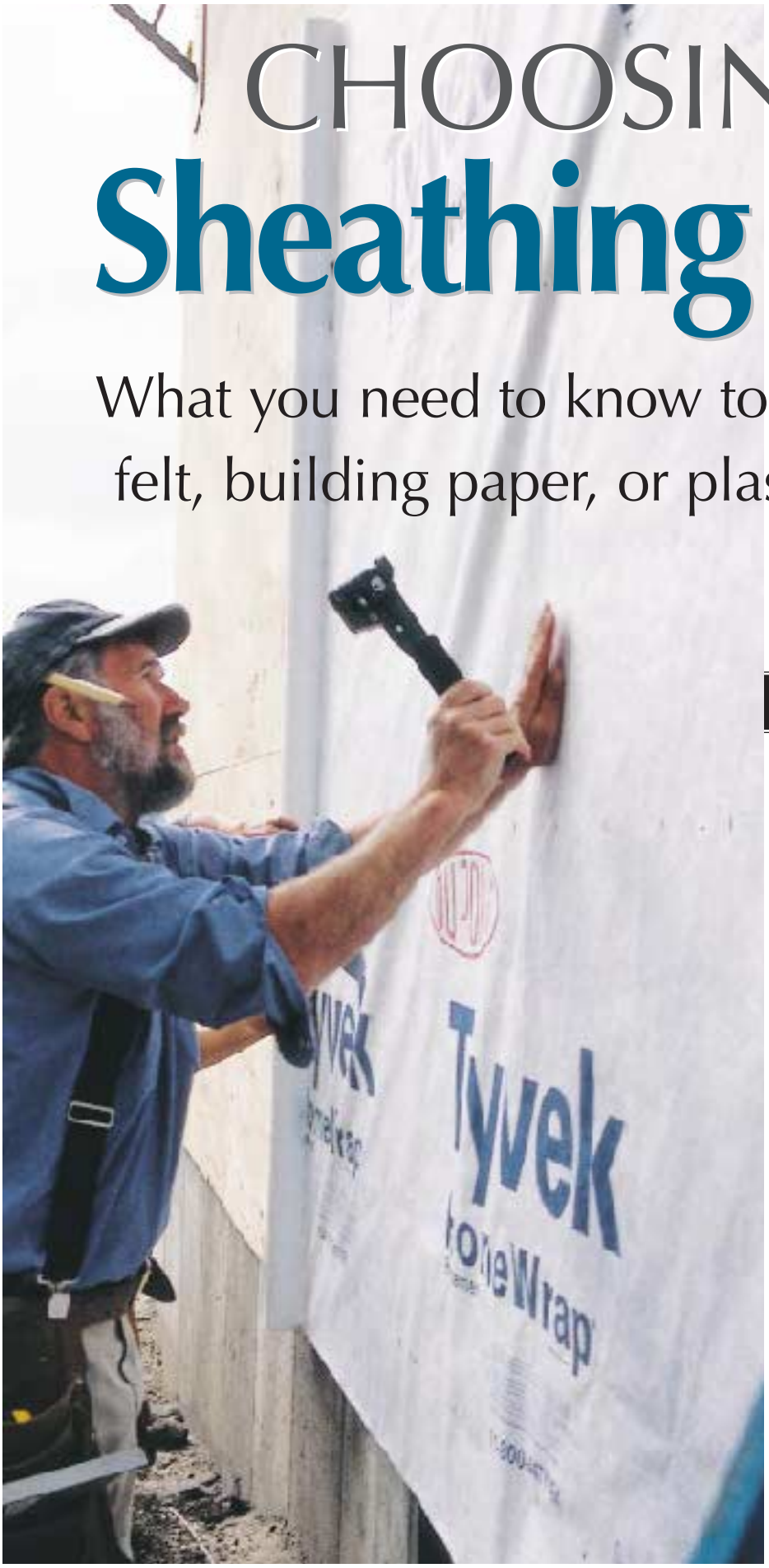
CHOOSING A Sheathing Wrap

What you need to know to choose asphalt felt, building paper, or plastic housewrap



by Martin Holladay

What should you be using —- asphalt felt, building paper, or housewrap? There is no shortage of opinions when it comes to these products, which I'll refer to as sheathing wraps in this article. (They're also called weather-resistive barriers.) Builders following the sheathing wrap debates may feel like they're being whipsawed back and forth, as manufacturers and building science experts announce the latest claims or laboratory findings.

Some professionals who have made noble attempts to clarify the muddy waters appear to be failing. In an effort to make it easier to compare the products, an ASTM task force has been working for the last two years with scientists and manufacturers' representatives in hopes of developing common standards and test procedures for plastic housewrap, asphalt felt, and building paper. "We hoped we could write a specification, with tests to measure the performance of any of these products, but it's just not going to happen," says Thomas Butt, an architect from Richmond, Calif., who chairs the committee. "There are a lot of competing interests from some very economically powerful manufacturers. There is a lot of political pressure for something not to happen

Figure 1. Studies have shown that, on average, houses without a wrap under the siding are more likely to have damp sheathing than houses with felt, kraft paper, or housewrap.

