

Workplace Acoustics

Sound, Noise, and Effective Work



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“Then from five thousand throats and more there rose a lusty yell;

It rumbled through the valley, it rattled in the dell;

It knocked upon the mountain

And recoiled upon the flat,

For Casey, mighty Casey,

Was advancing to the bat.”

From Casey at the Bat

Ernest Lawrence Thayer



The Power of Sound

Sound is one of the most effective ways we can communicate.

It enables us to share information, build relationships, and recall memories.

Pros and cons

Many words encourage memories. The words “childhood,” “sports,” “grandparents,” “first car,” and “graduation” can automatically bring the reader to a different place and time. Some words carry an added bonus — they encourage memories of sound.

The phrase, “It rumbled through the valley and rattled in the dell,” not only brings you to a different place and time — it also encourages sound. Some of us can actually hear the “rumble” and the “rattle” in our heads.

Sound is one of the many ways we communicate.

And in the workplace, communication is a key foundation for getting things done. After all, sound is often the medium that supports information sharing, creativity, and problem solving. It also helps build trust, closer relationships, and a sense of community. Sound can even be a soothing or enlivening element that helps to energize a work environment.

In fact, the total absence of sound — complete silence — might be a significant impediment to effective work. Some people find it difficult to focus when a workplace is “just too quiet.” Or, when it is so quiet they feel everyone can overhear what they are saying.

But sound also can be distracting.



Sound vs. Noise

The ability to protect information as it is being transmitted in face-to-face conversation or via telecommunications is known as acoustical privacy.

A definition

Noise, as it's commonly understood in relation to the office workplace, is unwanted sound that disturbs concentration and generally impedes performance. Noise is what most people speak about when they complain that the acoustical condition of their workplace keeps them from working effectively.

The ability to work uninterrupted is particularly important in the knowledge age. When people need to concentrate the last thing they want is something that interrupts their thinking. Tom DeMarco and Timothy Lister, co-authors of *Peopleware: Productive Projects and Teams* state, "If you participate in or manage a team of people who need to use their brains during the workday, then the workplace environment is your business. It isn't enough to observe, 'You never get anything done around here between 9 and 5,' and then turn your attention to something else." If people are coming in early, staying late, and coming to work on the weekends, it may very well be because the workplace is too noisy.

Exactly how loud is too loud? "Sometimes, what's loud to one person, may not seem loud to another. And if you are listening to your favorite song on the radio or at a live concert, it may not seem that loud at all," says Steven Brown, Steelcase corporate acoustician. "But it's important to be aware of the sounds around you, and of the sounds you make. Sound, like beauty, is in the ear of the listener. Sounds that help you work or enjoy yourself are good. Sounds that distract or annoy are just plain noise."

Sound vs. Noise

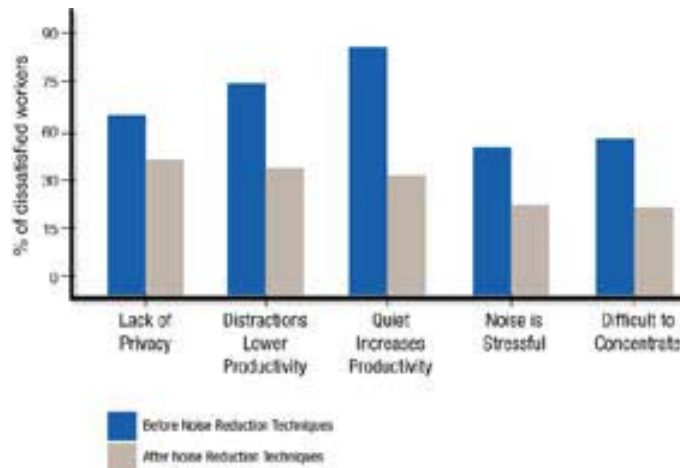
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The impact

Research indicates that today's workforce believes a noisy work environment inhibits effective work. This research is the result of a collaborative effort among Armstrong World Industries, Dynasound, Milliken & Company, Steelcase, and the American Society of Interior Designers (ASID). The significant findings include:

- More than 70 percent of workers believe noise is the most significant workplace distraction.
- Over 80 percent of workers believe a quieter environment would enable them to be more productive.
- The majority of workers believe reducing distracting noise increases their productivity.
- The majority of workers identify conversation as the type of noise that most affects work performance.

