EPS Silver in building and construction applications

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Outline

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

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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)

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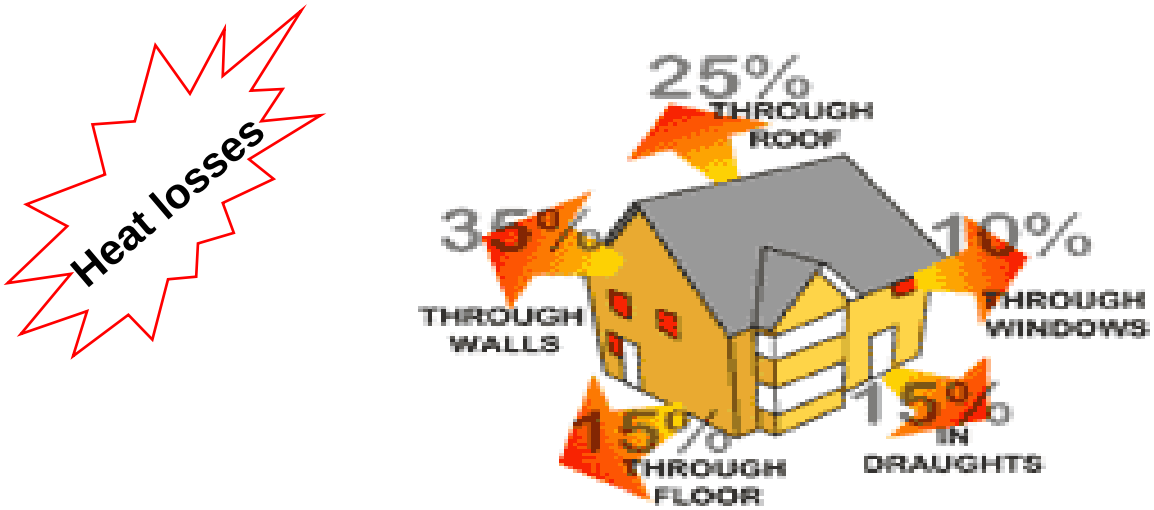
EPS Silver better living by efficient insulation



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

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Insulation characteristic parameters

- Thermal conductivity (lambda): W/m.K (°C)
- R (thermal resistance): thickness/λ (m^2.K/W)
- k or U (thermal transmittance):1/R (W/m^2·K**)**

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

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Thermal conductivity of EPS foam

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

Φ : heat flow rate (W)
d : thickness (m)
A : area (m^2)
T1, T2 : temperatures of hot and cold faces (K)

Heat Transfer :

- Conduction
- Convection
- Radiation

EPS thermal conductivity :

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

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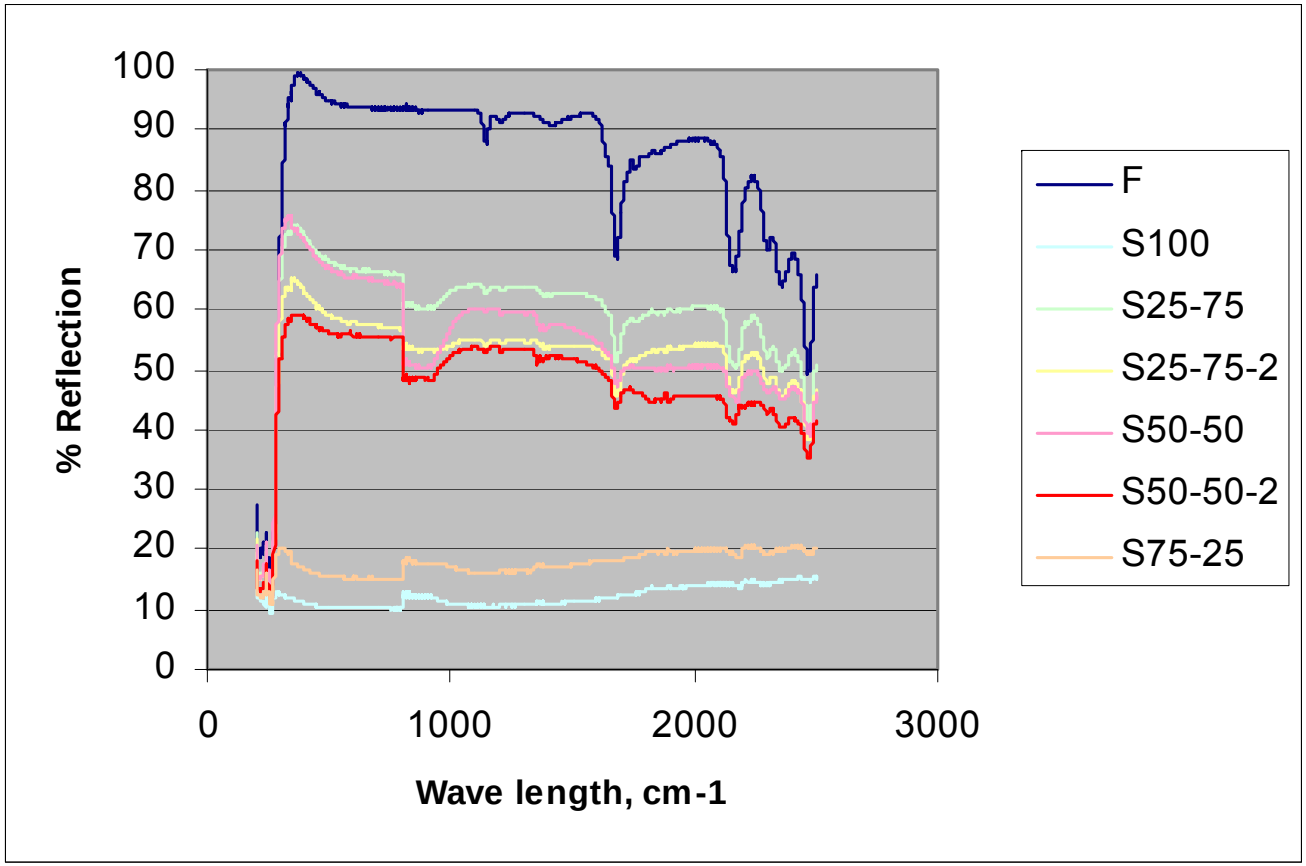
CB largely eliminates the heat radiation