STEPHEN SMULSKI

Figure 2. Highly permeable housewraps allow water vapor to escape to the exterior, helping walls to dry. However, in some circumstances, they can also allow water vapor to be driven inward, wetting the sheathing. Sun shining on damp wood siding can drive water vapor through a housewrap into the wall. These photos show water stains on the housewrap (top) and the sheathing (bottom) of a house with clapboard siding that had not been back-primed. The back side of the sheathing was dry, indicating that the moisture had traveled from the outside in. Although none of the sheathing on this house had rot, the siding paint peeled prematurely.

that would make one product look better than another," he says.

Code Requirements

In many areas, building codes do not require any sheathing wrap at all, except under stucco, brick, and stone. "The codes are all pretty murky," Butt says. BOCA, however, requires the use of #15 felt under all types of siding. In areas where the model energy code is in force, a vapor-permeable housewrap is required, unless special measures are employed to reduce air infiltration.

Where codes do not require sheathing wrap, some builders may be tempted to omit it (see Figure 1). However, studies have shown that houses without sheathing wrap tend to have damp walls. "Back in the late '80s, I did a study for the U.S. Dept of Energy," says George Tsongas, a professor of mechanical engineering at Portland State University and a consultant on moisture problems. "We opened up 86 homes in Washington State and Montana and took moisture measurements of the wall cavities. We found that in homes with no building paper or housewrap, there was a higher sheathing moisture content. In general, the use of a building paper or housewrap does tend to keep the sheathing drier."

What a Wrap Needs to Do

Most moisture problems in walls are water-entry problems, not vapor condensation problems, as *JLC* has reported for several years (see "Making Walls Watertight," 12/95; "Housewrap Versus Felt," 11/98; "Wrapping the House," 6/00). Sheathing wrap needs to resist any liquid water that gets behind the siding. In theory, at least, a sheathing wrap should also be a drainage plane. But in practice, most sheathing wraps can't drain. "When the siding is nailed on the housewrap, there is no theoretical provision for drainage," says Eric Burnett, director of the Pennsylvania Housing Research Center at Pennsylvania State University.

Like Burnett, George Tsongas doubts that sheathing wrap, as typically installed, permits much drainage. "People think of housewrap or building

Wrinkled Wraps

Recently, at least four wrinkled or corrugated sheathing wraps have been introduced. These products were developed to meet the need for a sheathing wrap that can drain, even when siding is installed directly against the wrap. All four products include wrinkles or vertical corrugations to provide gaps that allow moisture to drain.

Two of the products are draining versions of Grade D paper, and two are versions of plastic housewrap. Since these products are relatively new, there is still some uncertainty about their long-term performance. In order to evaluate these products, one question arises: How high does a corrugation need to be in order for water to drain? "An air gap does not have be 3/4 inch," says Mark Bomberg, editor of *Journal of Thermal Envelope and Building Science*. "I am quite happy with an air gap that is less than 1/8 inch. It does not ventilate, but it allows local drainage."

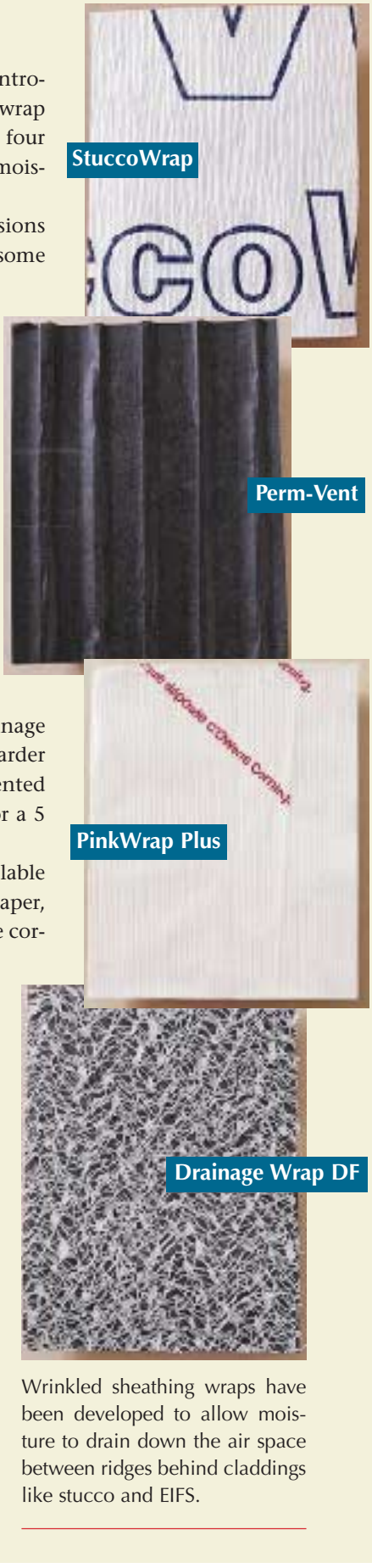
Although experts don't agree on a minimum corrugation height, many have said that the new wrinkled sheathing wraps look promising. If these products perform as hoped, they may allow builders to provide drainage behind many types of siding, including wood siding and stucco, without installing a rain screen with vertical strapping.

