HEALTH AND COMFORT DEPARTMENT

Acoustics Test Laboratory

TEST REPORT N° AC16-26064797/1
CONCERNING FOUR JAPANESE PANELS

It comprises seizeixteen pages.

REQUESTED BY: **LILY LATIFI**
11 rue des Gardes
75018 Paris

N/Ref. : BR-70055256
26064797/1
JB/VG

TEST REPORT N° AC16-26064797/1

TEST SCOPE

Determination of the equivalent sound absorption area A of four Japanese panels.

REFERENCE TEXTS

The measurements are carried out according to the Standard NF EN ISO 354 (2004).

TEST SPECIMEN

Date of reception in the laboratory : 3rd October 2016
Origin : Requester
Installation : CSTB

SUMMARY LIST OF TESTS

The samples were selected by the manufacturer as being representative of the current production at the factory.

Test n°	Object submitted for testing:
1	Unperforated felt sliding panels, 3mm thick.
2	Folding felt wall, 3mm thick.
3	Perforated felt sliding panels, 3mm thick.
4	Unperforated felt sliding panels, 2mm thick.

Prepared at Marne-la-Vallée, 24 November 2016

Responsible for the tests

Jivara BESHIR

Head of testing group

Alexandre CANCIAN

TEST REPORT N° AC16-26064797/1

DESCRIPTION AND INSTALLATION OF JAPANESE PANELS

Test 1
Date 03/10/16
Station ALPHA

REQUESTER, MANUFACTURER **LILY LATIFI**

NAME **Unperforated felt sliding panels, 3mm thick**

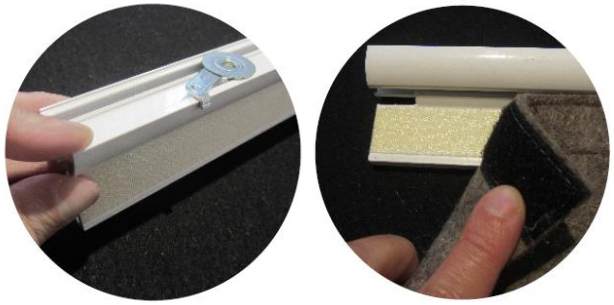
CONFIGURATION **Hanged on self-supporting construction and weighted on the bottom side**

FITNESS FOR PURPOSE **Unchecked**

MAIN CHARACTERISTICS

Dimensions in mm : 900 x 2400
Area in m² : 2.16
Thickness in mm : 3
Mass per unit area in kg/m² : 0.9

DESCRIPTION (dimensions are given in mm)

Panels	100% wool without perforations, of thickness 3mm and dimensions 900 x 2400. Weighted on the bottom side with an aluminium stick.
Fixing elements	PVC profile + velcro tape on trolley. 

INSTALLATION (dimensions are given in mm)

Three panels are put in test station. They are hung with the PVC profile which is fixed on a wooden self-supporting structure.

TEST REPORT N° AC16-26064797/1

EQUIVALENT SOUND ABSORPTION AREA OF JAPANESE PANELS

AA79

Test 1
Date 03/10/16
Station ALPHA

REQUESTER, MANUFACTURER **LILY LATIFI**

NAME **Unperforated felt sliding panels, 3mm thick.**

CONFIGURATION **Hanged on self-supporting construction and weighted on the bottom side.**

