

Sound and Your Fitness Facility

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You have just had a hard workout in your association's fitness room. It is a great facility and so convenient. If constructed properly, no problems. If not, owners near the fitness area may hate you.

The problem is sound transmission. Such as the rhythmic cadence of the treadmill or the sudden impact of the free weights hitting the floor. If the developer and architect have not designed the room's walls and floors with sound reduction in mind, those noises will be heard.

Some simple acoustics: sound is a pressure wave that travels through air, liquids or solids. Longer wave lengths are lower pitch sounds. They are higher energy and more difficult to dampen. Short wave lengths are higher pitch. When that free weight hits the floor, it vibrates the floor slab. The vibration wave propagates through the structure, reaches the ceiling of the room below and sets the air vibrating as a wave that travels into the room below and to the occupant's ears. Essentially the ceiling is acting like the diaphragm of a music-producing loud speaker and heavy metal is *not* your neighbor's favorite music.

Transmission through walls is the same. Noise in the fitness room generates the sound wave; the wave hits the walls, travels through the wall to the other side where it sets

the air to vibrating in the adjacent unit.

So how do we stop that transmission? During original construction it is relatively easy to construct double studded walls. Two sets of wall studs, not lined up stud to stud, with dry wall on the occupied sides. Add some sound absorbing insulation (a denser material than fiberglass thermal insulation) for even more noise reduction. It's important to remember the details. Sound waves are sneaky — Like water finding any opportunity to leak through a roof. Sound waves will find any crevice or break in the sound proofing to get past the insulation. These are called "flanking paths" and include ducts, pipes or any other devices passing through or around the sound proofing. Special caulks need to be applied at wall to floor

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and wall to ceiling joints. Electric outlets and data connections get special treatment too.

Sound proofing floors is a little more difficult. In high rise constructions, floors are often concrete slabs. In some cases the bottom of the slab is the ceiling of the unit below. For that construction, one technique is to build a platform floor on top of the slab. Isolate the sleepers from the concrete with sound absorbing mats. There are also specialized mat products to place on top of the floor to absorb sound. Remember, the new floor should have a gap around the perimeter so the floor does not touch the walls; another application for acoustic caulks.

If the floor/ceiling assembly is wood frame with joists and dry-wall for the ceiling surface, there are more options. Resilient channels can separate the joists from the dry-wall and limit sound transmission. Add some sound absorbing insulation between the joists. There are many other options.

If your association is in transition from sponsor to individual owners, have your transition engineer determine from the plans the Sound Transmission Class (STC) of the wall, floor and ceiling assemblies in the fitness room. STC measures air borne sound. The higher the rating the better. These ratings are measured in the laboratory so they are only indicative of the performance that will be achieved in the field. Actual performance testing will yield a lower STC rating. For impact sound transmis-

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sion there is a similar rating: Impact Insulation Class (IIC).

In New Jersey, the Uniform Construction Code specifies "wall, floor, and ceiling assemblies separating dwelling units including those separating town house units shall provide air borne sound insulation for walls and both air borne and impact sound insulation for floor, ceiling assemblies." STC and IIC ratings are specified to be a minimum of 45. While a 45 STC and IIC rating won't be adequate for a fitness room, assemblies with ratings well into the 60s or even 70s have standard designs that can be constructed with readily available building products.

If your association is converting a space to a fitness room or just frustrated with the performance of the one you have, there are many products commercially available to apply to walls and ceilings. Consult a professional to help you improve your noise reduction performance. Look for all those "flanking paths" that defeat even the best constructed assembly and specify the products that provide the aesthetics and fire rating that best meets your needs.

Many of the building product manufacturers publish online manuals that are very instructive and show how various wall and floor assemblies perform. Google "sound rated assemblies" to find them. ■

Robert N. Roop is a Professional Engineer with over 40 years of experience in providing engineering services. He is responsible for the process and execution of all engineering projects at Lockatong Engineering. The firm's focus is comprehensive investigations and design of buildings and associated property.