



## Building sound insulation: Plasterboard lined concrete walls

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The use of pre-cast concrete intertenancy walls in New Zealand construction is common. Such walls are seen to be of merit acoustically since they provide a massive, continuous separation between dwellings. It is well known that a 150 mm pre-cast concrete wall should have an STC of 55, thereby fulfilling the minimum requirements of the current New Zealand Building Code.

However, it is often desirable to line concrete walls with plasterboard to provide a more conventional surface finish, and to allow for the concealing of electrical wiring.

The lining of such walls must be undertaken with care, as it may lead to a decrease in the sound insulation offered by the system.

### ***How does the plasterboard lining affect the sound insulation of the wall?***

There are three factors which govern the manner in which a plasterboard lining affects the sound insulation of a concrete wall:

1. The method of support – ideally, the plasterboard should not be solidly connected to the concrete wall;
2. The depth of the cavity (the distance between the facing surfaces of the concrete and the plasterboard);
3. The use of sound-absorbing material in the cavity between the plasterboard and the surface of the concrete.

The addition of a plasterboard lining to a concrete wall will always increase the sound insulation at high frequencies. It is at low frequencies where the interaction of the concrete, cavity and plasterboard may combine to reduce the sound insulation of the system. While voices are not a source of low frequency noise, modern stereo equipment may be. It is these low frequency noises which an incorrectly lined concrete wall will allow to travel between apartments.

In general, the greater the cavity depth and the greater the mass of the plasterboard cladding the less chance there is that this effect will occur within at a frequency which is important in determining the STC of a wall.

The addition of sound-absorbing material to the cavity also assists in lowering the frequency at which this effect occurs, and improves the sound insulation at higher frequencies. Fibrous materials such as cellulose fibre, glass fibre or rock wool are good materials for this purpose. Closed-cell materials such as polystyrene are not, as they do not significantly absorb sound.

Decreasing the degree of physical connection between the concrete wall and lining by using resilient steel channels or a separate frame to mount the plasterboard will increase the sound insulation of a system at higher frequencies.

### ***How do I ensure the addition of a plasterboard lining does not detrimentally affect the sound insulation of a concrete wall?***

To maximize the improvement in sound insulation from adding a plasterboard lining to a concrete wall, the cavity depth should be made as large as practically possible. As a general guide, the product of the mass per unit area of the plasterboard (in kg/m<sup>2</sup>) and the cavity depth (in mm) should exceed 425 for a cavity filled with sound absorbing material (Warnock, 1998). The minimum cavity depth therefore recommended for different combinations of plasterboard lining is given in table 1.

*Table 1 – Recommended minimum cavity depths when lining a concrete wall with plasterboard*

Lining	Minimum recommended cavity depth (mm)
10 mm Standard Gib plasterboard	65
13 mm Standard Gib plasterboard	50
10 mm Gib Noiseline plasterboard	50
13 mm Gib Noiseline plasterboard	35

### ***What STC can I expect my particular plasterboard lined concrete wall system to have?***

The STC of a specific system is a complex function of parameters including concrete wall width and density, lining type, cavity depth, cavity absorption type and detail of the connection between the concrete wall and plasterboard lining.

An acoustic engineer will be able to assist you in calculating the expected STC of a specific system.