

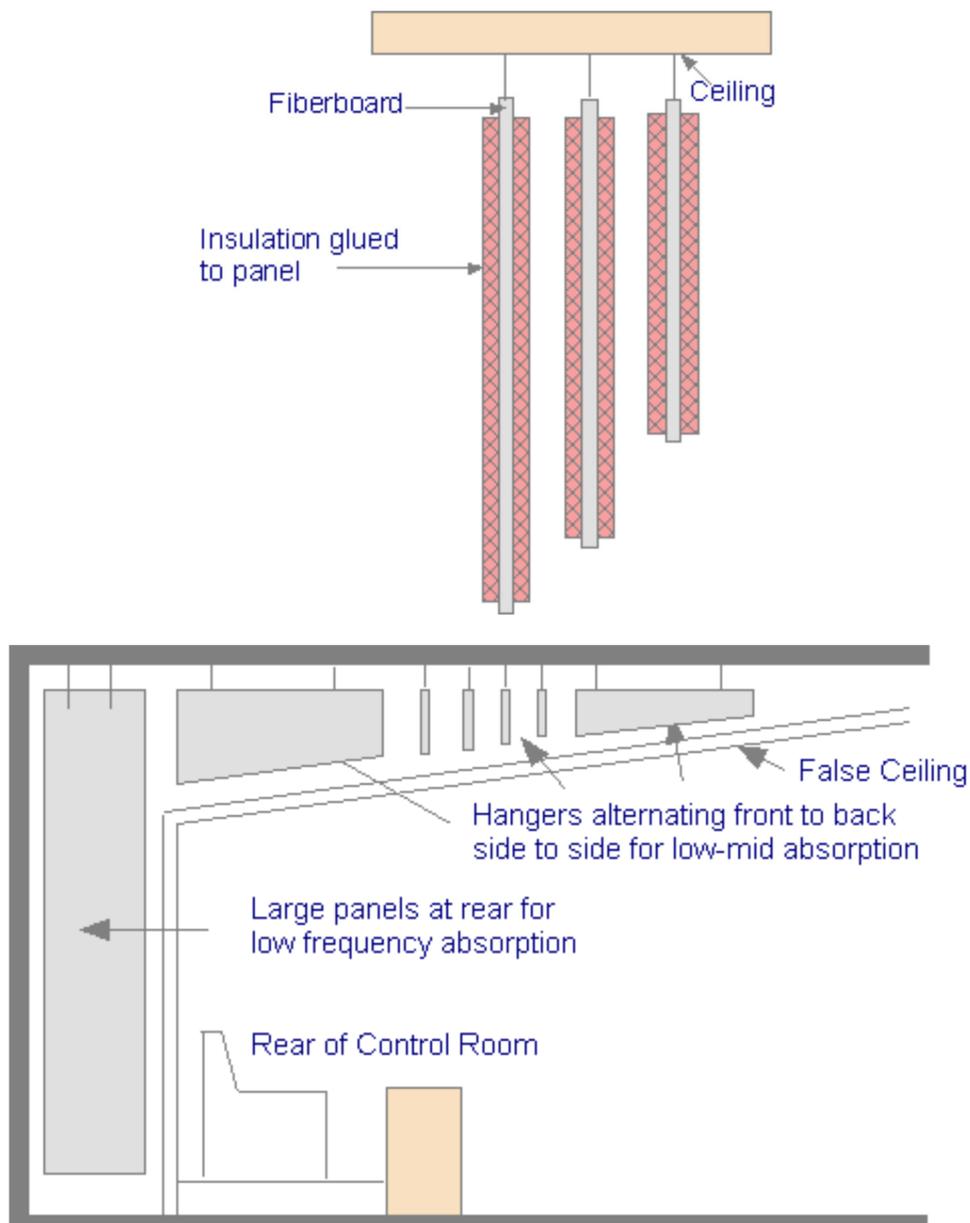
# LOW FREQUENCY ABSORBERS

Low frequencies are big waves, consider that a 50Hz wave is 6.6m (21' 8") and a 30Hz wave is 11m (36ft) long! That's 11m peak to peak -There's a lot of guys around here who would love to surf a wave like that! So to stop it it requires special techniques.

