DÉPARTEMENT ACOUSTIQUE ET ÉCLAIRAGE

Laboratoire d'essais acoustiques

TESTS REPORT N° AC07-26007053/1
CONCERNING SOME ROOF ELEMENTS

It comprises twelve pages.

REQUESTED BY : **FILC**
Slovenska 40
SI-1234 MENGES
SLOVENIE

Our/Ref.: BR-70006596
26007053
CH/GA

TESTS REPORT N° AC07-26007053/1

SCOPE

Study the sound behaviour of 3 roof elements, exited by an artificial rain.

REFERENCE TEXTS

The sound measurements are carried out according to the Standard NF EN ISO 140-18 (2006), entitled: "Laboratory measurement of sound generated by rainfall on building elements", and according to the Standard NF EN ISO 140-1.

OBJECT SUBMITTED TO THE TESTS

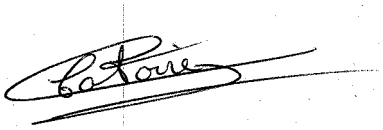
Date of reception at the laboratory : April, 18th 2007 & June, 6th 2007
Origin : Requester
Installation : Requester

SUMMARY LIST OF TESTS

1 Metal sheet
2 Metal sheet + DR!PSTOP 110
3 Metal sheet + DRAIN DR!PSTOP 150

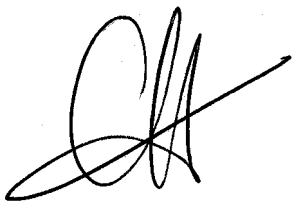
Made at Marne-la-Vallée, 25 February 2008

