



# Window pains

WITH THE BUILDING CODE OF AUSTRALIA DICTATING THAT HOME THEATRES MUST INCLUDE ACCESS TO NATURAL LIGHT AND FRESH AIR, **PAUL SKELTON** LOOKS AT WHAT THIS MEANS FOR ACOUSTICS.

In general, windows are seen as kryptonite to home theatres: “They provide very little isolation, resonate and reflect,” says Ultrafonic director and acoustic engineer Andrew Steel.

But, the Building Code of Australia (BCA) dictates that home theatres are by definition “habitable rooms” and therefore require permanent access to fresh air and natural light, most commonly in the form of windows.

In particular, installers should take heed of wording in the BCA – Volume 2, page 421 – *Ventilation: Acceptable construction practice – Ventilation requirements*, and page 419 – *Light*, which say natural lighting and air must be provided to all habitable rooms in a Class 1 building, with the glazed panel or opening not less than 10% of the floor area.

However, some in the custom installation industry are trying to bypass the Code by specifying a storage room, only to convert it into a home theatre after gaining building approval.

Ultimately, the Australian Building Codes Board deemed it necessary to

incorporate windows into these rooms to ensure home owners would avoid ‘sick building syndrome’ – a phenomenon that has been studied and shows that people need natural light for health and wellbeing – however, this decision highlights the building industry’s lack of knowledge of the practicalities of home theatres.

“A window acts like a bass absorber, which itself is a good thing; however, it also acts like a resonator and a reflector, which is a very bad thing,” Andrew says.

“Removing these acoustic distortions from a room requires blocking the window with something solid, which defeats the purpose of having a window in the first place. If windows are at points in the room where critical reflections are located, or where critical diffusion is required, the installer or theatre designer will have to block the window, perhaps with a removable or hinged solid panel, and then put an absorber or diffuser on the back of it.”

For this reason, it is almost never ideal to include windows in the design of a home theatre.

“However, windows can be dealt with.

We have done some massive projects where, for example, a great view was available. But to actually soundproof them, and also have motorised treatments that cover them when the theatre is in use, is likely to cost tens of thousands of dollars.

“Soundproofing glass at 40Hz is very difficult. The only real practical way is to cover it with something solid and damped, like MDF with Green Glue, and have it sealed with door seals.” (See Figure 1).

Aside from windows, the BCA states a door or permanent opening could also be used to meet the Code, but are doors or permanent openings better or worse than windows?

“Permanent openings in the right place can be dealt with acoustically,” Andrew says. “In the wrong place, however, they can be disastrous.

“Permanent openings mean there is almost zero soundproofing. Even a small permanent opening, just one, could render a highly soundproof room no longer effective.

“Doors are fine; they are much easier to soundproof than windows. But if two



doors are required then it can be hard to find a place to put them.”

Single doors, no matter what you do, are not very soundproof. Two doors with a damped cavity can be very soundproof (see Figure 2).

### VENTILATION

Andrew says that in an ideal world the BCA would state that if a home theatre is built airtight it must have either forced ventilation or a window.

“In all honesty, forced ventilation is a better option because the windows could be left shut,” he says. “More likely, they will be blocked up as soon as the house is handed over.”

Further, Andrew explains that ventilation systems are relatively inaudible so there is no effect on audio quality: “The size of the silencers is proportional the size of the duct, so silencing a small fan (150mm) is much easier than silencing an air conditioning duct (600mm). Further, air conditioning can be supplied by a split system which, these days, are incredibly quiet (see Figure 3).

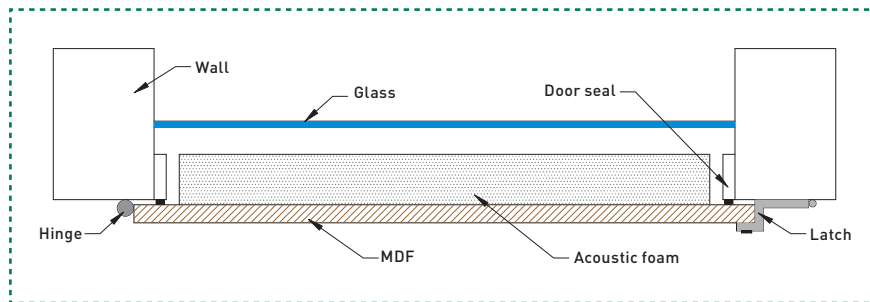
“Why go to all the trouble of building high isolation at low frequency then partially defeat it with a window? Windows are much harder to isolate than conventional walls, so this change to the BCA will undoubtedly cause more noise complaints from neighbours. Internally they are even worse; there is just no good way of putting glass of that size inside a home theatre.”

