



HNI

Applied Acoustics

Collaborating to Evolve
the Modern Workplace

“Simply meeting building code is no longer sufficient when designing effective spaces. Office environments need to holistically foster wellness and the human experience.”

The bottom line is that noise affects people. Consideration of acoustics is a key element to creating productive places where employees can focus and thrive.

Dr. Lauren Gant, CPE, WELL AP

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Today's Evolving Workplace

The office is changing.

These changes have implications for acoustics. Consider how the following factors may change the perception of sound:

- More open-plan workspaces
- More employees per square foot of office space
- Shorter desk partitions
- Fewer private offices
- Larger volume spaces with less sound absorption
- Exposed building systems
- Improved access to outside light (taller ceilings, more glass, shorter furniture systems)
- Easier access to communication devices (cell phones)

Poor acoustics are a source of frustration, distraction, and dissatisfaction in the work environment. The way we work is evolving and design trends will continue to change. However, the impact of those changes on acoustics is often not considered. Without thoughtful acoustic design, these spaces are likely to be more distracting, less productive, underutilized, and unhealthy for workers.

HNI is invested in created spaces that meet workspace needs on every level. We heard our clients' desire for better acoustic solutions, and a simultaneous lack of clarity on how to achieve their goals. We began a journey to research and assess acoustics to provide better solutions to address these issues.

In this E-Book, we will provide clarity to the complexity of acoustical design. We aim to have a discussion about measuring success through user satisfaction rather than outdated metrics. Our goal is to make spaces that work.

Sharing Knowledge

What We Know

“Acoustic success is not going to be measured by arbitrary values. Instead, success will be based on user experience, perception, and space utilization.”

Erik Miller-Klein, Tenor Engineering Group



The bottom line is that noise affects us.

Some noises are pleasant – in fact, if utilized correctly, noise can be part of biophilic design. However, the wrong noise, or more appropriately, the wrong attributes of sound, can have a negative impact on occupants.

Interior sound, like talking, typing, or building mechanical systems are linked with health and productivity detriments. Noise can impact perceived privacy, increase distraction, and reduce worker satisfaction. Noises are a common complaint in office environments.

We also know that everyone processes sounds differently. We need to be cognizant of the idea that occupants have a range of sensitivities to the processing of these inputs. What may be easily ignored by one individual may be quite debilitating for another.

[Acoustics Insights →](#)

What We Are Learning

“There is so much nomenclature around acoustics – and that is part of the challenge. We do not have a common language when we talk about it.”

Erik Miller-Klein
Tenor Engineering Group



Good acoustic design does not happen by accident.

Setting success metrics for acoustical design must happen at the beginning of a project. Additionally, one-size-fits-all and prescriptive solutions do not allow for flexibility. Standard acoustic ratings may not be meaningful for applications that differ from the conditions under which testing was conducted. In fact, this is true for most applications.

We are learning that we cannot rely on the traditional ways of speaking about and designing for acoustics. The ultimate measure of success is a positive user experience.

[Acoustics Insights →](#)

Acoustical Nomenclature & Misnomers



The intent of acoustic nomenclature is to assign technical metrics to human perception. This goal is important, but also limited. It is important that we understand the limitations of these metrics, and also appreciate how they do and do not communicate expectations and perceptions of users within the space.

Using a single metric to describe acoustics is akin to representing a famous painting with a single color. A single color, even if it is the most dominant color in the painting, does not give a full understanding of the

complexity of the image within the painting. Acoustical performance is complex, and representing it with a single metric may result in performance that does not match user expectations.

On the next page we have outlined some of the most common metrics, what they mean, the testing methods, where they're beneficial, and where they fall short. Our goal is to provide a deeper understanding of these metrics.

Background

ABC of Acoustics: (Absorbing, Blocking, Covering) This approach, when all aspects are considered together and within the specific space, can help to reduce the distracting and obtrusive impact of certain noises in open spaces or in closed rooms.

