CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a. s.
CENTRE OF BUILDING CONSTRUCTION ENGINEERING,
Joint Stock Company
workplace Zlín, K Cihelně 304, 764 32 Zlín - Louky

L 1007.1

Door and window testing laboratory, heat and acoustical engineering No. 1007.1, accredited by the Czech Accreditation Institute, o.p.s.

Test Report No. 19/10

Laboratory Measurement of Airborne Sound Insulation according to ČSN EN 1793-2, ČSN EN ISO 140-3

Item tested: MAKROLIFE polycarbonate sheet, thickness 15 mm

Contract No: 063 034

Number of pages: 4
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Customer: **TITAN-MULTIPLAST s.r.o.**
Jablonecká 1379
CZ-468 51 Smržovka, Czech Republic

Manufacturer: **Arla Plast AB,**
Box 33, Västanåvägen
SE-590 30 Borensberg, Sweden

Sample accepted on: 11 December 2009
Tested on: 15 December 2009
Tested by the Building Acoustics Laboratory
Head of laboratory: Ing. Miroslav Figalla
Head of testing laboratory No. 1007.1:
Ing. Miroslav Figalla .....

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Date: 14 January 2010

CENTRUM STAVEBNÍHO INŽENÝRSTVÍ, a.s. pracoviště ZLÍN
Laboratoř otvorových výplní, stavební tepelné techniky a akustiky č.1007.1
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1. Test specification

The test has been carried out based on order of 10 December 2009.

2. Test subject

Determination airborne sound insulation using a laboratory method. Conclusive test.

Tested element: MAKROLIFE transparent polycarbonate sheet, thickness 15 mm. Manufacturer: Arla Plast AB, Sweden.

3. Test Sample

The Customer supplied the testing sample with dimension 1,200 mm x 1,500 mm. The sample was installed into a measuring opening for vertical elements. Installation of the sample was carried out by the staff of the testing laboratory.

4. Standards used and measuring equipment

4.1 Standards

- ČSN EN 1793-2 Road traffic noise reduction devices – Test method for determining the acoustic performance – Part 2: Intrinsic characteristics of airborne sound insulation,
- ČSN EN ISO 140-3 Acoustics – Measurement of sound insulation in buildings and of building elements. Part 3: Laboratory measurement of airborne sound insulation of building elements,
- ČSN EN ISO 717-1 Acoustics. Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation.

Related standards:

- ČSN EN 1793-3 Road traffic noise reduction devices – Test method for determining the acoustic performance – Part 3: Normalized traffic noise spectrum,
- ČSN EN 20140-2 Acoustics – Measurement of sound insulation in buildings and of building elements. Part 2: Determination, verification and application of precision data.

4.2 Measuring equipment

- Norsonic RTA 840 analyzer	M 07 2024
- B. K. measuring microphone	M 07 2005

5. Testing Procedure

Measurement is carried out in sound chambers which comply with the requirements of ČSN ISO 140-1. The test sample is placed between the source room and the receiving room in the measurement opening for vertical elements. In the source room a steady sound with a continuous spectrum within the 100 to 5000 Hz range is generated. The measured quantities are the mean level of acoustic pressure (in decibels) in the source room and the receiving room. Sound reduction index is determined by the relation

$$R = L_1 - L_2 + 10 \log \frac{S}{A} \qquad \text{(dB)},$$

where L_1 is the mean sound pressure level in the source room,
L_2 .. mean sound pressure level in the receiving room,
S ... area of the test specimen in m^2,
A ... equivalent absorption area in the receiving room in m^2.

The size of the equivalent absorption area is determined from reverberation time measured according to the ČSN ISO 354 standard using the Sabine´s formula

$$A = \frac{0,16\,V}{T}$$

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

From the values of sound reduction R in the third of an octave ranges between 100 to 3150 Hz a single-digit quantity – weighted sound reduction index R_w, and spectrum adaptation terms C a C_{tr} are established using a directional curve in accordance with ČSN EN ISO 717-1.

Further, in accordance with ČSN EN 1793-2, a single digit quantity DL_R which characterizes the sound insulation of the element in terms of the road traffic noise spectrum is established (numerically being the sum of R_w + C_{tr}), and the categories are determined based on the following table:

Category	DL_R(dB)
B0	Not specified
B1	< 15
B2	15 to 24
B3	> 24

Tab. 1 Categories in accordance with ČSN EN 1793-2

6. Deviations from standard testing methods

Measurement and evaluation according ČSN EN 1793-2 were carried out only for the transparent part of barrier (polycarbonate sheet) without column.

7. Test Results

Test results for the airborne sound insulation of the MAKROLIFE sheet, thickness 15 mm:

- evaluation in accordance with ČSN EN ISO 717-1 . . . . **R_w (C; C_{tr}) = 35 (-2; -2) dB,**
- evaluation in accordance with ČSN EN 1793-2 . . . . . **DL_R = 33 dB, category B3.**

The sound reduction curve related to the spectrum and additional measurement data are shown in the standard measurement record on page 4.

