

Comparing Fiber Glass and Cellulose Insulation

Compare Today Insulate and Save Tomorrow

Introduction

Whether your pocketbook or the planet is your chief concern, energy efficiency can add up to a lot of savings.

Reducing energy demand reduces the amount of fossil fuel combustion needed to heat and cool homes, which in turn decreases the amount of carbon dioxide emitted into the atmosphere. In terms of your pocketbook, reducing your energy consumption means lower utility bills.

While there are many things you can do to increase your home's energy efficiency, one of the most inexpensive ways is to install additional insulation.












Before Choosing Your Insulation

Things to consider when choosing an insulation product include ease of application, thermal performance and value.

However, you should also consider the overall lifetime performance of an insulation product as well as its related safety aspects prior to purchase and installation.

A Side by Side Comparison

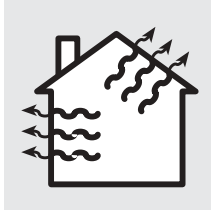
One way to compare insulation products is to do a side by side comparison. Here we compare the two most common types of insulation: fiber glass and cellulose. The following comparison reveals important differences between the two products which you should consider before making a final decision.

	Thermal Resistance		Air Infiltration
	Water Vapor Sorption		Resistance to Corrosion
	Convection		Use of Recycled Materials
	Impact of Weight		Sound Control
	Fire Safety		Safety
	Settling & Loss of R-Value		



THERMAL RESISTANCE R-VALUE

The thermal resistance of insulation is designated by R-value. R-value is resistance to heat flow - the higher the R-value, the greater the insulating power. Thickness of insulation is only one factor that determines its R-value. To ensure that consumers are provided with accurate information regarding R-values, the Federal Trade Commission (FTC) in 1980 established a rule which mandates that specific R-value information for home insulation products be disclosed in certain ads and at the point of sale. The purpose



of the FTC R-value disclosure requirement for advertising is to prevent consumers from being misled by certain claims which have a bearing on insulating value. When insulating a home, it's important that the homeowner gets the R-value specified and that the thermal performance lasts over time.

Fiber Glass Insulation

The R-value per inch of fiber glass insulation can vary depending on the density. Fiber glass batts and rolls, both faced and unfaced, have R-values printed on them. Standard fiber glass batt insulation has an R-value per inch of approximately 3.0. Most fiber glass manufacturers offer high-performance insulation products that yield a higher R-value per

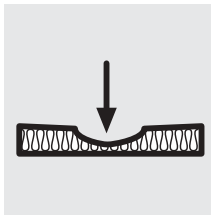
inch (4.0+). However, in nearly all applications, the overall R-value specified is what counts, not the R-value per inch. It's also very important that the R-value does not deteriorate. The R-value of fiber glass does not deteriorate over time.

Cellulose Insulation

Cellulose insulation manufacturers promote the product's "higher R-value per inch" as making it a better value than fiber glass. Higher R-value per inch is not important in selecting insulation material. It is an advantage only in areas with little space for insulation. In those particular applications, fiber glass high density insulation (R-13 and R-15 batts) provides higher R-value per inch than cellulose.¹

SETTLING AND LOSS OF R-VALUE

Settling is an important consideration in insulation product selection as it directly relates to the installed thermal performance over time.



Fiber Glass Insulation

Properly installed fiber glass batts and rolls do not settle. Some fiber glass loose-fill insulation may settle over time (usually around 1 percent). This settling does not alter the thermal performance of fiber glass insulation.

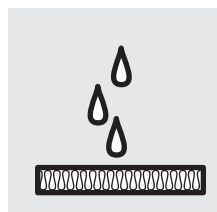
When manufacturers' installation procedures are employed, fiber glass insulation maintains its thermal performance for the life of the building.

Cellulose Insulation

Cellulose manufacturers agree that their products settle over time.² Most set the settling rate at about 20%. Therefore, if cellulose is mistakenly installed to its labeled settled thickness, it may lose about 20% of its R-value when it settles. When the product is not labeled for installed thickness, the Insulation Contractors Association of America (ICAA) recommends that an additional 25% of thickness be added above the labeled settled thickness.

WATER VAPOR SORPTION

In general, insulation will lose R-value when wet. However, there are important differences in the water vapor sorption properties of the two insulations which can impact their installed performance.



Fiber Glass Insulation

Insulation made of fiber glass is not absorbent.

If exposed to moisture, it will not wick up and hold water, thus it resists any permanent loss of R-value. If fiber glass insulation becomes saturated as the result of flooding or other events not related to actual product use, it should be removed and replaced.

