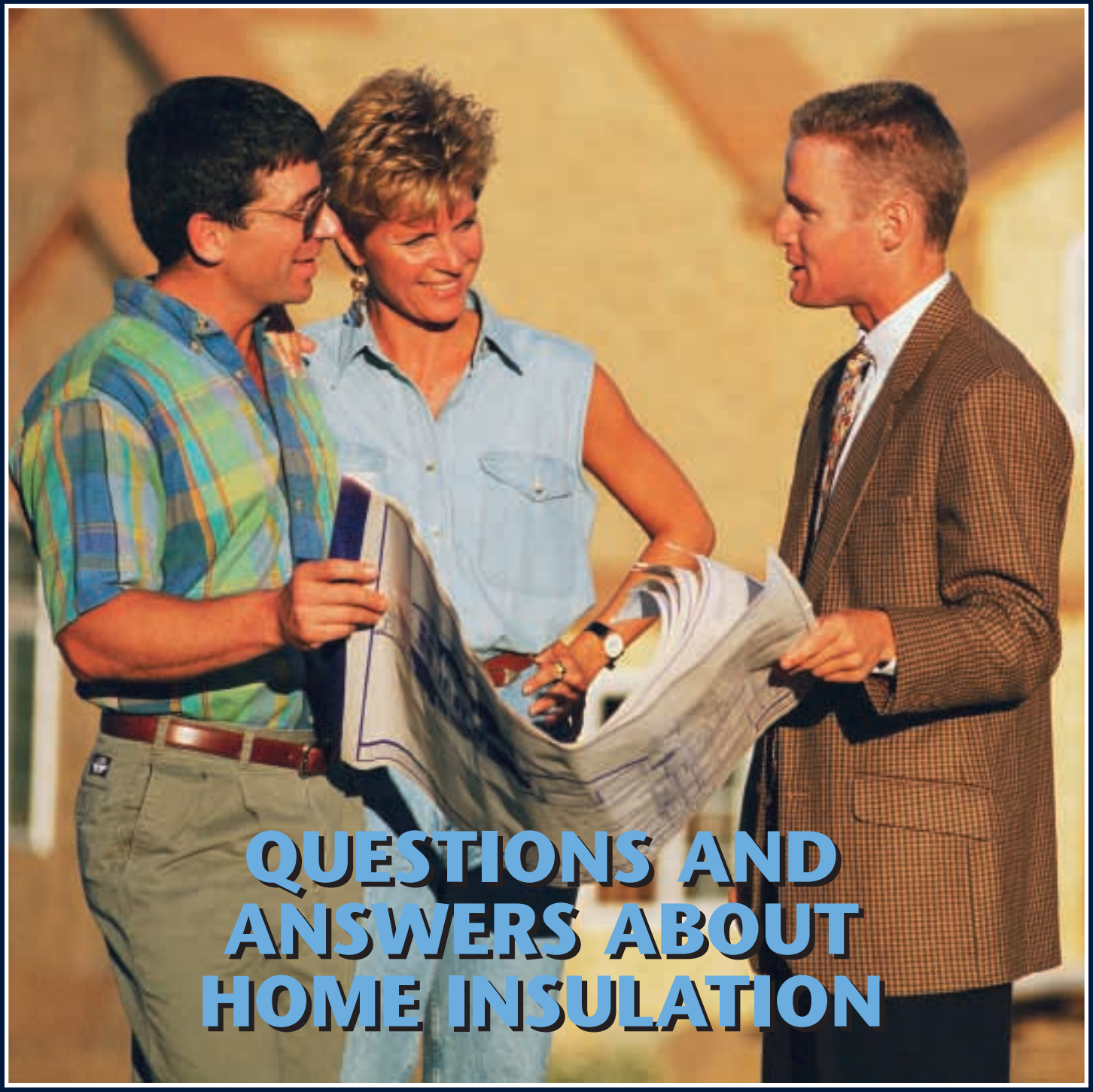


QUESTIONS AND ANSWERS ABOUT HOME INSULATION

Today, we know more about how to save energy than ever before. When it comes to our homes, the more energy efficient we make them, the lower the monthly utility bills are going to be.

