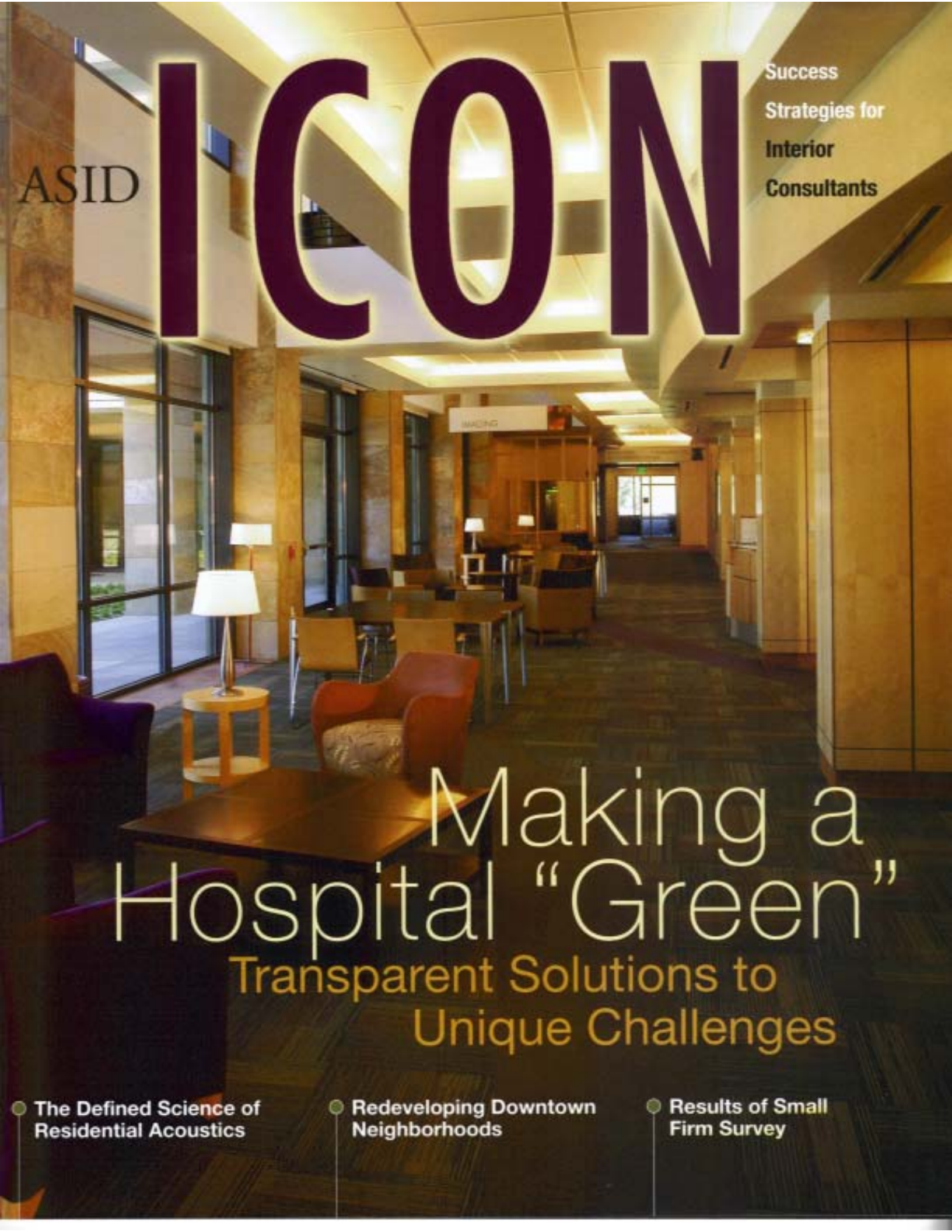

ASID

ICON

Success Strategies for Interior Consultants

Making a Hospital "Green"

Transparent Solutions to Unique Challenges

- The Defined Science of Residential Acoustics
- Redeveloping Downtown Neighborhoods
- Results of Small Firm Survey

Optimizing Residential Acoustics

By STEVEN HAAS

The science of acoustics has become so well developed in the last few decades that now practitioners in the field can predict the outcome of any solution with reasonable accuracy.

Over the last decade, the need has been slowly forming—partially in response to the introduction of high-tech audio/visual equipment and entertainment spaces into residences—for interior design professionals to address the acoustics of their clients' homes.

