MFPA Leipzig GmbH

Testing, Inspection and Certification Authority for
Construction Products and Construction Types

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Recognized Testing Laboratory by the VMPA
Acoustic Testing VMPA-SPG-129-97-SN

Test Report No. PB 2.3/20-216-2

22 February 2021
No. Copy: 1

Subject matter: Laboratory measurement of impact-sound reduction in accordance with DIN EN ISO 10140 (all parts) of a raised floor with concrete slabs on support system SurPlot SP3a Derzli (pedestals with rubber disc top)

Client: Armada Groupe İnsaat Turizm Gida Sanayi Ticaret Limited
Yenibosna Merkez Mah. Prof. Dr. M. Nevzat Pisak Cd. No:4/2-11
BAHÇELİEVLER / ISTANBUL / TURKEY

Date of order: 06-11-2020

Date of test: 21-12-2020

Person in charge: Dipl.-Ing. M. Busch
Dipl.-Phys. D. Sprinz

This document consists of 7 sheets and 2 annexes.

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-11021-01-00

Testing laboratory accredited by DAkkS GmbH according to DIN EN ISO/IEC 17025.

Notified testing laboratories, inspection bodies and certification bodies recognized according to the Construction Products Regulation (NB 800) and the State Building Code (SAC 02).

Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH)

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1. Task specification

For a raised floor with concrete slabs on support system with designation SurPlot SP3a Derzli (pedestals with rubber disc top), impact-sound shall be measured in accordance with DIN EN ISO 10140 (all parts) in order of

Armada Groupe İnsaat Turizm Gida Sanayi Ticaret Limited
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on a heavyweight standard floor in the testing laboratory of the MFPA Leipzig GmbH, with Rating acc. to. DIN EN ISO 717-2.

Adjustable pedestals SurPlot SP3a Derzli shall be built in the floor test setup with adjusted height of 110 mm between lower edge and upper edge of pedestal and without adhesions.

2. Testing material, place and date of measurement

Following components of floor test setup were delivered by client to MFPA Leipzig of December 01, 2020.

- adjustable pedestals (with spacers on top for joints between concrete slabs) with designation SurPlot SP3a Derzli
- rubber discs belonging to SurPlot SP3a Derzli (with recesses in its circular area), as intermediate layer between top of adjustable pedestal and bottom of concrete slabs

Concrete slabs, length x width = 500 mm x 500 mm, 52 mm thick, were provided by MFPA Leipzig.

Floor test setup was installed by qualified personnel of MFPA Leipzig in laboratory of MFPA Leipzig directly before test.

The date of test of impact sound insulation of floor test setup is revealed on the cover page of this report.

Pictures of floor test setup can be seen in annex 2.

3. Test object

Floor test setup

(from top to bottom)

- 52 mm concrete slabs 500 mm x 500 mm
- 112 mm air space with pedestals SurPlot SP3a Derzli with the system's own rubber discs on top *
- 140 mm reinforced concrete floor

* in grid complying with concrete slab dimensions

Total thicknes of floor test setup: 164 mm

Size of floor test setup: 10.5 m²

The following dimensions, masses, masses per unit area and raw densities were found.

Table 1: dimensions, masses, masses per unit area and raw densities

Description	length mm	width mm	thick-ness mm	mass kg	mass per unit area kg/m²	raw density kg/m³
concrete slab	500	500	52	28.3	113.2	2177
pedestal SurPlot SP3a Derzli	-	-	110	0.37	-	-
rubber disk for SurPlot SP3a Derzli	-	-	2	0.017	-	-

Installation in laboratory:

Adjustable pedestals SurPlot SP3a Derzli, with the system's own rubber discs on top and with adjusted height of 110 mm, were put on raw ceiling. Grid of pedestals complied with dimensions of concrete slabs finally layed on rubber discs on pedestals, with slab corners exactly at the joint spacers of pedestals.

4. Testing rooms

The testing rooms complies with the requirements imposed by DIN EN ISO 10140-5. They consist of a source room B F.01 and a receiving room below the ceiling B T.02. The ceiling area between source- and receiving room is 18.3 m².

The plan of the source room showed a rectangular angle and three oblique angles. The masonry walls are made of sand-lime bricks 2 DF, raw density class 2.0, 24 cm thick and to the reduction of flanking transmission cased with 14 cm gypsum plasterboard and mineral wool.

The source- and receiving-room volumes are revealed in Annex 1. The air temperature and relative humidity of the test rooms as well as the static pressure are also shown in Annex 1.

