

Report

Laboratory for Acoustics

Measurements of the airborne soundinsulation of a
fire ventilator type "Duo-Therma TG Ak",
made by Brakel Aluminium

Report number A 1609-2E dd. 18 July 2006

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Report number: A 1609-2E

Date: 18 July 2006

Ref.: TS/YW/A 1609-2E-RA

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1. INTRODUCTION

At the request of Brakel Aluminium B.V. based in Uden (the Netherlands) sound insulation measurements have been carried out on a

fire ventilator type "Duo-Therma TG Ak", made by Brakel Aluminium

in the Laboratory for Acoustics of Peutz bv, at Mook, The Netherlands (see figure 1).



For this type of measurements the Laboratory for Acoustics has been accredited by the Dutch "Stichting Raad voor Accreditatie" (RvA).

The RvA is member of the EA MLA¹

¹ **EA MLA: European Accreditation Organisation MultiLateral Agreement:**
<http://www.european-accreditation.org>

EA: "Certificates and reports issued by bodies accredited by MLA and MRA members are considered to have the same degree of credibility, and are accepted in MLA and MRA countries."

2. NORMS AND GUIDELINES

The measurements have been carried out according to the Quality Manual of the Laboratory for Acoustics as well as:

ISO 140-3:1995 Acoustics - Measurements of sound insulation in buildings and of building elements: Part 3: Laboratory measurements of airborne sound insulation of building elements

NOTE: this international standard has been accepted within all EU-countries as European Norm EN ISO 140-3:1995

Various other related norms:

ISO 140-1:1997 Acoustics - Measurement of sound insulation of building elements - Part 1: Requirements for laboratory test facilities with suppressed flanking transmission

NOTE: this international standard has been accepted within all EU-countries as European Norm EN ISO 140-1:1997

ISO 140-2:1991 Acoustics - Measurement of sound insulation of building elements - Part 2: Determination, verification and application of precision data

NOTE: this international standard has been accepted within all EU-countries as European Norm EN ISO 140-2:1993

ISO 717-1:1996 Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation

NOTE: De norm ISO 717-1 is binnen alle landen van de EG aanvaard als Europese Norm EN ISO 717-1:1996

3. TESTED CONSTRUCTION

The description of the construction and the figures were taken from the drawings supplied by the client.

The measurements have been carried out on a fire ventilator in normal condition, immediately before the tests the fire valve has been opened and closed several times.

A fire ventilator type Duo-Therma TG Ak (see figures 6 and 7) has been examined. The fire ventilator has been mounted by the principal into the test opening E (b x h ca. 4,0 m x 4,0 m) between the rooms 2 and 8 (situated one on top of the other), see figure 1, 2 and 3. The dimensions of the ventilator under test were 2,5 m x 2,5 m.

For the purpose of this measurement a floor construction has been made into the test opening. This floor construction exists of a separate frame covered on the bottom side with two panels of 12,5 mm gypsum board and at the upper side with underlayment made heavier with a gypsum board. The cavity (ca. 250 mm) is filled with rockwool (ca. 100 mm). This construction has an opening of 2,5 x 2,5 m.

The sound insulation of this construction being such that the sound transmitted through this construction was negligible compared to the sound transmitted through the fire ventilator under test. The joint between the fire ventilator under test and the perimeter of the test opening has been sealed with pvc semi open.

The fire ventilator exists of two doors that can be opened. When closed, the doors match to the basic frame. A threefold sealing was used. For the sealing from the fire ventilator on the floorconstruction an EPDM rubber profile (inner side) and pvc semi open 10 x 10 mm (middle) were applied. The valves had an EPDM rubber profile (outsideside) all-around (see also figure 7, detail A).

The base frame and the doors are double layered and made of :

base frame (from the outer side to the inner side):

- aluminium plating; 2 mm
- gypsum board; 9,5 mm
- Rockwool 201; 30 mm
- aluminium plating; 2 mm
- Vibraflex 50, sound damping sheet (self-adhesive); 5 mm

Doors (from the outer side to the inner side) :

- aluminium plating; 2 mm
- Vibraflex 50, sound damping sheet; 5 mm
- 2 x Rockwool 201; 50 mm
- Vibraflex50, sound damping sheet (self-adhesive); 5 mm
- steel plating; 2 mm

The results as presented here relate only to the tested items and laboratory conditions as described in this report. The laboratory can make no judgement about the representability of the tested samples.

4. MEASUREMENTS

4.1. Method

The tests were conducted in accordance with the provisions of the test method ISO 140-3 in the Laboratory for Acoustics of Peutz bv in Mook. A detailed description of the test set up has been given in the figure 2 and 3 of this report.

The construction to be tested is placed into a test opening between two measuring rooms. In one of the rooms (the so-called sending room) loudspeakers generate broadband noise.

In this sending room as well as in the adjacent room (the "receiving room") the resulting sound pressure level is measured by means of a continuous rotating boom, so the (time- and space-) averaged sound pressure level is determined.