DuPont's StuccoWrap. StuccoWrap is a wrinkled version of Tyvek, intended for use behind stucco or EIFS. The wrinkles are quite shallow — less than 20 thousands of an inch high. DuPont's product literature claims, "When the new product is sandwiched between sheathing and insulating foam board [in an EIFS wall], grooves designed into StuccoWrap create a drainage path for water or moisture to escape." Because StuccoWrap is wrinkled, it is harder to tape than conventional Tyvek. Reportedly, some builders have experimented with using StuccoWrap behind wood siding. StuccoWrap costs about $120 for a 5 ft. by 200 ft. roll, or 12 cents per square foot.

Hal Industries' Perm-Vent. At this point, Hal Industries' Perm-Vent is available only in Canada. It consists of two joined plies of asphalt-saturated building paper, one of which is corrugated. According to the manufacturer's information, "The corrugations provide vertical channels for moisture drainage and for air movement beneath the external cladding. Corrugations are 3/16 inch in depth, and are rigid enough to resist crushing when the cladding is applied." The price in Canada is said to be "competitive with Tyvek."

Owens Corning's PinkWrap Plus. PinkWrap Plus is a corrugated housewrap manufactured by Formosa Plastics and distributed by Owens Corning. Its corrugations are extremely shallow, however — even more shallow than those of StuccoWrap — raising questions as to whether any actual drainage can occur. Owens Corning claims that "the rough, corrugated surface provides better drainage than smooth-surface housewraps that can trap moisture in wall assemblies." PinkWrap Plus costs about 6 cents per square foot.

Senergy's Drainage Wrap DF. Drainage Wrap DF is a 60-minute building paper bonded to a three-dimensional tangled net of plastic filaments. The manufacturer claims that it "provides a clear drainage path that quickly evacuates incidental water should it find its way behind the exterior wall cladding." Bill Egan, vice president of engineering at Senergy, says, "The product is intended for use behind EIFS. However, we anticipate the concept to be used with other mechanically attached claddings." Drainage Wrap DF comes in rolls measuring 40 inches by 125 feet and costs between 40 and 50 cents per square foot.



Wrinkled sheathing wraps have been developed to allow moisture to drain down the air space between ridges behind claddings like stucco and EIFS.

paper as a drainage plane," says Tsongas. "But drainage is not possible with a siding that sits flush up against the building paper." Tsongas notes that clapboard, unlike plywood siding or shiplap siding (which are nailed flat to the sheathing), can permit some drainage between courses.

In order to function as a drainage plane, a sheathing wrap needs an air gap between the wrap and the siding. Partly in response to the EIFS crisis, at least four manufacturers have responded to the drainage-plane problem by developing wrinkled sheathing wraps that are said to be self-draining (see "Wrinkled Wraps," page 3).

How Much Does It Weigh?

		Weight per 100 Square Feet
Plastic Housewraps		1.2 to 1.9 lbs.
Grade D Building Papers	20-minute Grade D	3.3 lbs.
	30-minute Grade D	3.7 to 3.9 lbs.
	60-minute Grade D	5.6 to 6.4 lbs.
#15 Asphalt Felts	Unrated (non-ASTM) #15	7.6 to 8.8 lbs.
	ASTM D 4869 #15	8.0 to 9.7 lbs.
	ASTM D 226 #15 (Type 1)	11.5 to 12. 5 lbs.
# 30 Asphalt Felts	Unrated (non-ASTM) #30	15.7 to 19.9 lbs.
	ASTM D 226 #30 (Type 2)	26.4 to 27.3 lbs.

Controlling vapor diffusion. If a wall cavity gets wet, either because of leaking flashing or condensing water vapor, a sheathing wrap should be vapor permeable so that the wall can dry to the exterior (see "Permeance & Permeability"). Yet the ideal sheathing wrap would prevent water vapor from being driven into a wall by vapor pressure. Unfortunately, no one has yet developed a material that has "one-way permeance," allowing vapor out but not in. High vapor permeance is probably a desirable feature in a sheathing wrap during cold winter weather, but may be undesirable during hot, humid weather, when the action of the sun on saturated siding can cause vapor to be driven into a wall (Figure 2, page 80).