FITNESS FOR PURPOSE **Unchecked**

MAIN CHARACTERISTICS

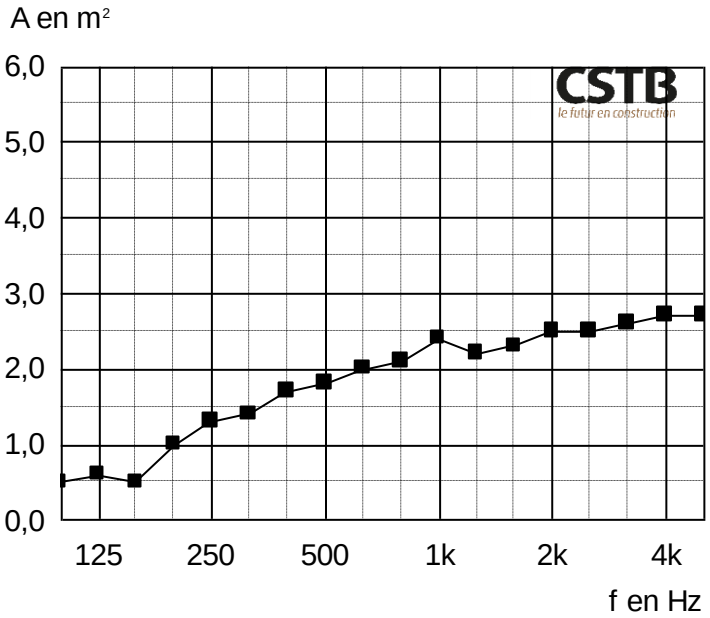
Dimensions in mm : 900 x 2400
Area in m² : 2.16
Thickness in mm : 3
Mass per unit area in kg/m² : 0.9

MEASUREMENT CONDITIONS

Empty room:
Temperature: 19.0 °C
Relative humidity: 61 %

Room with sample:
Temperature: 19.5 °C
Relative humidity: 58 %

RESULTS



f	A
100	0,5
125	0,6
160	0,5
200	1,0
250	1,3
315	1,4
400	1,7
500	1,8
630	2,0
800	2,1
1000	2,4
1250	2,2
1600	2,3
2000	2,5
2500	2,5
3150	2,6
4000	2,7
5000	2,7
Hz	m²

TEST REPORT N° AC16-26064797/1

DESCRIPTION AND INSTALLATION OF JAPANESE PANELS

Test 2
Date 03/10/16
Station ALPHA

REQUESTER, MANUFACTURER **LILY LATIFI**

NAME **Folding felt wall, 3mm thick.**

CONFIGURATION **Hanged on self-supporting construction.**

FITNESS FOR PURPOSE **Unchecked**

MAIN CHARACTERISTICS

Dimensions in mm : 1750 x 2450
Area in m² : 4.29
Thickness in mm : 3
Mass per unit area in kg/m² : 0.9

DESCRIPTION (dimensions are given in mm)

Panels	Folding felt wall 100% wool without perforations, of thickness 3mm and dimensions 1750 x 2450. Unweighted.
Fixing elements	PVC profile + hook and eyelet system. 

INSTALLATION (dimensions are given in mm)

Three panels are put in test station. They are hung with the PVC profile which is fixed on a wooden self-supporting structure.

TEST REPORT N° AC16-26064797/1

EQUIVALENT SOUND ABSORPTION AREA OF JAPANESE PANELS

AA79

Test 2
Date 03/10/16
Station ALPHA

REQUESTER, MANUFACTURER **LILY LATIFI**

NAME **Folding felt wall, 3mm thick.**

CONFIGURATION **Hanged on self-supporting construction.**

FITNESS FOR PURPOSE **Unchecked**

MAIN CHARACTERISTICS

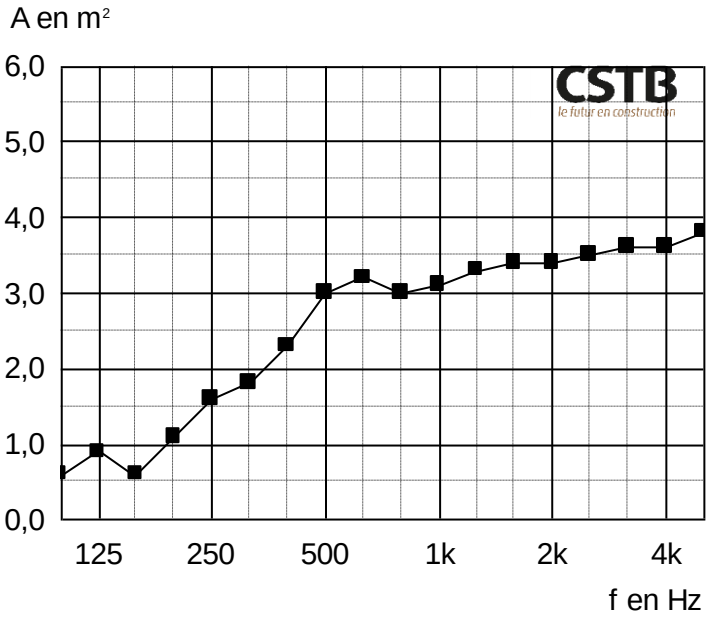
Dimensions in mm : 1750 x 2450
Area in m² : 4.29
Thickness in mm : 3
Mass per unit area in kg/m² : 0.9

