WI System and WI Slot Block
Acoustic Analysis

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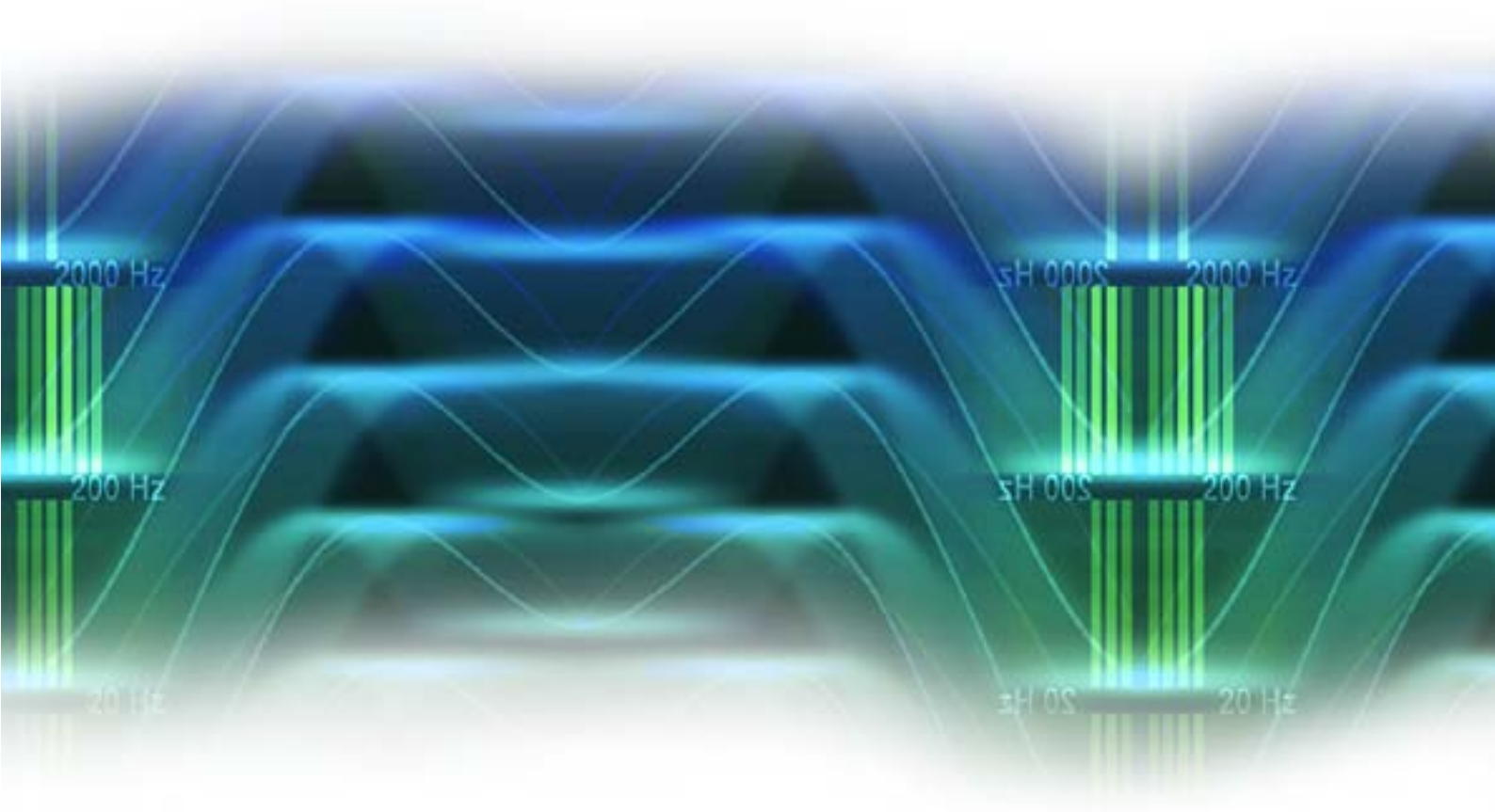
Wembley Innovation



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1. INTRODUCTION

Wembley Innovation Slot Block system is an innovative masonry support system, allowing the elimination of windposts and lintels, and ensuring seamless integration with surrounding blockwork.

It is a system where reinforcement is contained within hollow concrete blocks, rather than having blocks tied to windposts. These blocks are called slot blocks.

In addition, there are blocks called WI Columns and WI Beams. These are “more hollow”, but are filled with concrete following construction, so become formwork for a slip form concrete column or beam.

To date, blocks have been manufactured by Plasmor, and this is shortly to change to S Morris Ltd, though the new blocks will be the same as the Plasmor blocks, with very similar densities and constituents.

You have asked us to estimate and calculate the expected weighted sound reduction index of your Slot Block system, particularly in comparison to a traditional block. You have also asked to us to assess the performance of the WI Columns and Beams.

In general terms, the acoustic performance of a single leaf partition is determined at low frequencies, by the stiffness of the system, with the acoustic performance at the first panel resonance being low, determined by the system damping. Above this, the performance depends on the mass of the system (theoretically increasing at 6 dB / octave, though this is in practice usually limited to 4-5 dB / octave). At a point called the critical frequency, there is another dip in performance (damping controlled), and above this point, generally an increase of approximately 9 dB / octave will occur.

For concrete blocks, the acoustic performance is controlled by the middle “mass law” section. In normal circumstances, the first panel resonance frequency is sufficiently low to be out of the range of interest, and the high frequency performance, above coincidence, is not within a critical range under normal circumstances.

We can calculate the acoustic performance following these laws, by utilising Insul, a calculation programme that is based on these theoretical models. It uses primarily the mass law and coincidence frequency approach. We operate version 8.0.7 and more details are available here: www.insul.co.nz. As with any calculation procedure, it is not a substitute for test data, though for simple systems, such as these slot blocks, WI Columns and WI Beams, it is expected to reasonably correlate with test data. Input data has used block density as given in table 1 below, Youngs Modulus has been taken as 19.6 GPa, loss factor of 0.005, and Poisson’s Ration of 0.1 (All taken from Annex B of Bies and Hansen “Engineering Noise Control”, for concrete).

