The Building Test Centre
Fire Acoustics Structures

The Building Test Centre
British Gypsum Limited
East Leake
Loughborough
Leicestershire LE12 6NP
Tel 0115 945 1564
Fax 0115 945 1562

Report Number BTC 10724A

ACOUSTIC TEST REPORT COVERING LABORATORY SOUND INSULATION TESTS TO BS EN ISO 140-3:1995 AND BS EN ISO 140-6:1998 ON A 213mm TIMBER JOIST FLOOR WITH A GYPROC MF SUSPENDED CEILING INCORPORATING ACOUSTIC HANGERS.

Test Date: 5th August 1999

Customer:

British Gypsum Ltd
Head Office
East Leake
Loughborough
Leicestershire
LE12 6HX

A BPB group company

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DESCRIPTION

195mm x 45mm timber joists are laid at 450mm centres. A walking surface of 18mm T&G chipboard is screw fixed to the top of the joists using 42mm Gyproc Drywall screws. The perimeter of the floor is sealed to the test aperture with Gyproc sealant.

A Gyproc MF suspended ceiling is fitted to the underside of the joists. Gyproc MF6A Perimeter Channel is fixed to the perimeter of the aperture using 25mm Drywall screws. The Gyproc Perimeter Channel is fixed so that the distance from the underside of the chipboard walking surface to the underside of the Gyproc Perimeter Channel is 277mm. Gyproc Soffit Cleats are fixed to the ends of Gyproc Acoustic Hangers using MF11 nuts and bolts. The Gyproc Acoustic Hangers are fixed, at 1200mm centres, along one side of each intermediate joist, forming a 1200mm x 900mm grid of hangers. The Gyproc Acoustic Hangers are fixed to the timber joists so that the 'L' bend of the Acoustic Hanger is level with the base of the joists. Each Gyproc Acoustic Hanger is fixed to the timber joist using three 25mm Drywall screws.

Gyproc MF7 Primary Support Channels are fixed to the bottom of the Gyproc Soffit Cleats using two 13mm Gyproc Wafer Head Jack Point screws. The Gyproc MF7 Primary Support Channels are placed at 900mm centres and run parallel to the timber joists. Gyproc MF5 Ceiling Section is placed perpendicular to the joists and Gyproc MF7 Primary Support Channel and spaced at 450mm centres. The Gyproc MF5 Ceiling Section is clip fixed to the Gyproc MF7 Primary Support Channels using Gyproc MF9 Connecting Clips.

80mm thick Isowool 1000 is placed into the cavity above the framework.

The framework is clad with a double layer of 12.5mm Gyproc SoundBloc. The inner layer is fixed to the Gyproc MF5 Ceiling Section at 230mm centres in the field of the boards and at 150mm centres around the perimeter of the boards using 25mm Gyproc Drywall screws. The outer layer of Gyproc SoundBloc is fixed back to the Gyproc MF5 Ceiling Sections at 230mm centres in the field of the boards and at 150mm centres around the perimeter of the boards using 36mm Gyproc Drywall screws. All board joints are staggered between layers.

The perimeter of the ceiling was sealed to the test aperture with Gyproc Sealant. All outer layer board joints were taped with adhesive tape.

