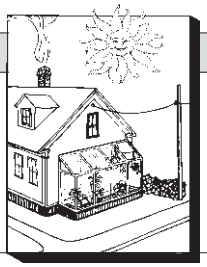
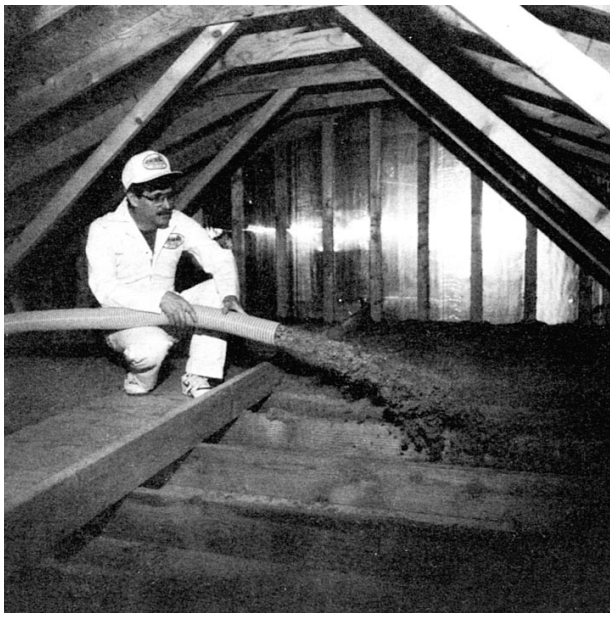


Cellulose Insulation—Why Not?

By Ned Nisson



Cellulose is a good option for attic insulation. Many common objections are unfounded.

Why don't more builders use cellulose insulation in attics? One obvious reason is that cellulose is generally less available than loose-fill fiberglass. Also, it's kind of dull looking compared to fluffy pink or silky white fiberglass. (After all, it is just a pile of gray-colored ground-up newspaper.) But cellulose has higher R-value per inch, better resistance to air leakage, and typically a lower price than fiberglass. Although I don't think either material is necessarily the "insulation of choice," I suspect that many builders are hesitant to use cellulose because of misinformation or unfounded concerns over material properties such as flammability, corrosiveness, and settling.

The most fantastic objection to cellulose I've ever heard was at a builders' workshop in Wisconsin last winter. One contractor in the audience was sincerely concerned that a house with cellulose attic insulation might explode violently if the ceiling collapsed during a fire. Living in dairy country, this contractor was well aware of the explosive hazard created by grain dust in silos. He simply extended that awareness to cellulose dust in houses.

In contrast to that extraordinary worry, a few of the other concerns over cellulose are a bit more common and should be addressed.

Figure 1. *The CISEP label assures that cellulose insulation has passed a full battery of tests based on random product sampling.*

Not a Fire Hazard

Can chemical additives really make ground-up newspaper permanently fire resistant? Yes, fire resistant, but not fireproof. (Wood isn't fireproof either.) Since 1979, the Consumer Product Safety Commission (CPSC) has required that all cellulose insulation pass two different ASTM tests to provide assurance that the material is resistant to flamespread and smoldering and will not constitute a fire hazard when installed in attics.

How permanent are the fire-retardant chemicals? Do they settle out or evaporate over time? Can they be washed out by moisture in the attic?

Concern over the permanency of the fire retardants was brought to a head a couple of years ago when cellulose taken from a group of houses in Palo Alto, Calif., failed the ASTM flammability tests. The Palo Alto incident prompted an extensive testing project at Oak Ridge National Laboratory which concluded that fire retardancy does not change over time.

ASTM tests and laboratory research aside, there simply is no documented field evidence of fires starting in or spread by cellulose insulation in attics. In fact, a comprehensive study in California performed in response to the Palo Alto incident found no correlation between house fires and type of attic insulation.

The Question of Corrosiveness

Another common concern about cellulose is that the fire retardant chemicals become corrosive if wetted and may attack metallic components such as nails, electrical boxes, and truss connector plates. There is one infamous (and unconfirmed) story about a cheese warehouse in Wisconsin which collapsed when the trusses gave way after cellulose supposedly corroded the connector plates.

This is a somewhat hazy area. The chemical fire retardants used by some cellulose manufacturers may be corrosive to metals. Most manufacturers will not disclose the exact formulation of their fire retardant additives for proprietary reasons, but all use some combination of either borate or sulfate salts. The suspected culprits with regard to corrosiveness are the sulfates—ammonium sulfate and aluminum sulfate. When wetted, those chemicals combine with water to form corrosive sulfuric acid.

Unfortunately, research studies in this area have been generally inconclusive and the most extensive experiments, conducted at Stevens Institute of Technology, showed conflicting results. Adding to the confusion is a common opinion among both researchers and manufacturers that the standard ASTM test for corrosiveness may not be appropriate.

