Acoustical Issues in Recreational Facilities

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Acoustical Issues in Recreational Facilities

Recreational facilities are often noisy and have issues with distortion that minimize the use of the space for other functions along with compromising the use of the space for recreation. This is especially true in educational, municipal and worship related facilities where these spaces are multi-functional.

While excessive noise levels may not be sufficient to substantially impede the use of the space if its primary function is a gymnasium giving instruction might be difficult. These conditions often limit the use of the space for other functions. In addition, if the gym is used for spectator events, the distortion makes announcements difficult (or impossible) to understand. Often school gymnasiums are used as an auditorium to accommodate large audiences. Other gyms are specifically designed as multi-purpose facilities and may be used as cafeterias and/or auditoriums.

The cause of these problems is the preponderance of hard surfaces that reflect and amplify sound. These multiple reflections cause the sound (words, music, etc.) to be heard several times with diminishing levels of volume as each reflection passes your ear. The phenomenon is termed reverberation time (RT) and is measured in seconds – the time that a sound decays by 60 decibels - and becomes inaudible. The greater the RT – the greater the distortion – the less intelligible words are – the quality of music is diminished.

Many untreated gymnasiums have reverberation times in excess of 10 seconds whereas a RT of less than 1 ½ seconds is desirable and required for clarity. As a reference, recording space RT should be under 0.5 seconds.

When the reverberation is reduced there is a simultaneous reduction of the volume of sound. Both are highly predictable using mathematical models that consider the volume of the space and the reflectivity of the surfaces (walls, ceiling and floor.)

This reflectivity is measured by a tested number that provides a Noise Reduction Coefficient (NRC.) This is the simple mathematical average of the absorption of sound at four frequencies: 250, 500, 1000 and 2000 Hz. These are the

frequencies we make the most and hear the best. A block wall has a NRC of 0.03 (3%) whereas an efficient wall or ceiling treatment can have a NRC of 0.80 (80%) or higher.

How this correction is achieved is through the application of sound absorbing materials to the walls and/or the ceiling. Perceived noise reductions of 30% to 50% are common given the proper engineering.

The ceiling is the first place to look to look at for acoustical enhancement. Some facilities have a suspended acoustical ceiling and, while its performance may not be optimal the gain in upgrading it (replacing the ceiling panels) is marginal. More significant gains can be had by treating the wall surfaces which are probably hard. A commonly used suspended ceiling panel will have an NRC of about 0.60 – or 60% absorption. Replacing it to bring it to bring it to 0.80 or higher is not a good place to spend your money unless it is aged and in disrepair (damaged, water stained, etc.) Even as such, there are restoration systems that are less expensive and do not downgrade acoustical performance. These would be acoustically transparent paints and snap on grid covers.

Many ceilings in recreational facilities provide virtually no acoustical contribution. Exposed bar joists and metal deck, gypsum board, preformed concrete and wood are the most common. Flush mounting acoustical panels (actually wall panels applied to the ceiling) work well and can be sized and patterned to avoid lighting, air conditioning vents, sprinklers or other obstructions.

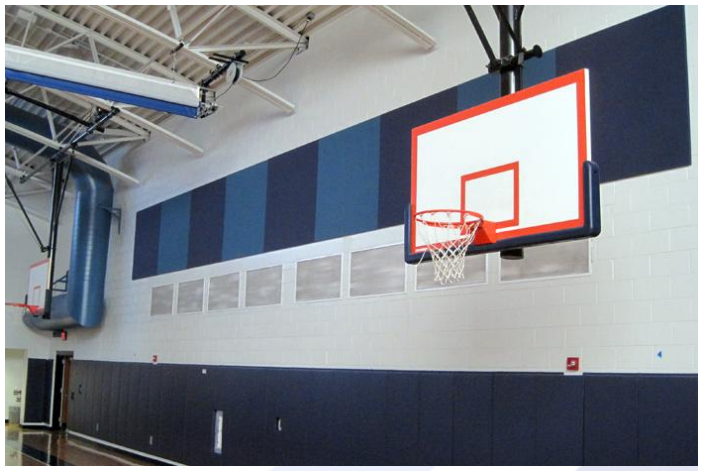
If the ceiling height permits, suspended acoustical banners are very efficient from both a material cost and installation perspective. They can also “take a hit” so the impact of volleyballs or other unintentional or intentional projectiles have no effect. They simply move out of the way.

Acoustical wall treatments may be of several designs. Fabric faced panels and perforated metal panels (with an absorbent material behind the metal face – usually fiberglass) are typical examples and are the most common. The important consideration is the tested acoustical performance. Impact resistance, maintenance considerations and aesthetics are secondary but, there is no need to sacrifice or compromise these considerations for the sake of acoustical performance. Most treatments enhance the design of the space and “look like they were there in the first place.”

Almost all of these treatments use fiberglass insulation as the absorbent component of their design.

Transmission of noise from these spaces to other space may also be a concern. School design typically situates these spaces remote from class rooms and other areas where the noise would be disruptive. A fitness facility in lease space or a free standing facility with the need for some quite space comes to mind. A YMCA or similar facilities with a gym and classrooms in close proximity are such examples as is the fitness facility with an aerobics room and yoga room adjacent to one another. A fitness facility in lease space next to a beauty parlor, medical office or other space is another.

The reduction in the noise level within the facility is a good first step, but hardly ever all that needs to be done. A tight, complete and substantial envelope needs to be established. Each common element – wall, ceiling or floor should be designed for maximum containment.



A few things to remember:

- A little leak lets a lot of sound through. A 0.3 % opening (less than ½ of one percent) or its equivalent in weak spots will reduce the sound barrier performance by a perceived 75%. So, 75% of the noise you thought you were blocking will get through that small and apparently insignificant opening to the other side.
- Common transmission points are doors, through a common plenum (the space above a suspended ceiling,) penetrations in the common wall or floor/ceiling for electrical, HVAC, plumbing and other utilities, where walls meet perimeter windows, etc.

Even if these paths are addressed properly, there may be structure borne transmission which is more difficult to deal with. This involves isolation/vibration mounts for equipment (usually air conditioning units) and systems such as "floating floors."

Properly addressed by knowledgeable, experienced people, most problems are solvable – some easier than others and, some less costly than others. Look for resources that are solution oriented. Not one that is focused on selling product and who may not have the product or combination of products and knowledge to address your problems. Ask for references of similar work done at facilities similar to yours. Just because they did the work or provided the material doesn't mean that they engineered the solution – make sure they did or can put you in touch with those who did.