

INEOSNOVA



EPS Silver in building and construction applications

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A photograph of a rowing team in action, with the word "Outline" overlaid in large black text.

Outline

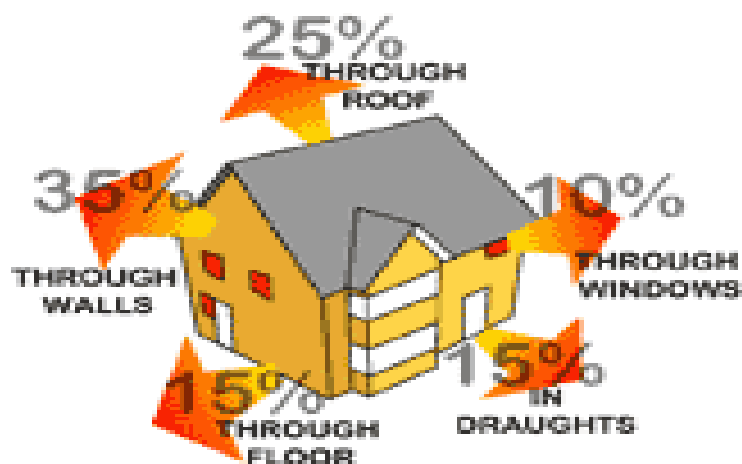
- Rationale
- EPS Silver Polymer
- Applications in B & C
- Conclusions

EPS Silver Polymer

- Specially designed EPS polymer containing carbon black and with enhanced thermal insulation properties
- Unique black colour (differentiation)
- Good mechanical and water absorption properties
- Flame retardant (DIN B1 and Euro Class E)



EPS Silver better living by efficient insulation



Effective insulation will enable the Building Industry to reduce energy demand by > 40%.



Insulation characteristic parameters

- Thermal conductivity (λ): $\text{W/m}\cdot\text{K}$ ($^{\circ}\text{C}$)
- R (thermal resistance): $\text{thickness}/\lambda$ ($\text{m}^2\cdot\text{K}/\text{W}$)
- k or U (thermal transmittance): $1/R$ ($\text{W}/\text{m}^2\cdot\text{K}$)



Better insulation: R (high) or U (low)



Thermal conductivity of EPS foam

- $$\lambda = \frac{\Phi \cdot d}{A \cdot (T1 - T2)}$$

Φ : heat flow rate (W)

d : thickness (m)

A : area (m²)

$T1, T2$: temperatures of hot and cold faces (K)

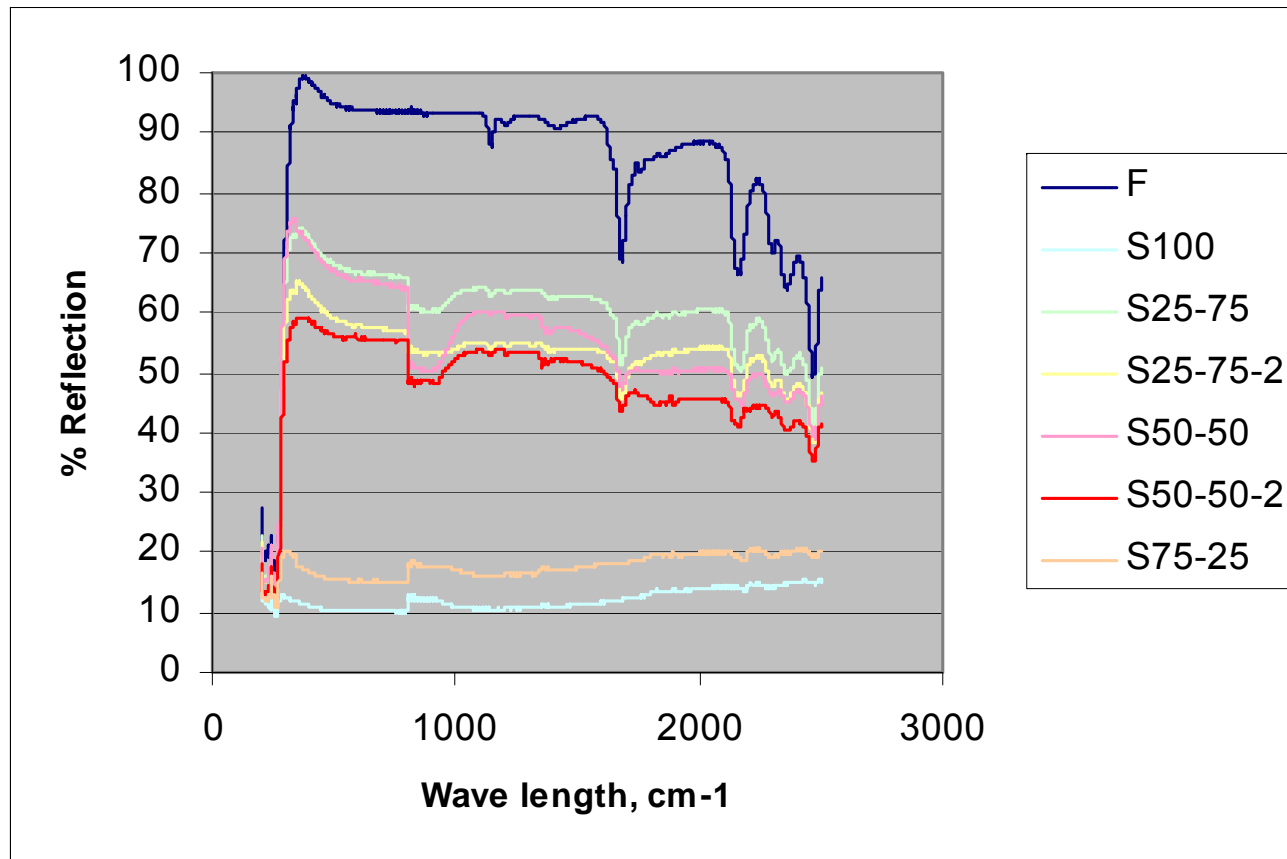
Heat Transfer :

