

# CSTB

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**ACOUSTICS AND LIGHTING DEPARTMENT**  
Pole Noise and Vibrations

## **TEST REPORT Nr ED-712-080006-712-BAT/6 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.

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It comprises eight pages.

**REQUESTED BY:** **L'ISOLANTE KFLEX srl**  
**Via Don Locatelli 35**  
**20040 Roncello**  
**ITALIE**

Our Ref. : DAE/2008-377 CH/CM  
Offer nr 26016370  
19 December 2008

**CENTRE SCIENTIFIQUE ET TECHNIQUE DU BATIMENT**

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ÉTABLISSEMENT PUBLIC A CARACTÈRE INDUSTRIEL ET COMMERCIAL | RES 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 + 2 x 240 + GK

Saint Martin d'Hères, December 19, 2008

Responsible for the tests



Carole HORLAVILLE

Team leader

Michel VILLOT

**DESCRIPTION AND INSTALLATION  
A 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 + 2 x 240 + GK

**MAIN CHARACTERISTICS**

Steel pipe:		Insulating system:	
Outer diameter in mm	: 325	Total thickness in mm	: 79
Wall thickness in mm	: 6.3	Mass per unit of area in kg/m <sup>2</sup>	: 16.5
Useful length in mm	: 5860	Treated length in mm	: 5860

**DESCRIPTION**

Steel pipe	Circular pipe, without weld, made of steel, consisting of, from the emission section to the end : <ul style="list-style-type: none"> <li>- Elbow of 90° with 500 mm returns,</li> <li>- Flange</li> <li>- Straight part with a total length of 7100 mm and a useful length (inside the reverberation room) of 5860 mm.</li> <li>- Anechoic termination: aluminium sheet pipe filled with glass wool of density approximately 18kg/m<sup>3</sup></li> </ul>
Insulating system	The insulating system is composed of, from the outer surface of the pipe outwards: <ul style="list-style-type: none"> <li>- 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/m<sup>2</sup> (density 50 kg/m<sup>3</sup>), named « ST »</li> <li>- Two layers of elastomer foam with opened cells K-Fonik 240 thickness 25 mm, density 240 kg/m<sup>3</sup> (mass per unit of area 6 kg/m<sup>2</sup>), named « 240 ».</li> <li>- One layer 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/m<sup>2</sup>, named "GK"</li> </ul>

**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 the product 240 in the same way (photo 2)
- Application of the covering layer GK by bonding with neoprene glue K-Flex K420 at the overlapping (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).