Recent research shows that if a house with absorbent siding is air-conditioned, solar-driven inward vapor movement can cause problems. Types of siding that can act as water reservoirs include brick, stucco, fiber-cement, and wood. "Inward vapor drive occurs everywhere, in almost any climate," says Mark Bomberg, a building science researcher and editor of *Journal of Thermal Envelope and Building Science*. Consultant Joe Lstiburek of Building Science Corp. in Westford, Mass., agrees. "I'm seeing a lot of problems with reservoir claddings — brick, cedar shingles nailed on felt without an air space, and stucco without an air space," says Lstiburek. "In all of these cases, the problems are caused by the solar-driven vapor phenomenon."

The problems are not restricted to the Deep South. "There is not much doubt that solar-driven vapor can damage walls," says John Straube, professor of civil engineering at the University of Waterloo in Ontario, Canada. "I have opened buildings and seen it. It can be a problem almost anywhere where there is air conditioning, including Toronto, Ontario."

Sheathings that are highly vapor permeable, like fiberboard and gypsum, are much more vulnerable to inward vapor-drive problems than sheathings that are relatively vapor impermeable, like OSB, plywood, or rigid foam. Back-priming wood or fiber-cement siding reduces problems from inward vapor drives. Finally, a simple way to avoid inward vapor drive problems is to choose a siding that can't act as a water reservoir, like vinyl siding.

Does permeance matter? Surprisingly, some experts feel that the need for high vapor permeance in sheathing wrap has been overstated. "I think vapor permeance is totally irrelevant," says Wesley Page, a retired waterproofing consultant from Novato, Calif. "I have never seen a building where water vapor was the cause of failure, but I've seen hundreds where liquid water was." Lstiburek also downplays the importance of permeance in a sheathing wrap, saying it "matters very little."

Most types of sheathing, including OSB and plywood, are not very vapor permeable, at least when dry. "Asphalt felt is rated at 5 perms, and the housewraps have ratings that range from 5 to 50," says Brad Allshouse, vice-president of marketing for Simplex Products, a housewrap manufacturer. "But commonly used sheathings have a permeance rating of less than 1. So the permeance of the housewrap is a moot point. A housewrap with a perm rating more than the code minimum of 5 is overkill," Allshouse says.

Controlling air flow. In the days of board sheathing, felt or paper was used under siding to slow wind down. Now that plywood and OSB are standard, the role of a sheathing wrap in reducing air infiltration is much less important, in spite of the energy claims made by plastic housewrap manufacturers. These days, most air leaks occur in ceilings and floors, not walls, so they are best addressed from inside a building, using gaskets and caulk.

Asphalt Felt

There are three basic types of sheathing wrap: asphalt felt, Grade D building paper, and plastic housewrap. Asphalt felt, which has been around for over a

hundred years, was originally a true cloth felt. "A long time ago, they used rag felt, which was cotton," says Dodie Webster, technical services manager at Tamko Roofing in Joplin, Mo., a manufacturer of asphalt felt. "But we can't get cotton rags any more." Since present-day asphalt felt is a paper product, the term "felt" is somewhat of a misnomer. "Unsaturated felt is basically composed of recycled corrugated papers mixed with sawdust," Webster says.

Over the years, asphalt felt has also gotten lighter. "In the old days, it used to weigh 15 pounds per 100 square feet, but not anymore," says Allen Snyder, product engineer at CertainTeed, a manufacturer of asphalt felt. The main reason manufacturers make lightweight felts is because they're cheaper. "The whole issue comes down to price," says Ed Todd, technical manager at Atlas Roofing, an asphalt felt manufacturer in Atlanta. "This is a price-sensitive product," Todd says. Manufacturers now call their product "number 15" felt instead of 15-pound felt, and it weighs anywhere from 7 to 14 pounds per square.

ASTM has established two standards for asphalt felt. The less stringent standard is ASTM D 4869, which requires Type 1 (#15) felt to weigh at least 8 pounds per 100 square feet. The more rigorous standard, ASTM D 226, requires a minimum weight of 11.5 pounds per square.

Most lumberyards stock only lightweight asphalt felt with no ASTM rating. "We sell a lot of the lightweight felts, the non-ASTM #15," says Webster. "It is probably our biggest seller." This type of #15 felt sometimes weighs only 7.6 pounds per square. There are a few regions where ASTM-rated felt is widely available, however, because of code requirements. "The most stringent felt market in the U.S. is Florida," says Ed Todd, of Atlas Roofing. "In Florida, at a minimum you must have 'ASTM D 4869' on the wrappers."

Asphalt felt is also available in a heavier version, commonly called 30-pound felt. This #30 felt is available in both the unrated grades and the ASTM-rated

Permeance & Permeability: What's the Difference?

