

S&VC

Sound & video contractor

January 20, 1995

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Liturgy, sound and acoustics: Why a church is not a concert hall

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Many have studied what is meant by good acoustics in concert halls and auditoria, but the same has not happened in churches. We need to consider churches as buildings with special acoustical demands and characteristics. In the act of worship, sound has greater impact than any other factor.

For the Western and European cultures, religious buildings and places of worship usually mean churches. Nearly all existing forms of churches have evolved from the circle, the oblong or the Latin or Greek cross. The design of churches was affected by goals other than the acoustic one, such as the different functions of the church, its traditions and rituals and the search for architectural beauty. The British architect Sir Christopher Wren (1632-1723) wrote, regarding a program for 50 new churches in London, that the average parish church preacher could not expect to be intelligible farther than about 50 feet (15m) to his front, 30 feet (9m) to either side and 20 feet (6m) to his back. Since the late 19th century, some people have been concerned about this subject, and some elementary research studies were undertaken. Many early studies (1870-1930) gave some simple guidelines about acoustics in churches for specific religions, including Methodist,

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Episcopal or Evangelical (Brabham 1928; Patterson 1875).

The interaction and coexistence of music and speech in churches and the different location and type of sound sources involved gives acoustics in churches a particular position in the field of architectural acoustics. "The conventional approach to the design ... of places of worship has been to recognize that both music and speech with their divergent acoustical needs must take place in the room because liturgy involves both" (Sovik 1973, 90). As Mills states, "conditions which are most suitable for preaching are not necessarily good for music; the long reverberation in a lofty Gothic church is unsatisfactory for preaching purposes but is excellent for choral music." (Mills 1956, 61).

Music and speech in churches

Today Roman Catholic churches follow the edicts of the Second Vatican Council (Vatican II), but in the previous 20 centuries, different rules existed. In 1965, Vatican II introduced important alterations in the liturgy and worship services that can have strong implications on the acoustical environment in which they are performed. The edicts stated that sermons should be presented in the vernacular to congregations, and music that people can sing should occur in the service. These changes imply a

new need for suitable acoustical conditions in the churches.

This was not the first time in the long history of the Catholic church that the speech and music of the liturgy underwent noteworthy transformations; it may not have been the most important one. Until the 4th century, the official language of the church was Greek. From the 4th century until the Vatican II, Latin was its official language. Throughout most of the history of the Catholic church there was not an emphasis on understanding what was said during services. Therefore, suitable acoustical conditions were not needed for that task.

There were even more changes in the music included in worship services over time. Music was very important at the birth of Christianity. St. Paul wrote: "Speak to yourselves in psalms and hymns and spiritual songs, sing and make melody in your heart to the Lord" (Ephesians 5:19). It followed the tradition of life and worship in Israel where music was central: "Let us sing unto the Lord; let us make a joyful noise to the rock of our salvation ... sing unto the Lord a new song" (Psalms 95:1, 96:1). The Bible mentions the use of trumpets, cymbals and other instruments.

Then, in the 4th century, the nature of music in the church was changed by a ban against the liturgical use of instru-

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ments in services. St. Jerome (340-420) condemned all musical instruments. Vocal music was still allowed, although in the absence of written notation, it remained simply monophonic. With the years, the assembly's voice was muted, and Catholics began to ritualize without congregational music. Experts took over the song of the faithful. The assembled church changed from groups of performers to a multitude of listeners.

Gregorian chant rose in the 6th-7th centuries; this monophonic music with a single melodic line was used to accompany the text of the mass and the canonical hours. The first organ was installed in a church in A.D. 757 in France. A few centuries later, the song of the church was transformed by the development of polyphonic music. It was the time for the motet and mass to appear in church music. With more melodic lines, different voices are heard as separate entities, and many complained about difficulty understanding the sacred texts.

The Protestant Reformation in the early 1500s deeply shook the Catholic church. In the 1530s, the Jesuits instituted year-round preaching instead of preaching only at Lent. Church music was composed to inspire religious contemplation. Pews and balconies were introduced into church buildings, and the reverberation time of new churches was decreased to provide more clarity. Professionals took over the performance of church music. New musical forms such as operas and oratorios appeared.

Twentieth-century and future requirements

Today there are a large number of churches, built in the last 16 centuries and erected under different times and circumstances, that must again meet new requirements. These buildings will also face new and unknown requirements in the future. There is a general consensus as to what the acoustical qualities of a church should be. With the new rules specified by Vatican II, several acoustical characteristics of many existing churches are now inadequate. A church must provide acoustical properties to support both intelligible speech and adequate reverberance for music. These have almost opposite necessities for reverberation and other acoustical properties. As Kuttruff says, "When listening to speech, we are interested in perceiving each element of the sound signal ... When listening to music it would be rather disturbing to hear every detail including the bowing noise of the string instruments or the airflow

noise of flutes ... These and similar imperfections are hidden or masked by reverberation" (Kuttruff 1991, 95).

Vatican II demanded that the assembly must sing. This is a habit that was lost, buried under centuries of muted assemblies. As Day says, "Today a large number of Roman Catholics in the United States who go to church regularly ... rarely or barely sing any of the music" (Day 1980, 181). The congregations are now culturally incapable of singing. The acoustical quali-

ties of the church can help in this matter: "Reverberance can also help the congregation avoid the feeling of singing alone during hymns or sung responses or speaking alone during prayer or responsive readings" (Egan 1988, 119). To achieve this goal of congregation participation: "Let the assembly hear its own voice, not the voice of an ego behind a microphone. Restrain the amplification. That sound of a cantor's voice sailing above the sound of the congregation and organ is