CONSIGLIO NAZIONALE DELLE RICERCHE
Istituto per le Tecnologie della Costruzione
Sede Istituzionale

Test Laboratory Notified in accordance with Regulation EU 305/11

TEST REPORT

Number:

0970-CPR-RP 1142

Issuing date:

01-02-2019

Applicant:

Solatube International, Inc.
2210 Oak Ridge Way
Vista, CA 92081-8341
USA

Trade Name of the tested product/specimen:

Tubolar Daylight Device
"SkyVault M74 DS-O"

Test/s performed:

Measurement of the element-normalized level difference

Normative reference/s

UNI EN ISO 10140 Part 1– 2016
UNI EN ISO 10140 Parts 2,4,5 – 2010
UNI EN ISO 717 Part 1 – 2013

The report is made up of 5 pages and can only be reproduced in full.
The results obtained are solely referred to the specimen/s subjected to the tests.
This is the English translation of the original Test Report issued on 01-02-2019.

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1 Description of the tested specimen

The description and the technical drawings below, related to the specimen under test, were supplied by the applicant under his own responsibility. The test described was carried out on 16/01/2019 at the testing laboratories of ITC-CNR in San Giuliano Milanese.

Name of the product: the Trade Name of the specimen under test is "SkyVault M74 DS-O"

Description of the test specimen:

The specimen under test consists of the following elements:

126000	Solatube M74 DS Dual Dome Assembly with Security Guard	1
480290	Thermal Insulation Panel (TIP) & Integral 24" Extension Tube with Tab Lock and Tube Belt	1
	Consists of :	
411110	M74 DS Thermal Insulation Panel (TIP)	1
570400	M74 DS 24" Integral Tubing	1
320325	600mm Extension Tube with Tab Lock and Tube Belt	1
420995	Solatube M74 DS Prismatic Diffuser Assembly	1

