ACOUSTICAL RESONATORS

Sound absorption at low frequencies can be achieved by using porous or resonant absorbers. Porous absorbers performance is excellent at mid and high frequencies and very poor at low frequencies. As the thickness of the absorber must be comparable to the wavelength of the sound, extremely thick panels are required for low frequencies absorption. For this reason, resonant absorbers must be used.

DIAPHRAGMATIC RESONATOR

Some of the great rooms have excellent acoustical characteristics achieved by extensive wall paneling. Plywood or tongue-and-groove flooring or sub-flooring vibrates as a diaphragm and contribute to the absorption of the low frequencies. Drywall construction of walls and ceilings does contribute to sound absorption too. As walls and ceilings can cover great part or the whole room surface, their absorption must be highly considered.
A diaphragmatic resonator is simply a panel, of known density, spaced from the wall and supported by a framework. The frequency of resonance of the system can be calculated from the formula below.

$$f_0 = \frac{170}{\sqrt{density * depth}}$$

Where:

F_0: frequency of resonance [Hz]
Density: surface density of the panel - [lb/sq ft]
Depth: depth of air space - [in]

For calculations in meters use the formula below.

$$f_0 = \frac{60}{\sqrt{density * depth}}$$

Where:

F_0: frequency of resonance [Hz]
Density: surface density of the panel - [Kg/m^2]
Depth: depth of air space - [m]

Note: the surface density of any material can be simply obtained by dividing the weight of the sample by the surface of the same sample. To simplify the calculations, when possible, use samples of 1 ft by 1 ft to avoid extra calculations.