MEASUREMENT CONDITIONS

Empty room:
Temperature: 19.0 °C
Relative humidity: 61 %

Room with sample:
Temperature: 19.5 °C
Relative humidity: 56 %

RESULTS



f	A
100	0,6
125	0,9
160	0,6
200	1,1
250	1,6
315	1,8
400	2,3
500	3,0
630	3,2
800	3,0
1000	3,1
1250	3,3
1600	3,4
2000	3,4
2500	3,5
3150	3,6
4000	3,6
5000	3,8
Hz	m²

TEST REPORT N° AC16-26064797/1

DESCRIPTION AND INSTALLATION OF JAPANESE PANELS

Test 3
Date 27/10/16
Station ALPHA

REQUESTER, MANUFACTURER **LILY LATIFI**

NAME **Perforated felt sliding panels, 3mm thick.**

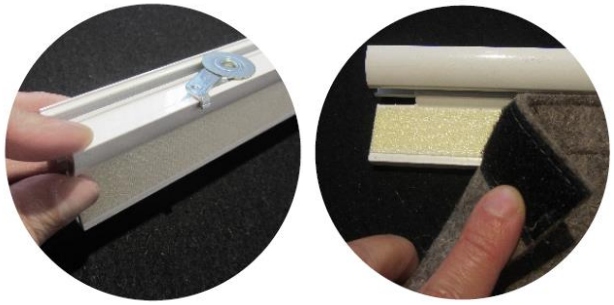
CONFIGURATION **Hanged on self-supporting construction and weighted on the bottom side.**

FITNESS FOR PURPOSE **Unchecked**

MAIN CHARACTERISTICS

Dimensions in mm : 900 x 2400
Area in m² : 2.16
Thickness in mm : 3
Mass per unit area in kg/m² : 0.9

DESCRIPTION (dimensions are given in mm)

Panels	100% wool with perforated pattern, of thickness 3mm and dimensions 900 x 2400. Weighted on the bottom side with an aluminium stick.
Fixing elements	PVC profile + velcro tape on trolley. 

INSTALLATION (dimensions are given in mm)

Three panels are put in test station. They are hung with the PVC profile which is fixed on a wood self-supporting structure.

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EQUIVALENT SOUND ABSORPTION AREA OF JAPANESE PANELS

AA79

Test 3
Date 27/10/16
Station ALPHA

REQUESTER, MANUFACTURER **LILY LATIFI**

NAME **Perforated felt sliding panels, 3mm thick.**

CONFIGURATION **Hanged on self-supporting construction and weighted on the bottom side.**

