

مرجعنا: 2022/ 10/10:

مرجعكم: 2022/10/3:

الموضوع: اختبار العزل الصوتي

الجهة الطالبة : شركة وودك للتجهيزات الخشبية

تحية طيبة وبعد،،

إيماءً إلى تعاقد سيادتكم الوارد بتاريخ 2022/10/3 بخصوص الموضوع عاليه، مرفق طيه

التقرير بالنتائج وقد سددت الرسوم المقررة بالقسيمة رقم 0409903 بتاريخ 2022/10/3.

وتفضلوا بقبول فائق الاحترام،،

مدير المعهد  
أستاذ دكتور /  
محمود علي حسن

نائب رئيس مجلس الإدارة  
لشئون البحوث والدراسات  
أستاذ دكتور /

٢٠٢٢/١٠/٣





المركز القومي لبحوث الإسكان والبناء

معهد بحوث فيزيقا المنشآت والعوامل البيئية المحيطة



## ACOUSTIC ACTIVITY

Testing name	Sound Insulation for Concrete Wall According ASTM E90-10 , ASTM E2235-10, ASTM E413		
Client Code	BPEL -A-TL-71/022	Testing date	10/10/2022
Delivery Date	3/10/2022	Sample Code	BPEL -A-TL1- Woodek S1/022
Delivery No.	0038395	Report No	BPEL -A-TL1- Woodek S1/022
Client Name	WOOD EQUIPMENT CO. (Woodek)		
Client Address	Alexandria/Cairo desert road, St. No. 1700, <a href="http://www.woodek.com">www.woodek.com</a>		

### MEASUREMENT OF AIRBORNE SOUND INSULATION FOR WOODEN DOOR



Report No. BPEL -A-TL1- Wooden S1/022

1/ 8

11/10/2022

Tel : (02) 33356722 / 33356853 / 33357107 / 01120943065  
FAX : (02) 33351564

P.O. BOX 1770  
87 El-Tahrir St., Dokki, Cairo, Egypt

### 1- Test Object

This test method is for evaluating the sound transmission for wooden door 6.5 cm including rockwool 30 mm of density 140kg/m<sup>3</sup>. The sample delivered from Wood Equipment Co. (Woodek). The sample was installed in acoustic laboratory in HBEC. Fig 1 and 2 show the construction details of the tested door. The test was carried out according to ASTM E-90 in acoustic laboratory of HBRC. The sound transmission between the source room and the receiving room through the sample was measured and the sound transmission class, STC was determined according to ASTM E413.