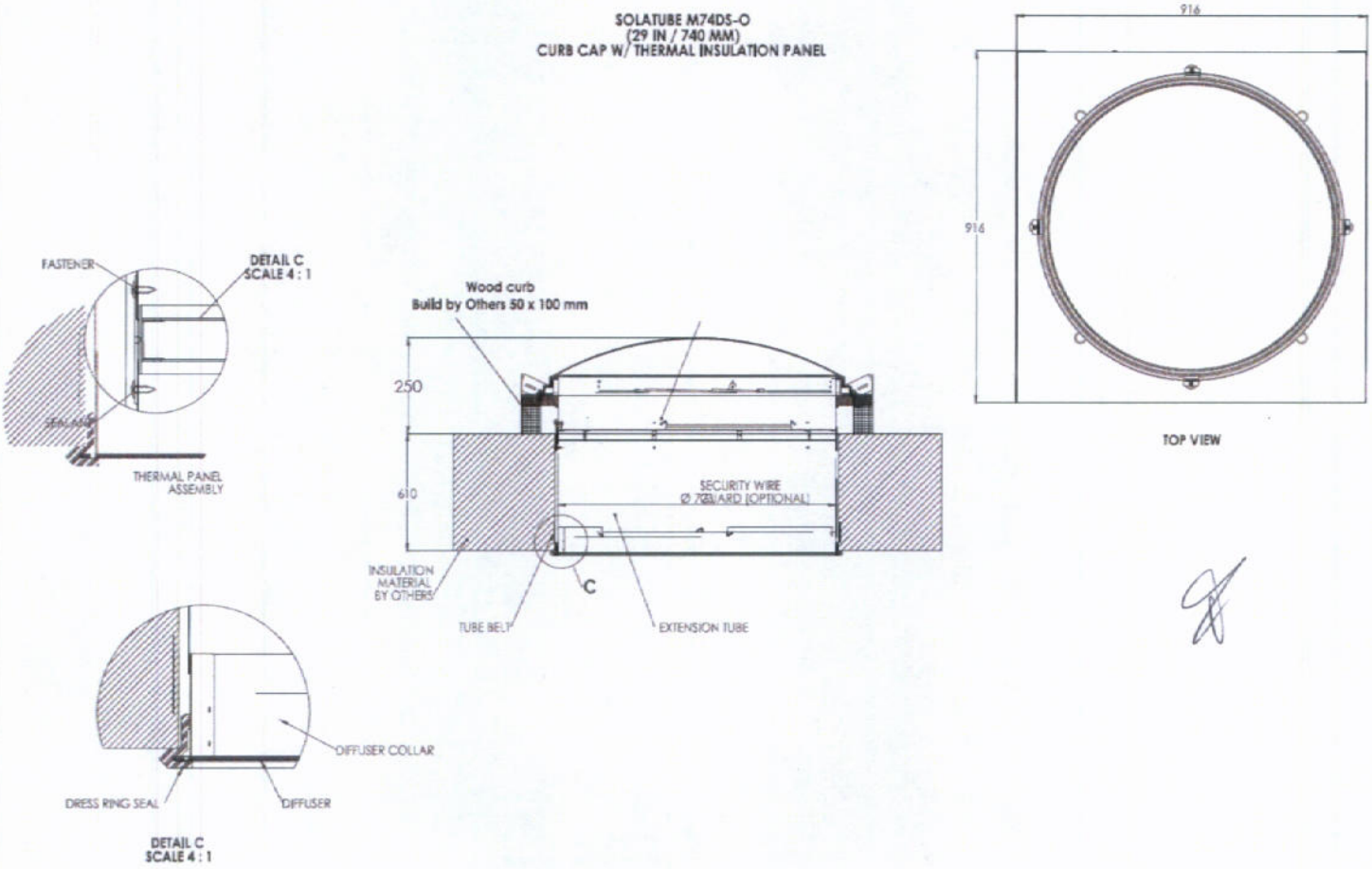


Figure 1 – Sections Solatube M74DS-O.

2 Sampling procedure

The specimen was delivered to the laboratories of ITC on 16/01/2019.

3 Specimen preparation procedure

The applicant himself installed the specimen to be tested.

4 Test method

Evaluation of the element-normalized level difference

The test was performed in accordance with standard series UNI EN ISO 10140 of 2010 and 2016 concerning the measurement of sound insulation of buildings and building elements.
Standards UNI EN ISO 10140 part 1 and 2 lay down the method for the laboratory measurement of the airborne sound reduction index of building elements such as walls, floors, doors, windows, façade elements or façades and small elements. According to the UNI EN ISO 10140 part 2, for laboratory measurements using sound pressure, the element-normalized level difference $D_{n,e}$ is calculated using the following expression:

$$D_{n,e} = L_1 - L_2 + 10 \text{ Log } (A_0/A) \quad \text{dB} \qquad 1)$$

where:

- L_1 is the energy average sound pressure level in the source room, expressed in decibels;
- L_2 is the energy average sound pressure level in the receiving room, expressed in decibels;
- A_0 is the reference area expressed in square meters, equal 10 m^2 for laboratory tests;
- A is the equivalent sound absorption area in the receiving room, expressed in square meters.

Generation of the sound field in the source room

The position and qualification of the sound source in the emitting room is determined in compliance with standard UNI EN ISO 10140 part 5. Measurements are made by using white noise.

Measurement of the average sound pressure level

The sound pressure level is measured by means of 1/3-octave filters in the frequencies from 100 to 5000 Hz.
The average level of sound pressure is determined in accordance with the procedures described in standard UNI EN ISO 10140 part 4 by using a continuously moving microphone.

Measurement and assessment of the equivalent sound absorption area

The equivalent absorption area A in the correction term of relation 1) is calculated from the measured values of reverberation time, through the Sabine formula:

$$A = 0.16 \, V/T \quad m^2 \qquad 2)$$

where:

- V is the volume of the receiving room, expressed in m^3;
- T is the reverberation time of the receiving room, expressed in seconds.

Reverberation time is measured in accordance with the interrupted noise method laid down by standard ISO 3382-2. The loudspeaker is used in two positions, while the microphone is used in three positions, allowing two readings in each position.

Single-number quantity of airborne sound insulation properties of building elements

The application of standard UNI EN ISO 717-1 of 2013, leads to the determination of one individual quantity intended to globally characterize the acoustic performance under examination; such quantity is called Weighted element-normalized level difference, $D_{n,e,w}$. This is the value, expressed in decibels, of the reference curve at 500 Hz resulting from the evaluation procedure of the experimental curve of $D_{n,e}$ as a function of the frequency in the field between 100 Hz and 3150 Hz. The evaluation procedure consists in comparing the experimental curve of $D_{n,e}$ with a reference curve defined in UNI EN ISO 717 part 1, seeking the best tuning condition between the two curves. Once this condition is reached, the evaluation index value is the value expressed in dB of the ordinate on the reference curve after the curve's translation, at the abscissa of 500 Hz.
To take into account the different spectra of noise sources, standard UNI EN ISO 717-1 of 2013 defined the spectrum adaptation terms C and C_{tr}; such terms are calculated in accordance with the above standard and added to the evaluation index in the expression of results.

Description of the test rooms

The laboratory test installations meet the requirements of UNI EN ISO 10140 part 5.
The dimensions of the two rooms and of the test opening are the following:

ROOM	1 – SOURCE	2 – RECEIVING
volume (m^3)	50	60
overall inner surface area (m^2)	79.5	91.5

TEST OPENING BETWEEN ROOMS 1 AND 2			
height	length	width	opening area
3.0 m	3.31 m	0.4 m	9.93 m^2

If the element under test is smaller than the test opening, it is fitted into a high sound reduction index wall built in the test opening.

5 Test equipment

Test equipment, microphones and cables meet the requirements of UNI EN ISO 10140 part 5.

a) Real time integrator/analyser.

