Energy Code Compliance

Montana

Best Practices Newsletter

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It is not the strongest or the most intelligent who will survive but those who can best manage change.

Charles Darwin

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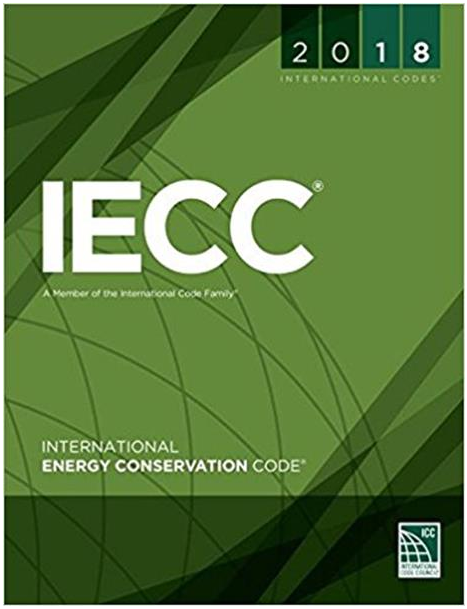
What's New in the Proposed Montana Residential Energy Code?



Background. Montana adopted the 2012 International Energy Conservation Code (IECC) with amendments on November 7, 2014. Local code jurisdictions began enforcing the code during the early months of 2015. The blower door requirement took effect in November 2015. The IECC is updated by the International Codes Council (ICC) every three years. The 2015 IECC was published before Montana finally adopted the 2012 version. Given the late adoption of the 2012 IECC the state elected to skip consideration of the 2015 IECC and instead is now considering the 2018 IECC which was published in September 2017. The state plans to hold listening sessions around the state about the 2018 IECC in the fall of this year.

Below is a review of the most significant differences between the current state energy code and the 2018 IECC. Key Montana amendments to the residential provisions of the 2012 IECC are also discussed. The Montana Building Codes Bureau has indicated that all previous amendments will carry forward. In other words, unless specific proposals are put forward to remove or modify the existing amendments they will remain in place after the 2018 IECC is adopted. The actual amendment language is available by searching the Internet for section 24.301.154 of the Administrative Rules of Montana.

Many builders are deeply concerned with the cost of implementing energy efficiency measures since the ability of potential buyers to afford a home is critical for their business. For builders whose business model emphasizes the lowest possible new house price, the cumulative costs associated with changes to all of the applicable building codes represent an even greater concern. Energy efficiency advocates, on the other hand, tend to emphasize that energy efficiency improvements included in the energy code result in a lower overall cost of owning and operating a home over its life. These two points-of-view, first-cost versus long-term cost, are usually at the heart of the debate over energy code provisions. In terms of energy savings the 2015 IECC is about 5 percent more efficient than the 2012 IECC and the 2018 IECC is about 5 percent more efficient than the 2015 IECC. Many of the changes in these two most recent code versions were made to improve the clarity of the code language. Below are the most significant changes:

2018 IECC Energy Code Changes

1. 2018 IECC Code Citation: R105 Required Inspections

The 2015 IECC was revised to list and describe required inspections such as footing and foundation, framing and rough-in, plumbing rough-in, and mechanical rough-in. The 2012 IECC provided no clear guidance or indication of which inspections are required. The 2018 IECC specifies when the inspections should be done and what should be inspected.

2. 2018 IECC Code Citation: R402.1 ICC 400 Log Home Standard

ICC 400 has been available for adoption for many years but has not been adopted by Montana. The 2018 IECC incorporates this standard as complying with the envelope requirements. All other mandatory code requirements still apply. Some log home manufacturers have taken exception to the energy code in the past. The ICC 400 standard was developed to deal with the unique features of log homes and is based on work done by the Log Homes Council, Building Systems Council, and the National Association of Home Builders.

3. 2018 IECC Code Citation: R402.1.2 Window U-factor

This change decreased the maximum allowable U-factor from 0.32 to 0.30 in the Montana climate zone. More and more windows are available with lower U-factors. Window heat loss remains a significant area of potential improvement in the building envelope as the insulating ability of a typical wall is over six times that of a code-complying window of the same area. Some builders, whose business mode is price point oriented, may take exception to the increased cost associated with this code change.

