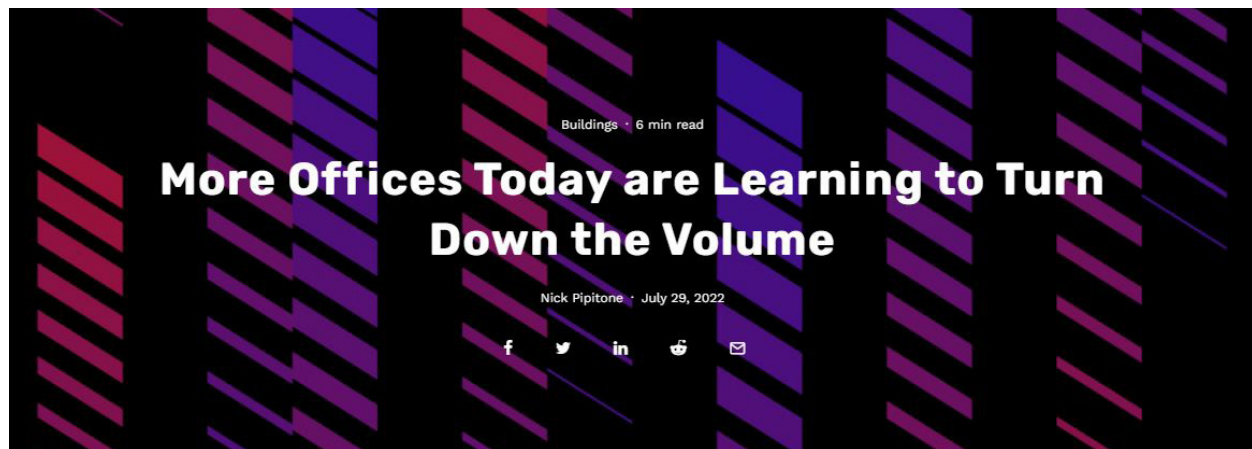




by Nick Pipitone
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You might not think much about acoustics in your day-to-day life, but when you're at a concert, the acoustics are at the forefront of your mind. You want to hear the rich melodic sounds of the musicians (after all, it's what you paid for). But acoustical design isn't considered as much in other places, like the office. Sure, you'll notice if your office is noisy, but are you necessarily thinking about the finer points of architectural acoustics and the science of sound design? Probably not.

Nevertheless, architectural acoustics are increasingly just as essential in offices, especially ones with open plans, as in the venues where you see your favorite bands, musicians, and orchestras. Loud, unwanted noise increases stress and anxiety and causes distractions for office employees. Many studies indicate that noise is a frequent complaint among office workers, and the distractions can sap the productivity of the people in the space.

Before the pandemic, about 80 percent of office-based employees worked in open-plan offices, according to research by Sage, a cloud business management firm. Complaints about the layout are endless, primarily because of the noise. Even after short exposures, research published last year in the *Journal of Management & Organization* found a causal relationship between open-plan office noise and stress and negative moods. The study found that negative moods increased by 25 percent, and sweat response spiked by 34 percent.

There's typically more noise in open offices because of the lack of partitions to block out and absorb sound. Ceilings play a role, too, as hard ceilings add to noise buildup and reverberations. Today's offices may try to buffer noise with parti-

tions, but partitions don't help with acoustics much because most of them are made of glass. Drywall or cubicle walls absorb sound, but glass's smooth surface reflects it so that even small amounts of sound get amplified. Ceilings today play a more significant acoustical role because many other components of sound absorption have been lost with open offices.

If landlords and corporate occupiers want to boost productivity and employee comfort, they'd be wise not to overlook acoustical design. And many landlords must pay attention because acoustic consultants say there's recently been an increasing focus on sound design in office projects.

Privacy and intelligibility

Ioana N. Pieleanu, a Principal Consultant at Acen-tech, an acoustics consultancy firm, is a classically trained piano player who has worked as a sound engineer. Pieleanu is now an acoustician and likes to advise recital halls and other venues where the main activity is listening. However, she also offers consultations for other buildings such as hospitals, universities, and offices. "An experience of a space includes the acoustical dimension," she told me. "It's not just about visuals, but how it sounds."

Pieleanu said she mainly advises on open-plan areas and closed rooms for office buildings. According to her, there are two main concepts for sound design in an office space. One is for speech privacy and the need for confidentiality in closed rooms. The other is speech intelligibility, ensuring the space's sound is sufficient enough that people can hear. Much of sound design in offices revolves around ceilings, which play a huge role in speech privacy and intelligibility.