Forget images of ugly burlap covered panels slapped on the walls of a living room or thoughts of plush furnishings, carpet and draperies that can "soak up the sound" in a space. The science of acoustics has become so well developed in the last few decades that now practitioners in the field can predict the outcome of any solution with reasonable accuracy. While acoustics is a defined science, what we are more concerned with in the residential world is "acoustic design"—the art of applying the science. And acoustic design in the home can be broken down into three major areas: containment of sound, control of noise and room treatments.

Materials Count

Classical home design dictates the use of a variety of acoustically reflective materials from hardwood or marble floors to plaster or stone walls. Add to this the vast expanses of glazing that comprise many exterior walls and the fact that a number of today's larger homes are designed with a degree of openness to allow the occupants to easily move from room to room, and you have the making of acoustic cacophony. Just imagine your client inviting a few dozen friends over for an evening of entertainment in their new house and, before the first round of hors d'oeuvres has passed, they feel like they are in a noisy restaurant and have to shout just to be heard by their new neighbor three feet away from them!

Like the difference in light spill from a room that's painted bright white versus that of a dark color—the brighter surfaces will reflect the light and amplify it in nearby areas—hard surfaces will reflect sound. The goal, then, is to reduce the sound energy as it reflects within a space and travels to nearby areas with materials that absorb sound, ideally those tested for sound-absorbing properties.

An unfortunate fact of physics dictates that acoustical materials need to be at least one and 1/2 to two inches thick to start controlling the bulk of speech, and even thicker to affect the mid-to-low frequencies of music. Of course, allowing for the relatively significant thickness of material early on by building out moldings, electrical devices, etc., is a whole lot easier than retrofitting acoustic treatments in a room that

Noise filtration is not just a problem in large homes. - JAMIE GIBBS, ALLIED MEMBER ASID

is already sheetrocked and finished. In fact, we have successfully incorporated special low-frequency treatments up to 12-inches in depth by using extended door jambs or treating them as architectural elements covered with sound-transparent finishes. The possibilities of integrating treatments are many when acoustic and aesthetic designs are approached in harmony at an early stage in any project.

Designers, aware that most fabrics and carpets have been proven to affect only the higher frequencies of sound (taking some "edge" off of the sound, but not even impacting much of the range of human speech), can now find many pre-assembled or field-fabricated products that have been laboratory tested at all frequencies so as to predict exactly how they will perform. A number of high-end silks, linens and even some wools have successfully passed sound transparency tests (almost all treatments consist of a sound-absorbing core, like compressed fiberglass, and a finish material that is transparent enough to allow the sound to pass through with little interruption).

Major high-end fabric suppliers are now offering lines of "acoustically approved" fabrics that can be used to conceal loudspeakers. We have worked for years with companies like Scalamandre and others to test their existing fabrics so that they can respond to the growing needs of residential and commercial clients for fabrics that can conceal acoustic equipment and loudspeakers. Some smaller fabric companies, like Steele Technical in NYC, now specialize in fabrics that offer proven acoustic performance at a higher aesthetic value than most commercially marketed acoustic coverings.

Thanks to modern acoustics, other materials now exist—ranging from perforated woods to micro-porous plaster systems—that once applied in the field over an absorptive mineral fiber core, look and feel as smooth and hard as a regular plaster or drywall surface. For a more contemporary look, some decorative perforated and expanded metal grilles have also found their way into residential acoustic design elements.

Creating the Envelope

With so many specialty rooms—including home theaters, music rooms, exercise and game rooms—now popping up in residences, homeowners are starting to care about acoustic privacy as much as the quality of sound in their spaces. The disparate schedules of today's family often result in activities that produce "acoustic conflicts." Examples of this include

- Watching movies or listening to audio in a home theater late at night while others are trying to sleep
- Running on a treadmill in a home gym that's located right above a sitting room
- Situating a master bathroom, in which someone may regularly take a shower much earlier or later in the day than other residents, directly next to other bedrooms

As homes get larger, these types of conflicts will only increase and may also include the effect of noise transmission from major mechanical and electrical rooms—some of which tend to house small commercial grade equipment radiating significant noise and vibration.

"Noise filtration is not just a problem in large homes," says designer Jamie Gibbs, Allied Member ASID, (who recently worked on a high-end Manhattan apartment). "It comes into play with condos and attached unit dwellings as well. Your neighbors don't want to know you are watching a movie, playing a video game or running on your treadmill. They rarely want to know if you are at home! Some communities have restrictions on the types of equipment that can be installed in a home . . . Designers need to be aware of these types of restrictions and the acoustic designs necessary to dispel problems in the future for clients."

