Special Report

Attic Insulation Problems

The Problem: Blown Fiberglass

Over the years, many problems have surfaced about the use of blown fiberglass insulation. Builders, homeowners, and insulation contractors ocassionally hear about the research and actual performance results, but rarely is all the information brought together to present a complete picture.

The next few pages summarize the current state of the blown fiberglass problem so that the readers can see all the facts and decide for themselves if this is the insulation they want to purchase for their homes.

The Problems

I. When properly installed, blown fiberglass loses up to 50% of it's R-value under certain conditions.

II. Blown fiberglass is installed improperly in 79% of homes according to a recent ICAA investigation.

III. New fiberglass performs even worse.

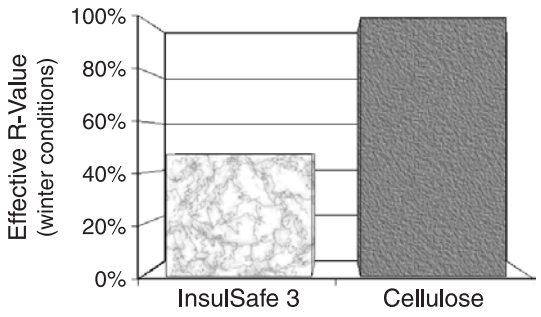
Complete Article

Vanishing R-Value

***Properly installed* fiberglass loses up to 50% of its labeled R-value under certain conditions.**

It is a little known fact that even *properly installed* loose-blown fiberglass attic insulation can lose up to 50% of its R-value under certain conditions.[1] Most people believe that when they pay for a certain R-value, they will receive that R-value. Sadly, this isn't true, even when the installer follows the manufacturer's recommendations to the letter.

Labelled vs. Effective R-Value



Half of the fiberglass I paid for is – gone?

Half the R-value of loose-blown fiberglass attic insulation can vanish! Let's emphasize that this is fiberglass insulation installed properly according to the manufacturer's recommended density and coverage. The problem is convection – air movement – through fiberglass that can decrease it's R-value by up to 50%.

This has been widely known for many years. As reported in *Home Energy* magazine, "Research in 1982 by Kenneth Wilkes and James Rucker at Owens-Corning Fiberglas first measured heat transport in fiberglass loose-fill attic insulation."[2] Tests at the University of Illinois[3] and Oak Ridge National Laboratories[4] confirmed the findings.

Unfortunately, although the results were reported in insulation publications and journals, few people outside the insulation industry knew. Most people still don't know - which is why fiberglass continues to be blown into millions of attics.

The problem is that air can move easily into and through fiberglass insulation, creating an efficient heat transfer mechanism – just what attic insulation is supposed to prevent (see graph below, right).

Large-scale tests in simulated attics conducted in 1991 by the University of Illinois[5] for CertainTeed showed a significant loss of R-value during cool periods, beginning at just 50° F. InsulSafe III® was blown 14 inches thick for an R-34 and yet at winter temperatures the effective R-value was as low as R-16. Similar results were confirmed at Oak Ridge National Laboratories with Owens-Corning Advanced Thermacube Plus.[6]

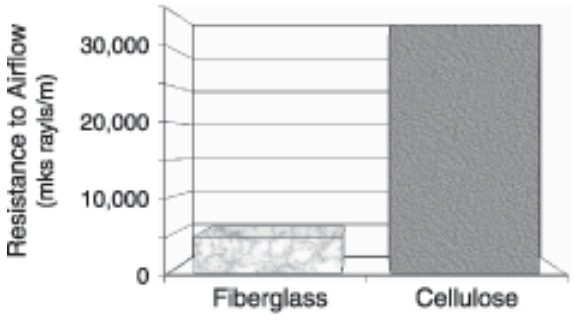
What About Cellulose?

Cellulose was subjected to the same tests. The results were solid and reassuring: "no problem"[7]. *Energy Design Update* reported, "The results showed no decline in R-value at cold temperatures." "In fact, the measured R-value of the [cellulose] insulation system actually increased slightly….The observed increase in R-value of cellulose at colder temperatures is expected….in the absence of air circulation within the material…"[8]

It's The Density

Why would blown fiberglass insulation allow such easy air convection? Because it's low density permits air flow. That is why common furnace filters are made from fiberglass. But the same property that makes fiberglass a good air filter makes it a poor insulator. An effective insulation material must help control air convection.

