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Determination of screen sound attenuation according to ISO 10053 and SS 25269

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Client

Götessons Industri AB

Assignment

Determination of screen sound attenuation of different office furnishings. Relevant parts of ISO 10053 have been used.

Date of test

December 3 and 15, 2015

Results

Weighted screen sound attenuation ($\Delta L_{s,w}$) is calculated according to ISO 10053 and given in table 1. Screen sound attenuation (ΔL_s) in octave band 125-4000 Hz, is given in table 2.

The results are valid for tested objects only.

Table 1- Weighted screen sound attenuation ($\Delta L_{s,w}$)

Measurement nr.	Test object	$\Delta L_{S,\,W}$ (dB)
1	The Hut – at joint (lowest part)	9
2	The Hut – at the center (highest part)	6
4	The Hut – inside the house	5
4	Sofa Sound Booth	6

Table 2 - Screen sound attenuation (ΔL_s) in octave band

Measure-ment nr.	Test object	Frequency (Hz)					
		125	250	500	1000	2000	4000
1	The Hut – at joint (lowest part)	0	6	4	8	11	16
2	The Hut – at the center (highest part)	0	6	6	6	7	6
4	The Hut – inside the house	1	7	7	6	5	5
4	Sofa Sound Booth	4	3	4	5	7	10

Test objects

The Hut had the dimensions 1870 x 2270 x 1800 (width x height x depth). The house consisted of screens with as thickness of 35 mm. The construction of the screens was a wooden frame out of pine with diagonal crosspieces, filling out of PET-fibre and lining out of fabric.

Sofa Sound Booth had the dimensions 1690 x 1400 x 695 mm (width x height x depth). The height and depth of the seat were both 510 mm. The back and the sides of the sofa were constructed out of a wooden frame out of pine with diagonal crosspieces. The seat construction also included MDF, sound absorbing material and laminate. The sofa was lined with fabric.

Both test objects had feet out of rubber that created an air gap to the floor of about 7 mm.

Measurement method

Measurements and determination of screen sound attenuation is performed according to ISO 10053:91 and SS 25269:2013, which SP are accredited for.

The screen sound attenuation ΔL_S is defined as

$$\Delta L_S = L_{p0} - L_p - 20 \lg (R/r)$$

where:

Lp0	The sound pressure level (dB) measured at the reference position (in front of the loudspeaker directly above the top of the screen but with the screen removed).
Lp	The sound pressure level (dB) measured at the standard position (at the position of the receiver, behind the screen)
R	Distance between the sound source and receiver (m).
r	Distance between the sound source and the measurement position for Lp0 (m).

The measurements were carried out in a hemi-anechoic room complying with the requirements of ISO 3745 which provides the same measurement conditions as outdoors (sound reflections only from the floor). The arrangement of the measuring site is shown in figure 1 below.

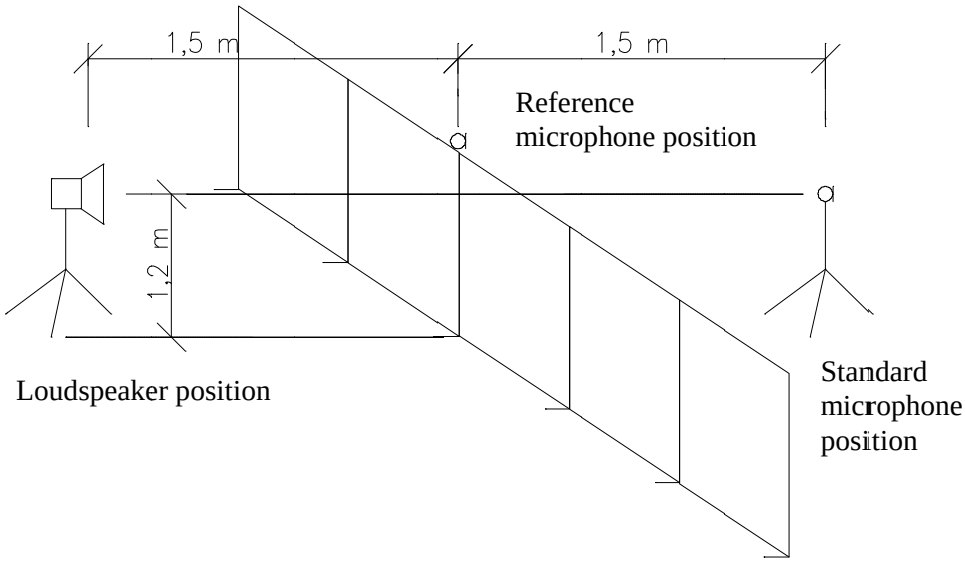


Figure 1 - Positioning of microphone and loudspeaker.

