



# SOUND ABSORPTION TEST REPORT

EN ISO 354:2003

For

**Remak™ Acoustic Wood**

**Model: 28/4 128x2440x12mm**

**Brand Name: REMAK**

**Report No.: ENC140217GZ60E1**

**Date of Issue: Feb. 21, 2014**

*Prepared For*

**Remak Construction and Interior Jsc**

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*Prepared By*

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**GENERAL INFORMATION:**

<b>Product Description:</b>	Remak™ Acoustic Wood
<b>Model Number:</b>	28/4 128x2440x12mm
<b>Model Difference:</b>	N/A
<b>Brand Name:</b>	REMAK
<b>Applicant:</b>	Remak Construction and Interior Jsc Lot 14B, The auction, Le Duc Tho street, Tu Liem, Ha Noi, Vietnam
<b>Manufacturer:</b>	Remak Construction and Interior Jsc Lot 14B, The auction, Le Duc Tho street, Tu Liem, Ha Noi, Vietnam
<b>Report No.:</b>	ENC140217GZ60E1
<b>Test Methods:</b>	EN ISO 354:2003 Acoustics - Measurement of sound absorption in a reverberation room. The absorption class was determined in conformance with EN ISO 11654:1997
<b>Test Results:</b>	See next sheet
<b>Sample Receiving Date:</b>	Feb. 17, 2014
<b>Test Performing Date:</b>	Feb. 17, 2014 – Feb. 21, 2014

**Summary of test results**

sound absorption coefficient - Remak™ Acoustic Wood (28/4 128x2440x15mm)									
Octave centre frequency f / Hz		125	250	500	1000	2000	4000	$\alpha_w$	Sound absorption class
Installation Methods	Stick metope	0.10	0.30	0.50	0.50	0.50	0.55	0.45	D
	3 cm spaces	0.15	0.45	0.55	0.55	0.55	0.60	0.55	C
	27.5 cm spaces	0.15	0.50	0.65	0.60	0.65	0.70	0.60	C
	3 cm Thickness/Fill 3 cm thickness 50kg/m <sup>3</sup> soft materials	0.15	0.50	0.65	0.80	0.85	0.85	0.75	C
	27.5 cm spaces/ Fill 4 cm thickness 50kg/m <sup>3</sup> soft materials	0.15	0.60	0.80	0.80	0.85	0.90	0.80	B

 Checked By Yemig  
 Yemig Feb. 21, 2014

 Authorized By Ray Zhou  
 Ray Zhou Feb. 21, 2014

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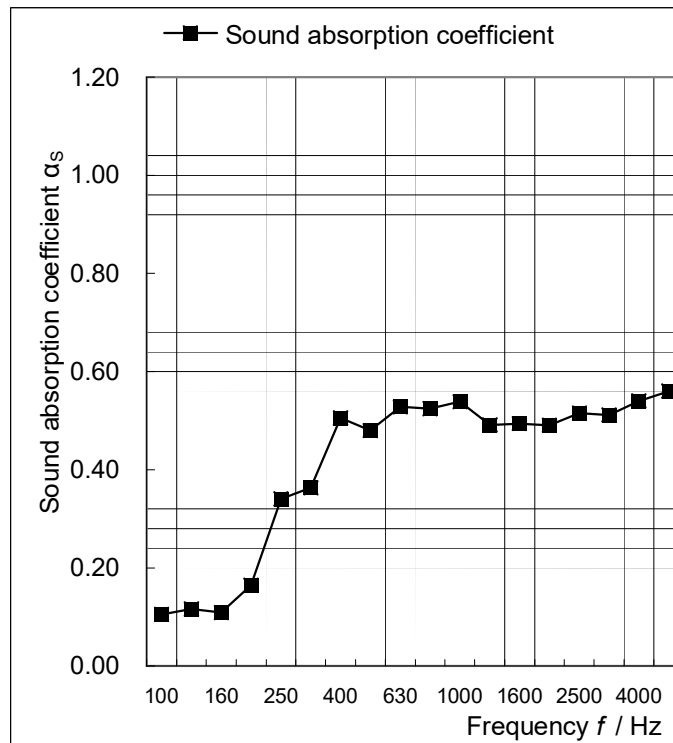
**Annex1: Test result 1**

**Specimen:** Remak™ Acoustic Wood  
**Installation Methods:** Stick metope  
**Client:** Remak Construction and Interior Jsc  
**Laboratory:** East Notice Certification Service Co., Ltd.