The reverberation time of the receiving room is also measured.

The instruments and the method used meet the requirements of ISO 140-3

As allowed by the test method the test procedure is repeated reversing the sending and receiving rooms. The reported value of each sound insulation is the arithmetic average of the two results.

In ISO 140-3 the airborne sound insulation of an object is defined as the "sound reduction index R" to be evaluated according to formula 1 and expressed in dB:

$$R = L_1 - L_2 + 10 \lg \left(\frac{S}{A} \right) \quad (1)$$

in which:

- L_1 = sound pressure level in the sending room [dB]
- L_2 = sound pressure level in the receiving room [dB]
- S = area of the object to be tested [m^2]
- A = equivalent sound absorption [m^2] in the receiving room according to:

$$A = \frac{0,16 V}{T} \quad (2)$$

in which :

- V = volume of the receiving room [m^3]
- T = reverberation time in the receiving room [s]

4.2. Accuracy

The accuracy of the airborne sound insulation as calculated can be expressed in terms of repeatability (tests within one laboratory) and reproducibility (between various laboratories).

4.2.1. Repeatability r

When: - two tests are performed on identical test material - within a short period of time - by the same person or team - using the same instrumentation - under unchanged environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to r.

In order to evaluate the repeatability r for the sound insulation measurements performed in the laboratories of Peutz bv in Mook eight series of measurements have been carried out according to ISO 140-2. From the results of those measurements the repeatability r has been calculated. It was found that for the frequency range from 100 to 250 Hz the repeatability r is 2,0 dB as a maximum. For the frequency range 315 to 3150 Hz the repeatability r is 1,3 dB as a maximum.

The repeatability r regarding the single-figure rating R_w is 0,7 dB as a maximum. As ISO 717-1 prescribes rounding of the R_w -values to the nearest dB repeatability r of 1 dB is applicable for the R_w -value.

From these results it may be concluded that the repeatability r as found satisfies the demands of ISO 140-2.

4.2.2. Reproducibility R

When: - two tests are performed on identical test material - in different laboratories - by different person(s) - under different environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to R

In ISO 140-2 there is a statement on the reproducibility R to be expected, based on the results of various inter-laboratory tests. The reproducibility of the single figure rating R_w is about 3 dB.

4.3. Environmental conditions during the tests

room	Temperature [°C]	relative humidity [%]
2	21,1	59,6
8	21,2	58,7

4.4. Results

The results of the measurements are given in table 1 and in figure 5.

Table 1 results of the measurements

	airborne sound insulation R [dB]	
fire ventilator figure	Duo- Therma TG Ak 8	
frequency [Hz]	1/3 oct.	1/1 oct.
100	32,2	
125	34,3	33,8
160	35,6	
200	36,3	
250	37,5	36,9
315	37,1	
400	38,7	
500	39,4	39,5
630	40,7	
800	43,6	
1000	45,0	44,5
1250	45,2	
1600	46,4	
2000	46,7	46,8
2500	47,3	
3150	48,6	
4000	50,3	50,2
5000	52,7	
$R_w(C;C_{tr})$	44(-1;-3) dB	

In the table and graph the values of the insulation found are presented in 1/3 octave bands. From these values the weighted sound reduction index R_w according to ISO 717-1 including the spectrum adaptation terms C and C_{tr} have been calculated and stated.

The results as presented here are based on a testing area of 6,3 m². In situations where different dimensions and/or method of mounting differ from the ones tested, different results may be found.