The technician responsible for the tests



Carole HORLAVILLE

The head of Division



Jean Baptiste CHENE

INSTALLATION OF THE ROOF ELEMENTS

Tests	1 to 3
Date	2007
Station	DELTA

REQUESTER, MANUFACTURER **FILC**

CONFIGURATION **Slope 5°**

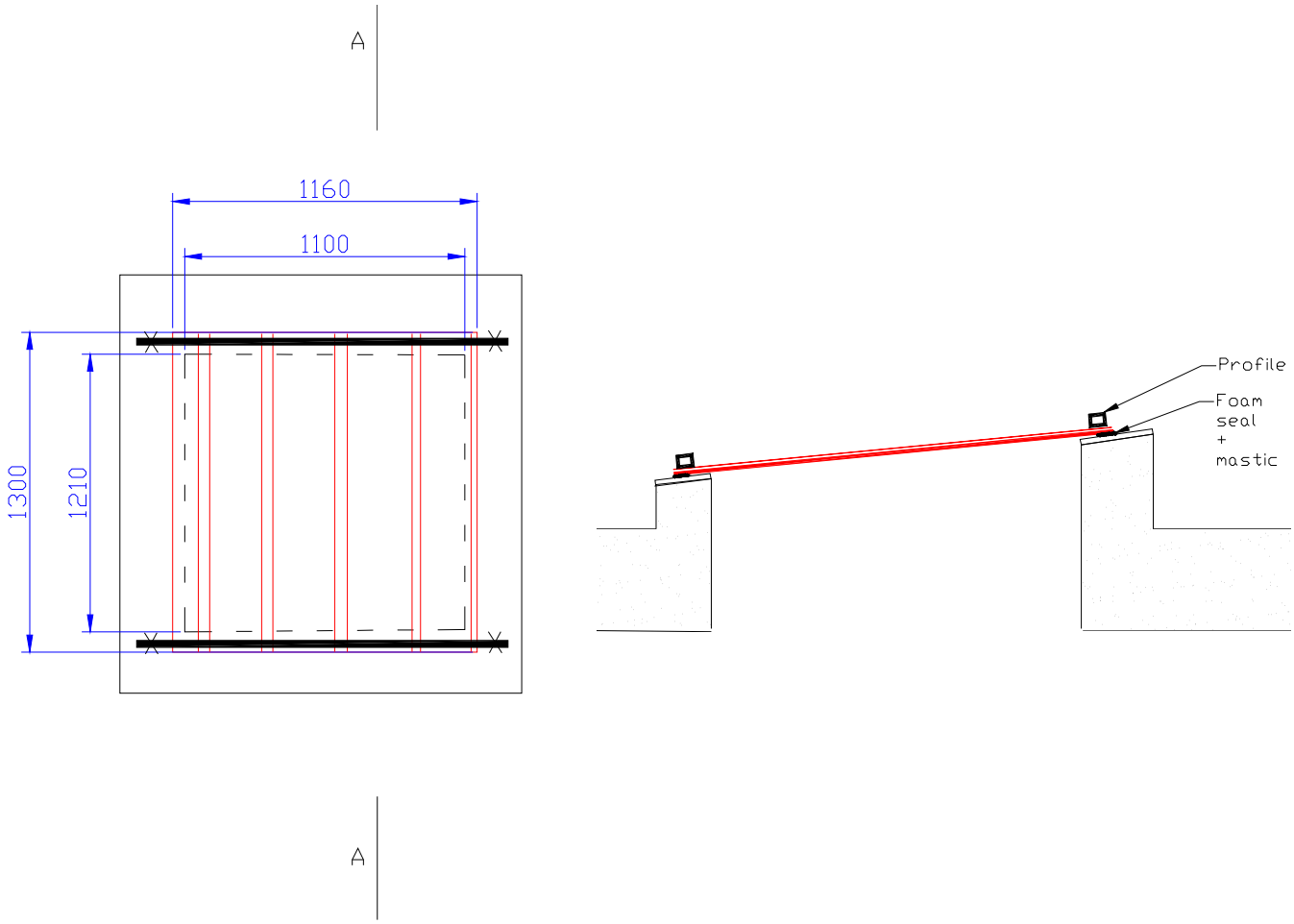
MAIN CHARACTERISTICS

Dimensions H x W of each element in mm : 1300 x 1150
Dimensions of the test opening in mm : 1210 x 1100

INSTALLATION

Every roof elements are fixed on an opening into a concrete partition with a slope of 5° with two metal profiles.

The waterproofing is made with a foam seal and mastic TX (ATE) at the periphery:



Overall view **Section view AA**

Dimensions in mm

DESCRIPTION OF A ROOF ELEMENT

Test	1
Date	21/06/07
Station	DELTA

REQUESTER, MANUFACTURER **FILC**

NAME **METAL SHEET**

CONFIGURATION **Slope 5°**

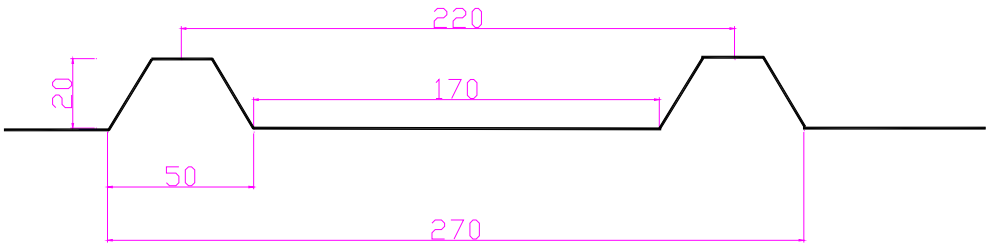
APTITUDE IN THE EMPLOYMENT **not determined**

MAIN CHARACTERISTICS

Dimensions H x W in mm : 1300 x 1150
Dimensions of the opening in mm : 1210 x 1100