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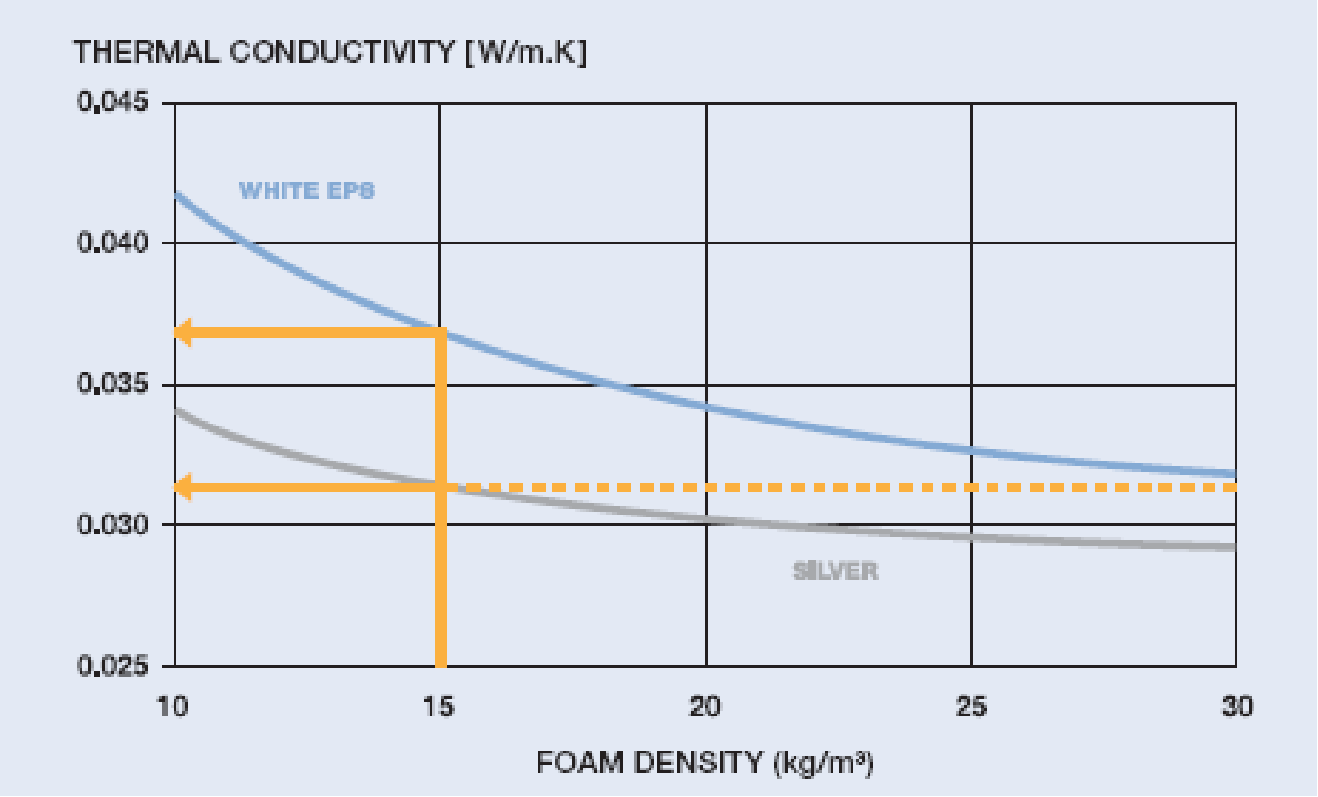
Thermal conductivity of Silver and white EPS