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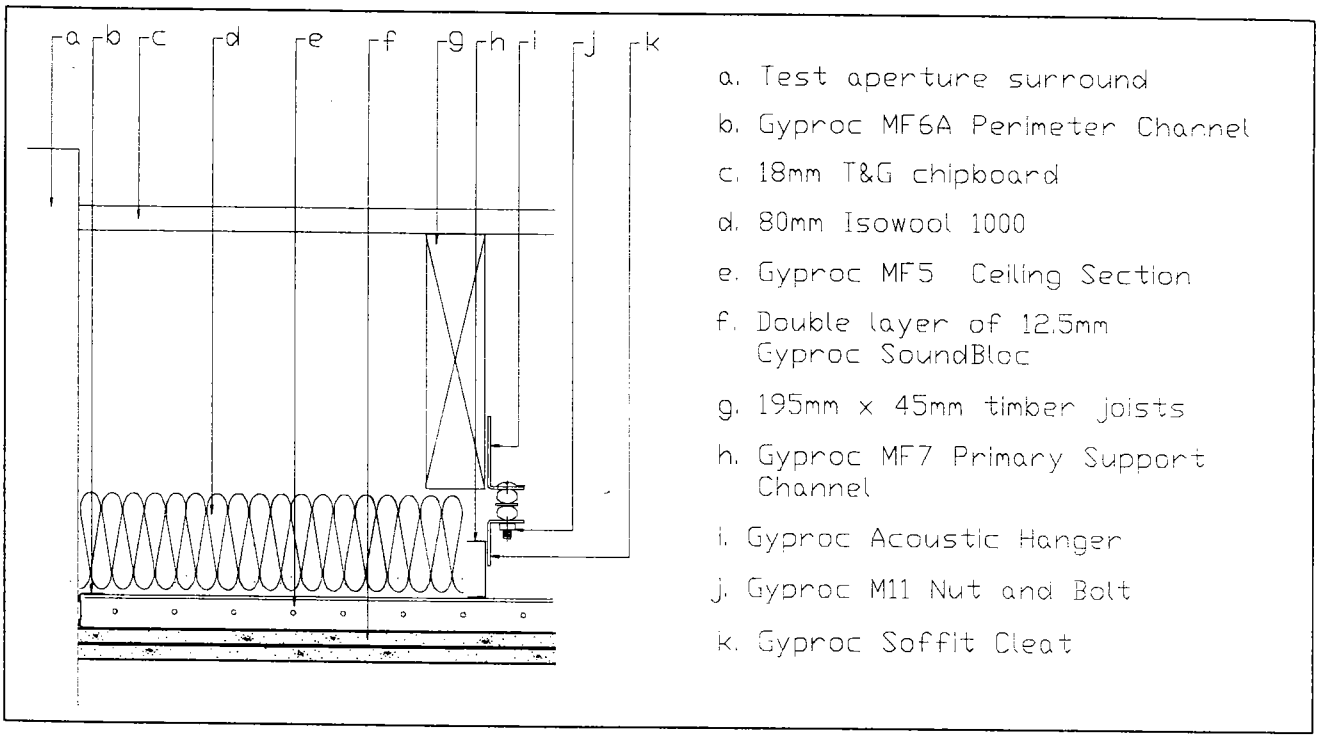

Figure 1: Section through test specimen

The descriptions of individual components making up the test specimen were provided by the customer and were checked for accuracy wherever possible.

RESULTS

Weighted Airborne Sound Reduction Index R_W **(C; Ctr) = 63 (-3; -8) dB**

Weighted Normalised Impact Sound Pressure Level Ln,w = 54 dB

For full data see pages 6 -9.

Tested in accordance with BS EN ISO 140-3:1995 and BS EN ISO140-6:1998
Airborne sound Insulation test rated in accordance with BS EN ISO 717-1:1997
Impact sound insulation test rated in accordance with BS EN ISO 717-2:1997

Customer: **British Gypsum Ltd**

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MATERIALS

Boards

Gyproc SoundBloc

Nominally 12.5mm (thick) x 1200mm (wide) x 2400mm (long) Gyproc SoundBloc manufactured by British Gypsum Limited at Kirkby Thore works.

Average thickness:	12.45 mm
Average surface density:	10.97 kg/m^2
Board code:	27-175-9 20:38
Nominal moisture content:	< 1%.

The surface density was calculated using the actual weight and size of the boards used for the test specimens. The moisture content of plasterboard has been established from measurements made over many tests using samples dried to constant weight in an oven at 40°C.

Timber

(i) Nominally 18mm (thick) x 600mm (wide) x 2400mm (long) grade P5 Caberfloor, manufactured by Caberboard Ltd, Station Road, Cowie, Stirling, Stirlingshire, FK7 7BQ

Average thickness	18.11mm
Surface density:	11.29 kg/m^2
Board Code:	02799 21:55

Surface density calculated using average weight and dimensions of the 18mm T&G chipboard used in test specimen.

(ii) Softwood timber joists nominally 195 mm (deep) x 45mm (wide) of SC3 grade timber.

Insulation

Isowool 1000

Nominally 80mm thick glass mineral wool. Manufactured and supplied by British Gypsum – Isover Ltd.