**Model:** 28/4 128x2440x12mm      **Test room volume:** 155 m<sup>3</sup>  
**Temperature of test room:** 23 °C      **Area of room boundaries:** 179 m<sup>2</sup>  
**Relative humidity:** 58 %      **Test date:** 2014-02-19  
**Atmospheric pressure:** 101 KPa      **Test file identification:** ENC140217GZ60E1-1

**Third octave band results:**

Frequency [Hz]	$\alpha_s$ 1/3 octave	$\alpha_p$ oktave
100	0.11	0.10
125	0.12	
160	0.11	
200	0.16	0.30
250	0.34	
315	0.36	
400	0.51	0.50
500	0.48	
630	0.53	
800	0.52	0.50
1000	0.54	
1250	0.49	
1600	0.49	0.50
2000	0.49	
2500	0.52	
3150	0.51	0.55
4000	0.54	
5000	0.56	



$\alpha_s$  Sound absorption coefficient according to EN ISO 354  
 $\alpha_p$  Practical sound absorption coefficient according to EN ISO 11654

**Weighted sound absorption coefficient  $\alpha_w = 0.45$ , Sound absorption class: D**



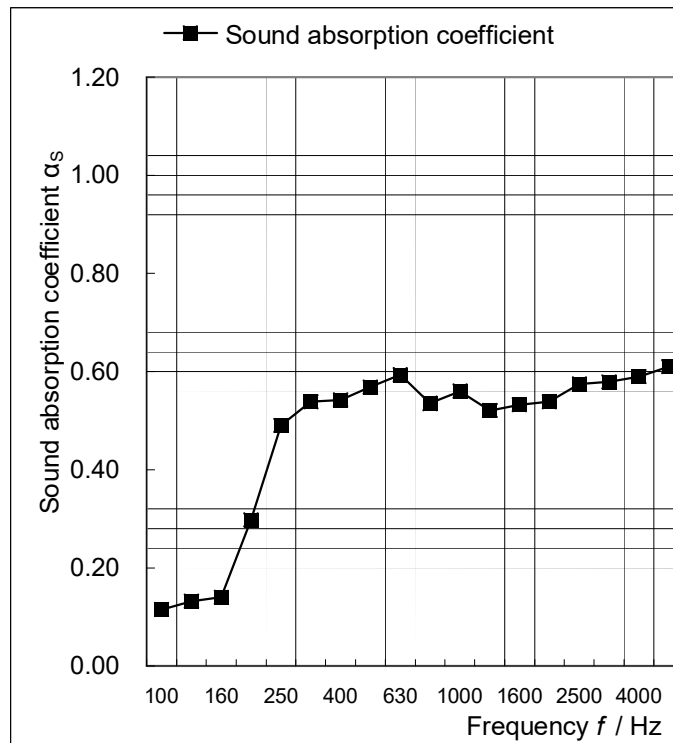
**Test result 2**

**Specimen:** Remak™ Acoustic Wood  
**Installation Methods:** 3 cm spaces  
**Client:** Remak Construction and Interior Jsc  
**Laboratory:** East Notice Certification Service Co., Ltd.

Model: 28/4 128x2440x12mm      Test room volume: 155 m<sup>3</sup>  
 Temperature of test room: 23 °C      Area of room boundaries: 179 m<sup>2</sup>  
 Relative humidity: 58 %      Test date: 2014-02-19  
 Atmospheric pressure: 101 KPa      Test file identification: ENC140217GZ60E1-2

**Third octave band results:**

Frequency [Hz]	$\alpha_s$ 1/3 octave	$\alpha_p$ oktave
100	0.11	0.15
125	0.13	
160	0.14	
200	0.30	0.45
250	0.49	
315	0.54	
400	0.54	0.55
500	0.57	
630	0.59	
800	0.53	0.55
1000	0.56	
1250	0.52	
1600	0.53	0.55
2000	0.54	
2500	0.57	
3150	0.58	0.60
4000	0.59	
5000	0.61	



$\alpha_s$  Sound absorption coefficient according to EN ISO 354  
 $\alpha_p$  Practical sound absorption coefficient according to EN ISO 11654