Absorbing: Absorption is a key element of designing for proper room acoustics. The goal is to reduce the energy of sound waves, which attenuates the sound from spreading across a room and reduces reverberation times. Absorbers often take the form of false ceilings, screens, baffles, furniture, curtains, carpets, or even plants.

Blocking: Blocking is an attempt to prevent sound from spreading into nearby areas where it is unwanted. Materials used to block sound are generally more dense than materials that absorb sound. Blockers often take the form of panels or walls.

Covering: The goal of covering is to effectively increase background noise in a strategic way that makes speech less obvious or clear. Sound-masking systems, or white noise machines, are often used for this strategy. It is important to note that these systems are most effective when a spectrum of noise similar to that of the speech is selected. Depending on the qualities of the background noise, these considerations may actually work to improve perceived sound privacy.

STC: Sound Transmission Class is a comparative rating of how well sound transmission is mitigated. Essentially, STC measures how effective a material is at attenuating sound from one space to another. This metric is determined through a lab-based test which evaluates the effectiveness of materiality on acoustical performance. The results, however, may

not properly reflect the actual performance of the product installed in the work environment, when factors such as ceiling and flooring material and assembly also impact sound transmission. That is, a product marketed with a particular STC may not deliver the same STC rating when installed.

NRC: Noise Reduction coefficient is not a measure of **noise reduction** as the name suggests, but instead is a metric of sound absorption. When inverted, NRC suggests how much noise is reflected back into the space. Like STC, NRC is determined in a testing lab rather than in an installed environment, with no consideration for the breadth of frequencies, space differences, or broad uses of the environment.

NIC: Noise Isolation Class is also a rating of sound attenuation, but unlike STC, NIC is evaluated within the workspace. NIC should be considered on a space-by-space basis because the results are significantly impacted by environmental conditions such as installation, size of the space, product within the space, layout, and other materials within the area.

SPC: Speech Privacy Class is an ASTM standard measurement that calculates how difficult it would be for someone outside a room to understand a conversation happening inside the room. SPC is considered to be a better metric of speech privacy than STC or Noise Reduction (NR) because it measures the signal-to-noise ratio of a space. The real benefit of this measurement over STC is that it takes into account factors like background noise.

Wellness & Acoustic Research



Research has linked the impact of sound to human wellness in numerous studies. In interior spaces, poor acoustics have been associated with an increase in stress and reduction in perceived privacy, learning, focus, memory, and productivity. Additionally, humans are not able to acclimatize to many noises, and there may be a cumulative effect of being exposed to noisy environments. Research suggests that the longer individuals work in noisy environments, the more disruptive those noises become.

Despite the understood impacts that sound can have, there has been no government-sponsored research on the national level since the early 1980's. The guidance that came out of earlier research is not applicable to current office trends and space usage.

Other groups have taken on the task of conducting, aggregating, and suggesting action regarding interior acoustics. These groups include International Green

Construction Code, LEED, and WELL Building Standard.

Considerations for diversity:

It is important to note that the impact of noise on individuals is not universal. We all have a spectrum of sensitivity to these inputs, and we need to be understanding of these differences in neurological processing. A noise that may be easily ignored by one individual may be debilitating for another.

