Insulation

Overview

Insulation serves a variety of purposes in a home. Insulation reduces energy consumption, increases comfort, reduces noise, and prevents condensation and moisture issues in building cavities. The variety of product choices may make insulation selection daunting, and this guide offers information to help you select the correct type of insulation for your application.

Definitions

R-value – Resistance to heat flow. A higher R-value means higher resistance and therefore conserves more energy.

Cellulose Insulation – Product made from a high percentage of recycled newspaper and cardboard.

Low-VOC – Low volatile organic compound (VOC). VOCs are additives that outgas from building products and pollute indoor air.

Formaldehyde-Free – A product with zero or ultra-low levels of formaldehyde, a carcinogen and chemical known to pollute indoor air.

Wind washing – Wind driven air passing through or behind the thermal insulation within a home, causing significant heat loss, drafts and possibly condensation.

When is This Applicable?

Attics, walls and floors can be insulated at any time, but it is often easier, less expensive and more effective during new construction or a renovation. Insulation is required any time you build a new home or addition, and an update to existing insulation may be required depending on the extent of remodel or retrofit. The energy code has specific insulation minimums.

Adding or replacing insulation may also be applicable if the original installation was insufficient, installed poorly, or has been disturbed. Common errors in installation include gaps between pieces of insulation, compression, and improper cutting around wall penetrations such as ductwork, plumbing or electrical wiring, and ceiling penetrations such as can lights or fans. Examples of activities that may disturb insulation include:

- Use of attics for storage;
- Repairs to plumbing or electrical system;
- Additions of low voltage wiring, like networking, security, video, audio and cable or satellite TV wiring;
- Rodent activity;
- Installation of ducts and vents;
- Effects of gravity on floor insulation; and
- General home maintenance.

What Makes it Green?

Adequate and properly installed insulation has major benefits to the homeowner, including both financial and comfort improvements. Additionally, maximizing the R-value of insulation will improve comfort and reduce utility bills. Lastly, improved whole-building energy performance can contribute to meeting requirements for Northwest ENERGY STAR Homes and help earn you points through Built Green and LEED for Homes. Insulation with low-emitting and recycled content often earns points in these rating systems as well.

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Best Practices

Before choosing standard fiberglass batt insulation, review the pros and cons and other considerations of the following options.

INSULATION TYPE	R-VALUE PER INCH	PROS AND CONS	BEST PRACTICES	WHERE TO INSTALL
Cellulose 	2.9 to 3.6	High recycled content. Can be recycled. Fills cavities more effectively than batts.	Select an ammonium sulfate-free product.	Attics, new walls, existing walls.
Fiberglass batt 	2.6 to 4.3	Lower first cost. Familiarity among installers. Requires close attention and careful detailing around wiring and pipes, etc.	Select high density batts for slightly higher R-value and better resilience. Many options available with high recycled content. **Prioritize GreenGuard-labeled products to protect your health.**	Floors, attics, new walls.
Blown-in Fiberglass (BiB) 	3.6 to 4.4	Fills cavities more effectively than batts.	Select high recycled content and low VOC products.	Attics, new walls, existing walls.

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INSULATION TYPE	R-VALUE PER INCH	PROS AND CONS	BEST PRACTICES	WHERE TO INSTALL
Spray Foam Insulation 	5 to 6	Best at stopping air flow. High R-value per inch. High embedded energy. Higher first cost than batts. Not recyclable.	Choose a qualified installer and ensure you completely fill cavities either with spray foam alone or a "flash and batt" technique combined with fiberglass batts. Use a minimum of two pound foam to avoid air bubbles and potential condensation.	Walls, underside of roof, rim joists, knee walls. Optimal for use in homes with limited space due to stud spacing.
Rockwool 	3.7 to 4.2	Rockwool is vapor-permeable, fire-retardant, and moisture-resistant and works will to provide exterior insulation on existing or new wall assemblies.	Rockwool comes in batts or panels. Consider the fastening system when installing siding and furring strips (if using a rain screen) over thick layers of rockwool.	Exterior side of new or existing walls, wall cavities, roof cavities
Rigid Insulation / Foam board 		High embedded energy, concerns about ozone depleting byproducts of manufacturing process. Flammable. High R-value per inch. Not recyclable.		Exterior side of new walls. Inside or outside of basement walls. Provides improved envelope efficiency.