Homes that are constructed to the latest energy codes using energy-efficient appliances, windows, doors, lighting and heating/air conditioning equipment will be more energy efficient.

One of the most important and cost-effective energy-saving building materials in a home is the insulation. Without the insulation, many of the other energy-efficient components won't perform as intended.

You don't have to be an energy expert to understand the basics of insulation. Whether building, remodeling or buying a home, the insulation tips in this brochure will help you save on heating and cooling bills and create a comfortable home all year round.*

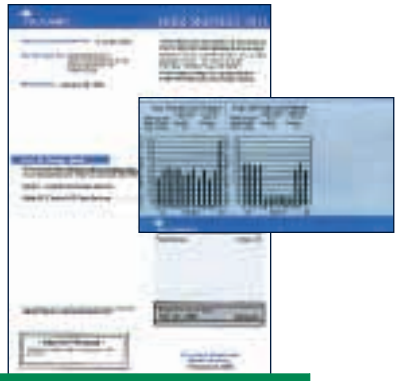
**Savings vary. Find out why in the seller's fact sheet on R-value. Higher R-values mean greater insulating value.*

Questions To Ask About Insulation

Prior to building or buying a home, it is important to spend some time talking to the builder or seller about the home's energy efficiency. And definitely ask about the insulation.

- What type of insulation is in the home?
- What areas of the home are/should be insulated?
- Does the insulation meet or exceed local building codes and national recommended insulation levels?

These issues are equally important in planning the remodeling of an existing home.



Insulation Types

Note: Thickness of some R-values can vary by manufacturer

	Loose-Fill	R-38 12"	R-38C 10"-10½"	R-30 9½"-10"	R-30C 8¼"- 8½"	R-25 8"	R-21HP 5 - 5½"	R-19 6 - 6½"	R-15HP 3½"	R-13 3½"	R-11 3½"	R-6 Masonry 11½"	R-3 Masonry 11½"
Attics & Flat Ceilings (New Construction)	✔	✔		✔									
Attics (Retrofit)	✔	✔		✔		✔		✔					
Cathedral Ceilings			✔		✔		✔						
2x4 Exterior Walls									✔	✔	✔		
2x6 Exterior Walls							✔	✔					
Floors & Crawl Spaces			✔		✔	✔	✔	✔	✔	✔	✔		
Basement Walls							✔	✔	✔	✔	✔	✔	✔

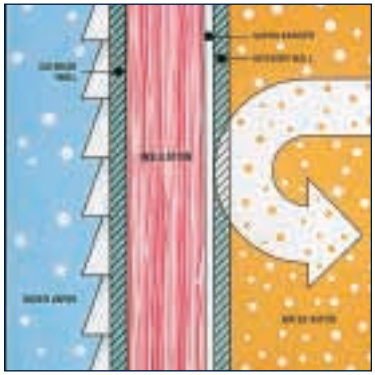
What Does Insulation Really Do?

A well-insulated home, particularly one that is insulated with fiber glass insulation, is one of the most cost-effective ways of saving energy and helping to reduce heating and cooling bills while adding to the thermal and acoustical comfort of a home.

A WELL INSULATED HOME SAVES ENERGY AND HELPS REDUCE HEATING AND COOLING BILLS

Thermal Comfort

Fiber glass insulation resists the flow of heat. Heat is a form of energy — it always seeks a cooler area — flowing outward in winter and inward in summer. By reducing heat flow, a properly insulated home uses less energy in winter for heating and less in summer for cooling.



