



Report 18-718-R2 2019-05-13 4 pages, 2 appendices

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IMPACT SOUND IMPROVEMENT FOR VIBRATEC VT-BAT FLOATING FLOOR SYSTEM

ABSTRACT

The impact sound level and the impact sound improvement have been measured in a laboratory for the floating floor system Vibratec VT-BAT with 50 mm height and with 45 mm mineral wool in the air gap. Two layers of 22 mm cement fibreboard were glued together with a visco-elastic glue and screwed to the steel profiles. The floating floor samples were mounted on a reference heavyweight floor made of 160 mm concrete.

All measurements have been performed according to SS-EN ISO 10140-3:2010 and evaluated according to SS-EN ISO 717-2:2013. Single number values for all measurements can be found in the table below.

Test sample	L _{n,w} (dB)	C _{I,50-2500}	$\Delta L_{\rm w}$ (dB)	$C_{\mathrm{I},\Delta}$
1. Vibratec VT-BAT-400, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement-bound chipboard on top	36	3	44	-14
 Vibratec VT-BAT-510, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement-bound chipboard on top 	37	2	43	-12
3. Vibratec VT-BAT-570, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement-bound chipboard on top	39	2	41	-13

1. CLIENT

Vibratec Akustikprodukter AB, Fagernäsvägen 1, 760 17 Blidö, Sweden Contact: Svante Hägerstrand, 0176 – 20 78 84, svante.hagerstrand@vibratec.se

2. ASSIGNMENT

To measure the impact sound level and the impact sound improvement of the floating floor system Vibratec VT-BAT with 50 mm height. The measurements shall be made according to SS-EN ISO 10140-3:2010 and evaluated according to SS-EN ISO 717-2:2013.

3. TEST SAMPLES

The constructions of the test samples are described in Table 1. The test samples were mounted on Akustikverkstan's 160 mm heavyweight reference concrete floor. The difference between the three tested VT-BAT systems is the load range, which depends on the elastic feet.

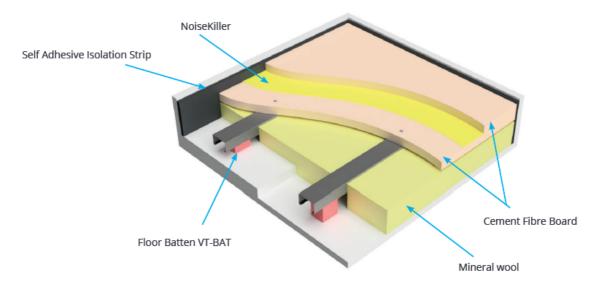


Figure 1: Illustration of a typical installation of the floor system VT-BAT.

Sample	Sample description
1	Vibratec VT-BAT-400, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement- bound chipboard (Swiss Pearl Ceminwood) glued together with NoiseKiller Yellow and screwed to the steel profiles. 600 mm between steel profiles and 375 mm between elastic pads
2	Vibratec VT-BAT-510, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement- bound chipboard (Swiss Pearl Ceminwood) glued together with NoiseKiller Yellow and screwed to the steel profiles. 600 mm between steel profiles and 375 mm between elastic pads
3	Vibratec VT-BAT-570, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement- bound chipboard (Swiss Pearl Ceminwood) glued together with NoiseKiller Yellow and screwed to the steel profiles. 600 mm between steel profiles and 375 mm between elastic pads

Table 1: Description of test samples.

4. MEASUREMENT PROCEDURE

The impact sound level measurements were performed according to SS-EN ISO10140-3:2010 with the tapping machine in 5 positions on the concrete floor. The microphone was placed on a rotating boom and the measurement period was 60 seconds, which corresponds to two full revolutions of the rotating boom. The reverberation time in the receiving room were measured using the rotating boom, 16 measurements in total. The measurements were then evaluated according to SS-EN ISO 717-2:2013.

The measurements were performed by Carl Nyqvist in Akustikverkstan's laboratory in Skultorp, Sweden, 2019-03-07.

5. MEASUREMENT EQUIPMENT

Table 2 presents the equipment that was used during the measurements. The equipment fulfils the requirements of Class 1 according to SS-EN 61672-1, 60942 and 61260. Date for last calibration is kept in Akustikverkstan's instrument journal. The equipment was control calibrated before and after the measurements.

