Sounds

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A Newsletter from ***Stewart Acoustical Consultants*** *Our 27th Year*

7406 L Chapel Hill Road, Raleigh, NC 27607 Ph. 919-858-0899 Fax 919-858-0878

Happy New Year!

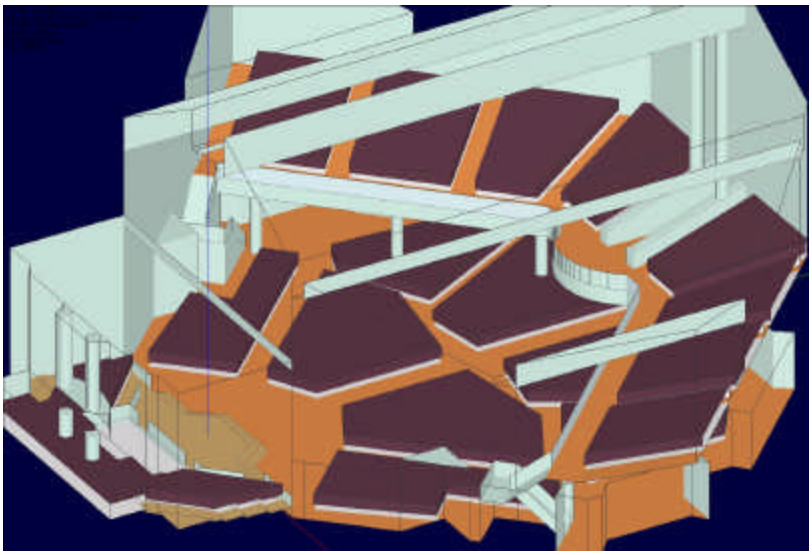
We wish everyone a happy new year as we start our 27th year and our second year in our new office. We sincerely appreciate your support and confidence that has allowed us to grow with the addition of Aaron Farbo. Many of you have had a chance to meet and work with Aaron in the past year. He has made major contributions on many architectural projects and helped with many field measurements.

Update your Records Please - Phones – Address

We continue to get some mail at our Post Office Box, and we expect some of you are still calling our old phone number that has been forwarded. We will soon be discontinuing the phone forwarding and post office box. Please update all your records to our new address and phone numbers:

Address: 7406 L Chapel Hill Road, Raleigh, NC 27607
Phone: 919-858-0899 Fax: 919-858-0878

Experiences with EASE



The EASE room acoustics modeling program has greatly expanded our capabilities. We and our clients are able to actually listen to the room (auralization). We can see the room's acoustical response to a loudspeaker system, instrument or voice throughout the space. We can trace the paths of reflections and determine the locations of problem reflections. Reverberation can be modeled more accurately in spaces with unusual shapes and uneven sound absorption. We truly have a very powerful tool for room acoustics design and diagnostics. Since most audio designers and many audio contractors use EASE for loudspeaker design, we are able to share our model with the designer or contractor and can also evaluate the impact of their design on the acoustics. This leads to a better overall result and a cost savings to the client since the model is only built once. In churches and public venues, we are exploring ways to expand our services and work more closely with sound designers and contractors to provide a better overall service.

Home Generators

The ice storms and hurricanes we endure in this area are among the reasons many homeowners are now installing emergency generators. Unfortunately, these generators are often put in locations that require more noise control than is provided. Owners are finding themselves in violation of local noise ordinances. Such ordinances usually but not always exempt generators during outages, but not for weekly testing and exercise. Please advise clients to take care with such generators. Buy well silenced models and place them far enough from the boundary to meet ordinance requirements.

North Carolina Chapter of ASA Awards Prizes to Virginia Students

The North Carolina Chapter of the Acoustical Society of America held its second annual student poster competition at Virginia Tech on December 3, 2004 and awarded prizes totaling $6500. Winners of $2500 Royster Awards were Nerissa McCoy for a comprehensive study of restaurant acoustics, and Kyle Schwartz for work on methods to provide good hearing for people wearing fully encapsulating helmets. A chapter award of $1000 was split among the team of Dan Mennitt, Julie Redenshek, and Adam Tawney who studied the sound field of a theater in detail and compared results to those from a scale model and a computer model. A special award of $500 sponsored by the Fauna Communications Institute for projects involving the environment or effects of sounds on animals was awarded to a team of seniors from Virginia Commonwealth University who worked on a project involving the prediction of storms and air turbulence using infrasound sensors.

