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TSE DENEY ve KALİBRASYON MERKEZİ BAŞKANLIĞI

Makina ve Yapı Malzemeleri Grup Başkanlığı

Yapı Malzemeleri Yangın ve Akustik Laboratuvarı Müdürlüğü

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HEADSHIP OF TSE TEST and CALIBRATION CENTER
CONSTRUCTION MATERIALS FIRE AND ACOUSTICS LABORATORY DIRECTORATE

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

AB-0001-T
293746
04-16

MUAYENE VE DENEY RAPORU
TEST REPORT

Deneyi Talep Eden (Adı,Adresi,Şehir vb.) *Customer (Name,Adress,City etc.)*	:	ÇAĞ MÜHENDİSLİK MİMARLIK TİCARET LTD.ŞTİ. (ÇAĞ MÜHENDİSLİK MİMARLIK TİCARET LTD.ŞTİ.: FEVZİ ÇAKMAK MAH.PARSAN SAN..SİTESİ DEVECİ SK.NO.7 KARATAY --KONYA)
Deney Talep Tarihi/No *Order Date / No*	:	15.03.2016 / 148963
Numunenin Tanımı (Cins, Marka, Tip, Tür, Model vb.) *Sample Description(Type,Mark,Model etc.)*	:	ALÇIPANELLER ARASINA YALITIM MALZEMESİ KOYULARAK OLUŞTURULAN BÖLME DUVAR, Knauf Alçıpan Flex 12,5mm- CELLUBOR , , - , - , 12.40 metrekare *Wall system that was constituted gypsum board and insulation material Cellubor,Knauf Alçıpan Flex 12,5mm- CELLUBOR,,,,12,40 square meter*
Numune Kabul Tarihi *Test Item Receipt Date*	:	15.03.2016
Deneylerin Yapıldığı Tarih *Date of Test*	:	24.03.2016 - 08.04.2016
Uygulanan Standard / Metod *Applied Standard/ Method*	:	TS EN ISO 10140-2:2013-06 , TS EN ISO 717-1:2013-06 *TS EN ISO 10140-2:2013-06 , TS EN ISO 717-1:2013-06*
Raporun Sayfa Sayısı *Number of pages of the report*	:	10
Açıklamalar *Remarks*	:	

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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.
Bu rapor özel deney talebine istinaden düzenlenmiş olup, Standartlara Uygunluk Belgesi niteliğinde değildir. Partiyi temsil etmez, ayrıca ilan, reklam ve ihalelerde uygunluk belgesi niteliğinde kullanılamaz.
This test report was prepared upon customer's request, can not be used as certificate of conformity to standards, does not represent a batch and can not be used as conformity document for advertisements and procurements .

Mühür / Tarih *Seal / Date*	**Deney Sorumlusu** *Person in charge of tests*	**Kontrol Eden** *Reviewer*	**Onaylayan** *Approved by*
08.04.2016	Berat USTA Tekniker	Sencer GÜVEN Teknik Şef	Metehan ÇALIŞ Laboratuvar Müdürü

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*
TS EN ISO 10140-2: 2013; TS EN ISO 717-1: 2013

Test Laboratory	TSE Construction Materials Fire and Acoustic Laboratory Aydınlı Mah. Gülennur Sokak No:7/1 Tuzla/İSTANBUL
Requested by	Çağ Mühendislik Mim. İnş. Tic. Ltd. Şti. Mimar Sinan Mah. Çavuşbaşı Cad. Özge Sok. No:1 Kat:2 D.10 Çekmeköy/ İSTANBUL
Manufacturer	Çağ Mühendislik Mim. İnş. Tic. Ltd. Şti.
Test Sample	Wall system that was constituted gypsum board (Knauf Alçıpan Flex 12,5mm) and insulation material (Cellubor)

1. Introduction

At the request of **Çağ Mühendislik Mim. İnş. Tic. Ltd. Şti.**, airborne sound insulation measurements were carried out for Wall system that was constituted gypsum board (Knauf Alçıpan Flex 12,5mm) and insulation material (Cellubor) at the acoustic department of TSE Construction Materials Fire and Acoustic Laboratory according to TS EN ISO 10140-2: 2013 on 24.03.2016.

2. Test Facility

Test facility complies with all requirements of TS EN ISO 10140-2 and TS EN ISO 10140-5 standards. Dimensions, shape and mounting conditions were presented at the end of the report.

