ABSTRACT

Absorption of sound by materials plays an important role in acoustics. Absorption coefficients not only vary with frequency, but also to a large extent, with the size, quantity of materials, spacing, distribution and mounting conditions. For example, the value of absorption coefficient falls as the ratio of treated to untreated surfaces increases, and larger value of coefficient is expected to result as the diffusion of sound is improved. These are the main reasons why the reverberation time calculations cannot be accurate. No existing formula would take all these effects into account.

Studies that are carried out in this dissertation on the effect of area and spacing of absorbing materials show that the absorption coefficient is inversely proportional to the area of the material. Various size samples indicate an increase in absorption with smaller samples.

The shapes of the sample also influenced the absorption but these changes are not proportional to the area as shown by the tests done on samples of different patch sizes but all having same area. The phenomenon underlying the aforementioned effect is due to edge effect in which the part of the sample near the edge absorbs more energy than the other parts.

The edge effect theory is further confirmed by the relation developed between the area and the shape of the test samples. The additional absorption is proportional to the relative edge length of the sample, i.e. the ratio of the length of the free edges to its surface area.

Studies on samples with and without air space, and with and without backing show that greater absorption at low frequency can be obtained with the use of an air space, and that the resonant frequency is dependent on the depth of air space. However at higher frequencies, the air space is not very effective.