2. BLOCK DETAILS

We are informed that the Plasmore Slot Blocks and S Morris Ltd Blocks are similar in acoustic performance. Data is available from the Plasmore Blocks:

Parameter	Plasmore Slot Block
Net dry density of concrete (kg/m^3)	1450
Block dimension (mm)	440 by 215
Width (mm)	100, 140, 190, 215
Unit weight (Kg)	12.7, 17.8, 21.8, 23.6
Calculated block density (kg/m^3)	1342, 1344, 1213, 1085
Calculated surface density (kg/m^2)	134, 188, 230, 249

Table 1: Block Parameters

There is no reason to anticipate any substantial difference between the Plasmore and S Morris Systems.

The acoustic performance of these blocks has been assessed by others, and given as:

Block thickness	"estimated sound reduction"
100 mm	44
140 mm	47
190 mm	49
215 mm	50

Table 2: Acoustic performance assessed by others

I have assumed that by "estimated sound reduction" the "Weighted Sound Reduction Index", denoted as R_w is intended. This is a single figure measure of the acoustic performance that would be achieved by the partition (block wall in this case) in a laboratory environment. I do not know the basis for these assessments.

The WI Column and WI Beam (Lintel) system would be expected to behave as a concrete slip form construction. The block element simply forms a formwork wrapper, which is subsequently filled with concrete. It is assumed that the concrete is of typical density 2400 kg/m^3, and has fully filled the blocks, and fully bonded to them. This would mean that the WI Column and Beam Blocks, when fully filled, are significantly denser than medium density solid blocks, which should lead to a higher standard of performance. In practice, it can be difficult to ensure this type of construction does get fully filled, as air pockets, the filler viscosity and workmanship can all lead to areas that are not filled. We have not inspected the filling process, so can offer no comment on the WI system's success or risk of this occurring. For the purpose of this assessment, it is assumed the block is fully filled.

3. ASSESSMENT OF PERFORMANCE

We would not anticipate any significant variation between the acoustic performances of different manufacturer's blocks, assuming the material properties are similar. Table 3 below summarises a comparison of the Slot Block performance to Lignacite Blocks, as an industry standard medium dense block and for which data is readily available. Table 3 also includes a calculation of the expected acoustic performance of the Slot Blocks, using Insul software.

Block	Thickness (mm)	Surface Density kg/m^2	Rw, dB
Lignacite Cellular	100	128 (includes mortar)	43 (manufacturer's data)
Plasmore Slot Block	100	134	44 (estimated performance by others)
Generic Slot Block	100	134	43 (calculated performance by Insul)
Lignacite Cellar/Hollow	140	168	47 (manufacturer's data)
Plasmore Slot Block	140	188	47 (estimated performance by others)
Generic Slot Block	140	188	48 (calculated performance by Insul)
Lignacite Cellar/Hollow	190	210	49 (manufacturer's data)
Plasmore Slot Block	190	230	49 (estimated performance by others)
Generic Slot Block	190	230	51 (calculated performance by Insul)
Lignacite Cellar/Hollow	215	231	50 (manufacturer's data)
Plasmore Slot Block	215	249	50 (estimated performance by others)
Generic Slot Block	215	249	52 (calculated performance by Insul)

Table 3: Comparison of previously assessed slot block performance, with calculated performance from Insul and traditional concrete blocks.

This then shows that the previous assessment of the slot block, is in keeping with our expectations. The 100 mm Slot block would be expected to be R_w 43-44 dB, 140 mm R_w 47-48 dB, 190 mm R_w 49-51 dB and 215 mm 50-52 dB. The previous assessment of this block has been at the lower end of the range given, but the predictions previously given are in keeping with my expectations as well.

Table 4 gives a comparison of the acoustic performance of fully filled beam and column blocks as calculated by Insul, from a slipform concrete construction, to manufacturer's data for solid blocks.

Block	Thickness (mm)	Surface Density kg/m^2	Rw, dB
Lignacite Solid	140	206 (lightweight mix)	48 (manufacturer's data)
Topcrete Paint Quality Solid	140	252-266	51 (manufacturer's data)
Column/Beam Block	140	336	53 (calculated performance by Insul)
Lignacite Solid	190	301	53 (manufacturer's data)
Topcrete Paint Quality Solid	190	342-361	53 (manufacturer's data)
Column/Beam Block	190	456	58 (calculated performance by Insul)
Lignacite Solid	215	340	54 (manufacturer's data)
Topcrete Paint Quality Solid	215	387-409	55 (manufacturer's data)
Column/Beam Block	215	516	60 (calculated performance by Insul)

Table 4: Comparison of manufacturer data for solid blocks, with calculated performance from Insul for a fully filled Column or Beam Block, with concrete (2400 kg/m^3)

This then shows the Column and Beam Block outperforming a solid block. However, this does assume the block is fully filled as described. At these higher standards of performance, it might be relatively safe to assume a range of performance between that of the higher density traditional solid block, up to the calculated performance based on mass law etc, as determined by the Insul software.

4. SUMMARY

Table 5 then sets out a summary of the predicted acoustic performance, in terms of a weighted sound reduction index, as described in more detail in section 3 above.

Block	Weighted Sound Reduction Index (Rw, dB)
WI Slot Block	
100 mm thick	43-44
140 mm thick	47-48
190 mm thick	49-51
215 mm thick	50-52
WI Column and Beam Block, Fully filled with concrete	
140 mm thick	48-53
190 mm thick	53-58
215 mm thick	54-60

Table 5: Summary of Acoustic Performance Calculations

Report Code: A/PA/M

APPENDIX A

Blockwork Acoustic Performance Data – Manufacturer

Product Data

Lignacite Range

Description

Lignacite concrete blocks comprise a range of medium density loadbearing units, 440x215mm face size*, used in internal or external walls and manufactured from cement, sand and lightweight aggregates. Lignacite blocks are medium grey in colour, with a fine surface texture, providing exceptional sound reduction qualities.

These blocks provide the robustness of a dense block whilst still providing the benefits associated with a medium density block.