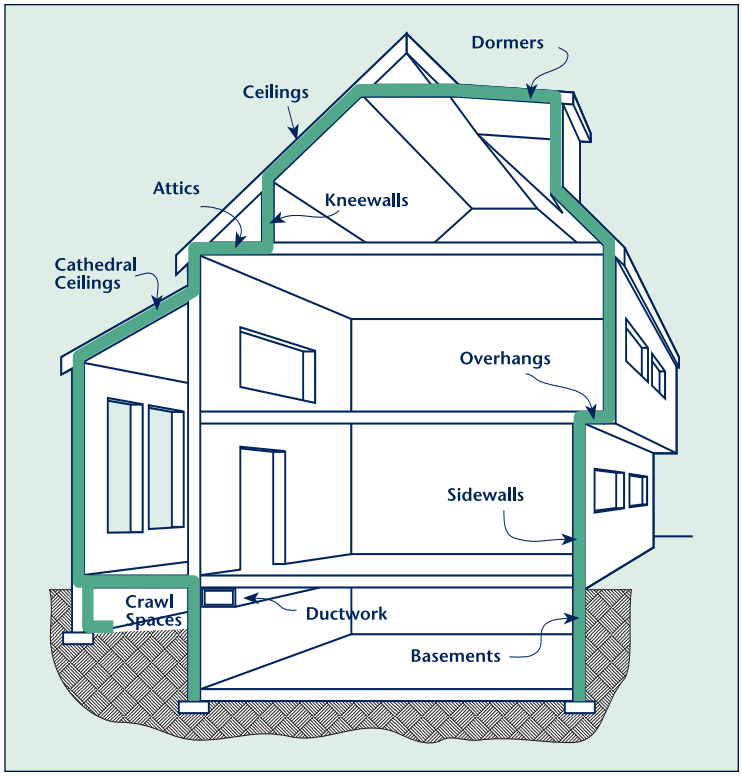
Acoustical Comfort

Fiber glass insulation is an excellent sound absorber as well as an energy saver. When installed in the walls and ceilings, it can reduce the transmission of sound from other rooms or from the outside. Sound transmission is noise that travels from room to room — or from home to home — or from appliances such as washers, dryers, heating and air conditioning systems, phones, radios and TV's.

Where Should Insulation Be Installed?

Insulation is not just for attics and outside walls. Insulation should be installed in many areas of the home including:

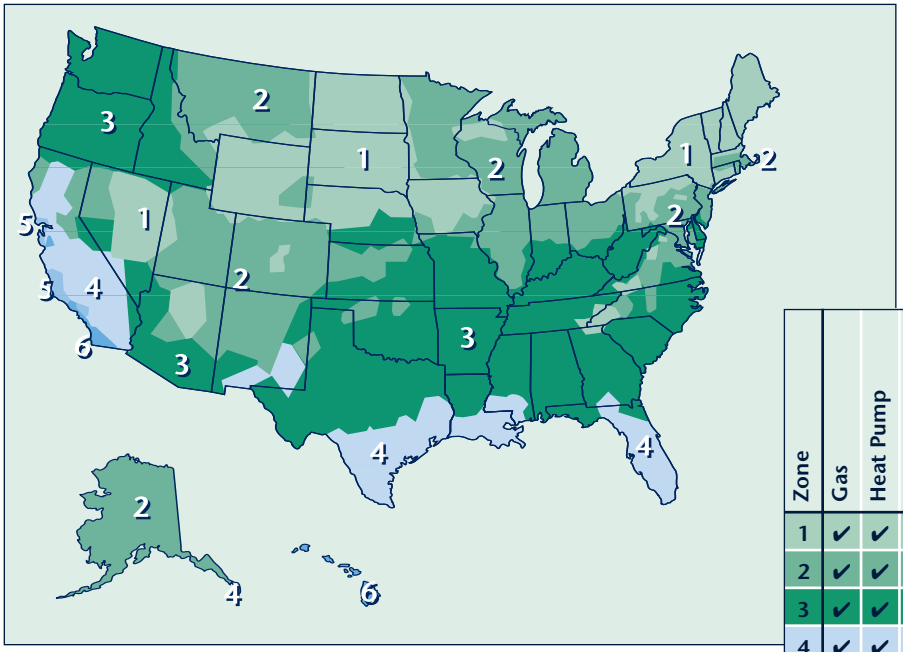
- Ceilings with unheated spaces above, including dormer ceilings
- Knee walls of attic spaces finished as living areas
- Sloped walls and ceilings of attics finished as living areas
- Cathedral or vaulted ceilings
- Around perimeters of slabs
- Floors above vented crawl spaces
- Floors over unheated or open spaces such as over garages or porches
- Basement walls
- Band and header joists
- Interior walls, ceilings or floors where extra sound control is desired
- Floors over unconditioned basements



How Much Insulation Should Be Installed?

