

TEST REPORT N° ED-712-080006-712-BAT/4
CONCERNING
A SOUND INSULATION SYSTEM
FOR A STEEL PIPE

This Test Report certifies only the characteristics of the object submitted for testing and does not prejudge the characteristics of similar products. So it does not constitute a product certification in the sense of Article L 115-27 of the Consumer Code and of the Law of June 3, 1994.

If this report is being issued through electronics and/or physical electronic media, only the paper version of the report signed by CSTB shall be deemed authentic in case of litigation. This report in paper form is kept at CSTB for a minimum period of 10 years.

The reproduction of this Test Report is authorised only in its integral form.

It comprises eight pages.

REQUESTED BY:

L'ISOLANTE KFLEX srl
Via Don Locatelli 35
20040 Roncello
ITALIE

Our Ref. : DAE/2008-373 CH/CM
Offer N° 26016370
19 DECEMBER 2008

CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT

ÉTABLISSEMENT DE GRENOBLE | 24 RUE JOSEPH FOURIER | 38400 SAINT-MARTIN D'HÈRES
TÉL. (33) 04 76 76 25 25 | FAX. (33) 04 76 44 20 46 | SIRET 775 688 229 000 50 | www.cstb.fr
SIÈGE SOCIAL - 84 AVENUE JEAN JAURÈS | CHAMPS-SUR-MARNE | 77447 MARNE-LA-VALLÉE CEDEX 2
ÉTABLISSEMENT PUBLIC À CARACTÈRE INDUSTRIEL ET COMMERCIAL | RCS MEAUX 775 688 229 | TVA FR 70 775 688 229
MARNE-LA-VALLÉE | PARIS | GRENOBLE | NANTES | SOPHIA-ANTIPOLIS

SCOPE

Determine the insertion loss D_w of a sound insulating system of a steel and circular pipe.

REFERENCE TEXTS

The measurements are carried out according to standards ISO 15665: 2003 « Acoustic insulation for pipes, valves and flanges » and NF EN ISO 3741: 2000 « Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms ».

OBJECT TESTED

Date of reception at the laboratory: November 27, 2008

Origin : Client

Installation : Client

SUMMARY LIST OF TESTS

Test N°	Object tested
1	Insulating system ST + 3 x 240 + 2 x GK + 2 x IN

Saint Martin d'Hères, december 19, 2008

Responsible for the tests



Carole HORLAVILLE

Team leader



Michel VILLOT

**DESCRIPTION AND INSTALLATION
OF THE ACOUSTIC INSULATING SYSTEM
FOR A STEEL AND CIRCULAR PIPE**

Test 1
Date 2/12/08
Test SR
room

REQUESTED BY L'ISOLANTE KFLEX
MANUFACTURER CIC (pipe), L'ISOLANTE KFLEX (insulating system)
NAME Insulating system ST + 3 x 240 + 2 x GK + 2 x IN

MAIN CHARACTERISTICS

Steel pipe:		Insulating system:	
Outer diameter in mm	: 325	Total thickness in mm	: 110
Wall thickness in mm	: 6.3	Mass per unit of area in kg/m ²	: 30.5
Useful length in mm	: 5860	Treated length in mm	: 5860

DESCRIPTION

Steel pipe	<p>Circular pipe, without weld, made of steel, consisting of, from the emission section to the end :</p> <ul style="list-style-type: none"> - Elbow of 90° with 500 mm returns, - Flange - Straight part with a total length of 7100 mm and a useful length (inside the reverberation room) of 5860 mm. - Anechoic termination: aluminium sheet pipe filled with glass wool of density approximately 18kg/m³
Insulating system	<p>The insulating system is composed of, from the outer surface of the pipe outwards:</p> <ul style="list-style-type: none"> - One layer of elastomer foam with closed cells K-Flex ST 25 mm, thickness 25 mm and mass per unit of area 0.5 kg/m² (density 50 kg/m³), named « ST » - Three layers of elastomer foam with opened cells K-Fonik 240 thickness 25 mm, density 240 kg/m³ (mass per unit of area 6 kg/m²), named « 240 ». - Two layers of a elastomer heavy mass, produced partially with recycled elastomer foam K-Flex St, thickness 4 mm and mass per unit of area 4 kg/m², named "GK" - Two layers of elastomer covering in hypalon K-Flex IN Clad of thickness 1 mm and mass per unit of area 2 kg/m², named « IN »

INSTALLATION

The insulating system is installed as follows:

- Application of the neoprene glue K-Flex K420 on the joints of the ST sheets and bonding board to board (photo 1).
- Addition of three layers of the product 240 in the same way (photo 2)
- Application of the covering layers GK and IN by bonding with neoprene glue K-Flex K420 at the over lapping (about 50 mm long) (photo 3).