**Weighted sound absorption coefficient  $\alpha_w = 0.55$ , Sound absorption class: C**



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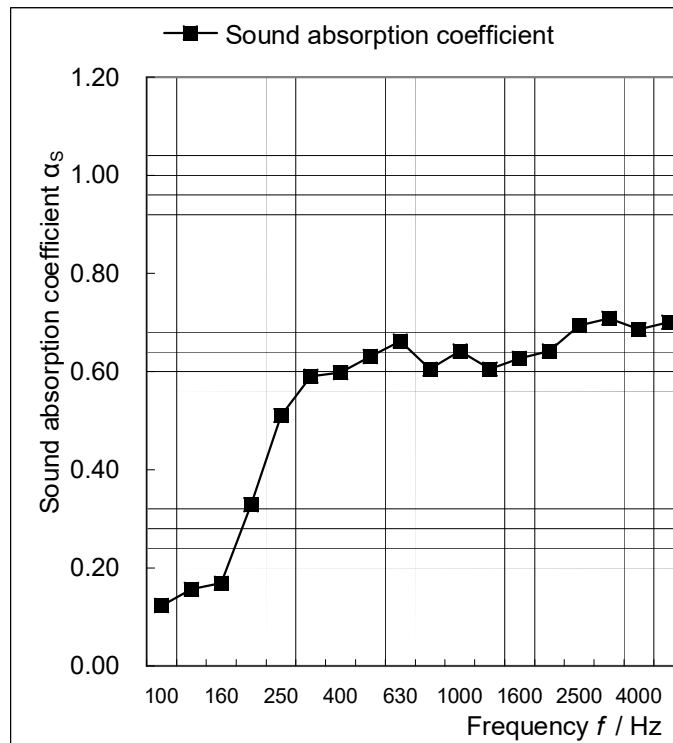
**Test result 3**

**Specimen:** Remak™ Acoustic Wood  
**Installation Methods:** 27.5 cm spaces  
**Client:** Remak Construction and Interior Jsc  
**Laboratory:** East Notice Certification Service Co., Ltd.

Model: 28/4 128x2440x12mm      Test room volume: 155 m<sup>3</sup>  
 Temperature of test room: 23 °C      Area of room boundaries: 179 m<sup>2</sup>  
 Relative humidity: 58 %      Test date: 2014-02-19  
 Atmospheric pressure: 101 KPa      Test file identification: ENC140217GZ60E1-3

**Third octave band results:**

Frequency [Hz]	$\alpha_s$ 1/3 octave	$\alpha_p$ oktave
100	0.12	0.15
125	0.16	
160	0.17	
200	0.33	0.50
250	0.51	
315	0.59	
400	0.60	0.65
500	0.63	
630	0.66	
800	0.60	0.60
1000	0.64	
1250	0.60	
1600	0.63	0.65
2000	0.64	
2500	0.69	
3150	0.71	0.70
4000	0.69	
5000	0.70	



$\alpha_s$  Sound absorption coefficient according to EN ISO 354  
 $\alpha_p$  Practical sound absorption coefficient according to EN ISO 11654

**Weighted sound absorption coefficient  $\alpha_w = 0.60$ , Sound absorption class: C**



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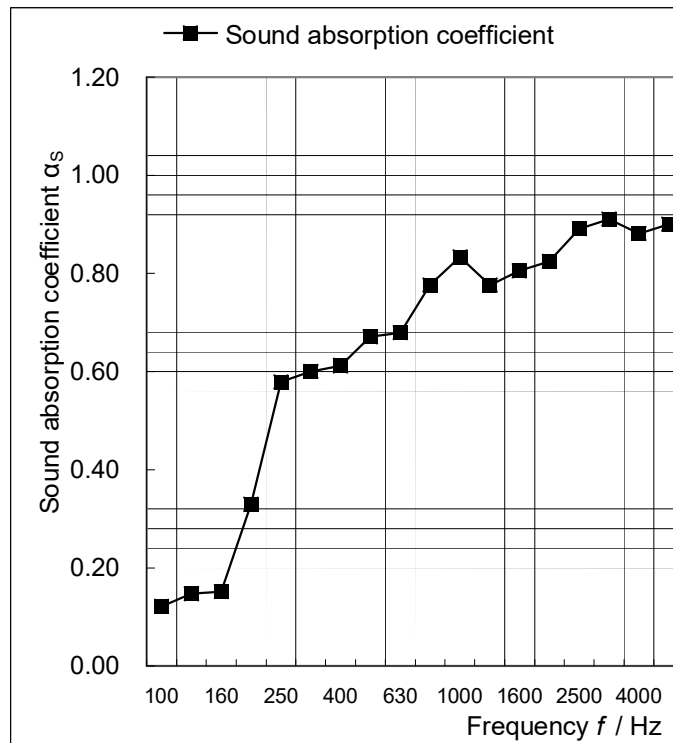
**Test result 4**

**Specimen:** Remak™ Acoustic Wood  
**Installation Methods:** 3 cm Thickness/Fill 3 cm thickness 50kg/m<sup>3</sup> soft materials  
**Client:** Remak Construction and Interior Jsc  
**Laboratory:** East Notice Certification Service Co., Ltd.