Average weight	11.7 kg
Average surface density	0.86 kg/m^2
Density	10.79 kg/m^3

Surface density calculated using actual weight of a pack of 80mm thick Isowool 1000 used in the test specimen.

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Fasteners

(i) 25mm, 36mm and 42mm Gyproc Drywall screws
(ii) 13mm Gyproc Wafer Head Jack Point screws
(iii) Gyproc MF11 nut and bolts

All fasteners supplied by British Gypsum Limited.

Metal Components

(i) Gyproc Acoustic Hangers
(ii) Gyproc MF5 Ceiling Section manufactured from 0.55mm gauge mild steel.
(iii) Gyproc MF6A Perimeter Channel manufactured from 0.5mm gauge mild steel.
(iv) Gyproc MF7 Primary Support Channel manufactured from 0.9mm gauge mild steel.
(v) Gyproc MF9 Connecting Clips.
(vi) Gyproc MF12 Soffit Cleats manufactured from 1.6mm gauge mild steel.

All metal components supplied by British Gypsum Limited.

Where measurements could not be taken then the weight and dimensions were provided by the customer or the manufacturer e.g. from material labelling. Material information was recorded according to procedure MAT/1.

TEST PROCEDURE

The test specimen (3.16m x 3.16m) is constructed in a floor dividing two reverberant rooms of approximately 98m^3 and 101m^3. The accuracy of the test method conforms to BS EN 20140-2: 1993, the test procedures used were 140/3 issue 1 (airborne) and 140/6 issue 1 (impact). Broad-band white noise was used to measure the level differences and broad-band pink noise was used to measure the reverberation times. Third octave band pass filters were used in real time mode. Four impact machine positions were used and placed more than 0.5m away from each other and the edge of the floor. See appendix for further information.

Report Author: [redacted]

Chris Oakton
Technologist

Report Approved by: [redacted]

Eur Ing **Paul Howard** B.Sc. (Hons.), C.Eng., MIOA
Head of Laboratory
The Building Test Centre

Report Date: 12 August, 1999

Customer: **British Gypsum Ltd**

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Leicestershire LE12 6NP
Tel 0115 945 1564
Fax 0115 945 562

LABORATORY AIRBORNE SOUND INSULATION TEST - BS EN ISO 140-3:1995

Test Code: **V10724AA**

Test Date: **05/08/99**

Specimen Area, S = **9.99** m^2

	Room T3	Room T4
Room Volume, m^3:	**98**	**101**
Temperature, deg.C:	**22.1**	**23**
Rel. Humidity, %RH:	**67.2**	**64.6**

Freq Hz	Test Room T3 to Test Room T4 Source dB	Rec. (uc) dB	Bgrnd dB	Rec. (corr) dB	Rev.time Sec	Corr. dB	R dB	U.Dev. dB	R 1/1Oct dB
50	64.9	51.5	27.6	51.5	2.04	1.0	**14.4**		
63	70.2	46.6	17.6	46.6	3.41	3.2	**26.8**		18.8
80	81.1	48.3	16.1	48.3	1.20	-1.3	**31.5**		
100	87.8	47.6	15.9	47.6	1.04	-1.9	**38.3**	5.7	
125	95.2	46.7	9.0	46.7	0.94	-2.4	**46.1**	0.9	41.6
160	99.6	53.1	17.7	53.1	1.07	-1.8	**44.7**	5.3	
200	101.7	54.4	17.3	54.4	1.41	-0.6	**46.7**	6.3	
250	100.3	51.0	8.5	51.0	1.80	0.5	**49.8**	6.2	49.4
315	100.0	44.4	8.0	44.4	1.85	0.6	**56.2**	2.8	
400	98.3	37.7	9.5	37.7	1.71	0.2	**60.8**	1.2	
500	97.5	35.3	6.6	35.3	1.71	0.2	**62.4**	0.6	61.9
630	96.7	33.9	5.5	33.9	1.60	0.0	**62.8**	1.2	
800	97.3	30.9	4.4	30.9	1.71	0.2	**66.6**		
1 000	99.4	32.9	6.8	32.9	1.88	0.7	**67.2**		67.5
1 250	101.3	33.1	5.3	33.1	1.96	0.8	**69.0**		
1 600	99.2	31.0	5.8	31.0	1.98	0.9	**69.1**		
2 000	101.0	33.1	6.3	33.1	1.93	0.8	**68.7**		69.1
2 500	101.8	32.8	6.6	32.8	1.91	0.7	**69.7**		
3 150	101.5	31.9	7.6	31.9	1.88	0.7	**70.3**		
4 000	96.7	23.5	10.3	23.3	1.72	0.3	**73.7**		73.1
5 000	102.7	22.8	10.7	22.5	1.51	-0.3	**79.9**		
6 300									
8 000									
10 000									