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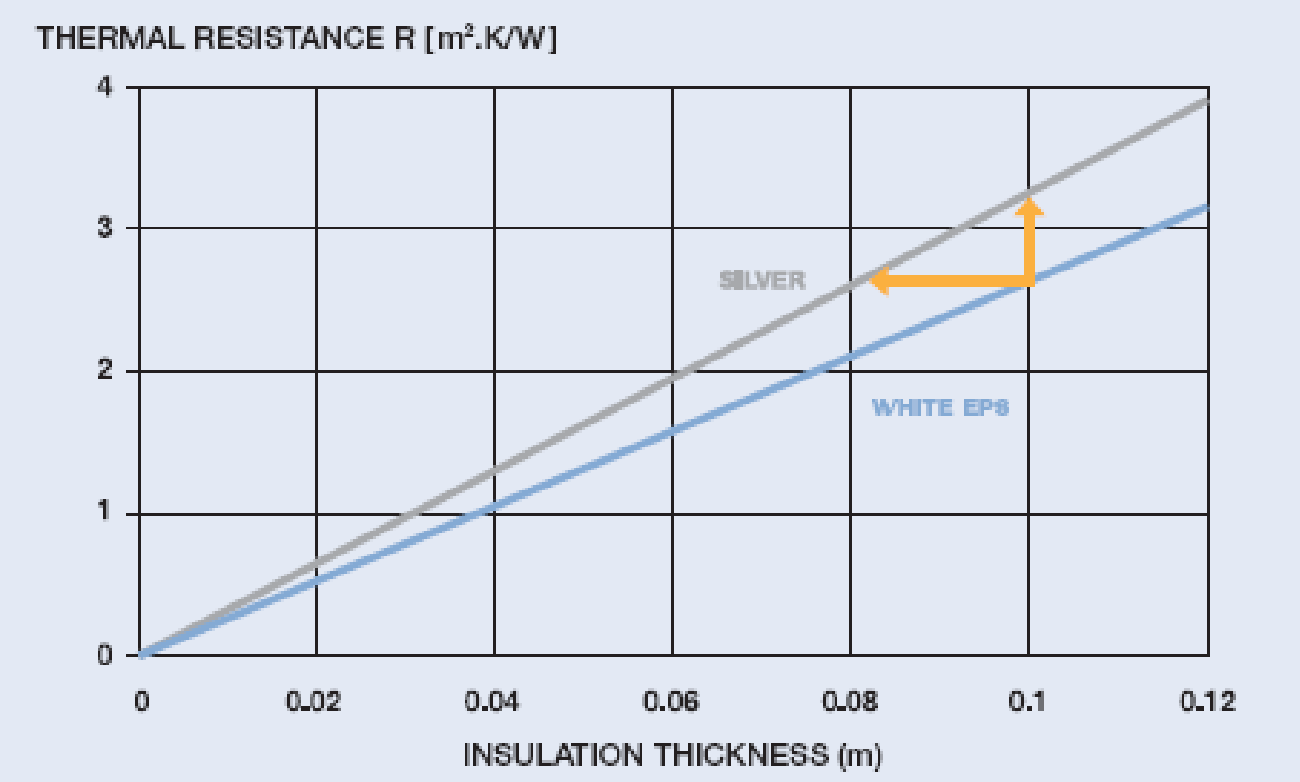
Thermal resistance of Silver and white EPS



(15 kg/m3)