8. Measurement Uncertainty

Measurement uncertainty is expressed in accordance with ČSN EN 20140-2 using repeatability indices *r* and reproducibility indices *R*, which are values below which the absolute value of the difference of the test results, obtained under prescribed conditions, is to be found with a probability of 95%. For the single-digit quantity R_w the repeatability index is *r* = 1 dB, the reproducibility index is *R* = 2 dB.

In charge for the test: Ing. Miroslav Figalla

Sound reduction according to ČSN EN ISO 140-3

Laboratory measurement of airborne sound insulation of building elements

Reg. No.: 267/09

Customer:
TITAN-MULTIPLAST s.r.o.
Jablonecká 1379
CZ-468 51 Smržovka, Czech Republic

Product: polycarbonate sheet

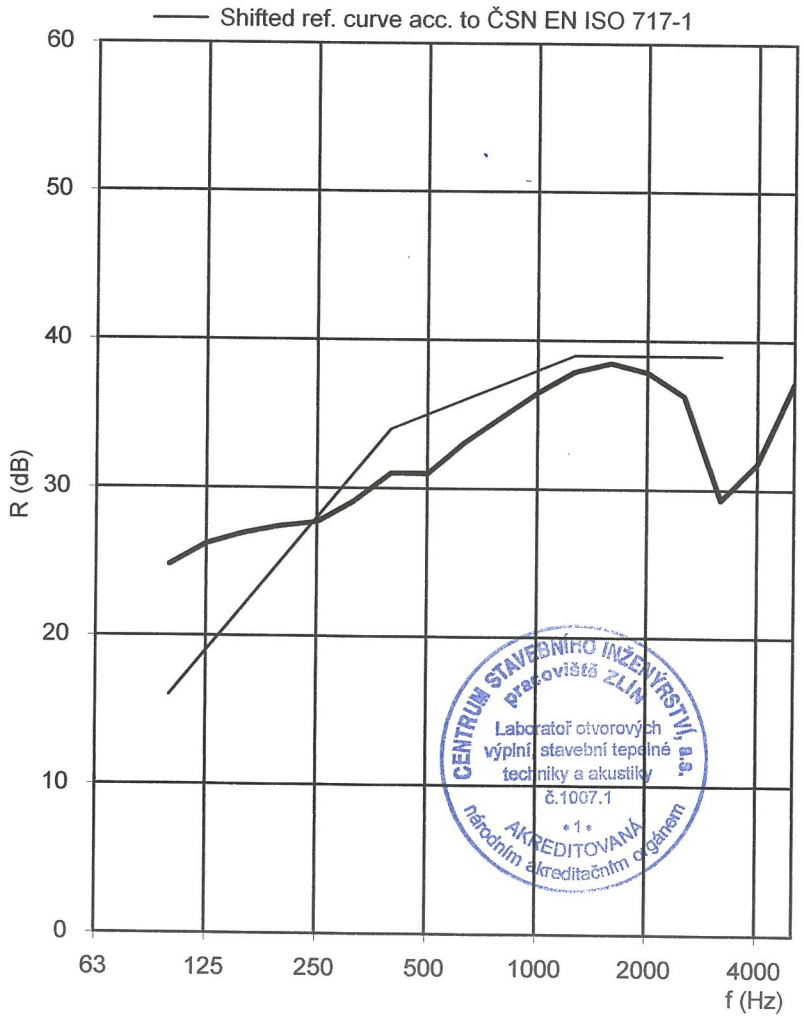
Sample description: MAKROLIFE transparent polycarbonate sheet, thickness 15 mm.
Manufacturer: Arla Plast AB, Sweden.
Dimensions 1,200 mm x 1,500 mm.
Weight 32.0 kg. Mass per unit 17.8 kg/m^2.

Sample No.: 175/A/09.

Conditions of the test

Test area:	1,7 m^2	Test date:	15.12.2009
Source room volume:	90 m^3	Air temperature:	18 °C
Receiving room volume:	70 m^3	Relative humidity:	56 %

Freq. (Hz)	*R* 1/3 okt. (dB)
100	24,8
125	26,2
160	26,9
200	27,4
250	27,7
315	29,1
400	31,0
500	31,0
630	33,1
800	34,8
1000	36,5
1250	37,9
1600	38,5
2000	37,9
2500	36,3
3150	29,3
4000	31,8
5000	37,2
Rating according EN ISO 717-1	
R_w (C;C_{tr}) = 35 (-2; -2) dB	



Centrum stavebního inženýrství a.s.
pracoviště Zlín

Date: 12.01.2010

Dipl. Ing. Miroslav Figalla
Head of laboratory