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Technical Information
BIS Yeti® Mountingsystem

Test Report
1762-001-19

- Impact Sound Reduction by Support Systems in the laboratory -

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SG-Bauakustik

Institut für schalltechnische Produktoptimierung

Test Report

No. 1762-001-19 dated 10th January 2019

Impact Sound Reduction by Support Systems in the laboratory

Client:	J. van Walraven Holding B.V. Industrieweg 5 3641 RK Mijdrecht The Netherlands
Test Object:	BIS Yeti® Support Systems, type 480 or 335 with additional load, without or with EPS-insulation
Contract:	Determination of the impact sound reduction according to DIN EN ISO 10140-1 and DIN EN ISO 10140-3 in the laboratory
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1. Definition of project and general details

1.1 Definition of project

J. van Walraven Holding B.V., Mijdrecht, Netherland, offers, among other things, BIS Yeti® Support Systems of the type 480 or 335 with non-slip anti-vibration mat made of EPDM, which are intended to elevate ventilation and air conditioning installations on flat and slightly inclined roofs. The Support Systems are to be examined with regard to their acoustic in different load conditions and configurations.

To determine the impact sound reduction, sample arrangements were prepared in which the to be tested BIS Yeti® Support Systems (type 480 and 335) by profile rail foot and BIS RapidStrut® profile rails were bolted with a steel plate. Depending on the test configuration, the profile rails were loaded, if necessary, with additional weights (load levels: 100 kg, 200 kg and 300 kg, each per foot) or the build-ups were examined with an EPS-insulation underlay (d = 200 mm, type DAA dm). The reference structure was an identical construction in which concrete slabs were used instead of the BIS Yeti® Support Systems. While stimulating the steel plate of the respective set-up by the standard tapping machine, the sound level in the receiving room below the laboratory ceiling was measured.

The measurements are carried out in accordance to DIN EN ISO 10140-3. Three measurements were performed per test and their results are averaged.

1.2 Manufacturer of the Support System

J. van Walraven Holding B.V.
Industrieweg 5
3641 RK Mijdrecht
The Netherlands

1.3 Client requesting tests

J. van Walraven Holding B.V.
Industrieweg 5
3641 RK Mijdrecht
The Netherlands

1.4 Measurement standards

The tests were carried out in the ceiling test stand by our company's skilled employees in accordance to the following standards and guidelines:

- DIN EN ISO 10140-1 "Acoustics – Laboratory measurement of sound insulation of building elements – Part 1: Application rules for specific products"
  (ISO 10140-1:2016); German Version EN ISO 10140-1:2016

- DIN EN ISO 10140-3 "Acoustics – Laboratory measurement of sound insulation of building elements – Part 3: Measurement of impact sound insulation"
  (ISO 10140-3:2015); German Version EN ISO 10140-3:2015

- DIN EN ISO 10140-4 "Acoustics – Laboratory measurement of sound insulation of building elements – Part 4: Measuring procedures and requirements"
  (ISO 10140-4:2010); German Version EN ISO 10140-4:2010

- DIN EN ISO 10140-5 "Acoustics – Laboratory measurement of sound insulation of building elements – Part 5: Requirements for test facilities and equipment"
  (ISO 10140-5:2010 + Amd. 1:2014); German Version EN ISO 10140-5:2010 + A1:2014

- DIN EN ISO 717-2 "Acoustics – Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation"
  (ISO 717-2:2013); German Version EN ISO 717-2:2013

2. Installation and design layout of the test objects

2.1 Laboratory

The laboratory ceiling is a homogeneously built-up, massive reinforced concrete ceiling which has a thickness of d = 120 mm. The surface of the ceiling measures approx. 20.4 m² as seen from the receiving room below. The reinforced concrete ceiling is treated with an even smooth coating. The reinforced concrete ceiling corresponds with DIN EN ISO 10140-5, Appendix C, Section C.2.

The standard impact sound level of the reinforced concrete ceiling with stimulus on the ceiling areas amounts to:

Table 1: Standard Impact Sound Level Raw Ceiling (measured on 26.09.2018):

f [Hz]	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**
$L_{n,0}$	60,0	56,2	64,1	64,0	70,1	67,6	73,4	71,5	71,0	70,6	72,1

f [Hz]	**630**	**800**	**1000**	**1250**	**1600**	**2000**	**2500**	**3150**	**4000**	**5000**
$L_{n,0}$	72,6	73,0	73,8	75,4	77,2	76,6	76,1	74,2	72,6	69,8

The evaluated standard impact sound level of the raw ceiling amounts to $L_{n,0,w}$ = 82 dB.