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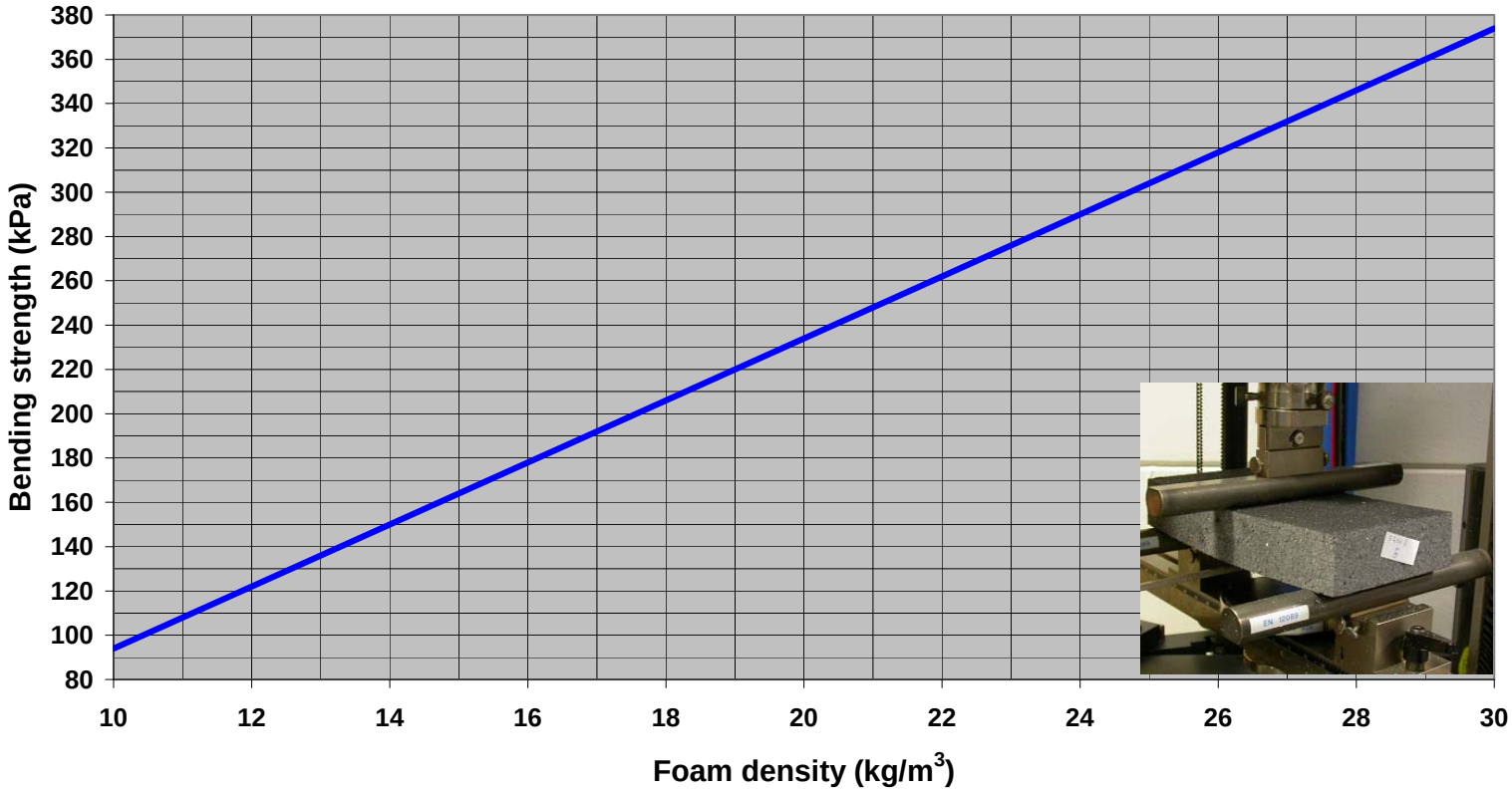
Bending strength of EPS Silver (EN 12089)



