CIRI – Buildings and Construction
ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA

Customer

Rotho Blaas GmbH, Italy

Acoustic sealing

FIRE SEALING SILICONE

Technical report

Scientific Coordinator
Prof. Luca Barbaresi

INDEX

1 INTRODUCTION

The aim of the present technical report is to characterize the Fire Sealing Silicone in acoustical applications. For this reason, the standard C919-19 for sealants applications and the ISO 10140-2:2021 for airborne sound insulation measurements have been followed.

2 STANDARDS

The standard C919-19 provides information for the use of sealants in joints, void, etc. to reduce sound transmission of interior walls, ceilings, etc. In fact, it can happen that there are holes or void, especially in lightweight construction positioned to reduce sound transmission, which compromise the acoustic performance of the structure. These voids can exist regardless of whether the wall or ceiling has been built well. Sound travels through unsealed joints and voids in walls and liquid-applied sealants can minimize sound transmission.

The standard ISO 10140-2:2021 concerns the laboratory measurement of airborne sound insulation of buildings products, such as walls, floors etc. To measure the sound transmission of a building element it is usually used the sound reduction index, R, which is defined as follows (1):

$$R = L_1 - L_2 + 10\ lg\frac{S}{A}\ \ [dB] \tag{1}$$

where:
L_1 is the energy average sound pressure level in the source room $[dB]$
L_2 is the energy average sound pressure level in the receiving room $[dB]$
S is the area of the free test opening in which the test element is installed $[m^2]$
A is the equivalent sound absorption area in the receiving room $[m^2]$

To find L_1 is sent a white noise through two omnidirectional loudspeakers in the source room. The signal is captured by two microphones in five positions each for a total of ten positions in the room. The sound pressure level of the positions is then averaged. L_2 is the same but in the receiving room. Finally, A is calculated by measuring the reverberation time of the receiving room with an interrupted noise method.
Weighted sound reduction index R_w and single-number ratings STC are calculated in according to EN ISO 717-1:2020 and ASTM413-16 respectively.

3 PROCEDURE

The Fire Sealing Silicone is a tested protection silicone sealant. It is classified, according to EN 15651-1, for indoor and outdoor non-structural uses, and it can also be used on façades and in areas with cold climates. High adhesion and high UV resistance are two important features.
All measurements have been made in the laboratory of Interdepartmental Centre for Industrial Research in Building and Construction (CIRI E&C) of the University of Bologna.
The effectiveness of the sealant in sound transmission was found by comparing sound reduction index of four configurations:

- Configuration 1: entire unit wall
- Configuration 2: conf.1 with a continuous leak in the plasterboard on each side (left and right)
- Configuration 3: conf.1 with a continuous leak sealed by one strip of Fire Sealing Silicone on each side
- Configuration 4: conf.1 with a continuous leak sealed by two strips of Fire Sealing Silicone on each side

The measurement equipment consisted of:

- LD 2900B s/n 883 (CH1 Preamplifier PRM900C and microphone capsule PCB377C20; CH2 CH1 Preamplifier PRM900C and microphone capsule LD2560)
- Calibrator LD CAL200
- Two omnidirectional dodecahedral sound sources OMNI12 01dB+L301
- Amplifier Crown XLS1000
- Pink noise generator.

4 *RESULTS*

The stratigraphy of the analysed wall is composed as follows:

- Two sheets of plasterboard 12,5+12,5mm
- Cavity 75mm with 35mm of absorbing porous material (polyurethane flexible foam ρ=81kg/m^2)
- Two sheets of plasterboard 12,5+12,5mm.

The results of the four configurations are shown hereafter.

