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المركز القومي لبحوث الإسكان والبناء
مكتب نائب رئيس مجلس الادارة
لشئون البحوث والدرسات

مرجعنا :10/ 10/ 2022
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 /**
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# 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, www.woodek.com** | | |

## MEASUREMENT OF AIRBORNE SOUND INSULATION FOR WOODEN DOOR



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## 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.



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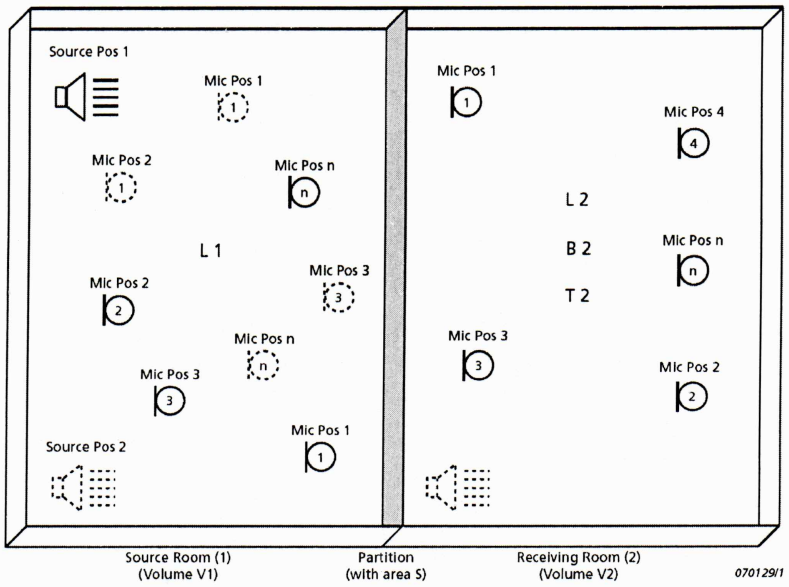


**Fig. 4 Selected positions of sound source and microphone.**

## 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,



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## 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, m3, 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.



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**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*



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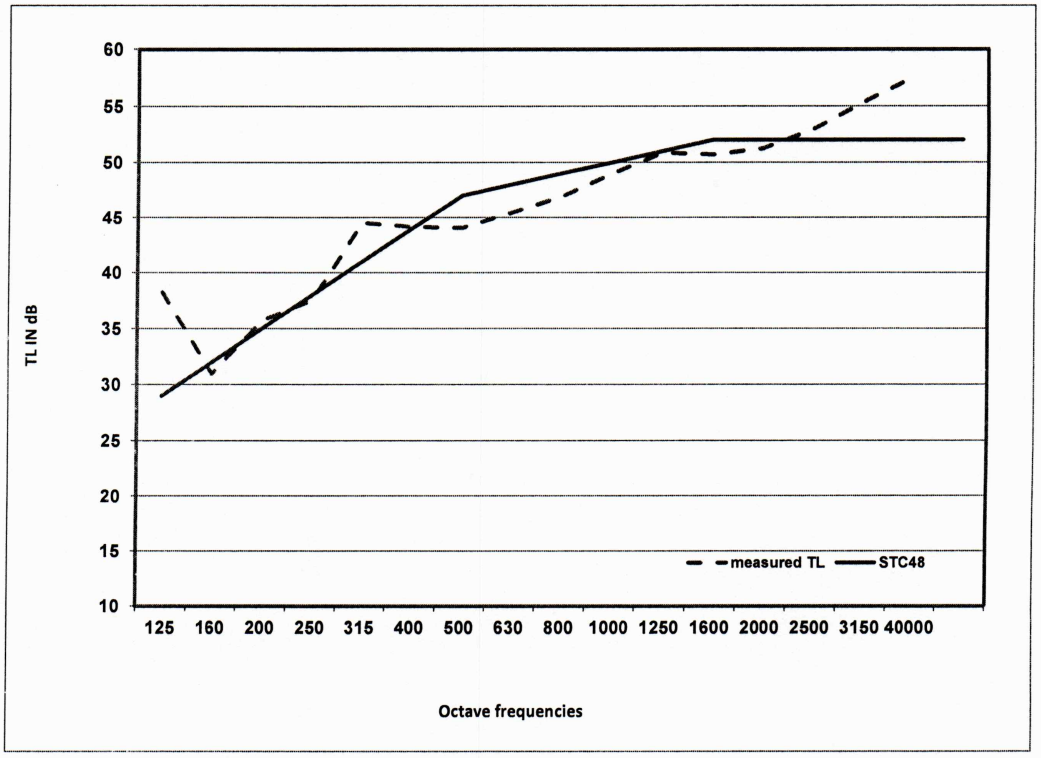
| Measurements of Laboratory Sound Transmission Loss According to ASTM E90-10 , ASTM E2235-10, ASTM E413 | | | | |
|---|---|---|---|---|
| *Client Name* | **WOOD EQUIPMENT CO. (Woodek)** | | | |
| *Environmental cond.* | $t_{ave}$ ($c^0$): 25 | $RH_{ave}$ (%): **55** | *Deviation of Calibration* | **0.11** |
| *Sample description* | Wooden door 6.5 cm including rockwool 30 mm of density 140kg/m$^3$ as given in fig 1,2 | | | |
| *Date of test* | 10/10/2022 | *Instrumentation* | SLM 2270 (B&K) & BZ-7228 & mic. 4189 (B&K) &S.S 4292 (B&K) | |
| *Area of the wall* | **2.20 m$^2$** | | | |
| *Receiving room Vol.* | **75 m$^3$** | | | |
| *Source room volume* | **65 m$^3$** | | | |

| Freq. | TL |
|---|---|
| **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 |
| **STC** | **48** |




| Tech. Eng. | Acoustic Tec. Manager |
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