Workplace Perceptions and Attitudes



A Traditional Approach

Most interior design and facility management professionals believe that an integrated approach is the most effective strategy to reducing noise and enhancing worker performance.

An integrated solution

Traditional acoustical workplace solutions take into consideration four product categories: ceiling systems, furniture systems, sound masking systems, and carpeted floors. Each plays a distinct role in reducing workplace noise and distraction.

Ceiling systems primarily serve to absorb sound. Their performance is measured by standard absorption criteria for critical human speech frequencies. In addition, the articulation class rating of ceiling material affects the amount of sound that is absorbed at specific angles. A rating of 180 to 200 appears to be the industry standard.

Speech sound frequencies	Absorption coefficient (% of sound absorption)
500 hertz	.65 minimum
1,000 hertz	.85 minimum
2,000 hertz	.85 minimum
4,000 hertz	.85 minimum

Furniture system panels are one of the main components that control noise in the workplace. Their effectiveness is based on both composition and height. Furniture panels should have a sound transmission class (STC) performance rating of 18 or greater. Panel heights lower than 53 inches are largely ineffective in reducing noise. In addition, panels can absorb sound based on their noise reduction coefficient (NRC). An NRC of at least .60 is recommended. Finally, the configuration of a workspace also can contribute to noise reduction.

A Traditional Approach

(continued)

Sound masking systems create background sound to mask conversational distractions and unwanted noise. They consist of electronic devices mounted above the ceiling plenum that generate a sound signal. The systems are typically set at a sound level of NC 40, which corresponds to 48 decibels (dBA) +/- 2db.

Carpeted floors absorb airborne sound, reduce surface noise (often called “footfall noise”), and help block sound transmission from floors above. The charts below indicate the noise reduction coefficient and impact insulation class (IIC) ratings recommended for carpet systems.

Flooring type	NRC rating	IIC rating
Bare concrete only (cement)	.015	34
Jute (28 oz/yd ² carpet face)	.20	60
Polyurethane cushion (28 oz/yd ² carpet face)	.25	62



Emerging Workplace Issues

Although an integrated acoustical approach is key to managing unwanted noise, several new factors challenge existing acoustical solutions.

Noise on the rise

Flexible work environment solutions, the introduction of new technologies, and the desire of workers to personalize their workspaces all contribute to noise levels. Most of these elements were not factored into the initial acoustical design of the workplace and can reduce the effectiveness of an integrated acoustical solution.

Flexible, open plan work environments

Space planning for today's high-performance workplace has changed. As a result of rising real estate costs, more people are placed in less space. In addition, work environments demand flexible configurations to support both team and individual work. And collaborative work groups and project teams engage in conversation, increasing noise levels.

Introduction of new technology

Office environments need to keep pace with technology while not allowing it to magnify noise. Speakers, modems, and DVDs make computing audible. Larger computer screens increase the reflection of sound waves, and speaker phones and conference calls transmit more and more voices. Technology is key to the future of work, but acoustical issues must be addressed.

Workspace personalization

Today's workers want more options in personalizing their environment — not merely with family photos, but with a combination of tools and aesthetics that they believe will enhance their performance. For example, workers who add large, framed art may unwittingly change the sound absorption quality of the space.

A New Approach

Today, an acoustically optimal work environment requires thought beyond the traditional integration of ceiling, furniture, sound masking, and carpet solutions.

Additional considerations

Facility managers and designers need to combine new issues to develop innovative acoustical solutions for the workplace.

Mobility/flexibility

Worksettings need to accommodate mobility as organizations become more fluid, as teams dominate the corporate landscape, and as job definitions call for rapid task shifting. It may mean that workers will need to take their acoustical environment with them as they move within the workplace.

