

UNDERSTANDING ACOUSTIC DESIGN

AN INTERVIEW WITH AN
ACOUSTIC CONSULTANT

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Do you work in an office? If so, chances are that you have been distracted by a noisy coworker on the phone or over-sharing something that happened last weekend. That's acoustic distraction, and it's a major issue in today's workplace – especially in the ever-more-common open office environment, criticized for its lack of privacy and near-constant sonic distractions.

Surprisingly, for being such a hot topic, acoustics can still be a point of confusion for architects and designers alike. Part of this comes from the fact that acoustic design can be complex, with many different factors – room size, floor covering, desk material, ceiling type, usage, even personality type – all affecting the perceived sound quality within a space.

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We partnered with James Black, an acoustic consultant with over 11 years of professional experience and a Master of Science in Acoustics, to answer some pressing yet common questions about acoustics. When we asked James what he felt was the most commonly overlooked element in acoustic room design, we were surprised by both the simplicity and complexity of the solutions. Read on to see your next project through James' eyes.

BREAKING IT DOWN

“There are so many different types of spaces and so many different ways things can go wrong acoustically. Typically, the most commonly overlooked thing is background noise levels. Sadly, some brand new spaces have such excessive noise levels that they are unusable for their intended function. Obviously, many spaces don’t have acoustic issues to that severe extent, but there are a good deal that still have detrimental excessive noise.”

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For room acoustics, sound absorption is often overlooked. Consider a restaurant. “Sound absorption is really needed to help reduce noise buildup in the space. Without it, noise levels can be so excessive that it’s difficult to understand your companion across the table, even with that companion shouting. Noise feeds on noise, and a lack of sound absorption to help break the cycle can be really detrimental.”

Gymnasiums used for sound-sensitive graduation ceremonies and other assemblies are another example of spaces in which room acoustics are often overlooked. “The excessive reverberation in these large spaces resulting from inadequate sound absorption really degrades the intelligibility and we can miss crucial words or moments.”

Another common mistake happens when looking to reduce sound from a neighboring room. Sound-absorbing sprays and other fibrous treatments are often added to the surface of assemblies in hopes of quieting sound coming from a neighboring room, thinking that this will greatly improve the sound transmission loss of that assembly.



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“Adding sound absorption to the receiving room can help improve the noise reduction some and can even be notable if the receiving space would otherwise have very little sound absorption. However, to significantly improve the transmission loss of a sound isolation assembly, typically adding a significant amount of mass, or resiliency and space between layers, to the assembly is required. Adding a fibrous spray or other treatment to the surface does not accomplish this.”

IT'S ALL ABOUT LOCATION, LOCATION, LOCATION

This maxim applies to the settings surrounding an entire space or building, where a room is located within a building, and where sound absorbent materials are placed. “Early on, there are some very important decisions that can have a big impact on mitigating acoustic issues during design.

"The location – not only the amount – of sound-absorbing material is crucial."

For example, don't build a recording studio next to the train tracks. Don't build a nightclub at the base of a residential tower. Avoiding these kinds of mistakes can prevent a lot of headaches, budget issues or worse.”

One thing to note with these kinds of rooms and spaces, is that the location – not only the amount – of sound absorbing material is crucial. “Location is critical for effectiveness as well as many other important acoustical aspects such as mitigating echoes and sound focusing, maximizing early reflected energy and limiting late reverberant energy.”



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SHAPE YOUR SPACES

The best solution in achieving good acoustics is to consider acoustic design from the earliest stages of a project. Room size and shape are initial factors that strongly shape the room acoustics (e.g., bigger rooms=more reverberation).

Room shape is an important factor to be considered sooner rather than later when designing a space.

“Avoiding round rooms or wide fan shapes can mitigate lots of acoustical problems that are difficult to deal with.”

"Thinking about these sorts of things early on can give you a head start – and choosing the right shapes can save you a good chunk of change before acoustics get out of hand."

That's not to say that there aren't things that can't be done to improve these types of rooms, especially if they are an important part of the design. However, thinking about these sort of things early on can give you a head start – and choosing the right shapes can save you a good chunk of change before acoustics get out of hand.

Of lesser importance, but still very important, is the acoustical properties of all the materials found within the space. Some materials reflect sound, some absorb sound, some diffuse sound, so it is essential to keep an inventory of the locations and acoustical characteristics of the materials specified in projects to achieve the proper reverberation, intelligibility, noise levels, etc.

BREAK UP THE SPACE

Today, we see many of the same designs in offices across the globe. The trend of open seating plans, hard desks, high ceilings, and glass walls seems to be infinitely widespread, and, while these spaces are often visually appealing, the acoustics can be borderline unbearable. So what can be done when a space is already designed, but there are very real acoustic issues?

The biggest improvement for this type of space is going to be made by providing barriers between work stations. These could be visually transparent at the top to maintain the open look.

