



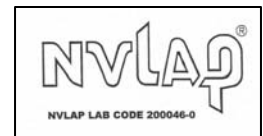
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SOUND REDUCTION TEST CONDUCTED ON CFS-BL FIRESTOP BLOCKS MANUFACTURED BY HILTI CONSTRUCTION (ISO 140-3)

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Sound Reduction Testing (ISO 140-3)

INTRODUCTION:

This report presents the results of sound transmission testing conducted on CFS-BL Firestop Blocks. This material was manufactured and submitted by Hilti Construction. This work was requested by Mr. Jonathan Matthews of Hilti Construction with testing completed on December 16, 2011.

The Sound Reduction (R_w) Values were generated under ISO test procedures which outline methodology to determine Sound Reduction values between 80 Hz - 4000 Hz.

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TEST RESULTS SUMMARY:

<u>Test Description.</u>	<u>R_w</u>	<u>def</u>
Control Wall	54	27
Control Wall with 11-1/2" x 23-1/2" open penetration	13	25
Control Wall with penetration Sealed with Hilti CFS-BL Firestop Blocks	51	25

Tabular and graphical presentations of the data are presented under "TEST RESULTS" below.

SPECIMEN DESCRIPTION: (Also see "Test Results")**Test #I Control Wall – Baseline Data**

The control wall was constructed with 25-gauge, 3-5/8" steel studs, spaced at 24" on center. Insulation consisted of 4" Thermafiber mineral wool insulation. A double layer of 5/8" gypsum board was attached to each side. An additional layer of 1/2" concrete board was attached to the source side. The boards were attached to the studs with #6 x 1-5/8" self tapping sheetrock screws. The screws were spaced every 6" apart on the wall perimeter and spaced every 12" on each stud.

Note: This test will give baseline data of the Control Wall prior to any modifications.

Test #II Control Wall with a Thru-Wall Penetration

A 23-1/2" wide x 11-1/2" tall wall penetration was opened in the control wall.

Note: This assembly was tested to display the degree of sound reduction with 'Open' penetrations through the control wall.

Test #III Control Wall with Sealed Penetration – Hilti CFS-BL Firestop Blocks

The wall penetration (23-1/2" x 11-1/2") was filled with Hilti's CFS-BL Firestop Blocks. The blocks were inserted into the opening in a tight fit as depicted in Figure 1.

Note: Ideally, this test (control wall with the sealed penetration) will reproduce the results from Test #1 - baseline data. If this is true, the product was successful in maintaining the acoustical performance of the wall.

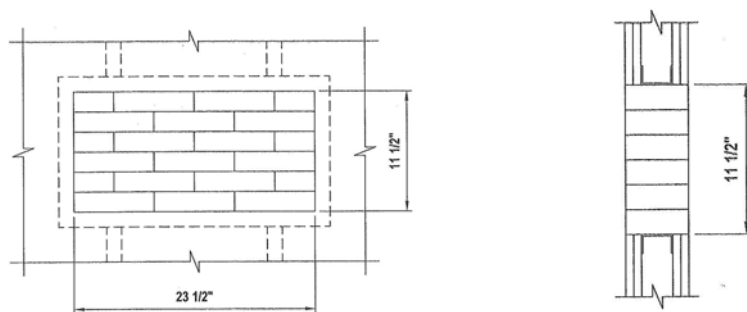


Figure #1

PROCEDURE:

ISO-140-3 (1995/05/15), "Acoustics – Measurement of Sound insulation in buildings and of building elements – Part 3 Laboratory measurements of airborne sound insulation of building elements". Sound Pressure levels were measured in 1/3 Octave bands from 100-Hz to 4000-Hz. R_w measurements based on frequency range of 100-Hz to 3150-Hz.

ISO-717-1 (1996/12/15), "Rating of Sound insulation in buildings and of building elements – Part 1 Airborne sound insulation".

According to the ISO-140-3, the calculation for R (Sound Reduction index) is:

$$R = (L_1 - L_2) + 10 \log(S/A), \quad A = 0.16 \times (V/T)$$

L_1 = Sound Pressure Level in Source Room, dB

L_2 = Sound Pressure Level in Receiving Room, dB

S = Area of Test Specimen, m^2

A = Equivalent sound absorption area in receiving room, m^2

V = Receiving room volume, m^3

T = Reverberation Time, seconds.

The source room has a volume of 2948-ft³ (83-m³) and the termination room has a volume of 5825-ft³ (165-m³). The temperatures and relative humidity of the termination room met the requirements of the standard during and after the test. All frequencies met the requirements for 95% confidence established by the standard.

TEST EQUIPMENT:

<u>Manufacturer</u>	<u>Model Description</u>	<u>S/N</u>
NI-ATS	Sound Measuring System	NI-92374-ATS TCT102709.2
Norsonic	Rotating Microphone Boom	NOR265
BSWA (Source Rm)	Pressure Condenser Microphone	MP253 450007
GRAS (Term Rm)	Pressure Condenser Microphone	40AD 19220-1244

REMARKS:

The test sample will be retained for a period of 10-days and then discarded unless notified by the client.