- Conduction
- Convection
- Radiation

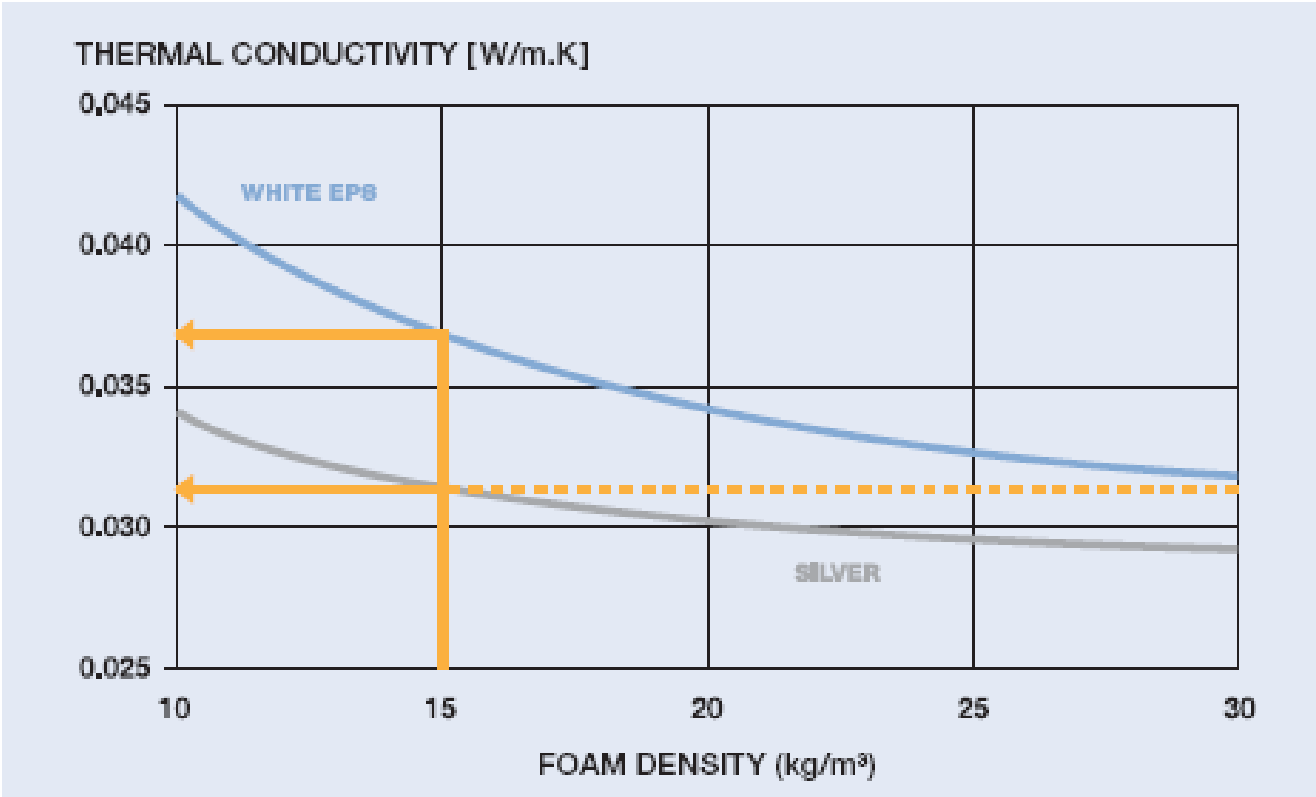
EPS thermal conductivity :

