WATER

TECHNICAL DOCUMENT

SANITARY TAPWARE

Technical document 077-01D

Complementary acoustic specifications applicable to certain families of products

Technical Document 077-01D Rev01
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CSTB
le futur en construction

CSTB (Centre Scientifique et Technique du Bâtiment), a public establishment supporting innovation in construction, has four key activities—research, expertise, assessment and dissemination of knowledge—organised to meet the challenges of ecological and energy transition in the construction sector. Their fields of expertise include construction materials, buildings and their integration into districts and towns.
With over 900 employees, its subsidiaries and networks of national, European and international partners, the CSTB group works for all the stakeholders in the construction sector to advance building quality and safety.

MODIFICATION HISTORY

Revision no.	Date	Modifications
18	01/06/2017	Update to the document layout and reference Substantial modification: Chapter 8 added.
01	02/04/2019	Update to the document layout and reference. Technical Document No. 1 divided into 6 technical documents No. 01A to 01F

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1. ACOUSTIC SPECIFICATIONS

LABORATORY MEASUREMENTS OF NOISE EMITTED BY HYDRAULIC EQUIPMENT

Given the possible interpretation of the variable parameters defined in NF EN ISO 3822-1, NF EN ISO 3822-3 and NF EN ISO 3822-4, this document defines the following paragraphs:

✓ DEFINITION AND FIELD OF APPLICATION

Determination of the acoustic pressure level, L_{ap}, for hydraulic equipment such as sanitary tapware and special equipment in NF 077 applications.
Principle:

"The tested equipment is mounted at the end of a pipe (the measuring pipe), which is attached to the wall of a room. This wall is referred to as the measuring wall, and the room is the measuring room.
The noise produced by the equipment is transmitted from the measuring pipe to the measuring wall. The airborne sound radiated by the measuring wall is measured in the measuring room". *NF EN ISO 3822-1 excerpt*.

✓ DESCRIPTION OF THE INSTALLATION

Closed circuit installation with pump equipped with a frequency variator allowing constant hydraulic pressure.

To prevent the transmission of pump noise to the measuring room, the pump room is at a considerable distance from the measuring room.

To separate the measuring room from the rest of the building, it is placed on 4 spring boxes.

We treated the room to make the acoustic field as homogeneous as possible.

✓ TECHNICAL DOCUMENT TO SPECIFY THE VARIABLE PARAMETERS DEFINED IN ACOUSTIC STANDARDS 3822-1 TO 3822-4 AND TO EXPLAIN MORE PRECISELY THE RESULTS IN THE ACOUSTIC TEST REPORT

Variable parameters defined by the NF EN ISO 3822-1 Standard

- Wall density

- The density of the measuring wall must be between 100 kg/m² and 250 kg/m².
  CSTB uses a 123 kg/m² gypsum block measuring wall.
  The technical choice of the measuring wall makes it possible to measure a minimum L_{ap} of 3 dBA for a flow <0.25 L/s.

Wall surface

- The measuring wall surface must be between 8 m² and 12 m².
  CSTB uses a wall with an area of 10.5 m².

- Room volume

- The recommended room volume is 50 m^3.
  The CSTB laboratory room is 50 m^3.
- Reverberation time should be 1s to 5s in the median octave frequency bands between 125 Hz and 2000 Hz.
  CSTB used values of 2.3 to 1.6 seconds (on the plane).

- Number of microphones

The standard requires at least one microphone. CSTB chose to use 2 microphones. The average of these 2 levels is used to obtain a more homogeneous acoustic field and to quickly note any shift or breakdown of one of the 2 microphones.

- Fork type selection

In the 3822-1 Standard, there are 2 possible fork types. Since the solution of Figure 3b) is an undesired alternative, CSTB chose that of Figure 3 a).

- Acoustic calibrator

The acoustic calibrator used by CSTB was manufactured by the CSTB workshop according to the plan provided in the standard. It respects the required tolerances and surface condition.

- Integration time

- Standard 3822-1 recommends a “fast” integration time (<= 0.25). Pursuant to a decision made at the last meeting (November 2009) of the special committee of the NF tapware mark, CSTB decided to use a 1 second integration time for products of the following types: mixer taps, mechanical mixers and thermostatic mixers (NF EN 200, NF EN 246, NF EN 817, NF EN 1111 and NF EN 1112).