2.2 Set-up of test objects

The test setups are sample arrangements in which the to be tested BIS Yeti® Support Systems (type 480 and 335 with non-slip anti-vibration mat made of EPDM) by profile rail foot and BIS RapidStrut® profile rails (version: 41 mm x 41 mm x 2.5 mm) were bolted with a steel plate (800 mm x 300 mm x 6 mm). Depending on the test configuration, the profile rails were loaded, if necessary, with additional weights (load levels: 100 kg, 200 kg and 300 kg, each per foot) or the build-ups were examined with an EPS-insulation underlay (d = 200 mm, type DAA dm). The reference structure was an identical construction in which concrete slabs were used instead of the BIS Yeti® Support Systems.

Concrete slabs (500 mm x 500 mm x 60 mm or 400 mm x 400 mm x 50 mm) were placed on the profile rails to produce the different load levels. The test material was supplied to our laboratory on 26.09.2018 and then prepared by specialists of the manufacturer and our company's skilled employees for testing.

In detail, the following tests were carried out:

Measurement 1: **reference arrangement (set-up with concrete slabs)**
with rail base (2 pieces), placed on laboratory ceiling
appx. 100 kg additional load per foot

Measurement 2: **BIS Yeti® Support System, type 480** (2 pieces) non-slip anti-vibration mat made of EPDM, placed on laboratory ceiling
appx. 100 kg additional load per foot

Measurement 3: **BIS Yeti® Support System, type 480** (2 pieces) non-slip anti-vibration mat made of EPDM, **placed on EPS-insulation** (t = 200 mm)
appx. 100 kg additional load per foot

Measurement 4: **BIS Yeti® Support System, type 480** (2 pieces) non-slip anti-vibration mat made of EPDM, **placed on EPS-insulation** (t = 200 mm)
appx. 200 kg additional load per foot

Measurement 5: **BIS Yeti® Support System, type 480** (2 pieces) non-slip anti-vibration mat made of EPDM, **placed on EPS-insulation** (t = 200 mm)
appx. 300 kg additional load per foot

Measurement 6: **BIS Yeti® Support System, type 335** (2 pieces) non-slip anti-vibration mat made of EPDM, placed on laboratory ceiling
appx. 100 kg additional load per foot

Measurement 7: **BIS Yeti® Support System, type 335** (2 pieces) non-slip anti-vibration mat made of EPDM, **placed on EPS-insulation** (t = 200 mm)
appx. 100 kg additional load per foot

Measurement 8: **BIS Yeti® Support System, type 335** (2 pieces) non-slip anti-vibration mat made of EPDM, **placed on EPS-insulation** (t = 200 mm)
appx. 200 kg additional load per foot

Measurement 9: **BIS Yeti® Support System, type 335** (2 pieces) non-slip anti-vibration mat made of EPDM, **placed on EPS-insulation** (t = 200 mm)
appx. 300 kg additional load per foot

The detailed build-up of the constructions can be seen in the manufacturer's construction drawings, annexes 1 to 3. Annexes 4 to 8 contain photo documentation of the set-up in the laboratory.

3. Measurement and execution of measuring

The measurement of the standard impact sound level (L_n in dB) and the ascertainment of the impact sound reduction (ΔL in dB) respectively were carried out in accordance with the requirements of DIN EN ISO 10140-3.

In order to ascertain the standard impact sound level of the test arrangement, a standardized tapping machine stimulated the test objects on the laboratory ceiling in a total of 3 measuring positions in the receiving room below which corresponded with the requirements of DIN EN ISO 10140-5, the sound level was ascertained. Taking reverberation time and the equivalent absorption area A into consideration, the standard impact sound level is attained.

The standard impact sound level $L_{n,0}$ of the raw ceiling was determined using the same procedure by stimulating the smooth coating without test objects. The difference of the impact sound level with and without test object gives the impact sound reduction. The single value specification ΔL_w results from converting the measured value of impact sound reduction ΔL to the standard impact sound level of a reference ceiling according to the procedure described in DIN EN ISO 717-2. A description of measuring as well as the measuring instruments used can be seen in annex 9.

4. Measurement results

In the following table 2 the standard impact sound levels of the raw ceiling as well as the impact sound reduction of the individual set-ups are illustrated.