Resistance to Air Movement



Source: National Research Council Canada

Executive Summary

The Problem: Homeowners aren't getting the R-value they pay for.
What?: *Properly installed* blown fiberglass.
Who?: Everyone with blown fiberglass attic insulation.
Where?: Anywhere it is 50° F or cooler - the temperature at which convection in loose-fill fiberglass begins.[11] Also anywhere it is hot, because fiberglass becomes less effective on hot, sunny days.[12]

Getting What You Pay For

One building scientist illustrates lost R-value this way:

"Let's say you bought a furnace for your home and later discovered that on the coldest days it provided only 50% of its rated capacity! It performed worst when you need it most!"

"We wouldn't stand for such nonsense! And we shouldn't accept it in our insulation."

What if fiberglass was installed at a higher density? Compacting fiberglass can theoretically help reduce air convection, but at a steep cost. To guarantee against the possibility of convection, fiberglass manufacturers would have to increase the amount of material to the point where the product may no longer be competitive. In analyzing fiberglass, *Energy Design Update* noted that higher-density fiberglass is "less susceptible to air movement"[9] but that it takes "300% more fiberglass to get just 36% more R-value"[10].

But I Live In The South!

Southern dwellers may believe that this won't affect them much. But remember, the loss of R-value begins at just 50° F. Also, while homes in colder regions typically have vastly oversized furnaces that can probably keep the home warm despite the vanishing R-value (albeit with cold spots and high utility bills), homes in the south may have less heating "cushion" or they may depend on expensive backup electric resistance heat.

Even during the summer, air movement through insulation affects the comfort and energy efficiency of a home. In fact, movement of hot, moisture-laden air is probably a greater concern because of the danger it poses to the durability of the home. If hot, humid outdoor air can move easily through the insulation, it is likely to come in contact with cool surfaces near the interior of the home that may cause the moisture to condense and accmulate in the building assembly.

Bad News During Hot Weather, Too

Fiberglass has another serious problem: radiant heat transfer. Radiant heat is transferred via electromagnetic waves - this is how heat from the sun reaches the earth. When radiant heat from the sun strikes a roof, the roof deck re-radiates the heat down into the home. It is the insulation's job to significantly slow the radiant heat transfer and keep the heat from searing into the home and causing discomfort and high energy bills.

Owens-Corning researchers first measured the vanishing R-value in 1982.[2]

Tests have been conducted where radiant heat is applied to both fiberglass and cellulose while monitoring the temperature of the insulation. The results are immediate and striking: the fiberglass temperature increases rapidly, showing that the radiant heat penetrates easily. The cellulose temperature increases very slowly, showing that the denser, natural cellulose fibers are a much more effective barrier against the onslaught of the summer heat.

This Can't Still Happen - Can It?

Certainly CertainTeed pulled InsulSafe III® from the market. Surely Owens-Corning removed Advanced Thermacube Plus® from its product line. Didn't they? No. These products remained on the market despite undisputed evidence of their degraded performance. In fact, the new InsulSafe® 4 is now on the market - and it is even less dense than InsulSafe III® (see "The Fluffiest Gets Fluffier" on page 6).

(For more information on convection, including a complimentary copy of "R-Values and More", or for additional copies of this article, please call 800-627-7536.)

Sources

1 Energy Design Update, "Loose-Fill Fiberglass Versus Cellulose in Cold Attics", Oct. 1991.
2 Home Energy, "Convection Loss in Loose-Fill Attic Insulation", May/June 1992.
3 "Loose-Fill Fiberglass Versus Cellulose in Cold Attics".
4 "Convection Loss in Loose-Fill Attic Insulation".
5 "Loose-Fill Fiberglass Versus Cellulose in Cold Attics".
6 Energy Design Update, "Controversial Attic Insulation Performance Data to Be Released in April", Feb. 1991.
7 "Loose-Fill Fiberglass Versus Cellulose in Cold Attics".
8 Ibid.
9 Energy Design Update, "The Three Classes of Fiberglass Batts", March 1991.
10 Ibid.
11 "Loose-Fill Fiberglass Versus Cellulose in Cold Attics".
12 Brookhaven National Laboratory, "Assessment of Insulations".

