MEASURING THE ABSORPTION OF BARRIERS AND SCREENS

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Introduction

Traffic noise barriers with a sound absorbing face and absorbing office screens are two examples of sound absorbing screens and barriers. They are intended to be both a barrier to sound (with high transmission loss) as well as sound absorbing. Laboratory tests (such as ASTM C423) are required to verify the effectiveness of the sound absorbing surfaces.

A number of the details of the test procedures are not precisely specified, and it is possible to get a range of results for the same material. It is also not always clear exactly what is required of an absorbing screen.

This paper reviews the problems associated with measuring the sound absorption of screens and presents suggestions for recommended measurement procedures and areas in need of further research.

The Problems

Absorption coefficients obtained in a reverberation chamber test are angular averages. If the sound field is ideally diffuse these averages represent an even distribution of all possible angles of incidence. In practice reverberation chambers are not perfectly diffuse and all angles of incidence are not equally represented. Measured absorption varies accordingly.

Depending on the type of screen and the application, all possible angles of incidence may not be equally important. For an absorbing traffic noise barrier, near to normal angles of incidence will be most important because near to normally incident sound will be of greater intensity.

The sound absorption coefficients of samples installed on the floor of a reverberation chamber vary with sample size. Due to diffraction effects at the edges of the sample, smaller samples tend to be more effective than larger samples and measured absorption coefficients relate to the sample perimeter/area ratio (*P/A*). (See Figure 1).

The sound absorption of screens is most commonly tested by mounting the screen vertically in the middle of the reverberation chamber rather than lying it on the floor. These two different types of sample mounting produce quite different sound absorption coefficients. (See Figure 2). The sample size effects and the variation with sample perimeter/area ratio are reduce for free standing vertical samples.

It is common to measure both the absorption and the sound transmission loss of the screens. It would be convenient to use the sound transmission loss mounting for both tests. However this mounting restricts the angles of incidence and has larger sample size effects than the vertical mounting.

Recommendations

- Sample size should be representative of actual applications.
- Sample size should be standardised and as large as possible.
- Free standing vertical mounting is preferred.
- A sound transmission loss mounting is not recommended.
- We need to assess the influence of angle of incidence.
- We need to determine representative angles of incidence.
- We need to determine preferred absorption versus frequency characteristics for each type of screen.

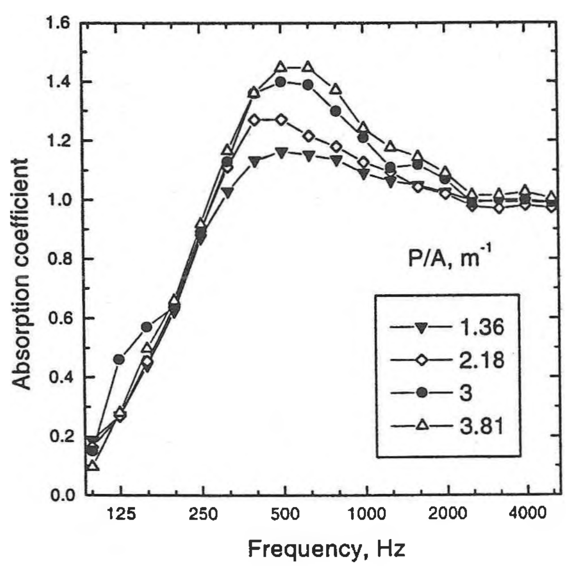

Fig. 1. Glass fibre sample absorption coefficients for four perimeter/area ratios (P/A).

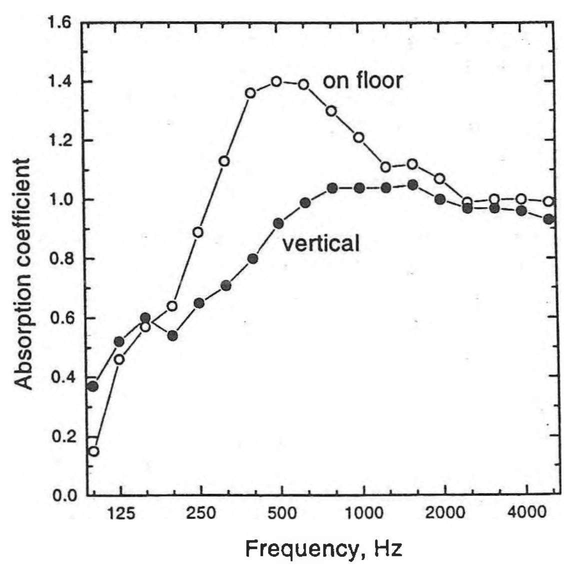

Fig. 2. Glass fibre sample absorption coefficients for vertical and flat on floor mounting .