Single Figure Ratings BS EN ISO 717-1: 1997	Rw dB	C dB	Ctr dB
	63	-3	-8
	(100-5000)	-2	-8
	(50-3150)	-10	-24
	(50-5000)	-9	-24

Total U. Dev., dB: **30.2**

Background Corrected

RT's > factor 1.5 apart

Tested Serially [ ] Real Time [✓]

Tested By [redacted]

Checked [redacted]

Test Procedure: 140/3/issue 1

Worksheet: MSOFFICE\EXCEL\140\140_3_1.XLS

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Leicestershire LE12 6NP
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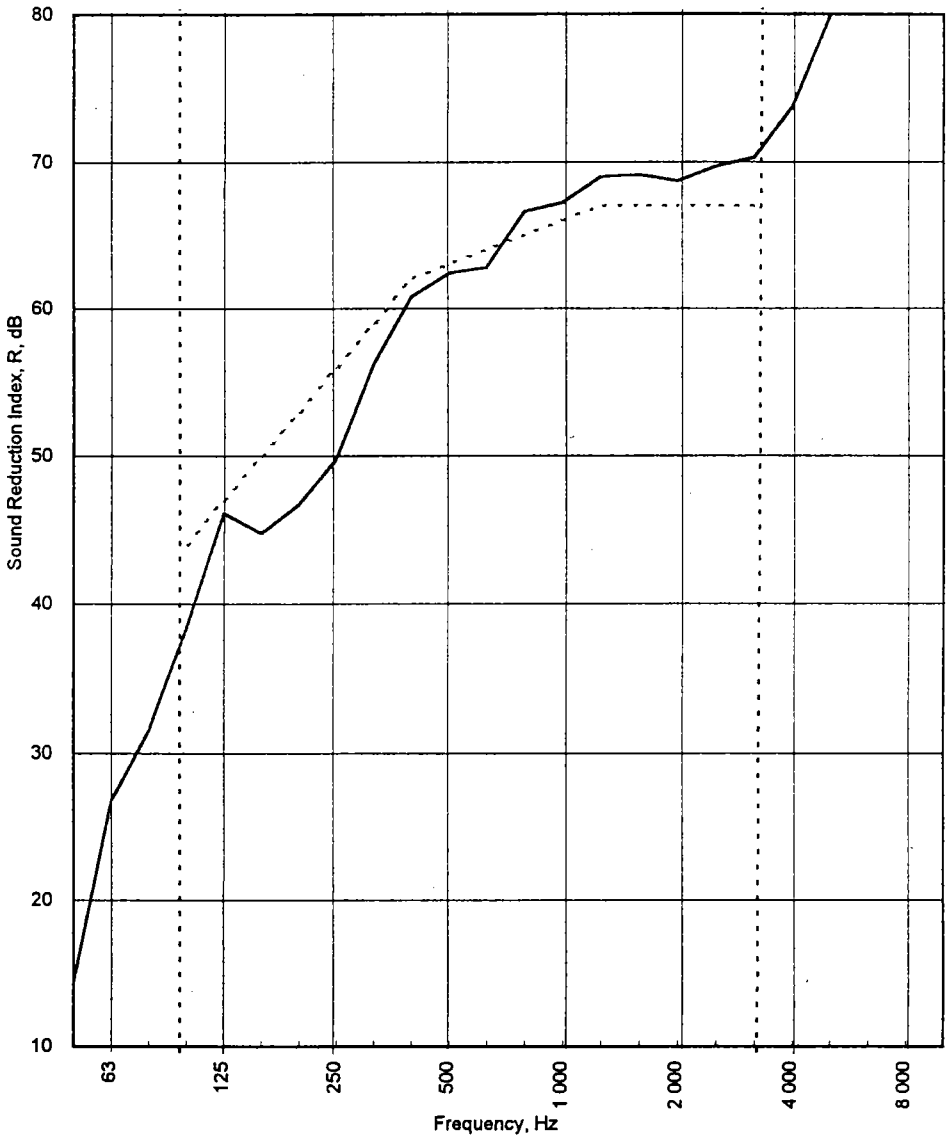
Test Code:
V10724AA
Test Date:
05/08/99