Table 2: Impact Sound Reduction in dB, measurements on 26.09.2018

f_{Terz} in Hz	50	63	80	100	125	160	200	250	315	400	500
$L_{n,0}$	60,0	56,2	64,1	64,0	70,1	67,6	73,4	71,5	71,0	70,6	72,1
ΔL, Measurement 1	-3,9	-9,4	-2,8	11,2	7,1	2,8	8,2	5,6	5,6	-0,6	5,5
ΔL, Measurement 2	10,3	3,6	24,2	24,2	18,8	14,7	19,9	19,7	18,1	14,3	18,3
ΔL, Measurement 3	16,7	6,9	22,7	23,2	14,8	11,8	20,1	21,2	19,9	21,1	23,9
ΔL, Measurement 4	12,6	3,2	16,9	16,7	16,0	10,5	18,6	20,6	18,7	22,0	25,6
ΔL, Measurement 5	15,7	5,7	16,4	15,7	17,6	9,1	23,5	19,3	17,7	19,9	25,1
ΔL, Measurement 6	-1,4	-7,3	11,6	16,4	12,0	8,6	15,1	14,2	16,0	13,9	14,6
ΔL, Measurement 7	10,6	6,0	19,8	22,3	17,6	17,3	16,2	19,8	20,9	13,8	15,5
ΔL, Measurement 8	18,7	8,8	14,0	15,8	20,2	22,0	17,1	18,9	20,1	17,6	17,2
ΔL, Measurement 9	16,1	7,1	18,2	20,1	20,8	19,8	19,0	18,6	21,1	17,8	18,3

f_{Terz} in Hz	630	800	1.000	1.250	1.600	2.000	2.500	3.150	4.000	5.000
$L_{n,0}$	72,6	73,0	73,8	75,4	77,2	76,6	76,1	74,2	72,6	69,8
ΔL, Measurement 1	8,1	3,4	10,1	11,3	5,9	13,9	18,8	29,0	26,4	32,1
ΔL, Measurement 2	18,1	26,5	26,0	25,2	29,1	31,2	33,6	36,5	37,9	39,2
ΔL, Measurement 3	26,2	28,8	31,8	33,2	33,7	32,0	34,1	37,4	37,9	39,3
ΔL, Measurement 4	24,2	26,6	30,7	33,0	33,6	31,4	34,4	37,3	37,9	39,2
ΔL, Measurement 5	26,3	28,2	30,7	30,5	33,0	31,7	34,9	37,8	38,8	40,5
ΔL, Measurement 6	13,7	14,4	15,6	17,6	19,6	27,0	28,9	32,9	34,7	38,3
ΔL, Measurement 7	19,6	27,1	24,6	31,3	32,9	31,7	33,9	36,6	37,7	39,2
ΔL, Measurement 8	20,6	26,4	24,0	30,5	32,7	31,6	34,2	37,0	38,4	40,2
ΔL, Measurement 9	20,5	25,4	25,5	30,4	32,4	31,8	34,1	36,5	37,8	39,9

The evaluated impact sound reduction ΔL_w according to DIN EN ISO 717-2 for the set-ups amounts to:

Measurement 1:	**concrete slabs with rail base, 100 kg load per foot**	**ΔL_w = 13 dB**
Measurement 2:	**BIS Yeti® 480, 100 kg load per foot**	**ΔL_w = 28 dB**
Measurement 3:	**BIS Yeti® 480, 100 kg load per foot, EPS-insulation**	**ΔL_w = 31 dB**
Measurement 4:	**BIS Yeti® 480, 200 kg load per foot, EPS-insulation**	**ΔL_w = 30 dB**
Measurement 5:	**BIS Yeti® 480, 300 kg load per foot, EPS-insulation**	**ΔL_w = 30 dB**
Measurement 6:	**BIS Yeti® 335, 100 kg load per foot**	**ΔL_w = 22 dB**
Measurement 7:	**BIS Yeti® 335, 100 kg load per foot, EPS-insulation**	**ΔL_w = 29 dB**
Measurement 8:	**BIS Yeti® 335, 200 kg load per foot, EPS-insulation**	**ΔL_w = 29 dB**
Measurement 9:	**BIS Yeti® 335, 300 kg load per foot, EPS-insulation**	**ΔL_w = 30 dB**

The frequency dependent course of the standard impact sound level of the raw ceiling and the impact sound reduction of the set-ups are illustrated in annexes 10 to 18.

Mülheim an der Ruhr, 10th January 2019

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Laszlo Pobloth