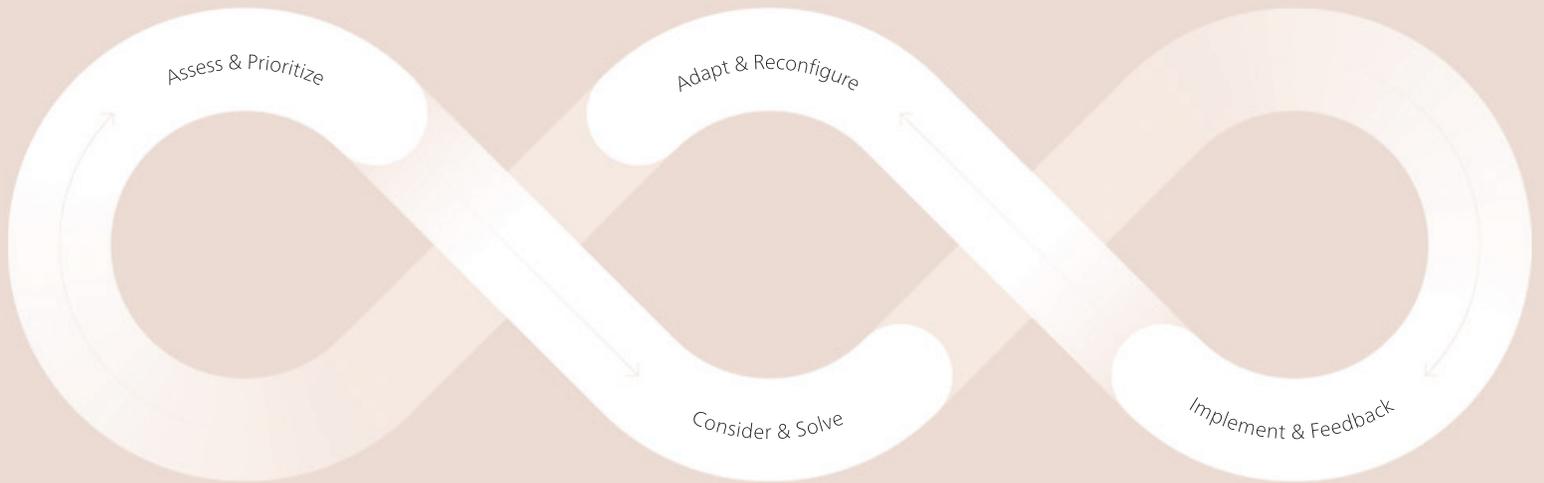
[International Green Building Code →](#)

[LEED →](#)

[WELL Certified →](#)

Acoustic Design: Dimensions & Phases

Key Phases



Key phases of adapting in the evolving workplace.

HNI works with organizations through four crucial phases in a continuous, adaptive process to improve user experience, spatial effectiveness, and distributed work.

Assess & Prioritize

Work together to identify needs and challenges, and establish goals. Consider what kinds of spaces and applications are needed and desired for the work tasks that are to be completed in the different workspaces.

Consider & Solve

Understand available options and what products and/or protocols may help to meet defined goals.

