

## FIELD TESTING

## Reach Your Limits

## Acoustical Room Treatments To Optimize Your Sound

by Wayne Dolnick

When you are in the highlands of Scotland visiting your new castle this fall in preparation for building your quaint bed and breakfast, most acoustic decisions have been predetermined for you already. And that is not always a good thing.

Castles aside, acoustics projects don't always have to be so difficult. If you are fortunate enough to be involved in the pre-build design of a space, your options for material applied, placement, color, mounting and the combination of a myriad of acoustic products are bound only by your client's budget, the desired resultant sound, and your knowledge of the propagation of sound. However, with existing construction, in this case a very reverberant solid-stone castle, room acoustic adjustments are started with the source and then the application of treatment.

In the lucky circumstance of designing before construction, the room is the first parameter that needs to be taken into consideration. What are your goals? The spoken word, boardroom presentations, live stage acts and post-production voiceover studios all have different object sound curves to strive for. OS-



After installing a JBL sub at the U.S. Athletic Training Center for last month's report, further adjustments were made with RPG's new Clearisorber.

HA has stated that to meet certain government approvals for preservation of hearing, measuring sound with a 90 dBA criterion level is acceptable. This is based on the American Standards Institute's (ANSI) S12.19, "Measurement of Occupational Noise Exposure," which defines the criterion sound level as, "That constant sound level in decibels (dBA), which, if it continues for the criterion duration, would pro-

vide 100 percent of an employee's allowable noise exposure."

Further, federal OSHA uses the 80 dBA threshold to determine compliance with the hearing-conservation provisions (www.osha.gov Standard #1920.95). As I am sure everyone reading this knows, pushing the little button on your SPL meter to convert from "A" weight to "C" weight pro-

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## Test Results

First up, I was rebuilding a home recording studio and mixing center for mixed use. I started with Echo Busters and placed Phase-4 towers in the corners of the front of the room. Bass Busters were placed in the rear corners adding three absorbing panels to the front of the room and three Double Busters reflective panels on the back wall.

Immediately, I noticed the intimacy of the room. Bass was very well absorbed, as I was not feeling the measured 64 Hz notes as before. I removed the first reflection panels and felt the room "open-up" a little and in every A/B test, preferred the sound without the absorbers on the side wall.

As a final A/B test, I removed all front absorbers with the exception of the corner Phase-4 towers and felt I achieved a perfect blend of reverb, absorption and musicality. I would recommend that Echo Busters be a serious consideration if the client wants something more than foam, but can't swing the expense of true fabric-covered fiberglass or mineral wool.

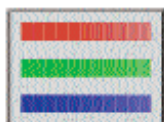
Next up, I installed some relatively new products from Auralex to absorb and diffuse sound, which, in effect, were fabric-covered fiberglass panels in two different thicknesses. I placed two 2-foot x 4-foot x 2-inch CT45 corner traps at the optional 45-degree angles in each front corner, two C24 2-inch-thick, 2 x 4-foot beveled-edge absorbers behind the main speakers, and two B24, 1-inch-thick, fabric-wrapped fiberglass panels at the first reflection points.

For commercial venue testing, I went back to the U.S. Athletic Training Center, where I had the opportunity to test a brand-new sound-absorption product from RPG designed for application on windows, skylights or anyplace where glass is used in excess as a design element and reverberation is of major concern. We are not talking about covering the light with heavy acoustic absorbing material. In fact, this patented material is made out of polycarbonate, is clear, and only 0.1mm thick. Yes you can see through it, and it works.

While I only had a small piece of the Clearisorber to work with, I hung the product about 2 inches in front of a large window parallel to the reception area and right in front of the cardio zone, where the music is pumping and the ambient noise raises the noise floor 15 dB. I held my meter 6 feet away and with a "C" weight and fast read I took RTA measurements with and without treatment trying to trigger the lve at the exact same spot in the song so as to see any changes. The result with two completely different types of music was astonishing.

To say I was skeptical of what was essentially to the eye a piece of plastic with perforations on one side, is putting it mildly, but lo and behold, bass frequencies were attenuated below about 100 Hz and raised slightly above 2 kHz. I went back, checked the white paper vs. the charted results from the lve unit and they correlate.

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duces an entirely different curve, hence it is best to know your goals before choosing materials.

When an architect is making plans today, whether for a large commercial multi-purpose facility, a broadcast center, or a new office complex, his or her choice of building materials to specify are almost boundless. Today more than ever, this plethora of choices expands into the realm of acoustic control, preservation and enhancement. With materials, sizes and options that run the gamut in most conceivable forms (and a few quite inconceivable!), choices include floating floors made of wood, aluminum lined or unlined with mineral wool, fiberglass or rubber. Add to this an array of fabric-covered panels based on fiberglass, mineral wool, compressed fiber or foam in thicknesses starting at 1 inch and running in some cases up to 6 inches as standard.