The joints of each additional layer are not aligned.

The waterproofness and the soundproofing, in the interface wall - Insulating system, are improved by one patch of 240 (photo 4).

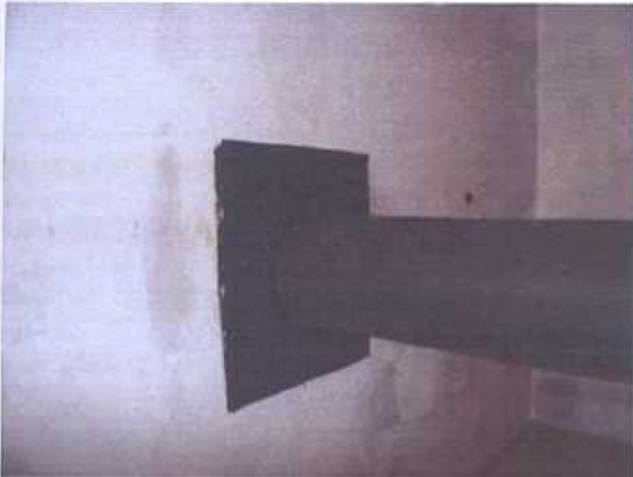


Photo 1



Photo 2



Photo 3



Photo 4

**INSERTION LOSS D_w
OF AN INSULATING SYSTEM
FOR A STEEL AND CIRCULAR PIPE**

Test 1
Date 02/12/08
Test SR
room

REQUESTED BY L'ISOLANTE KFLEX
MANUFACTURER CIC (pipe), L'ISOLANTE KFLEX (insulating system)
NAME Insulating system ST + 3 x 240 + 2 x GK + 2 x IN

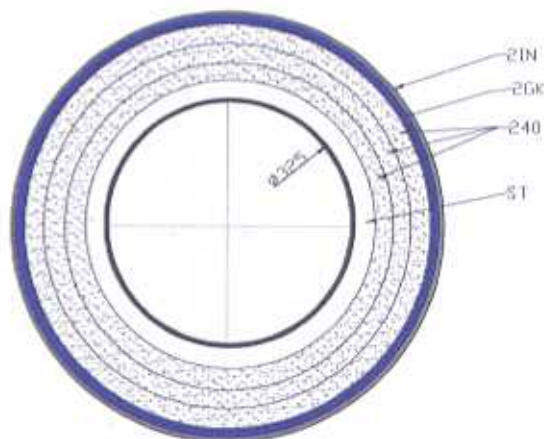
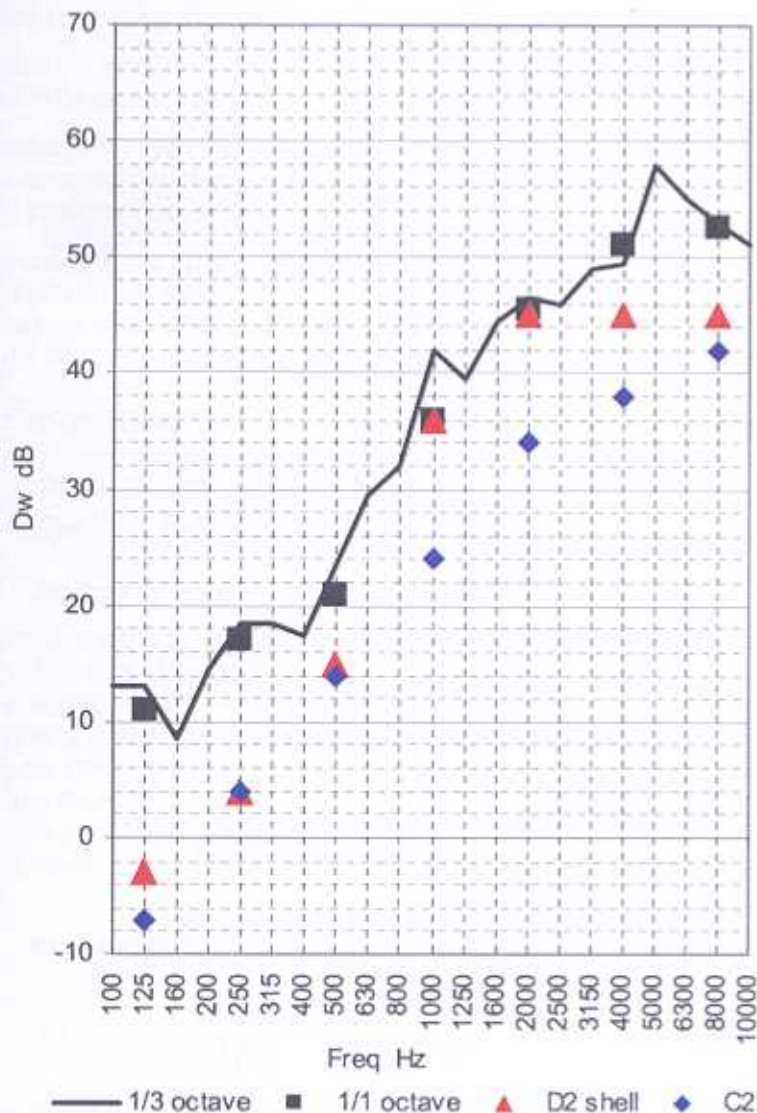
MAIN CHARACTERISTICS