Equipment	Brand and type	Serial number
Analyzer	Norsonic 140	1404198
Speaker	IMA Kub 1	9
Microphone cartridge	Norsonic 1225	215330
Microphone preamplifier	Norsonic 1209	13604
Calibrator	Norsonic 1251	31964
Tapping machine	Norsonic 277	2775763
Equalizer	Monacor MEQ-2152	-
Amplifier	Denon POA-2200	-

Table 2: Equipment that was used in the measurements.

6. MEASUREMENT RESULTS

The measurement results have been evaluated according to SS-EN ISO 717-2:2013. The weighted impact sound level, the weighted impact sound improvement together with selected correction terms are presented in Table 3. The measurement results are presented in detail in the attached measurement protocols 18-718-M13 to M18. The impact sound level of the reference floor is presented in measurement protocol 18-718-M19.

The measurement results are only valid for the tested samples.

Provnr / beskrivning	$L_{n,w}$ (dB)	C _{I,50-2500}	$\Delta L_{\rm w}$ (dB)	$C_{\mathrm{I},\Delta}$	Mät- protokoll
1. Vibratec VT-BAT-400, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement-bound chipboard (Swiss Pearl Ceminwood) glued together with NoiseKiller Yellow and screwed to the steel profiles. 600 mm between steel profiles and 375 mm between elastic feet	36	3	44	-14	M13, M14
2. Vibratec VT-BAT-510, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement-bound chipboard (Swiss Pearl Ceminwood) glued together with NoiseKiller Yellow and screwed to the steel profiles. 600 mm between steel profiles and 375 mm between elastic feet	37	2	43	-12	M15, M16
3. Vibratec VT-BAT-570, 50 mm height with 45 mm mineral wool, 2 layers of 22 mm cement-bound chipboard (Swiss Pearl Ceminwood) glued together with NoiseKiller Yellow and screwed to the steel profiles. 600 mm between steel profiles and 375 mm between elastic feet	39	2	41	-13	M17, M18

Table 3: Selected one-figure measurement results and corresponding measurement protocols.

7. MEASUREMENT PRECISION

The precision of the weighted one-figure numbers is normally within $\pm 2,2$ dB. Typical precisions for each one-third octave band is shown in Table 4. These values corresponds to the repeatability of one standard deviation for this laboratory, based on ten measurements on the heavyweight reference floor during 2004 to 2015.

50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
± 3,8 dB	± 3,2 dB	± 3,1 dB	± 2,2 dB	± 2,1 dB	± 1,5 dB	± 1,5 dB
250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz
± 1,1 dB	± 1,4 dB	\pm 0,8 dB	± 1,1 dB	± 1,1 dB	± 1,2 dB	± 1,3 dB
1,25 kHz	1,6 kHz	2,0 kHz	2,5 kHz	3,15 kHz	4,0 kHz	5,0 kHz
± 1,5 dB	± 1,9 dB	± 1,8 dB	$\pm 2,3 \text{ dB}$	± 2,3 dB	± 2,5 dB	$\pm 2,8 \text{ dB}$

 Table 4: One standard deviation for impact sound level measurements performed on the 160 mm heavyweight reference floor.

The measurement uncertainties for meteorological parameters are shown in Table 5.

Parameter	Uncertainty
Temperature	± 0,5° C
Relative humidity	\pm 3 percent
Air pressure	$\pm 0,5$ kPa

Table 5: Measurement uncertainty.

8. DEVIATIONS FROM STANDARDS

No deviations from the applicable standards were made during these measurements.

This report may only reprinted in its entirety. The measurement protocols may however be used separately.

Pontus Thorsson *PhD in acoustics*

Reviewed by Johan Jernstedt, 2019-05-13

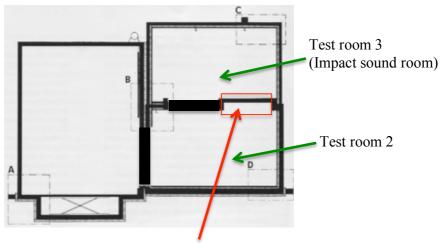
APPENDIX 1: INFORMATION ABOUT THE LABORATORY

Test room 3 (Impact sound room) on the laboratory's first floor has a rectangular shape with the dimensions L x B x H = 4,96 x 6,25 x 3,38 m. The room's volume is 105 m³ and the total surface for walls, floor and ceiling is 138 m².

