

Test Report No. 7191148874-MEC16/01-EMK
dated 18 Oct 2016
221409999



PSB Singapore

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SUBJECT:

Laboratory measurement of sound absorption on rubber materials submitted by Superlon Worldwide Sdn Bhd on 12 Oct 2016.

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TESTED FOR:

Superlon Worldwide Sdn Bhd
Lot 2736, Jalan Raja Nong
41200 Klang, Selangor
Malaysia

Attn : Ms. Joanna Chuang

DATE OF TEST:

17 Oct 2016

DESCRIPTION OF SAMPLES:

The following rubber materials were received for testing.

<u>Test Specimen</u>	<u>Quantity</u>
980mm (width) x 620mm (length) x 10mm (thick)	3 pieces
980mm (width) x 1020mm (length) x 10mm (thick)	9 pieces

Product : Acoustec Sheet Nitrile Butadiene Rubber (NBR)

Normal Density : 220kg/m³ (measured density 266kg/m³)

The rubber materials were placed on the floor as Type A mounting in the reverberation room (refer to Figure 2). The gap between room floor and the perimeter edges of the rubber material were sealed with reflective aluminium tapes.



LA-2007-0380-A LA-2007-0384-G
LA-2007-0381-F LA-2007-0385-E
LA-2007-0382-B LA-2007-0386-C
LA-2007-0383-G LA-2010-0464-D

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council. Inspections/Calibrations/Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our inspection body/laboratory.

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TUV®

METHOD OF TEST:

The test was conducted in accordance with ASTM C423-09a "Standard test method for sound absorption and sound absorption coefficients by the reverberation room method.

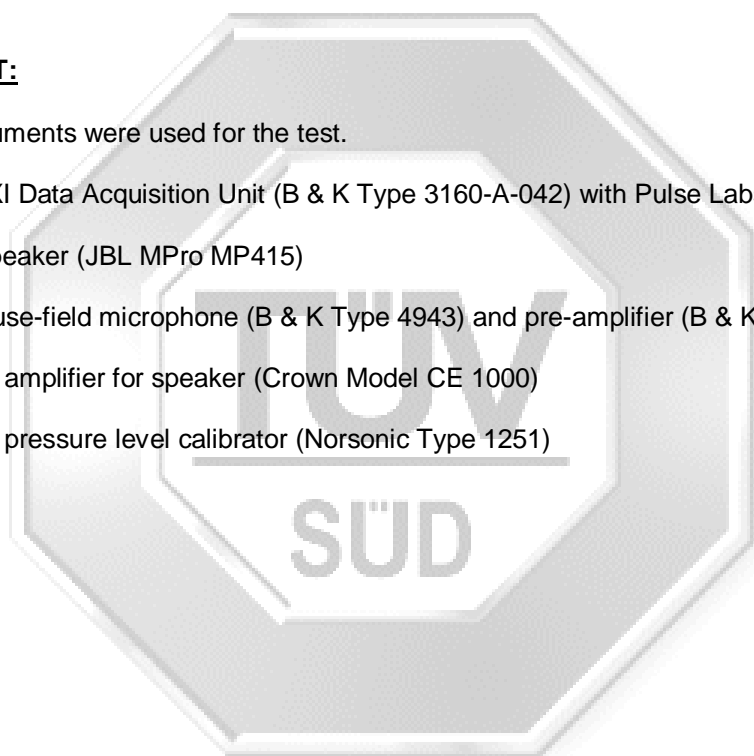
Total specimen exposed area : 10.74m²
Temperature in reverberation room : 27°C
Relative humidity in reverberation room : 47%
Reverberation room volume: 206m³
Location of the test: Acoustics Lab of TÜV SÜD PSB Pte Ltd

Figure 2 shows the test set-up in the reverberation room.

TEST EQUIPMENT:

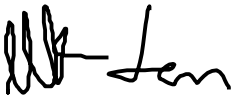
The following instruments were used for the test.

- 1) 1 unit of LAN-XI Data Acquisition Unit (B & K Type 3160-A-042) with Pulse Labshop (v.16)
- 2) 1 unit of loudspeaker (JBL MPro MP415)
- 3) 1 set of ½" diffuse-field microphone (B & K Type 4943) and pre-amplifier (B & K Type 2669)
- 4) 1 unit of power amplifier for speaker (Crown Model CE 1000)
- 5) 1 unit of sound pressure level calibrator (Norsonic Type 1251)



TEST PROCEDURES:

- 1) Instrumentation was set up according to ASTM C423.
- 2) Measurement board was calibrated using a sound level calibrator.
- 3) Loudspeaker and microphone were placed in 2 different speaker positions with a total of 16 microphone positions.
- 4) Microphone was placed at 1m away from the test specimen, testing room and diffusers and 2m away from loudspeaker.
- 5) Measurement was conducted in 16 decays for each centre frequency of 1/3 octave band from 100Hz to 5000Hz.
- 6) Mean reverberation time was calculated based on 16 measured reverberation times for each individual frequency of 1/3 octave band from 100Hz to 5000Hz.
- 7) Step 3 to 6 were repeated after the test sample was installed in the testing room to obtain mean reverberation time for each frequency band.
- 8) Sound absorption area of the test specimen was calculated using formula
$$A = (55.3V/c) \times (1/T_2 - 1/T_1)$$
where V is the volume of the empty reverberation room, (m^3)
 c is the velocity of sound in air,
 T_1 is the mean reverberation time of empty reverberation room, (s)
 T_2 is the mean reverberation time of reverberation room with test specimen installed, (s)
- 9) Sound absorption coefficient α_s was calculated using formula, $\alpha_s = A/S$ where S is the exposed surface area of the test specimen, (m^2).
- 10) Noise Reduction Coefficient (NRC) is the mean of the sound absorption coefficient in 250Hz, 500Hz, 1000Hz, 2000Hz frequency bands.
- 11) Sound Absorption Average, SAA is the average of the sound absorption coefficients for the 12 1/3-octave bands from 200Hz to 2500Hz.



RESULTS:

The results of the sound absorption coefficient of rubber materials for each individual 1/3 octave band centre frequency were tabulated in Table 1.

Table 1 : Sound absorption coefficients of Acoustec Sheet Nitrile Butadiene Rubber (NBR)

1/3 Octave Frequency (Hz)	10mm thick Acoustec Sheet Nitrile Butadiene Rubber (NBR) (Type A mounting)	
	Sound Absorption Coefficient, α_s	Uncertainty
100	0.03	± 0.01
125	0.03	± 0.00
160	0.02	± 0.00
200	0.07	± 0.01
250	0.07	± 0.01
315	0.10	± 0.01
400	0.16	± 0.02
500	0.28	± 0.02
630	0.38	± 0.03
800	0.60	± 0.05
1000	0.73	± 0.07
1250	0.84	± 0.04
1600	0.87	± 0.04
2000	0.86	± 0.05
2500	0.82	± 0.05
3150	0.78	± 0.03
4000	0.77	± 0.03
5000	0.74	± 0.02
Noise Reduction Coefficient, NRC	0.50	-
Sound Absorption Average, SAA (200Hz- 2500Hz)	0.48	-

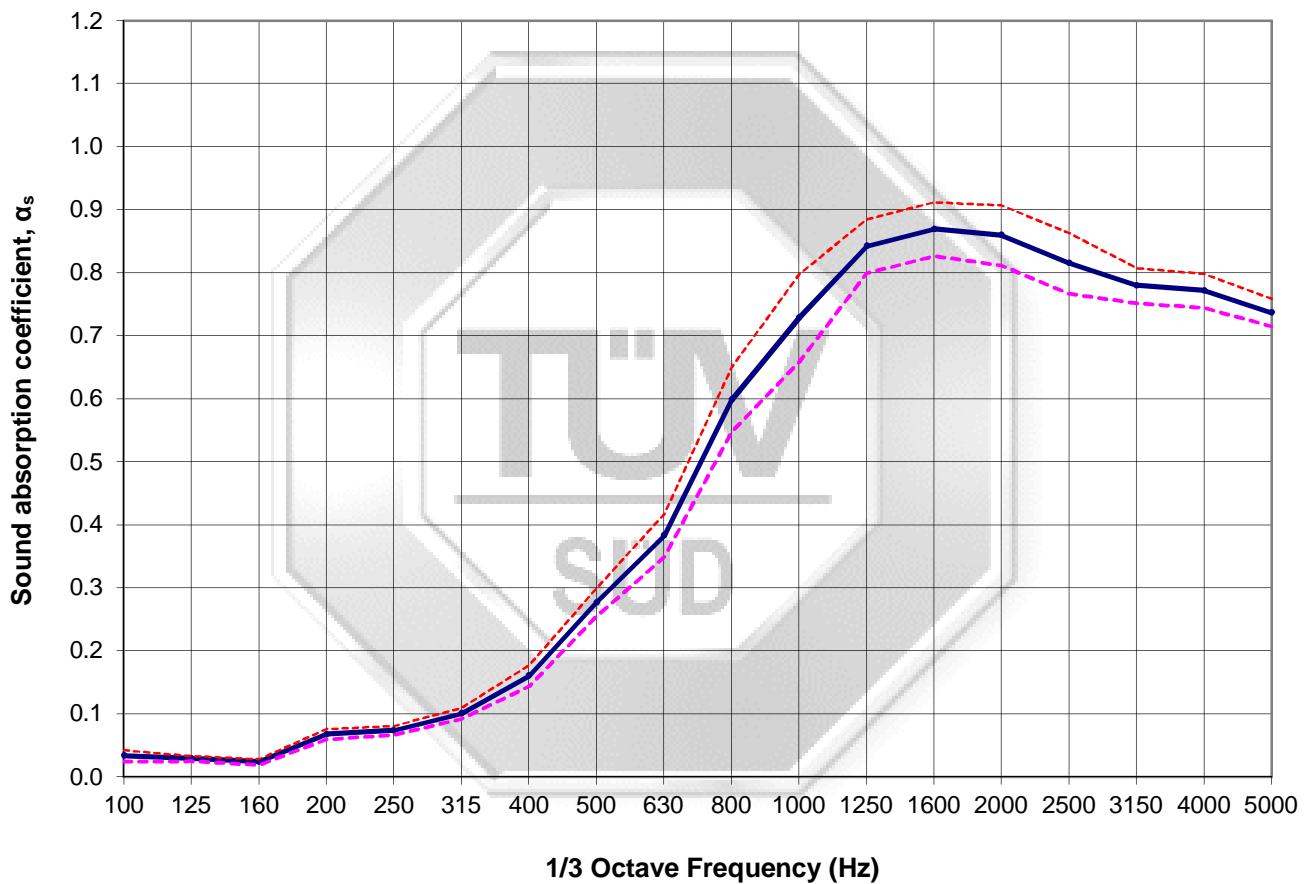
Remark : Values in bracket () denotes the values of sound absorption coefficient, α_s of 1/1 Octave Frequency Bands.