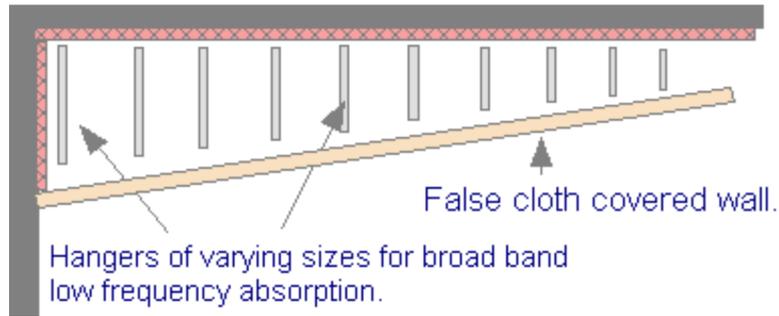
There are basically two ways to control low frequencies.

- **Acoustic Hangers.** This is a system of fibre board panels that are wrapped with insulation and are hung freely using wire or rope. The large hangers 1.8m x 500mm work in the low frequency range whilst the panels 1.2m x 300mm effect the low mid frequencies. It is common to have up to a 1.2m space at the rear of the control room with the large hangers whilst the smaller hangers are effective if suspended in the ceiling cavity created by a false ceiling.
- **Panel Absorbers.** A panel of plywood or particle board is placed over an air cavity with insulation glued to the back of the panel. The panel has a resonate frequency and when it occurs in the room it resonates and the insulation absorbs the energy.

## Acoustic Hangers



The above drawing shows the rear of a typical control room design. The fibreboard panels are suspended from the ceiling with the sizes varying to give a broadband absorption field. They can also be hung behind a false wall in the studio as in the following drawing.



