

What is the Difference Between Open-cell and Closed-cell Urethane Foams?

Open-cell foam is soft - like a cushion or the packaging material molded inside a plastic bag to fit a fragile object being shipped. The cell walls, or surfaces of the bubbles, are broken and air fills all of the spaces in the material. This makes the foam soft or weak, as if it were made of broken balloons or soft toy rubber balls. The insulation value of this foam is related to the insulation value of the calm air inside the matrix of broken cells. The densities of open-cell foams are around 1/2 to 3/4 of a pound per cubic foot.

Closed-cell foam has varying degrees of hardness, depending its density. A normal, closed-cell insulation or flotation urethane is between 2 and 3 pounds per cubic foot. It is strong enough to walk on without major distortion. Most of the cells or bubbles in the foam are not broken; they resemble inflated balloons or soccer balls, piled together in a compact configuration. This makes it strong or rigid because the bubbles are strong enough to take a lot of pressure, like the inflated tires that hold up an automobile. The cells are full of a special gas, selected to make the insulation value of the foam as high as possible.

The advantages of the closed-cell foam compared to open-cell foam include its strength, higher R-value, and greater resistance to the leakage of air or water vapor. The disadvantage of the closed-cell foam is that it is more dense, requiring more material, and therefore, more expense. Even though it has a better R-value, the cost per R is still higher than open-cell foam. The choice of foam should be based on the requirements for the other characteristics - strength, vapor control, available space, etc.

Both types of foam are commonly used in most building applications. Some are inappropriate in specific applications. For example, you typically would not use open-cell foam below grade where it could absorb water; this would negate its thermal performance because water is a poor insulator compared to air. Closed-cell foam would be a good choice where small framing sizes need the greatest R-value per inch possible. Basically, the choice depends on the conditions of each installation. We routinely select from a wide variety of foam systems with varying characteristics, depending on the particular requirements of our clients' projects.