Sound reduction index of the **configuration 1** (entire unit wall).
$R_w(C;C_{tr})$ = 50 (-2;-7) dB ; R_w = 50,7 dB, STC= 51 dB

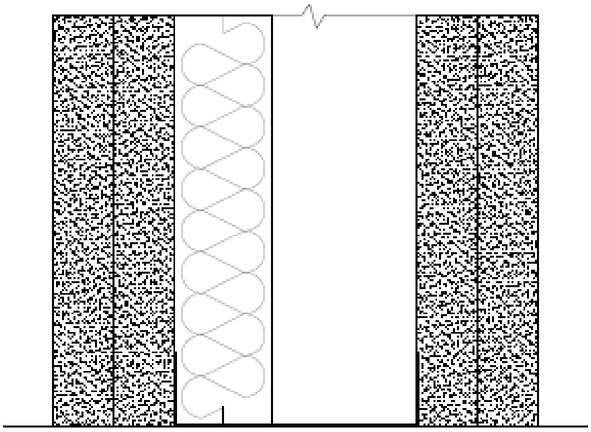
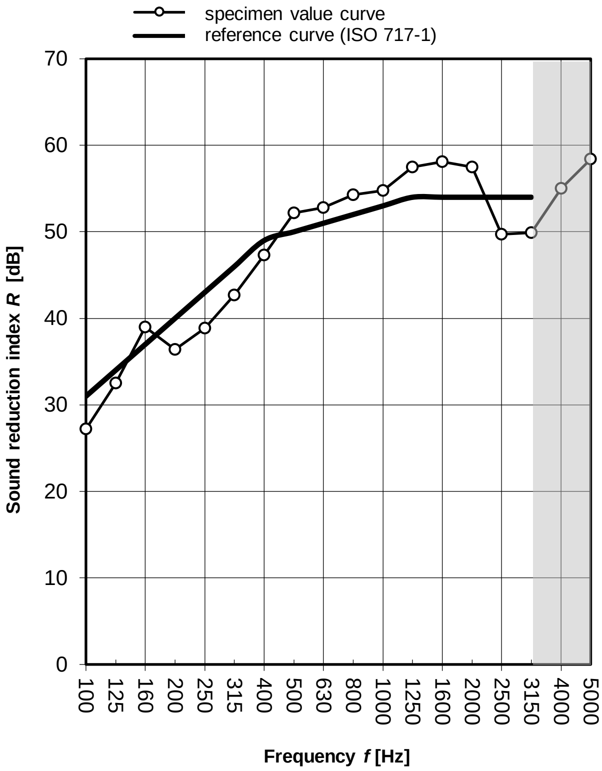


Figure 1 - Conf. 1 scheme



Graph 1 - Conf. 1

Sound reduction index of the **configuration 2** (wall with leaks unsealed).
$R_w(C;C_{tr})$ = 25 (0;-2) dB ; R_w = 25,7 dB , STC= 25 dB

