

SYNTHETIC STUCCO & INSULATION SYSTEMS

**Whichever
Product You
Choose,
Follow the
Details
To a Tee.**

by William Lotz



Exterior insulation systems with expanded polystyrene (EPS) insulation and acrylic stucco were developed after World War II in Germany, and exported to this country in 1969. The systems are especially popular for retrofitting existing, uninsulated masonry buildings. They are also increasingly popular in southern climates for new residential and commercial construction.

Many to Pick From

Dozens of manufacturers are selling variations of the system. Some sell the components and instructions to anyone, and some sell only to approved, trained contractors. (A few of the manufacturers are listed at the end of this article.)

The components of each system vary depending on the manufacturer, but all use some combination of the following options:

Attachment. The foam insulation is attached to the wall with various acrylic adhesives (usually mixed with portland cement) or various powder-actuated fasteners, drilled expansion bolts, or special screw fasteners with large washer heads. Some systems use both mechanical and adhesive attachment.

Insulation. Most systems use EPS or

extruded polystyrene. Polystyrene insulation is limited by fire codes to 4 inches in thickness. Systems are also available that use high-density fiberglass insulation boards. For example, the new Dryvit system called Exsulation uses 1-inch-, 1-1/2-inch-, or 2-inch-thick Owens Corning Fiberglas "Glas-Lath" board. Another manufacturer, Sto, uses a high-density mineral-wool board in special applications.

Recently, I specified a system using Pittsburgh Corning Foamglas for use on buildings with severe moisture problems. The advantage of Foamglas is its extremely good resistance to moisture and its total noncombustibility. It serves as both a vapor barrier and insulation. A typical system of polystyrene

A new Texan home finished with acrylic stucco installed over expanded polystyrene (EPS). The thin acrylic exterior resists cracking, fading, and staining, according to the manufacturer.

required. The mesh is either stapled in place or buried in the first stucco coat during troweling.

Base coat. This is a portland cement-acrylic-sand mixture that is troweled in place. The installation requires plastering skills and specialized tools.

Finish coat. This is an acrylic coating with the color mixed in. The variety of colors available is almost infinite.

Granite or other small stone granules are available to add texture to this final layer. Again, considerable plastering/stucco skills are required to obtain a good-looking system.

It's in the Details

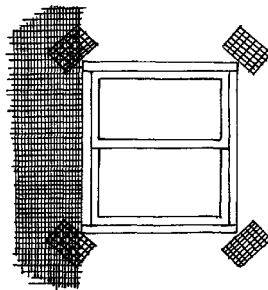
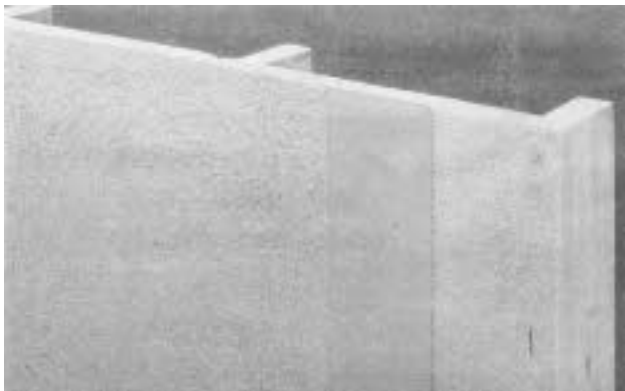
The installation details are critical to the success of an exterior insulation system. Cracks are inevitable, but the name of the game is to keep them to a minimum.

The first consideration is the substrate (surface) that the foam insulation is attached to. Manufacturers have different requirements for what their systems will successfully bond to. Pick a brand and follow the manufacturer's directions carefully.

Dryvit's Outsulation system relies on adhesives (acrylic and portland cement) to fasten the insulation to the building, so the bond to the substrate is critical. The company allows the use of only certain substrates, such as concrete and exterior gypsum board. When all else fails, they recommend that you mechanically fasten a corrugated 3.4-weight, self-furring, galvanized metal lath over the existing surface, and bond the insulation to the lath.

