SOUND OF WORSHIP SOUND ADVICE FOR TODAY'S HOUSE OF WORSHIP

WINTER 2007

Advanced Technologies
P.O. Box 1793 • Sulphur, LA 70664
www.advancedav.biz

PRSRT STD
U.S. POSTAGE
PAID
HUISINGA & OLSEN

Attention Secretary,
PLEASE ROUTE TO:

- ❑ Sound Operator
- ❑ Pastor
- ❑ Music Minister
- ❑ Other_______________
- ❑ Save for the Sound Operator Manual

A newsletter for anyone who wants to learn about sound!

SOUND OF WORSHIP

SOUND ADVICE FOR TODAY'S HOUSE OF WORSHIP / WINTER 2007

In This Issue

For More Information

Phone:
(337) 527-1001
(337) 513-9646

Website:
www.advancedav.biz

Email:
aavtinfo@yahoo.com

Advanced Technologies
A Quality Audio/Video Experience
P.O. Box 1793 • Sulphur, LA 70664
(337) 527-1001 • www.advancedav.biz

What is a Decibel...

The human ear is capable of identifying a wide range of sounds. The amount of sound pressure in the air the ear recognizes as being barely audible (sometimes called the threshold of hearing) has been determined to be .0002 microbars. The microbar is a unit of measure of sound pressure just as the inch is a unit of measure of length. This small amount of pressure causes the ear membrane to move less than the diameter of a single atom! The loudest sound that just begins to create a sensation of pain (the threshold of pain) represents a sound pressure that is 3,162,300 times more pressure than the threshold of hearing! These are two limits of our range of hearing. It is obvious that if we used absolute values of sound pressure to describe how loud sounds were, the numbers would be very cumbersome. In addition, it would be difficult to comprehend such a concept of comparison, not unlike trying to compare the length of a football field to the length of a mosquito wing using the inch as the unit of measure.

Early acousticians devised a simple method of comparing two sounds. A sound that was perceived to be twice as loud as another sound was said to be one Bel greater in sound level. The Bel was used as a unit of **comparison**, not a unit of measure. Its namesake was Alexander Graham Bell, a pioneer in the science of audiology (the study of human hearing).

It soon became apparent that this unit of comparison was not very accurate in describing the difference between two sounds very similar in level. A smaller unit of comparison, the decibel, was established. One decibel is defined as being equal to one-tenth of a Bel. The prefix "deci-" is a French derivative that means "one-tenth," as in decimal, etc. Since a decibel is one-tenth of a Bel, then 10 decibels would equal one Bel. In other words, a sound that is twice as loud as another sound could be described as being 10 decibels (or 10 dB) louder. Three decibels (or 3 dB) represents the smallest change in sound level that most human ears can perceive.