Beware!!!. Misleading Advertising and Common Mistakes

The following are some common cases where products are improperly represented or applied.

Thin Cloth Sound Absorbers

Cloth wall coverings about 1/8-inch thick are available. With that thickness, they can only absorb very high frequency sound effectively. Reputable manufacturers and sellers will indicate an NRC rating of 15 to 20, but most of the absorption that gives this rating is in the 2000 Hz band. Unfortunately, some disreputable or ignorant sellers advertise this product as having an NRC rating of around 60. If you get the test report, you will find this result was obtained with the cloth installed over a half-inch or 5/8-inch mineral-fiber sound absorber that is providing most of the absorption.

Light Foam Fillers for Concrete Block

Concrete block get most of their sound blockage ability from their heavy weight. Some blocks are heavier than others, providing better blockage especially at lower frequencies. The blockage ability of concrete blocks can be improved by filling cavities with sand or mortar. Lightweight fillers provide little or no benefit. One manufacturer of a light foam filler claims their product gives results equivalent to filling a block with sand. They can provide test reports showing the same STC for block walls with blocks filled with sand and filled with their foam. However, look carefully. You will see that the two tested walls weighed almost exactly the same. How did this occur? Lightweight blocks were filled with sand, and heavy blocks were filled with the light foam. The heavier block would have given the same result without the foam or sand.

Resilient Channel that is not Resilient

When a design calls for resilient channel, the intent is that the channel be 25-gauge steel (or possibly 26-gauge) with stretched Z shape where one leg is screwed to joists or studs and gypsum is screwed to the other. Some manufacturers sell channel that is a stiff 20 gauge steel. They also sell a product they call a two-leg resilient channel that is really more like a hat channel. This is not sufficiently resilient. Ideally, the channel also should have slots about 3 inches long with solid sections about an inch long in the web. Slots should be aligned with studs or joists. When installed on vertical walls, the leg attached to the studs should be at the bottom.

Heavy Vinyl

Heavy materials block sound. All materials will have a frequency range where they are weak. The stiffer the material, the lower this frequency will be. Thus, a limp but heavy material is desirable. Thin sheets of lead meet this description. Due to environmental concerns about lead, heavy vinyl has become a replacement. Many companies make vinyl sheets weighing about one pound per square foot. These have wide applications in industrial noise control and a few architectural applications where one pound per square foot is sufficient. Most architectural applications require much more weight for adequate blockage, and such weight is available with materials costing much less than the vinyl. Some manufacturers are attempting to sell vinyl for use in architectural walls. If a wall already weighs around 10 pounds per square foot, the extra pound added by the vinyl provides little benefit, especially considering the high cost of the vinyl. The vinyl could provide one advantage. Gypsum panels have a weakness at some frequency in the range of 1500 to 4000 Hz depending on thickness of the panels. This weakness in vinyl is at a much higher frequency. Thus, the vinyl can be strong where the gypsum is weak. However, the same benefit can be obtained by simply using layers of gypsum of different thicknesses such as 5/8 inch and 3/8 inch and not gluing them together. Thus, there is no justification for the extra expense of the vinyl.

Misuse of Resilient Channel

When a wall or floor-ceiling does not adequately block sound, an easy solution is often desired. A common mistake is to think that this can be achieved by simply adding resilient channel to an existing surface and then adding a layer of gypsum drywall leaving a space of only ½ to 5/8 inch between two layers of gypsum. This will improve blockage at very high frequencies but can actually make blockage worse for low-vowel sounds. This happens because the small airspace creates a resonance or condition in which the layers of gypsum want to vibrate in this frequency range. (Note that a similar effect occurs in many thermal windows with small air gaps.)

