TÜRK STANDARDLARI ENSTİTÜSÜ
DENEY ve KALİBRASYON
MERKEZİ BAŞKANLIĞI
YAPI MALZEMELERİ YANGIN VE AKUSTİK
LABORATUVAR MÜDÜRLÜĞÜ

TURKISH STANDARDS INSTITUTION
HEADSHIP OF TSE TEST and CALIBRATION CENTER
CONSTRUCTION MATERIALS FIRE AND ACOUSTICS LABORATORY

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Test
TS EN ISO/IEC 17025
AB-0001-T

AB-0001-T
202758
07-23

MUAYENE VE DENEY RAPORU
TEST REPORT

Deneyi Talep Eden/Firma : ***(Adı, Adresi, Şehir vb.)*** *Requesting/Customer (Name, Adress, City etc.)*	AKTAV AKUSTİK MALZEMELER.SAN.VE TİC.A.Ş. ZEYTINLI MAH. TURHAN CEMAL BERIKER BUL. NO:607 Seyhan/ADANA
Deney Talep Tarih / No : *Order Date/No.*	14.06.2023 / 2023-137625
Numunenin Tanımı : ***(Cins, Marka, Sınıf, Tip, Tür, Model vb.)*** *Sample Description (Type,Mark,Class,Model etc.)*	2023-182859, Modüler Akustik Panel (Modular Acoustic Panel), Parmephon, -, -, 30.00, adet
Numune Kabul Tarihi : *Sample Receipt Date*	19.06.2023
Deneylerin Yapıldığı Tarih : *Date of Test*	22.06.2023 / 10.07.2023
Uygulanan Standart Metot : *Applied Standard/Method*	ASTM C423 – 17/-
Raporun Sayfa Sayısı : *Number of pages of the report*	9
Deney Sonucu : *Test Result*	-
Açıklamalar : *Remarks*	

Yukarıda tanımlanan numune için laboratuvarımızda yapılan muayene ve deneylerden elde edilen sonuçlar müteakip sayfalarda verilmiştir.
The testing and /or measurement results are given on the following pages which are part of this report.

Deney laboratuvarları olarak faaliyet gösteren TSE Deney ve Kalibrasyon Merkezi Başkanlığı Deney Laboratuvarları TÜRKAK'tan AB-0001-T ile TS EN ISO/IEC 17025:2017 standardına göre akredite edilmiştir.
TSE Headship of Test and Calibration Center Testing Laboratories accredited by TÜRKAK under registration number AB-0001-T for TS EN ISO/IEC 17025:2017 as test laboratory.
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The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Karekod *QR Code*	**Tarih** *Date*	**Deney Sorumlusu** *Person in charge of test*	**Kontrol Eden** *Reviewer*	**Onaylayan** *Head of Laboratory*
	10.07.2023	BERAT USTA	HALİL ALPER YILDIRIM	HALİL ALPER YILDIRIM

Bu rapor, hazırlayan laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve karekodsuz raporlar geçersizdir. Bu rapor, sadece deneyi yapılan numune için geçerlidir ve "Ürün Belgesi" yerine geçmez.
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MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

ASTM C423-17

Test Laboratory	TSE Construction Materials Fire and Acoustic Laboratory Aydınlı Mah. Ulus Sokak No:7/1 Tuzla/İSTANBUL Phone: +90(216)560-0-500
Requested by	AKTAV AKUSTİK MALZEMELER SAN. VE TİC. A.Ş. Zeytinli Mah. Turhan Cemal Beriker Blv. Aktav No:607 A Seyhan/ADANA
Test Sample	PARMEPHON, Modular Acoustic Panel

1. Introduction

At the request of the ***AKTAV AKUSTİK MALZEMELER SAN. VE TİC. A.Ş.*** sound absorption measurements were carried out for **"PARMEPHON, Modular Acoustic Panel"** at the acoustic department of TSE Construction Materials Fire and Acoustic Laboratory according to **"ASTM C423-17 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method"** on **22.06.2023.**

2. Test Facility

Test facility complies with all requirements of **ASTM C423-17** standard. Dimensions, shape and mounting condition figures were given at the end of the report.