When it comes to permeability, wading into the technical definitions is not for the faint of heart. People often speak loosely about whether a material is breathable, or permeable to water vapor. In a technical discussion, however, the terms "permeance" and "permeability" must be used carefully. Engineers have very specific definitions for three different terms — water vapor transmission, water vapor permeance, and water vapor permeability.

The rate of water vapor transmission (WVT) is the rate at which a certain weight of water vapor passes through a certain area of a material, under certain test conditions. It is measured in grams per hour per square meter (metric units) or grains per hour per square foot (English units).

Water vapor permeance is the rate of water vapor transmission *induced by a difference in vapor pressure* through a certain area of material. The permeance of 3 inches of polystyrene insulation is different from the permeance of 1 inch of polystyrene insulation. Permeance is measured in grams per Pascal per second per meter squared (metric units) or perms (English units). One perm is equal to 1 grain of water vapor per hour per square foot per inch of mercury vapor pressure difference.

Water vapor permeability is the rate of water vapor transmission *induced by a difference in vapor pressure* through a certain area of material, *per unit of thickness*. Water vapor permeability is a property of a material. For example, the permeability of polystyrene insulation is a certain value, independent of whether the polystyrene piece in question is 1 inch thick or 3 inches thick. Permeability is measured in grams per Pascal per second per meter (metric units) or perm inches (English units).

When it comes to sheathing wraps, the most important of these three terms is permeance. It may be useful to know the permeance of a certain type of housewrap in order to compare it to the permeance, say, of #15 asphalt felt. Unfortunately, comparisons are complicated by the fact that there are at least two common testing procedures for determining permeance under ASTM standard E 96 — procedure A (the dry-cup test) and procedure B (the wet-cup test) — and these permeance ratings obtained by these two test procedures are not comparable.

Complicating the issue further, the specification for Grade D building paper, federal specification UU-B-790 (February 5, 1968), is based on a test for water vapor transmission, not permeance. The specification requires a minimum WVT of 35 grams per square meter per 24 hours. Unfortunately, the specification uses outdated terminology, referring to water vapor transmission as "water vapor permeability."

Since the test procedure for determining water vapor transmission is different from either of the test procedures for permeance, knowing just the water-vapor transmission rate is insufficient to determine permeance. But in general terms, there is a direct correlation between water vapor transmission and permeance. The permeance of a material in perms is equal to approximately 0.144 times the water vapor transmission in grams per square meter per 24 hours. Therefore, the specification for Grade D paper is equivalent to a permeance value of about 5.04 perms. Because permeance can be calculated by several methods, the actual ratio between permeance and water vapor transmission varies from about 0.142 to 0.165.

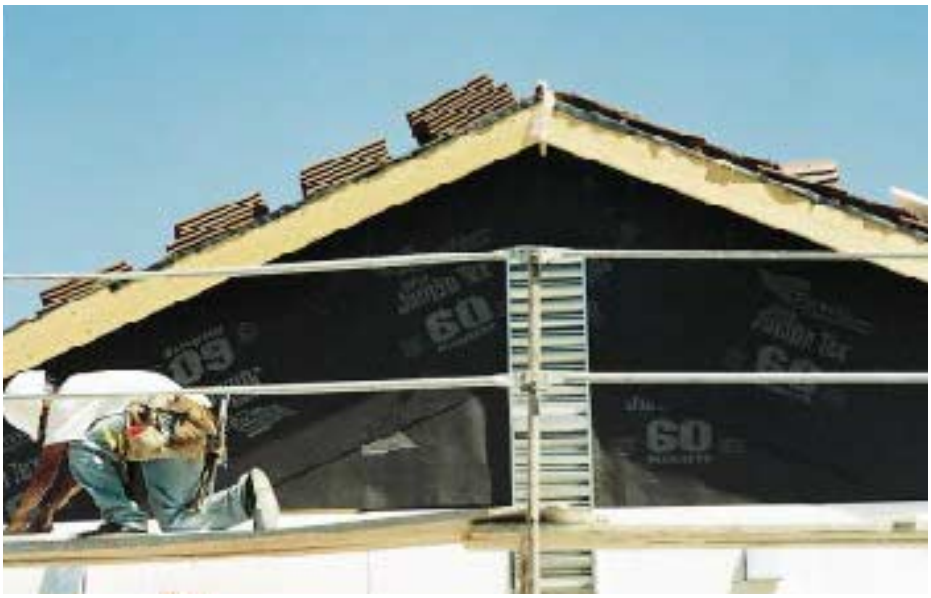


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Figure 3. Grade D building paper is similar to asphalt felt, but lighter. It is made from virgin wood pulp, while asphalt felt is made from recycled cardboard.