The amount of insulation a home should have will vary, depending on where it is located and how it is built. The U.S. Department of Energy has put together thermal recommendations for homes. The recommended insulation levels are based on geographic zones.

RECOMMENDED INSULATION LEVELS ARE BASED ON GEOGRAPHIC ZONES



Zone	Gas	Heat Pump	Fuel Oil	Ceiling: Attic	Ceiling: Cathedral	Wall (A)	Floor	Crawl Space (B)	Slab Edge	Basement: Interior	Basement: Exterior
1	✔	✔	✔	R-49	R-38	R-18	R-25	R-19	R-8	R-11	R-10
2	✔	✔	✔	R-49	R-38	R-18	R-25	R-19	R-8	R-11	R-10
3	✔	✔	✔	R-49	R-38	R-18	R-25	R-19	R-8	R-11	R-10
4	✔	✔	✔	R-38	R-38	R-13	R-13	R-19	R-4	R-11	R-4
5	✔			R-38	R-30	R-13	R-11	R-13	R-4	R-11	R-4
5		✔	✔	R-38	R-38	R-13	R-13	R-19	R-4	R-11	R-4
6	✔			R-22	R-22	R-11	R-11	R-11	(C)	R-11	R-4
6		✔	✔	R-38	R-30	R-13	R-11	R-13	R-4	R-11	R-4

(A) R-18, R-22 and R-28 exterior wall systems can be achieved by either cavity insulation or cavity insulation with insulating sheathing. For 2"x 4" walls, use either 3-1/2" thick R-15 or 3-1/2" R-13 fiber glass insulation with insulating sheathing. For 2"x 6" walls, use either 5-1/2" thick R-21 or 6-1/4" thick R-19 fiber glass insulation.

(B) Insulate crawl space walls only if the crawl space is dry all year, the floor above is not insulated, and all ventilation to the crawl space is blocked. A vapor retarder (e.g., 4- or 6-mil polyethylene film) should be installed on the ground to reduce moisture migration into the crawl space.

(C) No slab edge insulation is recommended.

For information regarding other fuel sources, visit the DOE website at: http://www.eren.doe.gov/consumerinfo/energy_savers/r-value_map.html

What Is R-Value?

Insulation is identified and labeled by R-value. "R" stands for resistance to heat flow. The higher the R-value, the greater the insulating power.

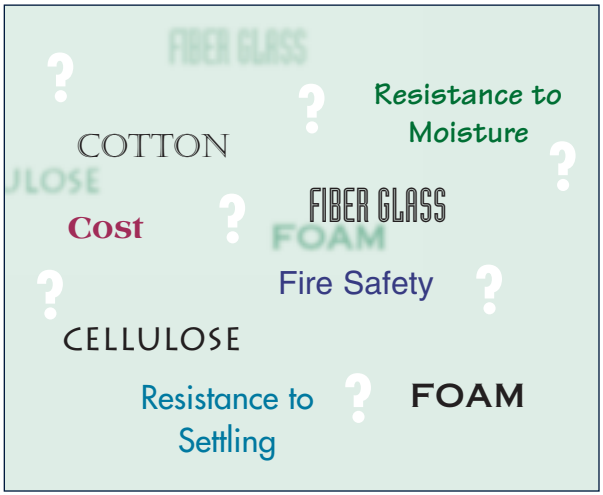
Manufacturers of insulation products print the R-values of their products either on bags or on labels attached to plain bags. In most cases, R-values are also printed on the facings of batts and rolls. On unfaced insulation, the R-value is printed on the product or indicated by stripe coding.

What Are The Options When Choosing Insulation?

There are a variety of insulations to choose from including: fiber glass, cellulose, foam and cotton. The two most common types of insulation for residential applications are fiber glass and cellulose. There are several things to consider before making an insulation decision:

- Thermal performance
- Permanence
- Resistance to moisture
- Resistance to settling
- Fire safety
- Cost

FIBER GLASS IS THE INSULATION OF CHOICE IN 85% OF AMERICAN HOMES



What Are The Important Differences Between Fiber Glass And Cellulose?

Installed R-value

When insulating a home, it is important to get the appropriate R-value for your climate as specified by the builder or the local building code. It's also important that the thermal performance lasts over the life of a home. For more information on insulation recommendations for a specific area, contact the local building department or the local gas or electric utility for their recommendation.