Volume of reverberation room	**:298,5m^3**
Surface area of reverberation room	**:273m^2**
Number of diffusers	**:9 pieces**
Surface area of diffusers	**:69,5m^2**
Number of microphone position	**:6**
Number of source position	**:2 (simultaneous)**
Repetition number	**:10**

3. Test specimen

The specimen was chosen and delivered by the client.
Arrival date of the test specimen to the laboratory:06/2023

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

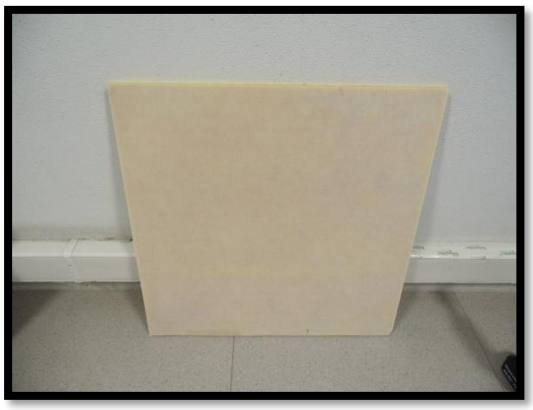
ASTM C423-17

3.1 Description of the test specimen

Description of the sample: PARMEPHON, Modular Acoustic Panel, Manufactured from 50 kg/m3 glass wool, modular acoustic suspended ceiling panels with visible surface covered with painted glass tissue, back surface covered with transparent glass tissue, open sided.

Sample surface area: 10,7 m^2

Boyutlar	Genişlik (mm)	Uzunluk (mm)	Yükseklik(mm)
(A sample)	≈600	≈600	≈15





* Product specifications are based on client's declaration..

3.2 Installation of test specimen

The test sample was placed in the reverberation room in accordance with the E200 type mounting scheme from the mounting types specified in ASTM E 795-16 standard item 10.

Accordingly;

- The samples were placed in the 200mm height wooden frame and were applied on wooden profiles.
- Frame with 3*3,57 m dimensions was used to cover about 10,71 m2 area.
- Tape was applied to the joints of the frame and laboratory floor.
- The test sample was mounted by the client.

*Mounting of the sample in the room was done by the client.

4. Method

Tests are performed with and without test specimen in order to measure reverberation times for mentioned two situations and sound absorption coefficient is determined with the help of NOR 850 software.

Method for calculating sound absorption is given below.

- The equivalent sound absorption area of the empty reverberation room, *A*1, in square meters,

is calculated using the formula

$$A_1 = 0{,}9210\,\frac{Vd_1}{c_1}$$

$$d' = \frac{6}{M(M^2-1)\Delta t}\left[(M+1)\sum_{i=1}^{M}(L_i) - 2\sum_{i=1}^{M} i\,(L_i)\right]$$

$$d_{air} = m'c$$

$$d_1 = d' - d_{air}$$

Where;

V: is the volume, in cubic metres, of the empty reverberation room;
c: is the propagation speed of sound in air, in metres per second;
d_1: Empty reverberation room decay rate;
m_1: is the power attenuation coefficient, in reciprocal metres, calculated according to ISO 9613-1 using the climatic conditions that have been present in the empty reverberation room during the measurement. The value of m can be calculated from the attenuation coefficient, α, which is used in ISO 9613-1 according to the formula ;

$$m = \frac{\alpha}{10\lg(e)}$$

c, For temperatures in the range of 15 °C to 30 °C, *c* can be calculated from the formula

$c = (331 + 0{,}6t / {}^{o}C)$ m/s

- The equivalent sound absorption area of the reverberation room containing a test specimen, *A*2, in square metres, is calculated using the formula

$$A_2 = 0{,}9210\,\frac{Vd_2}{c_2}$$

$$d_2 = d' - d_{air}$$

$$d_{air} = m'c$$

Where;

V: is the volume, in cubic metres, of the empty reverberation room;,
c: is the propagation speed of sound in air, in metres per second;,
d_2 : decay rate of the reverberation room after the test specimen has been introduced;
m_2 : is the power attenuation coefficient, in reciprocal metres, calculated according to ISO 9613-1 using the climatic conditions that have been present in the empty reverberation room during the measurement. The value of *m* can be calculated from the attenuation coefficient, α, which is used in ISO 9613-1 according to the formula

$$m = \frac{\alpha}{10\lg(e)}$$

- The equivalent sound absorption area of the test specimen, *A*, in square metres, is calculated using the formula

$$A = A_2 - A_1$$

- The sound absorption coefficient α_s of a plane absorber or a specified array of test objects is calculated using the formula

$$\alpha_s = \frac{A}{S}$$

***A* :** is the equivalent sound absorption area of the test specimen, in square meters
***S* :** is the area, in square meters, covered by the test specimen.