Sencon Systems (sold locally by DJ)

A new system from Dryvit, called Exsulation, is installed over rigid fiberglass insulation rather than EPS. Another key difference from its peers: It's mechanically fastened, so it can go over virtually any substrate.



Most systems require special reinforcement, such as these "butterfly" joints, at openings—to prevent cracking.

and acrylic stucco went over the Foamglas.

With all systems, the joint of the insulation board must be flush, tight, and even, or the boards will show through the final finish coat.

Reinforcing. Various weights of fiberglass mesh are used in the stucco finish, depending on the degree of strength and resistance to abuse

will bond to "virtually any type of wall," since the system uses screws with large washers to attach to the structural wall. Sto is more versatile, with detailed specifications for either adhered or mechanically fastened systems. Insul/Crete and Surewall require mechanical fasteners. Again, choose a manufacturer with a local experienced contractor, and then follow the manu-

drywall substrate.

As with any exterior made with portland cement, brick, block, or acrylic stucco, periodic maintenance should be done to repair cracks. Cracks will occur: the trick is to keep them infrequent and hairline-size. Large cracks and holes will allow the weather to damage the area around the penetration. (I saw one building recently where car bumpers had punched holes in the exterior insulation and the building owner didn't seem to care.)

Dryvit has detailed procedures for repairing cracks. They recommend cutting out the crack and the insulation under it down to bare substrate. Install new insulation, new reinforcing and stucco, and the final finish. An experienced craftsman can make a patch that can't easily be seen.

Warming the Walls

I have two buildings in design at present where the existing walls must be warmed up to solve condensation problems. One is a shopping center in New Hampshire. The block walls have vermiculite fill, which is wet due to the lack of a vapor barrier. The wall is, in fact, crumbling and is covered with mold as a result of the condensation.

We have specified two coats of Glid-

will serve double duty as a vapor barrier and the first layer of insulation. Over it will go corrugated self-furring metal lath, 4 inches of EPS, and one of the acrylic/stucco exterior finishes to match the existing buff-colored brick.

This solution will cost \$2 to \$3 million. An additional half million dollars will be spent to re-anchor the brick to the structural steel. The engineer is concerned that the existing four-year-old steel ties to the brick are compromised due to the rust resulting from condensation. A lot of money could have been saved if the original vapor-barrier system had been adequate. The exterior insulation system will allow the hospital to continue normal operations while the work is being done.

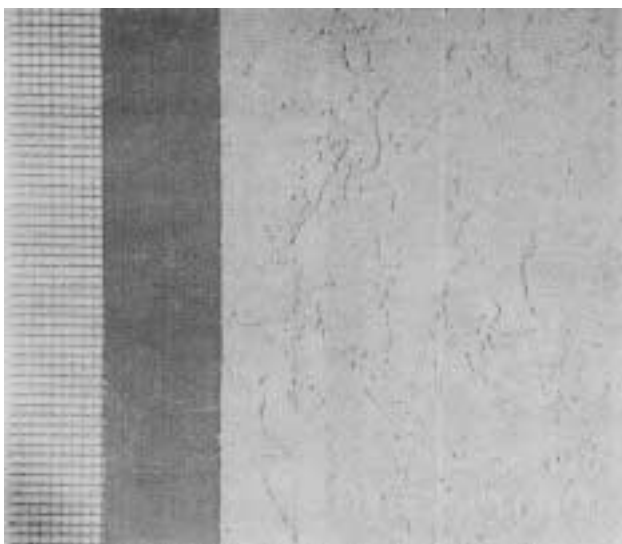
Exterior insulation can solve insulation and moisture problems that no other approach can accomplish. It can produce beautiful buildings as well. I have seen exterior insulation systems produce interesting colors and textures, and with sculptured EPS, some rather striking shapes and designs. ■

William A. Lotz, a consulting engineer, lives in West Newfield, Maine.