While cellulose insulation manufacturers promote their product's "higher R-value per inch" as making it a better value than fiber glass, it is the overall R-value specified that counts, not the R-value per inch. Higher R-value per inch is only an advantage 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. Fiber glass insulation can be blown in an attic to nearly any R-value. More R-value alternatives provide greater flexibility in meeting code energy requirements in your area.

Lifetime Performance

In order to ensure the expected energy savings, it is important that the insulation does not deteriorate or settle over time. Fiber glass batts and rolls do not settle. Some fiber glass loose-fill insulation may settle over time (usually around 1%). This minor settling does not alter the thermal performance of fiber glass insulation.

Cellulose manufacturers agree that their products settle over time. Most set the settling rate at about 20%. Therefore, if cellulose insulation is 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 to compensate for this loss of R-values.

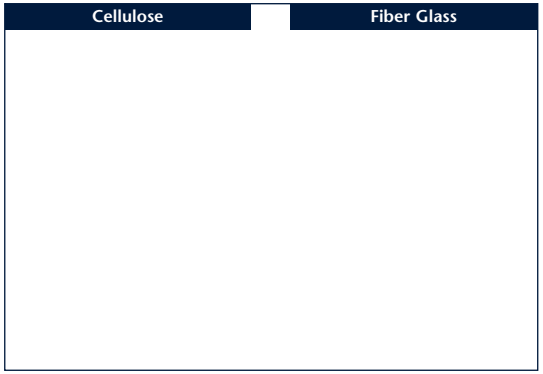
Fire Safety

Fiber glass and cellulose perform very differently in terms of fire safety.

Fiber glass insulation is naturally non-combustible because it is made from sand and recycled glass. The insulation 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 on fiber glass insulation are themselves combustible. Products with such facings are intended for non-exposed applications and should not be left uncovered. When properly installed, these products do not pose a fire hazard. Other special flame-resistant facings may be left exposed where desired, such as on a basement or crawl space wall.

Cellulose insulation is made primarily 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 Commission (CPSC). To protect against fire hazards, cellulose insulation is heavily treated with fire retardant chemicals prior to installation. Although cellulose is treated with fire retardants, it is not fireproof. This means the insulation could still burn if exposed to a heat source.



Standard 75 watt light bulb will cause cellulose insulation to smolder.

Fiber glass insulation is unaffected.
Note: a 75 watt light bulb is the equivalent of 450°F.

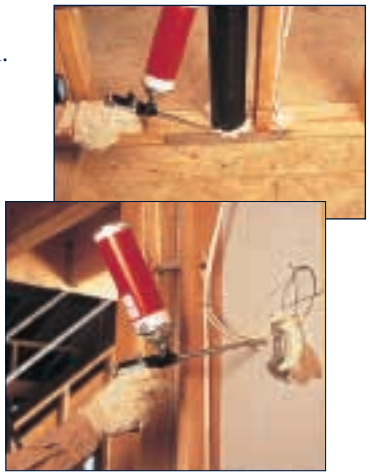
Tests conducted by the California Bureau of Home Furnishings and Thermal Insulation have demonstrated that some cellulose samples failed the standard fire safety test only six months after installation. Additionally, smoldering combustion and re-ignition problems are concerns with cellulose insulation should a fire start.

Moisture

Insulation will lose its insulating efficiency or R-value when wet. Fiber glass insulation is not absorbent and, if exposed to moisture, will not wick up or hold water. It will dry out and retain its original R-value as long as it recovers to design thickness.

Because cellulose is made from shredded newspaper, it will absorb and hold moisture, reducing energy savings. If soaked, cellulose will mat down and its thermal performance can be permanently reduced. Assuming existing cellulose does dry after becoming wet, there is a concern that the fire retardant chemicals may "wash away" leaving homes using these insulation materials at higher risk.

Many cellulose insulations are actually applied with water added by what is called a wet-spray method. Wet-spray applications do not achieve their R-value until dry. It is recommended that wet-spray applications remain uncovered until completely dry. In one study, this took 35 days, and, in another, over 5 months of drying in an arid, warm environment. Waiting until the cellulose is completely dry is difficult with today's building construction schedules. If wet-spray applications are covered up too soon, moisture problems can occur. Not only does the insulation efficiency suffer, but moisture can affect other building components, such as wood studs and drywall, and create a number of additional indoor air quality problems by promoting mold growth.