Lignacite blocks are available as:

Lignacite, available in all our standard sizes and forms:

- **Standard** - Suitable for locations where the surface will not be seen, ie plastered or rendered.
- **Paint-Grade** - Suitable for locations where a consistent close textured face is required as a painting background.
- **Fair faced** - Suitable for locations where a consistent colour and close textured face is required. (Please notify the Sales Office when being used as Fair faced).

Lignacite SP is only available in 140mm width solid blocks. This block consists of a specially formulated mix which reduces the block density, to produce a solid block under 20 kg. Available as Standard, Paint-Grade, Fair faced & GP finishes. Please note there will be a slight colour difference between the Traditional block and the SP.

Lignacite GP is only available in 100mm and 140mm solid form. These units have a striated face to provide a good key when plastering or rendering.

Uses

Suitable for use below DPC both internally and externally in 7.3N/mm² strength, and below DPC internally only, in 3.6N/mm² strength.

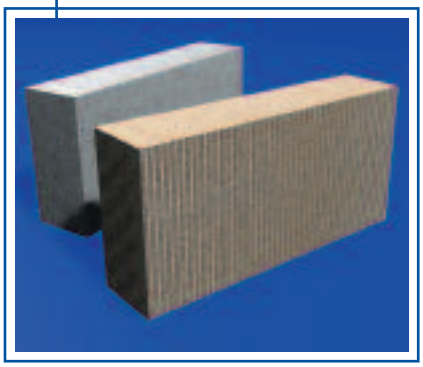
For block and beam flooring, 7.3N/mm² units are normally used.

Standards

Lignacite blocks are kitemarked as conforming to BS EN 771-3 Aggregate Concrete Masonry Units. They comply to Category 1 Masonry Units and are manufactured under a comprehensive Quality Assurance Scheme assessed and certified to BS EN 9001:2000 by the BSI.

Fire

Lignacite masonry units provide excellent fire resistant properties.



**Metric Modular (390x190mm) blocks are available to special order in 90mm, 140mm solid form, and 190mm widths in both solid & hollow form.*

Dimensional Tolerances	
Category:	D1
Flatness of surface (only applicable to paintgrade and fair faced units)	<2mm
Mean Unit Strength	
Lignacite (all strengths):	3.6, 7.3 & 10.4N/mm²
Lignacite SP	3.6 & 7.3N/mm²
Net Dry Density	
Lignacite (all strengths):	1570kg/m³
Lignacite SP:	1450kg/m³
Thermal Conductivity (W/mK)	
Lignacite (all strengths): Based on tabulated values from BS EN 1745	Internally 0.90 Externally 0.97
Lignacite SP: Based on tabulated values from BS EN 1745	Internally 0.79 Externally 0.84
Water Vapour Diffusion Coefficient μ	
Lignacite & SP: Based on tabulated values from BS EN 1745	5/15
Moisture Movement	
Lignacite:	<0.8mm/m
Water Absorption by Capillarity	
Lignacite:	<500g/m²/S$^{0.5}$
Reaction to Fire	
Classification to EN 13501-1:	A1
Durability	
Based on tabulated values from BS 5628-3 table 12	3.6N/mm² (not to be exposed) 7.3+10.4N/mm² (frost resistant)
Bond Strengths	
Based on tabulated values from BS EN 998-2 Annex C	0.15N/mm²

For information about shapes, see section PD10. For details of Hollow and Cellular blocks, see fig DC7 in Design Section. For information about the characteristic compressive strength of masonry fk, see section DC8.

High Street, Brandon, Suffolk IP27 0AX - Tel: 01842 810678 - Fax: 01842 814602 - E-mail: info@lignacite.co.uk - Website: www.lignacite.co.uk
Meadgate Works, Nazeing, Waltham Abbey, Essex EN9 2PD - Tel: 01992 464441 - Fax: 01992 445713

Thermal Resistance - Table 1

Width (mm)	Form	Thermal Resistance (m^2K/W) 3%	5%
75	Solid	0.083	0.077
90	Solid	0.100	0.093
100	Cellular	0.165	0.156
100	Solid	0.111	0.103
140	C/H	0.210	0.200
140[SP]	Solid	0.177	0.167
150	Solid	0.167	0.155
190	Hollow	0.246	0.235
190	Solid	0.211	0.196
200	Solid	0.222	0.206
215	Hollow	0.258	0.247
215	Solid	0.239	0.222

Fire Resistances (hrs) - Table 3*

Width (mm)	Form	Loadbearing	Non Loadbearing
75	Solid	-	1
90	Solid	1	1.5
100	Cellular	-	0.5
100	Solid	2	2
140	C/H	-	3
140[SP]	Solid	2	4
150	Solid	2	4
190	Hollow	-	4
190	Solid	2	4
200	Solid	2	6
215	Hollow	-	6
215	Solid	2	6

**Based upon single leaf with no finish*

Sound Insulation $Rw^{(C;Ctr)}$dB - Table 4

Width (mm)	Form	Lightweight Plaster	Dense Plaster	Dry lined	Fair faced
75	Solid	$43^{(-1;-4)}$	$45^{(-1;-4)}$	$45^{(-2;-6)}$	$39^{(-1;-6)}$
90	Solid	$44^{(-1;-4)}$	$46^{(-1;-4)}$	$45^{(-2;-6)}$	$43^{(-1;-6)}$
100	Cellular	$44^{(-1;-4)}$	$46^{(-1;-4)}$	$45^{(-2;-6)}$	$43^{(-1;-6)}$
100	Solid	$47^{(-1;-4)}$	$48^{(-1;-4)}$	$47^{(-2;-6)}$	$46^{(-1;-6)}$
140	C/H	$49^{(-1;-5)}$	$50^{(-1;-5)}$	$49^{(-2;-6)}$	$47^{(-1;-6)}$
140[SP]	Solid	$51^{(-1;-5)}$	$52^{(-1;-5)}$	$51^{(-2;-6)}$	$48^{(-1;-6)}$
150	Solid	$52^{(-1;-5)}$	$53^{(-1;-5)}$	$52^{(-2;-6)}$	$51^{(-1;-6)}$
190	Hollow	$50^{(-2;-6)}$	$51^{(-1;-6)}$	$50^{(-2;-6)}$	$49^{(-1;-6)}$
190	Solid	$54^{(-2;-6)}$	$54^{(-1;-6)}$	$53^{(-2;-6)}$	$53^{(-1;-6)}$
200	Solid	$54^{(-2;-6)}$	$54^{(-1;-6)}$	$53^{(-2;-6)}$	$53^{(-1;-6)}$
215	Hollow	$51^{(-2;-6)}$	$52^{(-1;-6)}$	$51^{(-2;-6)}$	$50^{(-1;-6)}$
215	Solid	$54^{(-2;-6)}$	$55^{(-1;-6)}$	$54^{(-2;-6)}$	$54^{(-1;-6)}$

Key: C/H=Cellular or Hollow.
[SP]=SP is a lighter mix only available 140mm.