Overblown?

"Overblows of 25% are common in the [fiberglass] industry, with some jobs overblown as much as 50%."[2] ***-former President of the Insulation Contractors Association of America***

The previous article, "Vanishing R-Value", revealed how *properly installed* fiberglass actually performs. But for years there have been rumblings of complaint from insulation contractors and even the Insulation Contractors Association of America (ICAA) that fiberglass insulation is often not properly installed. Specifically, they allege that overblowing is "common in every part of the U.S."[1]

Overblowing results when contractors blow in fiberglass to the depth listed on the bag label but cover a larger area than prescribed. The fiberglass is fluffed with too much air. *In these instances, the labeled R-value is not achieved because too little fiberglass has been installed.*

> **"The percentage by which fiberglass is overblown equates to the percentage loss in R-value".**
> **-Energy Design Update**

Put simply, overblowing is under-insulating. The customer doesn't receive the R-value they paid for.

Common Bird or Rare Species?

Of course, overblowing wouldn't be too much of a concern - if it was rare. But industry professionals believe that it is not.

"Overblows of 25% are common in the industry, with some jobs overblown as much as 50%", says Larry Helminiak, former president of the ICAA, who continues, "the Insulation Contractors Association of America has been engaged in a 15-year crusade to put an end to this."[2]

Mountain or Mole Hill?

What does an overblow of 25% to 50% mean to a homeowner or builder? According to the Energy Design Update, "The percentage by which fiberglass is overblown equates to the percentage loss in R-value"[3]. Stop and think about that. If a homeowner buys an R-38 blown fiberglass insulation job that is overblown by 25%, they actually receive an R-29! If it's overblown by 50%, they receive an R-19!

Tough to Spot

With most products, it is easy for the consumer to know if they received what they paid for. But not with fiberglass. Most homeowners are unlikely to poke around up in their attic. Even if they do, they won't spot overblowing because the fiberglass is probably at or near the proper depth, *but not the proper density*.

The only way to determine if insulation has been overblown is to take a sample of a known volume, weigh it, and calculate its density. This is obviously inconvenient, difficult, and almost never done. But after a decade and a half of pleading with the fiberglass manufacturers, the ICAA decided it was time to document what was really happening in fiberglass insulated attics across America.


Insulation Contractors Report

Independent Investigation Urges Adjustments in Attic

Interview with Douglas S. McCleery, P.E. MaGrann Associates' Prime Investigator

Sherlock Homes

Frustrated by the fiberglass industry's stonewalling, the Insulation Contractors Association of America "organized an independent investigation of attic coverage charts. MaGrann Associates, a building energy conservation and engineering firm, investigated and documented the installation of loose-fill fiberglass insulation in comparison with the attic coverage chart information printed on loose-fill insulation bag labels."[4]

> **The insulation crews *knew* they were being observed.**

"The purpose of the study was to

Executive Summary

The Problem: Homeowners receive 25% to 50% too little insulation.
What?: *Improperly installed* blown fiberglass.
Who?: 79% of homes with blown fiberglass attic insulation.
Where?: "Every part of the U.S.", according to the Insulation Contractors Association of America

observe professional insulation crews installing various loose-fill fiberglass insulation products and compare the field data to attic coverage chart information printed on the product label. The survey was designed to include a geographically varied sample of residential loose-fill fiberglass insulation installations in predominantly flat and open attics."[5]

The insulation crews knew they were being observed, so there is little doubt that if there is a built in bias in the investigation, it is in the favor of the contractors and the fiberglass insulation. Still, the results are shocking.