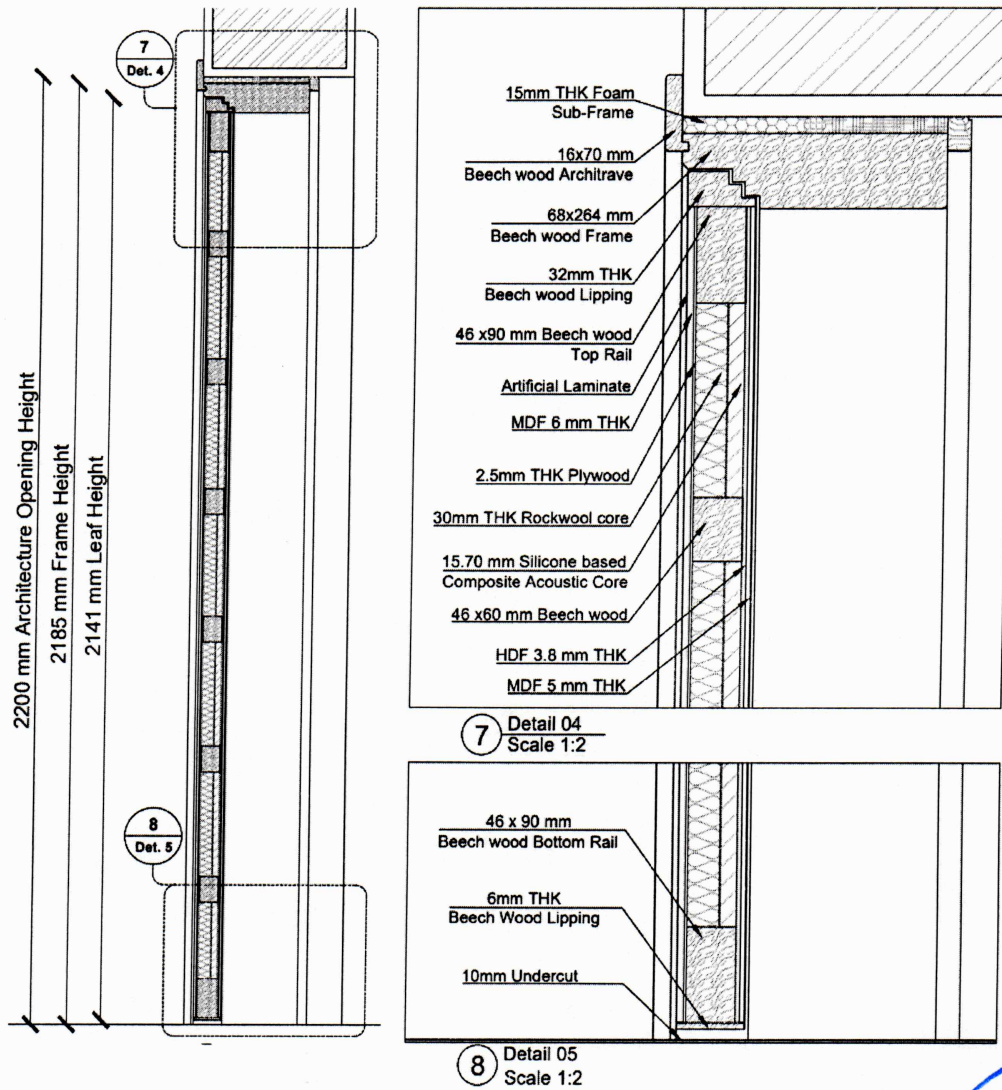


Fig 1 section 1 in the tested door



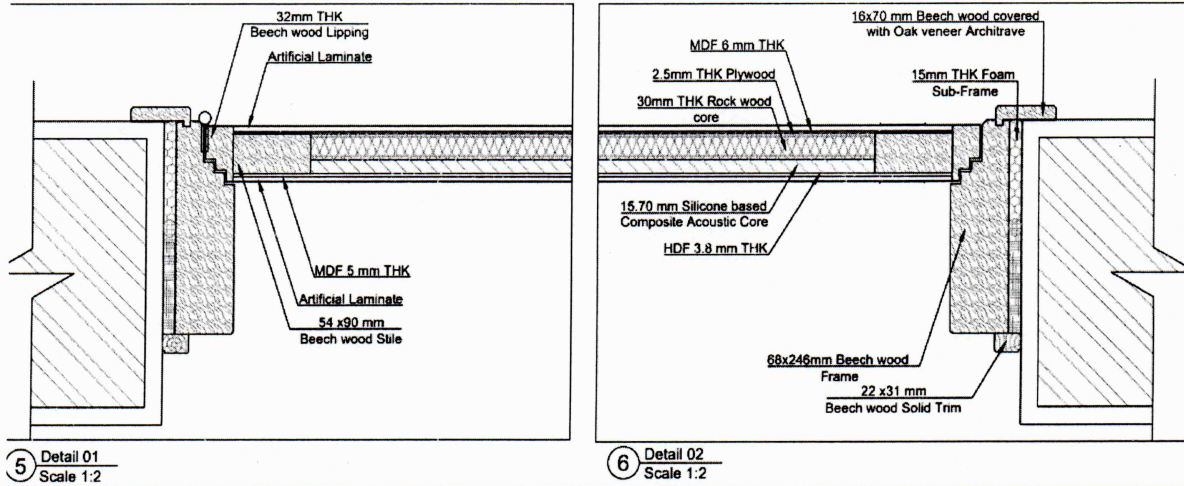


Fig 2 section 2 in the tested door



Fig 3 of the picture of the tested wall





## 2. Instrumentation and Measurements

The sound transmission loss test was carried out according to ASTM E-90 in HBRC acoustic laboratory. Instrumentation for measurements was as the following sections

### 2.1 Test Signal

The sound signals used for the tests were pink noise radiated at third octave bands with mid-band frequencies from 100 to 4000 Hz and exited through sound source type 4292 (B&K).

