

Expanded Polystyrene and Extruded Polystyrene

PURPOSE

This Qwik Guide is an update to a prior Technical Bulletin. Our [Qwik Guides](#) typically offer abbreviated (1-2 page) technical perspectives, with this one intended to provide objective information on the differences between EPS and XPS. EPS and XPS are both rigid, thermoplastic foam materials made from solid polystyrene, yet they are surprisingly different products with different applications, and rarely compete.

EPS

To manufacture a block of EPS, polystyrene beads enter a large block mold where steam heats and expands the beads containing polystyrene, blowing agents, and additives. As pressure builds, the beads are tightly fused together. At Dyplast, our well-controlled process creates a solid, homogeneous block with excellent insulating qualities that do not degrade over time - - as well as excellent water resistance and compressive strength - - meeting all requirements of ASTM C578. Densities are available at 1.0, 1.25, 1.5, and 2.0 lb/ft³. The large EPS blocks can be fabricated per specification to form insulation boards, blocks, or customized shapes for the roofing, insulated metal panels, geofoam, and packaging industries.



Figure 2: EPS Block



Figure 1: EPS Sheets

XPS

XPS foam is manufactured from solid polystyrene crystals. The crystals, along with additives and a blowing agent, are fed into an extruder. The mixture is blended and melted under high temperature and pressure, and becomes a viscous plastic fluid. The hot, thick liquid is then forced in a continuous process through a die. As it emerges from the die it expands to a foam, is shaped, cooled, and then trimmed to dimension. The size and shape of the die vary with the intended application. For instance, three common sizes of “billets” destined for fabricating pipe insulation shapes are: 7”x14”x108”; 8”x16”x108”; and 10”x20”x108” - - which is much smaller than EPS blocks. For wall insulation applications, XPS is typically extruded as 2ft by 8ft, or 4ft by 8ft sheets of varying thickness - - commonly 2 inches.



Figure 3: Styrofoam®
Pipe Insulation

SUMMARY

While EPS and XPS each comply with ASTM C578 (Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation), they are quite different products - - typically used in different applications. Care should be taken to evaluate the specific performance requirements and how/whether each may match a specific application. Lower density EPS blocks are generally considered cost-effective for typical applications such as refrigeration panels, lightweight concreted roofing, and geofoam. Both EPS and XPS provide good insulating performance. For example, commonly-used Type IX 1.8 lb/ft³ density EPS actually has a minimum R-Value of 4.2 versus 3.9 for the Type XIII 1.6 lb/ft³ typical XPS billets. We caution that clients should examine advertised properties against independent, third-party test results to make sure testing is performed per ASTM procedures.

EPS is not a true closed cell foam and therefore typically has higher water absorption values measured per ASTM C272, and Dyplast does not recommend its use on lower temperature pipe insulation applications. XPS, while a more expensive product, is a closed cell foam and can be used in limited cold applications. [Types](#) XI, I, VIII, II, IX, and XV typically are EPS and Types XII, X, XIII, I, VI, and V are XPS.

Additionally, EPS can be fabricated or shaped more cost-effectively. Another advantage of EPS is that scrap or waste generated during manufacturing and fabrication, or at the end-use stage can be recycled into the molding process. At Dyplast multiple levels of recycled materials are used.