79% Failure

"In 79% of the homes we evaluated....the R-value was not achieved."[6] reported Douglas S. McCleery, P.E., the lead investigator for MaGrann Associates. Mr. McCleery explains fiberglass "bag label information remains invalid and will, more than likely, not deliver bag label R-value."[8]

Perhaps the most stunning finding of the investigation is that "installing loose-fill fiberglass insulation to the required minimum thickness printed on product bag labels is inadequate in 92% of the homes in this study."[9]

Remember, these crews knew they were being monitored!

Conclusions

Clearly, any builder or homeowner who chooses loose-fill fiberglass insulation is taking his chances - and they're not good! In 4 out of every 5 homes they can expect to receive an insufficient amount of insulation.

Hope!

Fortunately, there is an alternative! Builders and homeowners who choose cellulose insulation do not need to worry. According to Energy Design Update, cellulose is a "short fiber product that can't be fluffed."[10] Cellulose is the answer for homeowners and builders who want the R-value they pay for.

According to Energy Design Update, cellulose is a "short fiber product that can't be fluffed." Quite the opposite with fiberglass.

For more information on overblowing, a reprint of the article "Deceptive Labelling and Installation Plague Blown-In Fiberglass Jobs", or for additional copies of this article, please call 800-627-7536.

Double Trouble

The problems with blown fiberglass compound themselves.

If a homeowner purchases R-38 blown fiberglass insulation, on average his home will be overblown by 12% (based on the ICAA study). So he actually receives an installed R-33.

Now the convection problems are even more critical, because fiberglass *loses up to 50%* of its installed R-value during cold weather.

The final result: although the homeowner paid for R-38, at times he may have the equivalent of 50% of R-33. Only R-17!

Sources

1 Larry Helminiak, quoted in Energy Design Update, "Deceptive Labeling and Installation Plague Blown-In Fiberglass Jobs", May 1998.

2 Ibid.

3 Ibid.

4 Insulation Contractors Report, "Independent Investigation Urges Adjustments in Attic Coverage Charts", Jan./Feb. 1999.

5 Ibid.

6 Insulation Contractors Report, "Interview with Douglas S. McCleery, P.E. MaGrann Associates' Prime Investigator", Jan./Feb. 1999.

7 Ibid.

8 Ibid.

9 MaGrann Associates, "Comparative Information on Fiberglass Loose-Fill Thermal Insulation: Field Installation in Comparison with Manufacturer's Coverage Charts", Nov. 1998.

10 "Deceptive Labeling and Installation Plague Blown-In Fiberglass Jobs".

Fluffiest Gets Fluffier

CertainTeed Replaces The Notorious InsulSafe III With InsulSafe 4

Problems with blown fiberglass have been known since at least 1982.

The Current State

A new generation of fiberglass is available and there was hope that improvements might have been made to the new products.

It has long been known that properly installed fiberglass loses up to 50% of it's effectiveness under certain conditions[1] and that in 79% of homes it isn't even installed properly[2]. For years, insulation contractors have confirmed that fiberglass is very succeptible to fluffing (pumping the insulation full of air during installation), and have urged fiberglass manufacturers to improve the performance of their products.

The InsulSafe tests showed 15% average overblow with some tests as high as 40%.[6]

InsulSafe III - "The Fluffers' Delight"[3]

The national association of insulation contractors eventually became so frustrated with fiberglass manufacturers that they decided to conduct their own independent tests to determine the "fluffability" of fiberglass. The Insulation Contractors Association of America conducted over 800 tests, 234 of these were on InsulSafe.[4] The result? Confirmation that fiberglass is extremely susceptible to fluffing and losing it's R-value. In particular, InsulSafe III was found to be "the fluffers' delight".[5]

This vividly demonstrated that fiberglass - especially InsulSafe III - desperately needed to be improved if it was to deliver the performance promised to homeowners.

The Problem: Density

Fiberglass' problems are simple: too much air and too little (fiberglass) insulation. And they can be solved easily: install denser fiberglass that contains less air.

When there is too much air in the insulation, convective air currents can move freely through the fiberglass and can diminish the R-value by up to 50% under certain conditions.

