

EPS vs XPS

Insulation industry advances with EPS developments.

By [Frank Keisecker](#)



There is much competition among polystyrene insulation manufacturers for the below-grade, under slab, and cavity wall insulation market. Claims made by the XPS (extruded polystyrene) industry are conflicting with that of EPS (expanded polystyrene) manufacturers. The validity of some claims is debatable. Specifiers, architects, and contractors must make well-informed decisions.

To thoroughly understand the difference between EPS and XPS insulation, it's useful to begin with a look at their similarities:

- Both are comprised of polystyrene resin;
- Both use trapped air as their long-term insulating medium;
- Both have a closed-cell structure;
- And, both fall under the same manufacturing standard: ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation. The ASTM C578 standard includes 14 different types of polystyrene. The different classifications relate directly to physical characteristics of each type—most notably, the density, compressive resistance, and R-value.

What makes EPS and XPS different is their manufacturing processes. EPS uses steam and the blowing agent pentane to expand polystyrene resin beads and subsequently mold them into blocks, which can later be cut to size. XPS, on the other hand, processes melted polystyrene resin through an extruder and expands it, using blowing agents.

There are key differences between EPS and XPS—most importantly, moisture resistance, environmental impact, long-term R-value, compressive strength, panel sizes, and cost per R-value.

Moisture Resistance

Moisture resistance is an important issue for architects, contractors, and specifiers to consider when selecting below-grade, cavity wall, and under-slab insulation. Claims by the XPS industry on moisture resistance conflict with those made by the EPS industry because one source is using controlled laboratory testing and the other is using real-life field testing.

The XPS industry prefers a controlled underwater test, submerging the XPS for a relatively short period of time, depending upon the type of XPS tested and the test parameters. Usually the

submersion time is somewhere between 2 and 24 hours. In this scenario, XPS appears to win over EPS because it resists water absorption in the near-term quite well. However, as the XPS takes in moisture more slowly than EPS, it also releases it very slowly.

“We believe nothing is more real than an actual installation dug up and tested after 15 years in the ground,” says Frank Kiesecker, ACH Foam vice president, architectural products. “A 15-year field study demonstrates actual performance in the ground after 15 years. The results show dramatic differences in the performance of the two insulation types.”

Environmental impact

EPS has never contained HCFCs. Environmental advocates also like that EPS uses no dyes, and can contain up to 15% recycled content. The XPS industry, with highly competitive subgroups, has used pink, blue, and green dyes as branding elements. In addition, the limited amount of recycled content in XPS varies widely by product and by company.

Long Term R-Value is affected by off-gassing. Off-gassing occurs when blowing agents present in XPS are released over the lifespan of the product and are slowly replaced with air, which then becomes the insulating medium. As the off-gassing occurs there is a loss of R-Value. This differential is evident in the disparate EPS/XPS industry warranties: The XPS industry offers a 90% R-value warranty due to the product’s off-gassing. The EPS industry, on the other hand, offers a 100% R-value warrantee.

Compressive strength and panel sizes

Although both XPS and EPS are available in compressive strengths of 15, 25, 40, and 60 psi, XPS also comes in 100 psi. If the job requires 100 psi compressive strength, it needs XPS. Because of market dominance, XPS is more widely available from distributors and in the insulation marketplace as a whole.

Foam-Control Plus+ is first in the EPS market to provide face labeling. This is beneficial for specifiers, contractors, and distributors. “Although XPS has offered face stamping since nearly the inception of the insulation, EPS hasn’t until now,” explains Kiesecker. “The face label on ACH’s architectural grade insulation makes it easier for distributors to identify the product and easier for contractors to know what they’re paying for. This in turn provides peace of mind to specifiers that the correct product was delivered to the job site.”

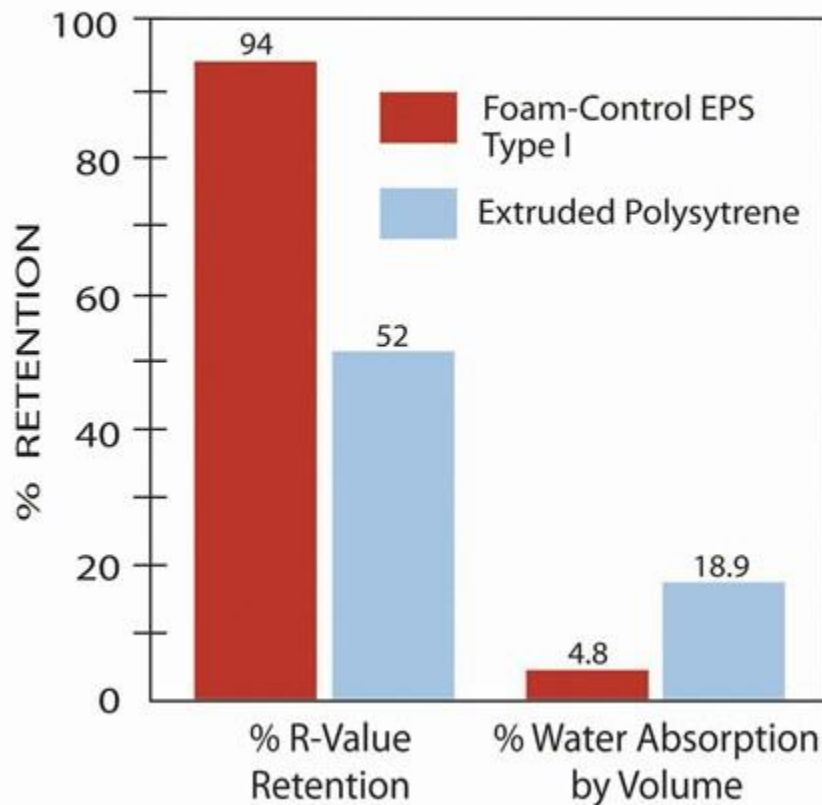
Cost per R-value

EPS costs 10% to 30% less than XPS per equivalent R-value and compressive strength. ACH Foam Technologies has made it easier for contractors and specifiers to see this with comparable features unavailable until now.

Frank Kiesecker has served as vice president sales and marketing, Architectural Products for ACH Foam Technologies since 2005. His expertise in the EPS industry spans 38 years. ACH Foam Technologies is a leading manufacturer of EPS products for construction, geotechnical, packaging, and industrial applications. For more information visit www.achfoam.com.

	EPS	XPS
Widths	8", 12", 16", 24", 36", or 48"	16", 24" or 48"
Lengths	2', 4', 8', 9', 10' or 16'	8'
Thicknesses	½" up to 36" in any variation	¾", 1", 1-½", 2", or 3"

WATER ABSORPTION AND R-VALUE RETENTION¹



Retained thermal resistance and water absorption of insulations subjected to 15 years below grade exposure

Samples of EPS and XPS insulation were placed into service in 1993 and had 15 years of use as vertical wall insulation separating the heated building foundation from soil on the exterior foundation of a building in St. Paul, MN. Samples were removed in the summer of 2008, brushed clean and tested immediately upon excavation for R-value. EPS and XPS samples were immediately adjacent to each other and were both on the foundation for 15 years. At the time of excavation the soil in contact with the insulation was dry and no abnormal conditions were observed. Both sets of samples were subsequently conditioned in a laboratory (72° F, 50% RH) for four weeks to determine a conditioned R-value. In addition, the moisture content of the samples was also measured.