



# Buying an Energy Efficient Home in Fairbanks



Buying a home in the Fairbanks area can be a formidable task. Building codes only pertain to homes inside city limits. Many of these homes are older and may not meet current energy standards unless they have undergone fairly extensive retrofitting. Outside city limits, the variations in construction, age, and quality of homes is immense. Below are a few important things to consider if you're looking for a safe, affordable home in Alaska's Interior.

## Basements, Crawlspace, and Foundations

Foundation insulation is one area that should be looked at closely. The current minimum insulation value for the walls of basements and crawlspaces is R-15. This is equivalent to roughly three inches of rigid foam insulation. Many older homes do not have any foundation insulation, which is a big source of heat loss. All-weather-wood foundations are relatively common in and around Fairbanks and are perfectly acceptable if properly engineered. If the stud bays in this type of foundation were insulated with fiberglass, the insulation should be examined for moisture damage. In general, the source of any water staining under a house should be identified.

## Walls

Walls comprise the greatest exterior surface area of a house and are often responsible for the greatest heat losses. Most homes in Fairbanks are built with two by six (2x6) frame construction with R-19 or R-21 fiberglass batting, although many homes built in the 1960s, 70s, and 80s have two by four (2x4) walls. Older houses with 2x4 exterior walls are expensive to heat. One of the greatest sources of heat loss is conduction through the stud walls as the wood does not have as high an R-value as the fiberglass insulation in between the studs.

Two telltale signs of conductive heat losses through the framing are the vertical rows of dark dots and/or shadow outlines of the studs that appear on the inside of exterior walls. This is caused by microscopic airborne dust particles that are deposited on particularly cold parts of the exterior walls where humid indoor air condenses during the winter. The screws or nails in the sheetrock (which create the dot patterns) are especially conductive. New paint, of course, will hide this temporarily.

Any home that has added extra insulation such as rigid foam on the outside of its walls will generally be a superior choice as the additional insulation greatly reduces conductive heat losses through the framing. However, it is important that the building has sufficient exterior insulation to keep the structural sheathing above the dew point (a ratio of 2/3 exterior to 1/3 interior insulation is recommended for the Fairbanks climate). Otherwise the retrofit may cause more problems by trapping moisture inside the walls, leading to mold and rot. Double-wall construction, structural insulated panels (SIPs), or insulated concrete forms (ICFs) can also be very efficient, but typically are found only in more expensive homes.

## Windows

Many older homes in Fairbanks have single-pane windows. These are the least desirable as they suffer from high heat losses. The best option for Fairbanks is a triple-pane window, though double pane can be adequate if they are in good condition. For frames, vinyl or fiberglass is ideal. Wooden frames are acceptable if they are in good shape, but metal is not a good option because it is highly conductive. Sliding windows should be avoided as they are more prone to heat loss and frost-related operational issues due to air leakage. Instead look for single or double locking casement windows.

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## Moisture and Water Issues

Mold and water damage around windows can also be indicative of a ventilation or humidity problem. If extensive water damage is present, the moisture problems go deeper in places such as bathrooms and basements. Once mold has established itself in other parts of the home, the situation should be approached with extreme caution due to the potential health risks and associated remediation costs. Children or others with sensitive immune systems will be at the greatest risk for mold-related health issues. Moisture can come from many sources including occupants, cooking, and crawlspaces without good vapor barriers applied continuously to the ground. A continuous ground vapor barrier is a code requirement in all residential construction in the state.

## Roof Systems

The current code minimum for ceiling insulation is R-38. This requires a 12" deep rafter bay, or a truss roof with similar capacity if fiberglass batting is used. Fiberglass and cellulose are the most common insulations you will find in Fairbanks. Other products are sprayed-in foam or rigid foam board, which can achieve R-38 with roughly 8 inches. It is common for the roofs in older homes to have less insulation than meets current minimum standards. The attics in most older truss roofs lend themselves well to comparatively inexpensive insulation upgrades by blowing in an additional layer of cellulose insulation.

## Log Houses

Log homes are not uncommon in Interior Alaska. A home built with undersized logs such as six-inch or eight-inch three-sided logs may suffer significant conductive heat losses through the walls. An eight-inch, three-sided log is going to provide a nominal R-value of roughly 10—significantly less value than a properly detailed 2x6 frame wall filled with R-21 fiberglass. If a three-sided log home is small, such as a cabin, the heating costs may be higher than a comparable home constructed with 2x6 stud framing, but it might still be affordable. A large home with 8-inch logs may become prohibitively expensive to heat with higher fuel prices. Particularly in three-sided log homes, a flexible caulking such as Permachink is beneficial as it is specifically designed to bond with wood to seal the joints and gaps in logs. Homes that use the full scribe (round log) method and large-diameter logs in the 16" range can perform very well, but will command a higher price.

## The Fuel Bill

The fuel bills of previous owners can provide valuable information about heating and utility costs. Conversely, a home insulated to lower standards than those mentioned above and no fuel history should be approached with more caution. Keep in mind that the presence of a wood stove in the home can greatly misrepresent the actual heating fuel bill.