Coverage Chart for CertainTeed InsulSafe III, known as "the fluffer's delight".[3]

New InsulSafe 4

CertainTeed has known for many years that InsulSafe III allows easy air movement and that higher density InsulSafe would help reduce the problem. Many in the industry hoped that CertainTeed would remedy the problem with an improved product. Years passed without any action. Finally, CertainTeed announced InsulSafe 4 and there was hope.

Coverage Chart for CertainTeed InsulSafe 4. which is actually less dense than the notorious InsulSafe III it replaces.

Even Worse Than InsulSafe III!

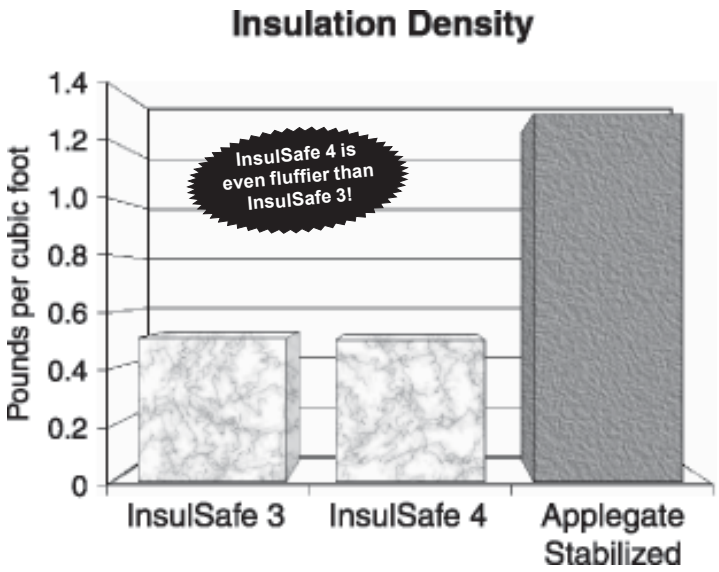
But insulation contractors, builders, and building scientists were dismayed to learn that *InsulSafe 4 is actually less dense than InsulSafe III!* How can this be? CertainTeed knows there is a problem. They know how to fix it. But they made it worse!

Who benefits from a fluffier InsulSafe? Not the homeowner. Not the builder. Only CertainTeed benefits by claiming that an attic can be insulated with even less fiberglass than before. In other words, they are saying that homeowners can get the same R-value by using even less of their product, when they know the performance wasn't there in the first place.

Executive Summary

The Problem:	Fiberglass is a low density product and easy to fluff - which degrades performance
What?:	Blown fiberglass, especially InsulSafe III
Opportunity:	New fiberglass products are on the market and could have been designed to be less fluffable
Result:	The new fiberglass is even less dense

Unwitting buyers who compare bids for various products at the same R-value will not realize that InsulSafe 4 may suffer the same significant loss of performance that plagued InsulSafe III.



The Solution: Cellulose Insulation

The graph to the right clearly shows why insulation products like Applegate Stabilized outperform blown fiberglass - they are much more dense and resist air movement.

The same research that uncovered the severe performance degradation of fiberglass was performed on cellulose. The result? Cellulose holds it own! In fact, cellulose "allows no convective patterns to develop" and its "R-values *increased*" during cold weather testing. Cellulose is "immune to the problem".

For new homes, the choice is clear: cellulose insulation. But what about existing homes insulated with loose-fill fiberglass? The researchers found another striking reaction. Covering the fiberglass with cellulose not only adds the R-value of additional insulation, it stops the convective air movement and helps restore the fiberglass' lost R-value!

For more information on getting the R-value you pay for or for additional copies of this article, please call: 800-627-7536.

Sources

[1] Energy Design Update, "Loose-Fill Fiberglass Versus Cellulose in Cold Attics", Oct. 1991.

[2] Insulation Contractors Report, "Independent Investigation Urges Adjustments in Attic Coverage Charts", Jan./Feb. 1999.

[3] Energy Design Update; "Blowing Wool 'Fluffability'"; Dec. 1991.

[4-6] Ibid.

InsulSafe III and 4 densities from CertainTeed Corp.
Applegate Stabilized density from Applegate Insulation.

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