### MATERIALS CHOICES

TYPE	DESCRIPTION
<b>Foam</b>	Being the least expensive solution and readily available, we have the ubiquitous foam in a multitude of colors, shapes and sizes and a relatively affordable price point that is easily available from firms like Auralex, RPG, Illbruck and EchoBusters.
<b>Fabric-Wrapped Panels</b>	Some fiberglass-based, others mineral wool and, in the case of others, foam-based. Again, these panels can be in the form of bass traps, absorbers, diffusers, and, in some cases, a combined treatment. These can be purchased off the shelf from Auralex, RPG, Illbruck, EchoBusters, ASC (TubeTraps) and Studio-panel to name a few of the brands. As a step up, firms like RPG offer fabric-based solutions with a membrane inside to control dispersion of sound and optional wood slots on the outside to disperse unwanted waves. Both Auralex and RPG offer a custom option for fabric choices and size variations.
<b>Solid-Based Products</b>	The clear leader in this field, both in off-the-shelf solutions and custom options is RPG. RPG manufactures products that either have aluminum skin, wood-slotted drop-ceiling or wood-faced, fiberglass-backed surface control for application on flat or curved surfaces. Auralex makes some very useful and cost-effective diffusers that are extruded out of expanded polystyrene and can be hung from a drop ceiling or attached using various methods, including a simple push-pin.
<b>Pre-Build Tools and Materials</b>	Auralex makes a trio of products that would suit anyone building a home studio or demo room; the previously described U-Boat, rubber isolator to separate the floor from the wall, the rolled specially designed vinyl to place between the sheetrock and the studs to reduce noise transmission (Sheetblok), and the RC8 Resilient Channel used as an add on to hanging drywall. Also if space requires, Auralex also has made available mineral wool to place between joists or under floor boards to reduce NC.
<b>Custom Pre-Build Tools</b>	This would apply to projects designed by an architect and specified by an acoustician and/or engineer and Illbruck, Auralex and RPG offer solutions, with the most varied selection of materials again offered by RPG. Consult with these manufactures directly for more information.

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Some firms even offer a "tuned" version of a fabric-covered panel, as in the case of the BAD from RPG. The company claims that through the use of a binary-hole, drilled-metal plate sandwiched between a rigid fiberglass core and a fabric covering to control bass in the form of regulated absorption and allow for diffusion of the treble above 1,000 Hz will maintain ambiance.

Auralex has a few great solutions for pre-build in the form of wall-isolators. Two products that a consultant can advise for inclusion on the plan are "U-Boats" floor isolators and SheetBlok, a vinyl type of material that is sandwiched between walls and said to reduce noise 6 dB more than lead.

Today, the acoustic world even offers what was once only obtainable at one time as custom-build, right off the shelf. Wood-based reflectors, extruded aluminum wall treatment, drop-ceiling panels in fabric, wood or fiberglass for either absorption, deflection, or both. But remember, in the end, either the acoustician you are working with on the job or yourself must decide what materials are required, based on the goal. The client can choose the finish and the color.

#### STEP ONE: KNOWING YOUR EQUIPMENT'S LIMITATIONS (AND YOURS)

Collecting data and not knowing what to do with it is useless. If your expertise is in designing, building and installing sound systems, then maybe it is wise to call in an acoustician (job permitting) at this

point. This should not be viewed as an embarrassing solution but one of a smart businessperson, looking to maximize his or her potential and deliver a very good product.

That said, if you are working within an existing space and you can read a meter, grab that new IVIE IE-33 or Sencore SP-295 you just bought and start testing the space for standing waves. Again, as a gentle reminder, your treatment decisions will be based on the ultimate priority of the project. At this point, you can EQ the system (if you have a 31-band, 1/3-octave parametric equalizer installed) and adjust, as close to the desired curve as possible.

Right now, your ears can and should be your best tool, and if you are experienced listening to live music in various venues, should recognize if the room sounds good or not, and adjust accordingly. Then grab your meter and pink-noise the room (if you are doing this yourself). Try to find any standing waves, variations above or below the desired curve, hot spots or dead spots. Do this in various positions throughout the room, and do this a few times to average the results.

Remember, if you just purchased the Ivie or the Sencore units, you can average your readings, chart them and look at the results either in real time, or back in the office on your computer. This is invaluable data that everyone involved in the project can use. After you have the

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data, you can design or specify what has to be corrected, but, in the end, in all but the biggest spaces, trust your ears. They will tell you if the music sounds good or bad!