FITNESS FOR PURPOSE **Unchecked**

MAIN CHARACTERISTICS

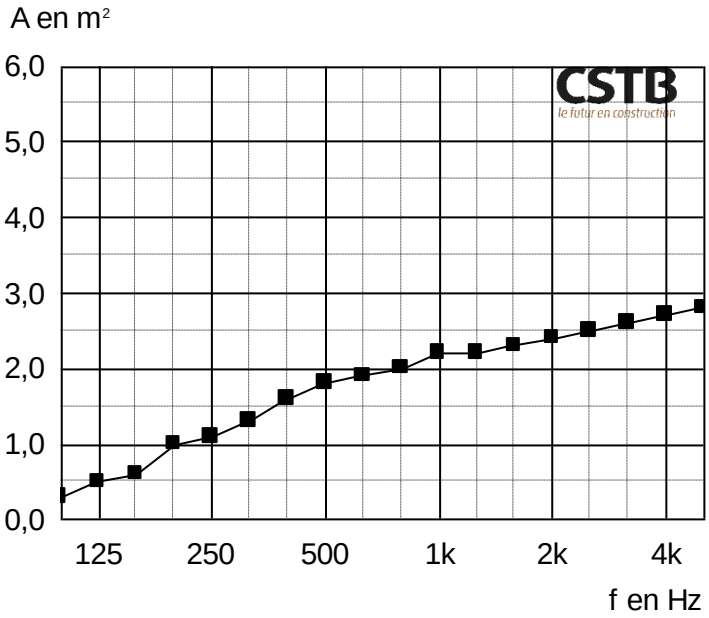
Dimensions in mm : 900 x 2400
Area in m² : 2.16
Thickness in mm : 3
Mass per unit area in kg/m² : 0.9

MEASUREMENT CONDITIONS

Empty room:
Temperature: 22.0 °C
Relative humidity: 63 %

Room with sample:
Temperature: 22.0 °C
Relative humidity: 59 %

RESULTS



f	A
100	0,3
125	0,5
160	0,6
200	1,0
250	1,1
315	1,3
400	1,6
500	1,8
630	1,9
800	2,0
1000	2,2
1250	2,2
1600	2,3
2000	2,4
2500	2,5
3150	2,6
4000	2,7
5000	2,8
Hz	m²

DESCRIPTION AND INSTALLATION OF JAPANESE PANELS

Test 4
Date 27/10/16
Station ALPHA

REQUESTER, MANUFACTURER **LILY LATIFI**

NAME **Unperforated felt sliding panels, 2mm thick.**

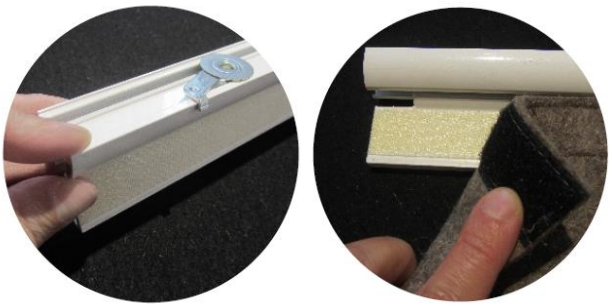
CONFIGURATION **Hanged on self-supporting construction and unweighted**

FITNESS FOR PURPOSE **Unchecked**

MAIN CHARACTERISTICS

Dimensions in mm : 900 x 2400
Area in m² : 2.16
Thickness in mm : 2
Mass per unit area in kg/m² : 0.6

DESCRIPTION (dimensions are given in mm)

Panels	100% wool without perforations, of thickness 2 mm and dimensions 900 x 2400.
Fixing elements	PVC profile + velcro tape on trolley. 

INSTALLATION (dimensions are given in mm)

Three panels are put in test station. They are hung with the PVC profile which is fixed on a wood self-supporting structure.

TEST REPORT N° AC16-26064797/1

EQUIVALENT SOUND ABSORPTION AREA OF JAPANESE PANELS

AA79

Test 4
Date 27/10/16
Station ALPHA

REQUESTER, MANUFACTURER LILY LATIFI

NAME Unperforated felt sliding panels, 2mm thick.

