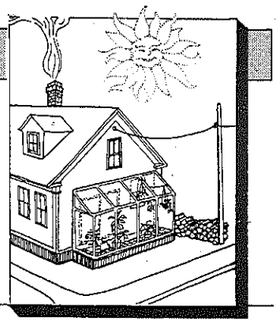
FOCUS ON ENERGY

Wrap Wars



by Alex Wilson

Dupont introduced Tyvek to the construction industry in 1979. It was a replacement for felt building paper, and it quickly proved itself to be vastly superior. Tyvek was stronger, lighter, thinner, easier to install, more durable, more resistant to air penetration, and less resistant to water-vapor transmission.

The purpose of an air barrier was to save energy by reducing infiltration while not trapping moisture in the walls. The idea caught on quickly. It caught on so well that since its introduction eight years ago, DuPont has had trouble keeping up with demand, and competitors have moved in.

Parsec was the first company to challenge DuPont. Parsec had been marketing Parsec Airtight White (really Tyvek under its own label) along with a patented tape for sealing edges and door/window penetrations. Then Parsec came out with its own product called Airtight Wrap. After that came Rufco-Wrap, Air Seal, and Barricade and yet another is expected out this year.

What are these new products? Are they any better or worse than Tyvek? How do their properties compare? Which should you choose?

I thought the task of comparing air barriers would be pretty simple when I started back in March. Just study their sales and technical literature and see how the products differ, right?

What I discovered, however, was a quagmire of conflicting numbers, and a raft of technical comparisons that were confusing at best and dishonest at worst. When read individually, each manufacturer's literature makes a compelling argument for its advantages over other products. When compared with competing literature, however, many of the claims lost all relevance. The findings I've been able to distill out of all this are presented below.

Three of the products—Airtight-Wrap, Rufco-Wrap, and Tu-Tuf Air Seal, are actually the same product, or very nearly identical. They are cross-laminated, high-density polyethylene films with microperforations (tiny holes) to allow moisture to escape. (Just before press time, I ran across the name of a product known as AirStop, which is reportedly another perforated film. For more information, you can write the manufacturer, listed with the others at the end of this article.) According to *Energy Design Update*, all of these are actually a material called Valeron, manufactured by Van Leer Plastics of Houston, Texas.

Tyvek is made of polyethylene, but in a different form. Thin polyethylene fibers are bonded into a mat, which DuPont calls "Spun-bonded Olefin," and has sold for years for use in airmail envelopes.

Barricade Building Wrap is the only non-polyethylene air barrier available. It is spun-bonded polypropylene (Barricade's literature calls it a "lightweight, non-woven material," and it took quite a bit of digging to find out what it actually is.)

Properties of all of these products are shown in Table 1. The most important properties are *air porosity* or resistance to air flow; *permeability* or the ability to let water vapor pass through; *strength*, measured either as tear resistance or bursting strength; and the resistance to (liquid) water penetration.

Unfortunately, not all the manufacturers provide numbers for all of these properties. Tear-resistance numbers are not given for Barricade, and air-porosity figures are not presented by the manufacturers of the perforated films, for example. In these cases, I have used values reported in a Tyvek brochure. (According to DuPont, the data was obtained from independent laboratory testing).

I discovered a quagmire of conflicting numbers.

Comparing the data was difficult for many reasons. In some cases the manufacturers were using different test methods. In others they were using different units of measure for comparison. In other cases, the test conditions differed, so that even identical products would yield different numbers. For example, the perforated films' water-vapor-transmission figures varied, though they are all Valeron. And while all three list their permeability in U.S. perms using the same methods (ASTM methods A and B), Airtight Wrap and Rufco-Wrap were tested facing one way and Tu-Tuf Air Seal was tested facing the opposite way—showing higher numbers. This seems to indicate that moisture vapor moves through these products more easily in one direction than the other, and that the perforated films should be installed with the writing facing out. (This is also best for advertising.)

The Parsec literature made a big deal of comparisons between its product and Tyvek, but Parsec's was taped at the joints when tested, and Tyvek was not. (Interestingly, the NAHB National Research Center compared air-leakage through a wall with tape alone to one with the tape plus Parsec Airtight-Wrap, and the tape alone won!)

What Does it All Mean?

Trying to wade through the technical literature from air-barrier manufacturers is educational—particularly if you are interested in how companies can mislead customers through their literature. But unless you study it very carefully and have the time to track down and interrogate company reps to fill in the gaps, you probably won't learn too much. To help out, I've summarized some of the key points of comparison between air-barrier products and offer a few opinions of my own.

Cost

In terms of cost, all of the wraps seem to be about on par, with the perforated films possibly a little less expensive. Most air barriers retail from between $110 and $130 for a 9x195-foot roll. The fluctuations in cost from one lumberyard to another seem to be greater

than the difference in cost from one product to another. It should be pointed out, however, that finding non-Tyvek air barriers may not be easy. I was unable to track down suggested retail prices on some of the products.

Durability

Regarding durability, the manufacturers of perforated film and spun-polyester air barriers claim that their products hold up better than Tyvek (as in presidential politics, everybody goes after the front runner). With tear resistance, the perforated films are a little stronger than Tyvek. (Barricade does not provide enough information to make a fair comparison.)

The spun-polyester mat which Barricade is made of is quite weak; you can tear it easily with your hands. But Barricade has reinforced strips at the center of the roll and along both edges for stapling, which, according to the manufacturer, make it stay on the wall better than Tyvek.

