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Bruce Ward
President
Alliance Residential Co.



Sound of SILENCE

A new class of building materials makes it easier to quiet residents' noise complaints.

Sound issues tend to take a back seat to architectural design when a building is on the drawing board. At least that's what you'll hear from acoustical consultants who work with multifamily developers. "When it's time to think about economy and the value of the building, control of sound gets kicked to the

side too often," says Steve Haas, president of SH Acoustics, a Milford, Conn., company that specializes in luxury residential projects. It's easy to do; acoustic design and performance happens behind the scenes, making it easy to discount or ignore compared to other must-have features that you can actually see.

By Charles Wardell



But that's a mistake. Haas and other consultants say that resident complaints over noise are on the rise. "Once people move into their apartments, sound issues quickly rise to the top of the priority list," he says, creating a customer service and construction nightmare.

Such problems have produced the development of a new class of building materials designed to simplify the soundproofing process for apartment and condo developers. The most promising newcomers? Sound-dampened drywall and plywood.

"They have really changed the face of how we design because they give us an almost guaranteed performance," says Haas. Such guarantees can be make-or-break at a time when noise levels in multifamily buildings are a growing concern.

THE DIN OF LIVING

Traffic and airplanes contribute to the din from outside; mechanical equipment and residents' stereo systems make life anything but quiet and peaceful on the inside.

Demographic shifts only amplify the sound problem in multifamily buildings. While most apartment dwellers are used to living in close quarters with their neighbors, many of the new residents moving into multifamily buildings today are baby boomers accustomed to living (quietly) in suburban single-family homes.

All the extras offered by new apart-

ment and condo buildings don't help, either. In order to attract these renters and buyers, new buildings are being outfitted with a growing list of social spaces—gymnasiums, activity centers, even bowling alleys. As fun as these amenities sound, they do come at an acoustic price. "I have heard from people in lower-level apartments who have to deal with the noise of crashing pins and dropping balls," says Haas.

But building noise isn't confined to the bottom floors. "One inherent conflict in multifamily dwelling design is that much of the noisy, vibrating equipment—fans, cooling towers, elevator equipment—is located at the top of the building, right above the highest-priced apartments," he says. Last year, Haas's firm got a call from a major condo developer in Miami who discovered this irony firsthand.

The developer, who lived in a penthouse in one of his own buildings, had to endure a constant whining noise caused by the property's elevator. He wasn't the only one. Residents at other properties were also complaining about the elevator noise, and sales had started lagging. So the developer decided to fix the noise problem. Although Haas won't give actual figures, he estimates the cost of the repairs at three to four times what it would have cost to engineer the same noise and vibration control solutions into the building when it was under construction.

Creating the sound of silence required some work. Part of the noise

problem stemmed from the limited barriers between the equipment room and the adjacent condos; the only thing separating the living spaces from the equipment room was a concrete block wall. So Haas' crew clad the inside of the room with metal studs, using resilient pads to decouple the studs from floor and ceiling. The studs were then covered with a layer of sound-absorbing drywall.

That eliminated one noise source, but there was still another to address. Sound from the elevator equipment room was also traveling into the elevator shaft through the holes where the elevator cables penetrated the equipment room floor. To stop the transmission of that noise, Haas created custom rubber gaskets to seal the holes.

Overall, soundproofing has become more difficult, experts say. As buildings become safer and more fire-resistant, they also become more rigid structures and more likely to act as a network of sound-transmitting materials. Just look at party walls and how they have changed. Mike Doty, an architect in Sun Valley, Idaho, says that in his market, party walls in new condos tend to consist of double walls with a 1-inch airspace. This gap has always done a good job at dissipating noise.

But as fire and seismic codes have gotten stricter, the insides of these walls have gotten lined with fire-rated drywall and plywood shear panels. Developers are reluctant to take even an inch of space away from adjoining



apartments, so the resulting response has been to narrow or even close the gap, significantly reducing the wall assembly's sound resistance.

Low-skilled labor and a lack of supervision make matters worse. "When framers build a party wall with an inner cavity, they often let junk fall into the gap," says Doty. "You design everything right, only to have the wall completely grounded out."