 Francis Ee Min Kuen
 Testing Officer


 Lem Chee Meng
 Product Manager
 Acoustics
 Mechanical Centre

RESULTS : (cont'd)

Figure 1 : Sound absorption performance of 10mm thick Acoustec Sheet Nitrile Butadiene Rubber (NBR)



— Measured values - - - Upper limit of uncertainty . . . Lower limit of uncertainty

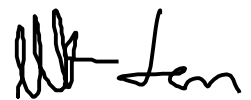




Figure 2 : 10mm thick Acoustec Sheet Nitrile Butadiene Rubber (NBR) laid on the floor as Type A mounting in reverberation room

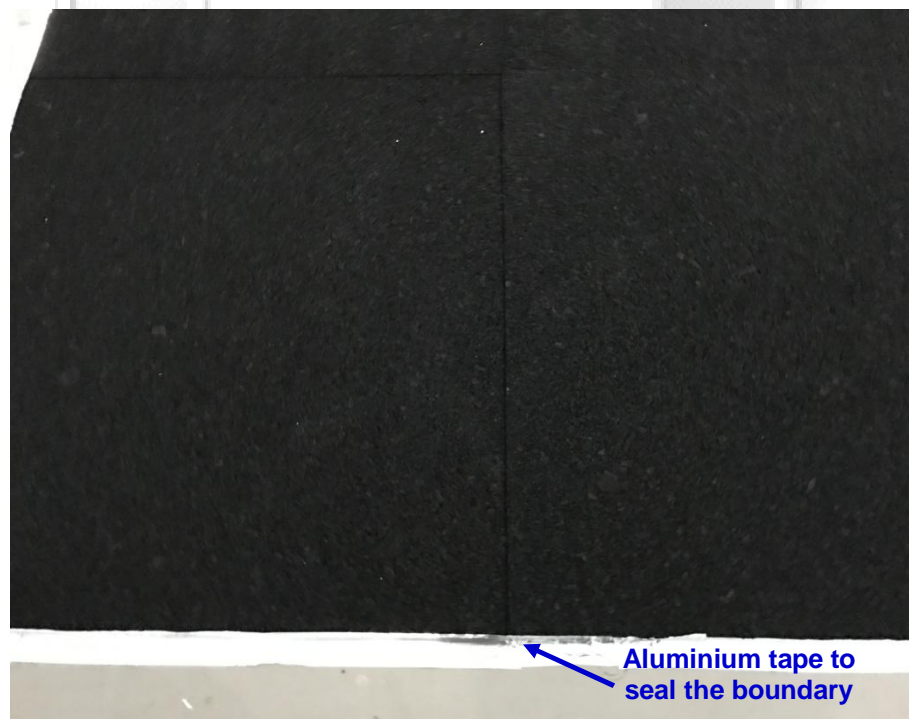
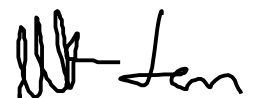


Figure 3 : Top side of Acoustec Sheet Nitrile Butadiene Rubber (NBR) (Close-Up View)





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July 2011