Mask that Sound

Sound exists all around us. Only in a few very rare environments do we encounter sound levels so low that we do not hear anything. We may not always notice what we are hearing, but we are hearing something. That is a clear distinction. We become accustomed to some sounds so that we do not notice them, and sometimes these sounds we do not notice are clearly loud enough to hear. We notice sounds we may not want to hear when they are distinctive, or contain information content, or are so loud that they interfere with some other sound that we want to hear. We then consider these sounds to be noises. In two of these cases, it can be helpful to actually add sound to cover up the distinctive or information containing sounds, as long as this can be done without the added sound creating a problem itself. The most common application of this added masking sound is in open-plan offices. Whether we hear or understand speech depends not only on the level of that speech reaching our ear, but also on the level of the background sound to cover it up. In open offices, it is impossible to reduce the speech level enough to provide privacy if the background sound is too low. Sometimes even with closed offices, adding background sound can be more practical in solving privacy problems than improving sound blockage. Masking can also be used to cover irritating sounds other than speech such as unpleasant mechanical sounds or music. These must be at a low level already, but just noticeable. Special equipment is required if the irritating sound is at low frequencies since most commonly available masking systems work only in the speech frequency range.

North Carolina ASA Soliciting Student Prize Contributions

The North Carolina Chapter of ASA is building a prize fund for the annual student poster competitions in acoustics. In some years, funds contributed by Larry and Julie Royster will be available for awards with some restrictions. However, other chapters can claim this award, and restrictions eliminate some student projects. Thus, the intent is to reward worthy projects that do not qualify for the Royster Award or provide additional awards in years when several projects are worthy. Contributions of any size are welcome. Please contact Noral Stewart.

Building Codes – Setting Minimum Acoustical Isolation Requirements

Until recently, North Carolina and some other nearby states had no requirements in their building codes for sound isolation between units in multifamily buildings. An exception in North Carolina was a requirement for duplexes and small buildings that did not require an architect. North Carolina and other states have now adopted new codes based on the International Building Code, and this has brought minimum isolation requirements for all multifamily buildings. Note emphasis on the word "minimum." The requirements in the code are too low for any building considered by the occupants to be luxury quality, buildings in quiet neighborhoods, or when separated rooms are dissimilar in use such as living-rooms and bedrooms.

The North Carolina code now requires walls and floor-ceilings between units to be designed to meet STC 50. Walls meeting this must typically contain three layers of gypsum, absorptive batts, and a non-rigid connection between the layers of gypsum on the two sides. Wood studs are too rigid. Resilient channel must be added to one side, or a separate set of studs used for each side. For best results, two sets of studs on separate base plates, and a total of four layers of gypsum are recommended, with two on each outside surface and none in the middle. This can provide a wall of greater than STC 60. Such a wall will then likely be compromised by flanking such as through a continuous floor under the wall. A new wall system developed by USG offers promise. It uses a central gypsum barrier that is continuous from top to bottom of the building, with an airspace and separate layer of gypsum on each side at each floor. The floors are not continuous through the wall. While the extra layer of gypsum in the middle would work better in blocking low frequencies if split to each side, this system is worth considering because it eliminates continuous floors.

Most floor-ceiling systems will meet the STC 50 requirement, but they need to be better to meet the expectations of many occupants, and they must also meet an impact sound requirement. They must be capable of an IIC rating of at least 50. This is related to the sounds produced by the floor-ceiling system when impacted by sources such as footsteps. Carpet will often provide a design that meets this requirement, as long as the carpet stays in place. Hard surfaces require special effort with resilient materials under the surface and resiliently mounted ceilings below. As with airborne sound, higher ratings should be achieved in luxury facilities, in quiet communities, and when for instance a kitchen is above a bedroom.

Privacy – It's now the Law

Recently enacted "HIPPA" legislation now requires medical facilities to assure the privacy of patient information. This is spurring new research and efforts at standardization for the already established science of speech privacy. Unfortunately, as so often occurs, this legislation was written without consulting the acoustics community regarding the available science and technology. Those responsible for developing specific regulations are now in contact with the acoustics community and in the process of developing the regulations. Interest has also increased in research in this area and in developing standards to evaluate privacy. A standard exists for open office areas, and consideration is being given to a similar standard for closed offices. Anyone involved in design of any type of medical facility should seek guidance.