Air Infiltration

When installed in sidewalls, thermal insulation, whether fiber glass or cellulose, has very little to do with air infiltration. The U.S. Department of Energy estimates that up to 40% of a home's heat loss can be from air infiltration. But only 4% of the total loss from air infiltration occurs through sidewall cavities, and most of that is around electrical outlets, a problem easily solved with inexpensive, easy-to-install electrical insulated outlet gaskets.

Air infiltration generally occurs in the areas of a home that are not insulated, such as around windows, doors, fireplaces, HVAC ductwork and perimeter joints. It can, and should be, controlled with the use of housewrap; proper caulking; and sealing of band joists, sill plates, header plates, and around doors, windows, electrical outlets and other openings.

Some insulation manufacturers make the claim that their products are superior because they can reduce air infiltration. However, the fact is, and recent studies confirm, that insulation (regardless of type) in a wall cavity does not significantly reduce air leakage. Study results show that if a wall cavity has been properly closed off, using drywall, sheathing and caulking, very little air will flow through the wall.

The results of a 1997 study by the National Association of Home Builders (NAHB) Research Center for the U.S. Environmental Protection Agency's Energy Star Homes Program found no significant relationship between the type of insulation used in a home and the amount of air infiltration. It concluded that

insulation products such as fiber glass batts, wet-spray cellulose, blown-in fiber glass (referenced as "Blow-In-Blanket System" or BIBS) and low density polyurethane foam insulation (also referred to as spray-in foam or polyicynene) do not significantly reduce air leakage. The study confirmed that the individual air sealing practices of the insulators had a larger impact on air leakage than the insulation products themselves.

An earlier study (1996) by G. K. Yuill, Ph.D. of Penn State University also measured the effect of different types of insulation on the air tightness of a home. The study confirmed that there is no significant difference between fiber glass batt and wet-spray cellulose insulations in their ability to resist air flow through the wall cavities of a home. Based on the data, Yuill found it was impossible to determine which insulation provided a more airtight structure. He concluded that the difference between the two types of insulation had little effect on the air tightness of a home.

A 1995 study by a St. Louis, MO utility company, Union Electric, tested seven homes for air infiltration and concluded that a properly installed sealant package could significantly reduce air infiltration and save energy in a home regardless of the insulation installed (fiber glass or cellulose). The study found that a sealant package can decrease air infiltration by more than 50% compared to a home that does not have one. In field tests, fiber glass and cellulose insulations were considered equal in their impact on air infiltration, leading to the conclusion that air infiltration is dependent upon the sealant package, not the insulation type.

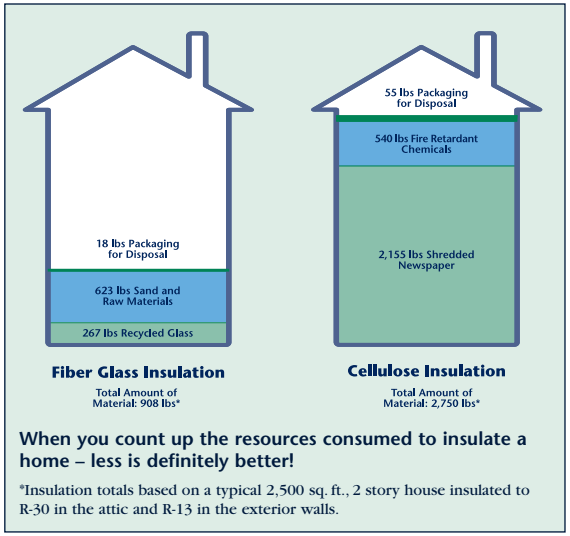
Environmental Benefits

As the environmental consciousness of Americans has been heightened, the building industry has responded. This kind of rethinking has led to a strong push to use building materials with lower environmental impact.