Steel pipe: Outer diameter in mm : 325
Wall thickness in mm : 6.3
Useful length in mm : 5860
Insulating system: Total thickness in mm : 110
Mass per unit of area in kg/m^2 : 30.5
Treated length in mm : 5860

MEASUREMENT CONDITIONS

Temperature: 19°C
Relative humidity: 50%

RESULTS



Freq (Hz)	Dw (dB)
125	11,0
250	17,0
500	21,0
1000	36,0
2000	45,5
4000	51,0*
8000	52,5*
CLASS (ISO 15665)	C2
CLASS (SHELL)	D2

(*) Limit of measurement of the experimental setup: the performances of the insulating system will be greater than the obtained results.

APPENDIX 1 EVALUATION METHOD AND EXPRESSION OF RESULTS

INSERTION LOSS D_w OF INSULATING SYSTEMS FOR PIPES, VALVES AND FLANGES

➤ **Evaluation method: Standard ISO 15665 (2003)**

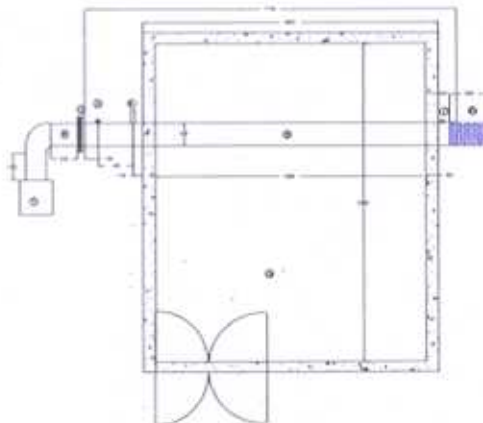
Standard ISO 15665:2003 is the method for the acoustic evaluation of the insertion loss of insulating systems for pipes, valves and flanges. It refers to Standard NF EN ISO 3741: 2000 for detail on the sound pressure level measurements in reverberation room.

The experimental setup is composed of a reverberation room of 200 m³ crossed by a steel circular pipe, disconnected from the walls of the room and equipped, on one side, with a flange and an elbow of 90°, and on the other side, with a termination treated in an anechoic way.

A white noise is produced in the pipe by a loudspeaker. The sound pressure levels are measured inside the reverberation room, first with the bare pipe and then, with the cladded pipe. The insertion loss of the insulating system is the difference between the two levels, with a correction for the variations of sound absorption in the test room, due to the cladding.

Measurements are performed in third octave bands, from 100 to 10000 Hz, for the following quantities:

- Back ground noise in the reverberation room L_{BGD}
- Averaged sound pressure levels generated by the bare pipe (L_b) and by the cladded pipe (L_c) in dB
- Averaged sound pressure levels radiated by the reference loudspeaker with the bare pipe (L_{br}) and with the cladded pipe (L_{cr}) in dB



Calculation of the insertion loss D_w in dB for each third octave band:

$$D_w = L_b - L_c - (L_{br} - L_{cr})$$

The higher D_w , the more insulating the system.

➤ **Accuracy of the measurement method:**

Accuracy range 1 according to the table 1 of the Standard NF EN ISO 3741: 2000

- Volume of the room = 200m³
- Volume V_q of the loudspeakers (pipe, reference loudspeaker) < 2% of the volume of the room
- White noise
- Low back ground noise,
- Numbers of measurement points: 6 fixed points or one rotation of the rotating arm
- Range 1 for the apparatus of measurement according to the CEI 61672
- Measurement of the sound levels by third of octave

➤ **Expression of the results: Calculation of the insertion loss in octave**

$$D_{w,oct} = -10 \lg \left(\frac{1}{3} \sum_{i=1}^3 10^{-D_{wi}/10} \right) \text{ dB}$$