Figure 4. If Grade D building paper stays wet without the ability to dry out, it can rot. Rotting Grade D paper changes color from black to light brown. Here, flashing errors contributed to the failure of Grade D paper installed under stucco.

WESLEY PAGE

felts. ASTM standards refer to #30 felt as Type 2. The lightest unrated #30 asphalt felt is still heavier than the heaviest ASTM-rated #15 felt (see "How Much Does It Weigh?" page 4), making it a logical choice for concerned builders.

Asphalt felt has a permeance of only 5 perms when dry, but a much higher rating of 60 perms when wet. Fans of felt note one of its advantages over housewrap: If water gets behind felt — either due to a flashing leak or condensation from solar-driven moisture — the felt can soak up the liquid water and gradually dry to the exterior. Plastic housewrap is not absorbent; any water trapped on the wrong side of plastic housewrap can only pass through to the exterior as vapor.

Grade D Building Paper

Builders in the western U.S., especially in areas where stucco is common, are familiar with Grade D building paper. However, in many areas of the country, including most of the East Coast, Grade D building paper is virtually unknown. Although Grade D paper is most often used under stucco, manufacturers point out that it can be used under any kind of siding.

Grade D building paper is an asphalt-impregnated kraft paper that looks like a lightweight asphalt felt (Figure 3). The term "Grade D" originated with federal specification UU-B-790, which dates back to 1968. The Uniform Building Code has a standard for kraft "waterproof" building paper, standard 14-1, which is based on the federal specification, and it is this UBC reference that established the Grade D specification in residential construction. The specification requires that Grade D paper have a minimum water-resistance rating of 10 minutes, and a minimum water vapor transmission rate that corresponds to a permeance rating of about 5 perms.

The water-resistance rating is based on a test, ASTM D 779, usually called the "boat test." If a piece of building paper or housewrap folded into a boat can float in a dish of water and withstand soaking for at least 10 minutes, it

meets the water-resistance requirements of the Grade D specification. Many Grade D manufacturers choose to exceed the minimum water-resistance rating, and produce 20-minute, 30-minute, or 60-minute papers. Although the UBC calls these Grade D papers "waterproof," even a 60-minute paper is, at best, only water-resistant.

Like asphalt felt, Grade D building paper is an asphalt-saturated paper. It differs from asphalt felt in two ways: It uses a lighter-weight paper, and the paper is made from new paper pulp rather than recycled cardboard. "Grade D paper is a kraft paper, made with virgin fiber," says Bob Woykin, sales manager at Hal Industries, a manufacturer of Grade D paper in Surrey, B.C. "Roofing felt is thicker than Grade D paper and is 100 percent recycled. The asphalt used to saturate the Grade D papers and the roofing felts is about the same," he says.

Since Grade D paper weighs less than asphalt felt, it also costs less. Manufacturers of Grade D paper like to point out that because it is lighter, it is easier to crease and install in inside corners. "There can be problems with the installation of felts on walls," says Frank Nunes, an officer with the International Institute of Lath and Plaster. "There is often cracking and tearing at the corners."

Some experts note, however, that the added thickness of #15 felt is one of its virtues. If Grade D paper gets wet and stays wet, it can rot (Figure 4). Although asphalt felt can also rot, it holds up better in extreme conditions, because it is heavier. "The market is shifting to using two layers of 30-minute paper," says Woykin. Because a single layer of Grade D paper may not hold up well to repeated wetting, the use of two layers of building paper has become a standard detail under three-coat stucco in many areas.

According to Mark Bomberg, the fact that both paper and felt tend to wrinkle is an advantage over plastic housewrap, since wrinkling can improve drainage. "With two layers of wrinkled paper under stucco, traditionally, we had a degree of local drainage," says Bomberg. "If you can spread the local moisture content, then the vapor can dry."

But in areas that get a lot of rain, even two layers of building paper can be overcome by regular soakings. "I've seen building paper rot, even if you have two layers," says Joe Lstiburek. "Grade D paper rots faster than roofing felt. The best paper for a wall is a roofing felt." Wesley Page agrees that Grade D paper cannot withstand repeated wetting. "Grade D building paper will fail completely if it gets wet," says Page. "It just disintegrates and disappears."

Those who have successfully used layers of Grade D paper under stucco, however, feel that building paper is being blamed for moisture intrusion problems that are best addressed with proper flashing details. All experts agree that any paper or felt will be less likely to rot if it is installed behind an air space that permits drainage.

Plastic Housewrap

Plastic housewraps are made from one of several available polyolefin fabrics, generally either polyethylene or polypropylene. Because there is no standard method for measuring vapor permeance, it is difficult to compare the permeance ratings of housewraps across brands. In general, housewraps have permeance values that range from 6 to 59 (see "Vapor Permeance of Plastic Housewraps").