DESCRIPTION

Metal sheet: Nature: Metal sheet
Thickness in mm: 0.5



Dimensions in mm

SOUND INTENSITY LEVEL L_i GENERATED BY A RAINFALL ON A ROOF ELEMENT

AD73

Test	1
Date	21/06/07
Station	DELTA

REQUESTER, MANUFACTURER **FILC**

NAME **METAL SHEET**

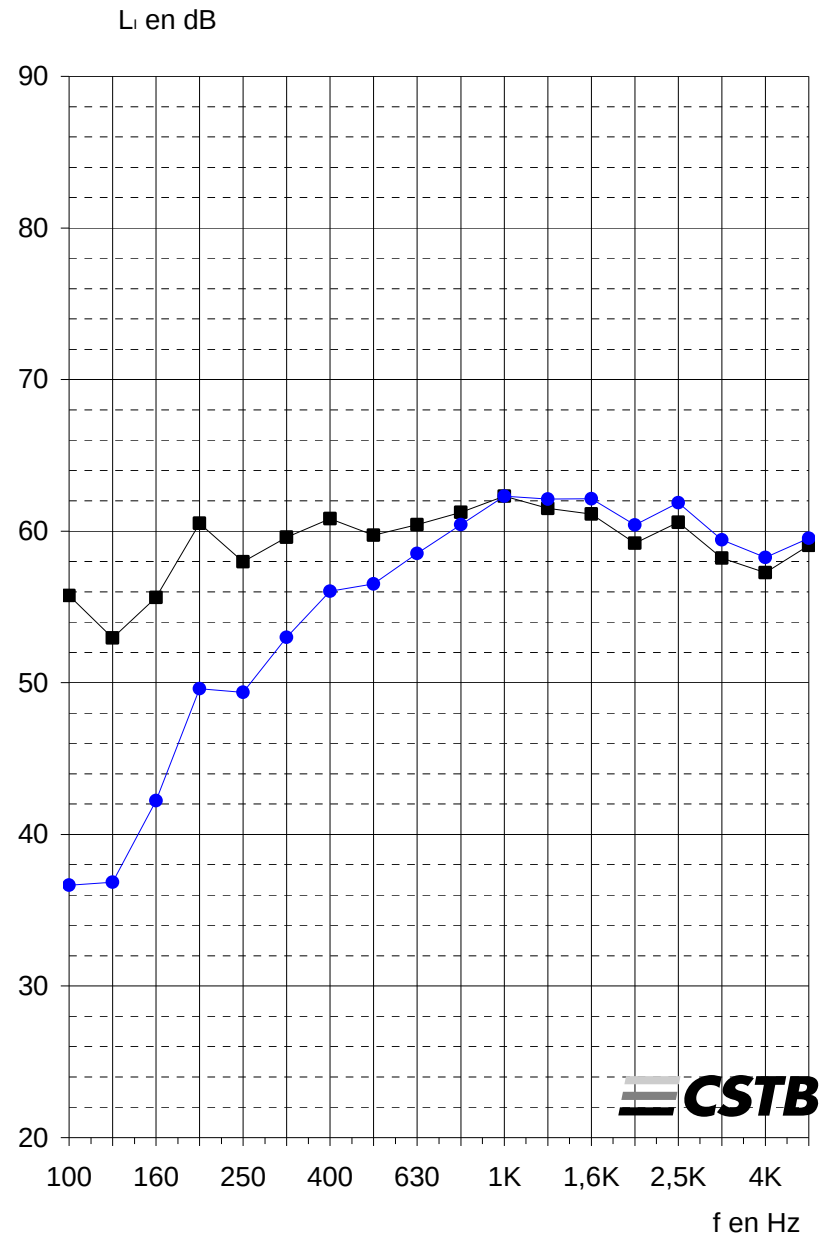
CONFIGURATION **Slope 5°**

APTITUDE IN THE EMPLOYMENT **not determined**

MAIN CHARACTERISTICS

Dimensions H x W in mm : 1300 x 1150
Dimensions of the opening in mm : 1210 x 1100