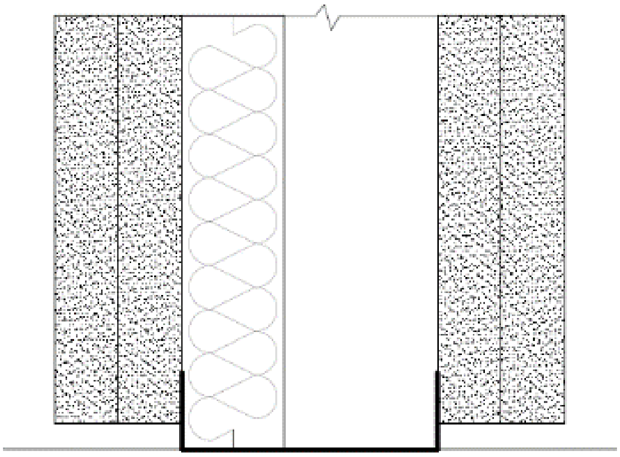
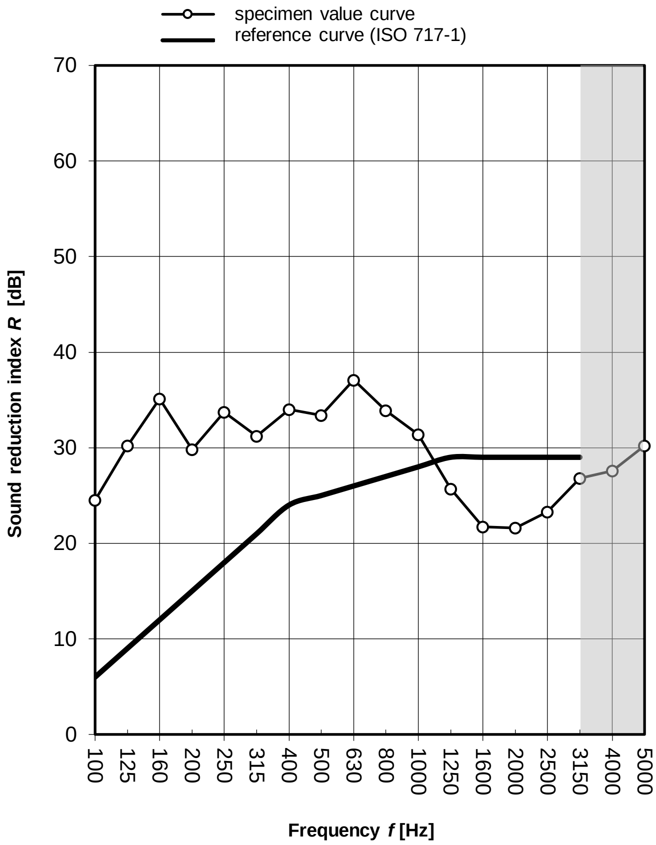


Figure 2 - Conf. 2 scheme



Graph 2 - Conf. 2

Figure 3 - Conf. 2 detail

Sound reduction index of the **configuration 3** (wall with leaks sealed with one strip of Fire Sealing Silicone).
$R_w(C;C_{tr})$ = 49 (-3;-8) dB ; R_w = 49 dB , STC= 49 dB

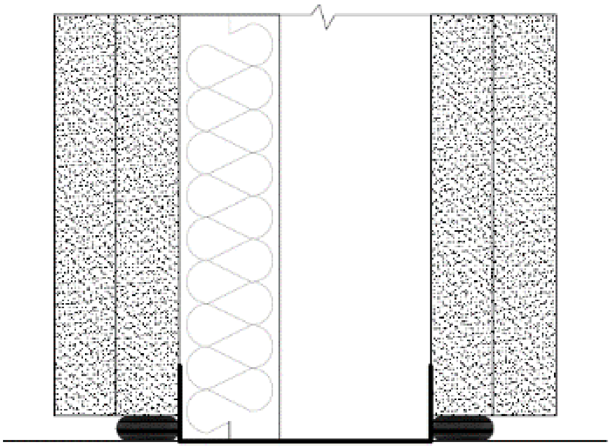
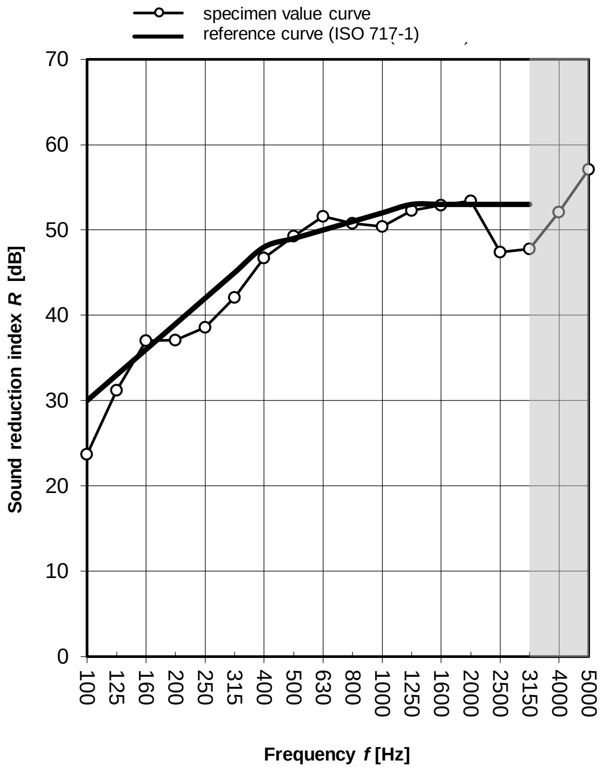


