

The Building Test Centre

Fire Acoustics Structures

The Building Test Centre
British Gypsum
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Report Number **BTC 21850A**

An acoustic test report covering laboratory sound insulation testing to BS EN ISO 10140-2:2010 on a SFS External wall system with a 100 mm Cold-Rolled Structural Steel Stud Framework clad with a triple layer of 15 mm Gyproc FireLine on the interior side, a single layer Glasroc X and with/without 100 mm Isover Polterm MAX on the Exterior with 50 mm Isover APR 1200 insulation in the cavity.

Test dates: 24th and 25th June 2021

Report issued date: 25th June 2021

www.btconline.co.uk

Customer: **British Gypsum**
East Leake
Loughborough
Leicestershire
LE12 6HX

Customer: **British Gypsum**

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Customer: **British Gypsum**

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FOREWORD

The test sponsor was British Gypsum.

The test specimens were installed by Joseph Trimble and John Gwynne on the 24th and 25th June 2021.

The Building Test Centre played no role in the design or selection of the materials comprising the test specimen. This information is provided by British Gypsum.

REPORT AUTHORISATION

Report Author



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Authorised by



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TEST REPORT AMENDMENTS

Page	Amendments	Date

Report Amendments Author

Name
Role

Amendments Authorised by

Name
Role

TEST CONSTRUCTION

The test specimens were constructed in an aperture having an overall opening of 2400 mm (high) x 3600 mm (wide).

Test H21850AA

A 104 mm x 40 mm x 1.2 mm gauge cold rolled structural steel channel was fixed to the base of the test aperture at 600 mm centres using 25mm British Gypsum Drywall Screws.

A 104 mm x 70 mm x 2.0 mm gauge cold rolled structural steel 'Slotted head' channel (3000 mm) were butt-joined with a 600 mm offset before being fixed to the head of the test aperture at 600 mm centres using 25 mm British Gypsum Drywall Screws.

100 mm x 50 mm x 1.2 mm gauge cold rolled structural steel studs were positioned at 600 mm centres between the channels. Each stud was engaged into the slotted head channel and fixed through the slots with a 13 mm British Gypsum Wafer Head Jack-point Screw each side of the stud positions.

At both edges the 100 mm x 50 mm x 1.2 mm gauge cold rolled structural steel stud was fixed to the test aperture, using 25 mm British Gypsum Drywall Screws at 600 mm.

50 mm Isover APR 1200 was placed within the stud cavity.

The framework was clad with a triple layer of 15 mm Gyproc FireLine on the interior face.

The inner layer boards were fixed with 25 mm British Gypsum Jack-Point Screws at 300 mm centres around the perimeter of the boards, except the head channel.

The middle layer boards were fixed with 41 mm British Gypsum Jack-Point Screws at 300 mm centres around the perimeter of the boards, except the head channel.

The outer layer boards were fixed with 60 mm British Gypsum Jack-Point Screws at 300 mm centres around the perimeter and within the field of the boards to all framing members except the head channel.

The exterior face of the specimen was clad with a single layer of 12.5 mm Glasroc X Sheathing Board.

The boards were fixed with 25 mm Glasroc X Screws at 300 mm centres around the perimeter and within the field of the boards, except to the head channel.

Customer: **British Gypsum**

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A continuous 6 mm bead of Glasroc X Sealant was applied along the vertical edges of the board which had boards abutting against them. The Glasroc X Sheathing Boards were pushed up to the previous board so that the sealant 'mushroomed' out fully sealing the joint.

All vertical joints were staggered between layers. All joints and screw heads were taped and the perimeter was taped and sealed with Gyproc Sealant.

Test H21850BA

After H21850AA had been tested, 100 mm Isover Polterm Max was installed over the Glasroc X Sheathing Boards and fixed in position to the steel framework with 70 mm diameter metal washer plates (IRD70x70-6,8) and 160 mm self-drilling stainless steel screws (SXC5-6,3 x 160 mm-A2) as per Figure 2.