RESULTS



f	L_i	L_{IA}
100	55,7	36,6
125	53,0	36,9
160	55,6	42,2
200	60,5	49,6
250	58,0	49,4
315	59,6	53,0
400	60,8	56,0
500	59,7	56,5
630	60,4	58,5
800	61,2	60,4
1K	62,3	62,3
1,25K	61,5	62,1
1,6K	61,1	62,1
2K	59,2	60,4
2,5K	60,6	61,9
3,15K	58,2	59,4
4K	57,3	58,3
5K	59,0	59,5

L_i = 72 dB

L_{IA} = 71 dB(A)

DESCRIPTION OF A ROOF ELEMENT

Test	2
Date	12/10/07
Station	DELTA

REQUESTER, MANUFACTURER **FILC**

NAME **METAL SHEET + DR!PSTOP 110**

CONFIGURATION **Slope 5°**

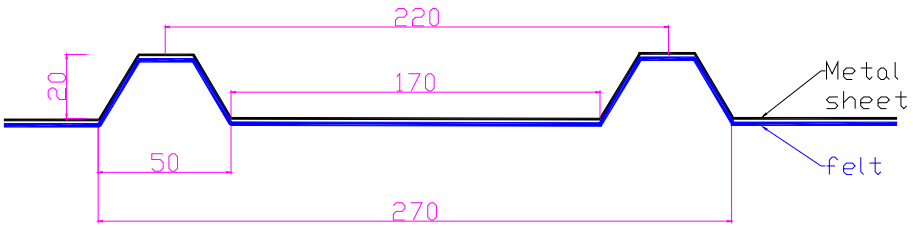
APTITUDE IN THE EMPLOYMENT **not determined**

MAIN CHARACTERISTICS

Dimensions H x W in mm : 1300 x 1150
Dimensions of the opening in mm : 1210 x 1100

DESCRIPTION

Metal sheet:	Nature :	Metal sheet
	Thickness in mm:	0.5
Felt:	Reference:	DR!PSTOP 110
	Nature :	100% PES Nonwoven – self adhesive
	Thickness:	1 mm
	Weight per unit of area:	110 g/m²
Manufacturing:	The felt is bonded under the metal sheet	