Mook,

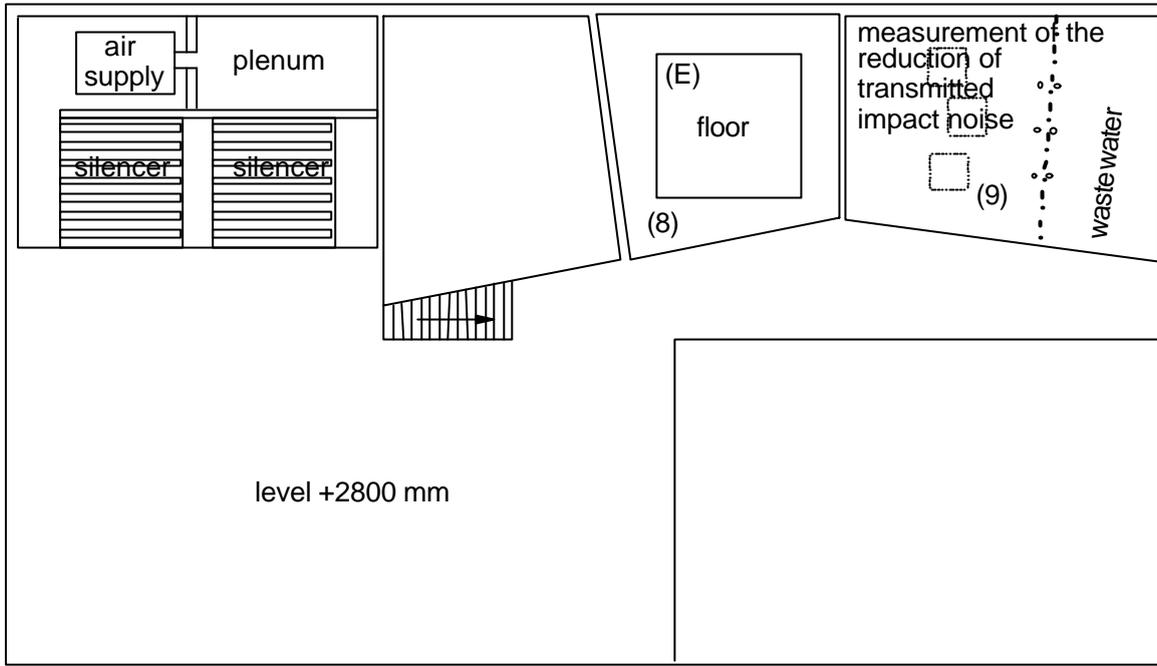
ir. M.L.S Vercammen
Manager

This report contains: 9 pages en 8 figures.

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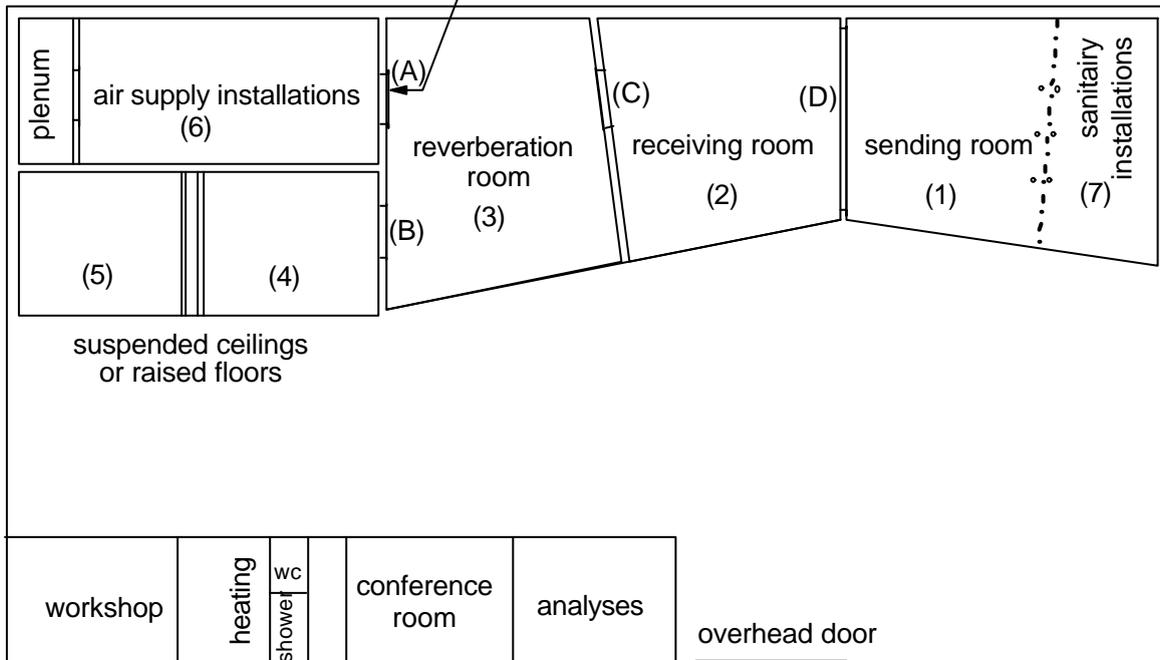
OVERVIEW

Story



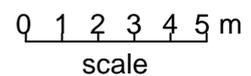
Ground level

opening (A) (closed)
w x h = 1300 x 1905 mm



TEST OPENINGS (w x h in mm)