## Wood Stoves

Wood stoves can be an economical way to provide supplemental heat, however they may require a lot of labor to operate. Clearances to combustibles should be closely inspected, especially where chimney pipes go through the roof. Many chimney fires turn into house fires due to improper clearances inside the roof cavity. There should be no insulation or framing contacting the chimney inside the roof. A link to wood burning information is available from the University of Fairbanks Cooperative Extension Service. Additionally, with Fairbanks' air quality problem there are certain days where wood should not be burned. More information is available on the Fairbanks North Star Borough website at [fnsb.us/transportation/pages/air-quality.aspx](https://fnsb.us/transportation/pages/air-quality.aspx).



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## Ventilation

An energy efficient home will typically have a very tight envelope in order to reduce heat losses from air leakage. As a result, some form of mechanical ventilation will be necessary to ensure humidity control and occupant health. A heat recovery ventilator (HRV) system currently represents the most advanced form of ventilation due to its control options, measured exchange of air, and ability to conserve heat. If no maintenance history is available for the HRV system, it may be necessary to contact an HVAC contractor to test the system and make sure it is balanced. A balanced system will be most efficient, as it draws in the same amount of air being exhausted. Other ventilation techniques may be code compliant, but do not recover heat, and may not regulate humidity. In this regard, dedicated ventilation systems with outside makeup air sources in the living spaces (such as the fresh 80 “pop up” wall vents) are still allowed by code, if properly sized and installed. All new homes are required by code to have mechanical ventilation. In new construction, a kitchen fan must be vented to the outside. In older homes direct-vented kitchen fans are also highly recommended if installation is possible.

## Permafrost

Many properties in Fairbanks contain permafrost. This type of ground should be approached with due caution. Permafrost is intermittent in and around Fairbanks, but is most often found in low-lying areas, the north sides of hills, or down in flat shaded areas with lots of ground cover. In most homes built on permafrost, seasonal movement is a fact of life unless the house is built on driven piles, which are expensive. Houses built on permafrost must have a feasible way of adjusting their foundations. The more complex the home and the more plumbing and other systems involved, the greater the chances for problems. All connections to the house, such as the foundation and buried power, water, and waste lines should allow for seasonal movement. From a maintenance perspective, small, adjustable, dry cabins are typically the best choice. A properly constructed house can perform successfully on permafrost, however a structural engineer should be consulted before any purchase negotiations take place. It should also be noted that some banks may not be willing to finance a home built on this type of soil due to the inherent risks.

## Energy Ratings

Air leakage can be one of the biggest culprits for heat losses and also one of the hardest sources of loss to identify. An energy rating on a home can cost from \$350 to \$600 depending on the size and complexity of the structure. If a prospective buyer has reached a point where they are serious about a particular home, an energy rating can be a good resource. A state-certified energy rater will perform a blower door depressurization test along with a detailed analysis of the house’s construction, insulation, and mechanical systems. This data is then entered by the rater into a design heat loss modeling program that calculates the yearly heating and electricity costs of the home. With the rater’s input, the software also produces a written report on any deficiencies and areas where the greatest efficiency gains can be made. Short of actually living in the home, energy ratings provide the most comprehensive method for determining a home’s energy performance. A list of energy raters can be found on the Alaska Housing Finance Corporation website at [ahfc.state.ak.us/iceimages/reference/icboraters.pdf](http://ahfc.state.ak.us/iceimages/reference/icboraters.pdf).



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## Water:

Sub-zero weather will freeze and damage pipes, drains, tanks, and wells unless these components are correctly installed. All water and drain lines need to be well insulated or placed inside heated space. Often, electric heat tape is used to keep water lines from freezing. Thermostatically controlled “self limiting” heat tape is desirable due to its increased efficiency. Heat tape can be a major fire hazard if not maintained, installed incorrectly, or used in the wrong application. Holding tanks should either be located inside a home’s heated space or buried and insulated sufficiently to avoid freezing. Freeze-prone areas in a house include locations near entry and exit points to the home’s building envelope, such as doors and windows, and low-lying drains and drain traps. Wells should be tested for contamination and flow.

## Septic:

Homes with indoor plumbing that do not have access to public sewer systems are served by individual septic systems of various types. All conventional systems use a septic tank. In Alaska, septic systems should be registered with the Department of Environmental Conservation (DEC), which prescribes various standards for their installation. DEC is an excellent source of information about septic and water systems: <http://www.dec.state.ak.us/water/wwdp/onsite/index.htm>.

In general, septic tanks and adjoining piping should be buried and insulated sufficiently to not freeze, drain to properly functioning leach fields, and be pumped regularly. Mounded systems, which place a septic tank and drain field above grade due to unsuitable existing soils, require special attention as they are more inclined to freeze during extreme cold and may be indicative of unstable ground. Alternatives to conventional septic tank systems and mounded systems include self-contained above-grade treatment tanks that are extremely well insulated and incorporate additional technologies to process waste. A comprehensive professional inspection of all septic and waste systems will help identify existing issues and should be considered before any home is purchased.

## RESOURCES:

Cold Climate Housing Research Center: [www.cchrc.org](http://www.cchrc.org)

University of Alaska Fairbanks Cooperative Extension Service:  
<http://www.uaf.edu/ces/pubs/catalog/detail/index.xml?topic=eeh>

U.S. Department of Energy Office of Energy Efficiency & Renewable Energy: <http://www.eere.energy.gov/>

Alaska Housing Finance Corporation Insulation and Ventilation requirements:  
<https://www.ahfc.us/efficiency/research-information-center/fact-sheets-and-information>