  For the rest, integration time shall continue to be “fast” for products of the following types: Flush valves, timed taps and electronic opening and closing valves (NF EN 12541, NF EN 816 and NF 15091).

  For all products of the following types: handsprays, shower heads, aerators, stop valves, where the acoustic level is a stationary noise, the integration time to reach the L_{ap} level for these products is 12 seconds.

Choice of parallel measurement per octave band.

In this case there are 2 possibilities:

- a first solution with an equalisation filter as defined in paragraph 8.2.2 (NF EN 3822-1);
- a second solution using a computer-assisted measuring device described in Appendix B (NF EN 3822-1).

Of the 18 laboratories participating in the inter-laboratory test:

- 7 laboratories use method 8.2.2.
- 11 laboratories perform their measurements with a computer-assisted analyser.

CSTB uses a computer-assisted analyser and has developed software to calculate the L_{ap} level of the tested product in real time.
The result obtained is corrected for background noise, if necessary.

Details of the mounting parameters and measurements defined by NF EN ISO 3822-2 according to the products

✓ MEASUREMENTS

- Mixer tap

[cold water]
- Fully open the valve head corresponding to the lowest temperature.
- Slowly close the valve until it is completely closed.

[hot water]
- Fully open the valve head corresponding to the highest temperature.
- Slowly close the valve until it is completely closed.

[mixed-1]
- Open both valve heads completely.
- Alternately close the two heads to reach a maximum level, starting with the hot water head.

[mixed-2]
- Open both valve heads completely.
- Alternately close the two heads to reach a maximum level, starting with the cold water head.

For each of these positions, the software performs a sound pressure measurement every second and records the maximum L_{ap} level attained
(it is true that using two positions, mixed-1 and mixed-2, raises the question among many customers of the need to use these 2 positions. This is the standard that defines this method).

Mixer tap and thermostatic mixer tap

[cold water]
- Open the tap completely at the setting for the lowest temperature.
- Slowly close the valve until it is completely closed.

[hot water]
- Open the tap completely at the setting for the highest temperature.
- Slowly close the valve until it is completely closed.

[mixed water]
- Open the tap completely and change the temperature over the entire setting range. Find the maximum level.
- Once this position has been reached, slowly close the tap until it is completely closed.

For each of these positions, the software performs a sound pressure measurement every second and records the maximum L_{ap} level attained.

Special case: A mixer tap must have a flow closure system to be able to measure these acoustic performances.

- Press flush valve

  - Activate the tap and measure the sound pressure level.
  During the entire tap operating time, the software performs a sound pressure measurement every ¼ of a second and records the maximum value of the L_{ap} level.
  For a press flush mixed valve, use the conventional mixer method with a ¼ second integration time.

✓ ASSEMBLY OF TESTED PRODUCTS

For all products, the connection is made on the measuring fork with the accessories supplied by the applicant and according to normal use.
Given the influence of the connection on the acoustic results, it must be rigid except for products equipped with hoses such as the “single hole” tap (combined visible body).
Considering that the installation fork of the product is of a fixed width of about 150 mm, there are difficulties related to the assembly of “concealed body” or “recessed” taps. A rigid connection must be favoured, even if it does not actually represent an assembly in accordance with the rules of the trade.

Example assembly of “single-hole” tap

✓ USE OF THE 3822-3 STANDARD FOR STOP VALVES

This type of product is tested with the tap completely opened. The outlet is connected to a long 3 metre hose providing silent resistance. The flow is adjusted using a control valve.

Stop valve

Control valve

VARIABLE PARAMETERS DEFINED BY THE NF EN ISO 3822-4 STANDARD

- Choice of hydraulic resistances for testing valves equipped with standardised aerators

CSTB chose tube resistors (Appendix A of NF EN ISO 3822-4). It is sufficient to change the length of the tubes in order to vary the flow rate with high precision.

Standard 3822-4 provides for the mounting of this resistor directly in place of the aerator.