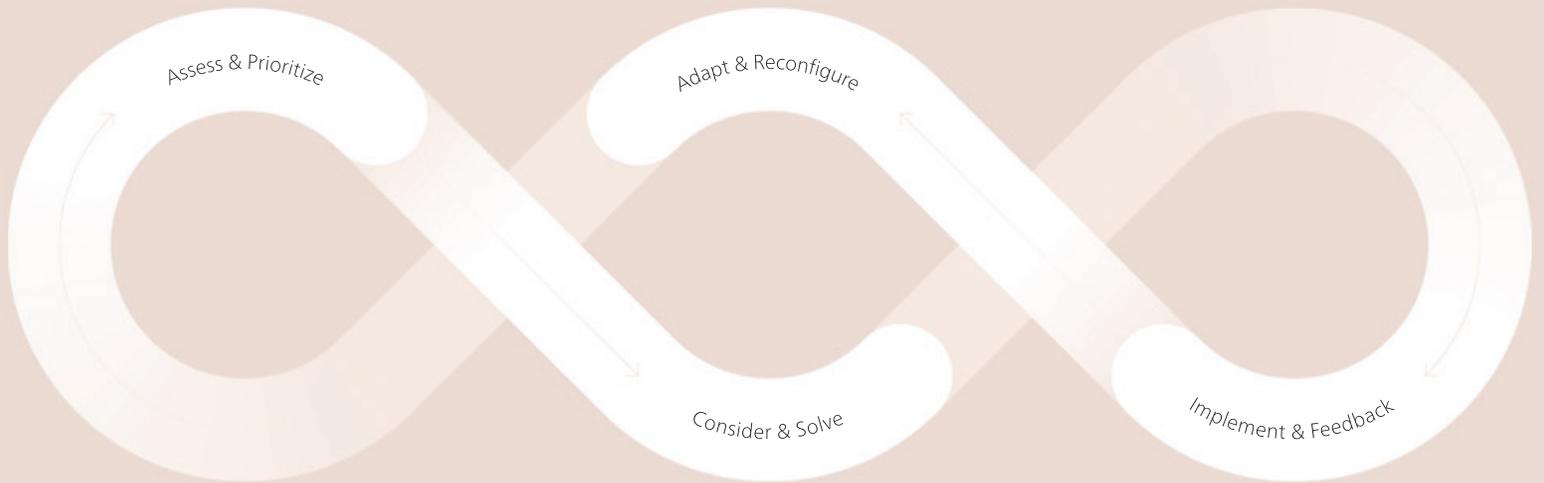
Implement & Feedback

Collect feedback on space satisfaction, effectiveness, and needs as employees use newly implemented spaces and products. Practice effective change communications to continually update users.

Adapt & Reconfigure

Learn from updated spaces. What's working and what isn't? Utilize the latest findings from outside researchers and standards organizations on current acoustic data and make further improvements as needs change and evolve.

How We Think About the Key Phases in Product Development



Key phases of considering product in the evolving workplace.

HNI's human-centric product considerations focuses on addressing real-world problems and meeting the needs of the way people want to work today and into the future.

Assess & Prioritize

We begin by first understanding the key activities and behaviors of the space and link it to expectations for noise levels and sound performance. We work together with designers, engineers, specialists, and clients to identify what is working well, and where there is room for improvement and optimization.

Consider & Solve

Determine the root cause of the noise source to best formulate a solution. We attempt to understand the available options within our portfolio that may address needs and determine whether improvements are feasible to enhance the ability of the product to meet client expectations. When needed, we work to develop new products or source from reliable and expert partners.

Implement & Feedback

Collect feedback on product satisfaction through acoustical data collection and research, live environment testing, and input from our clients. We work to understand the implications of this input on user experience, wellness, and satisfaction. Additionally, we collect feedback on how utilization of spaces is changing and evolving, and understand implications of the expectations.

Adapt & Reconfigure

We learn from updated spaces and the latest research from outside experts, standards organizations, and from current acoustic data and make further improvements as needs change and evolve.

Designing For Your Space



Myth: Laboratory ratings and best practices ensure performance success and satisfaction for users.

Myth: Most companies complete yearly surveys to gauge acoustical satisfaction and adjust future design strategies.

Critical Questions for Space Design

What is the goal for this space?

How many people will be using the space?

From which direction(s) will people be talking?

What spaces are planned adjacent to it?

Do these adjacencies make sense not only for work flow but also for acoustic expectation?

How are you naming rooms?

Room names should imply acoustic function as tied to room use (huddle room vs. phone room – implies two different uses)

How do the walls, ceiling, floor, and furniture contribute holistically to noise and acoustics?

How much sound absorption material is required to meet the acoustic goals?

Are the expectations for a room/space to be completely silent? What are the expectations for speech privacy and does that align with the layout of the spaces in the office?

For post-occupancy, is the utilization of spaces and settings as intended? If a space is being under-utilized, a potential cause is poor acoustics. Ask users for feedback specific to acoustics.

Critical Questions for Product Design

Every item within a space is contributing to either good acoustics (absorption) or bad acoustics (reverberation). How does this given element contribute?

What is the implied use for this product?

If user believes a product helps with acoustics, does it perform that function?

For example, a metal screen is highly cleanable and writable but does not help acoustically.

How can acoustic elements subtly support the overall design?

Considerations for Different Space Types



The way we work and the way we use the office differs across the floorplate. Because our expectations differ, acoustic design should not be the same for all spaces.