Volume of source room	**114,9m^3**
Volume of receiving room	**174,4m^3**
Test opening	**12,4m^2**

3. Test specimen

The specimen was chosen and delivered by the client.
Date of production: 2016
Specimen arrival date: 15/03/2016

3.1 Description of the test specimen

Description of the product: Wall system that was constituted using double gypsum board (Knauf Alçıpan Flex 12,5 mm) on both sides with 10 cm air gap, and the air gap was filled with sound insulation material called Cellubor.
Made of: Gypsum board, Insulation material (Cellubor), support system (C shaped studs)
Surface area: 12,42m^2
Mass per unit area (system): ≈39,9kg/m^2

Dimensions	Length (mm)	Height (mm)	Thickness (mm)
(Wall system)	4060	3060	150

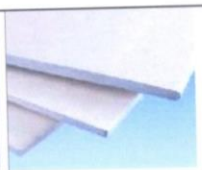
MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

TS EN ISO 10140-2: 2013; TS EN ISO 717-1: 2013


i)cellubor


ii)Profiles


iii)Ins. band


iv)Gypsumboard

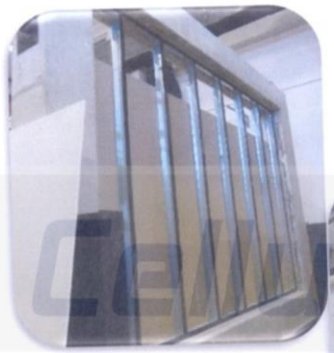
v)Gypsum

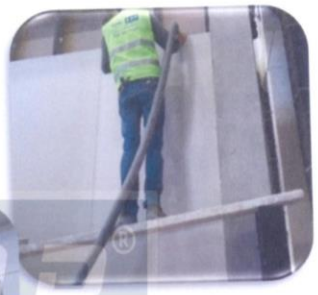

vi)Joint mesh

*Product specifications are based on client declaration.

PHOTOS FOR TEST SPECIMEN IN SEVERAL STAGES

1) Construction period





2)Measurement period

3.2 Installation of test specimen

- Test frame was chosen according to TS EN ISO 10140-5. Test frame has dimensions of 4060mm width and 3060mm height.
- Test specimen was installed in to the frame by client in a similar manner to the actual construction practice.
- Installation of the frame between the test rooms was carried out by the laboratory.
- Isolation bands were sticked to the back of the U shaped studs and these studs were fixed on the top and bottom of the frame by screws. C shaped studs were fixed on the U profiles vertically with 60cm space. Insulation band was used on the profiles faces where gypsum board will be fixed. Double gypsum boards (Knauf, Alçıpan Flex 12,5mm) were fixed on both sides of the wall in a way that has no air gap between two gypsum board and 10cm air gap between both sides of the wall. Mentioned 10 cm air gap was filled with insulation material called Cellubor. Silicon was used at perimeter of the wall in order to avoid air leakages. Joint meshs and gypsum plaster were used for junctions of gypsumboards.Drawings of the test specimen are presented in following pages.

4. Method

Test laboratory complies with all requirements of **TS EN ISO 10140-5** and **TS EN ISO 10140-2** standards.

- Two horizontally adjacent rooms, one of which is the source and the other is receiving, were used for tests.
- Test specimen was installed into the test opening as defined in clause 3.2 of this report.
- Loud speakers and microphones were placed at locations, which were determined previously.
- Microphone verifications were made before and after measurements.
- Sound pressure level measurements were carried out with mechanized microphone, during 60s. During the measurements, the time of rotating boom whole movement period is equal to 60 s.
- At the receiving room, 12 measurements were conducted for each 1/3 octave band frequencies to obtain reverberation time according to TS EN ISO 3382.
- Background noise measurements were conducted at receiving room for making correction on the sound pressure levels if necessary.

Results were calculated from the formula below which is indicated in TS EN ISO 10140-2 and TS EN ISO 10140-1 standards;

$$R=L_1-L_2+10\text{Log}\,(S/A)$$
$$A=0{,}16V/T$$

Where;

L_1: is the energy average sound pressure level in the source room, in decibels;

L_2: is the energy average sound pressure level in the receiving room, in decibels;

S: is the area of the free test opening in which the test element is installed, in square meters;

A: is the equivalent sound absorption area in the receiving room, in square meters;
V: receiving room volume, cubic meters;
T: reverberation time in receiving room, s.

- Single number rating was obtained according to TS EN ISO 717-1.

5. Results

Results were given in 1/3 octave bands in tabular and graphic forms below.

