RT – REVERBERATION TIME

Quick Explanation

RT is a number describing the amount of time it takes, in seconds, for an impulsive noise, such as a hand clap to decay 60 dB in a space. For practical purposes, this is the amount of time it takes for an impulsive sound to become inaudible. RTs are typically measured in noise spectra that are one octave band wide, with centers ranging from 125 Hz to 4,000 Hz. The RTs can vary greatly from one octave band to another. When one number is given for the RT in a space, it is usually the RT at 500 Hz. RTs can vary from small fractions of a second up to several seconds.

More Than You Wanted to Know

The formula for computing the RT at a given frequency is the following:

RT = (.049 x Volume)/(Surface Area x Average Absorption Coefficient)

Thus, to calculate the RT at any given frequency you must know the cubic volume of the space, along with the absorption coefficient (at that frequency) of each material in the space.

RTs vary considerably with room volume and acoustical absorption. The larger the room, and the more reflective the surfaces are, the higher the RTs will be.

Generally speaking, shorter RTs are better for speech intelligibility, while longer RTs usually make music sound better. For example, ANSI S12.60 recommends an RT of 0.60 seconds or less at 500 Hz for classrooms of 10,000 CF or less. On the other hand churches may have an RT of several seconds at that same frequency. Long RTs can have a very negative effect on speech intelligibility in a space.

Caveats

Two spaces that have the same RTs can sound very different, if the spaces are different sizes. Generally speaking, larger spaces can support longer RTs, while smaller spaces may sound more reverberant even with shorter RTs.

When only one number is given for the RT of a space it can sound exceedingly different from another space with the same RT. One of the spaces might have a much longer RT at the lower frequencies while the other might have very little low frequency reverberation but a great deal of high frequency reverberant energy. Yet, the two may have the exact same RT at 500 Hz, which is the frequency band often used to characterize a space.