Freq. Hz	R dB
50	14.4
63	26.8
80	31.5
100	38.3
125	46.1
160	44.7
200	46.7
250	49.8
315	56.2
400	60.8
500	62.4
630	62.8
800	66.6
1 000	67.2
1 250	69.0
1 600	69.1
2 000	68.7
2 500	69.7
3 150	70.3
4 000	73.7
5 000	79.9
6 300	
8 000	
10 000	



----- Curve of reference values (ISO 717-1)

Rating according to BS EN ISO 717-1:1997	**Rw (C;Ctr) = 63 (-3;-8) dB** Max dev. 6.3 dB at 200 Hz		
Evaluation based on laboratory measurement results obtained by an engineering method:	$C_{50\text{-}3150}$= **-10 dB**	$C_{50\text{-}5000}$= **-9 dB**	$C_{100\text{-}5000}$= **-2 dB**
	$C_{tr,50\text{-}3150}$= **-24 dB**	$C_{tr,50\text{-}5000}$= **-24 dB**	$C_{tr,100\text{-}5000}$: **-8 dB**

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Fax 0115 945 1562

LABORATORY IMPACT SOUND INSULATION TEST - BS EN ISO 140-6:1998

Test Code: **V10724AI**

Test Date: **05/08/99**

Specimen Area, S = **9.99** m^2

	Room T3	Room T4
Room Volume, m^3:	**98**	**101**
Temperature, deg.C:	**22**	**23**
Rel. Humidity, %RH:	**67**	**64.6**

Freq Hz	Test Room 4 to Test Room 3												
	Imp.L1 dB	Imp.L2 dB	Imp.L3 dB	Imp.L4 dB	SD dB	Li (uc) dB	BKGD dB	Li (corr) dB	Rev.time Sec	Corr. dB	**Ln dB**	U.Dev. dB	Ln 1/1 Oct. dB
50	62.1	61.7	65.2	63.1	1.6	63.3	15.3	63.3	2.52	-2.0	**61.3**		
63	59.6	59.6	62.9	61.4	1.6	61.1	20.6	61.1	2.39	-1.7	**59.4**		65.2
80	63.4	63.9	65.2	61.8	1.4	63.7	24.9	63.7	3.36	-3.2	**60.5**		
100	64.7	65.7	61.3	62.0	2.1	63.8	7.3	63.8	3.26	-3.1	**60.7**	4.7	
125	65.1	65.6	59.5	61.9	2.9	63.7	1.6	63.7	2.70	-2.3	**61.4**	5.4	66.9
160	66.8	65.7	63.3	64.6	1.5	65.3	0.8	65.3	2.34	-1.7	**63.6**	7.6	
200	62.9	62.8	61.8	63.0	0.6	62.7	5.8	62.7	1.49	0.3	**63.0**	7.0	
250	59.4	58.7	58.7	61.2	1.2	59.6	0.8	59.6	1.64	-0.1	**59.5**	3.5	65.0
315	55.5	52.6	54.1	55.2	1.3	54.5	5.6	54.5	1.54	0.2	**54.7**		
400	54.3	53.0	53.5	53.4	0.5	53.6	9.9	53.6	1.61	0.0	**53.6**		
500	55.0	54.3	55.3	55.5	0.5	55.0	4.3	55.0	1.60	0.0	**55.0**	1.0	58.7
630	52.1	52.5	53.7	53.5	0.8	53.0	4.1	53.0	1.61	0.0	**53.0**		
800	52.5	51.4	51.3	51.4	0.6	51.7	7.4	51.7	1.73	-0.3	**51.4**		
1 000	50.2	51.3	50.0	51.0	0.6	50.7	6.7	50.7	1.82	-0.6	**50.1**		54.6
1 250	46.2	48.5	45.9	47.1	1.2	47.0	4.7	47.0	1.70	-0.3	**46.7**		
1 600	42.8	45.6	43.4	44.3	1.2	44.2	5.7	44.2	1.71	-0.3	**43.9**		
2 000	40.2	43.0	40.1	40.5	1.4	41.1	6.0	41.1	1.70	-0.3	**40.8**		46.4
2 500	37.4	40.1	37.1	37.0	1.5	38.1	6.9	38.1	1.57	0.1	**38.2**		
3 150	36.2	38.0	35.0	34.3	1.6	36.1	8.5	36.1	1.51	0.2	**36.3**	0.3	
4 000	31.3	32.4	29.1	28.8	1.7	30.7	9.7	30.7	1.36	0.7	**31.4**		37.7
5 000	24.7	24.5	21.8	21.2	1.8	23.3	11.0	23.0	1.22	1.2	**24.2**		
6 300													
8 000													
10 000													

