

Highly Intelligible Sound System Standard

We all know that the three measures of sound quality are fidelity, intelligibility and loudness – but what are the true measures of those measures? After all, we've often talked about the subjective nature of good sound – so as you consider improving, replacing or rebuilding your church's sound system, what standards can you apply?



Joseph De Buglio

Here, we tap the expertise of Joseph De Buglio, author and audio consultant who has evaluated over 500 churches in North America. Discovering that less than 4% of them were pleased with their sound, he developed The Highly Intelligible Sound System Standard – or HIS System – for achievable standard setting in any house of worship.

Here's his take on the subject:

Sad Story

Since the mid-60s, churches have been sold all kinds of sound systems - some so bad that the sound is better with the system turned off. There are over 300,000 church sound systems in North America. Except for a small percentage – maybe 10% – all the other churches have sound systems that were "designed with good intentions."

These are systems that were designed without any standard or design goals. Churches are still putting in poorly designed sound systems that just make noise and fail to meet the hearing needs of the listener in church. Without a minimum standard, a church can't tell if it has a good system that can be built upon over a period of time or if it was sold another bad sound system that lowers intelligibility when it is being used.

Taking it to the Streets

Joe decided to perform some primary research by following the design experience of a number of professional sound experts, testing their sound systems, and charting the results. He tested over 200 sound systems designed by other professional church audio and acoustical experts. He had designed or installed 300 systems of his own as a consultant or contractor. After about 30 systems, he began started to see a pattern. Then he tested more churches. – about 500 altogether.

The Gospel According to Joe

A clear pattern emerged - for both the sound system and the acoustics of the church and the development of Joe's "The Highly Intelligible Sound System Standard" or The HIS System Standard. He believes it is possible to have a church sound standard based on clear design goals that can be applied to just about any church – yours included. Since these standards are goal or performance oriented, they're universal. With a slight adjustment, you can have

Genesis: The Four Stages of Church Sound Systems

1. The average church buys four sound systems. The lowest bidder often installs the first sound system when a church is built.
2. The second system is often installed by the local "expert", often a sincere, hard working and a well-meaning church member who is an audio hobbyist or works at a local music or electronics store.
3. The third sound system is often designed, engineered and installed by a professional audio company who does all types of sound systems, earning the title of "audio expert".
4. The fourth and final system is the system that becomes the permanent system. This system will last the lifetime of the church building and will have equipment upgrades as equipment fails due to age, wear and tear or as the ministry expands.
5. These final systems are designed and installed by the few who have a true understanding of the peculiar audio and acoustical needs of a church. These people go to great lengths to educate the members of the church before a proposal is even submitted.

a standard for any of the three basic styles of worship - traditional, contemporary and charismatic.

For the People

Having and meeting a standard lets the whole church community know how good church sound systems should be. "Most churches believe that it is reasonable to expect a minimum of 90% intelligibility and nothing less — the average comfort level for an audience. At 88%, people start complaining loudly. At 90%, the complaints drop dramatically." A standard will lead you to the right series of solutions.

Goals

The HIS System Standard is based on these goals:

1. Each standard must be applicable to over 90% of the churches within the church community.
2. The system should be built for expansion and future growth.
3. The system should have all the basic features required for the most common church events - from worship to weddings, to funerals to concerts to drama.
4. It must use a low-noise combination of equipment.
5. It must be affordable, with an entry-level target cost of \$35.00 to \$45.00 per seat installed - from the main speaker system to the mixer and wiring to the stage.
6. It must satisfy people with average hearing and benefit those with hearing aids. It is understood that a hearing assist system is needed for those whom you have to raise your voice to in normal conversation.
7. The system must be easy to operate.
8. The system must have enough gain so that a person can stand in a comfortable position with a fixed microphone on a stand.
9. The system must function within generally accept guidelines of coverage, intelligibility and performance standards.



Acoustical Considerations

Oh yes, there is an essential acoustical component. You can't avoid dealing with the acoustics of a space. Audio system cannot defeat the laws of physics. Here are the necessary acoustical conditions:

1. The room has to be free of echoes.
2. The room has to be free of flutter echoes.
3. The RT60* should not exceed - on average 2.2 seconds.
4. The RT60 should not be less than 1.3 seconds.
5. There should be no standing waves from any angle. That is from side to side, front to back and floor to ceiling.
6. The NC (noise criteria) of the room should be below 35dB.
7. The room should have an average signal to noise ratio of 25dB.

Failure to reach these acoustical conditions will limit the performance of the sound system in proportion to how serious the acoustical problems are.