It is really important to break the direct path between work stations. This should be done in combination with a sound absorptive ceiling. However, if the barriers aren't implemented, adding sound absorbing materials won't be entirely effective.

"The biggest improvement for this type of space is going to be made by providing barriers between work stations."



THE CONFERENCE ROOM

On a smaller scale – think glass or drywall conference room – acoustics should also be addressed, especially since these types of rooms are often used for more confidential or critical meetings.

“When opening to a noisy space, such as a conference room on the perimeter of open office space, adequate sound isolation is what often gets overlooked. Provide good acoustical seals on the doors, including door bottoms. Avoid butt-joint glazing systems when possible, since it’s very difficult to get a good seal.”

For particularly noise-sensitive and confidential spaces, there are other sound isolation improvements that may be needed, such as upgrading the glass, taking the walls full-height or eliminating cross-talk through the HVAC.”



"Often, conference rooms do not have enough sound absorption."

Additionally, providing a sufficient amount of sound absorptive treatment and achieving favorable background noise levels is critical in conference spaces. “Often, conference rooms do not have enough sound absorption. These spaces commonly are intended to be higher profile and receive higher-end finishes. This can mean more acoustically reflective materials."

"However, conference rooms are the spaces that need more acoustical control. For example, teleconferences can be particularly challenging because the muddying reverberation in the remote participants' spaces combine with that of the conference room, exacerbating the problem."

"Similarly, noise from multiple occupants around the room can mask the desired speech, particularly if the teleconferencing system is not providing good coverage to every participant. For the same reason, it is critical that HVAC noise be attenuated to preferable levels in these spaces."

WHAT ABOUT SOUND MASKING?

Another way to improve acoustics is to add a sound-masking system to the office. Sound-masking isn't anything new, but with more open spacing needing sound solutions fast, many people are turning to sound-masking systems. And for the right application, these systems do work.

"They can mask neighboring conversations and sounds that would otherwise be distracting. Similarly, it can help achieve speech privacy." When paired with acoustic materials, they can definitely improve sound within a space.



"Conference rooms are spaces that need more acoustical control."



KEEPING COST IN MIND

Many projects – specifically education spaces like schools, libraries and museums – are on tight budgets.

And when this is the case, acoustics often fall to the wayside. However, even with less money to spend, effective sound absorption can still take place. Even

coverage of sound absorption on the ceiling is typically what is needed most.

“If the budget is minimal, ACT or black fiberglass sound board could be used, depending on the look the client is trying to achieve. Acoustical deck could be a good choice too. If it is a lecture hall or conference room, the back wall and at least one adjacent side wall should receive some treatment as well, from approximately 3 to 7 feet above finished floor.”

“Besides attenuating reverberation, these wall treatments mitigate annoying echoes off the back wall and flutter echoes. Sometimes diffusion panels or wall shaping can break up these echoes as well.” These are basic fixes and are mostly recommended for spaces on a budget.

"Even with less money to spend, effective sound absorption can still take place."

SOUND INVESTMENTS

It's also important to consider noise when choosing and installing building equipment systems. "Using low-noise fan-array air handling units with remote chillers may seem more expensive up front. However, in the big picture, once you consider the cost of upgraded roofs, sound isolation ceilings, silencers, etc., that are needed to mitigate noise from less-expensive packaged units, you may be paying as much or even more for an inferior result. In any case, do not locate the loud equipment directly over the noise-sensitive spaces. It seems obvious, but unfortunately this happens all the time."



"Timely input from an acoustical consultant can prevent more expensive mistakes."

Working with an acoustic consultant early on can also help avoid easy mistakes. "But acoustic consultants are expensive!" you cry.

This is a common misconception, as a good acoustic consultant brings value. Timely input from an acoustical consultant can prevent more expensive mistakes, such as wasted materials, post-construction changes and unsatisfied clients.

Sure, it's possible to run up a significant bill for a full acoustic analysis of a space, but many acoustic consultants can take a look at drawings or photos and come up with quick and easy solutions for hundreds, not thousands of dollars. Taking advantage of this early in a project can save a lot of money later versus the cost of retrofitting to cover up unforeseen acoustic issues.

NEED SOME HELP WITH YOUR SPACE?

We've got you covered! At Kirei, we are proud to provide you with high-quality acoustic materials, made for all sorts of spaces and applications. From tiles, panels, partitions and more, our products can help reduce the noise in your open spaces.

Check us out at kireiusa.com or give us a call at 619.236.9924.



James Black has a Master of Science degree in Acoustical Engineering. He has worked professionally as an acoustical consultant for more than 11 years. Most recently, he was a senior consultant in one of the leading and international acoustical consulting firms, working on world-class projects. He now lectures at Montana State University and continues to provide acoustical consulting services. He can be reached at (858) 342-0986 or jblack@jbacoustics.com.