Single Figure Rating **Ln,w 54 dB** **Total U. Dev., dB** **29.5**

ISO 717-2:1997

Tested By: [redacted]

Checked By [redacted]

Background Corrected

RT's > factor 1.5 apart

Tested Serially[√ Real Time[ ]

Test Procedure: 140/6/issue 1

Worksheet: MSOFFICE\EXCEL\140\140_6.XLS

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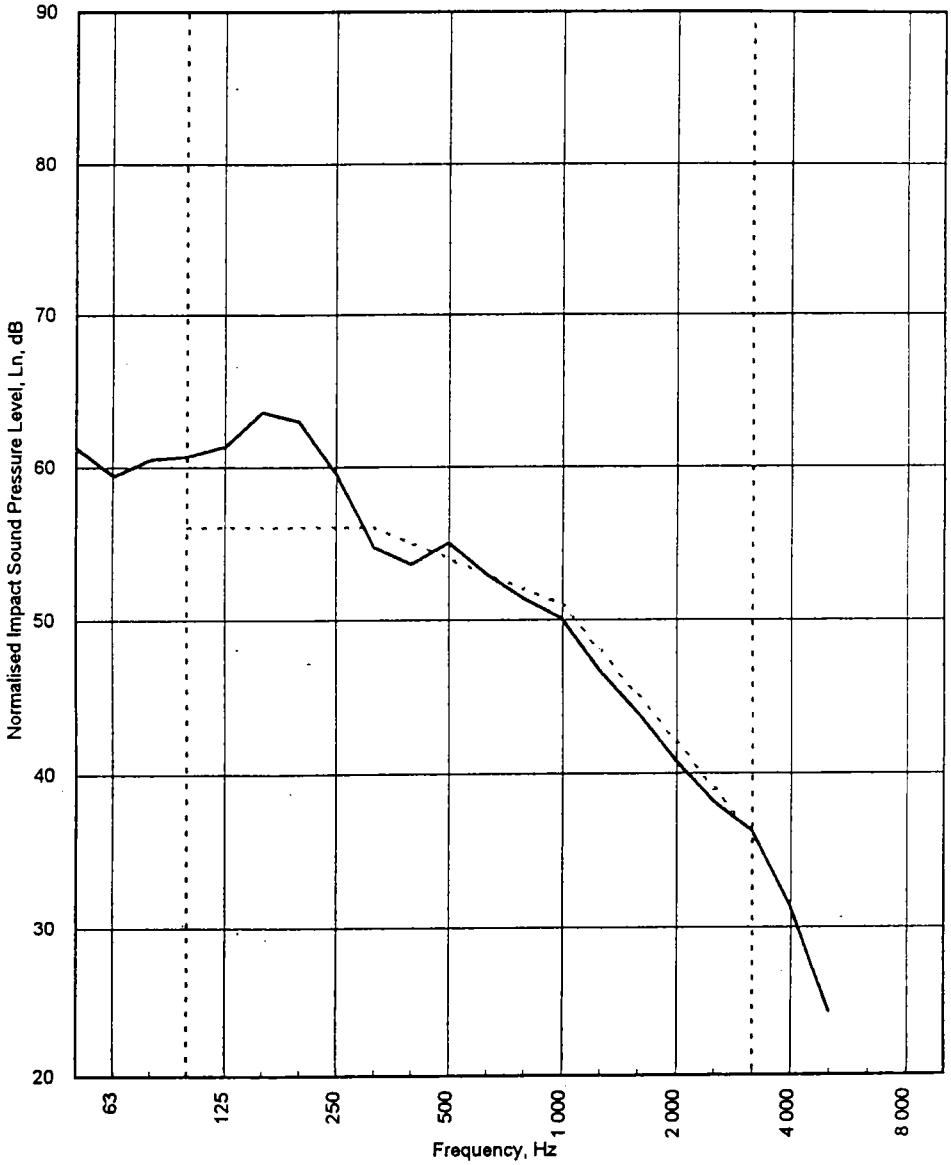
Fire Acoustics Structures