- Conduction (Solid + Gas)
- **Radiation**

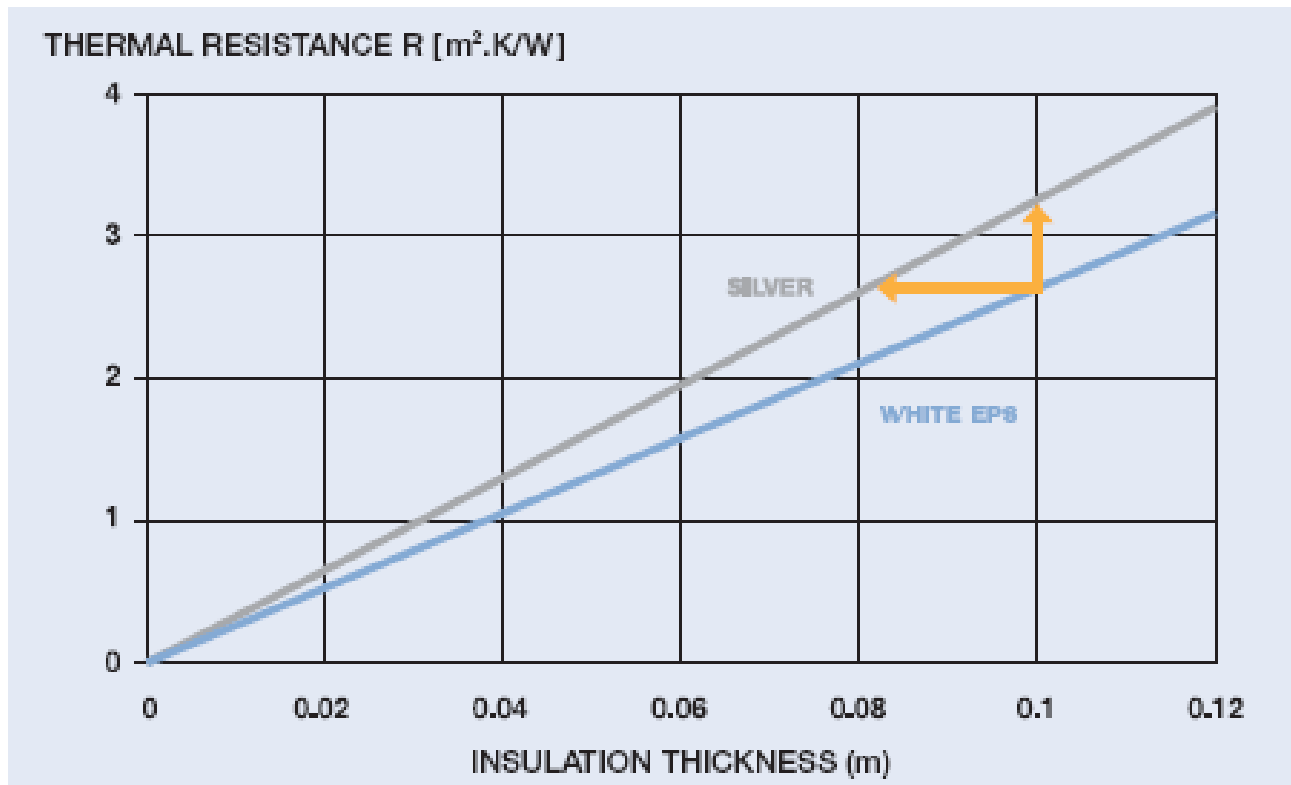
CB largely eliminates the heat radiation