CONFIGURATION Hanged on self-supporting construction and unweighted

FITNESS FOR PURPOSE Unchecked

MAIN CHARACTERISTICS

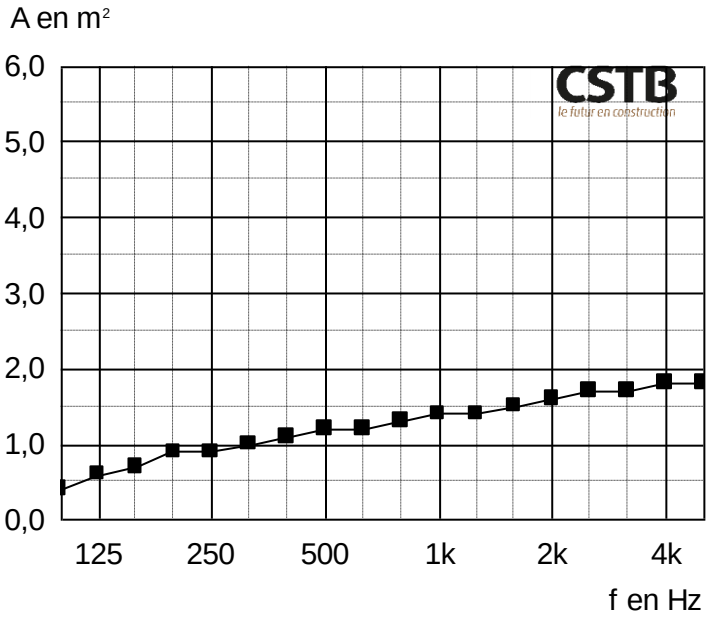
Dimensions in mm : 900 x 2400
Area in m² : 2.16
Thickness in mm : 2
Mass per unit area in kg/m² : 0.6

MEASUREMENT CONDITIONS

Empty room:
Temperature: 22.0 °C
Relative humidity: 63 %

Room with sample:
Temperature: 22.0 °C
Relative humidity: 57 %

RESULTS



f	A
100	0,4
125	0,6
160	0,7
200	0,9
250	0,9
315	1,0
400	1,1
500	1,2
630	1,2
800	1,3
1000	1,4
1250	1,4
1600	1,5
2000	1,6
2500	1,7
3150	1,7
4000	1,8
5000	1,8
Hz	m²

REVERBERATION TIME T

Tests 1 and 2
Date 03/10/16
Station ALPHA

f (Hz)	T of the empty room (s)	T of the room with sample (s)	
		Test 1	Test 2
100	11,20	8,12	7,49
125	10,23	6,99	6,09
160	9,21	6,71	6,40
200	8,66	5,26	5,05
250	8,38	4,61	4,20
315	9,10	4,66	4,07
400	8,40	4,13	3,47
500	8,56	3,97	2,93
630	8,25	3,71	2,78
800	7,59	3,46	2,82
1000	7,06	3,17	2,68
1250	6,52	3,13	2,53
1600	5,74	2,88	2,35
2000	5,31	2,70	2,29
2500	4,66	2,51	2,10
3150	3,81	2,20	1,88
4000	3,00	1,87	1,65
5000	2,42	1,61	1,42

REVERBERATION TIME T

Tests	**3 and 4**
Date	**27/10/16**
Station	**ALPHA**

f (Hz)	T of the empty room (s)	T of the room with sample (s)	
		Test 3	Test 4
100	11,32	9,10	8,21
125	10,26	7,56	6,98
160	9,81	6,89	6,43
200	9,08	5,50	5,54
250	8,74	5,07	5,41
315	9,18	4,78	5,45
400	8,5	4,18	4,95
500	8,36	3,99	4,84
630	7,83	3,72	4,63
800	7,47	3,58	4,33
1000	6,91	3,27	4,04
1250	6,38	3,15	3,84
1600	5,68	2,89	3,52
2000	5,23	2,69	3,25
2500	4,71	2,53	2,96
3150	3,9	2,21	2,58
4000	3,13	1,90	2,17
5000	2,58	1,66	1,86

ASSESSMENT OF THE REPEATABILITY COEFFICIENT "r"

Date 06/10/98
Station ALPHA

Design: 100 mm high rockwool panel

f (Hz)	r
100	0.03
125	0.07
160	0.05
200	0.10
250	0.08
315	0.04
400	0.03
500	0.06
630	0.04
800	0.06
1000	0.02
1250	0.02
1600	0.02
2000	0.03
2500	0.06
3150	0.02
4000	0.05
5000	0.04

APPENDIX 1
ANALYSIS PROCEDURE AND EXPRESSION OF THE RESULTS

METHOD OF MEASUREMENT: STANDARD NF EN ISO 354 (2004)

The Standard NF EN ISO 354 is the method of measurement of sound absorption in a reverberation room of materials used for the treatment of walls, floors, ceilings or separate objects.