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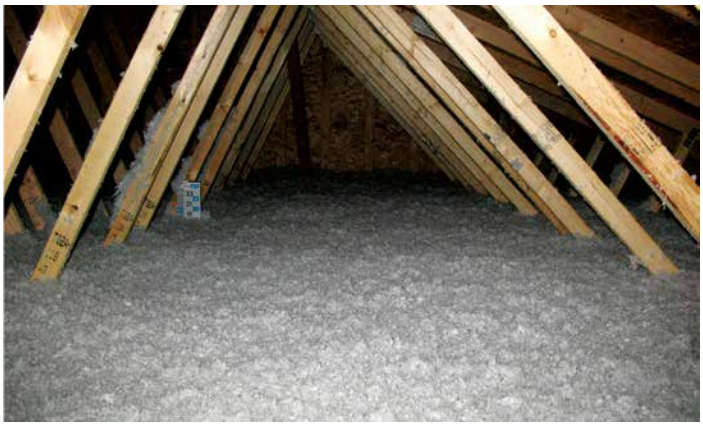
Any attic insulation should be smooth across the entire home. Mounding, lumps, valleys, voids and other problems with uniformity significantly reduce the overall R-value of the insulation.
Source: O'Brien & Company.



Here, loose-fill blown cellulose insulation covers the attic correctly – there is no indication of more or less insulation in any one area. Depth is uniform and smooth, and the code-required insulation ruler is visible near the back left to demonstrate insulation depth. *Source: O'Brien & Company.*

In order to most effectively insulate your home:

- Air seal cracks and penetrations before installing any insulation to ensure full R-value.
- Regardless of which type or brand of insulation you select, hire a contractor who will guarantee a "RESNET Grade I" installation quality – this will ensure you get the full R-value and best possible performance.
- Install a blown-in product rather than batt when possible – a higher quality install and better coverage are more likely.

Some houses may contain vermiculite insulation; a shiny, brown rock-like material roughly the size of a pea. This insulation potentially contains asbestos and could be a health hazard if disturbed and inhaled.
If you find this type of material:

- Do not perform any work that might disturb the material.
- Hire an AHERA Building Inspector to evaluate and test vermiculite.
- Conform to local remediation requirements and hire an abatement contractor as necessary.
- You may need to file a notification with your jurisdiction to remediate, renovate or demolish a building containing asbestos.

Vermiculite insulation is often nugget-shaped and silver-gold or gray-brown.
Source: Agency for Toxic Substances & Disease Registry

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- In attics where there is more room, add more insulation than required by code.
- Utilize raised heel trusses to enable more insulation around the perimeter of the attic/roof.
- Install eave baffles in vented attics to prevent wind washing at exterior walls from reducing the R-value.
- Select fiberglass products with high recycled content and no-added urea formaldehyde. Look for the GreenGuard label.
- Select cellulose insulation with 100 percent sodium borate additive and no ammonium sulfate, which can release an ammonia odor if it gets damp or wet.

Applicable References/ Standards

Energy Compliance Form: This required form includes tables of information for required insulation levels in different framed elements of your home. It also includes a description of the air barrier and insulation installation criteria for each component in your home in Table R402.4.1.1.

Resources

For the complete King County Green Building Handbook and individual Green Sheet PDF files, please visit our website at: http://kingcounty.gov/property/permits/publications/greenbuild.aspx. For additional information, please email dperwebinquiries@kingcounty.gov or call 206-296-6600.

See these related DPER Green Sheets (GS):

- Air Sealing Your Home, GS Number 10
- Alternative Heating Systems, GS Number 19
- Duct Sealing, GS Number 11
- Fresh Air Ventilation, GS Number 14
- Furnace Replacement, GS Number 18
- Right Sizing Heating/Cooling Systems, GS Number 17
- Thermostats, GS Number 16

Insulation Overview: This resource from Green Building Advisor covers the basics of insulation. Additional resources, such as insulation types, require a subscription to the site, but there are many free resources available.

Greener Options for Fiber Glass and Cellulose Insulation: List of products third-party tested for high recycled content and low emission of VOCs.

Puget Sound Energy; Energy efficiency rebates and offers: Current offers for rebates on a variety of items, including insulation.

Puget Sound Clean Air Agency; Regulating Asbestos: Local considerations, guidance and resources on asbestos containing materials.

Permit Tips

If you are adding insulation to an existing home (to the attic, walls, or floor/crawlspace/basement),typically you do not need a permit. However, if you are building new, adding on, or embarking on a significant remodel, then insulation is required as part of Energy Code requirements and inspections are required prior to drywall or cover. Plan reviewers will look for the insulation levels that are required by code.