ABS Absorption CLARIFICATION

A recent Syn-Aud-Con listserv thread brought out some interesting facts about absorption and absorption coefficients. A common definition of the unit of absorption, the Imperial Sabin, is that it is "one square foot of open window." A metric Sabin is "one square meter of open window." From this definition, it is tempting to associate unity with complete absorption. From this, a working definition of an absorption coefficient is that it represents the percentage of sound that is absorbed when a sound wave strikes a surface. So, a 0.5 coefficient means that 50% of the sound is absorbed. While elegant in it's simplicity, the percentage definition doesn't hold up under closer scrutiny.

A Closer Look

It is first necessary to differentiate between absorption and the absorption coefficient. The absorption, A, of a material is determined by measuring the reduction in the reverberation time of a reverberation chamber by the introduction of a specimen into the space. The formula is as follows:

$$A = \frac{0.921(60)V}{cT_{60}}$$

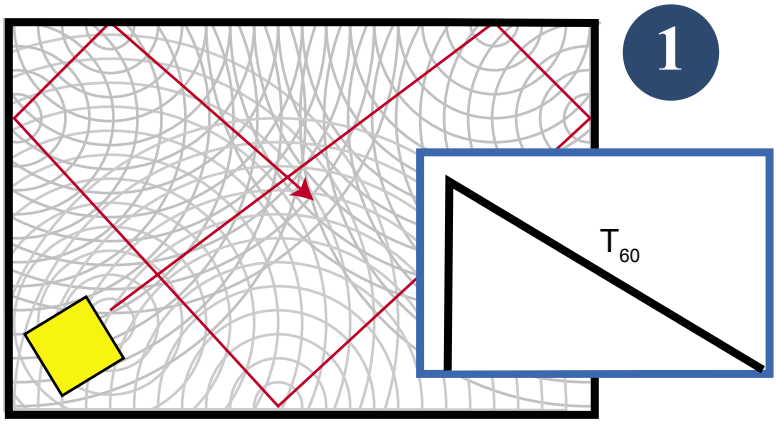
where V is the room volume in cubic feet
c is the speed of sound in air
T_{60} is the reverberation time for 60 dB of decay in seconds

Thus the difference between the empty room absorption (A_1) and the absorption of the room with the specimen (A_2) is equal to the total absorption of the specimen (A) at each test frequency. The formula is simply (A) = A_2 - A_1. The absorption coefficient, or ABS, is found by multiplying the absorption A times the area of the sample. The area of most samples is 72ft^2.

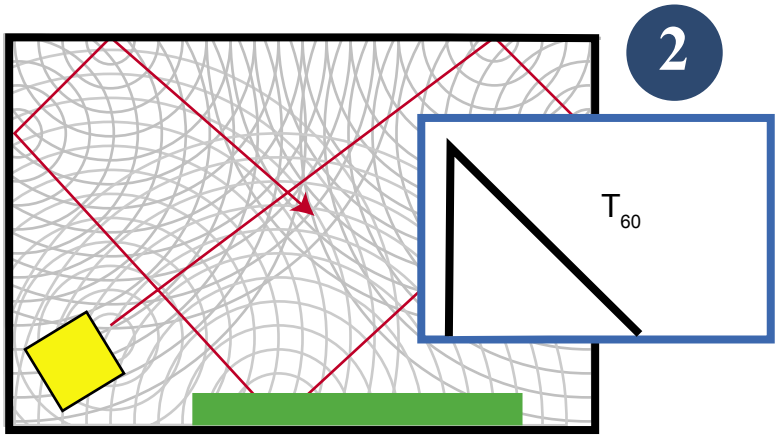
In essence, a 0.55 absorption coefficient is the numeric expression indicating the differences in time it takes the acoustical energy emitted into the test chamber to decay a given amount of dBs with and without a specimen. The more rigorous definition is needed to explain absorption coefficients that exceed unity, something not all that uncommon with modern materials.

Further Reading

Two excellent papers that provided the background for this overview were authored by David Moyer, lab manager at Riverbank Labs. They are available in the Member's Area of the Syn-Aud-Con website in PDF format. We are grateful to Mr. Moyer for clarifying this concept and sharing his papers, and to Jeff Symanski for making us aware of them. *pb*



The reverberation time of the chamber is measured prior to the introduction of the absorption sample.



The test is repeated with the sample in place. The change in T_{60} can be used to determine the coefficient of the sample.