Going Barking Mad?

Kennel noise is a stressor for animals and staff, but it can be reduced through good acoustic design

YOU LIVE WITH IT, your staff and adopters live with it, the cats live with it, and even the critters causing most of the ruckus suffer from its effects: the noise from the dog kennels. It's one of the things that can make the shelter environment off-putting for both people and pets, and it can be a vicious cycle: The more stressed out dogs are, the more they're inclined to discuss it, and the more they discuss, the noisier and more stressful the kennel becomes.

There are ways to reduce kennel noise, and the best time to plan for a little more peace and quiet is before the barkers even arrive. If your organization is making plans to build a new facility or retrofit an old one, planning for good acoustics should be a major part of the architect's design process.

A version of this article, which provides preliminary advice on effective noise control, originally appeared in the *Pet Services Journal* ("Controlling Noise in the Kennel," May-June 2003) and has been adapted for the sheltering audience. The author, C. Scott Learned, is the president of Design Learned, Inc., a building systems engineering and design firm that specializes in animal care facilities. The original article and more information about the firm's services are available at www.designlearned.com.

Soundproofing the Shelter

Acoustic design is particularly complex in the shelter setting because many of the sound reduction products that can be used safely in other settings can't be used in a kennel. For example, in sites where noise is created primarily by machinery or people, the loudness can be reduced through strategic use of porous materials, which are the most effective surfaces for minimizing and absorbing sound.

But in the shelter, the need for thorough cleaning and disinfection of surfaces precludes the use of the most effective materials for noise control. Kennel surfaces must be non-porous and washable and are usually hard, making them easy to disinfect—but some of the very qualities that make them cleanable make them noisy, since sound bounces off hard, non-porous surfaces. Even the ventilation requirements for disease control are often at odds with the design elements that make for reduced noise.

The control of noise usually takes one of two forms: the control of noise within a room and the control of noise leaving a room through walls, roofs, doors, and windows. Controlling noise within a room requires the means to both block or reduce the source of the noise and to minimize reverberation. Most of the sound that humans hear is reverberated or reflected from hard surfaces around us; the structure of the human ear is such that without reverberation, we would be able to hear only the sounds that were in the general direction of our ears. (Certain animals—cats, for example—have directional hearing, allowing them to hear, even without reverberation, sounds not directed towards them.)

Because it's the dogs who are the major culprit behind kennel noise, there are practical as well as humane reasons to make sure the shelter's canine charges are kept as comfy as possible. Regular walks and socialization as well as toys and other comfort items can all contribute to a sense of doggy well-being and make dogs less likely to vocalize due to stress. Designing the kennels so that the dogs in the runs don't have to be eye-to-eye all day long is another stress-reducer. Quiet, continuous classical music—which has been shown to reduce stress levels—provides a masking noise that can make the dogs less aware of smaller peripheral noises such as people entering the kennels and other dogs.

But when it comes to actually coping with the noise that the dogs do produce, the fundamental element is reducing reverberation within the kennel.

NRCs and STCs—Demystifying Construction Materials

Strategic use of materials that reflect or absorb sound in particular ways is one of the primary means of noise control. Construction materials can be measured to determine the *noise reduction coefficient,* or NRC, which is a measure of the percentage of sound that a particular product absorbs. The ability of prod-

KEEPING IT DOWN

- Address noise issues at the design phase, in terms of construction methods and materials as well as space planning.
- Reducing dogs' stress will reduce dogs' noise.
- Anything you do for noise control will affect ventilation, fire protection, lighting, cleaning, and other functions of the kennel.
- Hire engineers and architects with experience in animal care design. They can help you weigh the importance of the competing needs for noise and disease control.

ucts to absorb sound energy varies with frequency—another difficult issue in shelters, where the barking of many breeds and sizes of dog covers a large range of frequencies.

To standardize the measurement, the NRC of a given material is the average of the sound absorption at four different frequencies. On the NRC scale of 0 to 1, a product with an NRC of 0 is a perfectly sound-reflective surface, meaning it doesn't absorb sound at all and will in fact exacerbate the effects of background barking; an NRC of 1 means the product is perfectly absorptive. For example, hard, smooth glass has an NRC of 0 and will simply bounce sound back into the kennels. Three-inch-thick glass fiber board is on the opposite end of the scale; it has an NRC of 1, meaning it is perfectly absorptive. (These values are general, and you should review product literature—or hire a design professional with acoustics experience—before purchasing a product.)

While the NRC is a measure of how much sound a product absorbs, the STC—or *sound transmission class*—rates how much sound a product transmits. Products that control the reduction of sound through a barrier have a number that represents decibel reduction that the product provides. A product with an STC of 0 doesn't reduce sound at all; the sound would be equally loud on both sides of the barrier.

What all these numbers and abbreviations mean is essentially this: Within the kennels, you want to use materials with a higher NRC to absorb the direct and reverberated sound of the dogs, thus reducing the loudness within the kennel itself. For the barriers between the kennels and the rest of the shelter—walls, doors, and the like—you want to use products with a higher STC so that the noise still coming from the kennels seeps into the rest of the building as little as possible.