Vapor Permeance of Plastic Housewraps

Type	Brand	Perms	Test Method
Perforated Housewraps	AmoWrap (PinkWrap) from Pactiv	15	A
	AmoWrap-VW from Pactiv	15	A
	Barricade from Simplex	9	A
	Energy-Wrap from Fiber-Lam	9.7	B
	FirstWrap from FirstLine Corp.	47.5	
	PinkWrap Plus from Owens Corning	34.7	A
	Typar from Reemay	22	A
	Valeron from Van Leer Flexibles (Johns Manville Pro-Wrap, Raven Industries Rufco-Wrap, Weyerhaeuser Choice Wrap)	9	A
Non-perforated Housewraps	AmoWrap Ultra from Pactiv	48	A
	R-Wrap from Simplex	59	A
	Tuff Weather Wrap from Celotex	6	B
	Tyvek from DuPont	58	B

These vapor permeance ratings, provided by the manufacturers, are based on one of two test methods described under ASTM standard E 96, method A and method B. Because the standard warns that "agreement should not be expected between results obtained by different methods," the permeance values in this table are not strictly comparable. However, these numbers do help to differentiate low-permeance housewraps like Barricade, Tuff Weather Wrap, and Valeron from high-permeance housewraps like R-Wrap and Tyvek.

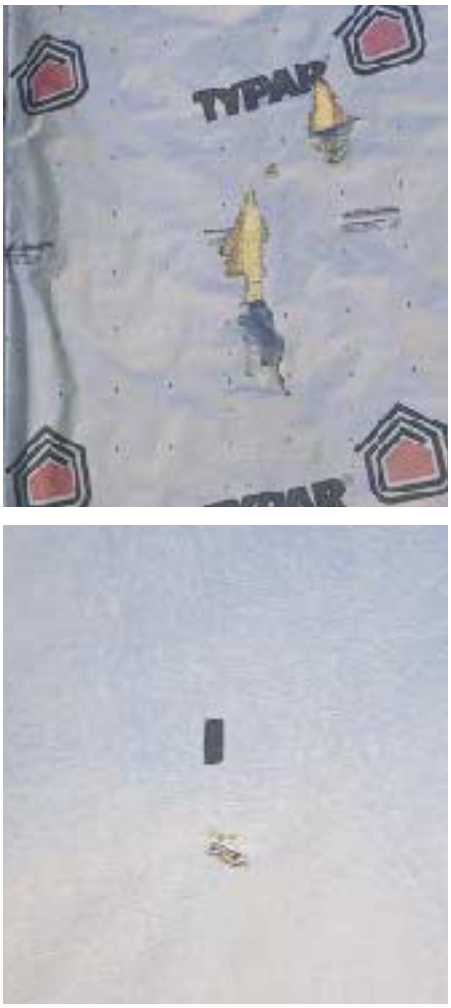

Figure 5. Damage from ladders (top) and tears at staples (above) can undermine an otherwise careful housewrap installation.

Housewraps can be divided into two categories, perforated and non-perforated. Non-perforated housewraps allow water vapor to pass between the fibers of the plastic fabric, while perforated housewraps are made from vapor-tight plastic films that are needle-punched with small holes to allow the passage of water vapor. Laboratory tests have shown that the non-perforated housewraps resist liquid water better than the perforated housewraps (see *Notebook*, 6/97 and 2/00).

Some surfactants, which are chemical extractives that can leach out of wet cedar or redwood siding, have the potential to degrade a plastic housewrap's water resistance. However, surfactants can also degrade asphalt felt. "There have been problems with cedar and redwood sidings leaching wood sugars or surfactants," says Lstiburek. "This has occurred with all the plastic housewraps and the felts. Everything is affected. But the plastics seem to have more of a problem than the felts," he says. Brad Allshouse from Simplex agrees that surfactants can affect any sheathing wrap. "The installer should back-prime the siding, so the chemicals can't leach out," he says.

Plastic housewraps are rarely used under stucco. "You can't stick stucco to any plastic housewrap, because if the stucco is in direct contact with a housewrap, the housewrap loses its water repellency," says Lstiburek. Frank Nunes has also seen problems using housewrap behind stucco. "Some housewraps are very reactive to surfactants in the cement plaster," says Nunes. "In one case I observed, the resins of the housewrap dissolved, leaving the fibers. It looked like a silkscreen — there was no material left."

Choosing a housewrap. If a wall is well designed and well flashed, any of the plastic housewraps will do the job. "The design of the wall is more important than the choice of housewrap," says John Straube. If you're concerned about inward vapor drives, you may want to avoid a high-permeance housewrap, especially when using a siding material that can hold water, like brick, stucco, or wood. The plastic housewraps with permeance ratings at the lower end of the range — from 5 to 15 — are comparable in permeance to asphalt felt.