Don't expect to stop in the middle of a wall and start up the next day without a control joint or other detail.

facturer's recommendations for every detail.

The surface you are covering with exterior insulation must be reasonably smooth and even. The insulation joints must be rasped smooth or they will show through the final finish as ghost



Ipsco's R-Wall system uses an all-acrylic coating and adhesive attachment to gypsum sheathing, concrete, or masonry.

lines. The corners of all doors and windows need reinforcing, as do places where the substrate changes direction. Make all expansion joints carefully and think out control joints ahead of time to correspond with completion of the day's work. Don't expect to stop in the middle of a wall at 4 P.M. and start up the next day without a V-groove control joint or some other detail to allow an aesthetically acceptable restart.

The type of caulk is also very important. Again, follow the manufacturer's precise specifications. The weather is another important factor in applying a water-acrylic-portland cement stucco material. The temperature must be above 40°F and below 100°F, and the application kept above 40°F overnight.

Design the application so there are no horizontal surfaces at windows or parapets where snow or water can stand on the acrylic surface. A slope of at least 6 in 12 is desirable.

Do not install polystyrene foam with the acrylic finish inside the building. This is against most fire and building codes. The acrylic finish can be textured and looks great indoors—but use it on a

den Insul-Aid paint over block sealer on the exterior of the block wall. This will provide a vapor barrier for the new, 2-inch-thick fiberglass board insulation. This building will get Dryvit's new Exsulation system, which is attached with mechanical fasteners (masonry screws) on approximately 12-inch centers. (Dryvit's standard Outsulation system could not bond to the painted block.) The exterior insulation system will allow business to continue in the shopping center while a vapor barrier, insulation, and a new exterior finish are installed outdoors.

The second project is an eight-story hospital in Iowa. The exterior is brick and has a serious moisture problem due, in part, to an inadequate vapor barrier. Also, because hospitals must be humidified, the brick wall must be warmed quite a bit to get above the dew point of the indoor hospital air.

To make the repairs indoors would require shutting down the hospital. To keep the work outdoors, I specified that a 2-inch layer of Foamglas be installed over the brick with both adhesive and mechanical fasteners. The Foamglas

EXTERIOR INSULATION MANUFACTURERS

Exterior-insulation manufacturers that I have literature on:

Product	Company
Dryvit	Dryvit Systems, Inc. One Energy Way W. Warwick, RI 02893
Sencon	Sencon Systems, Inc. 1935 Shermer Rd., Suite 100 Northbrook, IL 60062
Sto	Sto Industries, Inc. Quality Lane Rutland, VT 05701
Conproco	Conproco Corp. 1189 Hooksett Rd. Hooksett, NH 03106
Insul/Crete	Dow Chemical USA 2020 Dow Center Midland, MI 48640
Thorowall	Thorosystem Products 7800 NW 38th St. Miami, FL 33166
Surewall	W.R. Bonsal Co. P.O. Box 241148 Charlotte, NC 28224
R-Wall	ISPO, Inc. 792 S. Main St.. Mansfield, MA 02046
Ful-O-Mite IDF	H.B. Fuller Co. 315 S. Hicks Rd. Palatine, IL 60067

There are probably many more brands, and I'm sure I'll hear from their sales managers soon!

As with any product, know who you are buying from, what their track record is, and who to call if you have problems. Most of these companies have regional offices and sales representatives and contractors all over the U.S. ■

—W.L.

QUESTIONS ABOUT DURABILITY

Keeping Water Out Is the Key

Exterior insulation and stucco systems—dubbed EIFSs (exterior insulation finish system)—seem to be here to stay. But many options exist, and the technology continues to evolve. Which type is best remains a matter of some debate.