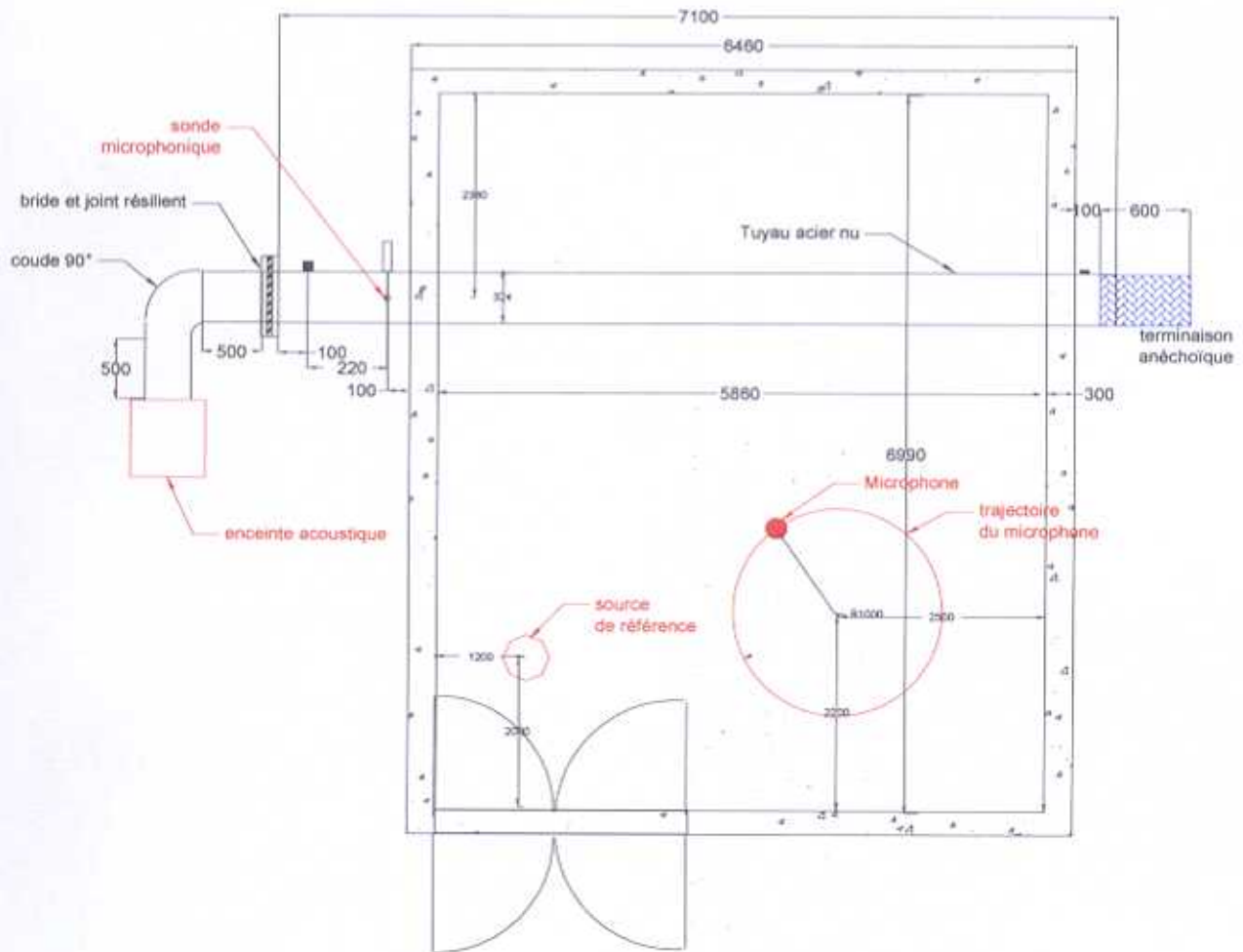
Where D_{wi} is the insertion loss in third octave band for the corresponding octave band. The values of D_w are rounded to the nearest 0.5 dB.

APPENDIX 2 – APPARATUS**TEST ROOM SR**

DESIGNATION	BRAND	TYPE
Sound sensor	Bruël & Kjær	Microphone 4190
	Bruël & Kjær	Preamplifier 2669
	Bruël & Kjær	Alimentation 5935
Micro phonic network	Bruël & Kjær	Microphone 4166
	Bruël & Kjær	Preamplifier 2671
	Bruël & Kjær	Alimentation 5935
Rotating arm	Bruël & Kjær	3923
Power amplifier	NAD	NAD
Loudspeaker	CSTB-PHL AUDIO	SP1280
Reference loudspeaker	Bruël & Kjær	4204

**APPENDIX 3 – DRAWING
OF THE EXPERIMENTAL SETUP**

TEST ROOM SR



The steel pipe crosses the reverberation room in its width.
The pipe is decoupled from the room walls by strips of SILODAMP surrounding the pipe and seal (silicon). An antivibratile seal is inserted into the flange before tightening.
The pipe is ended by an anechoic termination, filled by glass wool, mass per unit of area 12 kg/m^3 on a thickness of 600 mm (sound absorption coefficient > 0.9 from 100 to 10000 Hz).

END OF REPORT