5. Testing method

Measurements were carried out on a heavyweight standard floor (reinforced concrete) with a thickness of 140 mm in accordance with DIN EN ISO 10140-5, section C.2 in the laboratory of MFPA Leipzig GmbH.

Measurement was carried out according to category II (large test specimen) of:

- DIN EN ISO 10140-1, *Acoustics - Laboratory measurement of sound insulation of building elements – Part 1: Application rules for specific products;* December 2016 issue in connection with other parts of DIN EN ISO 10140 (parts 2 and 4, December 2010 issue; part 3, November 2015 issue; part 5, September 2014 issue)

Impact sound reduction was calculated according to:

- DIN EN ISO 717-2, *Acoustics - Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation*; June 2013 issue

Impact-sound level was measured by a rotating microphone in receiving room for 8 positions of standard tapping machine on reinforced concrete floor (heavyweight standard floor) and 8 positions of the standard tapping machine on top side of test specimen. Measurement was carried out on ⅓rd octave band frequencies of 50 – 5000 Hz. The normalized impact-sound level results from the equation

$$L_n = L_i + 10 \lg (A/A_0)$$

Note:

L_n normalized impact-sound level

L_i impact-sound level

A equivalent absorption area in the receiving room in m², determined from easurement of the reverberation period and the volume of receiving room

A_0 reference absorption area (A_0 is defined to 10 m²)

Impact sound reduction was determined from the difference of the normalized impact-sound level of the heavyweight standard floor without test specimen and of the heavyweight standard floor with test specimen in accordance with the following equation:

$$\Delta L = L_{n,0} - L_n$$

Note:

ΔL impact sound reduction

$L_{n,0}$ normalized impact-sound level of the heavyweight standard floor without test specimen

L_n normalized impact-sound level of the heavyweight standard floor with test specimen

The weighted impact sound reduction ΔL_w was calculated according to the following equations:

$$L_{n,r} = L_{n,r,0} - \Delta L$$

$$\Delta L_w = 78\ dB - L_{n,r,w}$$

Note:

$L_{n,r}$ calculated normalized impact-sound level of reference floor with the test specimen to be tested

$L_{n,r,0}$ given normalized impact-sound level of reference floor acc. to DIN EN ISO 717-2

$L_{n,r,w}$ weighted normalized impact-sound level of the reference floor with the test specimen to be tested

ΔL_w weighted impact sound reduction of the test specimen

Procedure and volume of measurements are in accordance with the principles of the research group of the building authorized acoustic noise laboratories.

6. Measuring instruments

Following measuring instruments were used.

Table 2: Measuring instruments used

Device	Type	Manufacturer
Real time analyser with noise generator	840	Norsonic
Free field microphone	1220	Norsonic
Pre-amplifier	1201	Norsonic
Calibration unit	4231	B & K
Output amplifier	260	Norsonic
Rotating microphone boom, remote control	252, 253	Norsonic
Loudspeaker combination (dodecahedron)	229	Norsonic
Standard tapping machine	211	Norsonic

The measuring instruments are calibrated on a regular basis, the measuring chain is calibrated before and after every measurement. MFPA Leipzig regularly takes part in the comparative measurements for Group 1 testing laboratories (qualification testing laboratories) of the Physikalisch Technischen Bundesanstalt (PTB = German national metrology institute) Braunschweig (the last one being in 2019) and registered as a testing laboratory in the "List of testing, monitoring and certifying laboratories in accordance with the state building codes" of the Deutschen Institutes für Bautechnik DIBt (German Institute for Construction Technology) under the code number "SAC 02".

MFPA Leipzig is a testing laboratory accredited by DAkkS GmbH in accordance with DIN EN ISO/IEC 17025.

7. Measuring results

The normalized impact-sound levels without and with test specimen are collated in following table.