* RT60 is an acoustical measurement used to calculate reverb time decay. In simple terms, it is the measurement of the time it takes a signal to fall -60db.

Quick Overview of THE HIS System

We've taken some liberties condensing acoustician De Buglio's "15 Basic Minimum Standards" for church audio to fit Shure Notes' format. Here are some of the highlights:

1. Average working distance from a regular dynamic microphone (for instance, a Shure SM58) before feedback - 18 inches. (In a room with NC 35 or lower)
2. Maximum working distance from a regular dynamic microphone before feedback - 30 inches (In a room with NC 35 or lower)
3. Average sound pressure coverage within the seating area +/- 3dB.
4. Intelligibility score +/- 2% of 92% in all seats with either oral

"I recommend Shure mics all the time - most often, SM58 and 87's. Whenever I do a proof of performance, I use the '58. I also find that when I do a quick EQ with the feedback method, I get a better overall setting that does not favor any other type of mic regardless of the make or model."

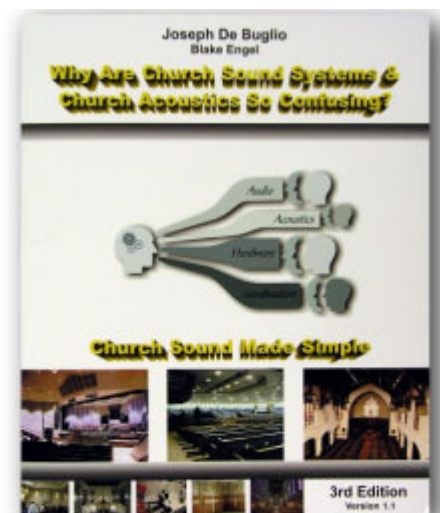
speech testing, STI or RASTI equivalent. (A computer should be used for this or you can use the oral speech test.)

5. With eyes closed, turn your head to the source of the amplified sound. When you open your eyes, you should be looking in the direction of the sound source from any location within the sanctuary.
6. At 18 inches from the mic, have enough sound pressure level (SPL) to be around 25dB above the room noise or to have an average SPL of 66dB in all of the seating. (The NC of the church has to be below 40dB flat to reach this goal)
7. System does not increase the reverberation time of the room.
8. System does not degrade the performance of the organ or compete with congregational singing when a microphone is left on.
9. Sound operator can change the controls quickly without anyone in the audience noticing.
10. System that is stable with 3 mics open and miking at 12 to 16 inches without feedback.
11. System will not introduce a signal or noise when using the maximum mic gain for a single open microphone.
12. System will not introduce a signal or noise when using 4 mic open and miking at 12 to 16 inches without feedback.
13. Have enough SPL in the sound system (without distortion) so that a person can be heard clearly when speaking to the audience during congregational singing.
14. Design the speaker system as a "point source " system (speaker front and center ahead of a central pulpit) and modified accordingly as the architecture permits of a sanctuary for the highest level of speech intelligibility and best coverage. The speaker system should always attract you to the main position a minister normally speaks from. It is important for the sound system to mimic natural communication where we look at what we hear during the spoken portion of any worship service. When this is not possible, get help.
15. All microphone lines should be balanced type II (two conductors, a ground wire and tin foil shield) using a 3 pin connector. All lines should be wired - Pin 1 ground, Pin 2 hot signal or positive signal (Red or White wire), Pin 3 cold or negative signal (Black). It is common for people to use unbalanced lines around the mixer, but those are line level signals. For mic level signals over distance, they must be balanced.
16. All microphone lines run continuous from the platform to the mixer position without any breaks. (DO NOT use multi pair cable or snakes that are not individually jacketed.)

You Can Do It

If your church is changing its current sound system or is building a new church, consider this standard or check with your denomination to see if this standard meets your needs. If it doesn't, write one that does. Then design your church sound system or sanctuary to meet it. And make the goal conditional in your purchase contract.

Meeting the HIS System Standard is not hard to do. It is simple enough that any church and any competent audio contractor can meet it. A minimum requirement, it was written so that any church can afford it. While there are many church sound experts who can design better systems at a higher price, this standard was also written for church members who want the challenge of installing the sound system themselves.



We are grateful to Joseph De Buglio and jdbsound for allowing Shure Notes for Houses of Worship to adapt his material and share his vision for standard setting in church audio.

You can read all about it in his book, "Why are Church Sound Systems and Acoustics So Confusing?" [available here](#). Or visit his website at www.jdbsound.com