CSTB does not follow this standard, since a hose is used to connect low noise hydraulic resistance to the tap. This resistor is connected by means of a hose that is 1200 mm long, with a diameter of 20/27.

This decision was made after confirming that this exception does not alter the acoustic results. The acoustic level of these low noise hydraulic resistors is reduced.

- Assembly of handsprays and shower heads

This point is defined in the standard, which states:
“For handsprays (or connection to the measuring circuit), assembly is carried out by means of a hose described in Appendix D, Part 3.8”.
Shower heads are connected to the measuring pipe by a 300 mm long straight pipe with the same nominal diameter as the shower head connection.

Handspray

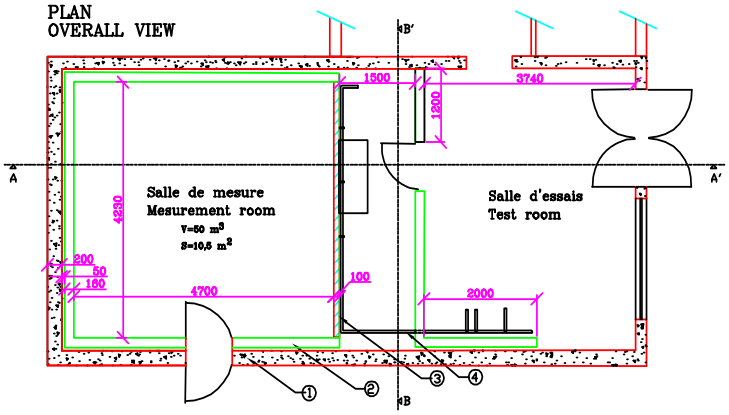
Shower head

INFORMATIONAL APPENDIX

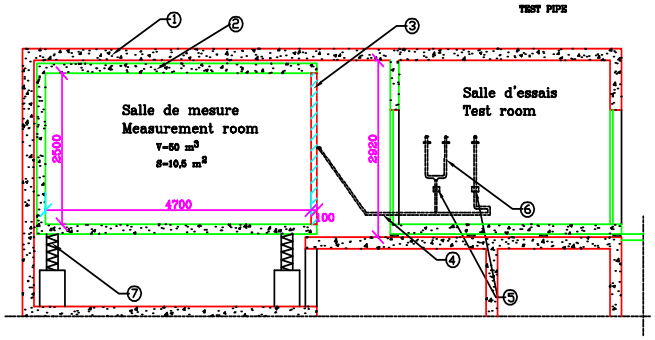
- Drawing of the station

APPENDIX 1 – DRAWING OF THE TEST STATION	STATION: RHÔ
APPENDIX 1 – drawing of the test station	*STATION: RHÔ*

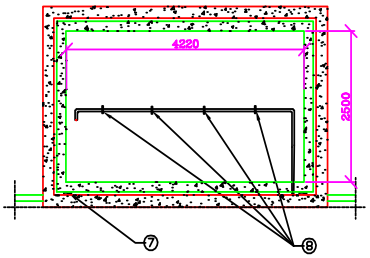
PLAN
OVERALL VIEW



COUPE AA'
SECTION VIEW AA'



COUPE BB'
SECTION VIEW BB'



Durées de réverbération
de la salle de mesure
Reverberation time
of measurement room

Fréquence de l'octave (Hz) Octave band frequencie (Hz)	T salle de mesure T mesurement room (S)
125	2.3
250	1.9
500	2.1
1000	1.9
2000	1.6
4000	1.4

dimensions en mm
dimensions in mm

REP	DESIGNATION - APPELLATION
8	Fixations de la canalisation - Pipe fixing
7	Boîte à ressort - spring box
6	Fourche d'essais - Twin outlet pipe
5	Prises de pression - Connection for mesuring pressure
4	Canalisation - Pipe
3	Cloison de mesure: carreaux de plâtre - test wall: plasterblock e= 100mm 123 kg/m²
2	Bloc de béton plein + enduit - Concrete block + cement rendering e = 160 mm
1	Béton - reinforced concrete e = 200 mm

échelle:
scale: 1/100

POSTE RHÔ
STATION RHÔ

ACOUSTIQUE
ACOUSTIC