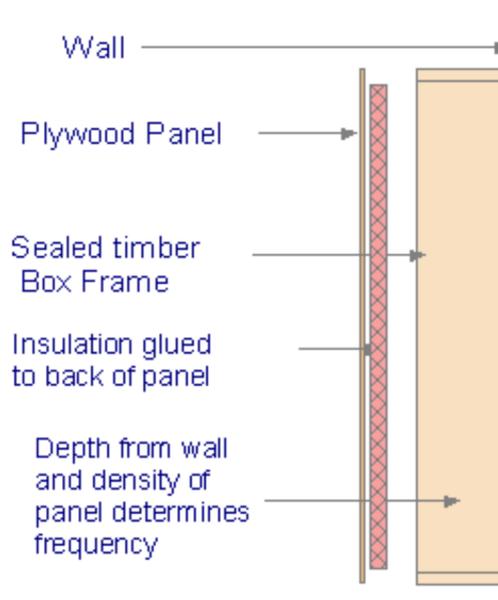
**False Wall with Acoustic Hangers**

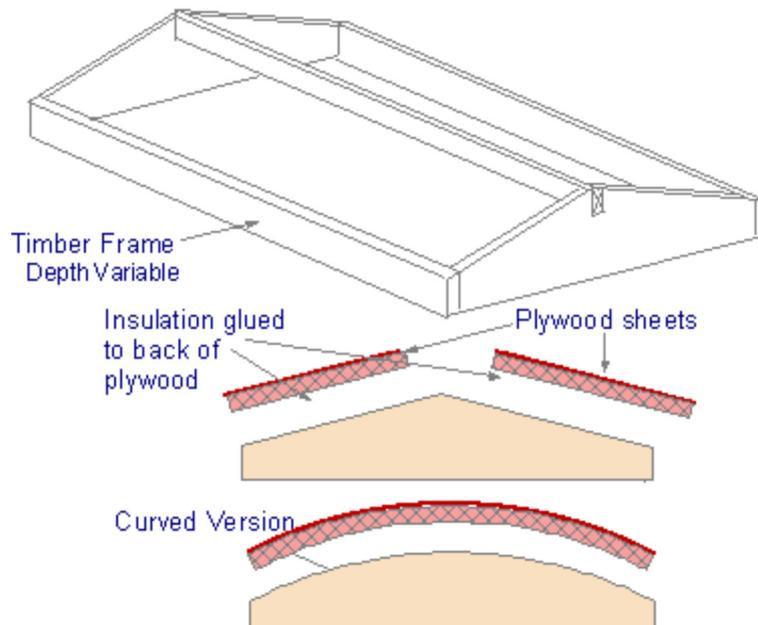
## Panel Absorbers

A panel absorber is created when you place a sheet of plywood or fibreboard, with insulation glued to the back of it, over an air cavity. The panel will have a resonate frequency of its own, tap it and you will hear it. When it is placed over a **sealed cavity**, and insulation is attached to the back, everytime it hears its own note it resonates and the air in the cavity resonates and the insulation absorbs the resonance, hence absorbing the frequency! It is important to note that here we have an absorber that reflects the high frequencies and attenuates the low. With the hangers all that exposed insulation absorbs the high frequencies as well so the panel absorber has a place in the studio. The two factors determining the frequency of absorption are:

- The mass or density of the panel.
- The depth of the air cavity, i.e. depth of the sealed timber frame.

A panel absorber is made like this:





### You can apply different shaped front panels

The other great advantage of panel absorbers is that they can have angled or curved fronts so when mounted on a wall or the ceiling they stop parallel wall interference and prevent standing waves creating **diffusion**.

You can even tune this absorber by placing a contact microphone on the plywood panel which is plugged into a real-time analyser and blasting the panel with white noise or a swept tone with a speaker. When the frequency = the panel's resonate frequency the panel will vibrate and the frequency will show up on the real-time analyser. The thicker the plywood the lower the frequency and the greater the depth (depth of the timber box) from the wall the lower the frequency. **Using fibreboard as an alternative tends to create a low-mid absorber.**

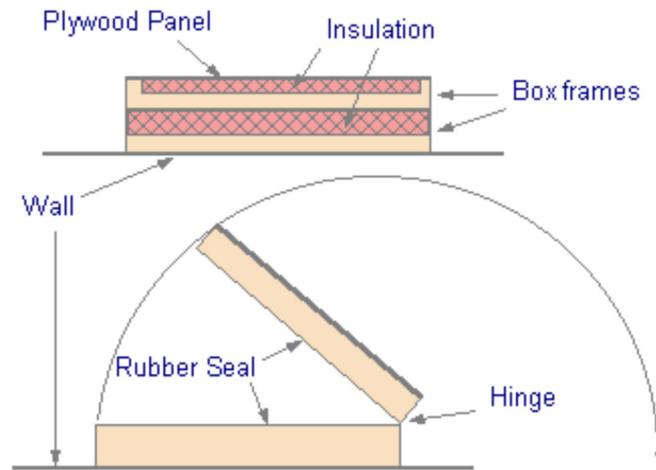
You can create a broadband low frequency absorption wall by building a series of sealed boxes with different depths with each box being only 1m x 1m (3' x 3'). With a variety of different thickness of plywood you can cover the whole low frequency range. It looks good too. You can also alternate the fronts between panels and slats. ([See helmholtz resonators](#))

For absorption coefficients and panel thickness check out the absorption coefficient [chart](#).

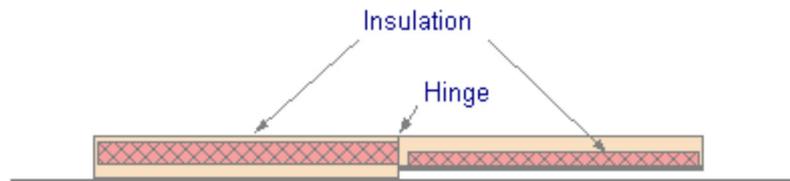
### Variable Panel Absorber

You can create a variable panel absorber by splitting the box into two boxes and placing hinges on one side so that it opens fully as per the following diagram:

## Low Frequency Absorber



## High Frequency Absorber



## VARIABLE PANEL ABSORBER

The variable panel absorber allows you to change the acoustics in a room. A wall of these absorbers can quickly change a room's acoustics from live to dead. A variation is to have a slat resonator in the bottom box so that when the box is opened it reveals a slat resonator so you end up with a wall of alternating low-mid absorbers and high frequency absorbers. If you can only afford the space for one studio this is an excellent addition as you can change the room acoustically to cover all situations.