Single number rating according to TS EN ISO 717-1 was found;

Rw (C;Ctr) = 58,2 (-4 ; -12) dB

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

TS EN ISO 10140-2: 2013; TS EN ISO 717-1: 2013

Sound reduction index according to ISO 10140-2

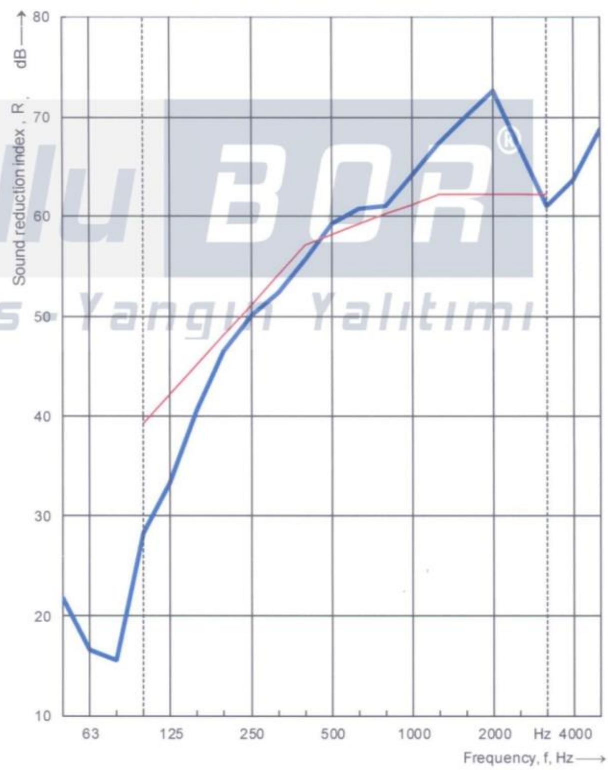
Laboratory measurement of sound insulation of building elements

Müşteri:	Çağ Müh. Mim. İnş. Ltd. Şti. — Date of test: 24.03.2016
Manufacturer:	Çağ Müh. Mim. İnş. Ltd. Şti.
Test room identification:	Two horizontally adjacent rooms, one of them is source room has a 114,9 m3 volume and the other one is receiving room has a 174,4 m3 volume, were used for tests. Diffusers were placed in rooms in order to provide diffuse sound field. Rooms are comply with all requirements of TS EN ISO 10140-2 and TS EN ISO 10140-5 standards. Figures regarding the rooms were presented in the report.
Test specimen mounted by:	Test specimen was mounted by the client
Description of the specimen:	Wall system that was constituted using double gypsum board (Knauf Alçıpan Flex 12,5 mm) on both sides with 10 cm air gap, and the air gap was filled with sound insulation material called Cellubor.

Static pressure:	99,0 kPa
Air temperature:	17,4 °C
Relative air humidity:	58,5 %
Mass per unit area:	≈39,9kg/m²
Area, S, of test element:	12,42 m²
Source room volume:	114,9 m³
Receiving room volume:	174,4 m³

Frequency f [Hz]	R 1/3 octave [dB]
50	21,9
63	16,7
80	15,6
100	28,2
125	33,3
160	40,6
200	46,5 [2]
250	50,2 [2]
315	52,3 [2]
400	55,7 [2]
500	59,2 [2]
630	60,7
800	61,0
1000	64,1
1250	67,4
1600	70,1
2000	72,6
2500	66,8
3150	61,0
4000	63,7
5000	68,8

[2] Minimum values



Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 58,2 (-4 ; -12) dB

$C_{50\text{-}3150}$ = -12 dB $C_{50\text{-}5000}$ = -11 dB $C_{100\text{-}5000}$ = -4 dB

$C_{tr,50\text{-}3150}$ = -24 dB $C_{tr,50\text{-}5000}$ = -24 dB $C_{tr,100\text{-}5000}$ = -12 dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

TÜRK STANDARDLARI ENSTİTÜSÜ DENEY ve KALİBRASYON MERKEZİ BAŞKANLIĞI 1954

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

TS EN ISO 10140-2: 2013; TS EN ISO 717-1: 2013

Sound reduction index according to ISO 10140-2

Laboratory measurement of sound insulation of building elements

Rating according to ISO 717-1

R_w $(C;C_{tr})$ = 58,2 (-4 ; -12) dB

Evaluation based on laboratory measurements results obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150}$ = -12 dB $C_{50\text{-}5000}$ = -11 dB $C_{100\text{-}5000}$ = -4 dB