Table 3: Test results

- $L_{n,0,w}$: weighted normalized impact-sound level of the heavyweight standard floor
- $L_{n,r,w}$: calculated weighted normalized impact-sound level of a referenc floor with the to be tested test specimen
- ΔL_w weighted impact-sound reduction ΔL_w
- ΔL_{lin} non-valuated linear impact-sound level $\Delta L_{lin} = \Delta L_w + C_{I,\Delta}$
- $C_{I,0}$ spectrum value for the normalized impact-sound level of the heavyweight standard floor
- $C_{I,r}$ spectrum value for the referenc floor with the tested test specimen
- $C_{I,\Delta}$ spectrum value for the impact sound reduction of test specimen

test object	test results	spectrum values C_I	see annex
reinforced concrete floor 140 mm (without test specimen)	$L_{n,0,w}$ = 76 dB	$C_{I,0}$ = -12 dB	-
tested floor test setup on 140 mm reinforced concrete floor	$L_{n,r,w}$ = 58 dB	$C_{I,r}$ = -4 dB	1
	ΔL_w = 20 dB ΔL_{lin} = 13 dB	$C_{I,\Delta}$ = -7 dB	

For graphical and tabular representation of ΔL values depending on the frequency please refer to Annex 1.

8. Notes on the test results

The result ΔL_w is a weighted impact sound reduction, achieved at laboratory conditions.

The results of the tests exclusively refer to the described test objects but not to the main unit. This document does not replace a certificate of conformity or suitability according to national and European building codes.

Leipzig, 22 February 2021

MFPA Leipzig GmbH II SAC 02 NB 0800

Dipl.-Phys. D. Sprinz
Head of Work Group

Dipl.-Ing. M. Busch
Testing Engineer

Reduction of impact sound pressure level according to ISO 10140 (all parts)

Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor

Client: Armada Groupe İnsaat Turizm Gida Sanayi Ticaret Limited, BAHÇELİEVLER / ISTANBUL / TURKEY Date of test: 21 December 2020

Test room identification: B F.01 / B T.01

Test specimen mounted by: MFPA Leipzig

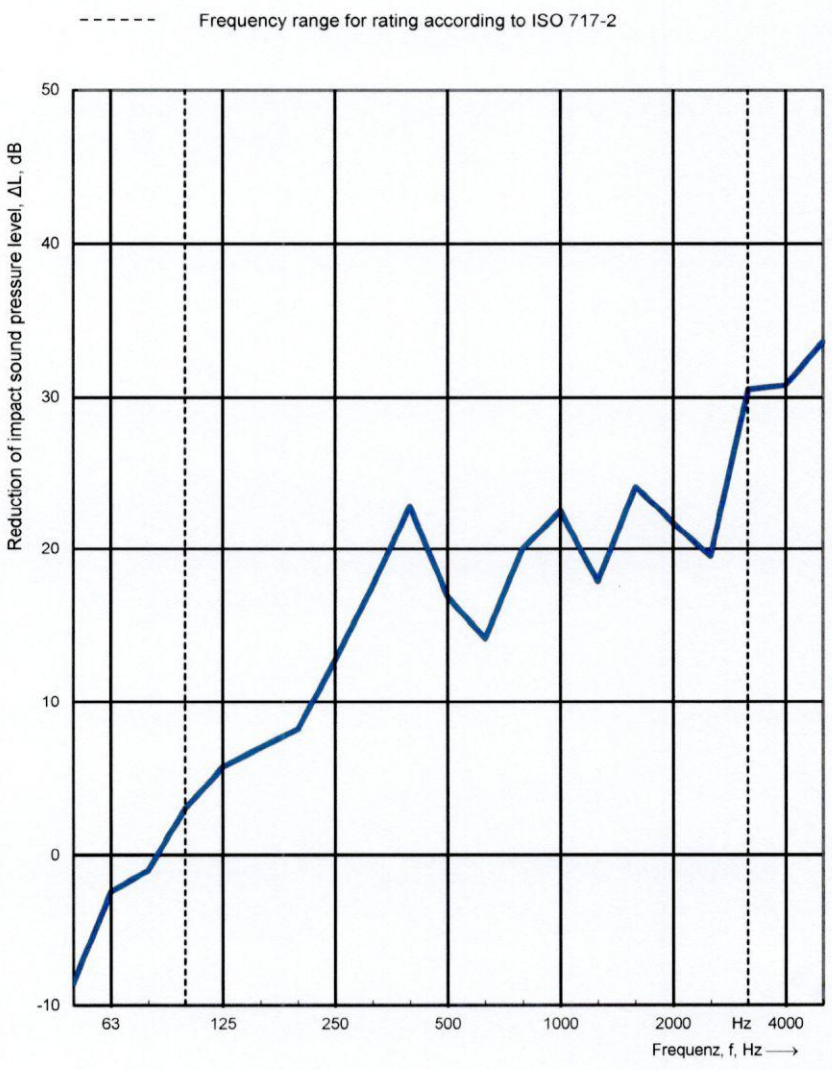
Product identification: raised floor with concrete slabs on support system SurPlot SP3a Derzli (pedestals with adjusted height of 110 mm and with rubber disc top); without adhesions