Test room 2 (used as receiving room in impact sound measurements) has a rectangular shape with the dimensions L x B x H = 5,0 x 6,25 x 3,93 m. The room's volume is 123 m³ and the total surface for walls, floor and ceiling is 151 m².

The reference floor's size is 4,0 x 2,5 m.

A section for the two rooms together with the location of the reference floor is shown in Figure B1.1.



Location of the reference floor

Figure B1.1: Section for Test room 2 and Test room 3 together with the location of the reference floor.

The Laboratory's address is Vallmovägen 11, 541 55 Skövde, Sweden.

APPENDIX 2: PHOTOGRAPHS FROM THE MEASUREMENTS



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according to ISO ²	0440 2				Date of report:	2010 05 12
	0140-3					2019-05-13
•		ion of floors			Date of test:	2019-03-07
aboratory measurements of ir client:	Vibratec Akustikpr				Name:	Pontus Thorsson
Manufacturer:	Vibratec Akustikpr					
est specimen mounted by:	•					
est room identification:						
est room 3 (sending room) to Product identification:	Test room 2 (receiv	ving room)				
T-BAT-400 50 mm height						
escription of the specimen: 'T-BAT-400 50 mm height, c/c etween elastic pads, with 2 la he Ceminwood boards were g nineral wool between Ceminw eavyweight reference concret	vers of 22 mm Swis lued together using bod and concrete fl	s Pearl Ceminw NoiseKiller Yel	vood boards. Iow. 45 mm			
lass per unit area:	426 kg/m ²					
Curing time:	1 days					
arometric pressure:	96,4 kPa					
emperature - source room:	17,9 °C					
- receiving room:						
ir humidity - source room:			Test san	nple, Lnw = 36	dB	
- receiving room:			Shifted c	curve of refere	nce values (ISO 717	-2), Ln,w = 36 dB
ource room volume:	105 m ³ 6	0				
Receiving room volume:	123,0 m ³					
Frequency L _n	Normalized impact sound pressure level, L ₇ , dB. 4					
f 1/3 octave	/el, L					
[Hz] [dB]	ି ବ ହ	0				
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63 37,5	nd bt			N		
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125 40,0	, mi pe			-1		
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250 43,7						
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630 34,8						
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1600 25,7						
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2500 14,8						
3150 9,2	1	0				
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5000 8,9						
					<u> </u>	
		63	125	250 5	500 1000	2000 Hz 4000
						Frequency, f, Hz \longrightarrow
Rating according to ISO 7	7_2					
$L_{n,w}(C_1) = 36 $	1)dB			C	c _{1,50-2500} = 3 dB	
					(LIND 2500 - 3 (1H)	

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Poduotie -	ofime	ant activ	d mr			1		No. of te	st report:	18-718-M1	9/mh/800
Reductior	-		a pr	essur	e ieve	I		Date of r		2019-05-1	
according	to ISO	10140						Date of t		2019-03-0	7
aboratory meas	urements of	the reduction of	of transr	nitted imp	act noise			Name:		Pontus The	
by floor covering											
Client:		Vibratec Aku	ustikpro	dukter AB							
Manufacturer:		Vibratec Aku	ustikpro	dukter AB							
Test specimen	mounted by:	Akustikverks	stan								
Fest room iden	tification:										
Fest room 3 (ser	nding room) to	o Test room 2	(receivir	ng room)							
Product identifi	cation:										
/T-BAT-400 50	mm height										
Description of t	he specimer	n:									
/T-BAT-400 50	•										
between elastic											
mineral wool bet		0 0	0								
Mass per unit a		61 kg/r	0								
Curing time:		86400 s									
Barometric pres	ssure:	96,4 kPa	ı								
Femperature -	source room	n: 17,9 °C									
- rec	eiving room	n: 17,9 °C									
Air humidity -	source room	n: 36,5 %			_	Test sam	ple, reducti	ion of impact	noise		
- rec	eiving room										
Source room vo	olume:	105 m ³	60	[
Receiving room	volume:	123,0 m ³	Î								
			В В								
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250	77,2	33,5									
315	77,2	36,3				1					
400	74,1	41,8				/					
500	77,0	41,5	20								
630	75,2	40,4									
800	76,3	42,2									
1000	74,8	40,3		/							
1250	75,7	46,3	10								
1600	75,7	50,0									
2000	75,7	53,9									
2500	75,3	60,5									
3150	74,3	65,1	0								
4000	72,6	65,1				Frequ	ency rang	ge for L _{n.w}	evaluatio	n	
5000	69,1	60,2				riequ		ling to ISO			▶
							accord		/ 1 / - 2		
			-10								
				63	125	i :	250	500	1000		Hz 4000
										Frequency	, f, Hz \longrightarrow
	ding to ISO 7	717-2									
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$\Delta L_w = 44$		on test made v						,			