While the jury is still out in the laboratory, the field evidence is still compelling. Except for the anecdotal report of the collapsed cheese warehouse in Wisconsin, there have been no documented cases of corrosion problems in attics or walls due to cellulose.

Read My Labels

Shopping for quality products is simply a matter of inspecting the bag labels. Although the CPSC requires that all cellulose insulation pass certain quality assurance tests, the regulation is poorly enforced. The best assurance of quality is either the UL or CISEP label on the bag (Figure 1).

A UL "classified" label means that the product is regularly sampled during unannounced visits to the factory and that it passes all the tests specified in ASTM Standard C739 for cellulose insulation. In addition to the flammability and corrosiveness tests, it must also pass tests for R-value, settled density, fungi resistance, moisture absorption, odor emission, and starch content.

The CISEP label indicates participation in the Cellulose Insulation Standards Enforcement Program, a voluntary certification program which includes slightly more rigorous sampling and testing than standard UL classification.

Cellulose Coverage Chart

		Maximum Net Coverage		Maximum Gross Coverage	
R-Value @ 75° mean temps	Min. Inch Thickness	Bags per 1,000 Sq. Ft.	Minimum Wt./Sq. Ft.	Exposed Framing 16" O.C.	Max Sq. Ft. per Bag
40	11.0	77.46	2.01	none	12.96
				2x6	15.56
32	8.8	61.97	1.61	none	16.08
				2x6	17.16
30	8.2	58.14	1.51	none	17.16
				2x6	18.36
24	6.6	46.48	1.21	none	21.48
				2x6	23.28
19	5.2	36.81	.95	none	27.21
				2x6	30.00
13	3.6	25.15	.65	none	39.72
				2x6	43.80

Figure 2. *Cellulose bag coverage charts are often misunderstood. The "minimum thickness" is actually the settled thickness and must be exceeded to obtain the indicated R-value. The most important spec to assure any specific R-value is the "bags per 1,000 square feet."*

R-Value and Settling

The R-value of blown cellulose is straightforward, but the "coverage chart" printed on the bag (Figure 2) is frequently misunderstood. The "minimum thickness" listed in the second column of the coverage chart is not the recommended installed thickness. It is the settled thickness. The installed thickness should be 10% to 20% greater than the listed "minimum thickness" to allow for settling over time.

The most important specification in the coverage chart is the number of bags per 1,000 square feet. With proper machine settings, it should be easy to blow in the specified number of bags at a thickness 10% to 20% above the bag label minimum. Initially, the R-value will be higher than specified, but it should drop to the desired level as the insulation settles.

Most cellulose insulation has an R-value between R-3.6 and R-3.8 per inch.

What About Cellulose for Walls?

Is cellulose a viable option for sidewall insulation in new construction? Maybe. Wet-spray application has been growing in popularity. But although the finished job looks good and works well, there are some nagging questions about whether the insulation will dry properly in some situations.

Dry installation would definitely be an attractive option were it not for one problem: When installed into a fully sheathed wall the finished job cannot be inspected.

One solution to the problem is to pre-drill installation holes in the exterior sheathing before the drywall goes up, making sure that every area in each stud cavity is covered. This approach sounds good but depends heavily on the skill and conscientiousness of the installer.

Another innovative solution uses the wall system shown in Figure 3. Dry cellulose is blown into the stud cavities through holes in the exterior sheathing before the interior drywall is installed. The installation can be visually inspected from the inside through the polyethylene vapor retarder which is held firmly in place by horizontal 2x2-inch strapping. The system has been successfully demonstrated in Canada, producing not only good insulation coverage, but an extremely airtight envelope as well. But again, it depends heavily on installer skill. Overfilling the cavity could easily bulge and possibly rupture the polyethylene.

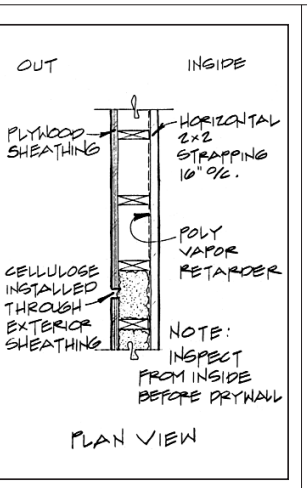


Figure 3. *One way to use dry cellulose loose-fill in new construction is to install it through holes in the exterior sheathing before the drywall is installed. This allows visual inspection of the installation. Horizontal 2x2 strapping holds the vapor retarder in place.*

At this point, cellulose accounts for less than 3% of the total insulation market. But with the "decade of the environment" upon us, consumers may take a stronger liking to it because it is made mostly of recycled paper. In fact, the U.S. Environmental Protection Agency passed a ruling, effective last February, stating that all projects using more than $10,000 in federal funds per year to purchase insulation must give preference to materials with recycled materials content. Public concern over possible health hazards associated with fiberglass, even though unconfirmed, may also create increased demand for alternatives such as cellulose. ■

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