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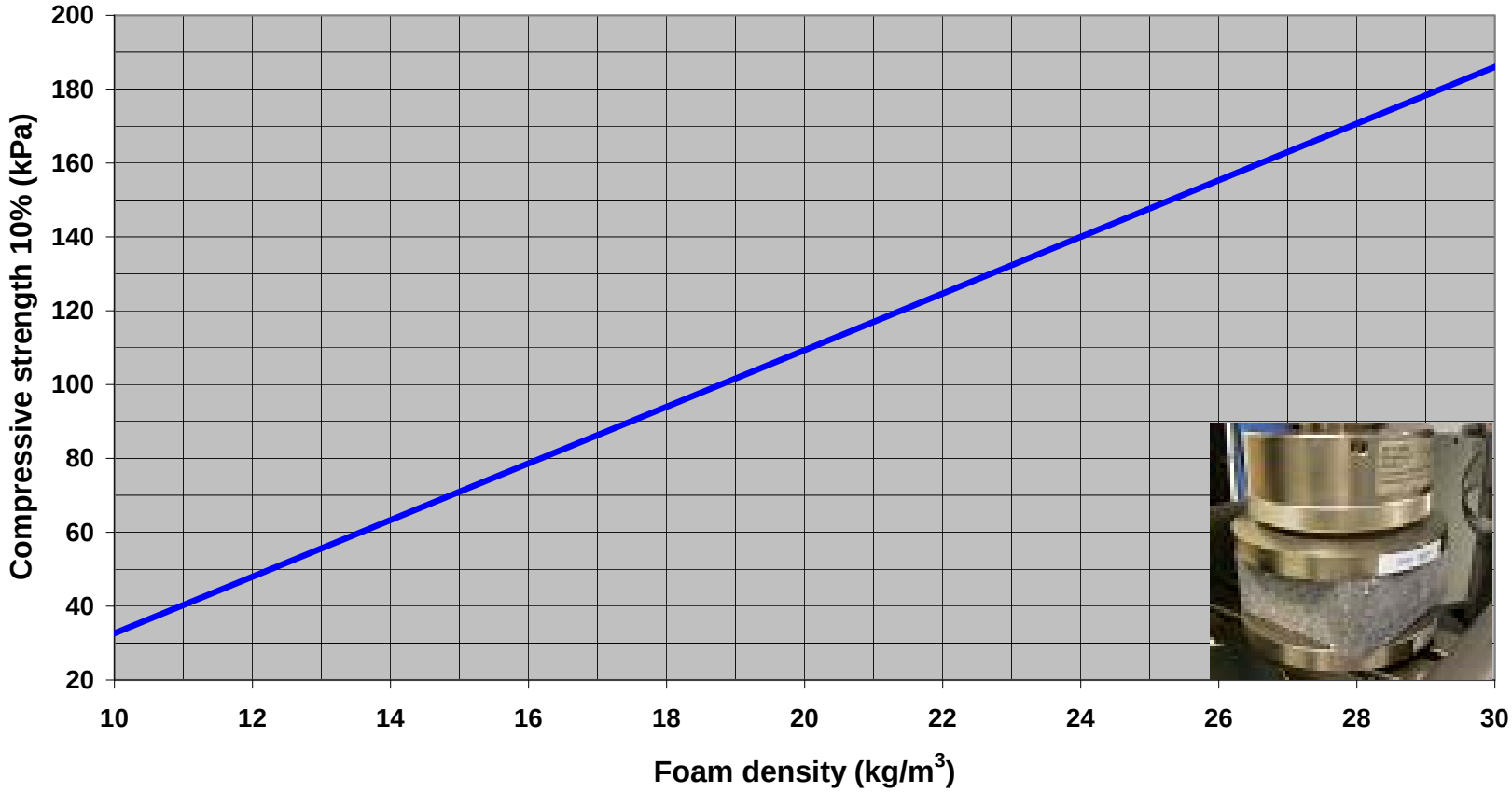
Compressive strength of EPS Silver (EN 826)