Here, we introduce several acoustic considerations based on space type.

Space Types



Overview

Solo

Gives the individual user control over how they work. To determine which applications and what attributes are most appropriate, a number of considerations should be reviewed including the range of activities and nature of tasks, level of visual and acoustical privacy needed, and power accessibility.

Team Neighborhood

Because work has become much more interdependent and collaborative, proper design is essential for these spaces. It's critical to uncover a team's most important group work activities—from intense to causal, tech-rich to conversation-rich, ad-hoc to planned, and quick to long project duration—to appropriately plan and provision the right mix of settings with the proper acoustics, containing noise-producing activities and adjacencies.

Shared

Intended for use by the entire workforce (and their guests). Spaces that are hubs of activities need to accomplish many things, making adaptation important. Settings range from cafés and libraries or open social spaces like lobbies / reception areas. Community spaces support meetings and learning, employee wellness, and socialization. The range of day-to-day activities should be considered when choosing appropriate acoustic solutions.

Solo: Private Office



Private Office

Private offices may be assigned, shared by more than one person, or be free-address. The layout may also be designed to double as a small meeting room that accommodates 2-3 workers.

Considerations for Private Offices

- To control flutter echo (echos that occur in rapid succession) it is recommended that sound-absorptive materials be placed on the two perpendicular walls on either side of the occupant.
- Place absorptive elements as close to the occupant(s) as possible.
- Ceiling-suspended elements are less effective for rooms with sound-absorptive ceiling tiles.
- The room size and shape affect the acoustic performance. Materials are most efficient when they are evenly distributed within the room. For areas with concentrated wall treatments, install these as close to the occupant as possible.

Solo: Touchdown



Touchdown

These alternative spaces give users additional options to work alone, with less visual or auditory stimulation while providing some measure of privacy. Typically adjacent to primary work areas, touchdown spaces enable users to quickly relocate from their desk to take a personal call further away to prevent interruptions.

Considerations for Touchdown Spaces

- In smaller rooms, prioritize vertical absorptive materials over horizontal ceiling-suspended materials.
- Visual display privacy should also be noted. Absorptive elements can serve the purpose of acoustic control and visual privacy when hung along a sight line.
- Place acoustic elements so they are concentrated at the same height as the user's mouth. The preferred placement is in front of and to the side of the person speaking.
- An acoustic phenomenon called the "flutter effect" can happen in smaller rooms when sound reflects back and forth between flat parallel walls (think of a bouncy ball going back and forth). To control this it is recommended that sound absorptive materials be placed on two perpendicular walls within the plane of the mouth.

Shared: Conference Room



Conference Room

Conference rooms are often designed for more structured meetings with teams and clients, so they may be somewhat fixed in their design and use. When organizations move to fewer private offices and more open workspaces, conference rooms take on added importance in the workplace.

Considerations for Conference Rooms

- A key factor is the quantity of highly sound-absorptive treatments in relationship with the room volume; the larger the room, the more materials are needed to control the reflected sound.
- The room size and shape affect the acoustic performance. Materials are most efficient when they are evenly distributed within the room. For areas with concentrated wall treatments, install these as close to the speaker, listener, or microphone as possible.
- Sound-absorptive finishes do not affect the sound transmission to adjacent rooms nor improve speech fidelity within the enclosed room only. Each space should be considered independently.
- Visual display privacy should also be noted. In some cases, absorptive elements can serve the purpose of acoustic control and visual privacy when hung along a sight line.

Shared: Café & Flex Space



Café & Flex Space

Cafés are becoming destination areas that double as all-day meeting spaces. Projects often move faster toward more successful completion when people share knowledge and experience, get instant feedback, build trust and camaraderie, and profit from diverse ideas and points of view. A mix of different tables and seating – not to mention the proximity of food and drink – makes the café a great place to meet or socialize throughout the day.