Unit Weights - Table 2

Width (mm)	Form	Unit Weight (kg)	Weight laid inc Mortar (kg/m^2)
75	Solid	11.1	118
90	Solid	13.4	143
100	Cellular	11.8	128
100	Solid	14.9	159
140	C/H	15.3	168
140[SP]	Solid	19.2	206
150	Solid	22.3	238
190	Hollow	19.0	210
190	Solid	28.2	301
200	Solid	29.7	317
215	Hollow	20.8	231
215	Solid	31.9	340

Surface Finish Recommendations

- **Drylining**
  Application to be as manufacturer's recommendations.
- **Dense Plaster**
  Rake-back joints and apply stipple coat.
  Apply either 1:1:6 cement:lime:sand or 1:4½ masonry cement:sand or 1:5½ cement:sand & plasticiser or designation Grade III mortar/render.
  Alternatively: Thistle bonding or Thistle Hardwall or Knauf Ultimate backing plaster.
- **Finishing Coats**
  Thistle plaster finish or Thistle multi finish or Knauf Multi cover.
- **External Rendering**
  To be In accordance with BS 5262: 1991, using initial spatterdash coat, consisting of 1 cement, 1 sand, gauged with a proprietary bonding agent (SBR).

Sound Absorption - Table 5

Frequency (Hz)	Sound absorption coefficient a_p
125	0.15
250	0.25
500	0.35
1000	0.40
2000	0.45
4000	0.45
Weighted Sound Absorption Coefficient a_w	0.40
Classification of Sound Absorption	Class D

Sound Absorption coefficient (a_s) measurements of 100mm thicknesses of Lignacite were made in the AIRO acoustics Laboratory. The measurements were made in $^1/_3$ octave bands from 100Hz to 5000Hz in accordance with BS EN 20354:1993.

From the results of the measurements the octave band Practical Sound Absorption Coefficient (a_p), single figure Weighted Sound Absorption Coefficient (a_w) and Sound Absorption Class have been determined in accordance with BS EN ISO 211654:1997.

Topcrete *Properties*

Topcrete Standard blocks

For general use in walls above and below ground and in beam and block floors. They offer high loadbearing potential, excellent sound insulation and are extremely robust and durable. They are ideal for finishing with render, cladding, plaster or drylining.

Topcrete Paint Quality blocks

Close textured blocks ideally suited for walls in commercial and leisure buildings which are to receive direct decoration. The colour and texture of blocks may differ according to factory of origin. Samples are available on request.

Material properties

	Standard	Paint Quality
Compressive strength to BS EN 771-3 (N/mm²)		
Solid blocks	7.3, 10.4, 17.5 & 22.5	7.3 & 10.4
Cellular and hollow blocks	3.6, 7.3 & 10.4*	3.6, 7.3 & 10.4*
Equivalent compressive strength to BS 6073 (N/mm²) (superseded by BS EN 771-3)		
Solid blocks	7.0, 10.0, 15.0 and 20.0	7.0 &10.0
Cellular and hollow blocks	3.5, 7.0 and 10.0*	3.5, 7.0 & 10.0*
Material dry density (kg/m³)		
	1900 - 2000	1800 - 1900
Thermal conductivity (W/mK @ 3%) moisture content		
	1.28	1.18
Moisture movement (mm/m) (shrinkage & expansion)		
	< 0.5	< 0.5
Typical airtightness (m³ [h.m²] @ 50 Pa)		
100mm solid blocks – emulsion paint finish	-	0.13 - 1.16
140mm solid blocks – emulsion paint finish	-	0.36

Note *Manufactured to order

Topcrete *Standard*

Sizes and unit weights (kg)

Face size 440 x 215mm (Midi 290 x 215mm) Block width (mm)						
75	90	100	140	150	190	215
Solid: 7.3, 10.4, 17.5, 22.5N/mm²						
14.0	17.0	18.5	26.0	28.0	35.0	40.0
Solid Midi: 7.3, 10.4, 17.5, 22.5N/mm²						
-	-	-	17.3	-	-	-
Cellular: 3.6, 7.3N/mm²						
-	-	14.5	18.4	-	-	-
Cellular Multicore: 3.6, 7.3N/mm²						
-	-	-	18.5	-	-	-
Hollow: 3.6, 7.3N/mm²						
-	-	-	17.0	-	-	27.0

Notes Unit weights, which are given for design purposes, are approximate only and based on 3% moisture content

Tolerance to BS EN 771-3, Tolerance Category D1.

Laid weights (kg/m²)

Face size 440 x 215mm (Midi 290 x 215mm) Block width (mm)						
75	90	100	140	150	190	215
Solid: 7.3, 10.4, 17.5, 22.5N/mm²						
148	177	198	275	295	374	423
Solid Midi: 7.3, 10.4, 17.5, 22.5N/mm²						
-	-	-	276	-	-	-
Cellular: 3.6, 7.3N/mm²						
-	-	155	194	-	-	-
Cellular Multicore: 3.6, 7.3N/mm²						
-	-	-	199	-	-	-
Hollow: 3.6, 7.3N/mm²						
-	-	-	180	-	-	285

