TECHNICAL REPORT

Acoustic properties of deck coverings PU-D20 concrete

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Date	:	3 February 2012
Client	:	Danish Marine System
Report no.	:	12.003
Project no.	:	11.023

Contents

1. Introduction

An investigation has been performed to determine the acoustic properties of the noise reducing deck covering type PU-D20 concrete system.

2. Definitions

Impact sound

The noise from impacts such as steps, walking etc overhead the receiving room is described by the normalized impact sound pressure level as follows:

$$L_n = L_i + 10 \log (A/10m^2) \text{ (dB)}$$

L_i: sound pressure re 10^{-9} Pa (dB)

A: receiving room equivalent absorption area (m^2)

Based on the L_n values and their frequency dependence, the single value weighted normalized impact sound pressure L_{nw} is determined based on the procedure in ISO 717/2.

Structureborne sound

The structureborne noise radiated from the deck into the receiving room above is described by the sound power as follows:

$$L_w = L_v + 10\log\sigma + 10\log(S/1m^2) - 34 \text{ (dB)}$$

L_v: vibration velocity re 10^{-9} m/s (dB)

$10\log\sigma$: radiation index (dB)

S: area of deck (m^2)

The notation (*) is introduced for the bare steel reference deck. The notations (above/below) are introduced for top and bottom of the deck covering (relevant for floating floors).

Thus, the structureborne noise related acoustic properties are as follows:

$$IL_v = L_{v,above} - L_v^* \ (dB)$$

$$10\log\sigma = L_w - L_{v,above} - 10\log(S/1m^2) + 34 \ (dB)$$

IL_v: insertion loss velocity (dB)

$10\log\sigma$:   radiation index (dB), deck including covering

$L_{v,above}$:   vibration velocity re 10^{-9} m/s (dB), deck including covering, top of deck covering

L_v^*:   vibration velocity re 10^{-9} m/s (dB), bare steel reference deck

S: area of deck (m^2)

3. Results

The relevant results and data are shown in the attached diagrams. The acoustic properties refer to impact noise from steps or similar overhead the receiving rooms, and structureborne noise radiated from the deck into the receiving rooms above the deck.

A. Deck covering: PU-D20 concrete

3 - 10 mm DMS Concrete Mix or BH 3000
2 - 1 mm PU-D20 Visco Elastic Layer
1 - Steel Deck
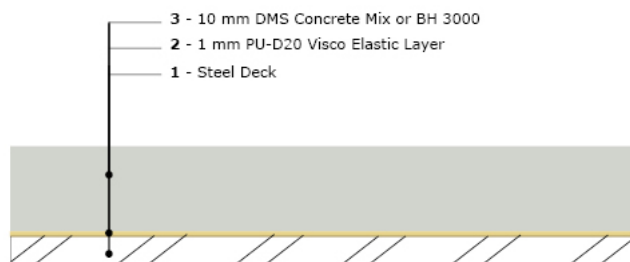
Reference deck: 6 mm steel, stiffened panel.

B. Acoustic properties I
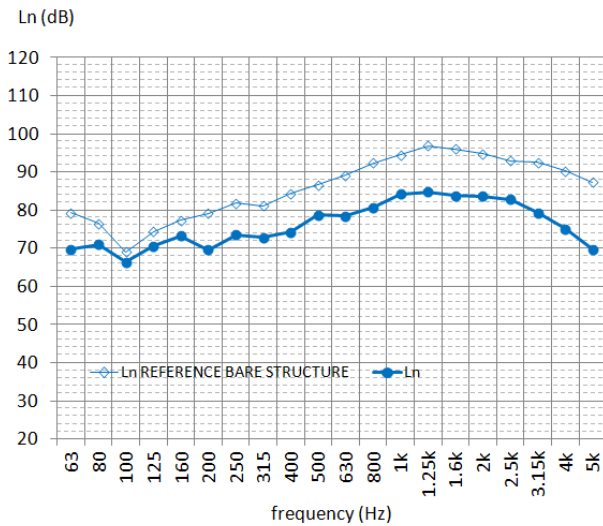
Ln (dB)

frequency (Hz)

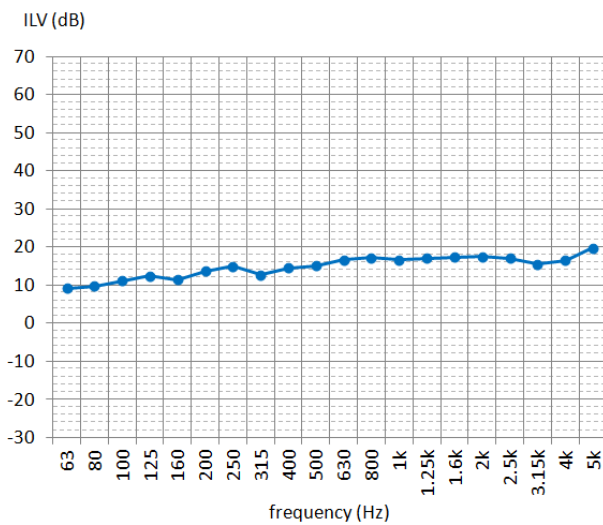| Hz	dB
63	69.7
80	71.1
100	66.4
125	70.6
160	73.3
200	69.6
250	73.6
315	72.8
400	74.2
500	78.7
630	78.5
800	80.7
1000	84.2
1250	84.8
1600	83.8
2000	83.6
2500	82.7
3150	79.3
4000	75.1
5000	69.7

Normalized impact sound pressure level Ln

dB re 20 microPa
per 1/3-octave frequency band.

