



SOUND BITE

Enhancing Acoustics in Indoor Atriums

By Sheldon Alfred

Photo © Richard Cadan/courtesy of Gensler

INDOOR ATRIUM SPACES ARE INCREASINGLY BECOMING A HOME FOR SOCIAL DINING AND DRINKING.

LARGE AND OPEN VOLUME ARE DESIRABLE FOR THEIR FLEXIBILITY, AIRINESS, AND ABILITY TO FILTER UNINTERRUPTED NATURAL LIGHT.

These spaces tend to feature many sound-reflective material surfaces, such as glass, stone, and concrete, creating a risk of excessive build-up of speech and activity noise. While the dialogue among activity noise, spatial volume, and material reflectivity tends to pose acoustical challenges, it is entirely possible to seamlessly incorporate effective acoustical solutions into the design of such spaces, at little to no expense to their architectural character.

Why does acoustical design matter?

The acoustics of a communal dining space should matter as much as the taste of the meal served there. While some diners have learned to settle for noisy environments, many struggle over the cacophony

of a restaurant with ineffective (or nonexistent) acoustical treatment. Some find it challenging to vocally project across the table or are frustrated when they cannot hear their dining companions. In a bar setting, patrons are distracted by alcohol-influenced speech and elevated laughter levels from neighboring tables and groups. Therefore, in order to foster intelligible conversation and control activity noise build-up in atrium food halls, which are highly reverberant by nature, intelligent acoustical design is critical.

One example of successful acoustical design in an atrium is High Street Place. This 1,858 m² (20,000 sf) five-story office atrium connects two office buildings in Boston's Financial District: 160 Federal Street, a 24-story Art Deco-style tower built in 1930; and 100 High Street, a 28-story office tower built in 1988. The owner transformed the once under-utilized atrium, previously notorious for its highly reverberant acoustics, into a food hall featuring a lively central gathering area with bars, restaurants, and seating. It is flanked by a series of food vendors on the ground floor, and an array of office windows overlooking the

space from levels two to five. High Street Place has become a popular hub for employees of both buildings and the district alike, offering amplified music, live entertainment, and watch parties, while being a comfortable culinary destination.

The design intent of High Street Place was to pay tribute to the original Art Deco design era of 160 Federal Street, via a palette of stone, marble, and glass—all highly sound-reflective materials. The acoustics consultants at Acentech worked with Gensler, the project architect, to develop a design strategy that incorporated sound absorptive materials to tame excessive reverberation and consequential sound build-up.

The ceiling sees and hears everything

The ceiling is where acoustic treatment usually starts. The ideal solution to controlling the room acoustics within large, active spaces begins with treating 100 percent of the ceiling area with highly sound absorbing materials, such as fiberglass lay-in tiles, felt baffles, or spray-on cellulose.

Acousticians use sound absorption coefficients within the major frequencies of human speech



(250 to 2000 Hz) to calculate the noise reduction coefficient (NRC), which is a single-number metric ranging from 0.0 to 1.0, that denotes the average degree of sound absorption of a given material based on laboratory tests.

Many atriums use skylights to carry natural light into the space, leaving minimal surface area for acoustic treatment at the ceiling. At High Street Place, the acoustics consultant specified sound absorbing panels rated NRC 0.70 of the acoustical treatment for the high ceiling soffit surrounding the skylights. They also specified sound absorptive material for the acoustical treatment at the lower ceiling areas on the ground floor.

The atrium was transformed into a food hall featuring a central gathering area with bars, restaurants, and seating.



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This 1,858 m² (20,000 sf) five-story office atrium in High Street Place connects two office buildings in Boston's Financial District.

A three-story artificial green wall with twinkling lights is one of the space's most significant interior design features, as well as its largest continuous surface area of sound absorptive treatment. Its artificial vegetation has a continuous backing of duct liner board, rated NRC 0.75. The atrium also features plant-filled window boxes to visually enliven the space. In addition, acoustically absorptive panels were installed at the underside of the boxes—a fragmented ceiling treatment of its own kind.

Team harmony in acoustical design

It is important to develop a strategy for incorporating intentional areas of sound absorption early in the design process to control the reverberation within the space and subsequent noise buildup. Effective teamwork among the owner, architect, and acoustic consultant is critical in determining parameters for such treatment. Rather than being excessive, the goal should be to design with sufficient absorption, while maintaining harmony with the architecture and interior design.

An acoustics simulation using rendering technology was critical in the design process, as its modeled auralizations provided audible proof of the difference in acoustical perception with and without the proposed sound absorptive treatment. By bringing owners as well as design team members into these listening sessions, the auralization technology provided strong direction to the design team, that the proposed acoustical features were needed and worth the cost.

In many cases, sound isolation is another critical acoustical concern, to ensure an active atrium space does not disturb adjacent sensitive spaces. Careful assessment of partition and window assemblies is critical in reducing sound transmission from the food hall atrium to these overlooking spaces.

In the case of High Street Place, Acentech and Gensler studied the acoustical performance of the office windows overlooking the atrium, and coordinated appropriately with building management. While louder sound levels in food venues usually convey a degree of excitement, one cannot overlook the overall acoustics of food hall atriums.

While louder sound levels in food venues usually convey a degree of excitement, a space that is too loud can have a negative effect on diners, food service staff, and nearby tenants. In general, project designers should aim for a lively, but acoustically controlled atrium by striking the right balance between spatial volume, perceived acoustics, and the intended programming within the space.

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ADDITIONAL INFORMATION

Author



Sheldon (Shelly) Alfred is a member of Acentech's Architectural Acoustics group. He consults on a range of project types, including institutional, residential, commercial, and historic buildings, providing guidance on room acoustics, sound isolation, and optimal

acoustical performance. He has a passion for the intersection of architecture and sound, believing the iterative nature of the two fields is the basis of high-quality deliverables for each project. He can be reached at salfred@acentech.com.

Key Takeaways

Indoor atrium spaces are increasingly becoming a home for social dining and drinking. Their large and open volume is desirable for their flexibility, airiness, and ability to filter uninterrupted natural light. These spaces tend to feature many

sound-reflective material surfaces, such as glass, stone, and concrete, creating a risk of excessive build-up of speech and activity noise. While the dialogue among activity noise, spatial volume, and material reflectivity tends to pose acoustical challenges, it is entirely possible to seamlessly incorporate effective acoustical solutions into the design of such spaces at little to no expense to their architectural character.

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