NOISES OFF

Doty's solution to the party wall problem includes the same material used to help fix the noise problem in the Miami condo: sound-absorbing panels, which have been on the market for about three years. Two companies, Quiet Solution in Sunnyvale, Calif., and Suppress Products in San Rafael, Calif., manufacture the panels.

These products use a technique called "constrained layer damping" to modify the behavior of sheet goods, according to Bruce Donaldson, CEO of Suppress Products. In a standard sheet of drywall or plywood, when airborne sound waves hit one face of the panel, it starts to vibrate, creating airborne sound waves on the other side.

But a sound-absorbing panel is a sandwich consisting of two layers of standard plywood or drywall separated by a thin polymer layer. "When one face of the panel starts to vibrate, the polymer shears the vibration into a tiny bit of heat," says Donaldson.

While the consultants and architects we spoke with say that these panels do a great job at absorbing sound, these new products have another advantage. The panels are only slightly different than standard drywall or plywood and require only standard skills for installation. That means these sound-absorbent panels can be easily handled by a builder's regular framing or drywall crews.

The material also addresses the weaknesses of resilient channels, or RCs, which reduce sound transmission by separating the drywall from the studs. Consultants say that the vast majority of resilient channel installations don't work because of poor installation. "We usually don't specify resilient channels because of that," says Michael A. Schwob, principal acoustical engineer with JBA

Consulting Engineers in Las Vegas. The main problem? Short circuiting, which is where sound bypasses the insulation provided by the resilient channels. For an RC installation to work, no screws can connect the drywall to the studs, and adjacent walls can't touch one another. He says that most RC installations have many such short circuits during installation and that as a result they don't work as advertised.

Schwob says that Pac International and Kinetics Noise Control make resilient assemblies that do a much better job than standard RCs. But they are best used in conjunction with the new drywall products.

Haas, the acoustical engineer, says that the new panels have made a big difference in sound control projects. He estimates that the real world (or "field") performance of a wall assembly using standard drywall with resilient channels drops between 8 decibels and 12 decibels compared to its (higher) performance in the lab. When sound-absorbent panels are used, however, performance dips between 4 decibels and 6 decibels, he says.

Of course, the new panels do cost more than conventional materials. Depending on the product, the retail

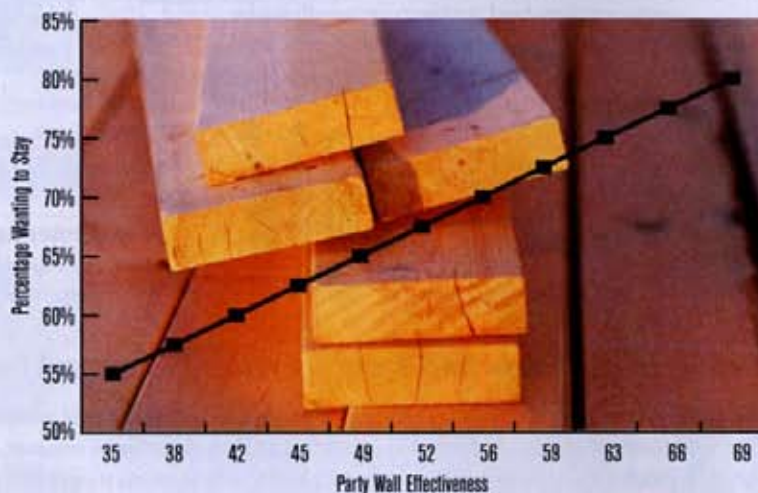
price for a half-inch sheet of 4x8 drywall would be around \$50 before any volume discounts. For maximum efficiency, performance, and value, though, manufacturers recommend looking at a project's entire wall assembly. For example, the new sound-absorbing drywall is effective enough [in terms of sound control that a builder can downgrade a wall assembly from double to staggered studs, while also increasing its acoustical performance. (Quiet Solution and Suppress both have extensive technical resources on their Web sites, including sample wall assemblies.)

For those worried about the price of such materials, offer it as an upgrade to condo buyers, Doty suggests. For instance, sound-absorbing drywall could be a standard feature in party walls separating units, but offered at extra cost in other places in the unit, such as between a master bedroom and other rooms.