Dimensions in mm

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SOUND INTENSITY LEVEL L_i GENERATED BY A RAINFALL ON A ROOF ELEMENT

AD73

Test	**2**
Date	**12/10/07**
Station	**DELTA**

REQUESTER, MANUFACTURER **FILC**

NAME **METAL SHEET + DR!PSTOP 110**

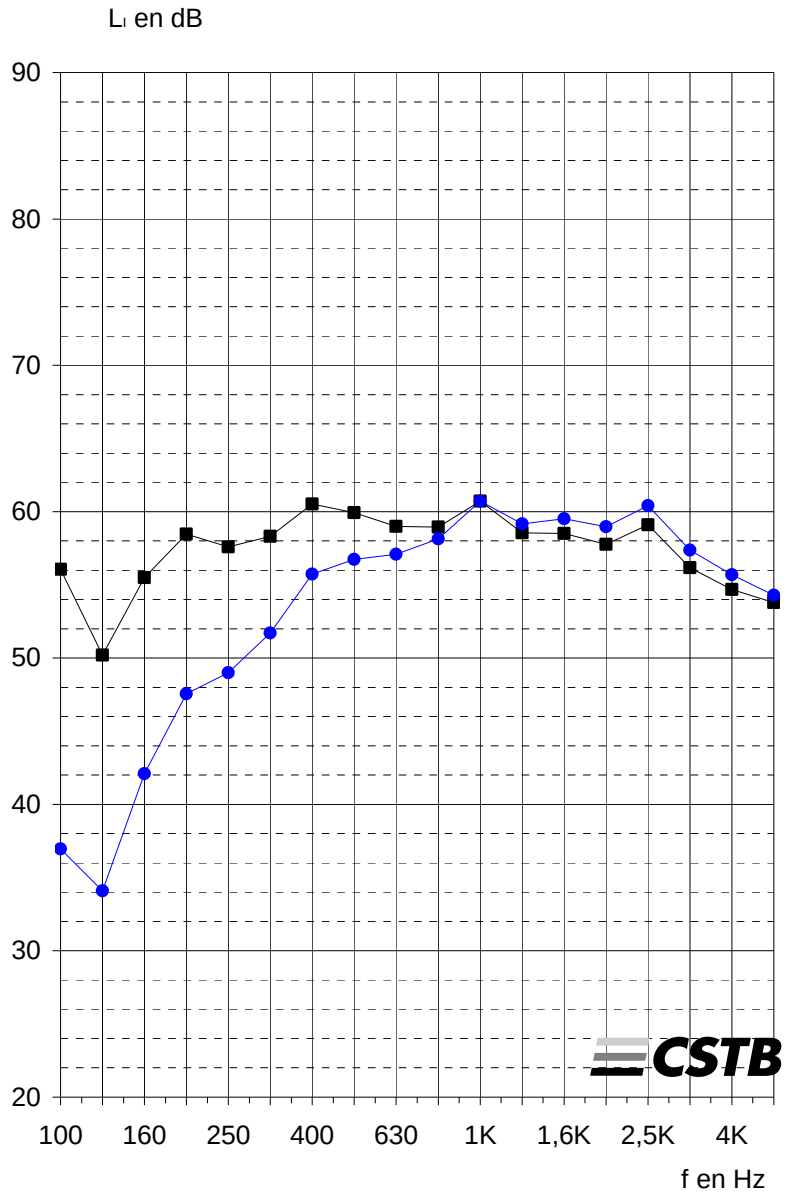
CONFIGURATION **Slope 5°**

APTITUDE IN THE EMPLOYMENT **not determined**

MAIN CHARACTERISTICS

Dimensions H x W in mm : 1300 x 1150
Dimensions of the opening in mm : 1210 x 1100

RESULTS



f	LI	L_{IA}
100	56,1	37,0
125	50,2	34,1
160	55,5	42,1
200	58,5	47,6
250	57,6	49,0
315	58,3	51,7
400	60,5	55,7
500	59,9	56,7
630	59,0	57,1
800	58,9	58,1
1K	60,7	60,7
1,25K	58,6	59,2
1,6K	58,5	59,5
2K	57,8	59,0
2,5K	59,1	60,4
3,15K	56,2	57,4
4K	54,7	55,7
5K	53,8	54,3

L_I = 71 dB

L_{IA} = 69 dB(A)

DESCRIPTION OF A ROOF ELEMENT

Test	3
Date	14/05/07
Station	DELTA

REQUESTER, MANUFACTURER **FILC**

NAME **METAL SHEET + DRAIN DR!PSTOP 150**

CONFIGURATION **Slope 5°**

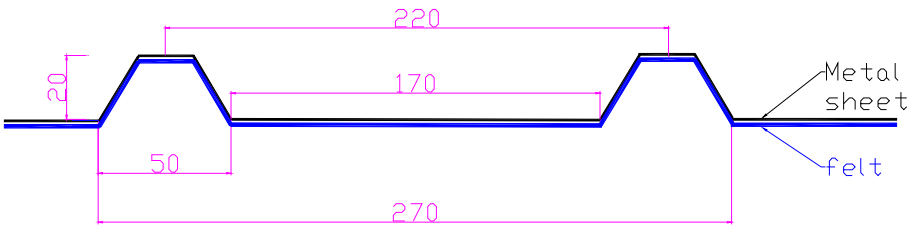
APTITUDE IN THE EMPLOYMENT **not determined**

MAIN CHARACTERISTICS

Dimensions H x W in mm : 1300 x 1150
Dimensions of the opening in mm : 1210 x 1100