Figure 4 - Conf. 3 scheme



Graph 3 - Conf. 3

Figure 5 - Conf. 3 detail

Figure 6 - Conf. 3

Sound reduction index of the **configuration 4** (wall with leaks sealed with two strips of Fire Sealing Silicone).
$R_w(C;C_{tr})$ = 49 (-2;-8) dB ; R_w = 49,7 dB STC= 50 dB

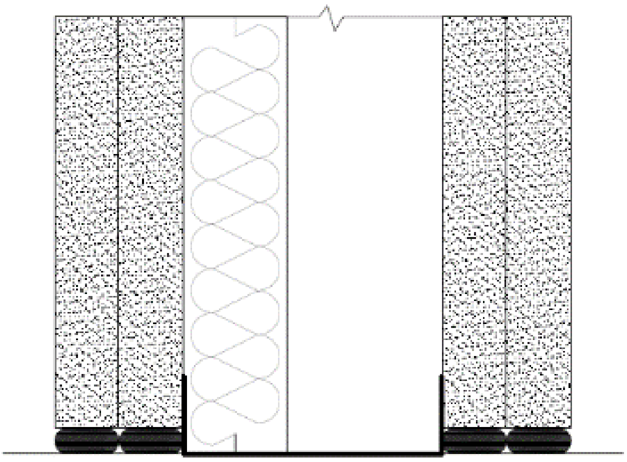
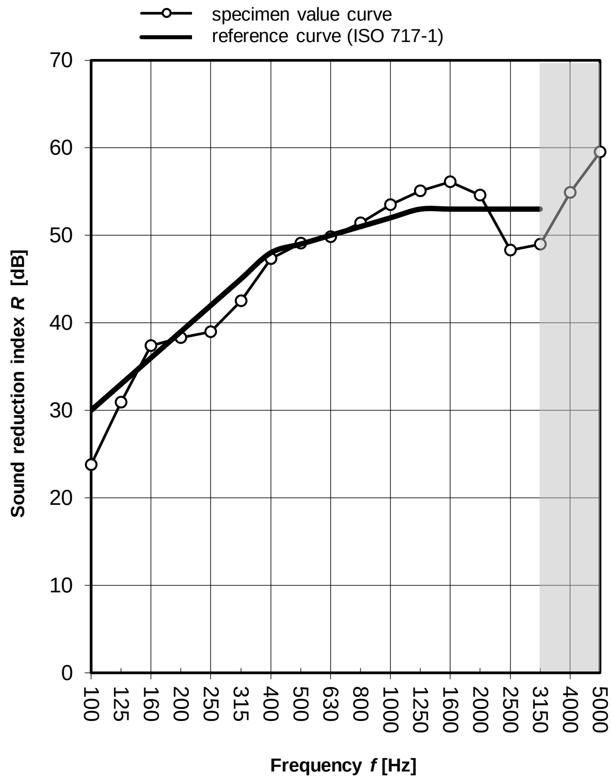