This instrument combines the functions of a precision integrator with those of a two-channel real time frequency analyser with octave and 1/3 octave digital filters; it can simultaneously detect and store the sound level of all normalized time constants and provides the direct measure of the Equivalent Level plotting the integrated level for the run period and that related to each 1/3 octave band.

b) Microphones on rotating booms

The two microphones used are 1/2" condenser microphones (sensitivity 50mV/Pa) fitted with a preamplifier; they are placed on a rotating boom with varying length from 0.5m to 2m with rotation times of 16, 32 and 64 seconds.

c) Sound source

It consists of a single box containing a noise generator, a power amplifier and a loudspeaker with diffusing cone: it can supply power up to 118 dB, continuous between 100 Hz and 4 kHz. During the measurements, the box is used to amplify the noise generated and filtered by the analyser.

6 Photos of the specimen under test and of the test setup

Figure 2 – Specimen under test: source room (left) and receiving room (right).

7 Results

The results of the measurements carried out on the specimen under test have been compared with those obtained from the separating wall with no test opening; corrections of flanking transmission were applied with differences less than or equal to 10dB.

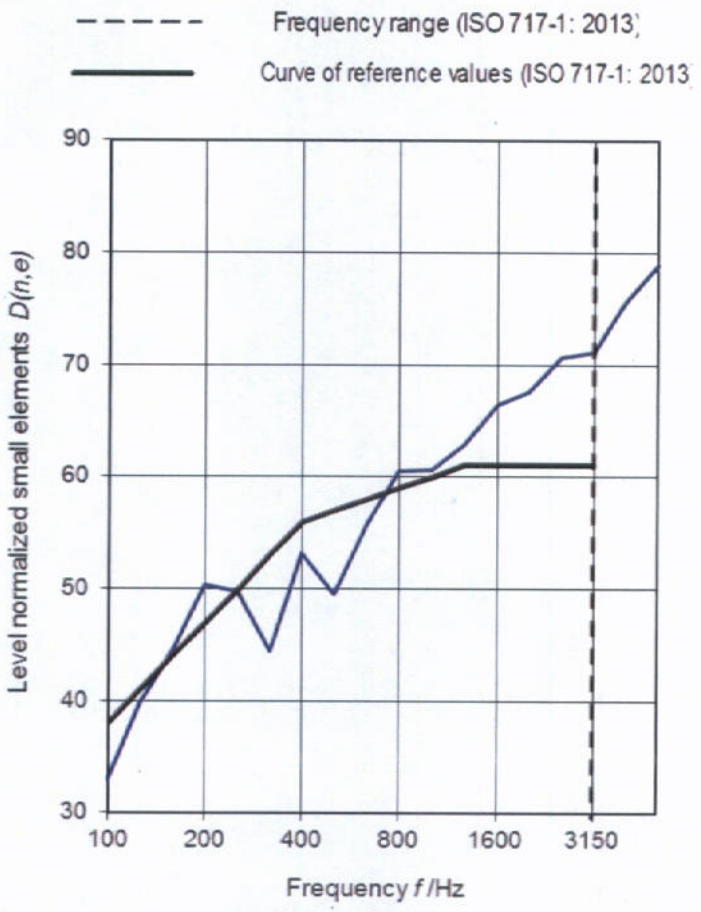
Weighted sound reduction index of small building elements in accordance with standard ISO 10140-2:2010

Manufacturer: Solatube International, Inc.
Client: Solatube International, Inc.
Test element mounted by: Solatube International, Inc.
Description of test facility, test element and test arrangement, from page 2 to 4 of this Report
Air temperature of the test room:16.8°C

Relative humidity of the test room: 34.3%
Volume of the receiving room: 60 m^3

Product identification: M74
Test room identification: ITC-CNR
Date of test: 16/01/2019

Frequency Hz	Dne dB
100	32,9
125	39,8
160	44,6*
200	50,4**
250	49,8**
315	44,5
400	53,2*
500	49,5
630	55,8*
800	60,5*
1000	60,6*
1250	62,9*
1600	66,4**
2000	67,6**
2500	70,7**
3150	71,2**
4000	75,6**
5000	79,0**



Rating in accordance with standard UNI EN ISO 717-1: 2013

$D_{ne,w}$ (C, C_{tr})= 57 (-2;-7) dB

Evaluation based on laboratory measurements results obtained by an engineering method

* The difference with respect to the weighted sound reduction index of the separating wall with no test opening $D_{n,e,F}$, is between 6 and 10dB.

** Minimum value: the difference with respect to the weighted sound reduction index of the separating wall with no test opening, Dn,e,F, is is less than 6dB; therefore, the Dn,e value may be greater than the value indicated.

8 Limitations

This Test Report, which is neither an assessment of fitness for use nor a certificate of constancy of performance of the product, is issued in accordance with Annex V of the CPR, paragraph 1.4 b).

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Testing operator
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