Thermal conductivity of Silver and white EPS

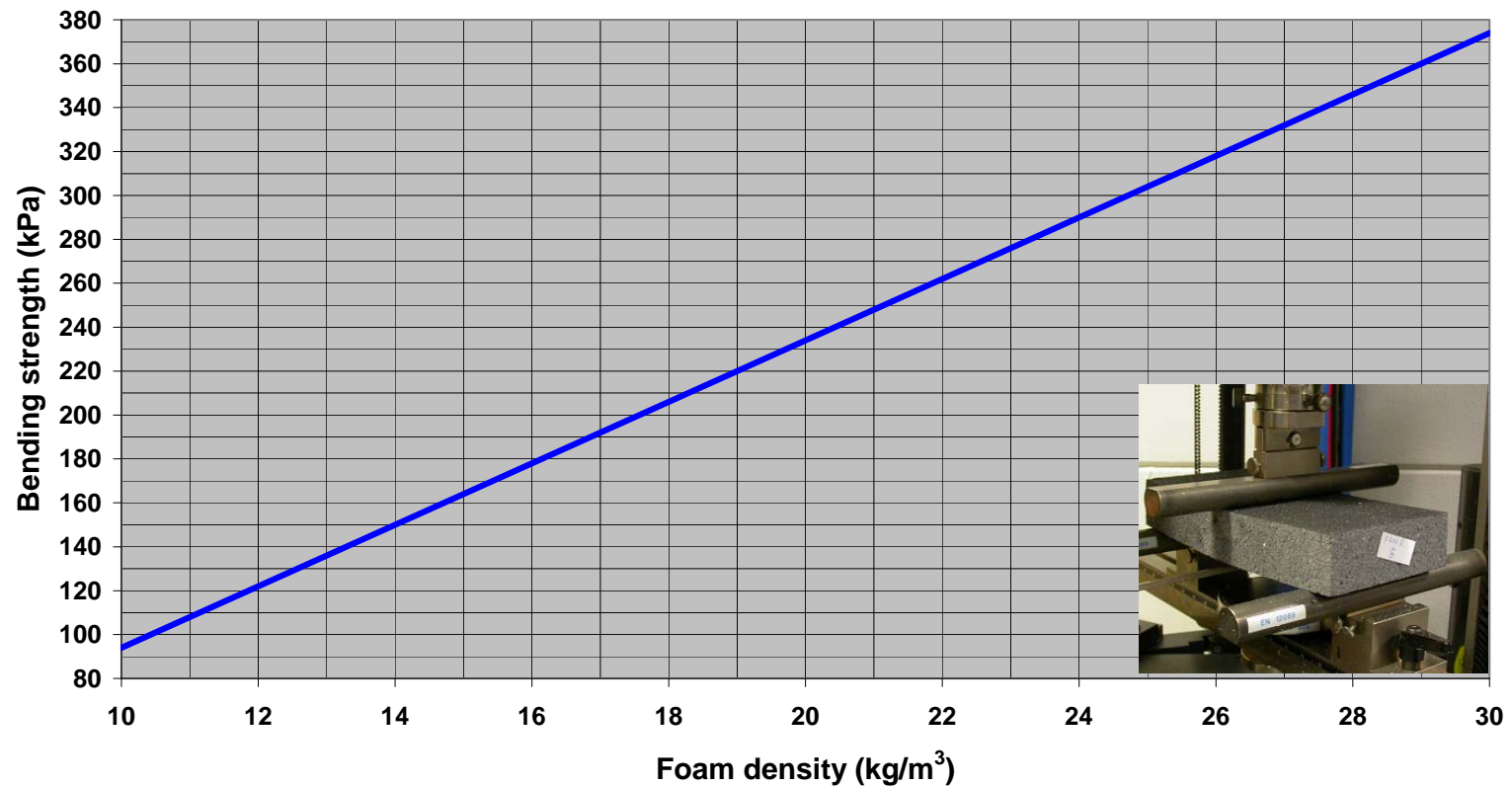


