

Report EURIMA Project TP07

Dry Wall Linings

Jürgen Royar

OBJECTIVE

The main objective of the project was to avoid disadvantages for mineral wool based wall linings in a new CEN standard under preparation.

Wall linings are in many countries used to improve the acoustical performance of solid walls; the classical version is a combination of mineral wool boards glued on plasterboard. The market importance is normally rather low

In some countries such wall linings are used to improve the thermal performance of lightweight massive walls. Especially in France this is a rather important market and is under strong competition between mineral wool and EPS.

First comparisons between wall linings based on the draft of a new European standard: prEN ISO 140-16: "Laboratory measurement of the sound reduction improvement by acoustical linings" showed advantages for linings based on non-elastified EPS foam which have additionally price advantages with regard to mineral wool systems. The project should lead to an alternative assessment of the linings to guarantee the documentation of better performance of mineral wool systems.

The Physikalisch-Technische Bundesanstalt (PTB) in Braunschweig has been chosen by EURIMA to study the question how different acoustical linings would act on different solid basic walls for sound insulation purposes. The measurements for this report were carried out by two officially accredited laboratories,

- Fraunhofer-Institut für Bauphysik in Stuttgart (IBP) and
- Materialprüfanstalt für das Bauwesen an der TU Braunschweig (IBMB).

The co-ordination of the measurement program and the summarising interpretation were made by PTB.

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The following questions were asked:

- Is the performance of linings independent from the basic wall construction?
- What are the values of the newly defined single number values according to prEN ISO 140-16 and which one should be recommended for use?
- Does the loss factor and with it the sound reduction index of the solid basic walls change when the lining is applied to the wall?
- How close are the results of different laboratories?

Three different basic walls were chosen (a heavy, a light and a light with cavities) and three different linings (a stiff one of EPS-plasterboard laminate, a soft one of mineral fibre-plasterboard laminate, and a free-standing one). Each lining was combined with each basic wall. To get some information about the reproducibility of the measurements in different laboratories, the heavyweight solid wall measurements including all lining versions were carried out in in both laboratories.

The measurements of the acoustical performance of the heavyweight solid wall in both laboratories show good correspondence, also the measurements of the lightweight walls together with the weakest lining.

All other combinations show big differences due to the fact that the laboratory in IBMB has a non neglectable flanking transmission in the high performance range. For that reason it will be necessary to give strong recommendations for boundary conditions in laboratories which can be used to test combinations of solid walls with highly performant wall linings in the future.

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Test program in detail:

The following basic walls were chosen for the tests:

Basic wall B1

heavy homogeneous masonry of
175 mm calcium silicate blocks
10 mm plaster render
total surface weight about 350 kg/m²

Basic wall B2

60 mm homogeneous gypsum blocks
smoothed on both sides
total surface weight about 60 kg/m²

Basic wall B3

70 mm hollow gypsum blocks
10 mm plaster render
total surface weight about 63 kg/m².

All linings were built up by the same craftsmen to keep differences of construction small. The following linings were tested:

Lining L1:

a system of insulating laminate, directly glued to the basic wall, consisting of

12,5 mm plasterboard

50 mm mineral fibre, dynamic stiffness about 9 MN/m³

Lining L2:

a system of insulating laminate, directly glued to the basic wall, consisting of

12,5 mm plasterboard

50 mm expanded polystyrene, dynamic stiffness about 70 MN/m³

.Lining L3:

a free-standing system on metal studs, consisting of

2 x 12,5 mm plasterboard (8,5 kg/m²)

100 mm metal studs, with

100 mm mineral wool between the studs.

Each lining was combined with each basic wall. The measurement program for basic wall B1 was carried out in both laboratories.

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Results

- The performance of linings is not independent of the basic wall constructions; especially at mid and high frequencies the improvement is better when the original basic wall is weak in performance.
- The difference in improvement is larger with high performant linings, especially at mid and high frequencies, it could be up to 15 dB in single number value.
- The improvement with a mineral wool laminate directly glued on the solid wall is about 8-12 dB and about 8-10 dB higher than with a laminate based on un-elasticated foam, which can lead to a decrease of performance by about -2 dB in the case of heavyweight solid walls.
- The improvement with a free standing mineral wool system can be up to about 30 dB in single number value and is by far the most performant solution.
- The loss factor together with the sound reduction index of the solid walls changes when the linings are applied to the walls.
- Producers/sellers of wall linings are allowed to give the improvement based on a reference curve or as direct difference between the values with and without the lining; there is no tremendous difference between the two possibilities.
- Results from different laboratories are sufficiently close together, when flanking transmission and mounting and fixing details are respected.