Note Laid weights are approximate and taken at 3% moisture content

Performance summary

	Fire resistance, no finish (hrs)		Sound reduction, (R_w dB)		Block thermal resistance (m²K/W)
Single leaf wall	**Non-loadbearing**	**Loadbearing**	**Lightweight plaster**	**Drylining**	**3.6, 7.3, 10.4N/mm²**
75mm solid	1 (2)	-	47	46	0.06
90mm solid	1½ (2)	1	48	47	0.07
100mm solid	2	2	50	49	0.08
140mm solid/ solid Midi	3 (4)	2 (3)	53	52	0.11
150mm solid	4 (6)	2 (6)	53	52	0.12
190mm solid	4 (6)	2 (6)	54	54	0.15
215mm solid	6	2 (6)	56	54	0.17
100mm cellular	2	2	46	46	0.12
140mm cellular or hollow inc. cellular Multicore	3	3	51	51	0.17
215mm hollow	6	(2)	53	53	0.22

Notes The values for fire resistance and sound insulation apply to Topcrete blocks of any strength

Fire resistance – figures in brackets denote blocks manufactured using limestone. These are available from a number of factories and should be specified where their use is essential in meeting the required fire resistance. The application of plaster or drylining finishes will generally increase the period of fire resistance

Sound reduction – finishes to both wall faces are assumed. Values are based on technical assessment and tests to BS EN 140

Topcrete *Paint Quality*

Sizes and unit weights (kg)

Face size 440 x 215mm (Midi 290 x 215mm) Block width (mm)					
90	100	140	150	190	215
Solid: 7.3, 10.4N/mm²					
16.0	17.8	24.9	26.7	33.8	38.2
Solid Midi: 7.3, 10.4Nmm²					
-	-	16.4	-	-	-
Cellular: 3.6, 7.3N/mm²					
-	-	18.0	-	-	-
Cellular Multicore: 3.6, 7.3N/mm²					
-	-	18.5	-	-	-
Hollow: 3.6, 7.3N/mm²					
-	-	18.0	-	-	-

Notes Unit weights, which are given for design purposes, are approximate only and based on 3% moisture content

Tolerance to BS EN 771-3, Tolerance Category D1.

Laid weights (kg/m²)

Face size 440 x 215mm (Midi 290 x 215mm) Block width (mm)					
90	100	140	150	190	215
Solid: 7.3, 10.4N/mm²					
168	187	262	281	356	403
Solid Midi: 7.3, 10.4N/mm²					
-	-	262	-	-	-
Cellular: 3.6, 7.3N/mm²					
-	-	197	-	-	-
Cellular Multicore: 3.6, 7.3N/mm²					
-	-	199	-	-	-
Hollow: 3.6, 7.3N/mm²					
-	-	197	-	-	-

Note Laid weights are approximate and taken at 3% moisture content

Performance summary

	Fire resistance, no finish (hrs)		Sound reduction, (R_w dB)	Block thermal resistance (m²K/W)
Single leaf wall	**Non-loadbearing**	**Loadbearing**	**Painted finish only**	**3.6, 7.3, 10.4N/mm²**
90mm solid	1½ (2)	1	46	0.08
100mm solid	2	2	48	0.08
140mm solid/ solid Midi	3 (4)	2 (3)	51	0.12
150mm solid	4 (6)	2 (6)	52	0.13
190mm solid	4 (6)	2 (6)	53	0.16
215mm solid	6	2 (6)	55	0.18
140mm cellular or hollow inc. cellular Multicore	3	2	51	0.18

Notes The values for fire resistance and sound insulation apply to Topcrete blocks of any strength

Fire resistance – figures in brackets denote blocks manufactured using limestone. These are available from a number of factories and should be specified where their use is essential in meeting the required fire resistance. The application of plaster or drylining finishes will generally increase the period of fire resistance

Sound reduction – values are based on technical assessment and tests to BS EN 140

APPENDIX B

Insul Calculation of WI Slot Block

Sound Insulation Prediction (v8.0.7)

- Key No. 2553

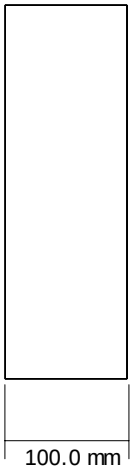
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 7 Oct 15 Initials:

File Name: insul



WI Slot Block, 100 mm

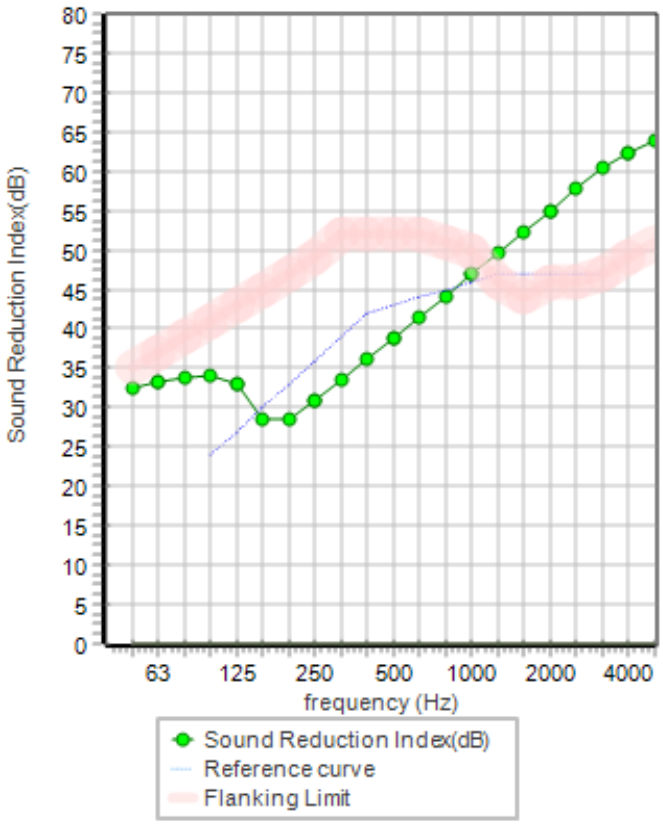
Rw	43 dB	
C	-1 dB	
C_{tr}	-5 dB	
D_{nTw}	45 dB	[V:50m3] [A:11m2]

System description

Panel 1 : 1 x 100.0 mm Slot Block 100 mm (ρ:1342 kg/m3,E:20GPa,η:0.02)

frequency (Hz)	R(dB)	R(dB)
50	32	
63	33	33
80	34	
100	34	
125	33	31
160	29	
200	28	
250	31	30
315	34	
400	36	
500	39	38
630	42	
800	44	
1000	47	46
1250	50	
1600	52	
2000	55	54
2500	58	
3150	60	
4000	62	62
5000	64	