Thermal resistance of Silver and white EPS

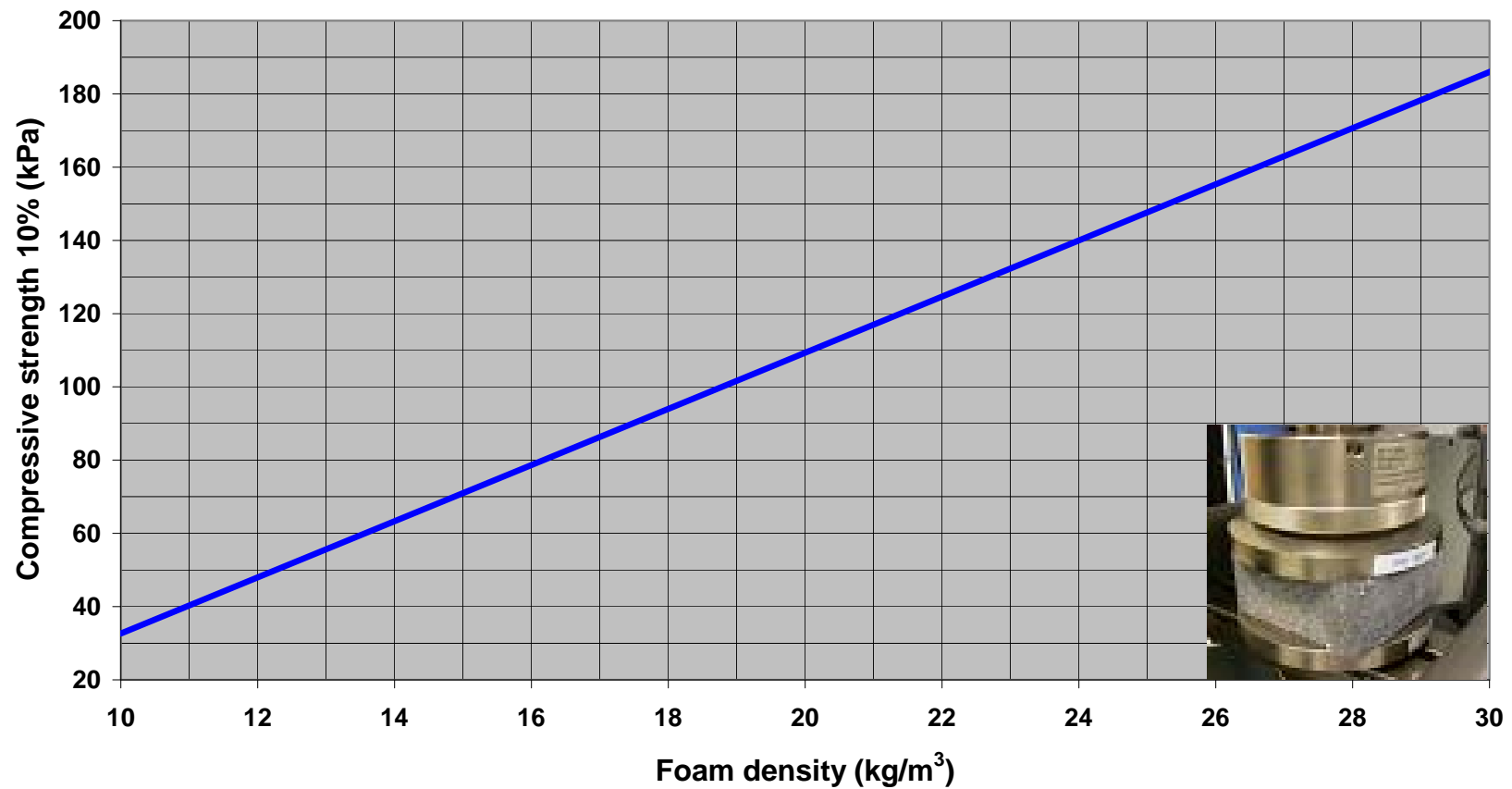


(15 kg/m³)