DESCRIPTION

Metal sheet:	Nature :	Metal sheet
	Thickness in mm:	0.5
Felt:	Reference:	DRAIN DR!PSTOP 150
	Nature :	100% PES Nonwoven - selfadhesive
	Thickness:	1.7 mm
	Weight per unit of area:	150 g/m²
Manufacturing:	The felt is bonded under the metal sheet	



Dimensions in mm

TESTS REPORT N° AC07-26007053/1

SOUND INTENSITY LEVEL L_i GENERATED BY A RAINFALL ON A ROOF ELEMENT

AD73

Test	**3**
Date	**14/05/07**
Station	**DELTA**

REQUESTER, MANUFACTURER **FILC**

NAME **METAL SHEET + DRAIN DR!PSTOP 150**

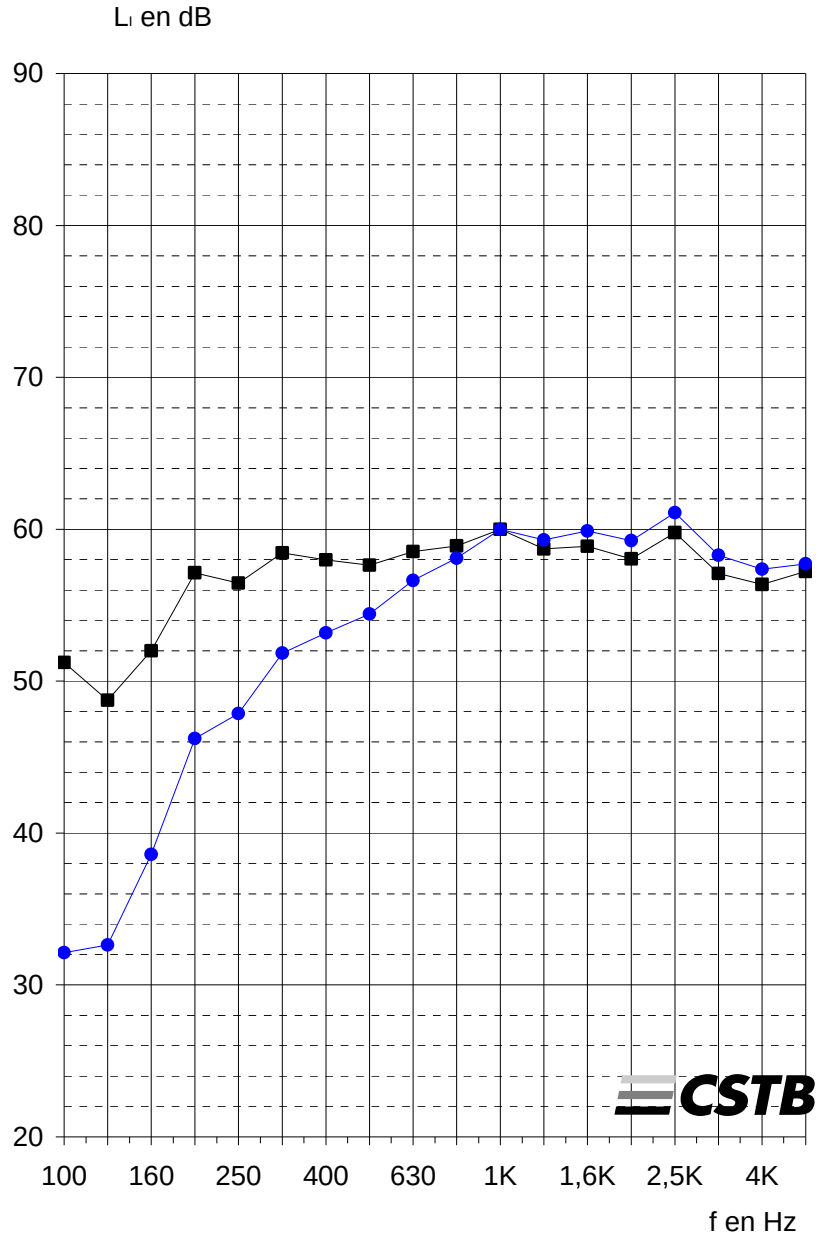
CONFIGURATION **Slope 5°**

APTITUDE IN THE EMPLOYMENT **not determined**

MAIN CHARACTERISTICS

Dimensions H x W in mm : 1300 x 1150
Dimensions of the opening in mm : 1210 x 1100