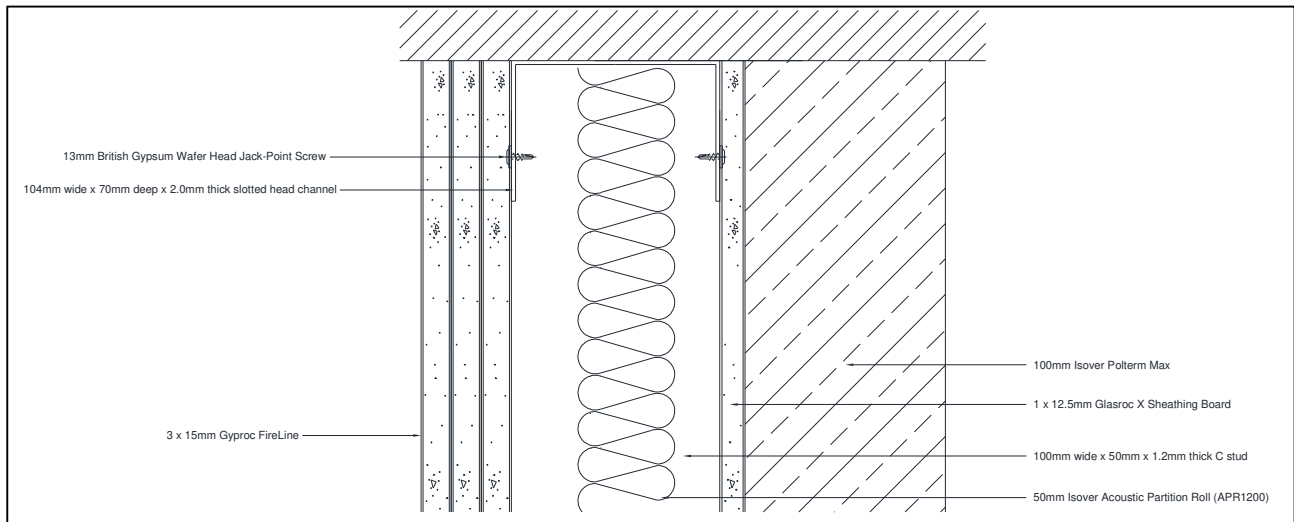


Figure 1. Horizontal cross section view with Isover Polterm Max installed.

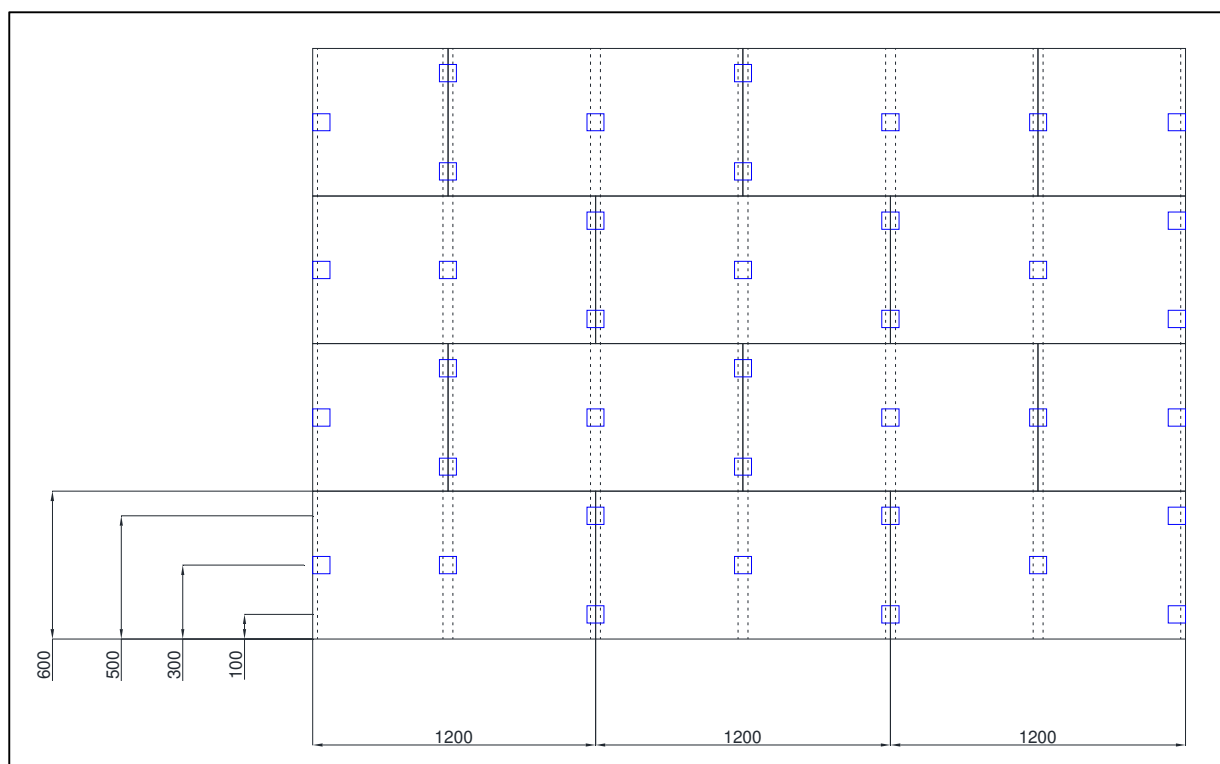


Figure 2. Polterm insulation layout on source room side of test specimen.