Considerations for Café & Flex Spaces

- Cafés and flex spaces should design sound absorption around the most significant daily or weekly uses. The needs can change hour by hour, but most acoustic treatments are not very adjustable or flexible.
- Within open-plan spaces, carving out intimate spaces, such as booths, involves considering direct and reflect sound paths.



Shared: Reception & Welcome



Reception & Welcome

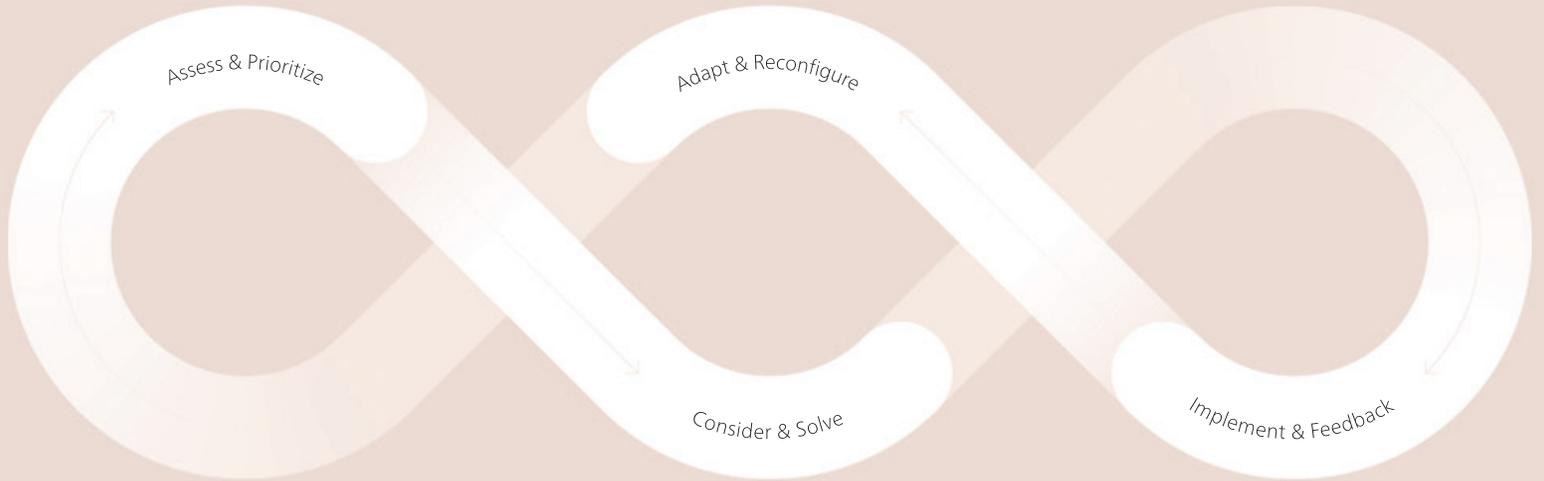
Workspaces are including multi-purpose spaces designed to accommodate a variety of uses and groups of people. This includes spaces designed for group brainstorming or meetings, dedicated team project rooms, welcome and reception areas, and impromptu huddle spaces strategically placed throughout the floorplan.

Considerations for Reception & Collaborative Spaces

- Ceiling-hung acoustic elements improve the localized performance and define the space, which can create a feeling of coziness.
- Floor-standing or ceiling-hung screening elements can provide psychological comfort of “protecting a user’s back” with the added benefit of absorbing sound.
- Sound masking provides a balanced and consistent level of background noise that reduces distractions and improves privacy within the open-plan areas.



Moving Forward



HNI is committed to continuing to research, engage, and work with clients to develop effective acoustical products and spaces. As workplaces, activities, behaviors, and expectations evolve, HNI is here to support, listen to, and guide customers to real solutions.

HNI plans to share further insights and findings as we continue to research and learn with and from our clients and expert partners.

Share Your Experiences

We would like to hear about your experiences with acoustics in your workplaces, especially as your workplace evolves. Please contact your HNI representative or dealer partner to share your insights.