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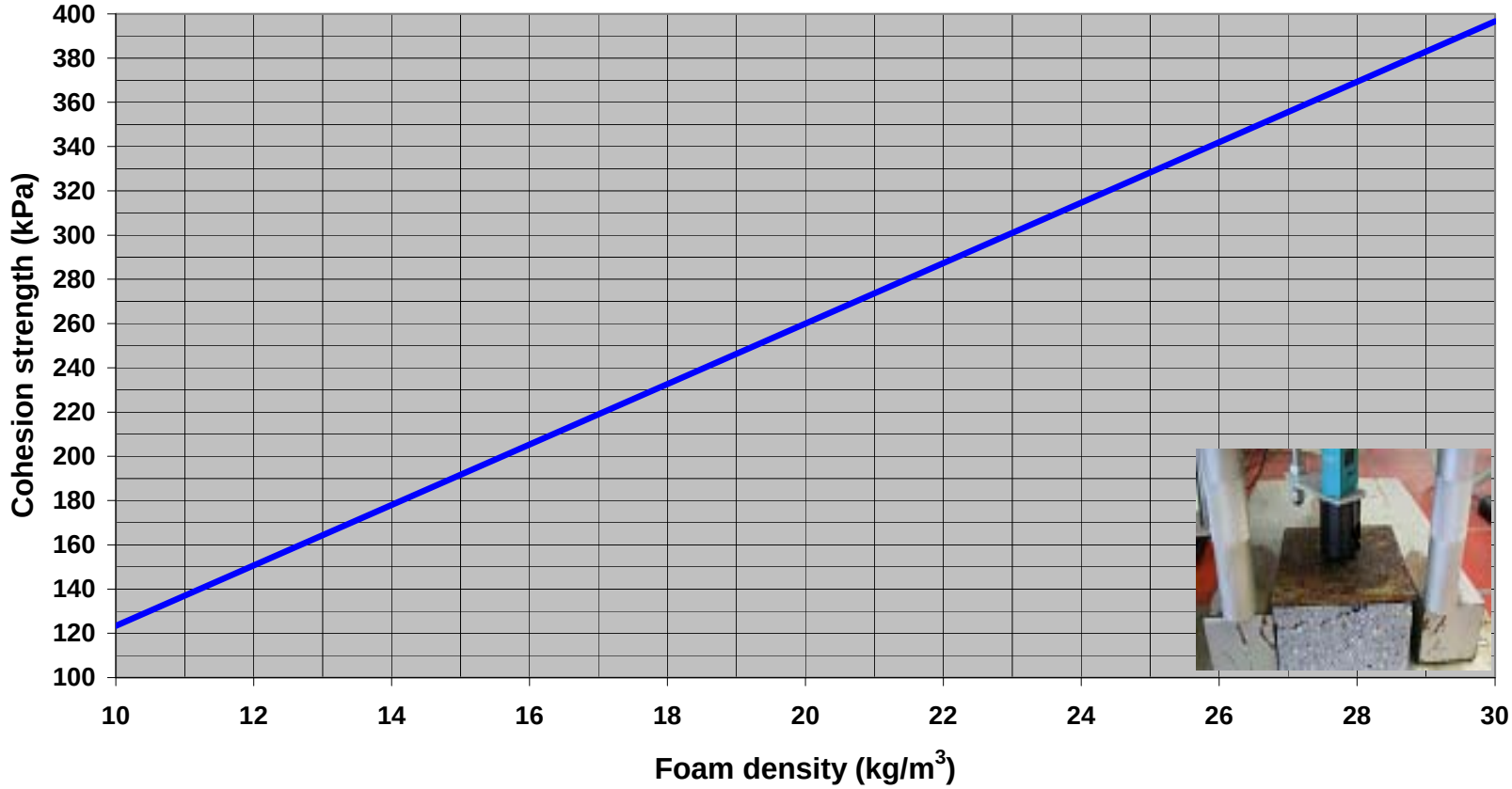
Cohesion strength of EPS Silver (EN 1607)



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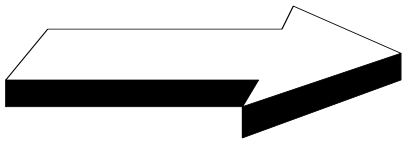
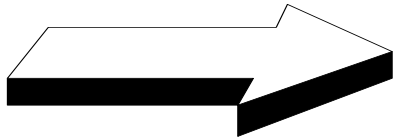
Processing of EPS Silver

Pre-expansion
(steam)



Maturing
(air)



Moulding: shape/block
(steam)