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

TEST MATERIALS

Plasterboard

- i) Nominally 2400 mm (long) x 1200 mm (wide) x 15 mm (thick) Gyproc FireLine manufactured by British Gypsum, ex Sherburn.

Surface density:	13.0 kg/m ²
Average thickness:	15.4 mm
Board Code:	31 170 21 17:02
	31 170 21 17:01
	31 170 21 17:01

- ii) Nominally 2400 mm (long) x 1200 mm (wide) x 12.5 mm (thick) Glasroc X manufactured by British Gypsum, ex Melnik.

Surface density:	11.0 kg/m ²
Average thickness:	12.5 mm
Board Code:	20 05 21 07:24
	20 05 21 07:24
	20 05 21 07:23

The surface densities were calculated using the actual weight and size of a selection of the boards used in the test specimen.

Material dimensions were supplied by the customer.

Insulation

- i) Nominally 50 mm thick Isover APR 1200 insulation supplied by British Gypsum.

Average area	15.60 m ²
Average weight	10.31 kg
Density	13.22 kg/m ³

- ii) Nominally 100 mm Isover Polterm Max insulation. Manufactured and supplied by Isover.

Average area	2.88 m ²
Average weight	16.64 kg
Density	57.78 kg/m ³

Customer: **British Gypsum**

The density was calculated using the actual weight and size of the insulation used in the test specimen.

Material dimensions were supplied by the customer.

Metal Components

- i) 104 mm x 40 mm x 1.2 mm gauge cold rolled structural steel channel manufactured by Hadley Steel Framing and supplied by British Gypsum.
- ii) 104 mm x 70 mm x 2.0 mm gauge cold rolled structural steel 'slotted head' channel. Incorporating slots on both sides 40 mm long at 25 mm centres manufactured by Hadley Steel Framing and supplied by British Gypsum.
- iii) 100 mm x 50 mm x 1.2 mm gauge (with 13 mm returns) cold rolled structural steel studs manufactured by Hadley Steel Framing and supplied by British Gypsum.

Fasteners

- i) 25 mm British Gypsum Drywall Screws supplied by The Building Test Centre.
- ii) 13 mm British Gypsum Wafer Head Jack-point Screw supplied by The Building Test Centre.
- iii) 25 mm British Gypsum Jack-Point Screws supplied by The Building Test Centre.
- iv) 41 mm British Gypsum Jack-Point Screws supplied by The Building Test Centre.
- v) 60 mm British Gypsum Jack-Point Screws supplied by The Building Test Centre.
- vi) 25 mm Glasroc X Screws supplied by British Gypsum
- vii) SXC5-6.3 x 160-A2. Stainless steel self-drilling insulation fastener screw 160 mm long x 6.3 mm diameter. Manufactured by SFS Intec and supplied by British Gypsum.

Miscellaneous Components

- i) Gyproc Sealant supplied by The Building Test Centre.
- ii) Joint tape supplied by The Building Test Centre.
- iii) IDR-70x70-6.8. Stress Plate square retaining washers. 70 mm x 70 mm, 6.8 mm diameter central hole, 304 Grade. Manufactured by SFS Intec and supplied by British Gypsum.
- iv) Glasroc X Sealant supplied by British Gypsum.

Where measurements could not be taken and were provided by the customer or the manufacturer e.g. from material labelling, or where mass and dimension measurements were provided by the customer or the manufacturer e.g. customer has completed material dimension forms the results only apply to the sample as received.

All data and materials supplied by the customer or manufacturer are clearly identified.

Material information was sampled and recorded according to procedure AP070 vs. 1.1.

Customer: **British Gypsum**

TEST RESULTS

Test Code	Description	Weighted Airborne Sound Reduction Index R_w (C; Ctr)
H21850AA	SFS External wall system with a 100 mm Cold-Rolled Structural Steel Stud Framework clad with a triple layer of 15 mm Gyproc FireLine on the interior side (receiving), a single layer Glasroc X on the Exterior (source) with 50 mm Isover APR insulation in the cavity.	50 (-2 ; -5) dB
H21850BA	SFS External wall system with a 100 mm Cold-Rolled Structural Steel Stud Framework clad with a triple layer of 15 mm Gyproc FireLine on the interior side (receiving), a single layer Glasroc X and 100 mm Isover Polterm MAX on the Exterior (source) with 50 mm Isover APR insulation in the cavity.	55 (-3; -9) dB

For full data see Appendix A of this report.