5. Room conditions

REVERBERATION ROOM	Temperature [^{0}C]	Pressure [kPa]	Rel. humidity [%]
Without test specimen	22,4±0,8	101,1±1	72,1±5
With test specimen	22,3±0,8	101,1±1	72,0±5

6. Results

Results were given below in 1/3 octave band frequencies in accordance with ASTM C 423 standard.

SAA=0,98
NRC=0,95

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

ASTM C423-17

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Sound absorption coefficient according to ASTM C423-17

Measurement of sound absorption coefficient in a reverberation room

Client: AKTAV AKUSTİK MALZEMELERİ SAN. VE TİC. A.Ş. Date of test: 22.6.2023

Description: PARMEPHON, Modular Acoustic Panel, Manufactured from 50 kg/m3 glass wool, modular acoustic suspended ceiling panels with visible surface covered with painted glass tissue, back surface covered with transparent

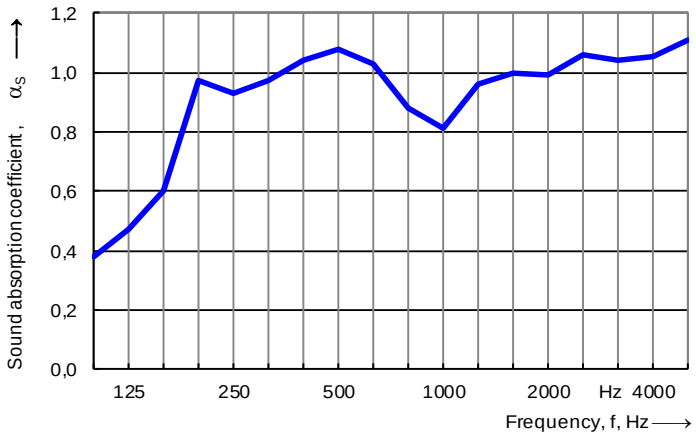
Mounting type: E-200

Test Room: The reverberation room is formed by double-walled walls which are not parallel to each other and have a volume of 298,5 m3. In order to provide a diffuse sound field in the room, scatterers and absorbers are placed. The reverberation room meets all the requirements of the ASTM C-17 standard. A drawing including the shape of the room, its dimensions and the installation of the sample is attached to the report.

Empty reverberation room:		Reverberation room with object:	
Relative humidity:	72,1 %	Relative humidity:	72,0 %
Temperature:	22,4 °C	Temperature:	22,3 °C
Barometric pressure:	101,1 kPa	Barometric pressure:	101,1 kPa

Surface area:	10,71 m²
Room volume:	298,5 m³

Frequency f [Hz]	α_s 1/3 octave
100	0,38
125	0,47
160	0,60
200	0,97
250	0,93
315	0,97
400	1,04
500	1,08
630	1,03
800	0,88
1000	0,81
1250	0,96
1600	1,00
2000	0,99
2500	1,06
3150	1,04
4000	1,05
5000	1,11



Sound Absorption Average SAA:	0,98
Noise Reduction Coefficient NRC:	0,95

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

ASTM C423-17

Sound absorption coefficient according to ASTM C423-17

Measurement of sound absorption coefficient in a reverberation room

Sound Absorption Average SAA: 0,98
Noise Reduction Coefficient NRC: 0,95

Surface area: 10,71 m²
Room volume: 298,5 m³

Frequency [Hz]		α_s	A [m²]	T1 [s]	T2 [s]
50		0,25	2,6	7,44	5,28
63		0,19	2,0	7,41	5,65
80		0,25	2,7	5,35	4,13
100		0,38	4,0	6,12	4,04
125		0,47	5,0	5,04	3,31
160		0,60	6,4	5,33	3,11
200		0,97	10,4	5,73	2,55
250		0,93	10,0	4,75	2,39
315		0,97	10,4	4,98	2,39
400		1,04	11,1	5,61	2,44
500		1,08	11,6	6,08	2,46
630		1,03	11,0	6,17	2,55
800		0,88	9,5	6,04	2,75
1000		0,81	8,6	5,59	2,78
1250		0,96	10,3	4,81	2,37
1600		1,00	10,7	4,48	2,24
2000		0,99	10,6	4,43	2,24
2500		1,06	11,4	4,12	2,08
3150		1,04	11,1	3,71	1,99
4000		1,05	11,3	3,09	1,79
5000		1,11	11,9	2,68	1,61