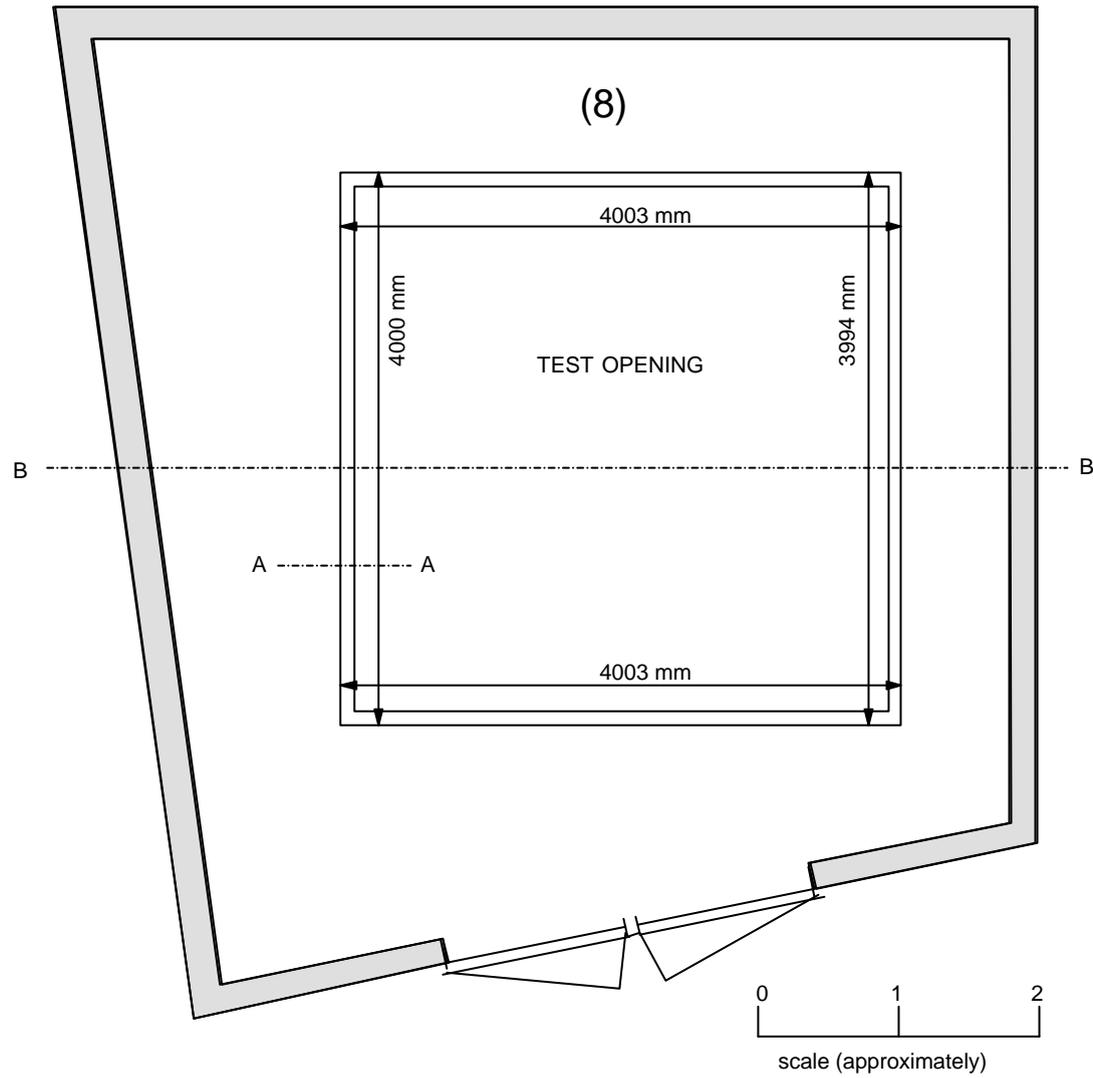
- (B) 1000 x 2200
- (C) 1500 x 1250
- (D) 4300 x 2800
- (E) 4000 x 4000



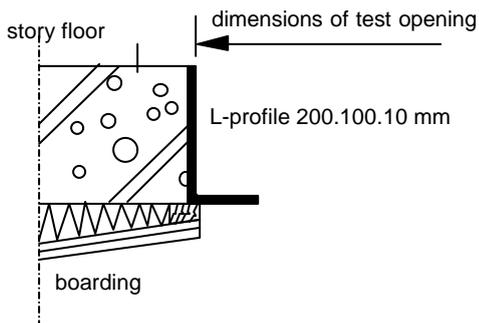
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TEST FACILITIES FOR ROOFS AND FLOORS