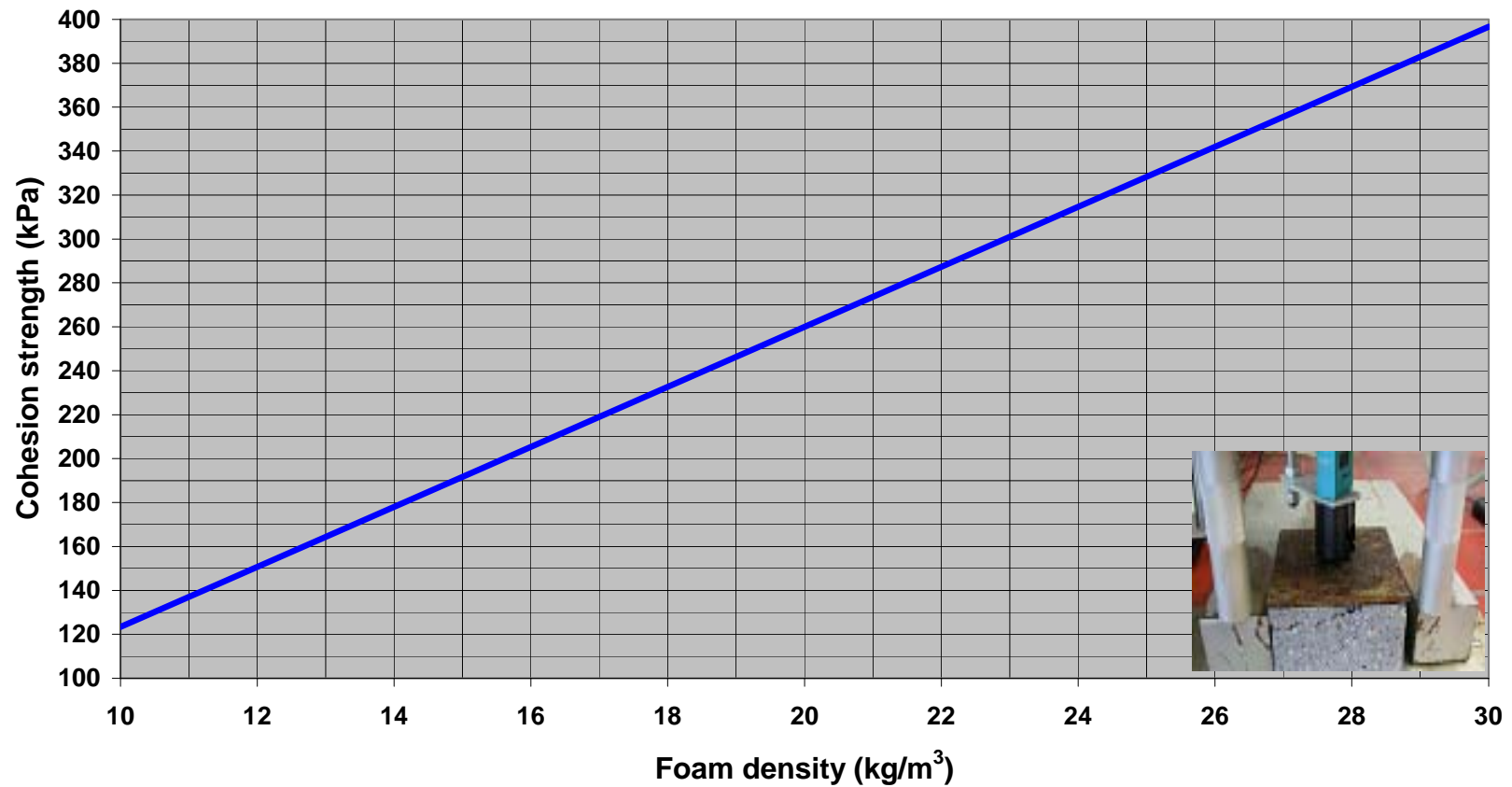
Bending strength of EPS Silver (EN 12089)



Compressive strength of EPS Silver (EN 826)



Cohesion strength of EPS Silver (EN 1607)

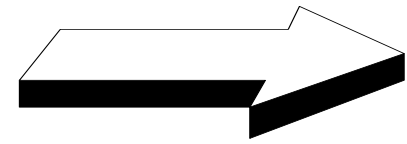


Processing of EPS Silver

Pre-expansion
(steam)



Maturing
(air)

