

Acoustics for Liturgy

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Sound is a fundamental element of Catholic liturgy. The sounds that are produced and heard during the Mass and other rites and celebrations are vital ingredients of the worship experience and can have a strong influence on the full, conscious, and active participation of the gathered faith community. The most familiar sounds in a liturgical setting include speech and music, of course. But acoustics for liturgy also involves other subtle and less obvious aspects of sound, some desirable, and others not desirable, such as silence and noise.

Here, paragraph 222 of the United States Bishops' Document, *Built of Living Stones*, is instructive: "*Silence is the ground of all prayer. From contemplative silence emerge the sung and spoken prayer of the entire assembly and the prayers and proclamations of the various ministers. Liturgical celebrations call for the clear transmission of the sung and spoken responses of the liturgical assembly, as well as of the words of the individual ministers such as the priest celebrant, the deacon, the readers, and the cantor and leader of song. In addition, the space should provide an environment for instrumental music that supports the assembly's song and worship.*"

Acoustics, a branch of physics and engineering, is the science of sound; architectural acoustics is a specialized branch of acoustics, wherein acoustical principals are applied to the control of sound within enclosed architectural spaces to optimize the projection and reception of sound. Architectural acoustics is applied to the design of all sorts of buildings and spaces including concert halls, schools, offices, churches, etc., and it is important that the acoustical design be based on the specific events and activities for which a space is to be used. In a Catholic church the acoustical design must be specifically focused on the ways that sound is used in liturgy and supports the liturgical action.

Once again, consider *Built of Living Stones*, no. 222: "*The first consideration in providing quality sound transmission is the acoustic design of the building. The interior surfaces such as the walls, the floor, and the ceiling affect the transmission of sound, as do design features like the ceiling height, the shape and construction of rooms, and the mechanical systems such as heating and cooling units and lighting fixtures. The sound-deadening tiles so vital to noise reduction in gymnasiums and other public buildings will be used rarely in a church and only with professional advice to reduce or eliminate outside noise. Soft surfaces such as carpets, rugs, and large fabric wall hangings absorb sound, while hard surfaces such as stone, tile, glass, and metals reflect it. A combination of sound-absorbing and sound-reflecting surfaces properly applied and used in correct proportion provides the kind of system needed for a worship space.*"

In the design and renovation of Catholic churches, it is advisable and often essential to have a professional in acoustics, an acoustician or acoustical engineer, on the design team: "Acoustical engineers can help parishes design a building capable of the natural transmission of sound; they also can be of great assistance in the renovation of existing

buildings." *Built of Living Stones*, no. 223.

The following is a summary of areas that would ordinarily be included in an acoustician's scope of work for a Catholic church building or renovation project:

1. **Room Acoustics** is the most fundamental aspect of architectural acoustics and involves the response of an architectural space to sound (particularly speech and music) without amplification. Room acoustics involves the shape, dimensions, proportions, surface finishes, etc., of a space. While it is true that all but the smallest Catholic churches will need a sound reinforcement system, that sound system is not used to support the sound of the assembly. It is, therefore, essential that the natural, unamplified sound qualities of the worship environment support the voice of the assembly.

2. **Music Space Planning** involves the design of the area for music ministry. It is most effectively done as an integral part of the architectural design. Ideally this will provide appropriate musical and acoustical conditions for the musicians, enabling them to hear and see each other as well as to project their sound to the assembly for audibility as well as to support and encourage the assembly's participation. At the same time, there are visual and liturgical factors to consider, particularly in configuring the music ministry area to image musicians as both ministers to and members of the assembly.

3. **Sound Isolation** is necessary to prevent unwanted or distracting sounds and noises from being heard within the worship space. These sounds and noises can originate from outside the building, such as traffic noise, or from other rooms within the building, such as from a Gathering Space, rehearsal and meeting rooms, nurseries, and other ancillary spaces. Proper space planning in the early architectural design phases can minimize the potential for noise intrusion and, thereby, minimize potential costs for expensive sound-insulating construction. Effective sound isolation is also necessary for rooms wherein privacy is essential, such as reconciliation rooms.

4. **Mechanical System Noise and Vibration Control** is related to sound isolation in that it provides for the analysis and treatment of mechanical system noise to minimize the intrusion of HVAC equipment and airflow noise. While noise can be disturbing and annoying, there is one aspect of most common noises that is a serious problem in the worship space: the reduction of speech intelligibility. There are nationally standardized noise criteria and well-established methods for calculating HVAC system noise levels during the design phases so that potential noise factors can be identified, diagnosed, and corrected.

5. **Sound Reinforcement Systems** for both speech and music are a virtual necessity in all but the smallest chapels and churches. Since the acoustics of the worship space can have a profound effect on the performance of the

sound system, the acoustical consultant must design the room acoustics and sound system to be completely compatible with the acoustical environment. The priorities of Catholic liturgy advocate the design of lively and reverberant spaces to support and encourage the assembly's participation. The sound reinforcement system must, therefore, be designed to provide excellent speech intelligibility within this reverberant space.

This summary indicates that acoustical design for a Catholic worship space is more complex and multifaceted than is often realized. More importantly it indicates that acoustics is a fundamental design consideration and can be most effectively integrated in the architectural design when done as a part of the early design phases, ideally during programming and schematic design phases. Most of the necessary acoustical design factors above cannot be successfully or cost-effectively incorporated once the architectural design is complete.

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