EIFSs are of two general types: hard coat and soft coat. Both use synthetic stuccos applied over fiberglass mesh over foam insulation. Hard-coat systems are thicker and more rigid, and are fastened mechanically to the structure. Soft-coat systems are thinner and more flexible, and are generally bonded with adhesive. The major differences are as follows:

Hard coat. Base coat is 1/4-inch-thick acrylic-modified stucco with chopped fiberglass. Installed over extruded polystyrene. Base and finish coats are unaffected by water. Control joints needed every 10 to 12 feet. Good impact resistance.

Soft coat. Base coat is about 1/16-inch-thick acrylic stucco. Installed over one-pound-density expanded polystyrene (EPS). Control joints necessary only where needed on substrate. Latex-emulsion finish coat is slightly water soluble, therefore surfaces must shed water (6-in-12 minimum slope). Finish is relatively flexible, but has less impact resistance.

In commercial construction, both types of systems are most often

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installed over exterior gypsum sheathing—favored for its low cost and good fire resistance. Gypsum sheathing has enough water resistance that it can be left exposed to the weather for up to a month after application. If it gets saturated, however, it will fail.

Gypsum's vulnerability to water can be a problem if water manages to penetrate the exterior stucco and insulation finish. It is particularly a problem in adhesively applied systems, since if the gypsum board gets wet, the paper facing—and hence the bonding of the insulation—is likely to fail.

Up until a few months ago, the Gypsum Association recommended against adhesively bonded systems over gypsum sheathing. The Association's newly revised standard allows adhesive bonding, but it makes clear that full responsibility for the system lies with the EIFS manufacturer and installer—not the gypsum industry.

One reason the Gypsum Association will not endorse this application, said an industry spokesman, is that there is still no industry-wide standard for EIFSs. "Someone can mix up some cement and acrylic in their

garage," he said, "and set up shop."

If the exterior finish is mechanically fastened, it is possible to protect the gypsum board with a layer of felt paper, as is sometimes done. This, of course, is not possible with an adhesively applied system.

Major manufacturers of soft-coat systems assured us that the product works well because no water will get through a properly installed system. The soft-coat finish, said one manufacturer, is "a complete water barrier" that will not leak. It will also not crack, he said, if the manufacturer's details are followed—including extra mesh around openings, and control joints in the finish wherever control joints are used in the substrate.

While millions of square feet of EIFSs installed over the last decade appear to be performing well, at least some problems have been reported. One case involves an elderly-housing project in Beverly, Mass. This and 16 similar projects across the state were the focus of a yearlong investigation recently completed by the Massachusetts Executive Office of Communities and Development. In response to complaints from local housing authorities, the state agency investigated the 17 projects, which used four different soft-coat systems. The agency found cracks in two-thirds of the buildings, and water penetration in all 17—ranging from minor to severe, according to the agency's staff architect, Richard Piper.

Other parties contacted by *NEB* have had trouble with retrofit applications of soft-coat systems over masonry—including cracking and delamination. In these cases, as in the earlier ones, it's not yet determined what the contributing factors were. Poor surface preparation, improper mixing or application of the materials, excess building movement, or failure to follow rasping, flashing, or reinforcing details are some possibilities.

Some critics fault the design itself of the soft-coat system. Piper, for one, expressed strong reservations about the use of any adhesively applied gypsum-backed systems because of their overall vulnerability to water damage. European systems, he pointed out, use different mixes, and different sealing and joint details, to keep out water. And they do not use gypsum board as a substrate for adhesive fastening.

One promising innovation is the introduction of new gypsum sheathing products with vastly improved water resistance, such as Georgia-Pacific's Dens-Glas, which is faced with a fiberglass mat rather than paper. The EIFS manufacturers we spoke with welcome the introduction of this and similar products and, based on initial tests, expect that they will enhance EIFS systems without adding significant cost.

Whatever option you choose, one message is clear: Start with an adequate substrate, look for a strong warranty, and follow the specs to a tee.

—S.B.