Intimacy

As organizations increasingly focus on teamwork and collaboration, being close to others has become more important to work effectiveness. Proximity lessens the need to be loud, facilitates spontaneous communication and information transfer, and can decrease the use of noisier forms of communication (paging, shouting, etc.).

Serenity

The rise of group work also emphasizes the value of private concentration. Workplaces require acoustical planning that supports the need for a quiet, comfortable place to focus, reflect, and think. These serene places will need to be relatively adjacent to other team/group spaces to be used effectively.

Ambience/comfort

As organizational performance relies more and more on what some call “soft issues,” concerns surface about the overall comfort and atmosphere of the workplace. Acoustics can play a significant role in enhancing overall comfort — an issue many people believe will be increasingly important for workplace effectiveness and attraction and retention.

Workplace protocols

Previously, acoustical planning focused largely on materials and configurations. However, future acoustical designs will also focus on behaviors. Workplace protocols are gaining popularity as tools for managing shared spaces and groupwork areas. It is increasingly important to use protocols to manage acoustical conditions.

Some Tips

Here are some things to consider when planning a workplace environment.

Acoustical issues

1. Channel most foot traffic and subsequent noise away from areas where workers need to concentrate.
2. Position office equipment like fax machines and printers so the noise doesn't adversely affect those who work nearby.
3. Encourage people to turn down the ringer on their phones. When they are not at their desk, have them send calls to the voice mail system on the first ring.
4. Ask people to position themselves so they speak into sound absorbing panels when on a desk phone as opposed to talking freely into the surrounding environment.
5. Suggest people limit the amount of tackable materials they use to personalize their workplace, as these items often reduce the quality of sound absorption of surface materials.
6. Acoustically accommodate any technology that will be used in a workspace.
7. Discuss the personal use of speakerphones, radios, and other items that create noise.
8. Consider inconsistent ceiling levels and hard surfaces like large windows that will invariably reflect and deflect sound into other areas of the worksetting.
9. Encourage people to stop, look, and listen before interrupting someone who is working.
10. Build in private spaces for people to retreat to when acoustical privacy is needed.
11. Look for lines of sight between people, since intensive sound could travel the same path.

A Quick Summary

What's meaningful sound for some people may be disturbing noise to others. Noise is unwanted sound that can be distracting, stressful, and unhealthy.

As organizations evolve and are faced with new technologies, new processes, and new business practices, acoustics will continue to play a pivotal role in workplace design. In the book *Making and Managing High-Quality Workplaces: An Organizational Ecology*, Fritz Steele writes, "As for audile privacy, there are too many open layouts that are too dense, contain too many hard, reflective surfaces, or have too low a level of ambient sound so that conversations are not masked. The same is true for many 'closed' plans, where paper-thin walls or heating and ventilation ducts transmit conversations to adjacent offices. Closed offices provide visual separation, but do not guarantee audile privacy. In fact, private offices may provide a false sense of security for people who should instead realize that they can be easily overheard."

Effective acoustical design can enhance the ever-changing workplace. And, in a round about way, so can sound itself. It is necessary to communicate with co-workers regarding the noises that bother us and the sounds that help us. These conversations can establish protocols that are the foundation to acoustically effective workplaces.



Glossary of Acoustical Terms

acoustics: The science or study of sound.

articulation class (AC): The rating that identifies the ability of a building system or subsystem to provide office speech privacy.

decibel: A measure of sound, volume, or intensity; the smallest noticeable sound intensity difference detectable under laboratory conditions.

hertz: A unit of frequency equal to one cycle per second (500 Hz = 500 cycles per second).

impact insulation class (IIC): The rating that identifies the ability of a floor-ceiling construction to reduce impact sound transmitted to a space below.

noise reduction coefficient (NRC): The rating that identifies the ability of an object to absorb rather than reflect sound.

sound: An audible vibration transmitted through a medium such as air.

sound masking: A contoured, consistent, broadband, low-level background sound that masks conventional distraction and unwanted noise.

sound transmission class: The rating that identifies the ability of an object to block sound.

workplace protocols: Behavioral and process guidelines that, when followed, can enhance the overall effectiveness of the workplace.

For further reading

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