STORY

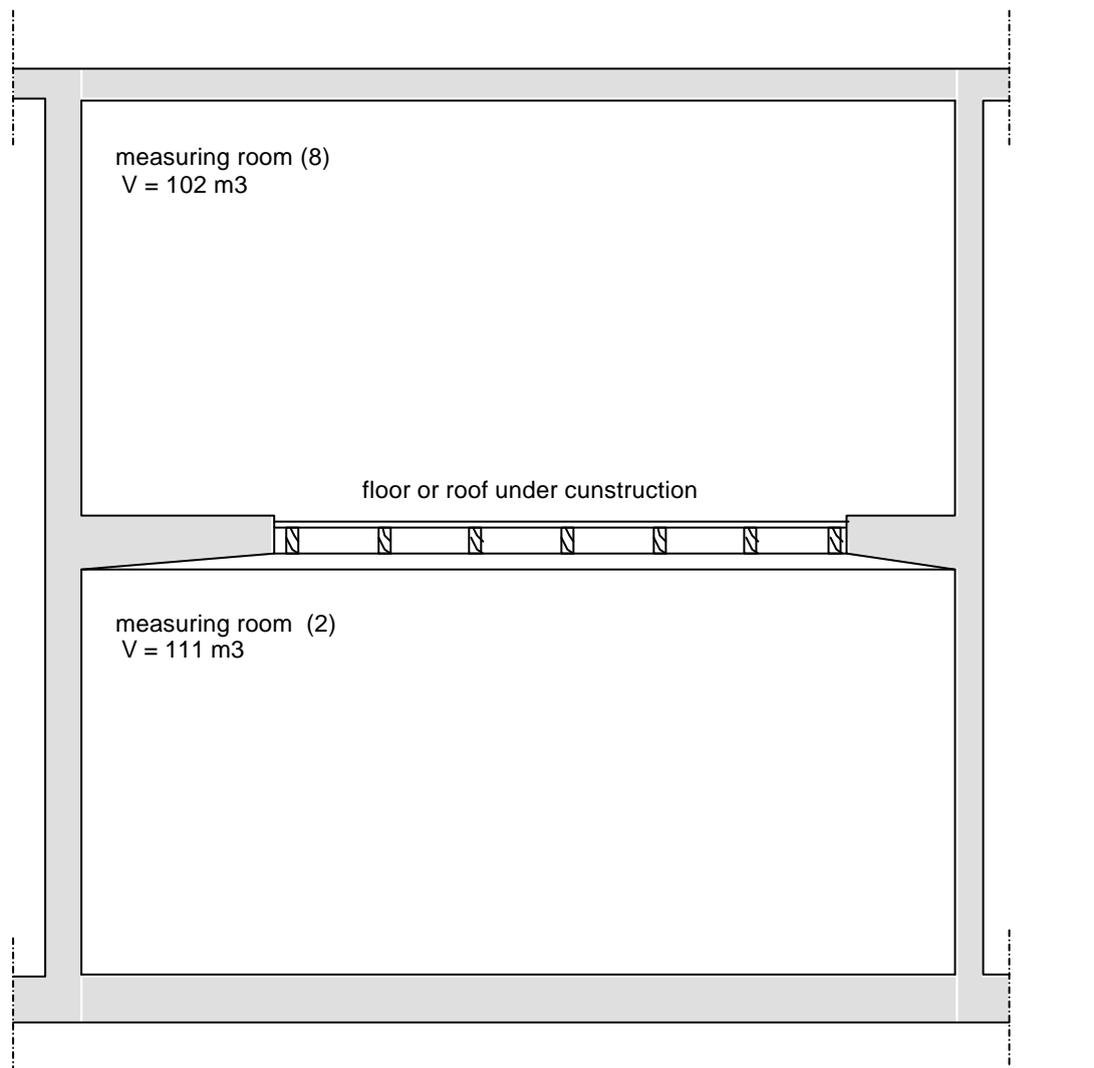


SECTION A - A



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TEST FACILITIES FOR ROOFS AND FLOORS
VERTICALSECTION B - B



0 1 2 m
scale (approximately)

making of a floor construction into the test opening



“separated frame”



Detail: “separate frame”



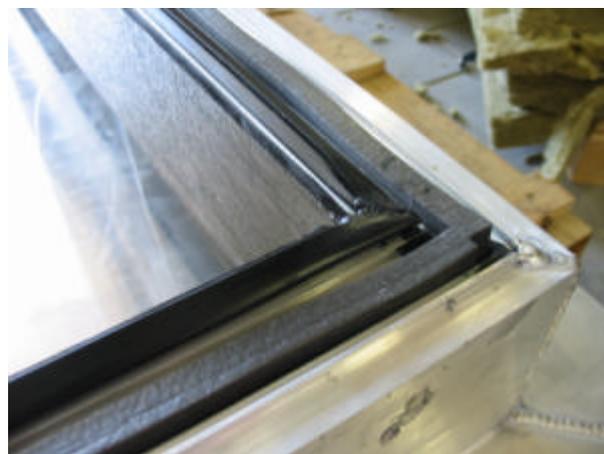
Construction with opening of 2,5 x 2,5 m