Since the most important function of a sheathing wrap is to resist liquid water, you may feel more comfortable with a non-perforated housewrap, especially if you are building in an area with a lot of rain. "If I want to keep the water out, maybe I wouldn't choose a housewrap with a whole bunch of holes punched in it," says Straube. Not all experts agree, however. "All housewraps are perforated, because they are stapled or nailed," says Joe Lstiburek. "Whether or not they come from the factory perforated is irrelevant."

In general, housewraps cost more than building paper or asphalt felt. Most builders find that housewrap is easier to install than paper or felt, because it comes in wide rolls (usually 9 or 10 feet wide) and it weighs less. On the other hand, builders working alone or working on a very high building may find a wide roll of housewrap more awkward than a narrow roll of paper or felt.

Housewraps stay more flexible in cold temperatures than paper or felt, and they resist tearing better. However, asphalt felt is better able to seal around fastener holes than housewrap. In the real world, housewrap is almost never installed as carefully as it is when tested in a laboratory. Researchers from the Pennsylvania Housing Research Center performed a field survey of installed plastic housewrap, and reported, "In the majority of the houses where staples have been installed with an automatic staple gun, tears and holes in the housewrap were common" (Figure 5). Frank Nunes points out, "As you wrap a building with housewrap and staple the material off, and keep rolling it out and tugging it, you will see an oval-shaped hole opening at the fastener. Moisture may be able to penetrate that hole." One solution to this problem is to switch to plastic-cap nails, which pro-

vide much better sealing than staples.

Virtually all plastic housewraps have been reviewed by the model code organizations and have been accepted as equivalents to #15 asphalt felt and Grade D building paper. Nevertheless, if you intend to substitute a plastic housewrap for code-required asphalt felt or building paper, it is always best to check for approval from your local building department.

Wrapping Up

There is no evidence that one type of sheathing wrap is disproportionately associated with moisture problems in walls. George Tsongas's research in the late 1980s confirmed this. "As long as the house had either building paper or housewrap, there was no significant difference in sheathing moisture content between the different types of paper or housewrap," says Tsongas.

When it comes to resisting liquid water, the non-perforated housewraps appear to be the most waterproof, closely followed by asphalt felt. But neither asphalt felt nor Grade D paper nor perforated housewraps can keep water at bay for long. "Everyone seems to think of building paper as a moisture barrier," says George Tsongas. "In fact, they are not moisture barriers. If you get any significant amount of water behind the siding, the building paper will not hold back water — not even 15-pound felt. All the papers will allow liquid water to go through them in one day."

Moisture problems in walls, which are rare, are best avoided by good wall design and proper flashing. Which sheathing wrap to use is a secondary concern. If you're building in a location that gets a lot of rain, you may want to consider installing siding over a rain screen, since virtually all moisture problems in walls are lessened or eliminated when there's an air gap between the siding and the sheathing wrap.

***Martin Holladay** is an associate editor at* The Journal of Light Construction.

Manufacturers of Sheathing Wraps

Manufacturers of Asphalt Felt

American Saturated Felt
800/292-6728

Atlas Roofing
770/933-4479

CertainTeed
800/233-8990

Tamko Roofing
800-641-4691

Manufacturers of Grade D Kraft Paper

Davis Wire Pueblo
800/350-7851

Fortifiber Co.
800/773-4777

Hal Industries
800/663-0076

Senergy
800/221-9255

Plastic Housewrap Manufacturers

Celotex
800/235-6839
Tuff Weather Wrap

DuPont
800/448-9835
Tyvek, *HomeWrap*, and *StuccoWrap*

Fiber-Lam
804/876-3135
Energy-Wrap

FirstLine
912/247-1717
FirstWrap

Johns Manville
800/654-3103
Distributor of *ProWrap*, manufactured by Van Leer Flexibles

Owens Corning
800/438-7465
Distributor of *PinkWrap,* manufactured by Pactiv, and *PinkWrap Plus*, manufactured by Formosa Plastics in Taiwan

Pactiv (formerly Tenneco Building Products)
800/241-4402
AmoWrap, *AmoWrap-VW*, and *AmoWrap Ultra*. AmoWrap is also relabeled as *PinkWrap* for distribution by Owens Corning

Raven Industries
800/635-3456
Distributor of *Rufco-Wrap*, manufactured by Van Leer Flexibles

Reemay
800/321-6271
Typar

Simplex Products
800/345-8881
Barricade and *R-Wrap*

Van Leer Flexibles
800/825-3766
Manufacturer of *Valeron*, which is distributed by Johns Manville as *ProWrap*, by Raven Industries as *Rufco-Wrap*, and by Weyerhaeuser as *ChoiceWrap*

Weyerhaeuser
253/924-2345
Distributor of *ChoiceWrap*, which is manufactured by Van Leer Flexibles