Panel Size 2.7x4 m; Mass 134.2 kg/m2



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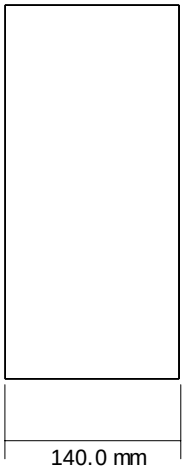


WI Slot Block, 140 mm

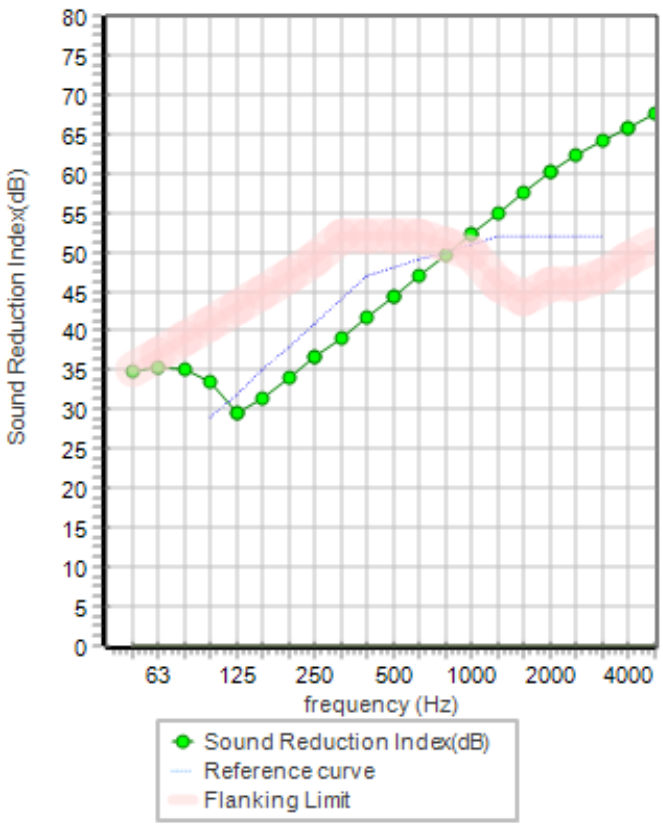
Rw	48 dB	
C	-2 dB	
C_{tr}	-6 dB	
D_{nTw}	50 dB	[V:50m3] [A:11m2]

System description

Panel 1 : 1 x 140.0 mm Slot Block 140 mm (ρ:1344 kg/m3,E:20GPa,η:0.02)

frequency (Hz)	R(dB)	R(dB)
50	35	
63	35	35
80	35	
100	33	
125	30	31
160	31	
200	34	
250	37	36
315	39	
400	42	
500	44	44
630	47	
800	50	
1000	52	52
1250	55	
1600	58	
2000	60	60
2500	62	
3150	64	
4000	66	66
5000	68	

Panel Size 2.7x4 m; Mass 188.2 kg/m2



Sound Insulation Prediction (v8.0.7)

- Key No. 2553

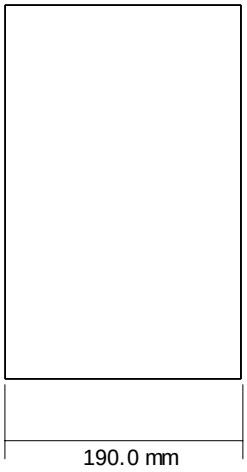
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 7 Oct 15 Initials:

File Name: insul



WI Slot Block, 190 mm

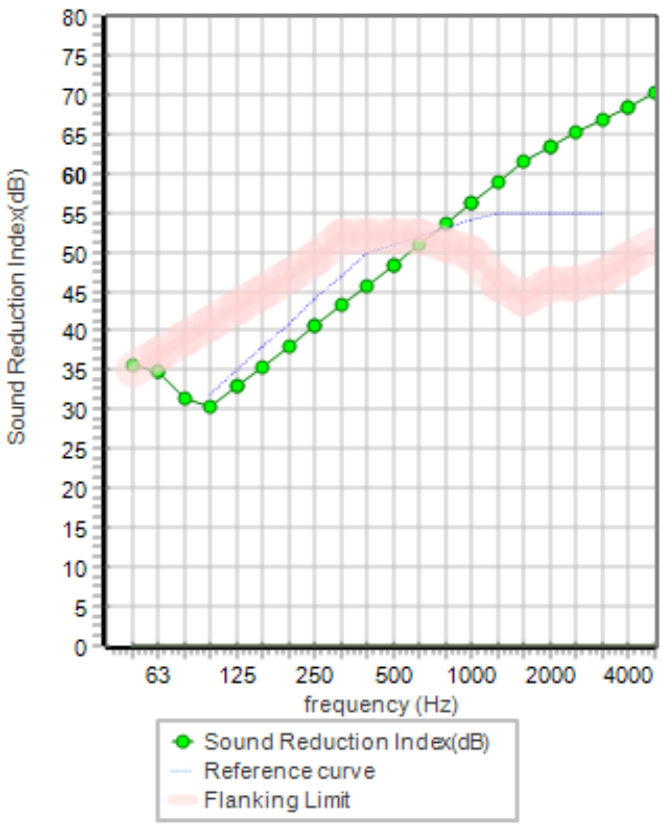
Rw	51 dB	
C	-1 dB	
C_{tr}	-6 dB	
D_{nTw}	53 dB	[V:50m3] [A:11m2]

System description

Panel 1 : 1 x 190.0 mm Slot Block 190 mm (ρ:1213 kg/m3,E:20GPa,η:0.03)

frequency (Hz)	R(dB)	R(dB)
50	36	
63	35	34
80	31	
100	30	
125	33	32
160	35	
200	38	
250	41	40
315	43	
400	46	
500	48	48
630	51	
800	54	
1000	56	56
1250	59	
1600	61	
2000	63	63
2500	65	
3150	67	
4000	68	68
5000	70	

Panel Size 2.7x4 m; Mass 230.5 kg/m2



Sound Insulation Prediction (v8.0.7)