600 - 650 kg/m3 ----> 15-16 kg/m3

Second pass : 9-10 kg/m3

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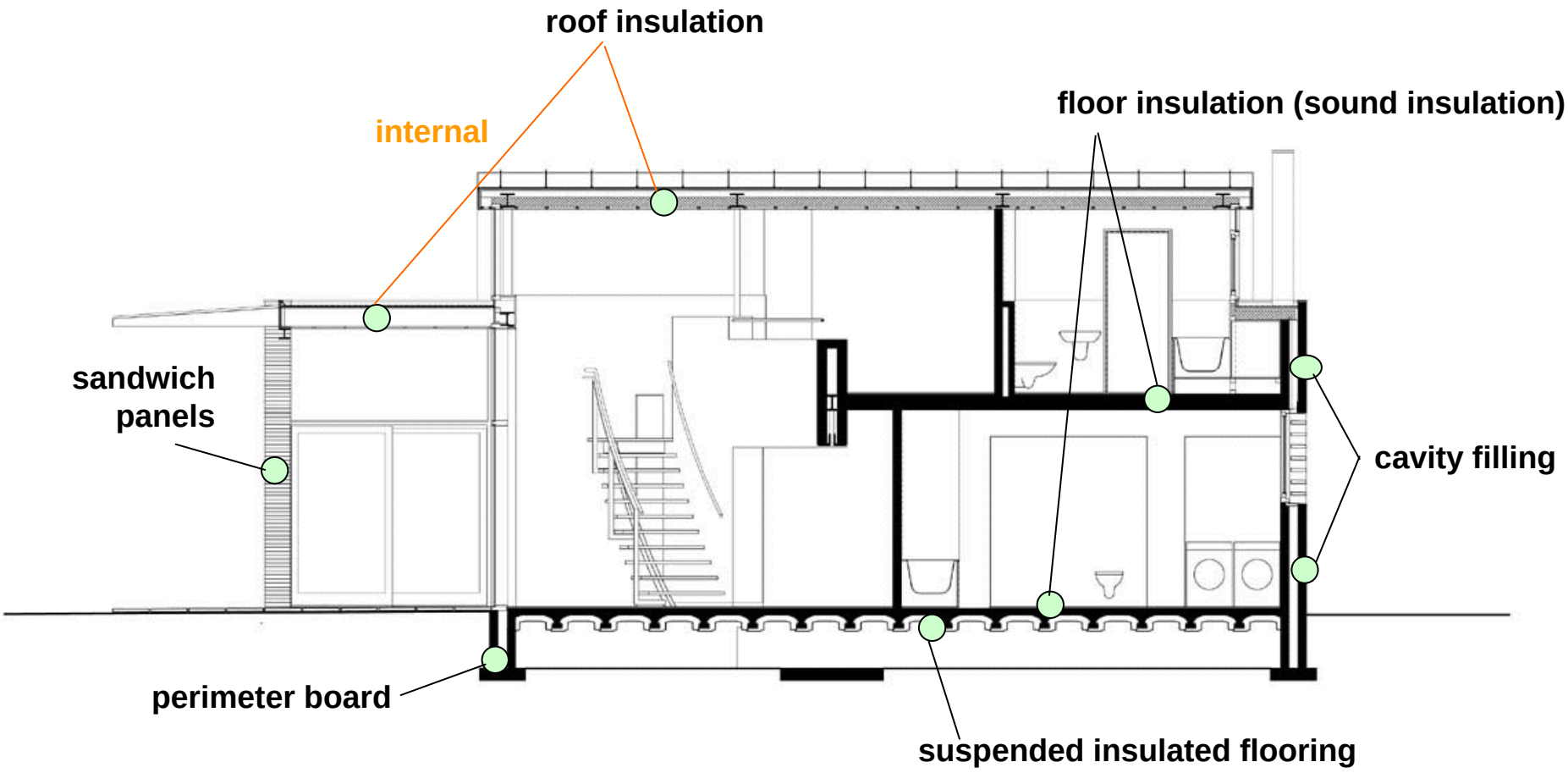
EPS Silver in B & C Applications



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External wall,roof and floor

Germany	Kg/m3	WG	Cohesion, kPa	10% Comp., kPa
Façade (ETICS)	14-15 18-19	035 032	100 (80*) 100 (80*)	-
Roof/floor	20-25	031	-	100-150

*:elasticized

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Roof system

- Multidak, Nl 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/m3	mW/m.K	Thickness, mm
Std. EPS	15 20	36 34	140 140
Silver	15 20	32 30	140 140

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Roof system (Contd.)

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Cavity wall insulation

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

For new builds

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Cavity wall (Contd.)

- 20 kg/m3
- Cut from block

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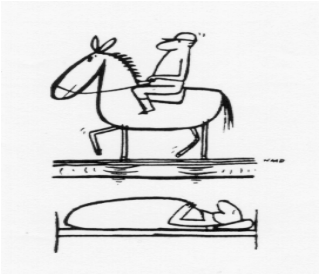
Thermo-acoustic

- 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)

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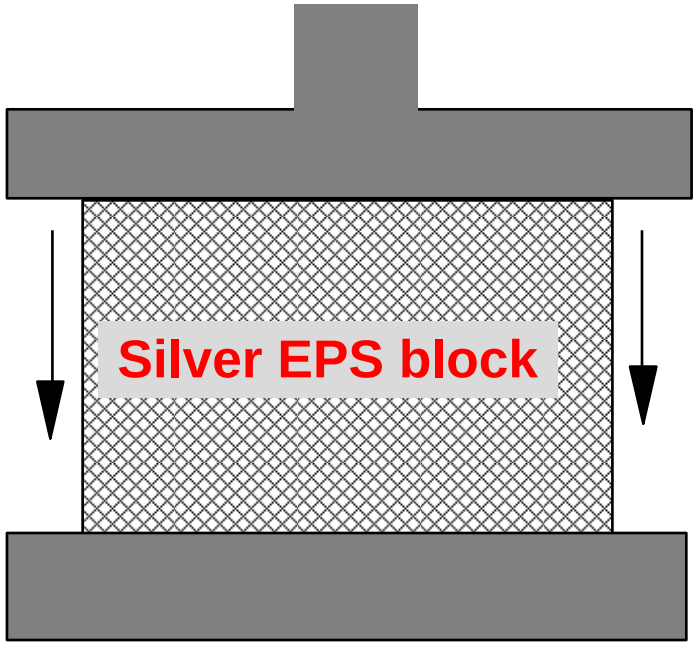
Thermo-acoustic (Contd.)