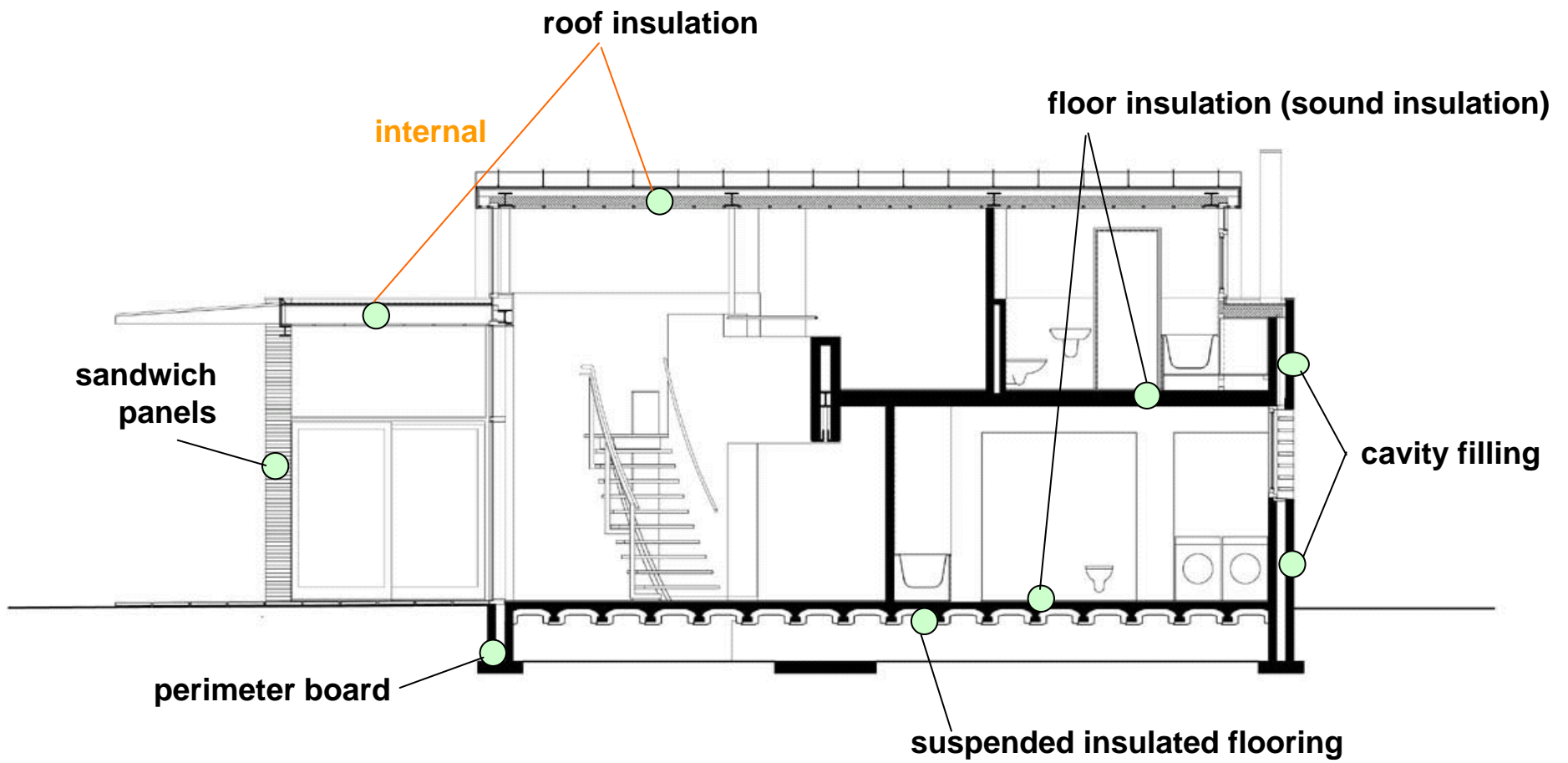


Moulding: shape/block
(steam)

600 - 650 kg/m³ ----> 15-16 kg/m³

Second pass : 9-10 kg/m³

EPS Silver in B & C Applications

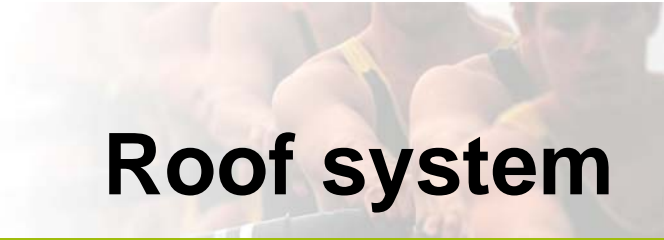


External wall, roof and floor

Germany	Kg/m ³	WG	Cohesion, kPa	10% Comp., kPa
Façade (ETICS)	14-15	035	100 (80*)	-
	18-19	032	100 (80*)	
Roof/floor	20-25	031	-	100-150

*: elasticized





Roof system

- Multidak, NI using S400R
- Cut from block moulding
- System: 2.5 m wide and up to 9.5 m long
- Pitched roof
- Silver (Rc 5) and white (Rc 4)

System	kg/m ³	mW/m.K	Thickness, mm
Std. EPS	15	36	140
	20	34	140
Silver	15	32	140
	20	30	140

Roof system (Contd.)



Cavity wall insulation

- Shape moulding
- 22 kg/m³
- 32 mW/m.K
- S500R



For new builds

Cavity wall (Contd.)

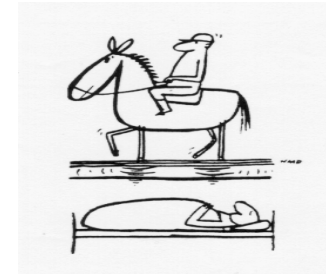
- 20 kg/m³
- Cut from block



Thermo-acoustic

- Acoustic

- ▶ Impact sound (indirect)
- ▶ Air-borne sound (direct)