RESULTS



f	L_i	L_{iA}
100	51,2	32,1
125	48,7	32,6
160	52,0	38,6
200	57,1	46,2
250	56,5	47,9
315	58,4	51,8
400	58,0	53,2
500	57,6	54,4
630	58,5	56,6
800	58,9	58,1
1K	60,0	60,0
1,25K	58,7	59,3
1,6K	58,9	59,9
2K	58,1	59,3
2,5K	59,8	61,1
3,15K	57,1	58,3
4K	56,4	57,4
5K	57,2	57,7

L_i = 70 dB

L_{IA} = 69 dB(A)

APPENDIX 1
METHOD OF EVALUATION & EXPRESSION OF THE RESULTS

MEASUREMENT PROTOCOL

This protocol was prepared and based on specifications taken from the above-designated texts and, more specifically, from the Standard EN ISO 140-18.

What it does is define the sound intensity level generated by the impact of rain on the roof elements, and the types of rain to be applied.

The type of heavy rain chosen is characterised by the following parameters:

- Rain fall measurement : 40 mm/h,
- Drop diameter : 5 mm,
- Falling speed : 7 m/s

The surface exposed to rain is equal to 1.625 m².

The sound intensity level L_i is obtained from the standard sound pressure level L_{pr} by the following formula:

$$L_i = Lpr - 14 - 10\log\left(\frac{T}{T_0}\right) + 10\log\left(\frac{V}{V_0}\right) - 10\log\left(\frac{S}{S_0}\right)$$

With: L_{pr}: Averaged sound-pressure level measured in the test room under the roof element subjected to the tests (dB),

T_0 : Reference time (1s),

S_0 : Reference area (1m²),

V_0 : Reference volume (1m^3),

S : Area of the test specimen directly excited by the rainfall (m²),

V : Volume of the test room (m^3),

T : Reverberation time in the test room (s).

The measurement rig is composed of:

- A perforated box that can wet 1.625 square metre of the roof test specimen. It is positioned 3.50 metres high.
- A test frame upon which the model is placed.

The area of the model subjected to the test is 1.6 m².