### 2.2 Sound Sources

The sound source type 4292 (B&K) is used for radiating a steady noise with third octave bands over a wide angle. The sound source is placed apart enough from the tested wall and pointing in to the test specimen during the measurements. The sound source radiated enough sound above the back ground noise (more than 10 dB).

Two positions for sound source were selected where 4 m from the sample, 1.5 m from any surface and 1.75 m from the microphone positions

### 2.3 Microphone and Positions

1/2 inch microphone type 4189 (B&K) mounted on fixed boom that used to measure average sound pressure levels in the source room and receiving room. 5 positions of the microphone were selected for each sound source position in the source room and receiving room to measure the sound pressure levels. The sound decay rates in the receiving room were also measured for 5 microphone positions for each sound source position. The microphone positions were 1.75 m from the sound source, 1m at least from any surface. The average of sound pressure levels measurements was calculated in both; source room and receiving room. The average sound decay rates in the receiving room was also measured

### 2.4 Calibration

The building acoustic analyzer connected to microphone type 4189 (B&K) and calibrated by using calibrator type 4231 (B&K) where the system is excited with signal at 1000 Hz to give 94 dB.



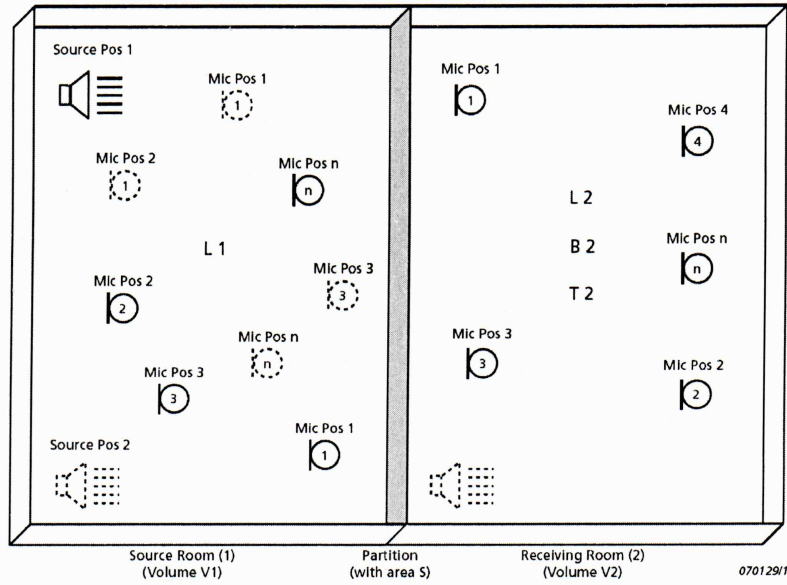


Fig. 4 Selected positions of sound source and microphone.

## 2.5 Measurements Procedure

The sound level meter type 2270 with Building Acoustics Software BZ-7228 connected with the sound source, omnidirectional loudspeaker type 4292 (Brul & Kjaer) and power amplifier type 2716 (Brul & Kjaer). Pink noise is generated to excite the source room for two positions of the sound source and 5 microphone positions in each room. The average sound pressure level in the source and receiving rooms was determined. Sound pressure level detected by the microphone and integrated over a proper length of time by the sound level analyzer. In the measurement of reverberation time, 5 decay samples were taken for each position of the sound source, also the reverberation time was deduced from the average of the decay samples.

The sound transmission loss was calculated according to the international standard ASTM E90, the sound transmission loss is found from

$$TL = L_1 - L_2 + 10 \log(S/A_2)$$

Where

- $L_1$  = average sound pressure level in the source room
- $L_2$  = average sound pressure level in the receiving room
- $S$  = area of the test specimen
- $A_2$  = equivalent absorption area in the receiving room,

## 2.6 Determination of Receiving Room Absorption A

The receiving room absorption,  $A_2$  is determined by measuring the reverberation time in the receiving room in the same one-third octave bandwidths from 125 to 4000 Hz according to ASTM E2235. The sound absorption of the receiving room,  $A_2$  was determined, by:

$$A_2 = 0.921 Vd/c$$

where:

$A_2$  = sound absorption of the room,  $m^2$

$c$  = speed of sound in air, m/s,

$V$  = volume of room,  $m^3$ , and

$d$  = rate of decay of sound pressure level in the room, dB/s.

where:

$d = 60/T$ ,  $T$  is reverberation time in seconds

## 3. Determine Sound Transmission Class (STC)

This classification covers methods of calculating single number acoustical ratings for laboratory and field measurements of sound attenuation obtained in one-third octave bands. This value is determined as follows:

- The reference contour is defined by the array of values given in ASTM E413.
- The transmission loss data is rounded to which the contour is to be fitted to the nearest integer
- Fit the reference contour to the data by increasing simultaneously all the values in ASTM E413 (table 1) in 1-dB increments until some of the data are less than the shifted reference contour.
- At each frequency the difference between the shifted reference value and the data is calculated. If a measured data point is less than the reference contour this is a deficiency; only
- deficiencies are counted in the fitting procedure. increasing the reference contour values to the highest level that will satisfy requirements ASTM E413
- The single-number rating is given by the value of the shifted reference contour at 500 Hz.



**Table 1 List of Equipment used for laboratory sound transmission loss test**

Item	Equipment Name	Type	Serial No.
1	Omni Directional Loud Speaker	4292(B&K)	017022
2	Power Amplifier	2716(B&K)	562839
3	Sound Level Calibrator	4231(B&K)	2169925
4	Rotating Microphone Boom	3923(B&K)	2610778
5	KIMO	KH100A0	07031635
6	Sound Level Meter	2270(B&K)	2679295
7	Preamplifier	ZC0032(B&K)	11418
8	Microphone	4189(B&K)	2676444

**Notes1:**

*The results of this report refer only to the particular item submitted to HBRC acoustic laboratory for testing.*

**Notes 2:**

- *The sample was delivered to the laboratory by the entity requesting the test*
- *The aforementioned data according to what was mentioned by the body requesting the test without any responsibility on the HBRC*
- *The attached results apply only to the sample submitted to the HBRC, bearing in mind that the results are not valid and are not valid for the approval of any quantitative production / and practices / supplies / as well as export and is not considered as a conformity certificate*
- *The Egyptian code must be referred to if there is a mechanism to determine the periodicity of conducting the test*
- *This report is valid for one year. It is not allowed to reproduce this report except with the written consent of the HBRC*
- *The laboratory is bound by the terms of the international standard for accreditation of laboratories ISO 17025 of 2017 in terms of confidentiality of data, transparency and neutrality with customers*

**Note 3**

- *The standard calculation ASTM E 413 is not accredited by IAS*





Measurements of Laboratory Sound Transmission Loss According to ASTM E90-10 , ASTM E2235-10, ASTM E413			
<b>Client Name</b>	<b>WOOD EQUIPMENT CO. (Woodek)</b>		
<b>Environmental cond.</b>	$t_{ave}$ (c°): 25	$RH_{ave}$ (%): 55	<b>Deviation of Calibration</b> 0.11
<b>Sample description</b>	Wooden door 6.5 cm including rockwool 30 mm of density 140kg/m <sup>3</sup> as given in fig 1,2		
<b>Date of test</b>	10/10/2022	<b>Instrumentation</b>	SLM 2270 (B&K) & BZ-7228 & mic. 4189 (B&K) & S.S 4292 (B&K)
<b>Area of the wall</b>	2.20 m <sup>2</sup>		
<b>Receiving room Vol.</b>	75 m <sup>3</sup>		
<b>Source room volume</b>	65 m <sup>3</sup>		
<b>Freq.</b>	<b>TL</b>		
125	38.2		
160	31.0		
200	35.7		
250	37.5		
315	44.5		
400	44.1		
500	44.1		
630	45.4		
800	46.9		
1000	49.0		
1250	50.9		
1600	50.7		
2000	51.2		
2500	53.0		
3150	55.4		
4000	57.5		
<b>STC</b>	<b>48</b>		

<b>Tech. Eng.</b>	<b>Acoustic Tec. Manager</b>
انانف يونس المصرى	د. ه. س. سعدة
<b>Dr. A. Y. El-Masry</b>	<b>Prof. Dr. H. S. Seddeq</b>