4. 2018 IECC Code Citation: R402.2.4 Vertical Access Doors

A new exception has been added—"Access hatches and doors." This exception allows vertical doors that provide access from conditioned to unconditioned spaces to meet the fenestration requirements in Table R402.1.2. This change means that these types of doors, such as attic knee wall doors, do not have to be insulated to the same level as the surrounding wall, as long as they meet the fenestration U-factor requirements specified in Table R402.1.2. This change should actually reduce the cost of a house but the resulting energy loss will be minimal.

5. 2018 IECC Code Citation: R402.4.1.1 Air Sealing and Insulation Installation Table

This table was revised in the 2015 IECC with separate columns added for the "insulation" and "air barrier" requirements. This helps to clarify these requirements. Other changes are minimal, such as clarifications regarding sealing recessed light fixtures to the ceiling and insulating behind electrical boxes.

6. 2018 IECC Code Citation: R402.4.1.2 Building Envelope Tightness Testing Standards

Under the 2015 IECC, building envelope air leakage testing must be done in accordance with either ASTM E 779 or ASTM E 1827. The 2018 IECC adds the RESNET/ICC Standard 380-2016 to the two acceptable standards that were included in the 2015 IECC. RESENT/ICC 380 is the most user friendly of the three options. The standards provide much needed clarification regarding test procedures and calculations. Adoption of these standards should improve consistency in building tightness testing. The standards require more detailed reporting compared to the 2012 IECC which referenced no standard.

7. 2018 IECC Code Citation: R402.4.4 Rooms Containing Fuel Burning Appliances

This provision was added to the 2015 IECC. Provision R402.4.4 states *where open combustion air ducts provide combustion air to open combustion fuel burning appliances, the appliance and combustion air opening shall be located outside the building thermal envelope or enclosed in a room, isolated from inside the thermal envelope.* Open combustion fuel burning appliances include atmospherically vented gas furnaces, boilers, and water heaters. The code

goes on to require that these combustion closets be insulated to levels not less than the basement wall R-value requirements in Table R402.1.2. The combustion closet must also be air sealed and the door must be fully gasketed.

Weatherization providers and building scientists have known for years that atmospherically vented appliances represent a real threat to occupant health due to back drafting. The make-up air openings required for combustion air represent a major air leak when left unobstructed and health hazard when plugged by the occupant. Basic house pressurization testing demonstrates that return duct leaks, exhaust fans, the stack effect, and wind can cause backdrafting of atmospherically vented appliances when inadequate combustion air is provided for atmospherically vented appliances. The threat of backdrafting and the unnecessary energy waste from an open combustion air duct is removed by either installing a combustion closet as required by this provision or by eliminating the atmospherically vented appliance.

The need for a combustion closet can be avoided by not installing atmospherically vented appliances. In other words the added cost of a combustion closet can be avoided by installing sealed combustion appliances (furnace, boiler, and water heater) where both combustion air intake and exhaust pipes are continuous to the outside or by installing electric appliances. This provision has significant energy and health (backdrafting) advantages for the individual home. Emerging technologies such as sealed combustion appliances and electric heat pumps will eventually make this issue irrelevant but as long as builders install atmospherically vented appliances outside of a sealed combustion closet occupant health will be a major concern. Builders may object to the added cost of installing the combustion closet.

8. 2018 IECC Code Citation: 403.3.6.1 Ductwork Insulation

Language in the 2018 IECC makes duct insulation requirements dependent on location and the diameter of the duct. The 2012 IECC requires supply ducts in the attic to be R-8 other ducts outside the conditioned space to be R-6. The 2018 code revises the requirements so that supply and return ducts in the attic must be a minimum of R-8 (where ≥ 3-inch diameter) and R-6 (where <3-inch diameter). Also, supply and return ducts everywhere else outside the thermal envelop must be a minimum of R-6 (where ≥ 3-inch diameter) and R-4.2 (where < 3-inch diameter). There is an exception which allows for ducts (or portions of ducts) located completely inside conditioned space to not be insulated. This provision clarifies how ducts buried in attic insulation should be insulated. Varying the amount of insulation based on the diameter of the duct is new to the codes since the 2012 IECC.

9. 2018 IECC Code Citation: R403.3.7 Ducts Located in Conditioned Space

Buried attic ducts can be considered in conditioned space, for purposes of the Energy Rating Index (ERI) compliance path, if the maximum duct leakage rate is less than or equal to 1.5 cfm/100 ft2 and if the total ceiling insulation against and above the duct is equal to the prescriptive value for the attic plus the required duct insulation.