As a general rule, products with good STCs have poor NRCs, and vice versa. Some general examples of the STC values of design facets you may have in your own building: A solid core wood door with poor seals would have an STC of around 22, whereas acoustically designed and sealed doors should be between 35 and 50.

The Sounds of Hounds

There are three typical noise problems in animal care facilities: direct kennel noise, internal room-to-room noise transmission, and external noise transmission to neighboring properties. Treating the direct noise produced by dogs is difficult; in buildings designed for purposes other than animal care, the primary problem is the reverberation of noise—but in kennels, each dog creates a source of direct noise physically close to the ears of kennel technicians.

Dogs are pack animals and love to be heard, and will frequently begin vocalizing when they hear the sounds of other dogs. Unfortunately, acoustic sound panels have no effect for those in the direct path of the barking. And since kennels are usually made of hard, sound-reflective materials, they create a substantial amount of echoed noise. So what kennel techs face every day amounts to multiple sources of direct noise and an unbearable—and potentially ear-damaging—level of reverberation.

For direct, internal kennel noise, there are three solutions: sound blocking, reverberation control, and animal excitation control. Sound blocking refers to a physical, solid barrier between kennel staff and the dogs. Plexiglas, Lexan, or safety glass panels over most of each cage door will reduce the decibel level of the barking for kennel staff, and will cause each dog to hear the noises of other dogs less. But the use of such products must be combined with an appropriate ventilation system that provides for direct exhaust from the dog cage.

Acoustic treatments for direct kennel noise are generally limited to ceiling and wall materials. To avoid contact with urine and damage from excessive contact with chemical cleaners, acoustic treatments must be washable and should be located five feet or more above the floor. (Unfortunately, this limits their effectiveness because most of the noise sources are below that level.)

Generally speaking, massive materials such as concrete absorb low frequencies, such as the booming bark of St. Bernards, and light porous materials absorb higher Chihuahua squeaks. Thicker materials and trapped air spaces make better absorbers. Acoustic products, even acoustic concrete, should never be painted, sealed, or otherwise altered. Practically any finish will diminish the product's noise-reducing qualities.

Preventing Leakage

Noise from the kennels frequently leaks into other areas of the shelter, and that's a problem that's definitely best solved in the design phase—one poor decision can easily undo all the positive noise control elements, and such problems are expensive to fix later.

Some general guidelines: Animal care facilities should be designed with transitional areas from the loudest locations in the rear to the quietest in the front. General kenneling should be in the back; bathing, grooming, training, and holding areas are best located in the middle; and veterinary facilities, quarantine areas, catteries, and reception areas should be in the front.

Whenever possible, the areas where humans sit and work should be separated from the areas where the animals reside—for the sake of all species involved. Just as the barking can be stressful for staff, the proximity of machine sounds can be stressful for dogs. For example, offices shouldn't be near holding areas: Dogs can hear computer monitors and video displays, which resonate at a frequency beyond our hearing, and this alone can start some dogs barking.

In the design phase, avoid wall penetrations. High-pressure wash lines, watering systems, and drainage systems should run under the floor. Avoid windows and doors in the kennel area—but if windows must be included, they should be non-openable with large (three- to six-inch) air gaps between the fixed, gasketed panes.

The front portion of the animal care facility should be separated from the kennel by an acoustic wall and an intervening hallway. The exterior doors from the kennel should be acoustically sealed, and the doors from the front of the building through the hall to the kennels should include a double set of doors. These design elements also provide excellent airborne pathogen control in properly pressurized facilities.

One of the most common failures in noise control is poorly designed mechanical systems. Don't allow your mechanical system to be a "design/build" in which the contractor takes responsibility for the design—instead, use an experienced animal care engineering firm. Kennel mechanical zones must be isolated and non-communicating with other areas. (This is critical for disease control as well). All mechanical duct systems should be low-velocity, insulated systems and should include 360 degrees of turn between different rooms.

Duct lining is one of the best means for the control of noise both generated by and transferred through mechanical systems, but it's also very prone to collect fur, bacteria, and fungi. Since it's difficult to clean, duct liner is not a good choice for most locations in shelters. One final consideration is mechanical noise, such as the low vibration of a rooftop air conditioning unit. Any large mechanical equipment should be located away from veterinary exam rooms, offices, and cat housing.

Construction elements are as important to internal noise control as design. For example, mass reduces noise, but it's only part of the noise control solution. The effectiveness of wall mass on noise control is highly dependent on the frequencies that require control. Since kennel noise is made up of a wide range of frequencies, sealed walls, dead air spaces, and insulation are as important as mass.

Properly constructed acoustic walls must be built and sealed from the floor to the roof. Any ductwork or other penetrations must be thoroughly caulked and sealed from both sides. One door or window can destroy the acoustic value of a wall. Construction must be impeccable, with sealing of all joints, tight seams, and no spaces or gaps. Imagine the room as a vessel of water: If it can leak fluid, it can leak sound. ■

Do they hear what you hear?

They hear even more, but good acoustic design can help.