Description of specimen (from top to bottom):
- 52 mm concrete slabs 500 mm x 500 mm
- 112 mm air space with pedestals SurPlot SP3a Derzli with the system's own rubber discs on top
- 140 mm reinforced concrete floor

Mass per unit area: approx. 115 kg/m²

Temperature SR / RR: 20 / 20 °C
Air humidity SR / RR: 49 / 49 %
Static pressure: 100 kPa
Volume SR / RR: 57.9 / 58.9 m³
(SR = source room; RR = receiving room)

Frequency f [Hz]	$L_{n,0}$ 1/3 octave [dB]	ΔL 1/3 octave [dB]
50	59,2	-8,6
63	64,5	-2,4
80	59,7	-1,0
100	59,7	3,1
125	66,6	5,8
160	64,6	7,0
200	63,3	8,2
250	64,4	12,7
315	64,2	17,5
400	65,0	22,8
500	67,0	16,8
630	67,0	14,1
800	68,0	20,0
1000	68,6	22,5
1250	68,3	17,8
1600	68,8	24,1
2000	69,5	21,7
2500	70,2	19,5
3150	71,0	30,5
4000	69,8	30,8
5000	67,7	33,6



Rating according to ISO 717-2

ΔL_w = 20 **dB** $C_{I,\Delta}$ = -7 dB $C_{I,r}$ = -4 dB

These results are based on test made with an artificial source under laboratory conditions obtained in one-third-octave bands by an engineering method.

Signature:

MFPA Leipzig GmbH II
SAC 02
NB 0800

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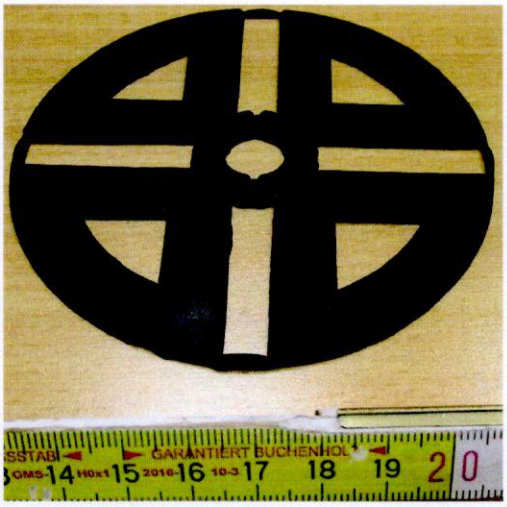
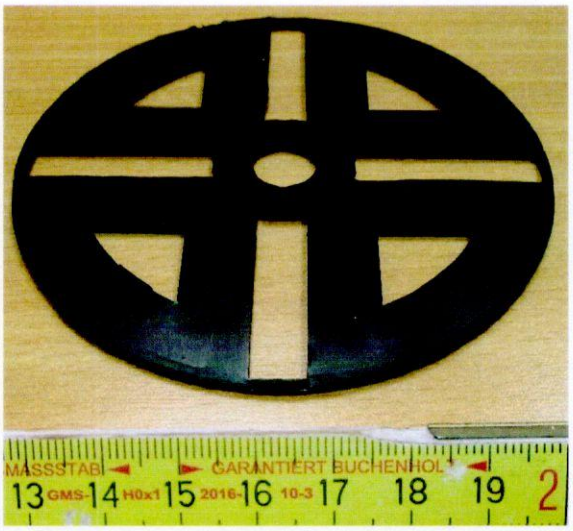
Hans-Weigel-Str. 2b
04319 Leipzig
Tel. 0341- 6582115

Picture A.2.1: adjustable pedestal SurPlot SP3a Derzli (with spacers for joints on top)

