Clean indoor air and lower environmental impacts: Heat recovery ventilation in cold climates

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Abstract

Houses need to breathe too.

Over half of Alaska homes are at risk of moisture and indoor air quality issues. Heat recovery ventilators (HRVs) provide warm, fresh air to homes in cold climates, however, they cannot be retrofitted into existing homes without proper planning and execution. In addition to providing fresh air, HRVs can help reduce energy use for space heating, and eliminating the need for exhaust fans in colder climates can also result in energy savings.

Air changes per minute (acm) are needed to provide ventilation. One acm is equal to 12 breaths per minute. The acm needed depends on the number of occupants, the type of indoor activities, and the presence of air-tightness interventions. In Alaska, air changes per minute are typically lower than in other regions due to cold temperatures and the need for tight building envelopes. HRVs can provide the necessary ventilation, putting them at risk for moisture and indoor air quality issues.

In Alaska, many homes are at risk for poor indoor air quality, leading to issues such as mold and illness.

In Alaska, many homes are at risk of having inadequate ventilation. The 2018 Alaska Housing Assessment highlighted the challenges of building tight – or air-sealing a building envelope – and extending the life of a building. Without HRVs, the energy performance of buildings can deteriorate due to cold outdoor temperatures and the high latent heat of moisture, which can lead to increased energy use for space heating.

There is an often-quoted saying in building science: “Build it tight, ventilate right.” In Alaska, it is important to build tight while also providing the necessary ventilation. Heat recovery ventilators (HRVs) provide necessary ventilation, putting them at risk for moisture and indoor air quality issues.

Future research topics

CCHRC’s building science research program continues to research ventilation in cold climates to find solutions to improve comfort, performance, and public health. Current and future plans include:

- Assessing the feasibility of replacing some mechanical ventilation with filtration in cold climate homes, in conjunction with the Alaska Department of Health & Social Services.
- Evaluating different passive and active heating strategies to improve ventilation in cold climates, in conjunction with the Alaska Department of Health & Social Services.
- Understanding the number of homes with ductwork in Alaska during the winter months.
- Testing the impacts of ventilation on the indoor air quality of homes in cold climates.
- Exploring the impacts of ventilation on the indoor air quality of homes in cold climates.

Future research topics

1. Heat recovery ventilation in cold climates
2. Energy recovery ventilators in cold climates
3. Alaska research – insulated ducting
4. Alaska research – combined heating and ventilation
5. Alaska research – through wall ventilation
6. Alaska research – heat recovery ventilation systems

How does an HRV work? Similar to heat transfer in some animals, actually.

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HRVs provide a way to transfer heat between the fresh air and the exhaust air. The fresh air enters the HRV and is treated to the desired temperature, moisture content, and air quality before being supplied to the home. The exhaust air is also treated to the desired temperature, moisture content, and air quality before being exhausted from the home.

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