10. 2018 IECC Code Citation: R403.6.1 Mechanical Ventilation Fan Efficiency

Values were added to the fan efficiency table for heat recovery ventilators (HRVs) and energy recovery ventilators (ERVs). This is a minor addition to the table.

11. 2018 IECC Code Citation: R404.1 Lighting Equipment

The minimum requirement for high-efficacy lamps was increased from 75 percent in the 2012 IECC to 90 percent in the 2018 IECC. The relatively low cost of compact fluorescent lights (CFLs) and the rapid commercialization of LED lamps makes complying with this provision relatively easy. Still, there could be some price-point builders who would rather not see the modest cost increases associated with this change.

12. 2018 IECC Code Citation: R406 Energy Rating Index (ERI)

An optional Energy Rating Index (ERI) compliance path was introduced in the 2015 IECC. The ERI compliance option provides design flexibility that can lead to significant cost savings over the prescriptive path, while also allowing home buyers to understand a home's energy efficiency. The voluntary ERI compliance path provides builders the option of

complying with the code by meeting a target Energy Rating Index. The minimum index for Montana according to 2018 IECC is 61. This is a numerical score where 100 equates to the levels prescribed in the 2006 IECC and zero is equivalent to a net-zero-energy home. Currently the only system that would qualify is the Residential Energy Services Network (RESNET) Home Energy Rating System (HERS). About one-third of all new homes in the country currently receive a HERS Rating. In Montana the percentage of new homes that receive a rating is far less. In addition to meeting the ERI target, under the ERI compliance path a home must also meet the minimum envelope requirements of the 2009 IECC (if no on-site power generation is included) and all of the applicable mandatory code provisions.

When introduced, the ERI provision was supported by more than 20 of the country's largest home builders—including Meritage Homes, Pulte Group, and KB Homes—and 90 small builders and other building industry stakeholders. This compliance path allows builders to select the most cost-effective energy efficiency measures to achieve the best performance for each home rather than installing a series of prescriptive measures. The ERI compliance option has the potential to allow builders to keep construction costs lower because of the added flexibility in how compliance is achieved.

A change in the 2018 IECC allows on-site renewable power generation to affect the ERI. The use of on-site power generation determines the prescriptive envelope backstop (minimum allowed characteristics regardless of the ERI score). If renewables are used, the 2015 IECC prescriptive envelope requirements must be met. If renewables are not used, then the 2009 IECC requirements remain the backstop. The ANSI/RESNET/ICC Standard 301 for home rating is now referenced in the energy code. Under the version of ANSI/RESNET/ICC Standard 301 referenced in the 2018 IECC, it is easier for a larger house to comply with the ERI score than a smaller home. A recent amendment to that standard (ANSI/RESNET/ICC 301-2014 Addendum E-2018 House Size Index Adjustment Factors) solves that problem. If Montana adopts the ERI compliance path this amendment should also be adopted.

According to the 2018 IECC, the code official can determine that only an "approved third party" (R406.5) may perform an ERI analysis. Since HERS Ratings are the only current rating system in the marketplace, it is assumed that only HERS Raters will be allowed to perform this analysis. RESNET has forged a partnership with the ICC regarding residential energy code compliance activities. It may be advantageous for Montana to adopt an amendment requiring that individuals who perform ERI analysis for code compliance also be certified as a Residential Energy Inspector/Plans Examiner by the ICC.

13. 2018 IECC Code Citation: Chapter R5 Existing Buildings Chapter

This chapter was added to the 2015 IECC to deal specifically with existing buildings. There have been many questions about how to apply the energy code to existing buildings. The intent of this new chapter is to provide clarity.

14. 2018 IECC Code Citation: Appendix RA Solar-Ready Provisions

This appendix was added to the 2015 IECC. It contains provisions for the future installation of solar electric or solar thermal energy systems on a house. The appendix is not considered a part of the energy code proper. Per 24.301.134 of Montana's administrative rules, the state could adopt the Solar Ready Appendix as state code or allow local jurisdictions the option to adopt it. In other words, the state would have to include a specific reference to the appendix in its adoption language in order for local jurisdictions to have the option to also adopt it.

Montana 2012 IECC Residential Energy Code Amendments

The state intends to carry forward past IECC amendments. Following are the most significant amendments made by Montana to the 2012 IECC:

A. 2018 IECC Code Citation: Table R402.1.2 Frame Wall Insulation Prescriptive Requirements

Montana amended the 2012 IECC prescriptive frame wall insulation requirement from either R-20 cavity plus R-5 continuous or R-13 cavity plus R-10 continuous to R-21 cavity or R-13 cavity plus R-5 continuous. In other words, Montana kept the 2009 IECC requirement for frame wall insulation. The 2018 IECC prescriptive frame wall insulation requirement is unchanged from the 2012 IECC. Unless the amendment is eliminated, the 2009 frame wall requirement will be in effect after the 2018 IECC is adopted.