Respectfully submitted,



Test Data:

Sound Reduction Index

ISO 140-3:1995 Airborne Sound Insulation of Building Elements

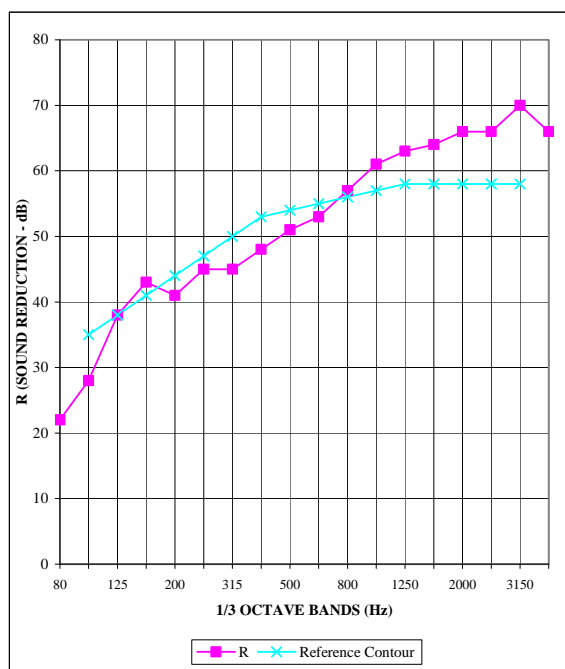
ISO 717-1:1996 Airborne Sound Insulation

1/3 Oct.	L ₁	L ₂	Bkgd	T	A	R	Def
Band, Hz	(dB)	(dB)	(dB)	(S)	(m ²)	(dB)	(dB)
80	94.8	72.7	46.9	6.1	4.33	22.0	
100	98.7	69.8	42.1	5.1	5.17	28.0	7.0
125	99.6	62.6	42.4	7.8	3.38	38.0	0.0
160	93.8	52.3	42.2	7.6	3.47	43.0	0.0
200	90.6	50.0	35.0	6.3	4.19	41.0	3.0
250	95.0	50.6	37.5	6.4	4.12	45.0	2.0
315	95.0	50.5	35.9	6.7	3.94	45.0	5.0
400	96.5	48.3	33.2	6.0	4.40	48.0	5.0
500	99.4	48.4	27.2	5.7	4.63	51.0	3.0
630	98.3	44.3	21.0	5.2	5.07	53.0	2.0
800	96.8	39.6	29.6	4.9	5.39	57.0	0.0
1000	94.3	33.7	25.8	4.6	5.74	61.0	0.0
1250	94.1	31.2	20.6	4.1	6.44	63.0	0.0
1600	95.3	31.9	19.9	3.8	6.94	64.0	0.0
2000	95.9	29.4	20.4	3.5	7.54	66.0	0.0
2500	96.8	28.7	19.4	3.2	8.25	66.0	0.0
3150	94.3	24.4	19.9	2.9	9.10	70.0	0.0
4000	89.9	21.2	20.8	2.4	11.00	66.0	
						Total Def.	27.0
						R _w	54

Test #	1
Product:	Controll Wall
Test Date:	15-Dec-11

Environmental Conditions

Temp (°C):	21
R.H. (%):	55
ATM (mbar):	1000



Sample Description:

Control Wall

Test Results

R _w	54
C =	0
Ctr =	-6

Test Data:

Sound Reduction Index

ISO 140-3:1995 Airborne Sound Insulation of Building Elements

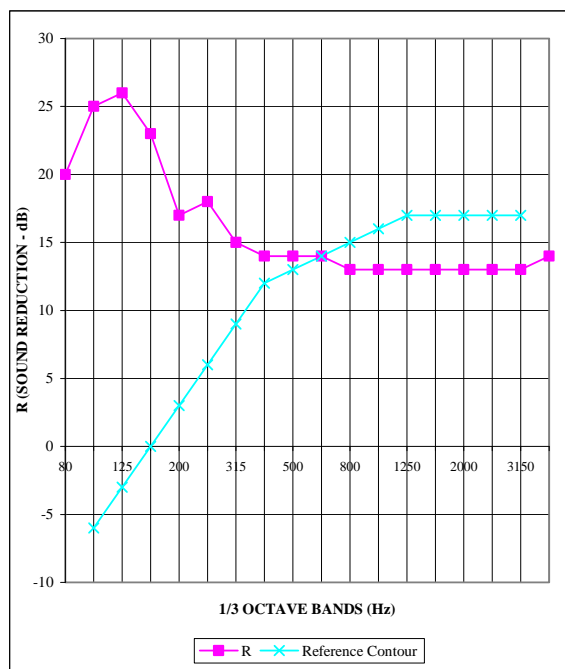
ISO 717-1:1996 Airborne Sound Insulation