- Key No. 2553

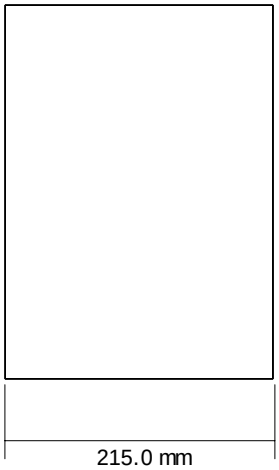
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 7 Oct 15 Initials:

File Name: insul



WI Slot Block, 215 mm

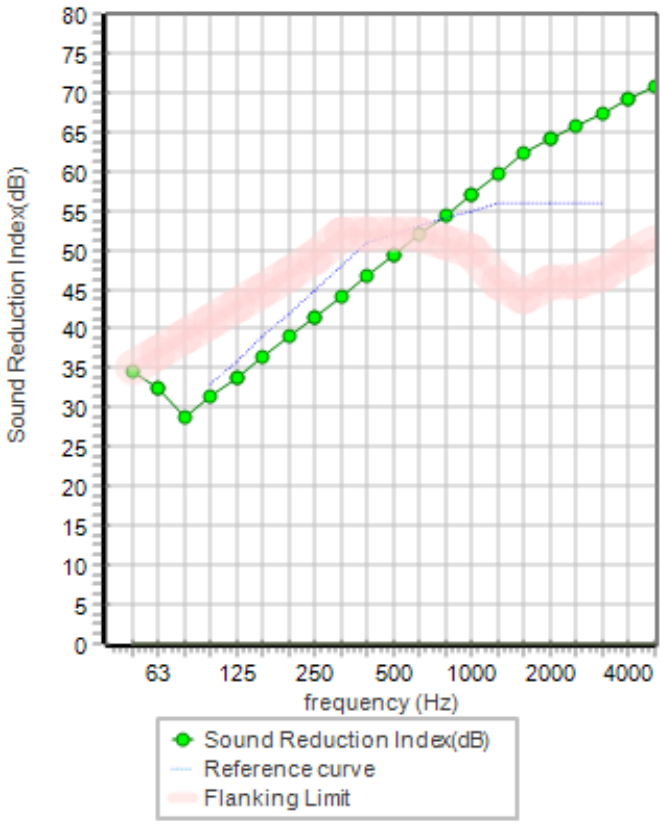
Rw	52 dB	
C	-1 dB	
C_{tr}	-6 dB	
D_{nTw}	54 dB	[V:50m3] [A:11m2]

System description

Panel 1 : 1 x 215.0 mm Slot block 215 mm (ρ:1085 kg/m3,E:20GPa,η:0.03)

frequency (Hz)	R(dB)	R(dB)
50	35	
63	33	31
80	29	
100	31	
125	34	33
160	36	
200	39	
250	42	41
315	44	
400	47	
500	49	49
630	52	
800	55	
1000	57	57
1250	60	
1600	62	
2000	64	64
2500	66	
3150	67	
4000	69	69
5000	71	

Panel Size 2.7x4 m; Mass 233.3 kg/m2



APPENDIX C

Insul Calculation of WI Column/Beam

Sound Insulation Prediction (v8.0.7)

- Key No. 2553

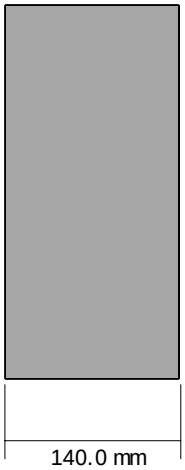
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 7 Oct 15 Initials:NTreby

File Name: insul



WI Column/Beam, filled 140 mm

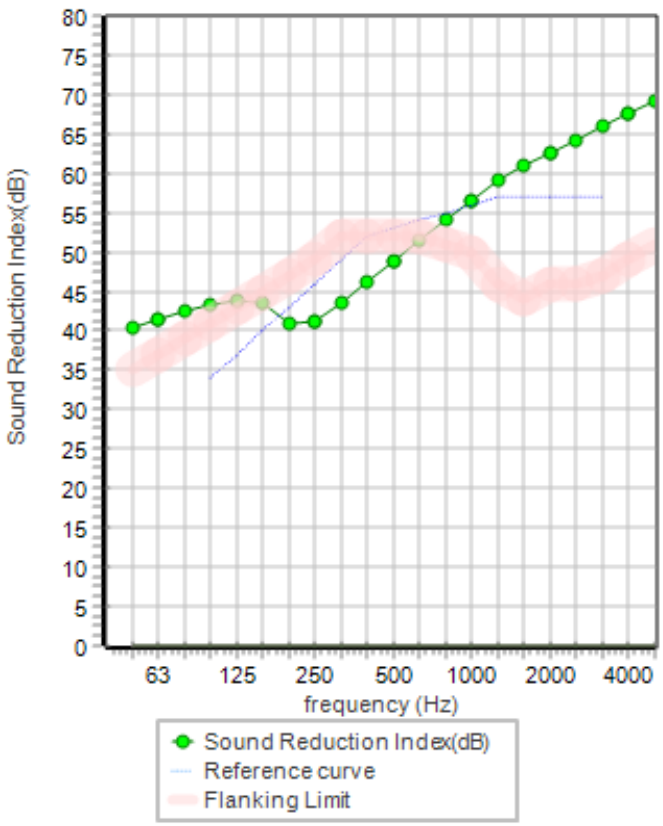
Rw	53 dB	
C	-1 dB	
C_{tr}	-4 dB	
D_{nTw}	55 dB	[V:50m3] [A:11m2]

System description

Panel 1 : 1 x 140.0 mm Concrete (ρ:2340 kg/m3,E:11GPa,η:0.04)

frequency (Hz)	R(dB)	R(dB)
50	41	
63	41	41
80	42	
100	43	
125	44	44
160	44	
200	41	
250	41	42
315	44	
400	46	
500	49	48
630	51	
800	54	
1000	57	56
1250	59	
1600	61	
2000	63	62
2500	64	
3150	66	
4000	68	67
5000	69	

Panel Size 2.7x4 m; Mass 327.6 kg/m2



Sound Insulation Prediction (v8.0.7)