$C_{tr,50\text{-}3150}$ = -24 dB $C_{tr,50\text{-}5000}$ = -24 dB $C_{tr,100\text{-}5000}$ = -12 dB

Sum of unfavourable deviations : 31,8 dB

Max. unfavourable deviation : 11,0 dB at 100 Hz

Frequency [Hz]	R [dB]	L1 [dB]	L2 [dB]	T [s]	Corr. [dB]	u. Dev. [dB]	Bgn status	Ftm status
50	21,9			2,26				
63	16,7			1,99				
80	15,6			2,24				
100	28,2			2,83		11,0		
125	33,3			2,62		8,9		
160	40,6			2,59		4,6		
200	46,5			2,68		1,7		Minimum values
250	50,2			2,99		1,0		Minimum values
315	52,3			2,62		1,9		Minimum values
400	55,7			2,96		1,5		Minimum values
500	59,2			3,14				Minimum values
630	60,7			3,01				
800	61,0			2,84				
1000	64,1			2,64				
1250	67,4			2,37				
1600	70,1			2,30				
2000	72,6			2,51				
2500	66,8			2,57				
3150	61,0			2,37		1,2		
4000	63,7			2,04				
5000	68,8			1,84				

Receiving room volume:	174,4 m³	Air temperature:	17,4 °C
Source room volume:	114,9 m³	Relative air humidity:	58,5 %
Area, S, of test element:	12,42 m²	Static pressure:	99,0
		Mass per unit area:	≈39,9kg/m²

TÜRK STANDARDLARI ENSTİTÜSÜ KALİBRASYON MERKEZİ BAŞKANLIĞI 1954

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

TS EN ISO 10140-2: 2013; TS EN ISO 717-1: 2013

R'_{max} comparison table

Frequency [Hz]	R [dB]	R'_{max} [dB]	R'max - R [dB]	
50	21,9	44,6	22,7	
63	16,7	46,3	29,6	
80	15,6	50,8	35,2	
100	28,2	54,9	26,7	
125	33,3	53,0	19,7	
160	40,6	56,3	15,7	
200	46,5	59,0	12,5	Minimum values
250	50,2	59,0	8,8	Minimum values
315	52,3	64,1	11,8	Minimum values
400	55,7	70,4	14,7	Minimum values
500	59,2	73,3	14,1	Minimum values
630	60,7	77,3	16,6	
800	61,0	80,8	19,8	
1000	64,1	85,7	21,6	
1250	67,4	89,6	22,2	
1600	70,1	93,4	23,3	
2000	72,6	95,1	22,5	
2500	66,8	96,0	29,2	
3150	61,0	94,5	33,5	
4000	63,7	94,3	30,6	
5000	68,8	93,1	24,3	

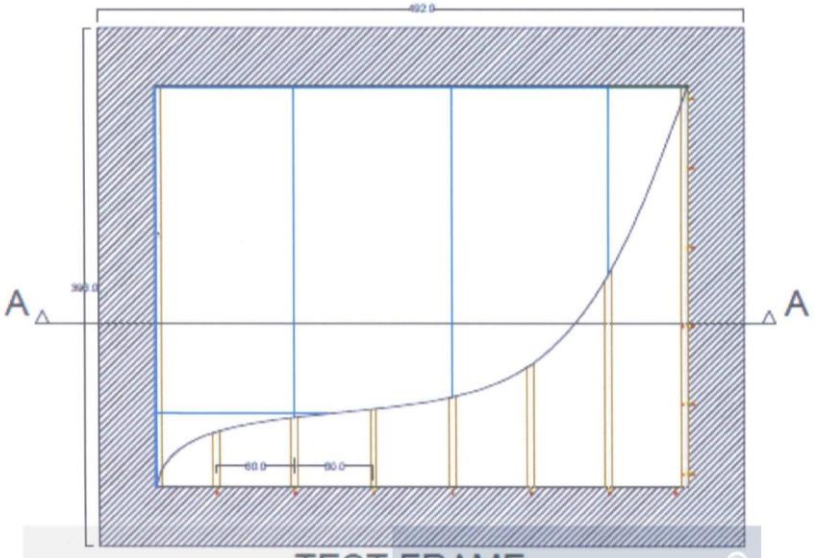
Legend:
R: Sound reduction index of the test specimen.
R'max: The maximum sound reduction index of a building element.