Normalized impac	t sound pres	ssure lev	vels		No. of test report:	
according to ISO 1	0140-3				Date of report: Date of test:	2019-05-13 2019-03-07
_aboratory measurements of in		on of floors			Name:	2019-03-07 Pontus Thorsson
Client:	Vibratec Akustikpro					
Manufacturer:	Vibratec Akustikpro					
Fest specimen mounted by:	Akustikverkstan					
Fest room identification: Fest room 3 (sending room) to	Test room 2 (receivir	ng room)				
Product identification: /T-BAT-510 50 mm height						
Description of the specimen: /T-BAT-510 50 mm height, c/c between elastic pads, with 2 la The Ceminwood boards were g nineral wool between Ceminw heavyweight reference concret	vers of 22 mm Swiss lued together using bod and concrete floo	Pearl Ceminv NoiseKiller Ye	vood boards. llow. 45 mm			
Mass per unit area:	426 kg/m ²					
Curing time:	1 days					
Barometric pressure:	96,4 kPa					
Femperature - source room:	17,9 °C					
- receiving room:	17,9 °C					
Air humidity - source room:	36,5 %			mple, Lnw = 37		
- receiving room:	36,5 %		Shifted of	curve of refere	nce values (ISO 717	-2), Ln,w = 37 dB
Source room volume:	105 m ³ ₆₀		i			
Receiving room volume:	123,0 m ³					
Frequency L _n	q L					
f 1/3 octave	evel,					
[Hz] [dB]	<u>່</u> ຍ 50 ຍຸ					
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63 37,8	bun		k /	N		
80 40,1	ct soi	/		\mathbf{N}		
100 44,4	ed 40	$H \not$				
125 38,8 160 40,8	ized					
200 50,7	Normalized impact sound pressure level, L ₁ , dB					
200 50,7 250 43,6	No					
315 40,6	30					
400 35,8	50					
500 37,4						
630 35,3						
800 34,6						
1000 34,8	20					
1250 29,2						
1600 25,7						
2000 22,1						
2500 15,5	10					
3150 10,6			Гио		for l avaluation	
4000 9,4 5000 9,6			Freq	uency range	for L _{n,w} evaluation	
3,0						
	0	63	125	250	500 1000	2000 Hz 4000
						Frequency, f, Hz \longrightarrow
Rating according to ISO 71	7-2					
$L_{n,w}(C_1) = 37$ (($c_{1,50-2500} = 2 \text{ dB}$	
$L_{n,u}(U_1) = -57$						

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Reductior	ו of imp	act soun	d I	pre	ssure l	evel		No. of test rep			
according	-			•				Date of report		9-05-13	
-								Date of test:		9-03-07	
aboratory meas by floor covering					itted impact	noise		Name:	Pon	ntus Thorsso	วท
Client:		Vibratec Ak	ustik	prod	ukter AB						
Manufacturer:		Vibratec Ak	ustik	prod	ukter AB						
Test specimen i	mounted by:	: Akustikverks	stan								
Fest room ident Fest room 3 (ser		o Test room 2	(rece	eivin	g room)						
Product identifi /T-BAT-510 50 i											
Description of t	he specimer	n:									
/T-BAT-510 50 ı	mm height, c/	/c 600 mm bet									
between elastic p		•									
The Ceminwood nineral wool bet		•		•							
Mass per unit a		61 kg/r	0								
Curing time:		86400 s									
Barometric pres	ssure:	96,4 kPa	1								
Femperature - :		1 : 17,9 °C									
- rec	ceiving room	n: 17,9 °C									
Air humidity -	source room	n: 36,5 %				Test sar	nple, reductior	n of impact noise	;		
-	ceiving room										
Source room vo	-	105 m ³		60	-						
Receiving room		123,0 m ³	↑								
			dB								
Frequency	L _{n,0}	ΔL	keduction of impact sound pressure level, ΔL , dB						/		
f	1/3 octave	1/3 octave	leve.	50		i I I					
[Hz]	[dB]	[dB]	sure						/		
50	46,0	2,2	pres						/		
63	43,1	5,3	pund								
80	54,2	14,1	ct so	40				\checkmark \checkmark			
100	64,3	19,9	impa								
125	60,1	21,3	n of i								
160	65,9	25,1	uction								
200	79,2	28,5	Redu	30			/				_
250	77,2	33,6	-								
315	77,2	36,6									
400	74,1	38,3									
500	77,0	39,6		20							
630	75,2	39,9			/						
800	76,3	41,7			/						
1000	74,8	40,0			/						
1250	75,7	46,5		10	⊢/	1 1 1					
1600	75,7	50,0			/						
2000	75,7	53,6									
2500	75,3	59,8									
3150	74,3	63,7		0							
4000	72,6	63,2				Frequ	Jency range	for L _{n.w} evalu	ation		
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							accoruli		2		
				-10							
				-10	63	125	250	500 1000	2	000 Hz	4000
									Fr	equency, f, Hz	\longrightarrow
Rating accor	ding to ISO 7	717-2									
Rating accor $\Delta L_w = 43$		717-2		$C_{I,\Delta}$	= -12 dB		(C _{1,r} = 1 dB			