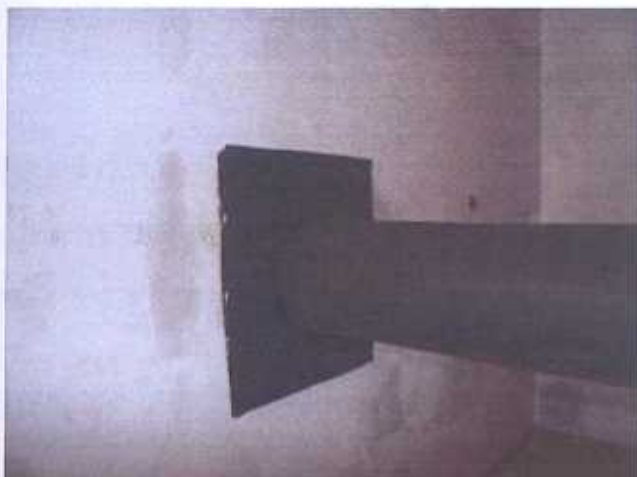


Photo 1



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 + 2 x 240 + GK

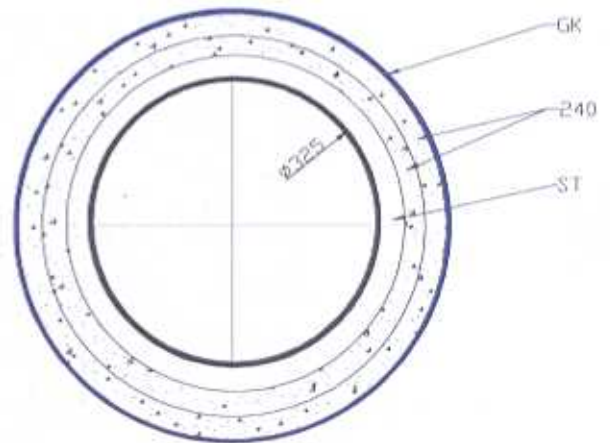
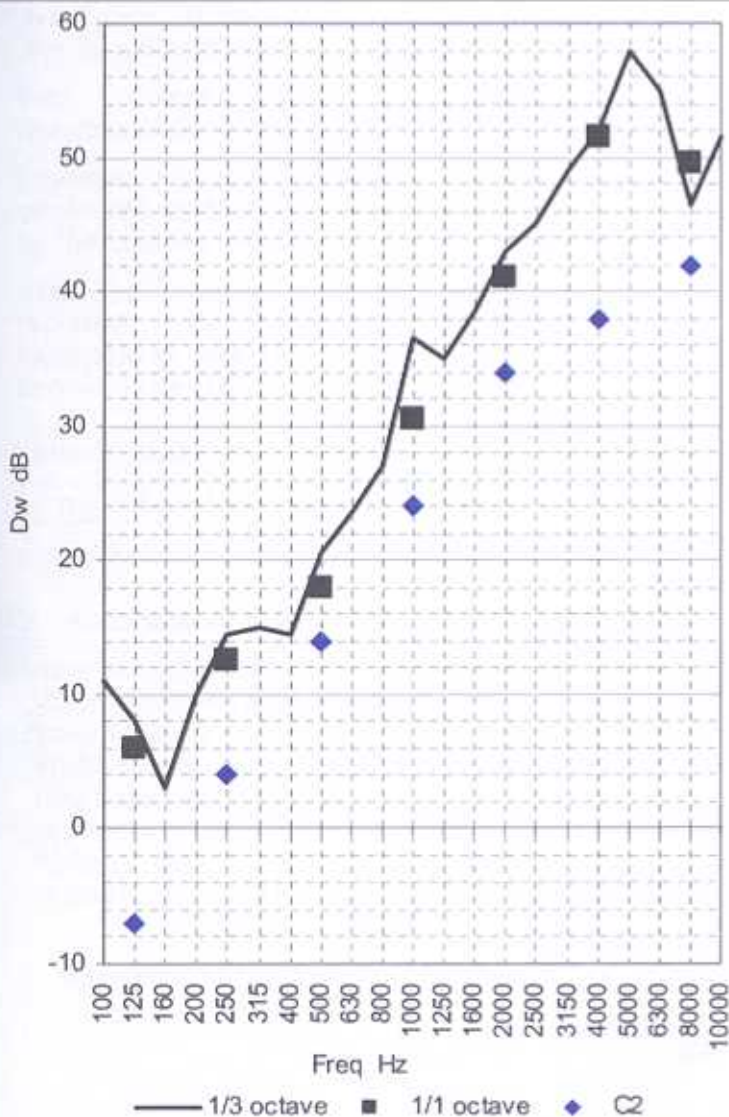
**MAIN CHARACTERISTICS**

Steel pipe: Outer diameter in mm : 325  
Wall thickness in mm : 6.3  
Useful length in mm : 5860  
Insulating system: Total thickness in mm : 79  
Mass per unit of area in  $kg/m^2$  : 16.5  
Treated length in mm : 5860

**MEASUREMENT CONDITIONS**

Temperature: 19°C  
Relative humidity: 50%

**RESULTS**



Freq (Hz)	Dw (dB)
125	6,0
250	12,5
500	18,0
1000	30,5
2000	41,0
4000	51,5*
8000	49,5*
<b>CLASSE</b>	<b>C2</b>

(\* ) 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)**

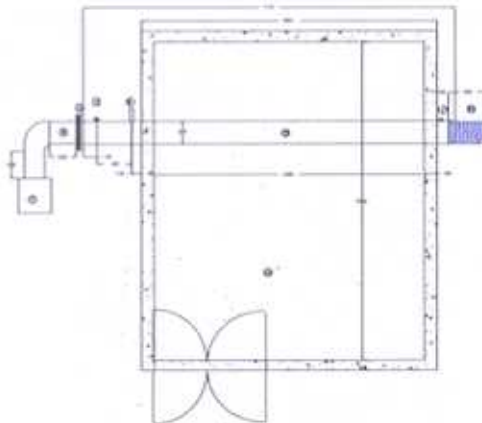
Standard ISO 15665:2003 is the method for the acoustic evaluation of the insertion loss of insulating systems for pipes, valves and flanges. It refers to Standard NF EN ISO 3741: 2000 for detail on the sound pressure level measurements in reverberation room.