Ln is measured below the
test deck and serves to evaluate
reduction of noise from
activity overhead e.g.
walking.

The weighted normalized value
Lnw provides an overall single
number for the frequency range
100 Hz to 3.15 kHz.

Lnw: 89 dB

ILV (dB)

frequency (Hz)

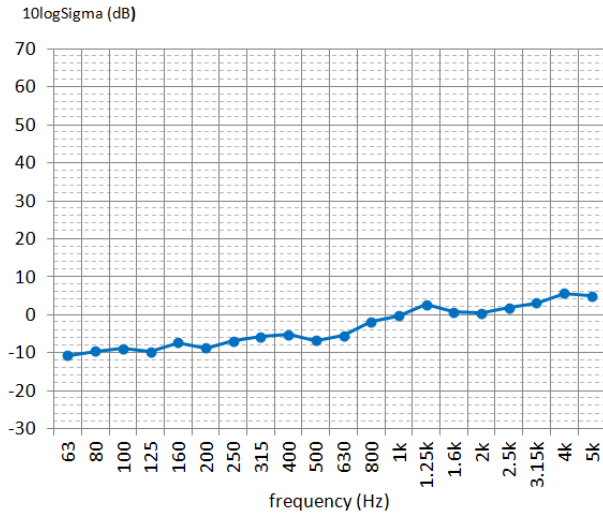| Hz	dB
63	9.2
80	9.8
100	11.2
125	12.4
160	11.4
200	13.7
250	14.9
315	12.7
400	14.6
500	15.1
630	16.7
800	17.2
1000	16.6
1250	17.1
1600	17.3
2000	17.4
2500	17.1
3150	15.6
4000	16.5
5000	19.8

Insertion loss ILv

dB mean velocity
per 1/3-octave frequency band.

The insertion loss refers to the
top of the deck covering.

ILv serves to evaluate the
reduction of the structureborne
velocity level in the floor.

C. Acoustic properties II

10logSigma (dB)

Hz	dB
63	-10.7
80	-9.5
100	-8.8
125	-9.7
160	-7.3
200	-8.7
250	-6.9
315	-5.7
400	-5.2
500	-6.7
630	-5.4
800	-1.8
1000	-0.2
1250	2.7
1600	0.7
2000	0.4
2500	1.9
3150	3.1
4000	5.7
5000	5.0

Radiation index 10logSigma

dB
per 1/3-octave frequency band.

10log Sigma describes the radiated
sound for given vibration velocity
in the floor.

frequency (Hz)

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No 1: PU-D20 concrete

R (dB)
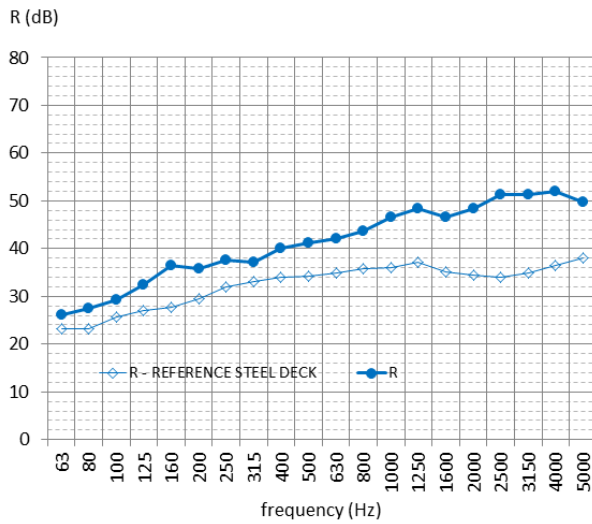
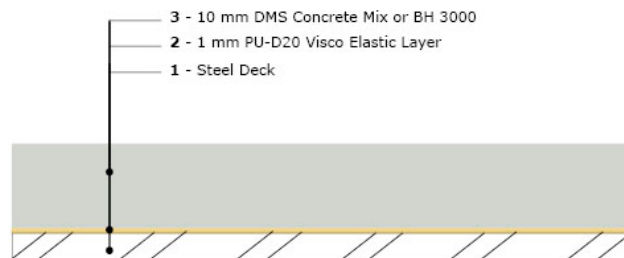| Hz	dB
63	26.1
80	27.5
100	29.3
125	32.4
160	36.4
200	35.9
250	37.6
315	37.2
400	40.0
500	41.2
630	42.0
800	43.6
1000	46.6
1250	48.3
1600	46.5
2000	48.5
2500	51.2
3150	51.4
4000	52.0
5000	49.7

Airborne sound insulation
Sound insulation index (R)

dB
per 1/3-octave frequency band.

R is a measure for the sound
insulation of the deck and
is used for assessment of
the noise reduction between
rooms on top of each other.

The weighted normalized value
Rw provides an overall single
number for the frequency range
100 Hz to 3.15 kHz.

Rw: 45 dB

◇ R – REFERENCE STEEL DECK ● R

frequency (Hz)

3 - 10 mm DMS Concrete Mix or BH 3000
2 - 1 mm PU-D20 Visco Elastic Layer
1 - Steel Deck

$R = L_1 - L_2 + 10 \log (S/A)$ (dB)

L_1: sound pressure in source room (dB)
L_2: sound pressure in receiving room (dB)
S: area of dividing partition between the rooms / test specimen (m^2)
A: receiving room equivalent absorption area (m^2)

Reference deck: 6 mm steel, stiffened panel.