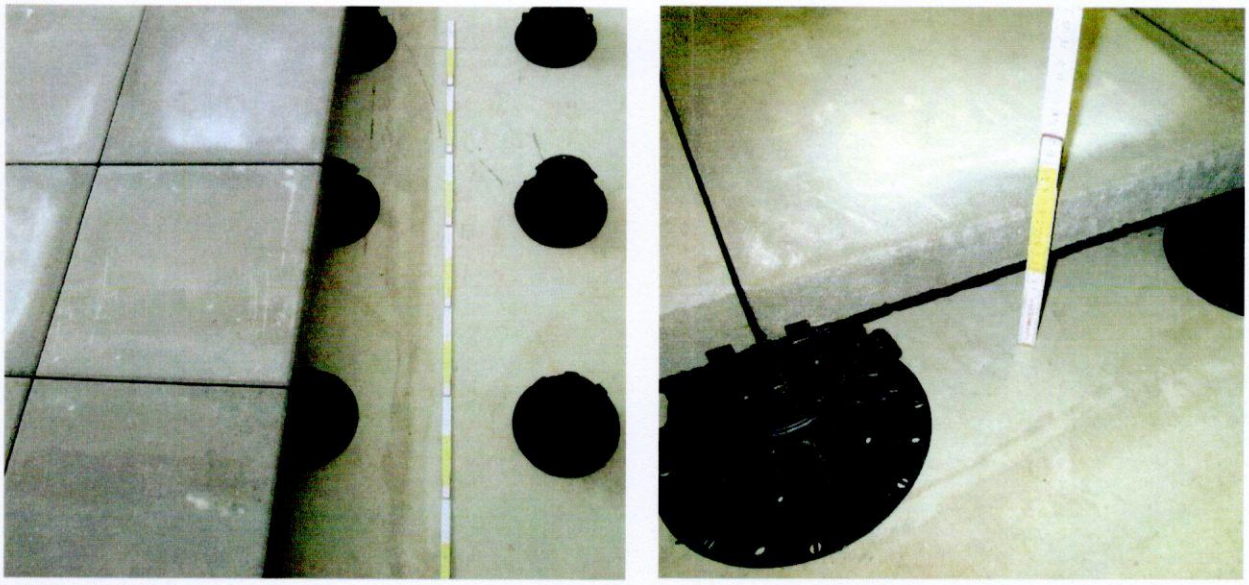
a)



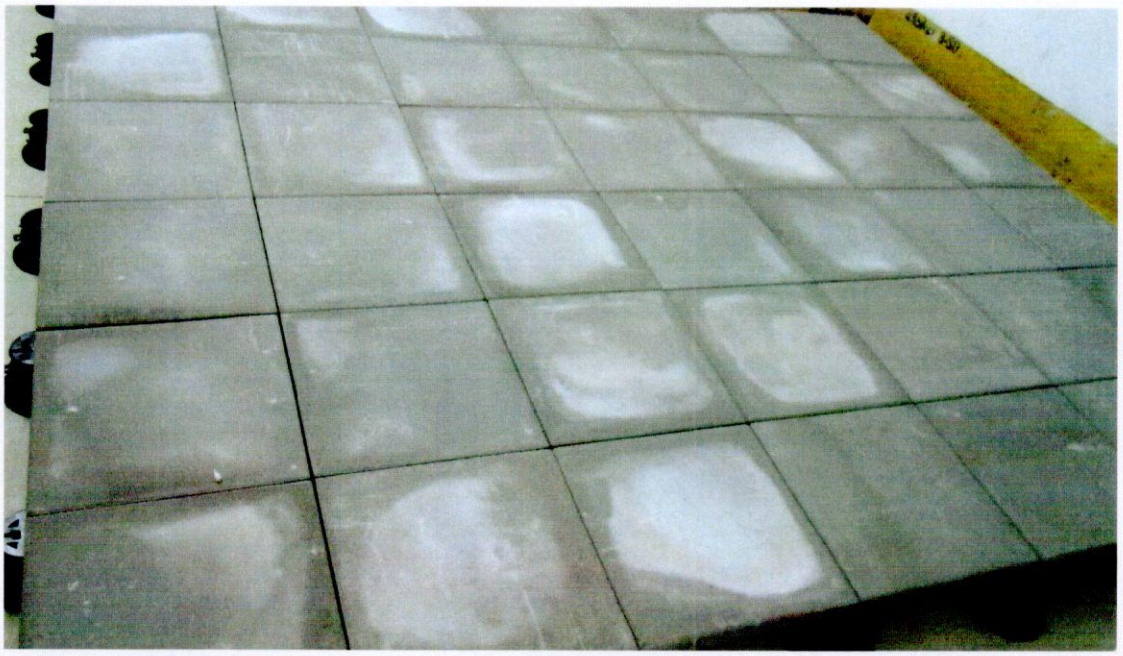
b)



Picture A.2.2: rubber disc belonging to SurPlot SP3a Derzli; a) top; b) bottom



Picture A.2.3: floor test object (mounting situation; close-up on the right)



Picture A.2.4: floor test object (situation for test)