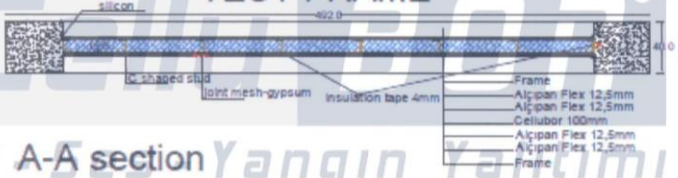
TÜRK STANDARDLARI ENSTİTÜSÜ TSE KALİBRASYON MERKEZİ BAŞKANLIĞI 1954

MUAYENE - DENEY SONUÇLARI *TEST RESULTS*

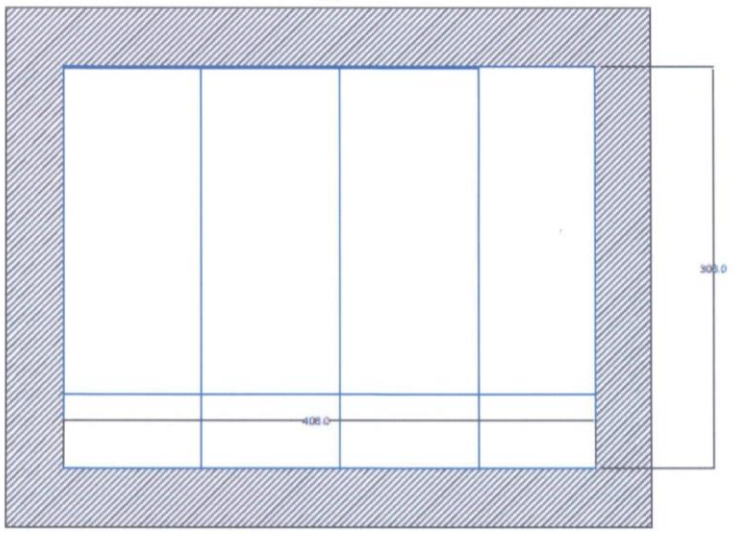
TS EN ISO 10140-2: 2013; TS EN ISO 717-1: 2013

FIGURE REGARDING TEST SAMPLE MOUNTING





A-A section



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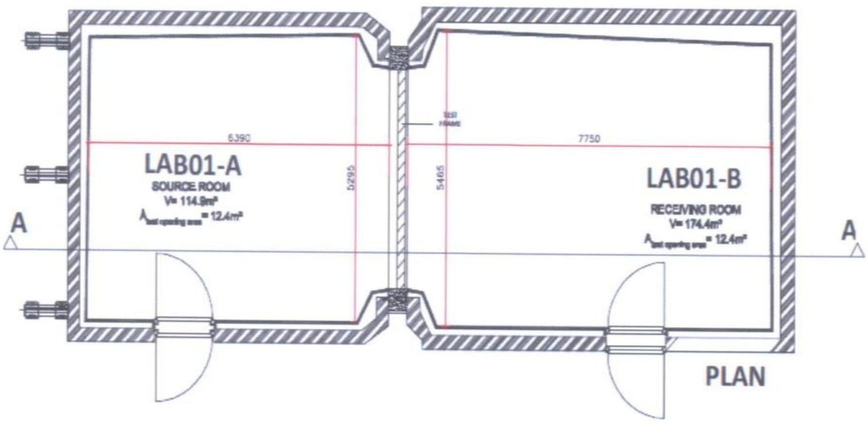
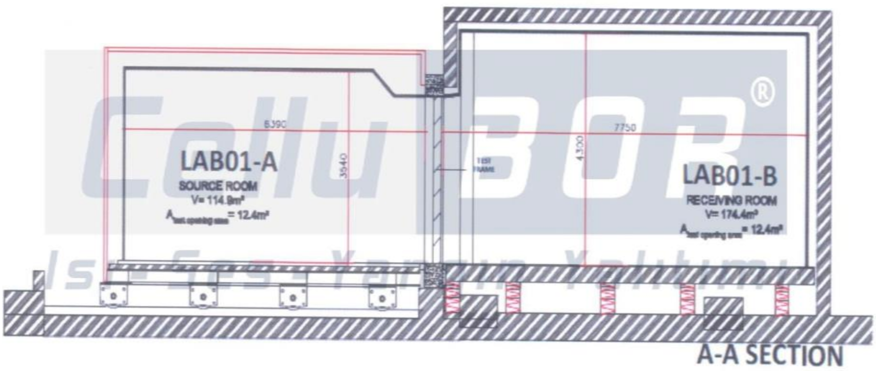
FIGURES REGARDING THE TEST FACILITY



PLAN



A-A SECTION