While recycled content may be the most recognized environmental attribute associated with consumer products, the U.S. Environmental Protection Agency (EPA) admonishes organizations selecting or endorsing products to be aware that environmental preferability is a function of numerous attributes, not just one or two. The EPA, therefore, recommends that a comparison of the environmental properties of competing products take a life-cycle approach. When fiber glass and cellulose insulation are analyzed by a life-cycle standard, fiber glass is environmentally preferable.

More total recycled material by weight is contained in fiber glass insulation than in any other type of insulation used in the building and construction industry. Some manufacturers use up to 40% recycled glass in fiber glass insulation. The 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.

Cellulose insulation is inaccurately portrayed as environmentally friendly because the bulk of cellulose is comprised of shredded newspapers. However, by using recycled newsprint in their insulation, cellulose manufacturers are removing newsprint from the recycling stream and forcing printers to rely upon virgin, rather than recycled newsprint. This translates into a further loss of renewable raw timber resources. Cellulose is comprised of up to 80% newsprint and the remaining 20% of the insulation is made up of chemicals which are added to retard flammability. These chemicals, such as boric acid and sulfates, may create additional environmental problems.



When you count up the resources consumed to insulate a home – less is definitely better!

*Insulation totals based on a typical 2,500 sq. ft., 2 story house insulated to R-30 in the attic and R-13 in the exterior walls.

When a life-cycle approach is used to compare both products, the total amount of material required to insulate can be just as relevant as recycled content. Consider the fact that to insulate a typical 2,500 square foot, two-story home with an R-value of R-30 in the attic and R-13 in the exterior walls requires 2,695 pounds of cellulose which is three times more material per house than would be required with fiber glass. The difference in the density of fiber glass and cellulose insulation has another environmental consequence — the amount of packaging. For example, to insulate a typical 2,500 square foot house requires 30 packages of fiber glass compared with 109 cellulose insulation packages. In addition, since fiber glass insulation products are so highly compressed, more insulation can be shipped in each truck and the result is a reduction in the energy required for transportation.

Another important factor in the life-cycle approach is whether the product is recyclable. Fiber glass has the capacity to be reclaimed from a home and recycled into new product. Cellulose insulation, however, is not recyclable. Once cellulose insulation is installed in the home, the chemical saturation of the shredded newspaper renders the product useless for future applications.

Health And Safety

Fiber glass insulation is one of the most thoroughly tested building materials in use today. Over fifty years of research by government and independent research organizations supports the conclusion that fiber glass is safe to use when manufacturers' recommended work practices are followed. Fiber glass may cause itchiness and temporary skin irritation in some people handling the products.

Cellulose, on the other hand, remains a largely untested commodity. Even though it is composed of 20% fire retardant chemicals, the cellulose industry has performed little, if any, health and safety testing on its products. Questions about the health and safety aspects of cellulose insulation persist in the building industry. The limited scientific testing conducted on cellulose to date indicates a potential for serious health problems. For example, documented worker exposures to respirable cellulose fibers have been measured at 50 to 200 times higher than fiber glass. Clearly, more research is needed.

As an industry, fiber glass manufacturers reference health and safety information in their Material Safety Data Sheets (MSDSs) as well as on their packages.

Over the years, fiber glass manufacturers have put together "work smart" recommendations that provide practical safety measures designed to minimize any potential irritation. Now, a new program, called the Health and Safety Partnership Program (HSPP), consolidates existing industry work practice recommendations into an organized program approved by OSHA. Developed voluntarily and cooperatively by NAIMA, OSHA, and contractor organizations, the HSPP outlines general work practices recommended when handling synthetic vitreous fiber (SVF) insulation materials. These include:

- Minimizing dust generation, using a dust collection system where appropriate
- Wearing a long sleeved shirt, loose at the neck and wrists, long pants, gloves and a cap
- Wearing a NIOSH-certified disposable dust respirator (N95 or greater)
- Wearing eye protection or a face shield.

A Last Word About Insulation

Finally, perhaps the most important consideration of all is the installation of the insulation. Regardless of the insulation type, the full R-value can only be achieved with proper installation. To help ensure the proper installation of fiber glass insulation, the North American Insulation Manufacturers Association (NAIMA) provides strong outreach support for professional contractors. In addition, NAIMA acts as an industry resource for architects, builders, homeowners and the general public. (See next page for a description of NAIMA services/activities.)