Mounting of the fire ventilator in the test opening



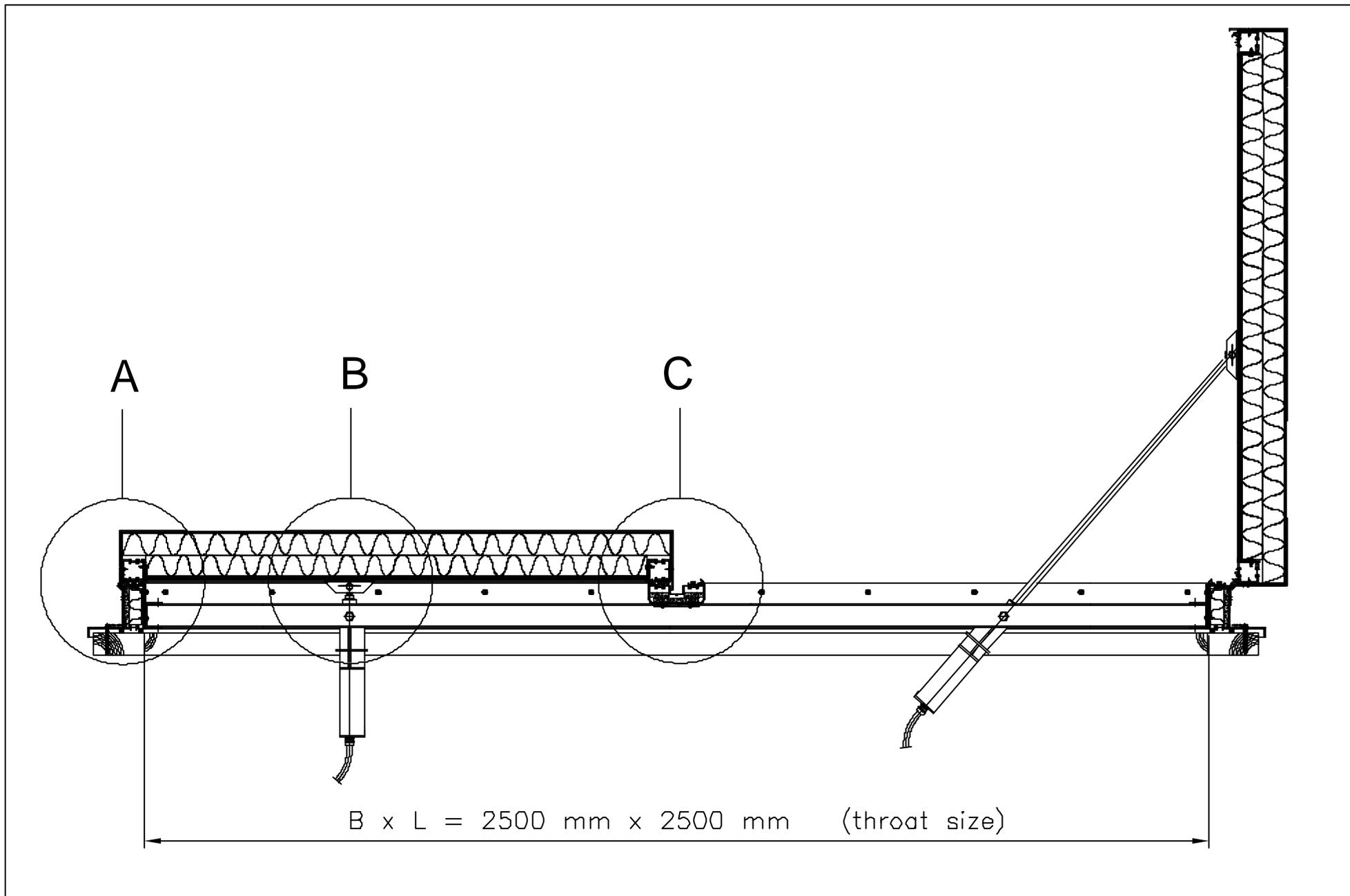
Measurement configuration

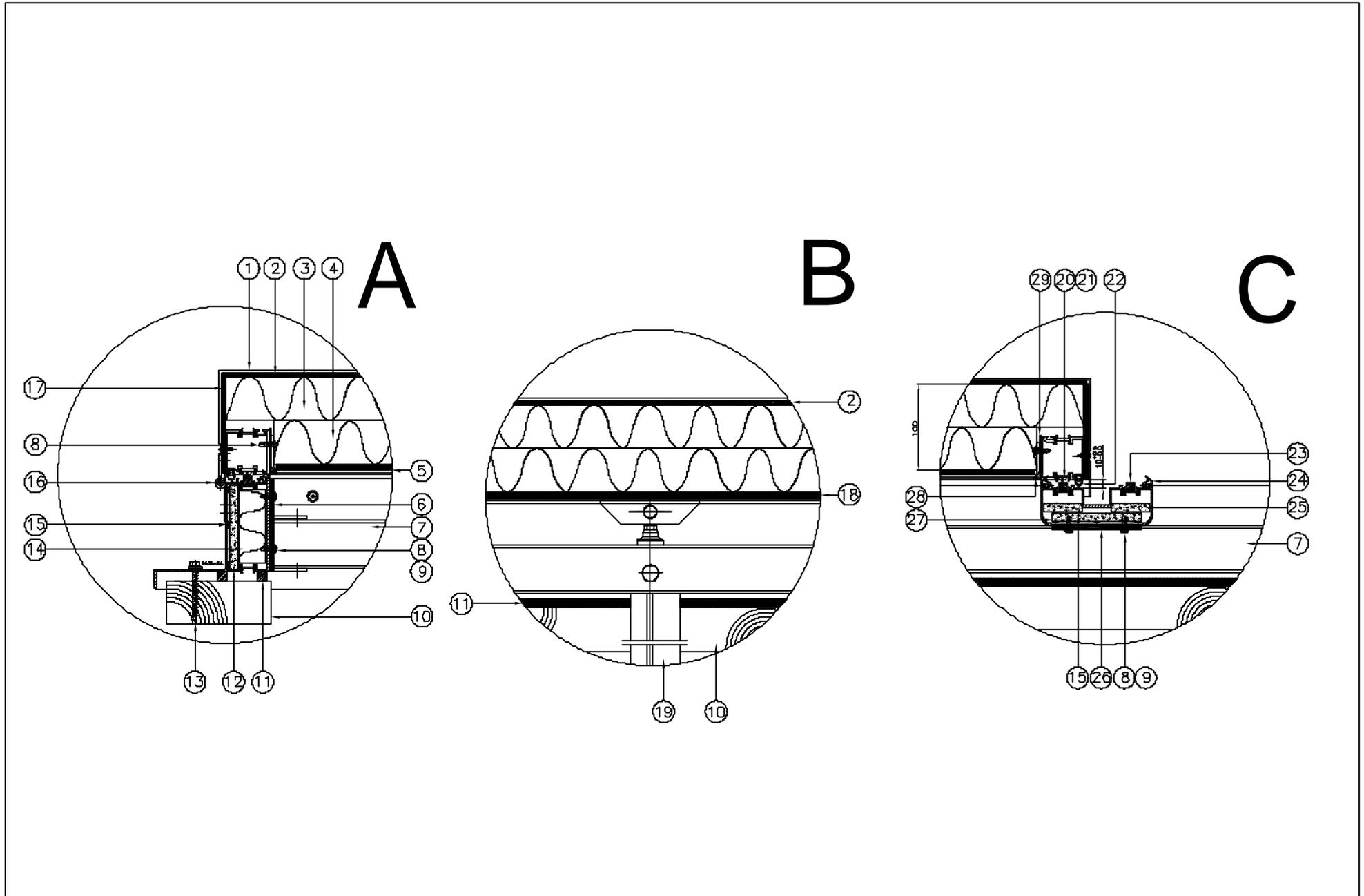


Detail (see also : fig. 7 detail A)

partlist Duo-Therma T with acoustic insulation

Pos .nr	Naming	Raw material	Note Drawing		Revision date
	assembly drawing		type 2525	Duo-Therma-Acou	120606
1	outer louvre	aluminium sheet	2 mm	Duo-Therma-Ac-A	120606
2	sound damping sheet - lid	Vibraflex 50	5 mm 10 kg/m2	Duo-Therma-Ac-A	120606
3	insulation lid - upper part	Rockwool 50	type 201	Duo-Therma-Ac-A	120606
4	insulation lid - lower part	Rockwool 50	type 201	Duo-Therma-Ac-A	120606
5	inner louvre	steel sheet	2 mm	Duo-Therma-Ac-A	120606
6	sound damping sheet - base	Vibraflex 50	5 mm 10 kg/m2	Duo-Therma-Ac-A	120606
7	traverse	steel		Duo-Therma-Ac-A	120606
8	screw	A2	ø4,8x16	Duo-Therma-Ac-A	120606
9	ring	A2	M5	Duo-Therma-Ac-A	120606
10	construction	wood	test facilities	Duo-Therma-Ac-A	120606
11	adhesive seal	pvc semi open	10x10 mm	Duo-Therma-Ac-A	120606