1/3 Oct.	L ₁	L ₂	Bkgd	T	A	R	Def
Band, Hz	(dB)	(dB)	(dB)	(S)	(m ²)	(dB)	(dB)
80	93.7	72.5	40.6	5.4	4.89	20.0	
100	98.7	72.5	35.9	4.7	5.61	25.0	0.0
125	98.0	72.5	40.9	7.0	3.77	26.0	0.0
160	94.1	71.2	35.5	7.1	3.72	23.0	0.0
200	91.0	73.9	33.4	6.3	4.19	17.0	0.0
250	94.9	76.6	34.2	6.1	4.33	18.0	0.0
315	95.2	79.8	34.7	6.1	4.33	15.0	0.0
400	95.8	81.2	33.8	5.7	4.63	14.0	0.0
500	99.3	84.0	32.3	5.3	4.98	14.0	0.0
630	97.8	82.7	29.4	5.0	5.28	14.0	0.0
800	96.6	81.8	28.8	4.7	5.61	13.0	2.0
1000	94.1	79.2	26.0	4.4	6.00	13.0	3.0
1250	93.8	78.3	22.1	4.2	6.28	13.0	4.0
1600	95.1	79.3	19.4	3.9	6.77	13.0	4.0
2000	95.9	79.6	19.8	3.3	8.00	13.0	4.0
2500	96.7	80.0	19.4	3.1	8.51	13.0	4.0
3150	94.3	77.1	20.1	2.7	9.77	13.0	4.0
4000	89.9	71.4	20.9	2.3	11.47	14.0	
						Total Def.	25.0
						R _w	13

Test #	2
Product:	Open Penetration in Wall
Test Date:	15-Dec-12

Environmental Conditions

Temp (°C):	22
R.H. (%):	47
ATM (mbar):	983



Sample Description:

23-1/2" x 11-1/2" Open Void in Wall

Test Results

R _w	13
C =	3
Ctr =	3

Test Data:

Sound Reduction Index

ISO 140-3:1995 Airborne Sound Insulation of Building Elements

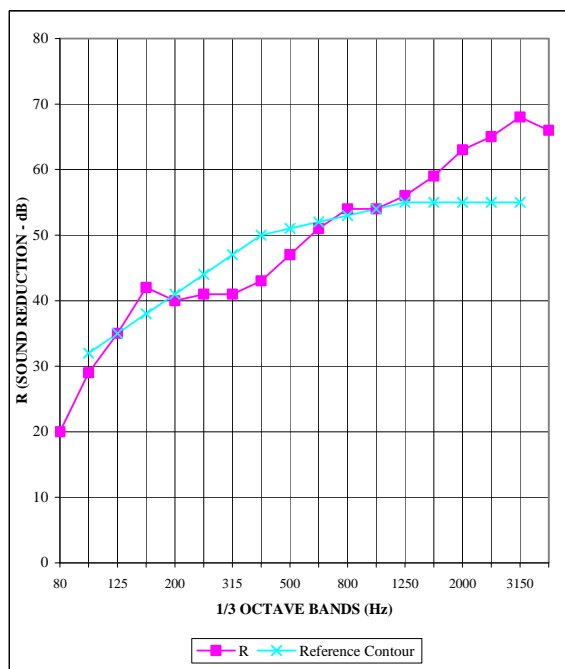
ISO 717-1:1996 Airborne Sound Insulation

1/3 Oct.	L ₁	L ₂	Bkgd	T	A	R	Def
Band, Hz	(dB)	(dB)	(dB)	(S)	(m ²)	(dB)	(dB)
80	94.4	73.6	42.3	5.3	4.98	20.0	
100	99.2	68.7	41.5	4.7	5.61	29.0	3.0
125	98.7	64.6	48.5	7.1	3.72	35.0	0.0
160	94.6	53.6	40.6	7.9	3.34	42.0	0.0
200	91	50.5	34.9	6.4	4.12	40.0	1.0
250	95.4	54.3	37	6.3	4.19	41.0	3.0
315	95.8	54.1	34.4	6.3	4.19	41.0	6.0
400	96.2	52.5	31.7	6.1	4.33	43.0	7.0
500	99.4	51.4	29.4	5.5	4.80	47.0	4.0
630	98.4	46.6	23	5	5.28	51.0	1.0
800	96.9	41.9	26.8	4.8	5.50	54.0	0.0
1000	94.5	39.2	24.1	4.6	5.74	54.0	0.0
1250	94.1	36.6	21.1	4.3	6.14	56.0	0.0
1600	95.5	35.1	18.7	3.9	6.77	59.0	0.0
2000	96.2	31.4	19.4	3.3	8.00	63.0	0.0
2500	97.1	29.8	19.2	3.2	8.25	65.0	0.0
3150	94.6	25.1	19.9	2.8	9.42	68.0	0.0
4000	90.3	21.4	20.8	2.2	11.99	66.0	
						Total Def.	25.0
						R _w	51

Test #	3
Product:	Hilti CFS-BL Blocks
Test Date:	15-Dec-12

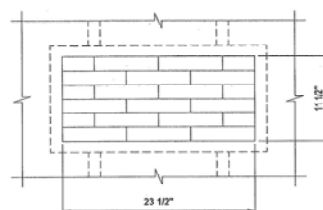
Environmental Conditions

Temp (°C):	22
R.H. (%):	51
ATM (mbar):	994



Sample Description:

Hilti CFS-BL Blocks



Test Results

R _w	51
C =	1
Ctr =	-4