Test conducted in accordance with BS EN ISO 10140-2:2010 except for Clause A.2 in BS EN ISO 10140-4:2010 where minimum distances for measurements at frequencies under 100Hz cannot be met.

Rated in accordance with BS EN ISO 717-1: 2013.

No visible damage of the test specimen occurred during test.

Testing to BS EN ISO 10140-2:2010 conforms to the requirements of BS EN ISO 140-3:1995 (withdrawn).

Where the uncertainty of measured values is stated, (e.g. temperature, relative humidity and static pressure) the reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Customer: **British Gypsum**

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TEST PROCEDURE

The test specimen (3.6 m x 2.4 m) was constructed in a wall dividing two reverberant rooms of approximately 98 m³ and 62 m³. The accuracy of the test method conforms to BS EN 20140-2:1993, the test procedure used is detailed in the test data in Appendix A of this report. 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. See appendix B for further information.

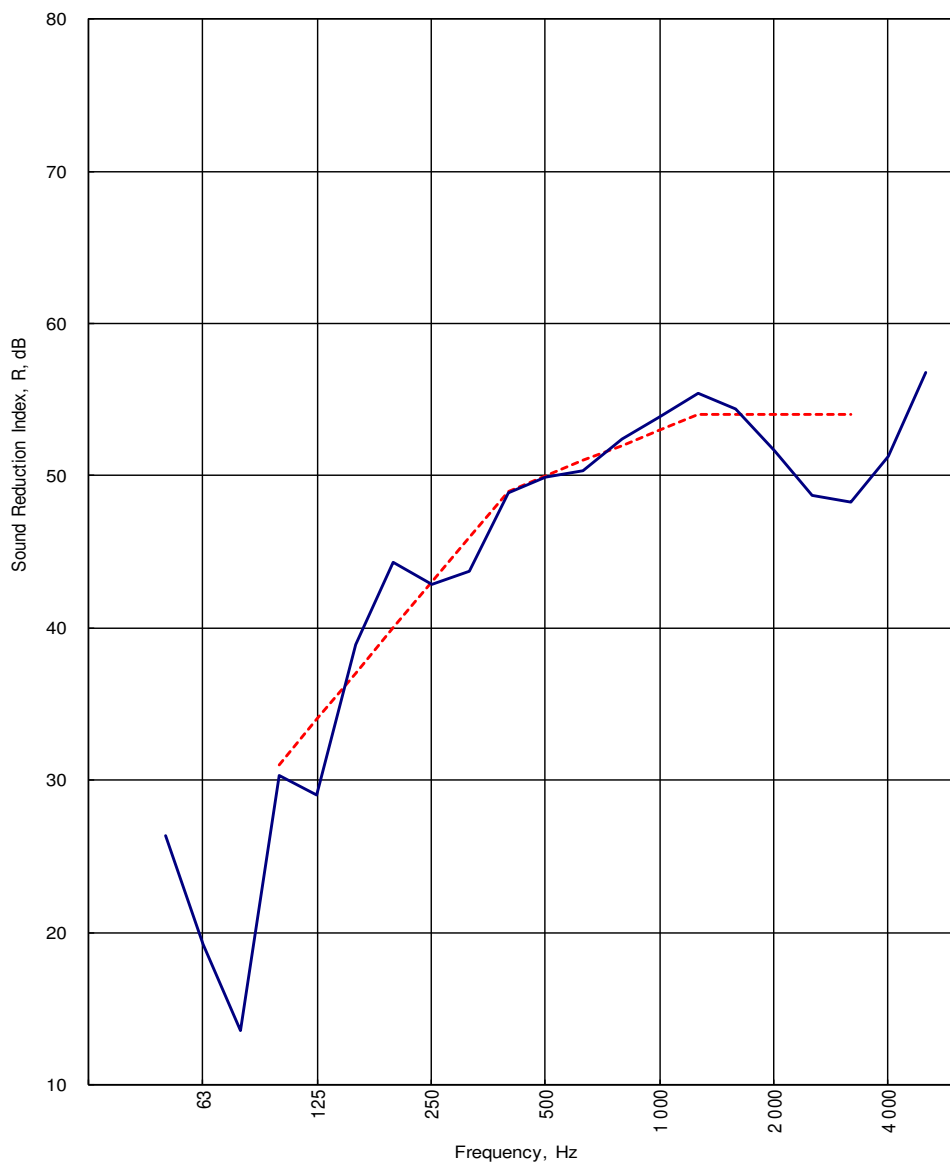
LIMITATIONS

The results only relate to the behaviour of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential acoustic performance of the element in use nor do they reflect the actual behaviour.