Normalize	-	-	ressu	re lev	els			No. of test report		18-718-M17 2019-05-13	
according	to ISO 1	0140-3						Date of test:	••	2019-03-13	
Laboratory meas	urements of im	pact sound insu	lation of f	floors				Name:			
Client:		Vibratec Akustik	produkte	r AB							
Manufacturer:		Vibratec Akustik	produkte	r AB							
Test specimen r	nounted by:	Akustikverkstan									
Test room ident Test room 3 (sen		Test room 2 (rec	eiving roo	om)							
Product identifi √T-BAT-570 50 r											
Description of the VT-BAT-570 50 r between elastic p The Ceminwood mineral wool betw heavyweight refe	nm height, c/c bads, with 2 lay boards were g ween Ceminwo	vers of 22 mm Sv lued together us bod and concrete	viss Pear ing Noise	l Ceminv Killer Ye	vood b llow. 4	l5 mm					
Mass per unit ar	rea:	426 kg/m ²									
Curing time:		1 days									
Barometric pres	sure:	96,4 kPa									
Temperature - s	source room:	17,9 °C									
- rec	eiving room:	17,9 °C									
Air humidity - s	source room:	36,5 %	_			Test sam	ple, Lnw = 3	9 dB			
- rec	eiving room:	36,5 %				Shifted cu	urve of refere	ence values (ISC	0 717-2	2), Ln,w = 39 d	βB
Source room vo	lume:	105 m ³	⁶⁰ Г								
Receiving room	volume:	123,0 m ³ ↑									
Frequency f [Hz] 50 63 80 100 125 160 200 250 315 400 500 630 800 1000 1250 630 800 1000 1250 1600 2000 2500 3150 4020	L _n 1/3 octave [dB] 39,9 37,5 41,2 46,0 40,7 46,0 52,1 45,9 42,8 37,3 39,3 35,8 36,4 35,6 29,4 25,6 22,3 15,1 10,0 7,2	Normalized impact sound pressure level, L _n , dB	50 40 30 20								
4000 5000	7,3 8,9				•	⊦requ	ency range	e for L _{n,w} eval	uatio	·· ►	Ī
0000	0,0										
			0 L6	3	125	·	250	500 100	0	2000 Hz	4000
			C		120	-			~	Frequency, f, I	
L _{n,w} (C Evaluation ba	ased on labora	7-2 1) dB tory measureme e bands by an er			1			C _{1,50-2500} = 2	dB		