SOUNDPROOFING STRATEGY

As helpful as sound-deadening drywall and plywood can be, though, these materials don't reduce the need for a comprehensive strategy to block sound paths. Most developers are aware of the need to seal around pene-

SERIOUS ABOUT SOUND



Source: Quiet Solution

SILENCE IS GOLDEN: When researchers asked multifamily residents if they intended to stay in their apartments come lease renewal time, the answer was directly linked to the STC rating of their party wall. Only 55 percent of occupants with STC 35 party walls intended to stay in their units, but that number increased to 66 percent for those with STC 50 walls.

trations like electrical boxes and HVAC ducts, but those penetrations aren't the only culprits. For instance, Schwob has seen problems in high-rise buildings where curtain walls are hung from the slab with a gap in between. "Sound goes around the edges of the slab and into the unit above or below," he says. Unless these gaps are properly sealed, then even the best floor and wall designs will be ineffective.

The other drawback is that these new panels don't absorb different types of sound equally. The ability of a wall assembly or material—including the new sound-absorbing panels—is expressed as its sound transmission class, or STC rating. "STC ratings were designed to measure sound transmissions at middle frequencies: people talking, pots and pans banging around, or perhaps a single console radio," says Brandon Tinianov, an acoustical engineer and Quiet Solution's chief technology officer. They don't indicate how well a material or an assembly will block sound at very low frequencies. That was fine in the 1960s, Tinianov says, but not so helpful today, thanks to subwoofers that transmit the low bass sounds of an action movie to a resident and all the neighbors.

Despite this drawback, experts say that STC ratings are still useful as a relative measure and that a resident will be happier with a wall rated at STC 50 than with one that gets a 30. Research backs this up. The National Research Council of Canada recently surveyed multifamily residences to determine residents' satisfaction with different ratings. The result was that complaints were reduced for walls with a rating of 50 or better—which is the minimum for party walls—and almost nonexistent for walls with STCs of 60 or above, "where you can't

hear neighbors voices, sound of pipes, music at reasonable levels, or sound of computer video games," according to Donaldson of Suppress Products.

Of course, that still doesn't predict the behavior of a wall at extremely low frequencies, such as those broadcast by home stereo and home theater systems. Today's subwoofers can produce sounds in the 40-hertz range. Even the new panels don't claim to be effective at blocking sounds at frequencies that low.

That's a problem, because low frequency sound issues arise in all types

or how it must be mounted in the unit.)

Design offers a partial solution. In a high-end project, some rooms might be designated as media rooms, which can then be designed with the goal of keeping the low frequencies from entering the building's structure in the first place, Haas suggests. "We end up using a combination of sound-absorbing drywall and resilient attachments to decouple structures in these rooms," he says. This includes putting a resilient pad between the subfloor and finish floor, as well as an isolation material around the edges of

the subfloor, to acoustically separate it from the adjoining rooms. (Kinetics makes a roll-out floor material for this purpose. It has pre-positioned isolation pads to support the plywood.) The slab or floor framing in this room needs to be about two inches lower than the rest of the unit to maintain a flush finish floor. Penetrations such as sprinklers and lights need to be sealed for air transfer. Recessed ceiling lights should be surrounded with sound-absorbing drywall.

Overall, while controlling sound is a tough challenge, noise issues can be minimized. But that requires willingness to pay attention to the hidden details and spend some extra money. For high-end projects, such cost and effort are probably worth it. "The competition is pretty fierce among developers, and this gives them a hook to differentiate themselves," Haas says. Still, it may not be the easiest sell. It's a challenge to present a good acoustic design, but once buyers and renters move into their units, solid sound control is something they will appreciate daily.

Especially when their building's new bowling alley opens on the first floor. **(M)** Charles Wardell is a freelance writer in Martha's Vineyard, Mass.



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—Brandon Tinianov, Quiet Solution

of construction, thanks to the ability of such frequencies to travel through concrete as easily as wood framing. Because of this, Tinianov knows one consultant who advises all apartment owners to prohibit residents from using subwoofers. (Most consultants say this isn't practical, although an owner could specify what type of stereo equipment a resident can have