Model: 28/4 128x2440x12mm Test room volume: 155 m<sup>3</sup>  
 Temperature of test room: 23 °C Area of room boundaries: 179 m<sup>2</sup>  
 Relative humidity: 58 % Test date: 2014-02-19  
 Atmospheric pressure: 101 KPa Test file identification: ENC140217GZ60E1-4

**Third octave band results:**

Frequency [Hz]	$\alpha_s$ 1/3 octave	$\alpha_p$ oktave
100	0.12	0.15
125	0.15	
160	0.15	
200	0.33	0.50
250	0.58	
315	0.60	
400	0.61	0.65
500	0.67	
630	0.68	
800	0.78	0.80
1000	0.83	
1250	0.78	
1600	0.81	0.85
2000	0.82	
2500	0.89	
3150	0.91	0.90
4000	0.88	
5000	0.90	



$\alpha_s$  Sound absorption coefficient according to EN ISO 354  
 $\alpha_p$  Practical sound absorption coefficient according to EN ISO 11654

**Weighted sound absorption coefficient  $\alpha_w = 0.75$ , Sound absorption class: C**

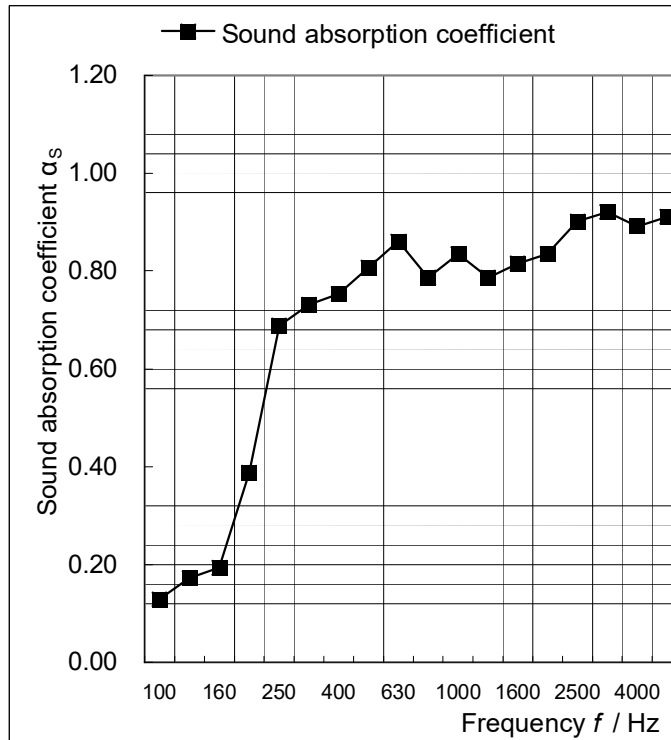
**Test result 5**

**Specimen:** Remak™ Acoustic Wood  
**Installation Methods:** 27.5 cm spaces/ Fill 4 cm thickness 50kg/m<sup>3</sup> soft materials  
**Client:** Remak Construction and Interior Jsc  
**Laboratory:** East Notice Certification Service Co., Ltd.

Model: 28/4 128x2440x12mm      Test room volume: 155 m<sup>3</sup>  
 Temperature of test room: 23 °C      Area of room boundaries: 179 m<sup>2</sup>  
 Relative humidity: 58 %      Test date: 2014-02-19  
 Atmospheric pressure: 101 KPa      Test file identification: ENC140217GZ60E1-5

**Third octave band results:**

Frequency [Hz]	$\alpha_s$ 1/3 octave	$\alpha_p$ oktave
100	0.13	0.15
125	0.17	
160	0.19	
200	0.39	0.60
250	0.69	
315	0.73	
400	0.75	0.80
500	0.81	
630	0.86	
800	0.79	0.80
1000	0.83	
1250	0.79	
1600	0.82	0.85
2000	0.83	
2500	0.90	
3150	0.92	0.90
4000	0.89	
5000	0.91	