I haven't found any builders who have switched from Tyvek, so I don't have a direct comparison on installation. I have worked with Tyvek a lot, even leaving it on an unsided wall for a whole season (a bad practice), but my own feeling is that all five products should perform adequately in most climates if installed as recommended and sheathed within a reasonable period of time. In extremely windy locations, you might try either the perforated films or Barricade and see if they hold up better than Tyvek.

Permeability

As for permeability, Tyvek seems to be the best, though it is quite likely that all the others are more than adequate at preventing moisture build-up in walls. All of them are far more effective than 15-pound felt at allowing water vapor to escape.

Jack Mikuski, Barricade's Director of Technical Development, believes that only his product and Tyvek are acceptable in terms of permeability. He believes that users of perforated films, especially in humid climates, will begin seeing condensation problems in walls three to five years down the road. I don't agree, and I couldn't find any unbiased authorities that backed up Mikuski's concerns.

I believe that all of the products will prove adequate in allowing moisture to escape, though Tyvek and Barricade appear to be more permeable than the perforated films.

Air Porosity

DuPont and Barricade use the Gurley Porosity test, while the perforated-film manufacturers use the ASTM E-283 test. There is some controversy over which test is best. But I believe that Tyvek and, to a lesser extent, Barricade, are better at blocking air infiltration than the perforated films. However, the difference between taping the edges and window/door penetrations and not taping them is far more significant than the difference between one air barrier and another. This is a critical point: If you want a really tight house, use whatever air barrier you want, but tape or caulk the edges of the air barrier and the window and door frames.

Water Resistance

Resistance to (liquid) water penetration is another potentially important property. The numbers given in the table are measures of how high (in centimeters) a column of water the material can support before water leaks through. Whether or not this is also a good measure of rain penetration is being questioned by the perforated-film manufacturers, but it seems reasonable to me.

Tyvek wins on this test by a considerable margin. None of the other barriers were as water resistant as 15-lb building felt. Tyvek's ability to be the most permeable to water vapor and the least permeable to liquid water is rather remarkable, especially since Tyvek has been around the longest. One would expect the newer products to offer improved performance on properties such as this, but they don't.

So Which is Best?

Based on the information currently available, I believe all of the air barrier products on the market will perform adequately, indeed far better than building felt. That said, I guess I'll stick with Tyvek. I've used it for a long time. I've been satisfied with it. And I haven't found any product that is any better—in fact, most of the newer products are not quite as good by most measures of performance.

In a way I regret drawing this conclusion, especially after wading through the shoddy technical literature provided by DuPont. I like to see new products, and I like to support the underdog. But I also operate under the principle, "if it ain't broke, don't fix it."

If you've had experience with more than one air barrier, let me (and other readers) know with a quick letter to NEB. Tell us what you think, and let us know if you've had any problems. ■

Alex Wilson is a technical writer based in Brattleboro, Vermont who specializes in energy and building issues.

AIR BARRIER COMPARISON

	Tyvek housewrap DuPont Company	Airtight-Wrap Parsec, Inc.	Rufco-Wrap Raven Industries	Tu-Tuf Air Seal STO-COTE Products Inc.	Barricade Building Wrap/Simplex Products Division	15-lb Building Felt
Type of Product	Spun-bonded polyethylene	Micro-perforated, cross-laminated, high-density polyethylene film	Micro-perforated, cross-laminated, high-density polyethylene film	Micro-perforated, cross-laminated, high-density polyethylene film	Spun-bonded polyester	Conventional 15-lb. Asphalt-impregnated Felt Paper
Thickness (mils)	6.1	3.0	3.0	3.4	6.0	37.4
Weight (lbs/1000 ft²)	8.81	12.7	12.7	12	9.37	136.1
Available Dimensions	9 x 195' 3 x 160'	9 x 195' 4½ x 300'	9 x 195' 4½ x 195'	9 x 195' 4½ x 195'	3 x 195' 4½ x 195' 8 x 195' 9 x 195'	3' rolls
Tensile Strength - lbs (ASTM D-1682)						
Length	43.2	57.2	57.2	57.2	N.A.	N.A.
Width	64.0	60.4	60.4	60.4		
Tear Resistance - lbs						
Length (ASTM D-827)	32.5	[36]	[36]	[36]	[5.2]	[24.8]
Width	24.8	[36]	[36]	[36]	[14.6]	[20.7]
Moisture Vapor Transmission (Perms) (ASTM E-96)						
Method A	94	15.2 [A]	15.2 [A]	21.8	25.4	[5.6]
Method B	103	17.3 [A]	17.3 [A]	26.4	47.9	
Air Porosity - seconds						
Gurley Pososity TAPPI-T460	17.6	[8.7]	[8.7]	[8.7]	10.5	[14.3]
Water Resistance - cm AATCC Method 127	99.3	11.0	11.0	11.0	[35.8]	[41.8]

Notes Values in brackets obtained from DuPont technical literature on Tyvek

All other values obtained from company literature or personal communication with company

[A] Values low because film installed backwards (worst-case situation)

For more information:

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DiversiFoam Products
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800/752-4306
612/633-6770

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Simplex Products Division
Anthony Industries
P.O. Box 10
Adrian, MI 49221-0010
517/263-8881

Parsec Airtight Wrap
Parsec, Inc.
P.O. Box 38527
Dallas, TX 75238
800/441-0324

Rufco-Wrap
Raven Industries, Inc.
P.O. Box 1007
Sioux Falls, SD 57117-1007
800/227-2836
605/336-2750

Tu-Tuf
Sto-Cote Products, Inc.
Drawer 310
Richmond, IL 60071
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Textile Fibers Dept.
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Wilmington, DE 19898
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