14 Kalwall acoustic data

Sound insulation

The airborne sound insulation of Kalwall panels is summarised in the table below. All results quoted are weighted in accordance with EN ISO 717-1:1997.

Results marked with an asterisk were derived from laboratory tests carried out according to American Standard ASTM:E90 which is broadly equivalent to European Standard EN ISO 140-3:1995. All other results were derived from calculations.

Kalwall panel type denomination	Sound insulation rating (dB)		
	R_w	C	C_{tr}
Kalwall 2,74	23	-1	-5
Kalwall 2,57	24	-1	-5
Kalwall 1,56	31	-3	-9
Kalwall 1,25	31	-3	-8
Kalwall 1,20	31	-3	-8
Kalwall 0,99	31*	-3	-8
Kalwall 0,78	31	-3	-8
Kalwall 0,56	31*	-3	-8
4/16/4 double glazing (for comparison)	*31*	*-1*	*-5*
Kalwall with Nanogel	34*	-2	-6
Kalwall 100mm panel	35*	-2	-7

All results quoted relate to test sample sizes of 4 m^2. The sample size used for the laboratory tests for Kalwall 0,99 and Kalwall 0,56 was 4 m^2. Test results for Kalwall 100mm panel and Kalwall with Nanogel have been adjusted to account for tested sample sizes being between 7.4 m^2 and 2.2 m^2 respectively.

Panels of less than 2 m^2 area are likely to perform around 2 dB better than the values quoted in the table above. Panels of 10 m^2 or larger are likely to perform around 1 dB lower than the values stated in the table above.

Laboratory testing and calculations suggest that the internal framework grid centre spacing and grid pattern type may have a small effect on sound insulation (primarily at low frequencies). However, for the common Kalwall configurations noted in the tables above, the net effect in terms of R_w, C and C_{tr} is negligible.

Flanking sound insulation

Measured data from field tests in classrooms, together with calculations, show that Kalwall is capable of providing the following flanking sound insulation performance:

Flanking sound insulation

Flanking sound insulation performance	$D_{nT(0.8s),w}$ (dB)	$D_{nf,w}$ (dB)
Horizontal	44 to 46	36 to 39
Vertical	48	40

Tests were carried out in accordance with EN ISO 140-4:1998. All results quoted are weighted in accordance with EN ISO 717-1:1997. Site conditions encountered during the tests indicate that the flanking sound insulation performance of Kalwall is actually likely to be higher than indicated by the test results.

The results indicate that Kalwall facades are compatible with achieving the classroom to classroom sound insulation requirements given in Building Bulletin 93.

It should be noted that the flanking performance is likely to be heavily dependent upon the detailing of the junctions between the Kalwall and the adjoining building elements.

Sound absorption

The sound absorption performance of Kalwall has been estimated based on calculations and reverberation time field measurements in classrooms:

Sound absorption

Sound absorption coefficients						
Octave band centre frequency (Hz)						α_w
125	250	500	1k	2k	4k	
0.55	0.40	0.25	0.15	0.15	0.15	0.20

Octave band values and the weighted absorption coefficient have been calculated in accordance with BS EN ISO 11654. All calculations and assessments made using these estimated values should have due regard for the likely tolerances of the estimates.

Rain noise generation

Kalwall has been tested for rain noise generation under 'heavy rainfall' conditions in accordance with ISO 140-18:2006.

The resultant A-weighted sound intensity levels have been calculated and compared to the A-weighted intensity levels produced by other roofing materials.

Data for other materials has been obtained from BRE document (dated 2 December 2004) *'Building Bulletin 93 - Information on rain noise from roof glazing, polycarbonate roofing and ETFE roofing'* and the correction detailed in Section 3.1, Equation 1 applied to allow a direct comparison.

The table has been ordered in terms of increasing levels of rainfall noise.

Sound intensity

Element	A-weighted sound intensity (dB)
6/12/6.4 glazing	54.7
4R1 – Kalwall 0.28 (Nanogel)	54.9
2R1 – Kalwall 0.78	60.1
3R1 – Kalwall 0.56	60.7
1R1 – Kalwall 1.25	62.5
Polycarbonate	67.3
ETFE Pillow	74.2

Reference documents

The following acoustic assessment and test reports are available upon request:

Document date reference	Authoring organisation	Subject
2010-03-05	Taylor Woodrow	**Laboratory rain noise sound intensity measurements** on a series of skylights for the Kalwall Corporation carried out to ISO 140-18:2006.
2009-04-03	Sandy Brown Associates LLP	**Estimation of EN ISO 140-3 sound insulation** of Kalwall panels. Performances based on data from ASTM:E90 laboratory tests and calculations using Insul and Winflag acoustic modelling software. Results weighted to EN ISO 717-1.
2009-02-13	Sandy Brown Associates LLP	**Estimation of Kalwall sound absorption coefficients** based on field reverberation time tests and calculations using Winflag acoustic modelling software. Results weighted to EN ISO 11654.
2008-12-22	Sandy Brown Associates LLP	**Flanking sound insulation field tests** in classroom to EN ISO 140-4. Results weighted to EN ISO 717-1.
2008-06-03	Architectural Testing Inc.	**Laboratory sound insulation tests** for 4" Kalwall panels carried out according to ASTM:E90.
2004-12-04	BRE	**Laboratory rain noise sound intensity measurements** "Building Bulletin 93 - Information on rain noise from roof glazing, polycarbonate roofing and ETFE roofing' carried out to ISO/CD 140-18 (2004 draft version).
2002-02-02	Architectural Testing Inc.	**Laboratory sound insulation tests** for Nanogel filled Kalwall panels carried out to ASTM:E90.
1997-08-07	Intertek Testing Services	**Laboratory sound insulation tests** for standard Kalwall panels carried out to ASTM:E90.