

Acoustics in Houses of Worship

Application Note 0602

- 1) Introduction: Houses of worship have several acoustic requirements:
 - a. Optimum spoken word clarity
 - b. Natural ambience for group singing
 - c. Low background noise
 - d. High quality sound reinforcement

MSR offers several solutions for the above criteria

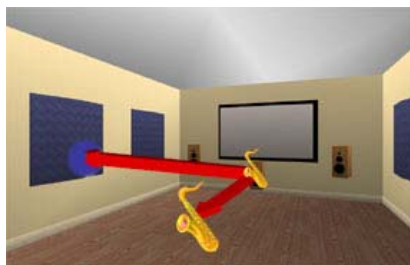
- 2) Speech clarity: Several items affect speech clarity. These include speaker and microphone quality; sound system design, installation, and calibration; and sound reflections, echoes, and reverberation. The latter group is very often ignored until much too late in the process of sound system installations, and will usually result in reduced sound clarity.

A room with hard surfaces will reflect sound, much like a mirror will reflect light. Some sound reflection is good for a sense of presence but too much of it reduces clarity, and is fatiguing. Typical assembly rooms will have between 3 and 6 seconds of sound decay time, as the sound waves bounce around the hard surfaces in the space. This is much too long for clarity and comfort. A good target time would be 1 second.

Sound reflections and echoes should be reduced and controlled. Absorption and scattering are two strategies for reducing echoes and reflections. In either case the solutions consist of surface treatments applied to the walls.



Sounds reflect of walls



Absorption removes reflections



Scattering breaks up reflections

Figure 1: Treatments to reduce sound reflections: Absorption and Scattering.

Typical treatment coverage ratios should be between 20 and 30 percent of the wall surfaces, depending on the room's size, shape, and existing conditions. Treatments are available from MSR in a wide variety of forms, sizes and colors.



Figure 2: Sound absorbing panels and example installation

- 3) Natural ambience for group singing: For members of a congregation to enjoy signing together it is important for the room to enhance the sonic ambience of the group. This requirement can lead to a conflict with the needs for speech clarity, since ambience is created through lengthy reverberation times. However, judicious use of sound scattering treatments can bridge the gap between the two needs. Scattering units have several forms and sizes:



Figure 3: Sound scattering panels and example installation

- 4) Noise control: There are several sources of noise in a room. The most typical is the heating, cooling, and ventilation system. The mechanical noise generated by the air handlers units can be reduced by using suspension systems.



Figure 2: Air handler suspension system

The noise generated by the fans and the air rushing through ducts can be reduced by the use of duct silencers. Silencers can also reduce the sound bleed-through between rooms on a joined HVAC system.



Figure 3: An inline duct silencer

Silencers can easily be retrofitted to the ducting system.

MSR has several models of suspension and silencer systems available to fit your needs

- 5) High quality sound reinforcement: MSR can assist in the design and tuning of high quality sound systems. Its sister company, Performance Media Industries (PMI) has years of experience in the engineering and calibration of AV systems. PMI can be contracted to consult on any aspect of a system in order to maximize its potential.