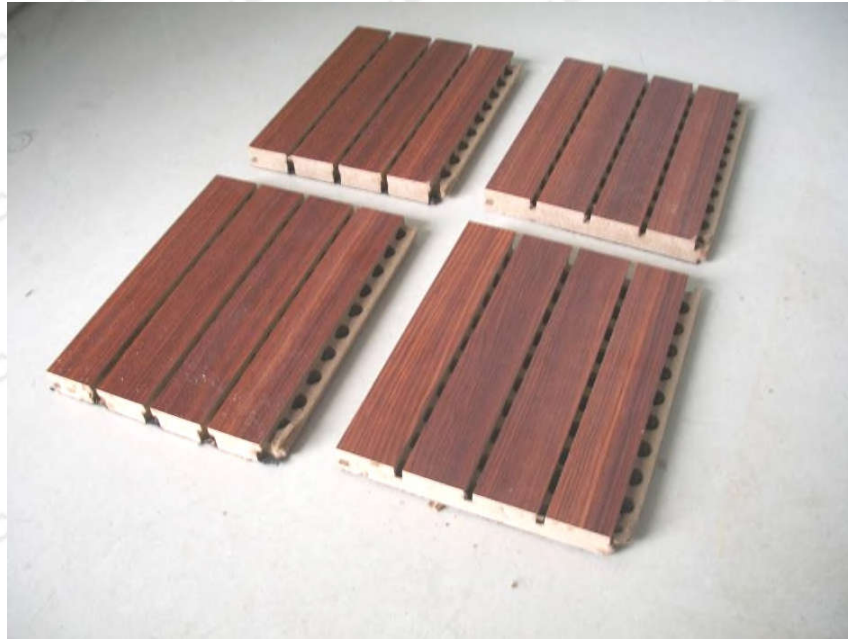
$\alpha_s$  Sound absorption coefficient according to EN ISO 354  
 $\alpha_p$  Practical sound absorption coefficient according to EN ISO 11654

**Weighted sound absorption coefficient  $\alpha_w = 0.80$ , Sound absorption class: B**



## Annex 2: Mounting of specimen

The specimen was mounted in the reverberation room in conformance with EN ISO 354:2003 Annex B.



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### Annex 3: Measurement arrangements

#### 1. Acoustical measurements

The test signal was produced to the test room using three fixed omnidirectional loudspeakers (6 x Seas B&K2260D). The test signal (pink noise) was produced by a real time analyzer (Bruel & Kjaer 2133) and amplified with terminal amplifier (B&K2716). The sound pressure level in the reverberation room was measured with a condenser microphone on a tripod (B&K 5821 equipped with a pre-amplifier B&K4296).

The reverberation time at third-octave bands was measured with the real time analyzer (B&K4189) using 20 dB decay range. All frequency bands were measured using 2 sources simultaneously and 4 microphone locations. In every location an ensemble average of 10 decays was measured. The total number of reverberation time measurements was 8.

The acoustical measurement equipment fulfilled the following IEC standards and grades of accuracy:

IEC 651	Sound level meters	type 1
IEC 804	Integrating sound level meters	type 1
IEC 1260	Octave-band and fractional-octave-band filters	class 1
IEC 942	Sound level calibrators	class 1

#### 2. Other measurements

The temperature and the relative humidity of the measurement rooms were measured with a psykrometer (Casella London 7165). The ambient atmospheric pressure was measured with a barometer (B&K MD0001). The specimen was weighed with a 150 kg precision weighing machine (PM 150). The dimensions of the specimen were measured with a roll meter (K-Prof).

#### 3. The test room

The reverberation room was equipped with six fixed diffuser panels. The positions were selected randomly in respect with altitude, angle and position. The amount of diffusers and their arrangement fulfills the requirements of Annex A in ISO 354. The reverberation time of the reverberation room fulfills the requirements of EN ISO 354 for 155 m<sup>3</sup> test room.

#### 4. References to the ISO standards

Test: EN ISO 354:2003 (E) Acoustics - Measurement of sound absorption in a reverberation room, International Organization for Standardization, 2003, Genève, Switzerland.

SFS-EN ISO 11654 Acoustics - Sound absorbers for use in buildings - Rating of sound absorption, International Organization for Standardization, 1997, Genève, Switzerland

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