Figure 7 - Conf. 4 scheme



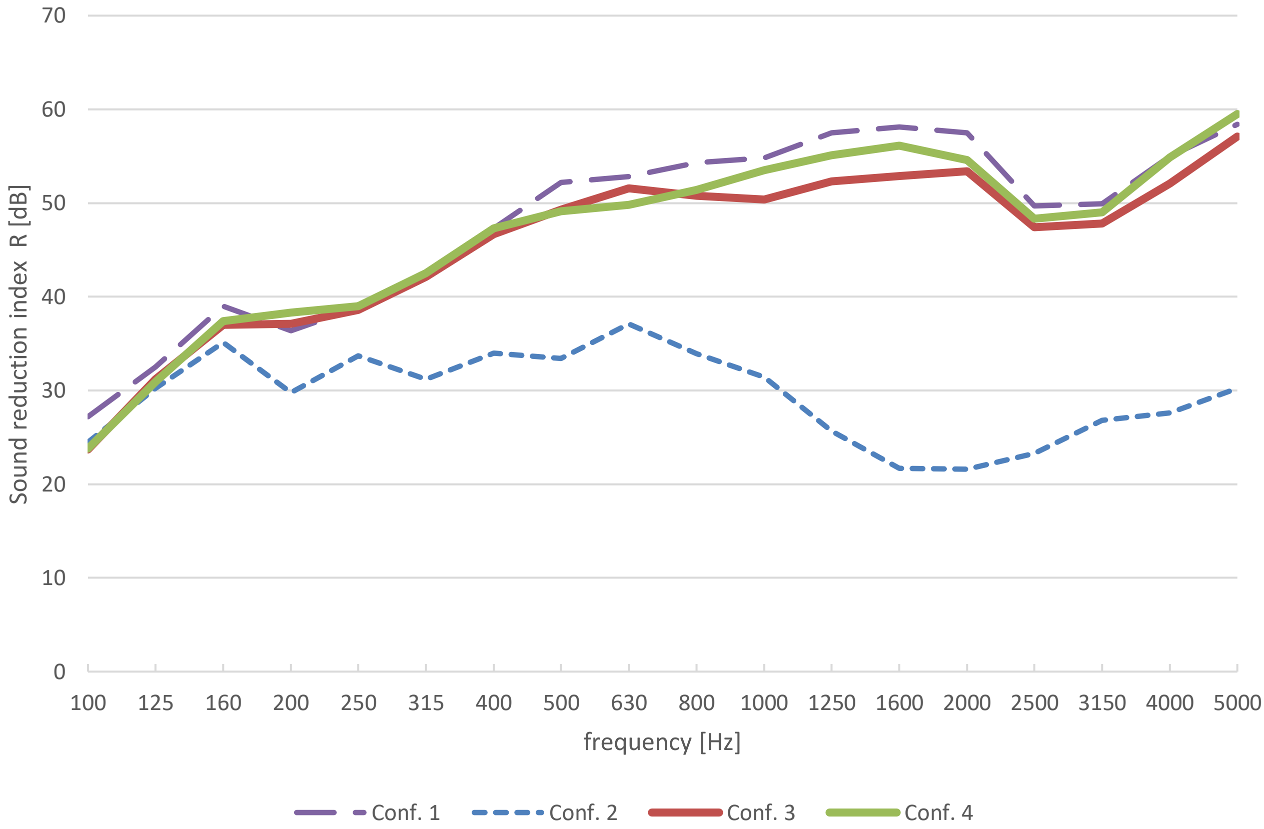
Graph 4 - Conf. 4

Figure 8 - Conf. 4 detail

Figure 9 - Conf. 4

5 COMPARISON

The following graph compares all the analysed configurations.



Graph 5 – Comparison between all the configurations assessed

6 CONCLUSIONS

Fire Sealing Silicone proves to be significantly effective because it allows to obtain from a R_w =25 dB in the configuration 2 (leaks unsealed) to a R_w = 49,0 dB in the configuration 3 (leaks sealed with one strip of Fire Sealing Silicone) and a R_w = 49,7 dB in the configuration 4 (leaks sealed with two strips of Fire Sealing Silicone), remembering that configuration 1 (entire unit wall) has a R_w = 50 dB.

Bologna, July 25, 2022

The Scientific Coordinator

Prof. Luca Barbaresi

School of Engineering and Architecture
University of Bologna

Digitally signed
by: Luca Barbaresi,
on: 28 luglio 2022