

In Search of the Perfect Room

Physics, it's not just a good idea, it's the Law!



What is the Perfect Room? In this article, we will explore this subject with the goal of helping you -- our customer -- avoid many problems which commonly occur in the construction of worship spaces.

For a room to be "Perfect" one must first understand:

- It all depends on your usage of the room. What is perfect for one use may not be perfect for another use.
- What is considered perfect may change over the life of the space.
- What is considered perfect may even change during a typical service.
- Both Perfect rooms and those less than perfect were designed that way. If we are going to design a room, why not do it right the first time?
- Priorities must be established from the beginning.
- Remember -- the room will determine what can or cannot be done in the space.
- Contrary to some opinions, there are times that the original construction of a room creates problems which cannot be completely corrected. Therefore building a room and then attempting to "fix" it may not be possible.

Key Factors to All "Perfect" Rooms:

- They enhance your ability to communicate your message, be that worship or speech.
- They use the properties of sound to work for you -- not against you.
- Good sight lines are very important. Sight lines over 140 degrees should be avoided.
- Remember the eyes are the window to the soul. If I can't maintain eye contact, then I'm not communicating effectively. This can be greatly enhanced with video imaging.
- Low ambient noise levels should be a priority.
- HVAC systems should generate NC or RC ratings in the 20-25 range. The goal is to move a lot of air slowly, not fast.
- Be aware of outside sources of noise, such as road and air traffic noise -- as well as open foyers, hallways, and ineffective door seals.
- Avoid parallel reflective surfaces spaced 50' or more apart. These surfaces generate slap and flutter echoes.
- Diffusion, which is a redirecting of the energy in random directions, is preferred. This is achieved by ornamental detail, architectural wall design such as saw tooth, splay, or cylindrical designs, and applied materials such as diffusive or absorptive panels.
- Avoid concave surfaces. These focus energy, which in most cases is not desired.
- Fan shaped rooms typically have trouble with radius walls focusing energy back to the platform. This can come from either the front or the back walls.
- Barrel vaulted ceilings can create serious intelligibility problems if the ceiling is not properly placed.
- Avoid excessive amounts of thin layer dry wall (also called gypsum board or sheet rock). This material has a tendency to be diaphragmatic, meaning that it vibrates.
- Walls typically need mass in their construction, so use double layer sheet rock whenever possible.
- Avoid metal studs. These are rarely attached properly and have a tendency to rattle.
- Platform and chancel areas should be solidly built of concrete or wood. If wood is used, make sure bracing is substantial and the decking is doubled up to minimize resonance problems.
- Avoid deep under balcony areas. The depth of the under balcony should not exceed 1.5 to 2 times the ceiling height. Areas larger than this can lead to a feeling of detachment from the rest of the congregation.
- Room volume: If speech emphasis is the primary goal then use 180-300 cubic feet per listener. If the goal is primarily music, use 200-400 cubic feet per listener.

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Acoustical properties of "Perfect" Rooms:

- Use appropriate RT 60 for the application.
- Speech only applications should be around .9 - 1 second measured in the mid octave bands.
- Music - Contemporary music demands a quicker room response. RT 60 in the 1 second range. Traditional music varies from 1.5 up to over two seconds based on style.
- The direct acoustic energy coming from the chancel/platform area is also accompanied by early reflections. The time gap between the direct sound and the reflected sound is called ITG or Initial Time Gap. The first 20 ms are critical to enhancing localization and intimacy.
- After the first 20 ms it is critical to get reflections to the listener's ears out to around 80 - 100 ms. These reflections shape our perception as to the envelopment of the sound. If anything in this time reference as well as later arrivals is heard as being close to the same amplitude level as the direct sound, we hear it as an echo.

New Technologies to help deliver the "Perfect" Rooms:

Many churches are building facilities commonly referred to as multipurpose buildings. These facilities may be used for recreation, fellowship/ social areas, class rooms, and worship centers all in the course of one week; some in the course of one day! Often the design compromises result in a building that does an inferior job of being anything other than a mediocre gym. .

Please note: these are not really multipurpose buildings for we have but one purpose for a building in the body of Christ and that is to fulfill the Great Commission! If we are to win this generation to Christ we must dedicate ourselves to excellence in buildings that enable us to more effectively communicate. We will call them variable use facilities.

So, if we are going to have variable use facilities, can we also have acoustical environments that vary with need and application? Yes -- there are two primary ways of doing this.

- One is a physically adjustable room with varying absorption, diffusion, and even room volume elements that allows a variety of acoustic settings. These are primarily common in Europe and very costly to implement.
- The other way is an electro-acoustic system. Recent advances in digital signal processing and acoustic research have brought us products only dreamt of a few years ago. Electronic variable room acoustic systems are a reality and represent an enormous potential for creative use of facilities as well as dramatically enhanced worship.

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Summary:

- Perfect Rooms are a result of proper planning, design, and follow through.
- Proper priority will result in dramatically better designs. If you don't ask for it, don't expect to get it.
- The architectural team wants the project to succeed, however they need your input. Their expertise is not in audio, acoustics or video. Therefore a good communications design assists you and the architect in making your dreams a reality.
- Bring a competent designer in on the project as early as possible. They should design the project with the architect. This delivers a much better product and is less costly in the long run.
- Don't ever be afraid to ask questions. The design team of communication designers and architects are there to serve you, not the other way around.
- Do your homework. Qualify your design team, check out their references and go look at their work.
- Read up on the subject of acoustics. I highly recommend David Egan's book Architectural Acoustics. Also F. Alton Everest has two fine books on the subject.

Our prayer is that the ideas in this article will help you create a listening/viewing environment where the Gospel can be clearly heard and seen -- without any distractions created by problems overlooked in the design of the room.

If you have any questions about any part of this article, please feel free to contact us. One of our Systems Advisors and/or engineers will be happy to assist you.

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