Continued on page 2

Continued from page 1

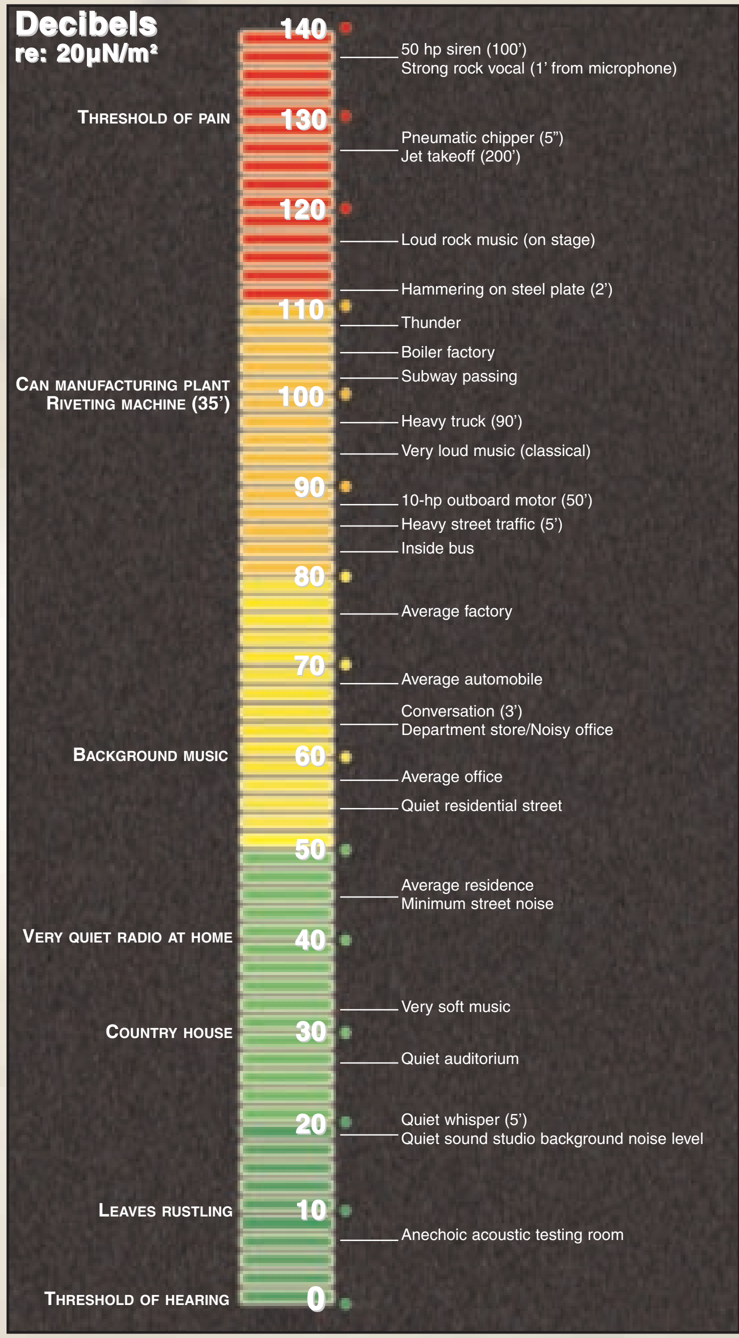

Figure 1 Relative loudness levels of common sounds

Take a look at Figure 1. This chart shows several common sounds and their **relative** sound pressure level (SPL). Even though the threshold of hearing is defined as 0 dB-SPL, this does not mean that no sound exists. Remember that the dB (decibel) is a unit of comparison, not a unit of measure. For example, leaves rustling have a relative value of 10 dB-SPL. That means the sound of leaves rustling is 10 dB louder than the threshold of hearing (0 dB-SPL), or twice as loud.

The sound pressure levels at your church can be measured with an SPL meter. Radio Shack has a very inexpensive model at under $50. Better meters are also available from Galaxy Audio in their Checkmate line.

An SPL meter can help provide more consistent audio levels between sound technicians. Please call us if you have more questions.

Travis Ludwig

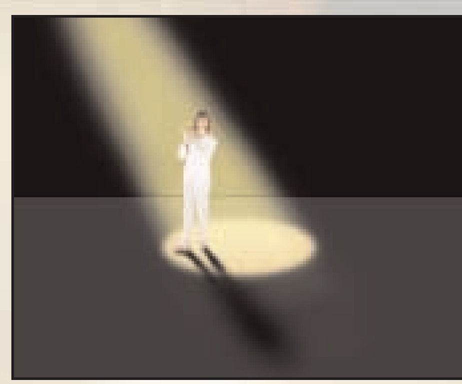

Figure 2 Spotlight

Figure 3 Floodlight

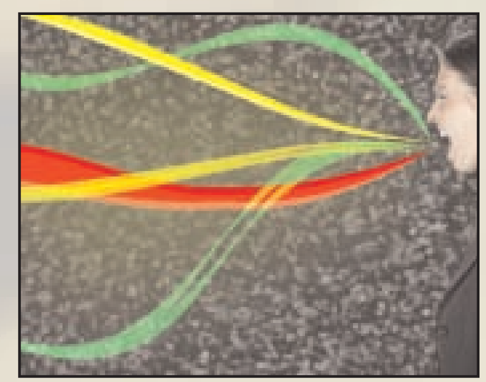

Figure 4 The sound coming from the mouth radiates in many directions

Figure 5 The sound coming from the megaphone is concentrated

TECH TALK

DIRECTIVITY

The formal definition of directivity requires a mathematical discussion in theoretical acoustics. For our purposes, we will discuss directivity by a simple analogy. Most of us have seen a theatrical production, either as an actor or spectator. And as such, we are familiar with the visual effect of spotlights and floodlights (Figures 2 and 3 on page 2).

Floodlights are used for a "wash" of lighting covering a large area. Spotlights are used for selective lighting in order to highlight certain characters or set locations. Generally speaking, spotlights have a higher **directivity** than floodlights. Spotlights concentrate the available light energy into a smaller area.

Directivity, as it relates to acoustics and the technology of sound systems, is very similar in concept. Someone using a megaphone is much more successful in talking to a group of people at a distance. (Figures 4 and 5 on page 2). Using a megaphone effectively concentrates the available sound energy into a smaller area. This can be described as a ratio. The directivity ratio is the amount of energy that radiates in a certain direction as compared to the same amount of energy if it were to radiate in all directions.

Directivity is a characteristic that is usually associated with sound sources such as loudspeaker systems. In most specification sheets, directivity is listed as the "Q" of the loudspeaker. The sound system designer can use the measured Q or directivity of the loudspeaker in the sound system design. Knowledge of the room's acoustics and the directivity of the loudspeaker will help the designer. They can predict how well the system will work in that particular room. As the size or the reverberation time of the room increases, the requirement for a higher directivity system also increases.

One aspect of directivity will separate a well-designed loudspeaker system from a poor system. Directivity is frequency-dependent. That is, directivity of a loudspeaker or system will vary from one pitch or frequency to another. A poorly designed system may sound fine if the listener is directly in front of the loudspeaker system. However, it may sound dull or unnatural if the listener is to the side of the loudspeaker system (Figure 6). A well-designed system, often referred to as a **constant directivity system,** will maintain a fairly uniform directivity regardless of frequency. This is important, especially within the speech frequency range. The loudspeaker designer's goal is to provide a loudspeaker that sounds the same within the coverage pattern of that loudspeaker. Then the system designer can take that loudspeaker and engineer a system that will produce consistent sound no matter where you sit.

Travis Ludwig

Figure 6 A loudspeaker will sound quite different as you change your listening position