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Montana Building Codes Education Conference

The Montana Department of Labor and Industry's Building Codes Program will be hosting the 18th Annual Building Codes Education Conference in 2023. The conference is scheduled for March 13 - March 16, 2023, at the Hilton Garden Inn, 3720 N. Reserve, Missoula. Registration and conference information is available at.

Montana Homes Collaborative to Continue in 2023

If you are interested in building science and building codes, you'll want to join in the monthly virtual meeting of the Montana Homes Collaborative. The Collaborative is a group of home designers, builders, and other parties interested in energy-efficient, affordable housing that gathers once a month to discuss interesting projects and best practices. If you are interested in joining the conversation, email Carl Little at <mailto:carl.little@littlewise.net> to be added to the invitation list.

Cold Climate Heat Pumps

According to the U.S. Department of Energy (DOE), space conditioning and water heating consume over 40% of the nation's primary energy and are a major source of greenhouse gas emissions. Electric heat pumps, which extract heat from the air and ground, are an efficient alternative to fuel-fired heating systems. However, until recently, heat pumps were not suitable for Montana's climate, as the performance of conventional heat pump technology declined in cold climates. In October 2021, DOE issued a Residential Cold Climate Heat Pump Challenge. In partnership with the U.S. Environmental Protection Agency, Natural Resources Canada, and heat pump manufacturers, DOE's goal will be to accelerate the development and commercialization of next-generation cold-climate heat pumps (CCHPs) that meet consumer comfort and efficiency needs in cold climate regions of North America. The specific performance requirement of most interest to Montana is the ability to heat a home at temperatures as low as -15°F.

Sub-freezing Coefficient of Performance

The most important specification for the energy efficiency of any heat pump is the COP (Coefficient of Performance) value, which tells us how much useful heat we can get from converting electricity into heat.

An electric furnace or electric space heater will have a COP value of 1. That means that it will convert 100% of electricity into heat. However, heat pumps have a COP value above 1, sometimes up to 400% efficiency at higher temperatures. The reason heat pumps can operate at this level is because they don't convert electricity into heat; they just use the electricity to pump the heat from outdoor to indoors. Therefore, when outdoor air temperatures are lower, the COP value or efficiency of the heat pump at low temperatures will be lower as well. In standard heat pump technology, the COP drops to 1, or the equivalent of resistance heater at 0° F. Cold-climate heat pumps have similar COP as standard heat pumps at higher temperatures (40°F or above). However, their efficiency is not reduced as radically as standard units at lower temperatures. That means that the best cold-climate heat pumps can be used in low temperatures, as well. The best mini-split heat pumps will operate at 200% efficiency at 0° F. During extreme cold, the temperature falls far enough that the COP value for a heat pump is no longer efficient, which is not uncommon in Montana, and a backup system of radiant electric heat recommended.

Designers I have talked to are convinced that these systems will work in Montana's climate; however, finding a contractor to install these units may be a challenge. In my own area, I contacted five HVAC contractors to inquire if they would install cold-climate heat pumps. Two told me that they wouldn't work in our climate, and three said they were familiar with the technology but didn't think it was proven yet and therefore wouldn't recommend them.



Photos: U.S. Department of Energy

References

- U.S. Department of Energy. 2022. DOE Announces Breakthrough in Residential Cold Climate Heat Pump Technology. June.
- Gartman, Michael. 2020. Heat Pumps: A Practical Solution for Cold Climates. RMI. December.
- Consumer Reports. 2022 Heat Pump Buying Guide. May.



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Energize Montana Energy Code Website:
<http://deq.mt.gov/Energy/EnergizeMT/EnergyCode>