- Key No. 2553

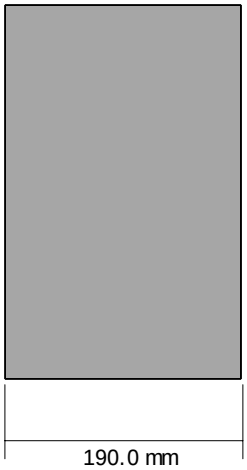
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 7 Oct 15 Initials:NTreby

File Name: insul



WI Column/Beam, filled 190 mm

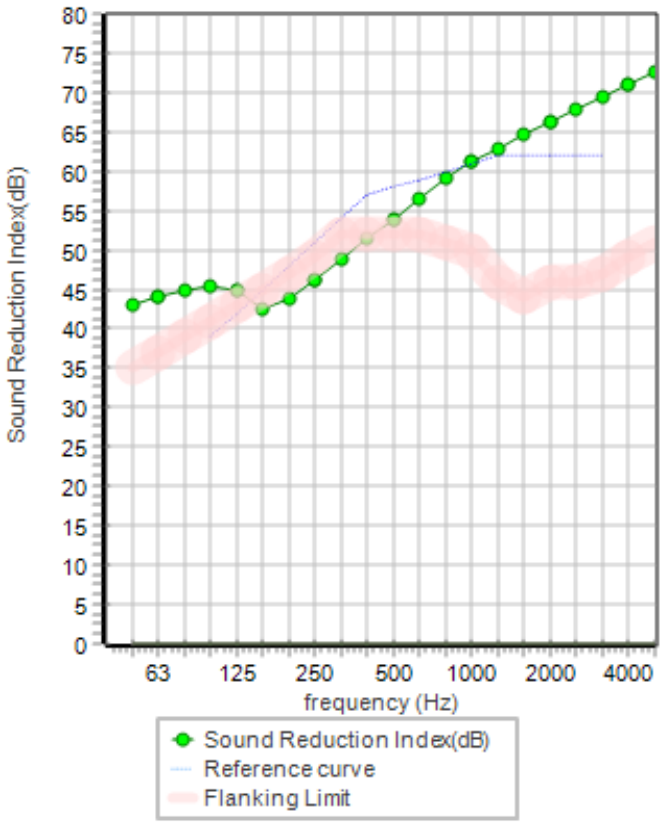
Rw	58 dB	
C	-1 dB	
C_{tr}	-5 dB	
D_{nTw}	60 dB	[V:50m3] [A:11m2]

System description

Panel 1 : 1 x 190.0 mm Concrete (ρ:2340 kg/m3,E:11GPa,η:0.05)

frequency (Hz)	R(dB)	R(dB)
50	43	
63	44	44
80	45	
100	45	
125	45	44
160	43	
200	44	
250	46	46
315	49	
400	51	
500	54	53
630	56	
800	59	
1000	61	61
1250	63	
1600	65	
2000	66	66
2500	68	
3150	69	
4000	71	71
5000	73	

Panel Size 2.7x4 m; Mass 444.6 kg/m2



Sound Insulation Prediction (v8.0.7)

- Key No. 2553

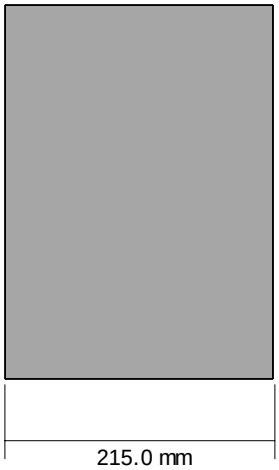
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 7 Oct 15 Initials:NTreby

File Name: insul



WI Column/Beam, filled 215 mm

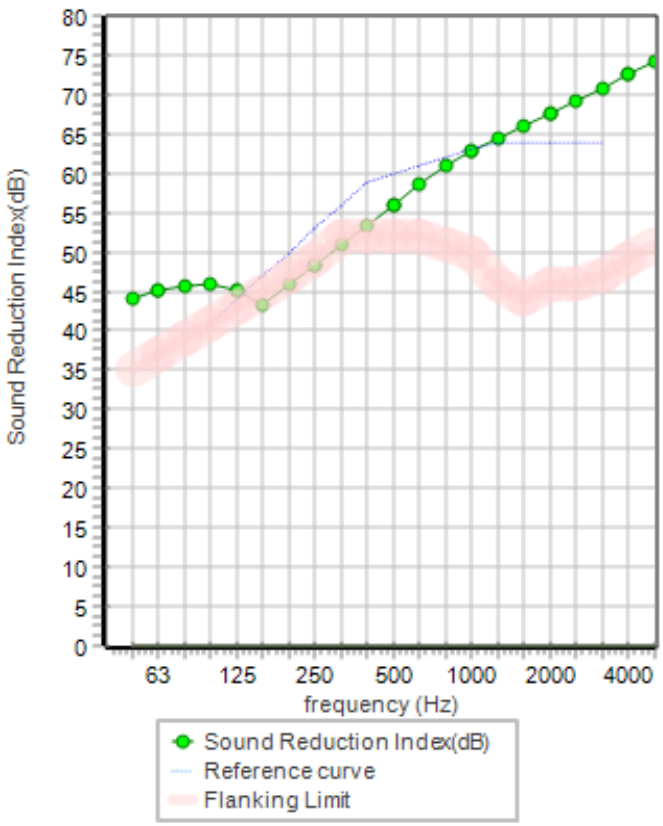
Rw	60 dB	
C	-2 dB	
C_{tr}	-5 dB	
D_{nTw}	62 dB	[V:50m3] [A:11m2]

System description

Panel 1 : 1 x 215.0 mm Concrete (ρ:2340 kg/m3,E:11GPa,η:0.05)

frequency (Hz)	R(dB)	R(dB)
50	44	
63	45	45
80	46	
100	46	
125	45	45
160	43	
200	46	
250	48	48
315	51	
400	53	
500	56	56
630	59	
800	61	
1000	63	63
1250	64	
1600	66	
2000	68	67
2500	69	
3150	71	
4000	73	72
5000	74	

Panel Size 2.7x4 m; Mass 503.1 kg/m2



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