The experimental setup is composed of a reverberation room of 200 m<sup>3</sup> 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 = 200m<sup>3</sup>
- 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.

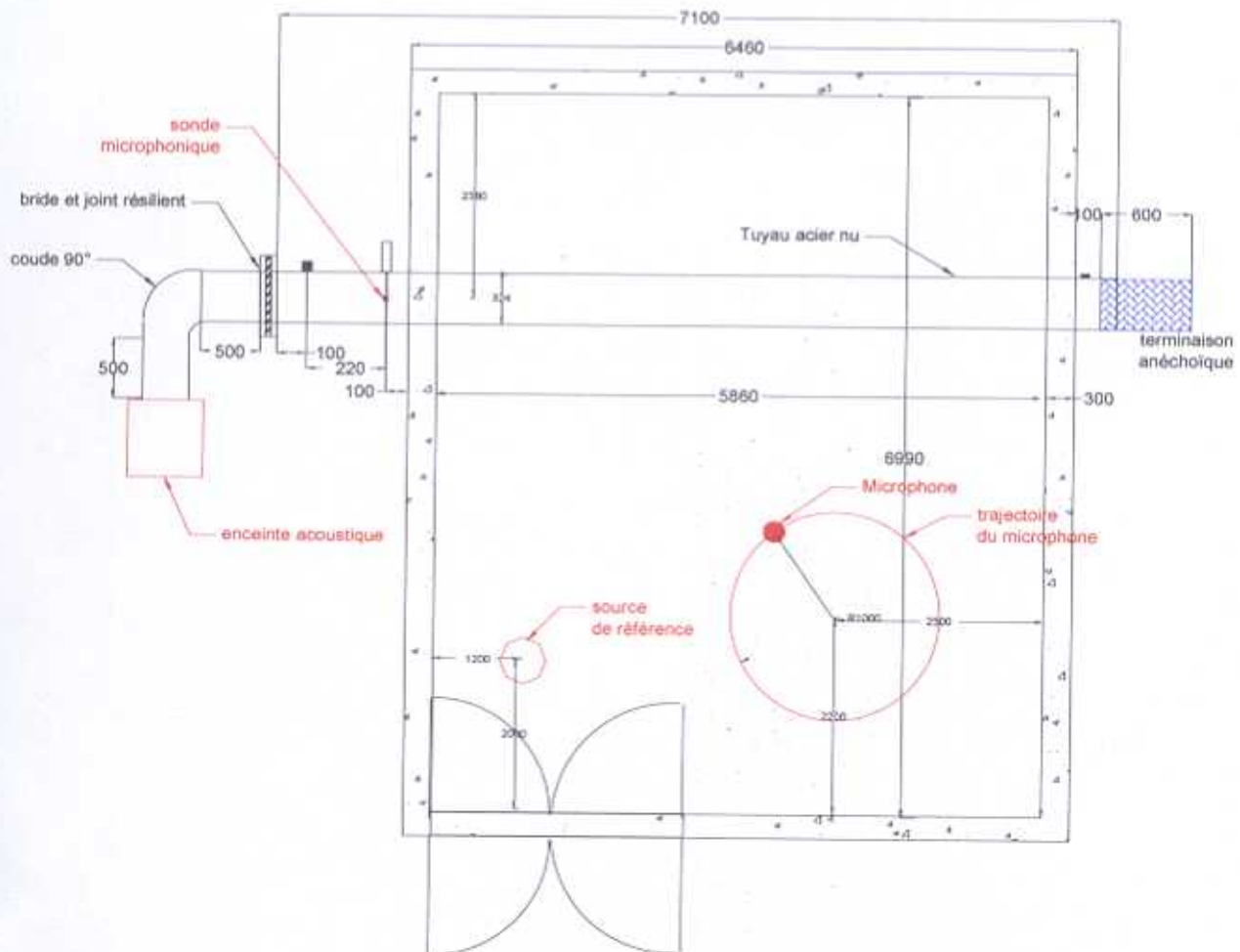
**APPENDIX 2 – APPARATUS**

**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  $12 \text{ kg/m}^3$  on a thickness of 600 mm (sound absorption coefficient  $> 0.9$  from 100 to 10000 Hz).

**END OF REPORT**