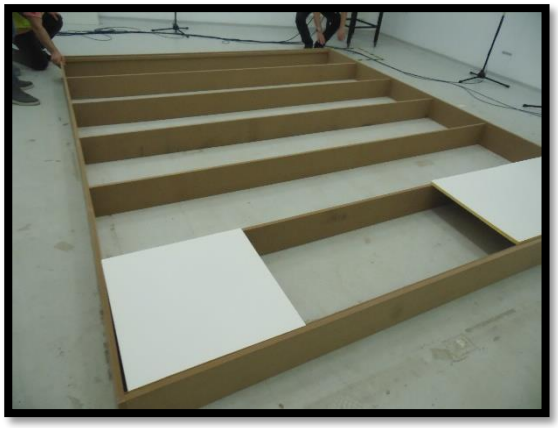
Empty reverberation room:
Relative humidity: 72,1 %
Temperature: 22,4 °C
Barometric pressure: 101,1 kPa

Reverberation room with object:
Relative humidity: 72,0 %
Temperature: 22,3 °C
Barometric pressure: 101,1 kPa

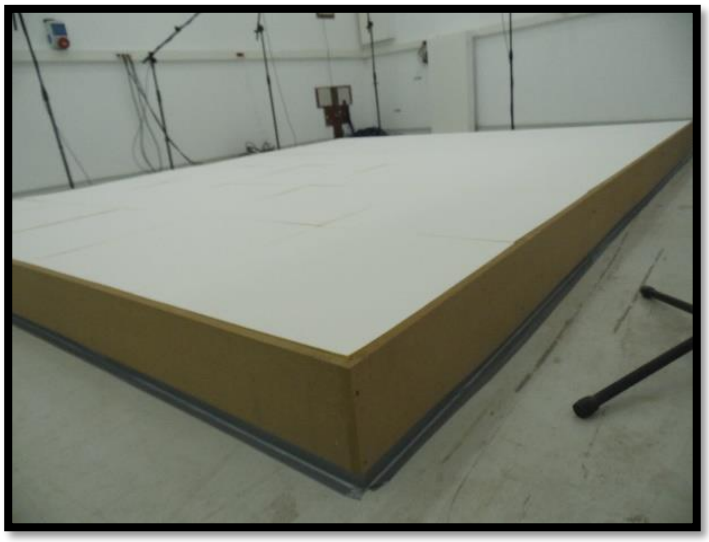
MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

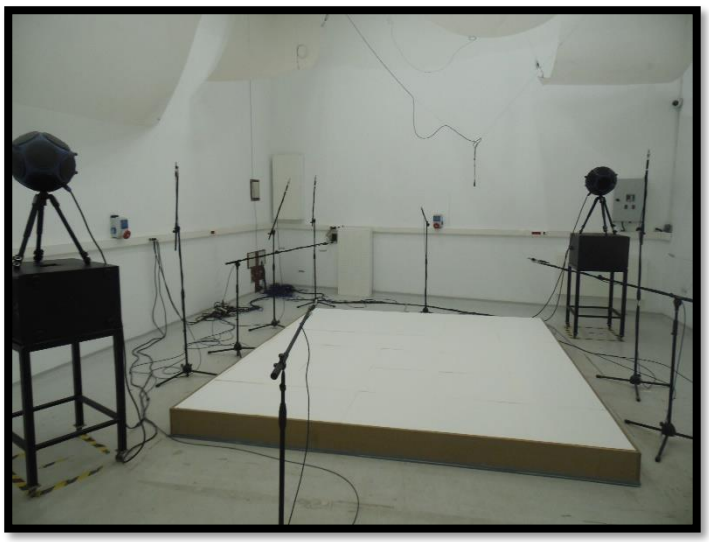
ASTM C423-17

PHOTOS REGARDING MEASUREMENTS









MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

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ROOM DIMENSIONS AND SPECIMEN PLACEMENT