Once the list of potential noise conflicts is compiled, a plan can be developed to upgrade the wall, floor, ceiling and door constructions to better isolate sound between specific rooms. While sources of major sound—like home theaters—often require a high degree of acoustical engineering to accomplish complete isolation, many other rooms in the home can benefit from simple additions, such as

- Adding multiple layers of drywall or plywood on each side of a partition
- Upgrading to acoustically engineered composite drywall or plywood
- Caulking around partition intersections, electrical boxes and other gaps with acoustical sealant
- Utilizing resilient rubber spacers and furring strips to attach drywall to the stud framing
- Adding commercial-grade sound gaskets around the entire perimeter of doors
- Installing a resilient underlayment below hardwood or tile floors where footfall noise to spaces below is a concern

All of these modifications, again, are best addressed during the initial design since there are obvious dimensional and aesthetic issues involved with doing this type of upgrade.

Homeowners building a very large residence in rural Pennsylvania had designed an enormous ballroom (60 feet wide by 80 feet long by 30 feet high) to host parties, fundraisers and musical concerts for up to several hundred guests. They also wanted to use the space as a place for daily relaxation. We were originally hired just to look at their lower level home theater design, but soon became inquisitive about how they were planning to deal with the natural sound in the ballroom—considering that every surface was intended to be traditionally hard materials—plaster walls, wood floor, a plaster ceiling painted with an artist's mural and plenty of exterior glazing. They hired us to do some remedial design work to "tame" the sound of this large space.

Our initial calculations showed that, with light occupancy, the ballroom would have a reverberation time—the time it takes a single syllable to decay to a level of inaudibility—of over six seconds (think of a large cave!). Compounding this problem was the fact that the ballroom is very open to the

CONTINUED ON PAGE 37

rest of the house. We worked with the interior design team to turn what was originally planned to be a painted ceiling mural into a high-quality digital image printed on a wide-span fabric. The ceiling will be broken up by moldings and the fabric stretched to the counter of each section with thick sound-absorbing insulation material above. Combining this with a smooth acoustic plaster system on many of the ceiling areas in the surrounding overlooks and adjacent hallways will allow us to reduce the reverberation time to just slightly over one and 1/2 seconds—a condition that will control the space quite well when full of talking crowds—yet still have a hint of liveness (i.e., reverberation).

Silencing the Noise

Once sound is controlled with treatments in critical areas and isolated with construction upgrades, there are still a number of noise sources to contend with throughout a home that can impact the quality of living for many people. Although some people can adjust over time to higher noise levels in the home, studies have shown that exposure to such noise usually increases general stress levels and often results in poor sleep.

One of the most prominent of these noise sources is the heating, ventilation and air conditioning system. As mentioned above, larger homes now require the use of small commercial grade air-handling units, which increase the level of noise and vibration. Noise is generated both directly by the fans and indirectly by turbulence created by high-speed airflow in the duct system. Working with an experienced mechanical engineer or contractor, both of these aspects can be addressed through the use of low-velocity ducts, vibration isolation hangers and sound-absorptive linings on the inside of the ducts (although some of these linings have a fiberglass core, much engineering has been done to ensure that, when properly installed, no fibers ever enter the air stream). When a homeowner needs more critical control over how much—or little—noise ends up being present in a particular room, acoustical engineering software can be used to predict final results with good accuracy.

Other noise sources that may cause problems and need to be considered in the home's design include

- Lighting and power transformers
- Refrigerator compressors in kitchens and bar areas
- Pool pumps
- Exercise equipment
- Recreational machinery (e.g., a pinsetter in a basement bowling alley)
- Audio/visual rack equipment and video projectors
- In-wall plumbing pipes
- Exterior vehicular and air traffic

In many cases, techniques described above for room treatment and sound isolation may help prevent these noise sources from becoming sore issues for clients. Going to the next level of assurance, again, would involve bringing in an expert to engineer quantifiable solutions.

Multiple areas of a residential ballroom ceiling being prepared for installation of digitally printed fabric over acoustical material to reduce reverberation.
PHOTO COURTESY SH! ACOUSTICS

The most important things for interior designers to realize with respect to the quality and control of sound in a home are that (1) issues and problems like those described in this article occur far too often because no one thought of them or felt it necessary to address them at the appropriate early stage of design; and (2) the integration of acoustic materials and methods has come a long way in recent years to embrace the aesthetic concerns of designers so that homeowners can achieve optimal visual and aural environments. No matter how much or little work is eventually done to improve the quality and control of sound within a home, it behooves an interior designer to be fully aware of the major issues so that he or she may educate clients and prevent aural shortcomings from ruining the serenity of their homes. ❍

Steve Haas is president of SH! Acoustics, an internationally known acoustical and audio consulting firm specializing in the design of luxury homes, performing arts spaces and museums. More information can be found at www.shacoustics.com.