So what can installers do to adhere to the Code while avoiding the inherent acoustic problems associated with windows?

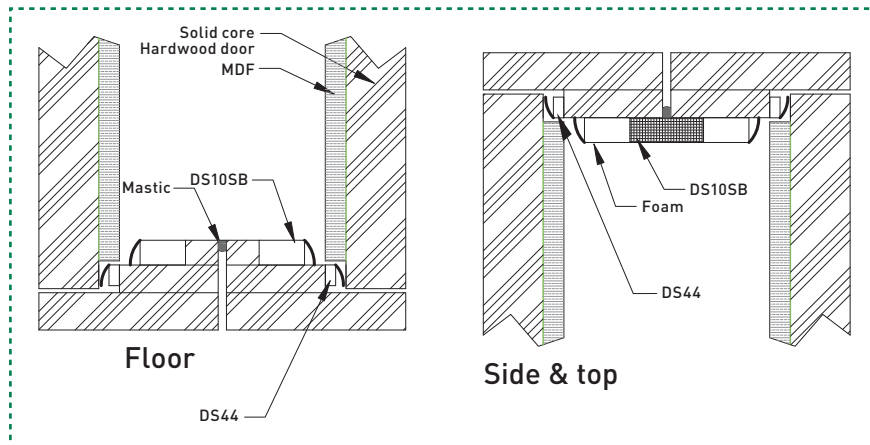
“Realistically, any home theatre that is built properly will be airtight. As a result, fresh air is critical, but we always build home theatres with forced ventilation just like you would for a recording studio.

“Without ventilation, things get smelly fast from body odour, breath, food and drink vapours, and after a while people become groggy with stale air and in the extreme case they could die. Windows, however, won’t solve this problem because you can leave them shut. Ventilation that comes on automatically is a much better idea.”

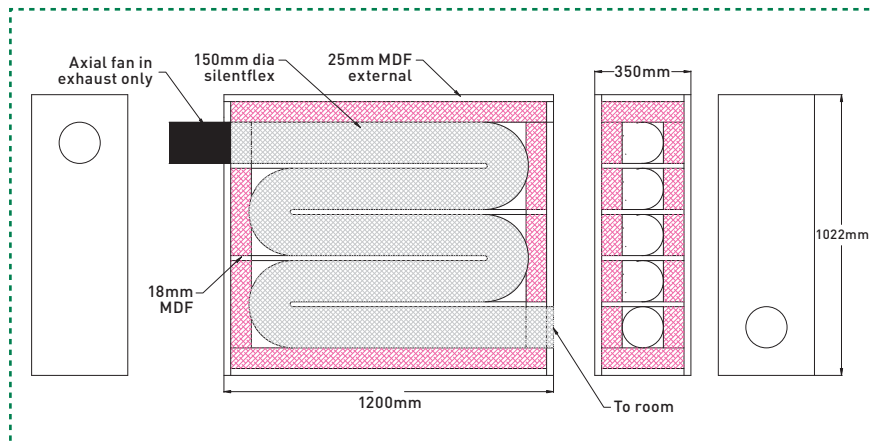
Andrew says there are ways to build inserts for windows that provide some



**Figure 1: Where double glazing is not an option, the design above works well. It is very important that the seal around all four edges of the window is airtight and the cavity is damped with acoustic foam or something similar. This is suitable for windows that need to be opened for light and ventilation but need to be closed for soundproofing at times. (Source: Ultrafonic)**



**Figure 2: Single doors, no matter what you do, are not very soundproof. Two doors with a damped cavity can be very soundproof. (Source: Ultrafonic)**



**Figure 3: Acoustic engineer Andrew Steel explains that ventilation systems are relatively inaudible so there is no effect on audio quality. (Source: Ultrafonic)**

isolation, as well as absorption, but “they are clunky and must be put in place and removed as needed.”

“Ultimately, it is best to keep the windows as small as possible, and keep them at the back of the room at the sides, not on the back wall. Also, keep the panes as far apart as possible, certainly no less than 100mm.

“Further, don’t get sucked in to spending money on double glazed

‘soundproof’ windows as they are not soundproof at low frequency. Windows for a home theatre need to be made to fit. Never triple or quadruple glaze – it is not as effective as the same amount of glass in two thicker panes.” **CHA**

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