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Deduction	ofime	a at a a un					No. of test report	: 18-718-M18	P ISO
Reduction	-		a pi	ressure	e ievei		Date of report:	2019-05-13	
according	j to ISO	10140					Date of test:	2019-03-07	
aboratory meas	surements of	the reduction (of trans	mitted imp	act noise		Name:	Pontus Thorsson	
y floor covering							itumo.		
Client:		Vibratec Aku	ustikpro	odukter AB					
Manufacturer:		Vibratec Akı	ustikpro	odukter AB					
fest specimen	mounted by	Akustikverks	stan						
Fest room iden Fest room 3 (ser		o Test room 2	(receiv	ing room)					
Product identifi	cation:								
/T-BAT-570 50	mm height								
Description of t	ho spocimo								
Description of t /T-BAT-570 50	-		ween r	orodiles c/c	375 mm				
between elastic	•					3.			
The Ceminwood	boards were	glued togethe	r using	NoiseKille	r Yellow. 45 mn				
nineral wool bet				oor. Mounte	ed on 160 mm				
Mass per unit a	rea:	81 kg/r	n-						
Curing time:		86400 s							
Barometric pres		96,4 kPa							
emperature -	source room	n: 17,9 °C							
- rec	ceiving room	n: 17,9 °C							
Air humidity -	source roon	n: 36,5 %			Test	sample, reducti	on of impact noise		
- rec	ceiving room	1: 36,5 %							
Source room vo	olume:	105 m ³	6	0					
Receiving room	volume:	123,0 m ³	1						
•			 8						
Frequency	L _{n,0}	ΔL	ΔL, d						
f	1/3 octave	1/3 octave	3, el	o					
[Hz]	[dB]	[dB]	keduction of impact sound pressure level, ∆L, dB ເມື						
50	46,0	6,1	essu						
63	43,1	5,6	nd br						
80	43,1 54,2	5,0 13,0	unos 4						
			act						
100	64,3	18,3	fimp						
125	60,1	19,4	ion o						
160	65,9	19,9	ducti						
200	79,2	27,1	Sec. 3	0		1			
250	77,2	31,3				/			
315	77,2	34,4				/			
400	74,1	36,8							
500	77,0	37,7	2	0					
630	75,2	39,4			F				
800	76,3	39,9			/				
1000	74,8	39,2							
1250	75,7	46,3	1	₀┝─┤					
1600	75,7	50,1							
2000	75,7	53,4							
2500	75,3	60,2							
3150	74,3	64,3		0					
4000	72,6	65,3		-	-				
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	, -	, =				accord	ing to ISO 717-2		
			-1	0 L 63	125	250	500 1000	2000 Hz 40	000
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									,
Boting cost	dina to ISO .	717 0							
	rding to ISO 7	1/-2	~	10	-ID		0 0 10		
AL - 41	aB		C	_{I,∆} = -13	aB		$C_{l,r} = 2 dB$		
$\Delta L_w = 41$		on tost	ditle en	ontificity -		roton /	s obtained in one-thir	d aatour her de le	





-	-	essure levels		No. of test report: Date of report:	18-718-M19 2019-05-13
according to ISO 10140-3				Date of test:	2019-02-11
Laboratory measurements of impact sound insulation of floors				Name:	Carl Nyqvist
	Vibratec Akustikp				
	Vibratec Akustikp	produkter AB			
Test specimen mounted by:	-				
Fest room identification: Fest room 3 (sending room) to ∃	est room 2 (rece	iving room)			
Product identification: Heavyweight reference floor, 16	0 mm concrete				
Description of the specimen: Heavyweight type 2					
	$205 kg/m^2$				
Mass per unit area: Curing time:	365 kg/m ² 0 days				
Suring time: Barometric pressure:	99,2 kPa				
Femperature - source room:	99,2 кРа 17,7 °С				
- receiving room:	17,7 °C				
Air humidity - source room:	34,2 %		Test sample, Lnw = 81	dB	
- receiving room:	34,2 %		Shifted curve of referer		-2), Ln,w = 81 dB
Source room volume:	105 m ³	90	1	-	
Receiving room volume:	123,0 m ³				
Frequency L _n	Normalized impact sound pressure level, L _i , dB				
f 1/3 octave	ivel, I				
[Hz] [dB]	ure le	80	N		
50 46,0	lressu			$\land \land \land$	
63 43,1	d pun				
80 54,2 100 64,3	ct so				$\backslash \mid \mid \land \mid$
100 64,3 125 60,1	impa	70			
125 60,1	lized				
200 79,2	ormai		/		
250 77,2	ž		/		
315 77,2		60			
400 74,1					
500 77,0					
630 75,2					
800 76,3		50			
1000 74,8					
1250 75,7 1600 75,7					
2000 75,7					
2500 75,3					
3150 74,3		40			
4000 72,6			Frequency range	for L _{n,w} evaluation	on 📕
5000 69,1					
		30 63 125	250 5	00 1000	2000 Hz 4000
		03 125	200 5	00 1000	Frequency, f, Hz \longrightarrow
Rating according to ISO 71	7-2				
$L_{n,w}(C_1) = 81$ (С	_{1,50-2500} = -9 dB	
			v		