#### STEP TWO: MEASURING THE ROOM AGAIN

RT-60 data is the goal here, which, if properly tested, allows you to see how much decay time is involved at various frequencies. The goal, as we know, is not to make a room too reverberant with long delays as to sound like your castle in Scotland, but not too "dry" as to make the room sound dead. Now a further decision can be made for additional absorbers and/or diffusers to control first and second reflections. Be judicious in your approach here, as too much treatment is not always better.

#### STEP THREE: CONSIDERING MATERIAL OPTIONS AND DEVISING A PLAN

Obviously, a budget is paramount in deciding whether you are installing foam or fiberglass-backed wood, but, aside from that, certain crucial needs must be met, based on your results from steps 1 and 2. If you are involved in a multi-use facility such as a health club, museum or conference center, your first objective is to control the sound. After all, you don't want the receptionist to be bothered with the sputtering of the tour guide in a museum any more

than people in a yoga session want to be hammered with music from the dance class at a gym.

#### STEP FOUR: PROPER APPLICATIONS

Normally in most sound rooms (post- and pre-production, home studio or recording facility), bass control is achieved by placing bass traps of various materials and sizes in the corners, with some engineers espousing the placement in the front of the room and others specifying starting in the rear, so some experimentation is in order before final application. The same holds true for additional absorbers and the application of diffusers.

That is, unless of course your space was designed by acoustical engineers using the CATT-v8 or SIA-smart programs to predetermine where and how many speakers and acoustical materials are required. For small home studios or smaller recording rooms, the RPG Room Optimizer program will also let you know to the inch on three axial planes, where and how much material to apply.

After placing your initial bass traps, determining your first reflection point is important and can

sometimes be achieved by the use of a mirror and a helper, moving along the side wall. In fact, one company, which offers a complete room package, includes a mirror and tape measure in its setup kit. Studio-Panel, which is the brainchild of record producer Keith Olsen and home theater acoustics expert Anthony Grimani, places these items in every kit they sell.

As discussed previously, a multitude of products can be placed on the ceiling, hung from a drop ceiling in a T-bar arrangement, or mounted on walls, in corners or on the floor. In industrial applications where curtailing of excess noise and/or vibration of offending equipment is key, acoustic treatments come in the form of rubber isolators to raise machinery off of the floor or "blankets" to wrap the surrounding area or machine room with. Illbruck makes a purpose-designed product called the SONEXcurtain BB. Properly applied, total isolation and "soundproofness" is possible.

With more than 30 years' experience in the audio industry, Wayne Dolnick (proaudionow@verizon.net) is now a sales and marketing strategist.

### For More Information

Many technical papers have been published over the years on the use and application of materials to control and enhance sound. Some of these white papers can be attained from the Audio Engineering Society (<http://www.aes.org/technical/asr>), or by visiting these websites as a starting point: <http://www.rpginc.com/listen/index.htm>, or <http://www.rpginc.com/news/library.htm>.

#### FIELD TESTING

### XTA's Walkabout [www.xta.co.uk](http://www.xta.co.uk)

**Project:** NFL Pro Bowl 2005 NFL All Stars Game  
Aloha Stadium, Aiea Hawaii  
**Contractor:** Jeff Kang  
Custom Audio, Kaneohe, HI

#### SCN: How did you use the XTA Walkabout for this project?

**Jeff Kang:** We used the recently released Walkabout Kit to tune and manage the field speaker system. With wireless capability, we could listen to just one frequency band in one area as needed and adjust for numerous variables in the stadium. We were able to walk just about the entire stadium and always have control of the system.

#### Which XTA products were you controlling with the Walkabout?

Our entire rig consists of XTA DP226 Loudspeaker Processors. Each rack has one processor that controls up to four speaker cabinets per side of the rack. For the Pro Bowl, we used Racks 1-4, using Rack 1 as the primary rack. On the rear panel of Rack 1, we have the walkabout transceiver mounted with all the cabling inside the rack. From there we use standard XLR cable to link the racks in series.

#### What adjustments did you make with the Walkabout?

Some of the variables involved were balancing, EQ, overall system protection and bandpass control. This gave us the ability to listen to just one stack at a time, or one frequency band at a time. It was great for system checking day to day and also being able to EQ the sound from the audience's POV.

#### Was it easy to set up the Wiser WLAN to serial converter for the XTA boxes?

Extremely easy!

#### Were you happy with the Netgear WiFi card?

The netgear card performs well all around, and is much more stable under Windows 2000 Professional.

#### How would you rate the XTA Walkabout's performance in this installation?

Flawless! Even with thousands of people on the field and in the stands, simply flawless. No adjustments were needed during the game, however, it allowed me to be in various places during the system use and still keep an eye on the processors.

#### If you could influence the next phase of product development, what features on this model would you like to see changed or added?

Perhaps a hardwire version, for those who have existing networks, or perhaps TCP/IP control for all XTA DP products over a TCP/IP network as opposed to XLR daisy-chaining.

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