Proceedings of The Institute of Acoustics

INVESTIGATION OF FLANKING TRANSMISSION IN THE HORIZONTAL AND VERTICAL TEST SUITES AT BRITISH GYPSUM.

P. ROYLE
BRITISH GYPSUM LIMITED, RESEARCH & DEVELOPMENT DEPARTMENT

Over the years it has been found that high performance lightweight structures under test in the laboratory approached a limiting sound reduction index that was less than expected. This implied the presence of flanking transmission, which was not in compliance with ISO 140 Part I, and so an investigation of the problem was necessary.

Considering firstly the Horizontal Test Suite used for testing partitions; the original plan is shown in Fig. 1. The 630 mm concrete dividing wall is vibration isolated from the two rooms. The aperture perimeter was lined with 50 mm thick timber to provide easy fixing of partitions. When the change-over to a metric size aperture was made (8' x 12' to 2.4 m x 3.6 m) extra timbers were added, approximately doubling the original thickness of the lining. It was then found that flanking transmission was taking place through the timber perimeter lining. Typical results from high performance partitions are shown in Fig. 2, the later results being approximately 3 dB lower than the earlier results at high frequencies. A plateau occurred at around 56 dB which implied that a partition with a mean sound reduction index in excess of 46 dB would be affected by flanking transmission.
A second cause of flanking transmission was found to be due to the relatively large area of 630 mm concrete presenting a limiting potential measurable sound reduction index.

The solution was to provide timber aperture linings in several sections as shown in Fig. 3 and to ensure that test partitions were placed over a gap between individual timbers. In addition, the solid concrete dividing wall was lined with an independent plasterboard lining each side, which also partially cloaked the edge of the timber lining. Before and after results are shown in Fig. 4 and the effect of lining the concrete walls gives further gains at high frequencies. The mean S.R.I. for the sample was originally measured as 53 dB and is now 62 dB.

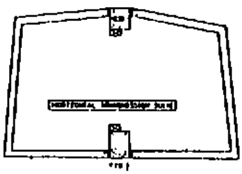
The Vertical Test Suite had similar design problems and a section of the laboratory is shown in Fig. 5. The dividing floor is 410 mm thick concrete and is vibration isolated from the two rooms. Clearly, airborne sound flanking transmission through the concrete was a problem and the sound power radiated from the dividing floor measured with the aid of accelerometers explained the limiting high frequency results shown in Fig. 6. The simplest way to solve the problem was to lay a floating floor which consisted of a layer of 13 mm chipboard on 50 mm resin bonded glass-wool slabs, over the concrete dividing floor. The sound reduction index of a high performance lightweight separating floor is now seen to be much higher as shown in Fig. 6.

Since impact insulation measurements are made in this laboratory, there is also a potential source of impact flanking transmission. This occurs when timber joists rest on the aperture lip and the walking surface is fixed

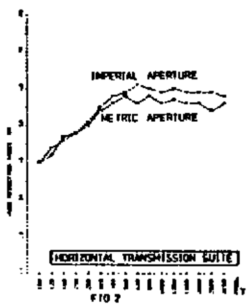
INVESTIGATION OF FLANKING TRANSMISSION IN THE HORIZONTAL AND VERTICAL TEST SUITES AT BRITISH GYPSUM.

directly to the joists. The joists transmit vibrations originating from the tapping machine to the concrete dividing floor thereby giving too high a sound pressure level in the receiving room. The problem is solved by ensuring that the joist ends are always placed on simple vibration isolation mountings such as soft PVC foam. The difference this can make ($\approx$ 5 dB) to impact measurements is shown in Fig. 7.

To conclude, it has been shown that careful attention to aperture linings is required in order to avoid airborne flanking transmission; independent linings are required to shield solid concrete dividing walls or floors and timber joists should be resiliently mounted to avoid impact flanking transmission.



Section through Horizontal Test Suite as originally designed.



Airborne sound insulation measurements in the Horizontal Test Suite prior to flanking transmission control.

INVESTIGATION OF FLANKING TRANSMISSION IN THE HORIZONTAL AND VERTICAL TEST SUITES AT BRITISH GYPSUM.

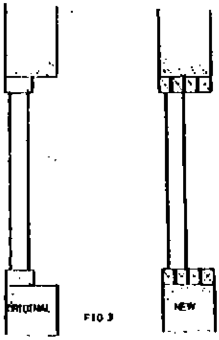


FIG 3

Modifications to the aperture timbers in the Horizontal Test Suite.

Airborne sound insulation measurements in the Horizontal Test Suite after aperture timber modifications.

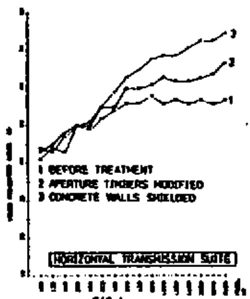
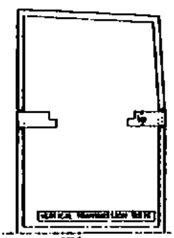


FIG 4



Section through Vertical Test Suite as originally designed.

INVESTIGATION OF FLANKING TRANSMISSION IN THE HORIZONTAL AND VERTICAL TEST SUITES AT BRITISH GYPSUM.

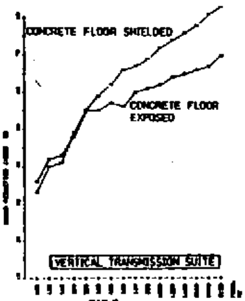


FIG.6

Airborne sound insulation measurements in the Vertical Test Suite after the provision of concrete floor shielding.

Impact sound insulation measurements in the Vertical Test Suite.

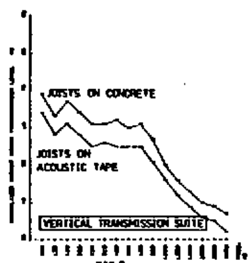


FIG 7