Acoustics

western red cedar and the Timbeck Décor Series

the science and theory behind acoustics within buildings is a very complex subject, and yet the basic fundamentals are very simple

the basics

Sound travels in waves and continues until it is either disrupted or it dissipates. What it does if disrupted is dependant upon the object that it encounters and the nature of that object. The reference to building products having 'good acoustic properties' is broadly an assessment of their ability to absorb sound.

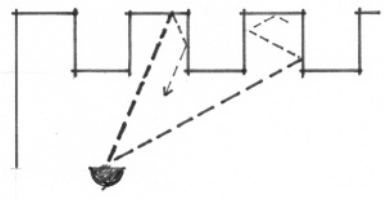
acoustics within buildings.

If the surface that the sound encounters is flat, dense and glossy, the sound wave will largely be reflected and head off in a different direction at marginally reduced intensity. This produces echos.

If the surface is less dense and less glossy, the sound wave is partly absorbed and partly reflected. The correct mix of surfaces will achieve the desired acoustics for a room's particular purpose.

If the surface that the sound encounters is soft and heavily textured, the sound wave is largely absorbed and any further effect of the sound has substantially reduced intensity. This results in a very flat sound

Within a building, if we have a room which has flat, dense shiny surfaces throughout, sound waves continue to bounce from one face to another and produce a noticable echo. Such a room can be quite uncomfortable to be in, especially if engaging in conversation. If that room has carpet on all surfaces, sound waves are almost totally absorbed.



In all cases, the angle at which the sound is reflected from a surface is the same angle at which it hits the surface. Each time a sound wave is reflected, it looses some of its intensity – the more it is reflected, the weaker it becomes.

The shape or profile of the reflecting surface will also have a bearing on acoustic properties.

acoustics and building materials

Materials which reflect sound and contribute to generating an echo have flat, dense, glossy surfaces – typical examples are glass, ceramic tiles, shiny metals.

Materials which absorb sound and help eliminate echos have soft & textured surfaces - typical examples are carpet, woven fabrics (curtains).

Apart from density properties, the degree of sound reflection or absorption attributed to a surface will be largely dictated by its level of gloss or shininess. For example, a plasterboard wall finished with a "flat" paint surface will absorb more sound waves than one with a "gloss" finished surface which will be far more reflective.

timber and acoustics

There are no specific acoustic properties which can be applied across the board to all timbers – individual species or density groups have their own unique acoustic properties and again, these are affected by the nature of any surface coating which may be applied.
From the contribution that density makes to achieving good acoustic properties, it stands to reason that lower density timbers offer better acoustic properties than those with higher densities. Western Red Cedar is amongst the lowest density of all readily available commercial timber species.

comparison of densities of timber groups – kgs/m3		
Western Red Cedar	**Construction Pines**	**Construction Hardwoods**
350	550 - 700	850 - 1100
some grades of Balsa Wood have a density of 380 kg/m3		

Western Red Cedar becomes the stand alone choice when selecting timbers which can offer good acoustic properties

timber coatings and acoustics

As the level of gloss or shininess also has a significant affect on acoustic performance, the optimum coating will be one that does not significantly change the nature of the raw timber surface.

Lacquers, enamels and other film forming coatings cover the natural surface of timber and their properties become the dominant criteria with respect to the acoustic performance of the finished timber product. In the case of low density timbers like western red cedar, those coatings will lessen the acoustic performance of the finished timber product.

Penetrating oils have a far less impact on changing the density of the timber's surface fibres and are by far, the preferred choice for coating timbers where acoustic performance is required.

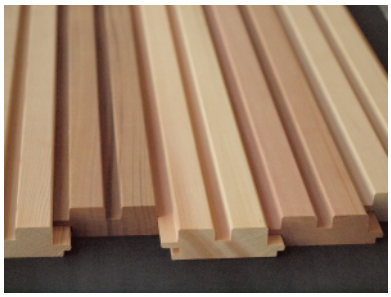
putting it all together

Timber certainly has a place amongst the list of building materials most frequently chosen for acoustic properties – it is also one of the very few materials which can offer unmatched natural beauty.

Western Red Cedar has the best properties for providing optimum acoustic performance from timber.

A surface profile which naturally induces multiple reflections of the sound waves will add to a products acoustic properties.

A penetrating oil coating will provide the most compatible finish, offering excellent colour options and natural appearance qualities while not materially affecting natural acoustic properties.



Timbeck's 26mm Décor Series Western Red Cedar with Cutek CD50 penetrating oil coating provides the perfect solution for a natural appearance building material with acoustic properties.

(*this design guide is intended to provide an overview of the fundamentals of acoustic design and is not intended to be a alternative to professional acoustic engineering*)