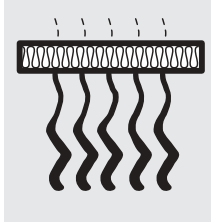
Cellulose Insulation

Cellulose insulation is made of shredded newspaper and will absorb moisture. Also, if soaked, cellulose will "mat" down and thermal performance can be perma-

nently reduced. Assuming existing cellulose does dry after becoming wet, there is a concern that the fire retardant chemicals may "wash away" leaving insulation materials insufficiently protected. In addition, studies conducted in Canada, New England and Ohio demonstrated that wet-spray applications of cellulose insulation do not achieve their advertised R-value until dry and may take as long as two months to dry.³ In many cases, wet-spray applications may need to remain uncovered until completely dry.

CONVECTION

Convection is a form of heat flow in which heat is transmitted by air currents. When air is heated, it expands, becomes less dense and moves in an upward direction. Generally, convection has no effect on insulation performance.



Fiber Glass Insulation

Fiber glass batts and rolls are not affected by convection. However, some lighter density loose-fill fiber glass may be affected slightly in limited applications such as those found in extremely cold weather environments. Laboratory attic tests have shown that loose-fill products experience improved thermal performance as the temperature in an attic drops, but that some light density loose-fill products then may see a reduction in thermal performance as attic temperatures drop further.

Cellulose Insulation

Convection will not affect the thermal performance of cellulose due to its heavy density.

THE IMPACT OF WEIGHT

When installing insulation above ceilings, homeowners should take into consideration the impact that the insulation weight can have on the ceiling structure of the home. The impact of weight is primarily an issue in northern climates where R-values of 30 and higher are commonplace.



Fiber Glass Insulation

Fiber glass insulation is extremely thermally efficient, yet light in weight. Homeowners can install fiber glass insulation up to R-70 over 1/2" ceiling drywall with framing spaced 24" on centers without causing drywall sag.

Cellulose Insulation

Based on U.S. Gypsum weight limit recommendations for backloaded standard drywall* and the installed density of shredded newspaper insulations, there is potential for ceiling drywall to sag at R-values above R-30 for regular cellulose insulation when installed over 1/2" ceiling drywall with framing spaced 24" on centers.

* Gypsum Construction Handbook, 1992 edition, pages 28 and 102

FIRE SAFETY

Fire resistance is an important attribute of any insulation material.



It is in a homeowner's best interest to consider the flame-resistance properties of the insulation in his or her

home. In terms of fire safety, fiber glass and cellulose perform quite differently.

Fiber Glass Insulation

Fiber glass insulation is made from sand and other inorganic materials which are melted and then spun into fiber glass. Fiber glass is naturally noncombustible and remains so for the life of the product. It requires no additional fire-retardant chemical treatments. Unfaced fiber glass insulation also is recognized by building code groups as an acceptable fire stop in residential wood frame walls.

Most kraft and foil facings available on some fiber glass insulation are themselves combustible. Products with such facings are intended for non-exposed applications and should not be left exposed. When properly installed, these products do not pose a fire hazard.

Cellulose Insulation

Cellulose insulation is made of ground-up or shredded newspaper which is naturally combustible. In fact, cellulose insulation is regulated as a recognized fire hazard by the Consumer Product Safety Council (CPSC).⁴ To protect against fire hazards, cellulose insulation is heavily treated with fire retardant chemicals prior to installation.

Tests conducted by the California Bureau of Home Furnishings and Thermal Insulation have demonstrated that some cellulose samples failed the standard fire safety test only six months after installation.⁵ Additionally, smoldering combustion and re-ignition problems are concerns with cellulose insulation should a fire start.⁶ Even properly treated cellulose insulations will burn at about 450°F. That's the surface temperature of a 75 watt light bulb.⁷

RESISTANCE TO CORROSION

It makes sense to avoid the use of products that may cause corrosion problems in a home.



Fiber Glass Insulation

Fiber glass insulation is not corrosive and contains no chemicals that can corrode pipes and wires.

Cellulose Insulation

Certain chemicals routinely applied as a fire retardant to most cellulose insulation (particularly the sulfates) can cause the corrosion of pipes and wires under some conditions.⁸

AIR INFILTRATION

Air infiltration is the uncontrolled leakage of air into and out of a home. It is driven by wind, temperature differences, or HVAC appliance-induced pressures.

If a wall cavity has been properly closed off using drywall, sheathing, and caulking, very little air will flow through a wall cavity regardless of the type of insulation used. Openings for wiring runs, light switches and electrical outlets where air infiltration can occur, can be sealed with foam sealants, caulking or foam gaskets. To control air leakage in a home, a housewrap or other air infiltration control strategies should be considered to limit air infiltration through cracks and joints.