The method of noise interrupted is adopted to determine the curves decrease noise in a reverberation room of 252 m^3, equipped with 12 broadcasters.

Measure per one-third octave, 100-5000 Hz:

- of reverberation time of the empty room T1 and temperature at time t1 of the measure,
- of the length of reverberation of the hall with sample T2 and temperature at the time t2 of the measure.

Calculation of equivalent absorption area in A_T in m² for each one-third octave:

$$A_T = 55{,}3V\left(\frac{1}{c_2 T_2} - \frac{1}{c_1 T_1}\right) - 4V(m_2 - m_1)$$

V : Volume of the hall in m^3

c_i : Speed of sound in m/s (c_i=331+0,6t_i)with t_i the temperature in Celsius degrees and 15 °C< t <30 °C)

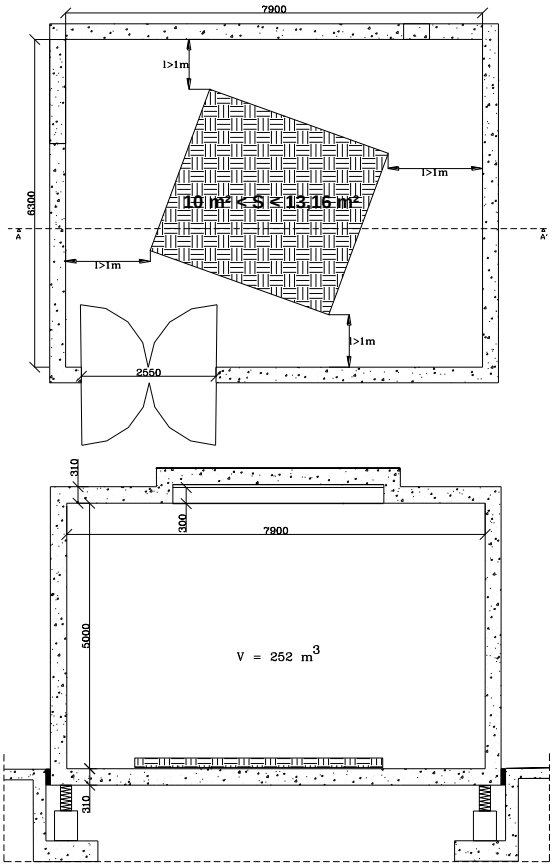
m_i : Attenuation coefficient of power in m^{-1} calculating using ISO 9613-1.

$$m_i = \frac{\alpha}{10\log(e)}$$

Calculation of the absorption coefficient (dimensionless) in the case of plane products for each one-third octave:

$$\alpha_s = A_T / S$$

S : Area of sample in m²



EXPRESSION OF RESULTS: CALCULATION OF THE SINGLE INDEX α_w ACCORDING TO THE STANDARD NF EN ISO 11654 (1997)

Taking into account the values of α_s per octave between 250 and 4000 Hz with an accuracy to 0.05. Vertical displacement of a reference curve by jumping from 0.05 until the sum of unfavourable deviation is the largest while remaining less than or equal to 0.1.

The value for α_w is recorded as the value of the reference curve at 500 Hz. There is no overall index for the equivalent absorption area, within the meaning of NF EN ISO 11654, it is given in one-third octave. But the French legislation is based on a total value, which is calculated as following : A = S x α_w.