Speech intelligibility is critical in areas where there are meetings, whether the meetings take place in-person or over video calls. Good speech intelligibility is achieved when the background noise level (such as from mechanical systems) is low and direct sound isn't overwhelmed by strong reflections off room surfaces. "This is why having a sound absorptive ceiling is important in a meeting room," Pieleanu said.

Sound absorptive treatment can be used on ceilings and wall surfaces to prevent flutter echoes, which is sound bouncing quickly back and forth between hard parallel surfaces and creating an audible ring quality. Architects will sometimes choose a ceiling design in a meeting room that combines hard, sound reflective, and absorptive surfaces, such as a drop ceiling in the middle and a gypsum wallboard perimeter. "This method is fine if you have the additional sound absorption on the walls," Pieleanu told me.

Normal speech privacy is the goal for open-plan offices, and confidential speech privacy is desired for closed rooms such as individual offices. A sound absorptive ceiling treatment can be used in open-plan offices alongside a well-designed electronic sound masking system to achieve optimal speech privacy. A proper level of ambient noise and sound masking also boosts employee comfort and concentration. The NAIOP says the most effective ambient noise level is typically between 46 and 50 decibels, and an existing sound system is usually good enough.

Dropping the drop ceilings

Traditional office ceiling design has always been drop ceilings, but that's starting to change. Architects are using more unique ceiling designs lately beyond plain-looking drop ceilings, such as "exposed structure" or "open plenum" ceilings. With open plenum ceilings, structural and mechanical systems are intentionally left exposed. This trendy design is caught on in offices in almost every industry, making rooms feel more spacious and giving spaces an industrial and warehouse feel. "Drop ceilings are becoming very unpopular, but they're usually more cost-effective," said Pieleanu. "Over half of the projects we advise on today don't have drop ceilings."

While exposed decks are trendy, they can also be

tricky regarding acoustics and sound absorption. Sound reflects off the mechanical systems and surfaces of exposed ceilings and can create an echo chamber. In order to convert an exposed ceiling into one that is sound-absorptive, the surfaces are sometimes sprayed with K-13, which is thermal and acoustical insulation. Another option is to apply surface panels called clouds, canopies, or baffles that absorb sound. For example, ceiling clouds are sound-absorbing materials hung from a ceiling made from fabric-wrapped panels, foam, or other materials. Ceiling clouds absorb sound reverberations and prevent echo chamber effects.

Suspended sound absorptive clouds are good for open ceiling designs, but there needs to be sufficient coverage. "Adding just one cloud here and there isn't sufficient," Pieleanu told me. "There must be a minimum of 60 to 70 percent area coverage by the clouds to provide significant sound absorption." No matter what ceiling treatment is used, Pieleanu said it should have a Noise Reduction Coefficient rating of at least 0.7.

Absorbing all the sounds

Ceilings play a significant role in office acoustics, but there are other ways to absorb sound and handle excessive noise. Occupiers may want to keep the workplace open, but putting up some partitions here and there could make sense. More open-plan offices today have dedicated collaboration and socializing areas and spots for "focused" work, including privacy booths.

For good acoustics, higher cubicle partitions are typically better. Improving acoustics is also a matter of using better materials. Glass walls look sleek, but inexpensive glass reflects noise and creates distractions. Landlords can still use glass, but it may be better to use high-quality laminated glass or even double-glazed transparent walls.

Even the choice of furniture affects office acoustics. Upholstered chairs and sofas with fabrics like corduroy, microfiber, and suede have been proven particularly effective as sound absorbers. Acoustical consultants recommend placing sound-absorptive furniture like this near the office's most common noise sources.

A recent study from Oxford Economics found that focusing on work without interruptions is a top

priority for employees, even rated higher than sought-after perks like onsite daycare and free food. This may be especially true after two-plus years of pandemic-induced remote and hybrid work, where most employees relished the lack of interruptions at home. Open-plan offices are facing increased criticism lately, but they are still popular nationwide among corporate occupiers. Despite their popularity, they can also be noisy places full of distractions if not designed correctly.

Bringing the noise level down in open offices means landlords may want to look into several design aspects, and ceilings are one crucial element. Ceilings play a more significant role in office acoustics these days, and there are considerations to keep in mind if going with trendy exposed decks. Acoustical engineers are in higher demand for office projects for a reason. Once the cubicle walls got knocked down, the nuances of architectural acoustics became much more critical for office design. Employees may not be thinking about the intricacies of sound engineering when they return to the office. They just know that, sometimes, the office gets too loud, and employees want some peace and quiet.