APPENDIX A - TEST DATA

Test Code:
H21850AA
Test Date:
24/06/2021

Freq. Hz	R dB
50	26.4
63	19.2
80	13.6
100	30.3
125	29.0
160	38.9
200	44.3
250	42.9
315	43.7
400	48.9
500	49.9
630	50.3
800	52.4
1 000	53.9
1 250	55.4
1 600	54.4
2 000	51.6
2 500	48.7
3 150	48.3
4 000	51.3
5 000	56.8



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

Rating according to
BS EN ISO 717-1:2013

R_w (C;C_{tr}) = 50 (-2;-5) dB

Max dev. 5.7 dB at 3 150 Hz

Evaluation based on laboratory
measurement results obtained by
an engineering method (T20) :

C₅₀₋₃₁₅₀= -6 dB

C₅₀₋₅₀₀₀= -5 dB

C₁₀₀₋₅₀₀₀= -1 dB

C_{tr,50-3150}= -17 dB

C_{tr,50-5000}= -17 dB

C_{tr,100-5000}= -5 dB

Customer: **British Gypsum**

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LABORATORY AIRBORNE SOUND INSULATION TEST - BS EN ISO 10140-2:2010

Test Code: **H21850AA**

Test Date: **24/06/2021**

Specimen Area, S = 8.64 m ²	Room Volume, m ³ : 98	Room T2 59.6	Room T1
	Temperature, deg.C: 20	20.1	± 0.3
	Rel. Humidity, %RH: 67.1	67	± 1.6
	Static Pressure, Pa: 101400	101400	± 65

Freq Hz	Test Room T2 to Test Room T1						R dB	U.Dev. dB	R 1/1Oct dB
	Source dB	Rec. (uc) dB	Bgrnd dB	Rec. (corr) dB	Rev.time Sec	Corr. dB			
50	58.7	30.9	13.2	30.9	0.80	-1.4	26.4		
63	61.4	41.6	8.8	41.6	0.96	-0.6	19.2		17.1
80	66.7	51.9	8.6	51.9	0.83	-1.2	13.6		
100	72.1	42.1	7.2	42.1	1.19	0.3	30.3	0.7	
125	103.1	74.6	6.2	74.6	1.24	0.5	29.0	5.0	31.1
160	84.9	47.0	9.5	47.0	1.40	1.0	38.9		
200	90.1	47.7	18.9	47.7	1.72	1.9	44.3		
250	91.7	51.0	8.5	51.0	1.84	2.2	42.9	0.1	43.6
315	91.3	50.1	11.5	50.1	1.96	2.5	43.7	2.3	
400	89.9	43.6	20.7	43.6	2.00	2.6	48.9	0.1	
500	88.9	41.3	8.3	41.3	1.88	2.3	49.9	0.1	49.7
630	87.7	39.5	6.9	39.5	1.78	2.1	50.3	0.7	
800	88.1	37.6	6.2	37.6	1.72	1.9	52.4		
1 000	88.0	36.1	13.9	36.1	1.76	2.0	53.9		53.7
1 250	88.6	35.3	6.9	35.3	1.80	2.1	55.4		
1 600	91.3	39.0	5.8	39.0	1.79	2.1	54.4		
2 000	93.3	43.7	6.2	43.7	1.75	2.0	51.6	2.4	51.0
2 500	92.1	44.8	5.5	44.8	1.54	1.4	48.7	5.3	
3 150	90.7	43.5	6.0	43.5	1.43	1.1	48.3	5.7	
4 000	88.4	38.3	7.7	38.3	1.46	1.2	51.3		50.9
5 000	87.1	31.3	10.4	31.3	1.39	1.0	56.8		
6 300									
8 000									
10 000									

Single Figure Ratings	Rw	C	Ctr	Total U. Dev., dB	22.4
BS EN ISO 717-1: 2013	dB	dB	dB		
	50	-2	-5		
	(100-5000)	-1	-5		
	(50-3150)	-6	-17		
	(50-5000)	-5	-17	Procedure: AP 046 vs 5.2	
				Worksheet: 140_3_1.XLS	