12	sound damping plate - base	plasterboard	9,5 mm	Duo-Therma-Ac-A	120606
13	screw	metall		Duo-Therma-Ac-A	120606
14	insulation - base	Rockwool	type 201	Duo-Therma-Ac-A	120606
15	flexible glue	silicon	Silglaze	Duo-Therma-Ac-A	120606
16	hinge	A2		Duo-Therma-Ac-A	120606
17	sound damping sheet - lid	Vibraflex 50	5 mm 10 kg/m2	Duo-Therma-Ac-A	120606
18	sound damping sheet - lid	Vibraflex 50	5 mm 10 kg/m2	Duo-Therma-Ac-A	120606
19	actuator		electrical or pneumatic	Duo-Therma-Ac-B	120606
20	seal	rubber		Duo-Therma-Ac-C	120606
21	glue	silicon	UVB	Duo-Therma-Ac-C	120606
22	seal	epdm		Duo-Therma-Ac-C	120606
23	adhesive seal	pvc semi open	10x10 mm	Duo-Therma-Ac-C	120606
24	seal	epdm		Duo-Therma-Ac-C	120606
25	sound damping plate - gutter	plasterboard	9,5 mm	Duo-Therma-Ac-C	120606
26	sound damping sheet - gutter	Vibraflex 50	5 mm 10 kg/m2	Duo-Therma-Ac-C	120606
27	sound damping plate - gutter	plasterboard	9,5 mm	Duo-Therma-Ac-C	120606
28	adhesive seal	pvc semi open	5x2 mm	Duo-Therma-Ac-C	120606
29	adhesive seal	pvc semi open	50x2 mm	Duo-Therma-Ac-C	120606