Mounting

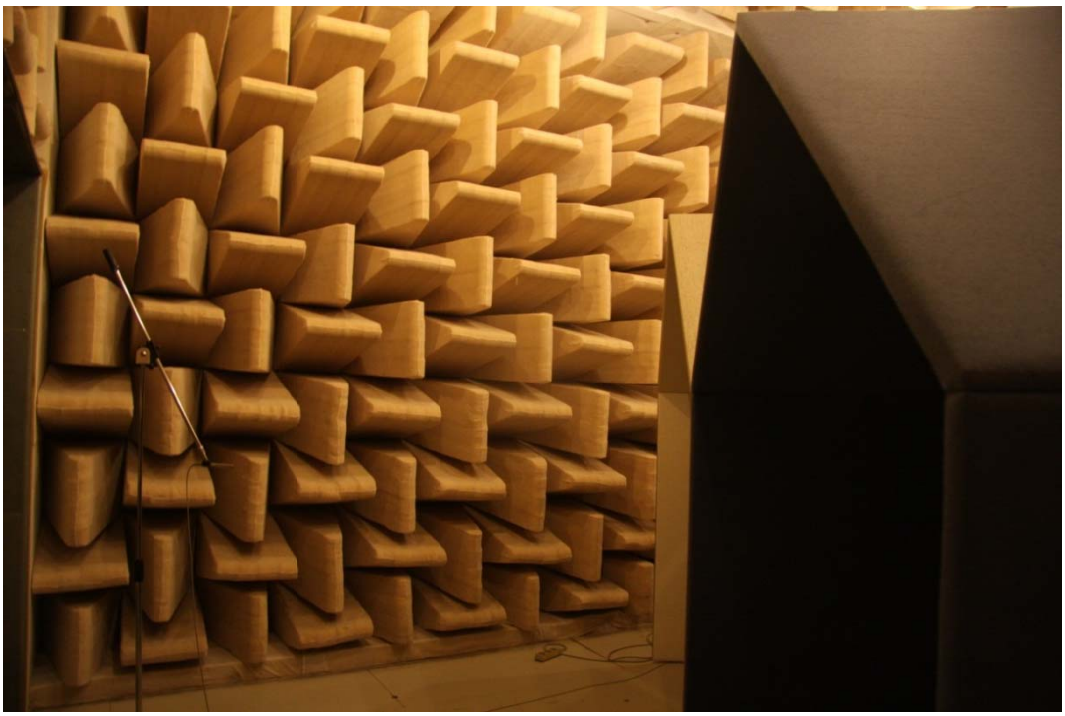
The screen was mounted by SP employees.

While measuring The Hut two test objects were mounted next to each other along the diagonal of the room, to form an equivalently infinite long screen. The test objects were mounted with the openings against the standard microphone position. The loudspeaker was mounted against the back of the test objects. The measurements were made at joint (according to standard) but also at the center of a test object since the height were varying. The height was lowest at the joint and highest at the center. The standard microphone position was placed 1,5 m from the nearest part of the test object (measurement 1 and 2). A measurement was also made with the standard position inside The Hut, 1,5 m from the back wall (measurement 3).

While measuring the Sofa Sound Booth three test objects was mounted next to each other along the diagonal of the room, to form an equivalently infinite long screen. The test objects were mounted with the sitting side against the standard microphone position. The loudspeaker was mounted against the back of the test objects. The measurement was made at a joint, 1,5 m from the nearest part of the test objects.

Pictures of the test arrangements are shown below.

Picture 1 – Test arrangement for measurement of The Hut – at joint. The loudspeaker is shown in the picture.



Picture 2 – Test arrangement for measurement of The Hut – at joint. The standard microphone position is shown in the picture.

Picture 3 – Test arrangement for measurement of The Hut – inside the house. The standard microphone position is shown in the picture.

Picture 4 – Test arrangement for measurement of reference microphone position for The Hut – at joint.

Picture 5 – Test arrangement for measurement of Sofa Sound Booth. The loudspeaker is shown in the picture.

Picture 6 – Test arrangement for measurement of Sofa Sound Booth. The standard microphone position is shown in the picture.

Measurement uncertainty

No estimate of the reproducibility is given in ISO 10053:91. The reproducibility indicates the spread in measured results when carrying out comparison measurements between different laboratories, with different test rooms, equipment, personnel etc. However, the repeatability is stated. The influence of the test room should be small. An estimate of the reproducibility has been made by adding an instrument variance of 0,5 dB:

Frequency (Hz)	Repeatability (dB)	Estimated reproducibility (dB)
125 Hz	≤ 1,5 dB	≤ 3,0 dB
250-4000	≤ 1,0 dB	≤ 2,0 dB

Equipment

Type	Manufacturer	Model no.	Serial no
Sound level meter	Norsonic	Nor 140	1404569
Microphone	Larson Davis	2541	7641
Pre-amplifier	Norsonic	1209	14154
Calibrator	Brüel & Kjær	4231	1762190
Sound effect source	Brüel & Kjær	4205	649625

Comment

The measurement standard ISO 10053 is formulated to be used to determine the sound attenuation of office screens. Here, not office screens have been tested, but a house/hut and a sofa and only relevant parts of ISO 10053 has been applied. This should be taken in consideration when using the results. The measurements are also expected to have a higher measurement uncertainty.

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Sustainable Built Environment - Sound and vibration

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