Customer: **British Gypsum**

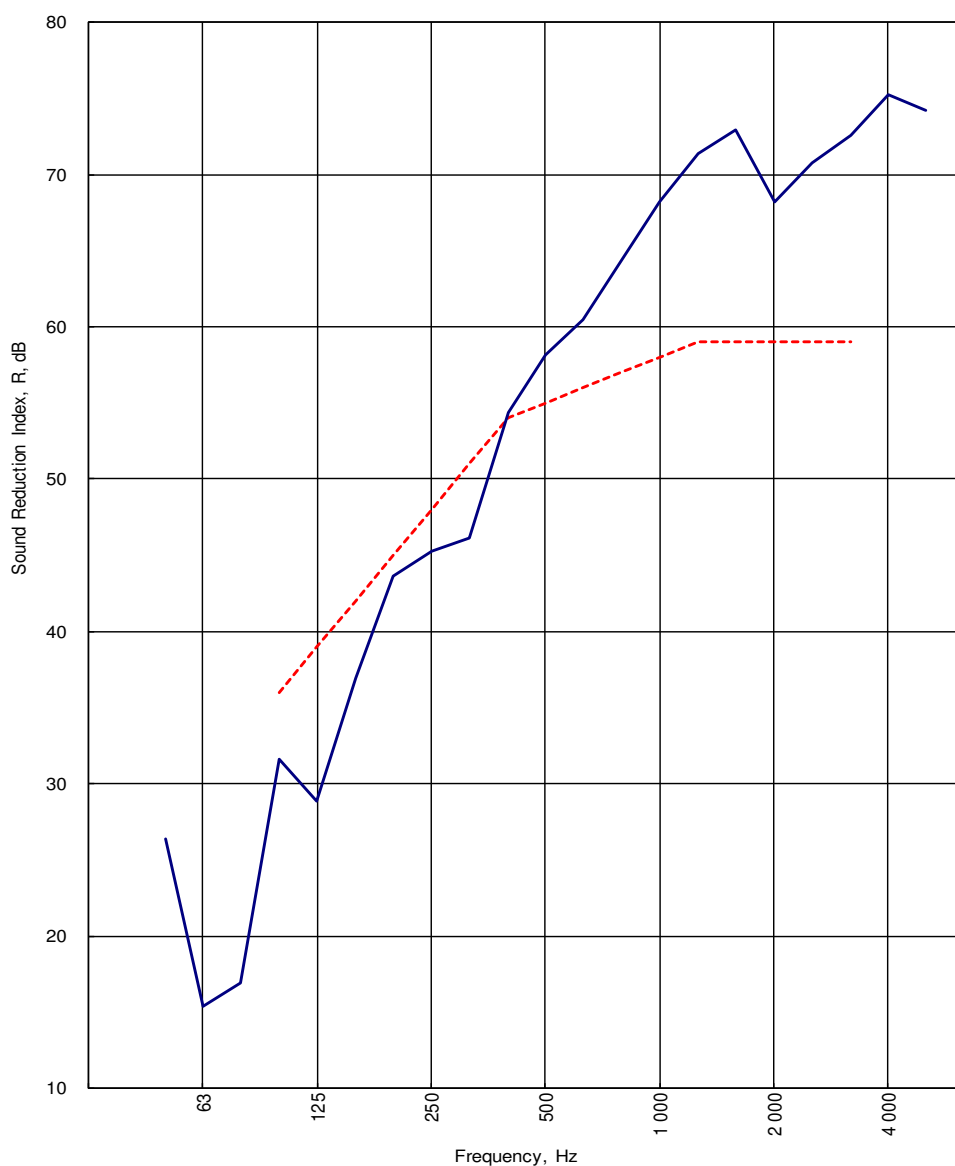
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Test Code:
H21850BA
Test Date:
25/06/2021

Freq. Hz	R dB
50	26.4
63	15.4
80	16.9
100	31.6
125	28.9
160	36.9
200	43.6
250	45.3
315	46.1
400	54.4
500	58.2
630	60.5
800	64.4
1 000	68.2
1 250	71.4
1 600	72.9
2 000	68.2
2 500	70.8
3 150	72.6
4 000	75.3
5 000	74.2



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

Rating according to
BS EN ISO 717-1:2013

R_w (C;C_{tr}) = 55 (-3;-9) dB

Max dev. 10.1 dB at 125 Hz

Evaluation based on laboratory
measurement results obtained by
an engineering method (T20) :