Insulation is one of the more important contributors to the energy efficiency of a home. Make the right choice and start saving money and energy in a more comfortable and more valuable home.

THE FULL R-VALUE OF ANY INSULATION CAN ONLY BE ACHIEVED WITH PROPER INSTALLATION

NAIMA — The Industry Information Resource

NAIMA (North American Insulation Manufacturers Association) is the trade association of manufacturers of fiber glass, rock wool, and slag wool insulation products. NAIMA members manufacture the vast majority of fiber glass, rock and slag wool insulations produced and used in North America.

Over 60 years of active industry participation positions NAIMA as the industry resource for architects and builders; design, process and maintenance engineers; utilities; contractors; codes and standards organizations; government agencies; and home and building owners. NAIMA activities include:

- Providing information on the application of fiber glass, rock and slag wool insulation products for thermal efficiency, sound control, condensation control and fire safety.
- Maintaining working relationships with government bodies to improve their knowledge of the economic, energy-saving and environmental benefits of insulation products.
- Providing testimony on important issues before federal, state and local governments and regularly updating members and customers on legislation and regulations that affect the industry.
- Providing technical input and guidance to standards-setting organizations that are of critical importance to energy-efficient building design and maintenance.
- Working with allied trade associations and labor organizations throughout the world in communicating the economic, energy-saving and environmental benefits of insulation.
- Encouraging medical and scientific research on the health and safety of glass, rock and slag fibers, and disseminating the results to government agencies, industry, customers, employees and the general public.
- Providing strong outreach support, including industry and issue-oriented presentations, participating in industry forums and co-sponsoring educational training programs.
- Supporting the use of environmentally sound products and packaging through the use of recycled materials, and advocating specifications for recycled content.

As an association, NAIMA publishes literature on product performance characteristics, installation guidelines, energy-saving tips, building code guidance, standards and specifications, sound control recommendations, use of vapor retarders and condensation control, insulation and fire safety, thickness recommendations, energy audit procedures, general health and safety information including the new Health and Safety Partnership Program (HSPP), and much more.

For More Information

Contact

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Alexandria, VA 22314

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Fax: 703/684-0427
E-mail: insulation@naima.org
Website: http://www.naima.org

NAIMA
Building Insulation Committee Members:

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800/233-8990

Johns Manville
PO Box 5108
Denver, CO 80217-5108
800/654-3103

Knauf Fiber Glass
One Knauf Drive
Shelbyville, IN 46176
800/825-4434

Owens Corning
One Owens Corning Parkway
Toledo, OH 43659
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MFS, Incorporated
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Toledo, OH

Rock Wool Manufacturing Company
Leeds, Alabama

Roxul, Incorporated
Milton, Ontario

Sloss Industries Corporation
Birmingham, Alabama

Thermafiber, LLC
Wabash, Indiana

USG Interiors, Incorporated
Chicago, Illinois

Western Fiberglass Group
Midvale, Utah

NAIMA Members produce the vast majority of fiber glass, rock and slag wool insulations in approximately 50 locations in North America.

For More Information

NAIMA

North American Insulation Manufacturers Association

PUB. NO. BI409 3/00

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Customer No. 150

YES, I'm interested in knowing more about fiber glass insulations.
Please send me a free copy of the publications I have indicated below.

- ☐ *Guide to Selecting Fiber Glass Insulation Products for New Home Construction and Remodeling* – 6 page fact sheet (BI473)
- ☐ *An Insulation Comparison* – 6 page fact sheet (BI475)
- ☐ *The Facts About Insulation and Air Infiltration* – 4 page fact sheet (BI 480)
- ☐ *Recommendations for Installation in Residential and Other Light-Frame Construction (Fiber Glass Building Insulation)* – 12 page booklet (BI402)
- ☐ *Recommendations for Installation in Residential and Other Light-Frame Construction (Fiber Glass Loose Fill Insulation)* – 12 page booklet (BI403)
- ☐ *Insulation Benefits in Everyday Life* – 24 page brochure (N015)
- ☐ *Environmental Life Cycle of Fiber Glass Insulation* – 12 page brochure (N016)

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Company _____

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