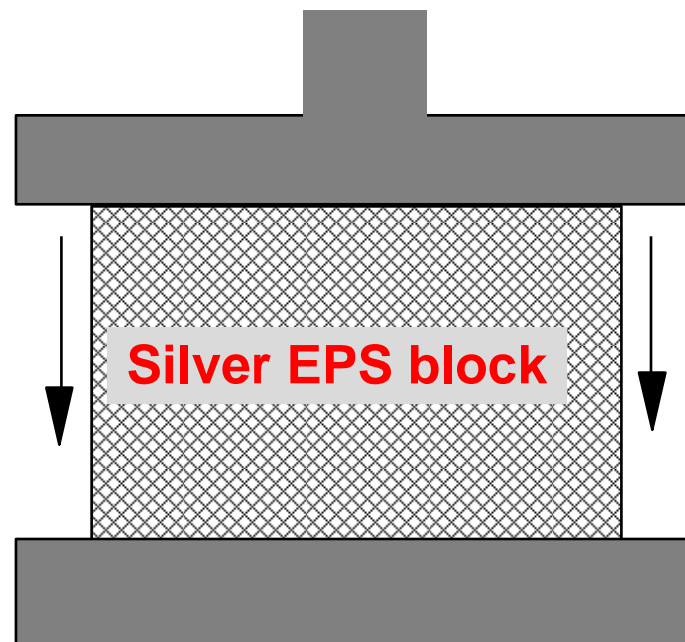
- Block compression to elasticize (**in-house art**)

- ▶ Doublage dB32 (France)
- ▶ S400R
- ▶ 10-11 g/l expansion, ca.17 g/l elasticized
- ▶ System: plaster board (10 mm) + Silver (40-120 mm)

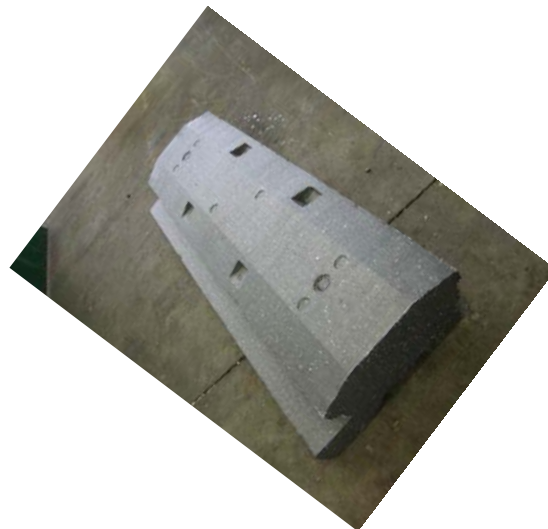
Thermo-acoustic (Contd.)

Block compression:

- Block age (°C)
- Compression (% , speed, pressure, number of cycles, etc)



- Between floor/cellar
- 15-16 kg/m³ minimum first pass and cut from block
- 18-20 kg/m³ moulded
- French compressive strength: 150 daN



Insulated concrete form (ICF)

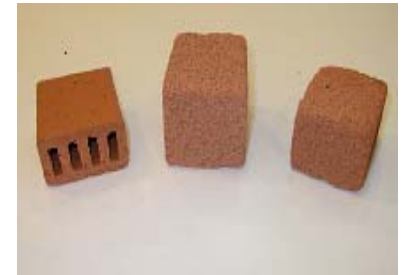
- 27-28 kg/m³
- S500R
- Inter spacer also in EPS Silver
- 30-31 mW/m.K



Rapid construction & excellent insulation

Cellular bricks and lightweight concrete form

- Cellular brick (development stage)
 - ▶ 11-12 kg/m³ pre-foam beads
 - ▶ Mixed with clay and fired
 - ▶ Residual carbon to enhance thermal insulation
- Light concrete weight
 - ▶ Pre-foam beads mixed with cement mortar
 - ▶ Low bulk densities
 - ▶ Good insulation properties
 - ▶ Fast drying times
 - ▶ Good flow EPS/cement mortar



Loose-fill cavity wall

- Silver pre-foam beads injected
- Systems:
 - ▶ U.K./Eire : 11-13 kg/m³ + glue
 - ▶ Germany : 18.5 kg/m³ without glue
 - ▶ Holland : 15 kg/m³ + glue (final stage)
- Higher R-value with the same cavity thickness



For renovation and new builds





Conclusions

- Improved insulation of the Building stock can reduce the energy consumption significantly (several oil tankers)
- The new mind set: building and construction with energy saving design/material, etc.



Conclusions

- EPS Silver Polymer an insulating material which improves the efficiency of old and new builds enabling regulations to be met whilst save energy costs
- 20% more insulating than white EPS at similar foam density
- 20% less foam thickness required vs.white for similar R value
- Foam properties including flame retardancy maintained
- Processed like the white EPS on existing m/c
- 3 grades available to cover B & C applications:

S400LR, S400R & S500R



**Let us use together EPS Silver in B & C applications
for building a sustainable future**