C₅₀₋₃₁₅₀= **-9 dB**

C₅₀₋₅₀₀₀= **-8 dB**

C₁₀₀₋₅₀₀₀= **-2 dB**

C_{tr,50-3150}= **-20 dB**

C_{tr,50-5000}= **-20 dB**

C_{tr,100-5000}= **-9 dB**

Customer: **British Gypsum**

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LABORATORY AIRBORNE SOUND INSULATION TEST - BS EN ISO 10140-2:2010

Test Code: **H21850BA**

Test Date: **25/06/2021**

Specimen Area, S = 8.64 m ²	Room Volume, m ³ : 97.14	Room T2	Room T1	
	Temperature, deg.C:	19.3	19.1	± 0.3
	Rel. Humidity, %RH:	60.4	61.5	± 1.6
	Static Pressure, Pa:	101000	101000	± 65

Freq Hz	Test Room T2 to Test Room T1						R dB	U.Dev. dB	R 1/1Oct dB
	Source dB	Rec. (uc) dB	Bgrnd dB	Rec. (corr) dB	Rev.time Sec	Corr. dB			
50	58.8	31.2	13.5	31.2	0.83	-1.2	26.4		
63	59.0	42.6	14.8	42.6	0.87	-1.0	15.4		17.6
80	64.2	45.9	11.4	45.9	0.80	-1.4	16.9		
100	70.7	39.2	7.9	39.2	1.13	0.1	31.6	4.4	
125	101.8	73.7	8.1	73.7	1.33	0.8	28.9	10.1	31.4
160	82.5	46.7	8.7	46.7	1.41	1.1	36.9	5.1	
200	86.8	45.1	19.3	45.1	1.70	1.9	43.6	1.4	
250	88.7	45.6	8.3	45.6	1.82	2.2	45.3	2.7	44.9
315	87.0	43.4	10.7	43.4	1.96	2.5	46.1	4.9	
400	108.7	56.8	22.5	56.8	1.98	2.5	54.4		
500	107.4	51.6	8.7	51.6	1.90	2.4	58.2		57.0
630	105.1	46.7	7.0	46.7	1.81	2.1	60.5		
800	104.5	41.9	6.1	41.9	1.67	1.8	64.4		
1 000	103.5	37.4	14.4	37.4	1.77	2.1	68.2		67.1
1 250	102.4	33.0	5.7	33.0	1.73	2.0	71.4		
1 600	104.7	33.9	4.9	33.9	1.78	2.1	72.9		
2 000	105.9	39.7	5.1	39.7	1.73	2.0	68.2		70.2
2 500	103.5	34.1	4.9	34.1	1.54	1.4	70.8		
3 150	101.2	29.5	5.6	29.5	1.37	0.9	72.6		
4 000	98.0	23.8	7.5	23.8	1.41	1.1	75.3		73.9
5 000	95.8	22.7	10.9	22.4	1.33	0.8	74.2		
6 300									
8 000									
10 000									

Single Figure Ratings	Rw	C	Ctr	Total U. Dev., dB	28.6
BS EN ISO 717-1: 2013	dB	dB	dB		
	55	-3	-9		
	(100-5000)	-2	-9		
Background Corrected	(50-3150)	-9	-20		
	(50-5000)	-8	-20	Procedure: AP 046 vs 5.2	
				Worksheet: 140_3_1.XLS	

Customer: **British Gypsum**

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APPENDIX B - TEST METHOD AND CONDITIONS