There was a general consensus in discussions at the Montana Energy Code Collaborative that requiring continuous wall insulation may be a step too far for Montana at this time. It appears that the continuous insulation requirement for walls is here to stay in the IECC. Continuous insulation raises the interior surface temperature of exterior sheathing which minimizes condensation potential inside the wall. Due to added cost and more complicated construction details there will likely be significant resistance from builders as a whole to continuous wall insulation, at least for the time being.

Building scientists continue to advocate for continuous wall insulation to improve the durability of the wall assembly. Energy efficiency advocates continue to advocate for continuous wall insulation to save energy. Builders generally resist continuous wall insulation primarily due to cost and also due to perceived wall integrity questions. The discussion at the Collaborative meeting generally agreed that the industry would probably struggle with a continuous insulation requirement. While continuous wall insulation is considered by many to be a better way to build a wall, the technique does provide a smaller margin of error for those who do not understand how to properly design a wall assembly with continuous insulation.

B. 2018 IECC Code Citation: R402.4.1.2 Allowable Envelope Air Leakage Rate

The 2012, 2015, and 2018 versions of the IECC call for a maximum leakage rate of 3 ACH50. Montana amended the 2012 IECC to allow 4 ACH50. The general consensus of the Energy Code Collaborative was that Montana's allowable envelope leakage should remain 4 ACH50. The tight building envelopes of modern homes require effective mechanical ventilation. As the mechanical ventilation systems become more effective an argument can be made for tighter building envelopes. However there is some uncertainty regarding the most cost effective air tightness level. Washington's 2015 residential energy code allows 5 ACH50 but the state also has a milder climate than does Montana. While all new homes in Montana must have whole house mechanical ventilation, the current codes lack the requirements that would assure effective mechanical ventilation. Moving from 4 ACH50 to 3 ACH50 would require only incremental improvements in construction practices but will likely meet resistance from builders. Over the last three years the average City of

Missoula house tightness was 2.9 ACH50. Requiring 3 ACH50 would create a challenge in multi-family housing where it is difficult to isolate leakage to the outside from leakage to adjoining spaces.

C. 2018 IECC Code Citation: R403.3.3 Duct Tightness Testing

The 2012, 2015, and 2018 versions of the IECC do not include a leakage to the outside test. The only test allowed in these codes is the total duct leakage test. Montana amended the 2012 IECC to allow a leakage to the outside test but without modifying the leakage limit. There was a strong sense by some of the Montana Energy Code Collaborative participants that this amendment, which allows a duct leakage to the outside test, should be eliminated. The Montana amendment created a loophole for houses that include ducts located outside the thermal envelope. The amendment also complicated the code by allowing two types of testing. The leakage to the outside test is more complicated and therefore more prone to error. Admittedly some builders who choose to locate ducts outside conditioned space will resist eliminating this loophole.

If Montana chooses to allow a leakage to the outside test then the allowable leakage rate should be reduced compared to the allowable leakage rate for the total duct leakage test. For example the 2009 IECC included both types of tests. The leakage to the outside test was allowed 8 cfm/SF compared to 12 cfm/SF for the total duct leakage test. If a leakage to the outside test is allowed, the leakage value should be no greater than 2.5 cfm/SF.

D. 2018 IECC Code Citation: R403.3.5 Building Cavities and Return Ducts

The 2012, 2015, and 2018 versions of the IECC do not allow building cavities to be used as return ducts. A Montana amendment to the 2012 IECC allows this practice. The most important reason for not using building cavities for returns has to do with health and safety. Building cavities are notoriously difficult to seal. It is well documented that leaky return ducts can contribute to backdrafting of atmospherically vented water heaters, furnaces, and boilers in the combustion appliance zone when there is inadequate combustion air which can occur when an occupant plugs the combustion air inlet. The potentially harmful effect of leaky return ducts can be mitigated if sealed combustion closets or sealed combustion appliances are installed.

DEQ
Montana Department of Environmental Quality

Energize Montana Energy Code Website:

http://deq.mt.gov/Energy/EnergizeMT/EnergyCode