical Code shall be included in the design of the balanced ventilation system.*

R403.5.6.1.3 Airflow verification. All mechanical ventilation system airflows greater than 30 cfm at the building intake and exhaust shall be tested and verified.

R403.5.17 Climatic conditions. HVAC equipment shall be sized according to ACCA Manual S or an equivalent method based on ACCA Manual J. Oversizing of heating equipment shall not exceed 40% and oversizing of cooling equipment shall not exceed 15%.

R404.1 Lighting equipment. A minimum of 75% of the lamps or lighting fixtures shall be high-efficacy (see R202 definition).