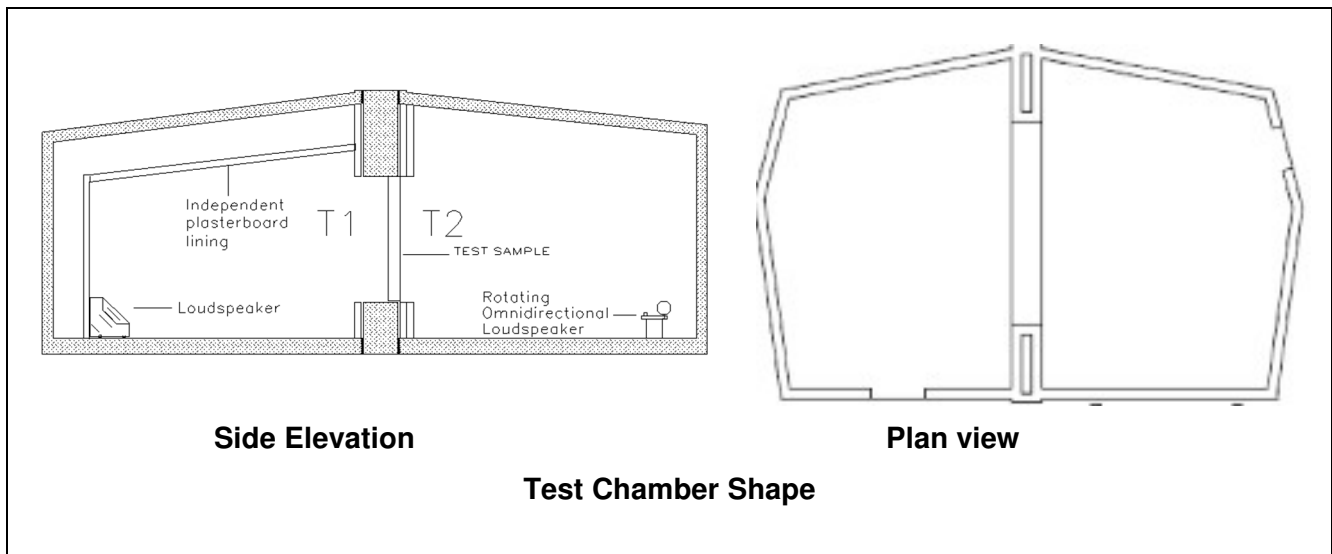
Method

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 1 m and between microphone and room boundaries is 0.7 m. The rotating microphone has a sweep radius of at least 1 m 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 the receiving room is determined by producing the arithmetic average of twelve reverberation times and applying this to the Sabine formula.

Test Chamber Layout

The test suite is constructed to be as independent from the surround building as is physically possible in order to minimise flanking transmission paths.

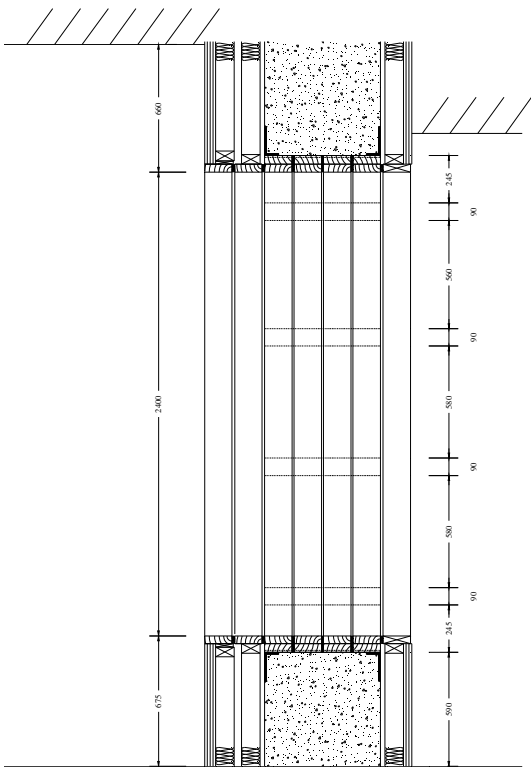


The source room (T2) contains two perspex diffusers of approximately 900 mm x 1220 mm. Panel absorbers are used to ensure reverberation times in source room (T2) are between one and two seconds at all frequencies at and above 100 Hz. An omni-directional loudspeaker sound source is placed near a back corner of the source room (T2), rotating at 1 rpm and at least 0.7 m from any room boundary. A stationary loudspeaker sound source is placed in the corner of the receiving room (T1) opposite the test specimen.

Mounting

The BTC has a solid concrete frame which has been additionally lined to give improved reduction of flanking transmission. This is in order to ensure that, as far as possible, lab limits will not restrict the real performance measurement of just the test specimen.

Recommendations for installation position within the niche are given in our Installation Guidance Document. Details of actual installation position are held by the BTC in the Test Report folder.



Cross section of test aperture

Lab Limits

The laboratory limit for measurement due to flanking is (combined BTC 11709A, BTC13562EA, BTC 15829A and BTC 19792A).

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	45.0	46.9	58.5	62.4	62.9	67.7	71.2	77.2	84.2	92.0	97.7	101.5	103.8	97.6	102.4	104.8	101.8	102.9	98.7	96.4	96.3

Uncertainties for test

The uncertainties values for test are taken from ISO 12999-1 situation B situ standard deviation.

Freq Hz	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
Standard Uncertainty	4.0	3.6	3.2	2.8	2.4	2.0	1.8	1.6	1.4	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.6	1.9	2.2

Descriptor	Rw	Rw + C (100-3150)	Rw + Ctr (100-3150)	Rw + C (100-5000)	Rw + Ctr (100-5000)	Rw + C (50-3150)	Rw + Ctr (50-3150)	Rw + C (50-5000)	Rw + Ctr (50-5000)
Standard Uncertainty	0.9	0.9	1.1	1.1	1.1	1.0	1.3	1.1	1.0

Customer: **British Gypsum**