Block compression:

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



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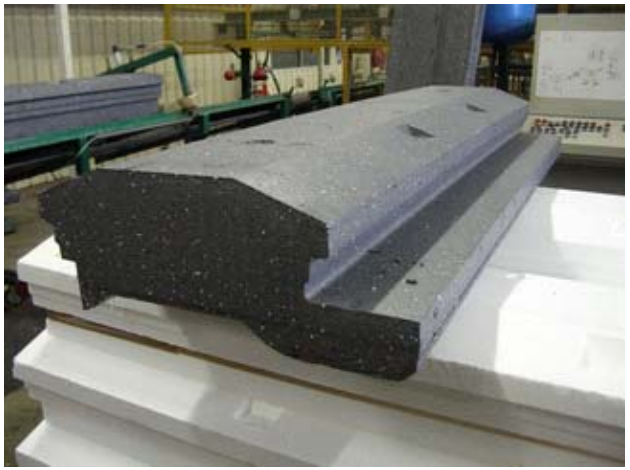
Entrevous

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



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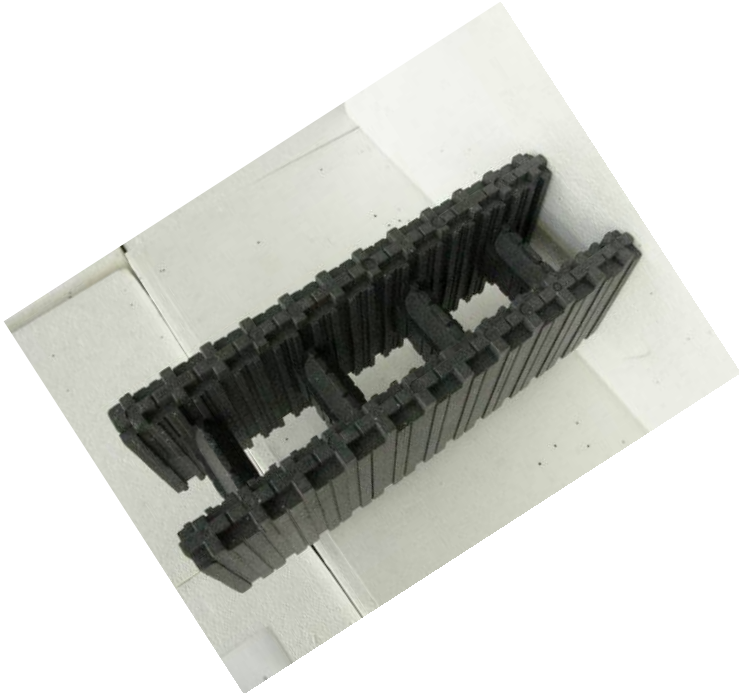
Insulated concrete form (ICF)

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



Rapid construction & excellent insulation

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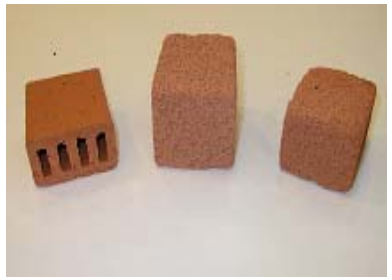
Cellular bricks and lightweight concrete form

- 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

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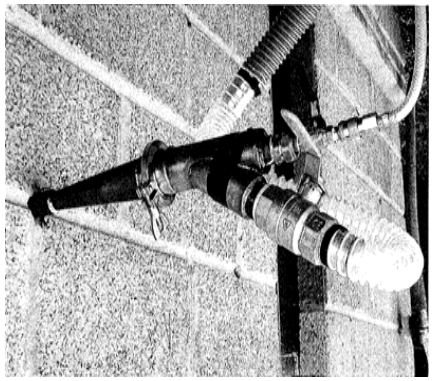
Loose-fill cavity wall

- 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

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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.

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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

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EPS silver

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

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