



Closed- and Open-Cell Spray Polyurethane (PU) Foam

DIFFERENCES BETWEEN CLOSED-CELL AND OPEN-CELL SPRAY POLYURETHANE (PU) FOAM

Spray Polyurethane (PU) Foam is a cellular product. The cell structure and more particularly the open (closed) cell content will have significant influence on the product performance and the final applications.

Whilst a closed-cell foam should contain more than 90% closed cells, there is no official definition in Europe for open-cell foam. A typical system would have less than 20% of closed cell-content. However, higher ratios may also be possible.

The manufacturer and the installer have the obligation to properly inform their customers about the properties of their product and its suitability for different construction methods and end-use applications.

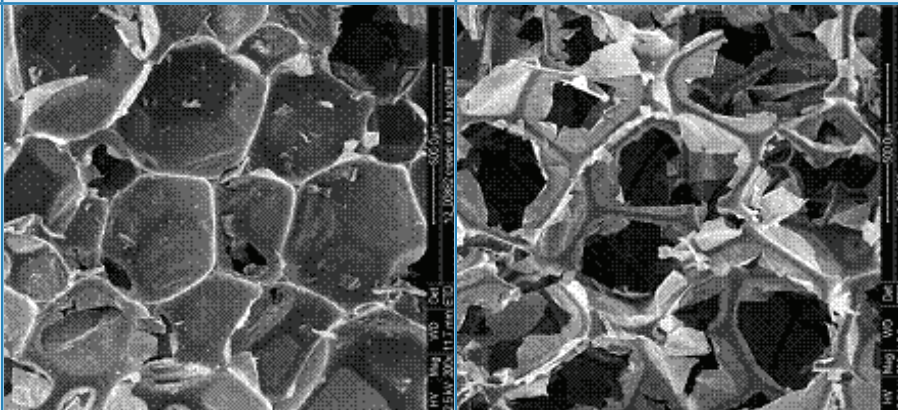
It is important to note that both types of foam are covered by the scope of EN 14315-1 [1]. All performance claims must therefore result from test methods referred to in that standard. As of November 2014, all PU spray foam systems must bear a CE mark according to EN 14315-1.

Systems that are CE marked based on a European Technical Approval (ETA) may continue to do so until the ETA expires. Alternatively, they can adopt the EN standard.

All declared thermal conductivity values (lambda values) must be aged values according to EN 12667 and EN 12939 (for thick products). Initial lambda values must not be used for performance declarations.

The table below describes the characteristics of closed- and open-cell foams.

Property	Closed-cell	Open-cell
Closed cell content (according to ISO 4590)	CCC4 according to EN 14315 ≥ 90%	CCC1 according to EN 14315 < 20%
Thermal conductivity (aged value according to EN 12667 and for thick products EN 12939)	0.026-0.028 W/m·K	0.035-0.042 W/m·K
Water resistance (according to EN 12087)	Long term water absorption < 2%	Not recommended for applications involving a possible direct contact with water

Water vapour resistance factor (μ) (according to EN 12086)	Medium permeability $50 < \mu < 150$	High permeability $\mu < 15$
Air flow resistance	Closed-cell foam helps to improve the air tightness of buildings	Open-cell foam can help to improve air tightness of buildings at higher installed thickness
Compressive strength (according to EN 826)	170-500 kPa	5-30 kPa
Strength and rigidity	Higher strength and rigidity. Depending on density, may add structural strength to certain load-bearing building elements (in particular timber constructions)	Lower strength and rigidity (will not add structural strength to load-bearing elements)
Density (according to EN 1602)	35-60 kg/m ³	8-15 kg/m ³ (up to 60 kg/m ³)
Acoustic absorption coefficient (according to EN ISO 11654)	Medium sound absorption 0.3	High sound absorption 0.5
Reaction to Fire Classification [2] (according to EN 13501-1)	Generally E (Range from C,s3-d0 – F)	F
Blowing agent	Physical blowing agent (non-ozone depleting HFC)	CO ₂ , water (no added physical blowing agent)
Picture of the cell structure		

Notes

[1] Thermal insulating products for buildings – In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products – Part 1: Specification for the rigid foam spray system before installation

[2] Classifications for naked foam only. Classifications for end-use application may reach up to B,s1-d0