Test Code:
V10724AI
Test Date:
05/08/99

Freq. Hz	Ln, 1/3 oct., dB
50	61.3
63	59.4
80	60.5
100	60.7
125	61.4
160	63.6
200	63.0
250	59.5
315	54.7
400	53.6
500	55.0
630	53.0
800	51.4
1 000	50.1
1 250	46.7
1 600	43.9
2 000	40.8
2 500	38.2
3 150	36.3
4 000	31.4
5 000	24.2
6 300	
8 000	
10 000	



- - - - - - - Curve of reference values (ISO 717-2)

Rating according to draft ISO 717-2:1997

Ln,w 54 dB

Max dev. 7.6 dB at 160 Hz

Evaluation based on laboratory measurement results obtained by an engineering method:

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TEST METHOD AND CONDITIONS

An omnidirectional loudspeaker rotating at 1rpm is used in source room satisfying Annex C of BS EN ISO 140-3: 1995. The average sound pressure level in each 1/3 octave band is measured using a rotating microphone boom, positioned such that the minimum distance between microphone and sound source is 1m and between microphone and room boundaries is 0.7m.
The rotating microphone has a sweep radius of atleast 1m and is inclined in relation to the boundaries at an angle of at least 30° to the horizontal. The microphone has a traverse time of 32 seconds, and the sound pressure levels are averaged over 64 seconds which is equivalent to two complete sweeps of the microphone boom. The equivalent absorption area of each room is determined by producing the arithmetic average of six reverberation times and applying this to the Sabine formula.

The laboratory limit for airborne sound insulation measurement due to flanking on a lightweight construction is

Freq Hz	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
R'max	20	27	29	33	43	53	55	60	63	66	70	72	73	78	82	83	84	82	84	88	88

The laboratory limit for airborne sound insulation measurement due to flanking on concrete based construction is

Freq Hz	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
R'max	26	36	33	35	39	47	51	58	61	66	70	68	71	75	79	83	85	84	82	85	83

The figures below show flanking and isolation treatments in the test chamber

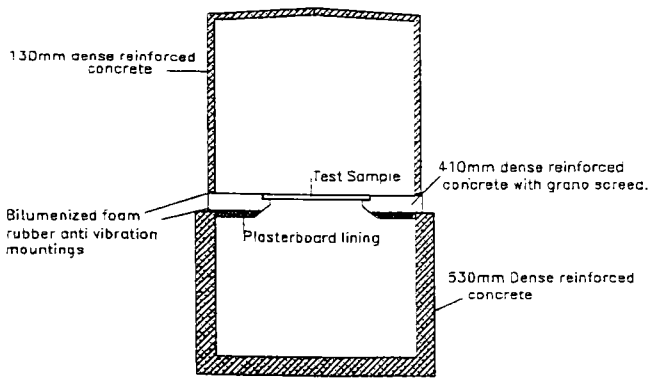

Figure 1 Chamber layout

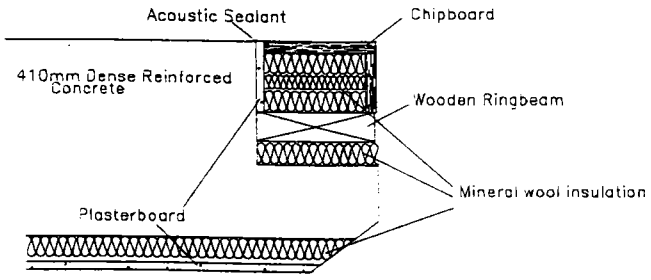

Figure 2 Ringbeam construction around test aperture

Customer: **British Gypsum Ltd**

BTC 10724A: Appendix

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