APENDIX 2 –EQUIPMENT

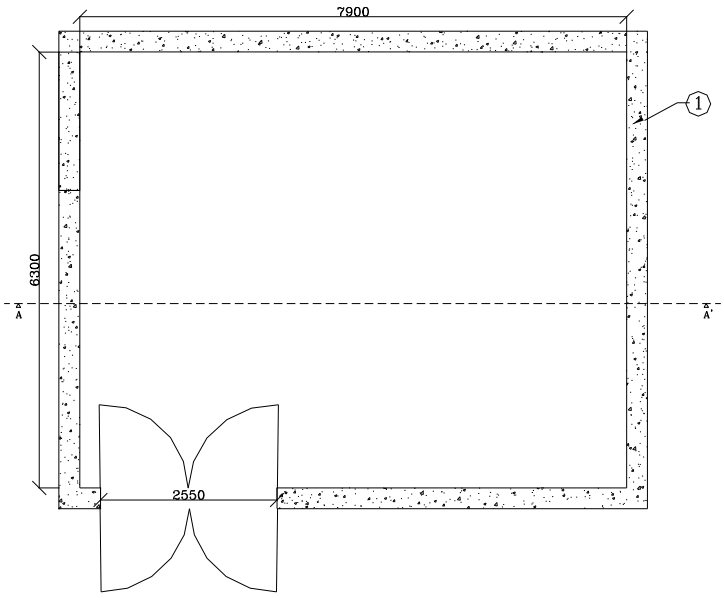
ALPHA STATION

DÉSIGNATION	***BRAND***	***TYPE***	**N° CSTB**
Microphone network	Bruël & Kjær Bruël & Kjær	Microphone 4943 Pre-amplifier 2669	CSTB 01 0213
Microphone network	Bruël & Kjær Bruël & Kjær	Microphone 4166 Pre-amplifier 2669	CSTB 04 1519
Rotating arm	Bruël & Kjær	3923	CSTB 12 0695
Amplifier	CARVER	PM600	CSTB 91 0119
Speaker	CSTB-ELECTRO VOICE	Pyramide	CSTB 97 0208
Speaker	CSTB-ELECTRO VOICE	Pyramide	CSTB 97 0205
Real Time Analyser	Bruël & Kjær	2144	CSTB 13 0656
Microcomputer	DELL	OPTIPLEX GX 270	
Calibrator	Bruël & Kjær	4231	CSTB 04 1839
Temperature and humidity transmitter	SPSI M-TUTA.11i	Hygrometer Thermometer	CSTB 97 0154
Pressure transmitter	FCO 322 SEN-I -TRAN	Pressure	CSTB 98 0188

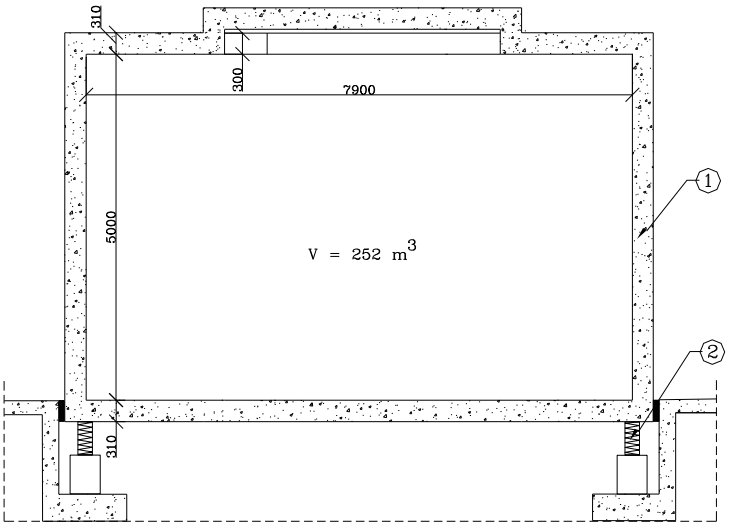
Script of measurement: 5 measurements of reverberation time are done for each position of microphone pair (2 microphones x 3 positions) and for each source (2 sources); therefore 60 measurements results are used for the calculation.

APPENDIX 3 – DRAWINGS OF THE TEST STATION | ALPHA STATION

SCHEME



SECTION AA'



dimensions in mm

	Total area of walls: 243.8 m²	Scale: 1/100
	Test station equipped of 12 diffusers:	ALPHA STATION (ABSORPTION)
	7 diffusers of 2.05x1.05 m, 4 diffusers of 2x1.20 m and 1 diffuser of 3x1.05 m	
2	Anti-vibration spring	
1	Concrete	ACOUSTICS
REP	DESIGNATION	

END OF REPORT