APPENDIX 2 – APPARATUS | STATION DELTA

Emission room: HALL

DESIGNATION	BRAND	TYPE	CSTB N°
Tapping machine	Bruël & Kjær	3204	CSTB 98 0182

Reception room: DELTA 2

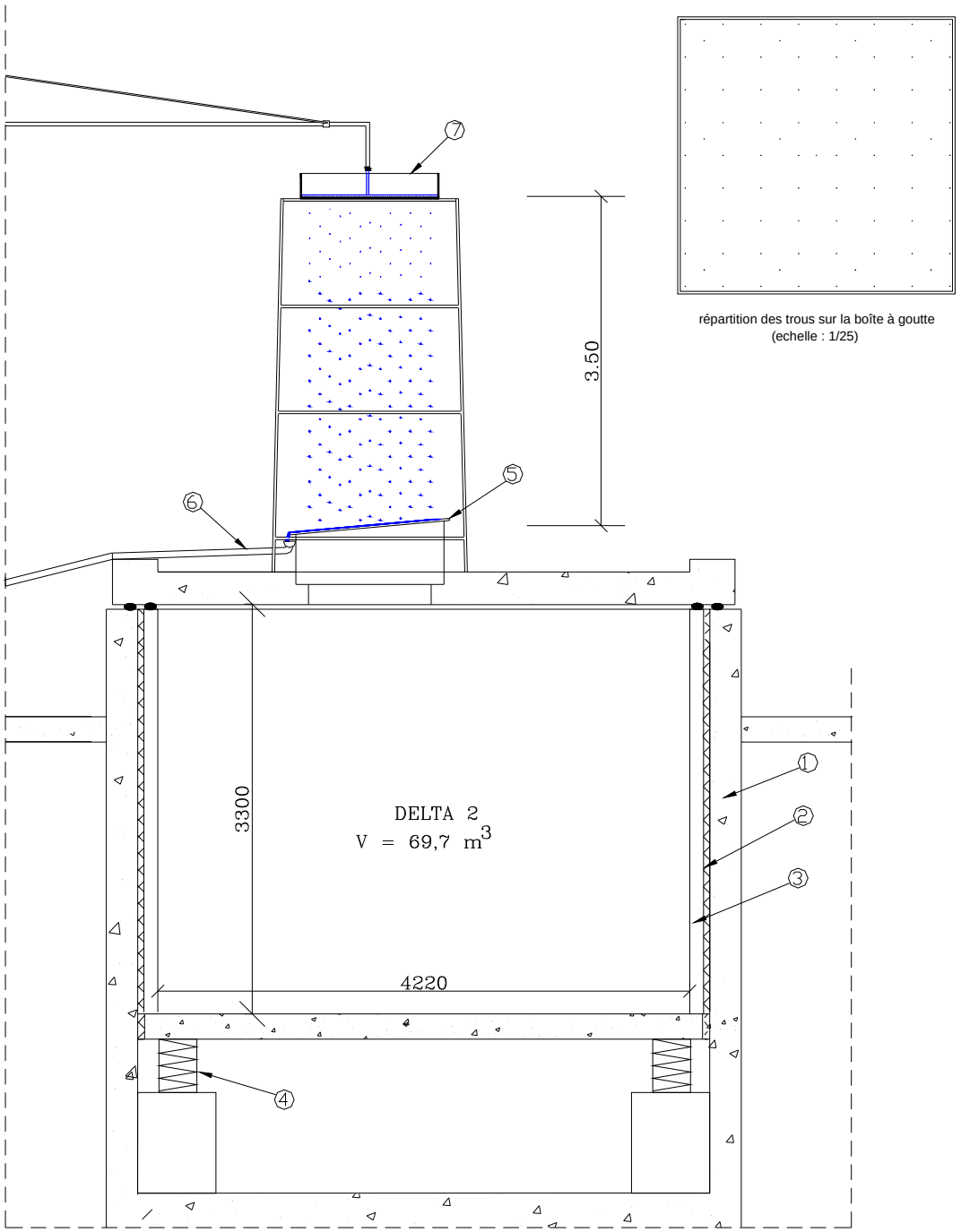
DESIGNATION	BRAND	TYPE	CSTB N°
Microphone network	Bruël & Kjær Bruël & Kjær	Microphone 4166 Preamplifier 2669	CSTB 01 0208
Rotating arm	Bruël & Kjær	3923	CSTB 90 0089
Amplifier	CARVER	PM600	CSTB 91 0116
Speaker	CSTB-ELECTRO VOICE	Pyramid	CSTB 97 0203

Control room:

DESIGNATION	BRAND	TYPE	CSTB N°
Real Time Analyser	Bruël & Kjær	2144	CSTB 96 0176
Microcomputer	DELL	OPTIPLEX GX 270	
Calibrator	Bruël & Kjær	4231	CSTB 04 1839

APPENDIX 3 – TEST STATION DRAWING

STATION DELTA



dimensions en mm

REP	DESIGNATION
7	Boîte à gouttes avec alimentation continue
6	Evacuation
5	caisson support
4	Boîte à ressort
3	Voile de béton plein e=100 mm
2	Laine minérale
1	Béton e=200 mm

échelle: 1/50

POSTE DELTA 2 (configuration pluie)

CSTB-ACOUSTIQUE

END OF REPORT