



Acoustic insulation of bulkheads and decks

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The acoustic insulation properties of insulation materials are usually expressed in terms of sound absorption or sound reduction/sound transmission loss. Another material property, airflow resistance, is also sometimes used in calculations of acoustic insulation performance.



Sound absorption

Sound absorption is a material property which describes how well sound waves are absorbed in a material. When a sound wave is absorbed, it simply means that the sound wave is transferred into another kind of energy i.e. heat.

For acoustic insulation requirements, sound absorption is relevant when considering noise levels within the same space as the noise source. The ability of the walls, floor and roof of a room to absorb noise will be important in reducing noise reflected back into the room from the surfaces of its boundaries.



Sound reduction / sound transmission loss

Sound reduction values are specific to constructions rather than a material property. The sound reduction value specifies the reduction of sound through an element of construction (wall, floor, or roof). For acoustic insulation requirements, the sound reduction value is relevant when considering noise levels in a space that is separate from the noise source, for example adjacent rooms separated by a wall. Sound reduction values for any construction will vary with the frequency of the sound source. Although sound reduction values for a construction are measured at various frequencies, an overall single figure is used to express the sound reduction value.

This figure is called the 'weighted sound reduction' or 'sound transmission loss' value (R_w) and is the almost equal to the sound reduction achieved in the middle of the human hearing range. The weighting procedure is standardised in ISO 717-1 standard for the sound reduction of airborne noise.

Airflow resistance

According to ISO 9053 this is the quotient of the air pressure difference across the specimen divided by the linear velocity, measured outside the specimen, of airflow through the specimen. For a homogeneous material the quotient of the specific airflow resistance divided by its thickness is called the airflow resistivity (r). Airflow resistance is a main product property of porous materials influencing the sound absorption in the material.

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Sound absorption

Test Method: BS EN ISO 354:2003

FireMaster Marine Plus blanket 45mm x 64kg/m³

Un-faced (no surface covering material used)
Sound absorption rating: 'Class A'

Frequency (Hz)	Sound absorption coefficient
125	0.15
250	0.75
500	1.00
1000	1.00
2000	1.00
4000	0.75
Overall sound absorption coefficient	1.00

Faced with glass cloth
Sound absorption rating: 'Class B'

Frequency (Hz)	Sound absorption coefficient
125	0.40
250	0.95
500	0.95
1000	0.85
2000	0.80
4000	0.65
Overall sound absorption coefficient	0.80

Faced with 30µm reinforced aluminium foil
Sound absorption rating: 'Class C'

Frequency (Hz)	Sound absorption coefficient
125	0.45
250	0.90
500	0.75
1000	0.65
2000	0.65
4000	0.45
Overall sound absorption coefficient	0.65

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Sound reduction

Weighted Sound Transmission Loss (R_w) values (ISO 717-1)

Steel bulkheads insulated with FireMaster Marine Plus blanket

System Construction Details	R_w (ISO 717-1)
45mm x 64kg/m ³ FireMaster Marine Plus blanket on bulkhead plate and stiffeners	45 dB
45mm x 64kg/m ³ FireMaster Marine Plus blanket + aluminium foil on bulkhead plate – stiffeners not insulated	44 dB
45mm x 64kg/m ³ FireMaster Marine Plus blanket + aluminium foil on bulkhead plate and stiffeners	47 dB
45mm x 128kg/m ³ FireMaster Marine Plus blanket on bulkhead plate and stiffeners	46 dB
50mm x 48kg/m ³ FireMaster Marine Plus blanket + aluminium foil on bulkhead plate – stiffeners not insulated	44 dB
50mm x 48kg/m ³ FireMaster Marine Plus blanket + aluminium foil on bulkhead plate and stiffeners	47 dB
75mm x 64kg/m ³ FireMaster Marine Plus blanket + aluminium foil on bulkhead and stiffeners	49 dB
75mm x 64kg/m ³ FireMaster Marine Plus blanket + ALGC foil on bulkhead and stiffeners	50 dB
60mm x 64kg/m ³ FireMaster Marine Plus blanket + ALGC foil on bulkhead and stiffeners	47 dB
60mm x 48kg/m ³ FireMaster Marine Plus blanket + ALGC foil on bulkhead. Stiffeners not insulated	47 dB
80mm x 70kg/m ³ FireMaster Marine Plus blanket + ALGC foil on bulkhead and stiffeners	52 dB

FRP Composite Sandwich Panel Bulkhead

(1.0 to 1.4mm GRP laminate and 50mm PVC Core 80 kg/m³)

FRP composite bulkhead specified above insulated with 3 layers of 25mm

FireMaster Marine Plus blanket 70 kg/m³ plus 1 layer of 25mm

FireMaster Marine Plus blanket 64 kg/m³ all layers with aluminium foil facing: $R_w=37$ dB

Airflow resistance

Airflow resistance of FireMaster Marine Plus blanket (ISO 9053: 1991)

Airflow Resistance of 45mm x 64 kg/m³

FireMaster Marine Plus blanket: 50.4 kPa.s/m²