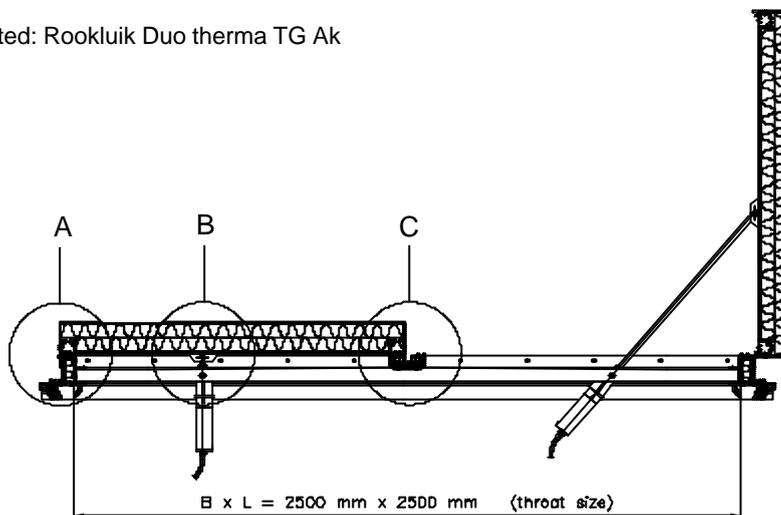


MEASUREMENT OF THE SOUND INSULATION ACCORDING TO ISO 140-3:1995

principal: Brakel Aluminium B.V.



construction tested: Rookluik Duo therma TG Ak



volume measuring room: 102 m³

volume measuring room: 115 m³

surface area tested partition: 6,3 m²

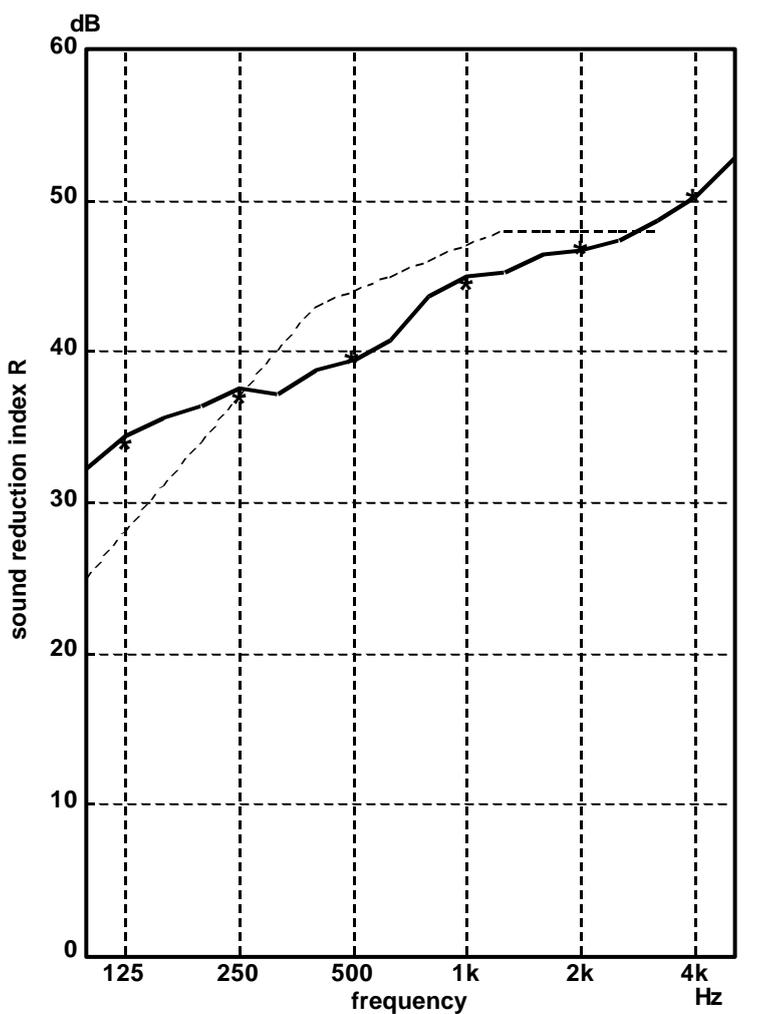
measured at: laboratory conditions

signal: broad-band noise

bandwidth: 1/3 octave

ISO 717-1:1996

$$R_w(C;C_{tr}) = 44(-1;-3) \text{ dB}$$



— 1/3 oct.
* 1/1 oct.

	125	250	500	1k	2k	4k
1/3 oct.	32,2	36,3	38,7	43,6	46,4	48,6
	34,3	37,5	39,4	45,0	46,7	50,3
	35,6	37,1	40,7	45,2	47,3	52,7
1/1 oct.	33,8	36,9	39,5	44,5	46,8	50,2

publication is permitted for the entire page only

Mook, 29-06-2006