Recently, there has been some debate over which insulation products are better at reducing air infiltration. The fact is, research shows that air infiltration is dependent on the sealant

package, and not the insulation installed in the wall cavity.

A 1997 study conducted by the National Association of Home Builders (NAHB) Research Center for the U.S. Environmental Protection Agency's Energy Star Homes Program⁹ could find no relationship between the type of insulation used and the amount of air infiltration. The study determined that the individual air sealing practices of the insulators had a larger impact on air leakage than the insulation products themselves. These findings were confirmed by a 1997 study conducted by a researcher at Penn State University¹⁰ and a 1996 study by a St. Louis, MO utility company.¹¹



Fiber Glass Insulation

Properly installed fiber glass insulation in a wall cavity matches cellulose in combating heat loss from air infiltration. Minimizing air infiltration is dependent on the sealant package, not the insulation. The purpose of insulation is to provide thermal performance.

Cellulose Insulation

Despite claims that wet-spray cellulose eliminates air infiltration, the research shows that what's in the cavity of the wall or attic - fiber glass or cellulose - has little, if any, effect on air infiltration.¹²

SOUND CONTROL

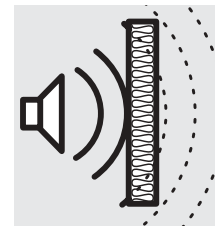
In general, the density of the insulation material in a sidewall assembly has little, if any, effect on the Sound Transmission Class (STC) rating of the assembly. STC ratings are a measure of the effectiveness of a given partition construction in reducing airborne sound transmission. Insulation thickness, however, has a more significant effect on STC ratings than does density. In comparison testing, representative 2 x 4 and 2 x 6 wood stud and metal stud walls demonstrated equivalent or slightly better performance for fiber glass over cellulose when the cavities were completely filled.¹³

Fiber glass Insulation

Fiber glass insulation significantly reduces sound transmission in wall, ceiling and floor assemblies. The first inch of fiber glass insulation can increase the STC value by 3 or 4 points in some constructions. Each additional inch of fiber glass insulation increases the STC value from one to two points. (Refer to NAIMA publication BI405 - Sound Control for Commercial and Residential Buildings)

Cellulose Insulation

Cellulose insulation is also considered a good insulator against unwanted sound in wall and ceiling assemblies.



USE OF RECYCLED MATERIALS

Increased attention has been given to recycling and recycled products as concerns about our environment have heightened. Both fiber glass and cellulose manufacturers use a significant amount of recycled materials in the manufacture and packaging of their products.



Fiber Glass Insulation

Between 1992 and 2000, the fiber glass insulation industry recycled approximately 8,355,848,000 lbs. of pre- and post-consumer glass containers, eliminating the need for millions of cubic feet of landfill space.

Many fiber glass insulation manufacturers have plants that use up to 40% or more recycled materials in their products. The current industry average is 30% recycled content. Manufacturers are currently exploring ways in which their use of recycled materials can be increased without compromising the effectiveness of their insulation products when installed in attics, sidewalls and floors.

In addition, the packaging materials used by fiber glass manufacturers can be recycled.

Cellulose Insulation

Cellulose insulation is generally made up of about 80% recycled newspapers and 20% fire-retardant chemicals. On the surface, cellulose insulation may appear to be the more environmentally acceptable insulation choice as it is made from shredded newspaper. However, it takes three times more cellulose material by weight than fiber glass to insulate a typical home. In addition, an average 1200 square foot attic insulated to R-38 with cellulose insulation would introduce 300 pounds of fire retardant chemicals into the home.

SAFETY

The value of scientific research regarding the health aspects of insulation materials cannot be overstated in relation to the safety of workers and the public.



Fiber Glass Insulation

Fiber glass insulation is one of the most thoroughly tested building materials in use today. The great amount of medical scientific evidence compiled over more than fifty years by industry, government and independent research organizations supports the conclusion that fiber glass insulation is safe to use when manufacturers' recommended work practices are followed.

Cellulose Insulation

Questions about the health and safety aspects of cellulose insulation persist in the building industry because comprehensive medical scientific testing of the products has never been conducted. Repeated requests by union and contractor groups that such testing be undertaken have been ignored.¹⁴ Given the high levels of exposure measured during cellulose installation, only after long-term experiments are available will it be known if cellulose insulation is safe to use.

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ABOUT NAIMA

NAIMA is the association for North American manufacturers of fiber glass, rock wool, and slag wool insulation products. Its role is to promote energy efficiency and environmental preservation through the use of fiber glass, rock wool, and slag wool insulation, and to encourage the safe production and use of these materials.

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