Version 3

ASG
APPLICATION SUPPORT GROUP
EAW

APPLICATION SUPPORT GUIDE

for

Houses of Worship

Metropolitan Baptist Church

SITE ·· *Washington, D.C.*
APPLICATION ·· *Large House of Worship*
DEVICES USED ·· *JF560, LA118, JF60, MX100*
CONSULTANT ·· *All Pro Sound*

EAW
EASTERN ACOUSTIC WORKS

The Laws of Physics / *The Art of Listening*

General Design Criteria for Houses of Worship

For most HOW applications, two criteria play dominant roles in defining sound system design: speech reproduction and aesthetic considerations. These two elements can be combined into the concept of sound system "invisibility." Many people view technology in the worship context as a necessary evil with a tendency to distract and intrude. Some high-tech churches use audio/video support extensively in their services, but these are rare. As a rule, the less noticeable the sound system is, the better.

With virtually no exceptions, natural speech reproduction establishes the success or failure of a sound system design. In HOW applications where the human voice makes up the vast majority program material, this point cannot be overemphasized.

Aesthetic considerations often create the most rigid and difficult obstacles faced by the designer/installers. In addition to sightline issues that play into any venue, HOW managers may insist that loudspeakers be painted to blend-in with the decor. Dealers can special-order EAW loudspeakers in any Pan-Tone™ shade.

The skillful designer must therefore balance speech intelligibility and source localization against aesthetic considerations to achieve the most natural reproduction possible within the context of each particular worship space.

Program Material

The vast majority of HOW sound systems are designed to reinforce one of three types of program material:

Speech only
Speech and low-volume music
Speech and high-volume music

Accurately determining which type of program material the system must support helps the designer/installer specify which loudspeakers should be employed, how many and in what configuration. In this regard, there is no substitute for a site visit which includes observing every type of service the HOW offers. Friday night's service may be very different from the one given on Sunday morning.

General Design Concepts

Two basic design concepts account for the vast majority of HOW sound systems: the central cluster design and the distributed system approach. Implementing the central cluster design in larger spaces sometimes requires the use of additional left and right clusters. Many sound systems ultimately employ a combination of both approaches and the skillful designer/installer must balance the qualities of each approach.

Acoustically, the central cluster's great advantage is its ability to provide directional realism or source localization. Since the sound source is located near the orator's position, the listener perceives the sound reinforcement as coming from the orator. Further, this approach offers a high degree of dispersion control, assuming that the loudspeakers provide the necessary directivity. EAW's Virtual Array and VA4 loudspeakers provide extended bandwidth pattern control in a variety of enclosure sizes and configurations.

In larger spaces using three clusters (L/C/R), speech is reproduced through the center cluster, providing directional realism while music is panned to all three clusters for a more spacious sound quality. Skillful attenuation of the left and right clusters can help maintain source localization.

Economically, fewer loudspeakers can mean a lower bid. On the down-side, central cluster designs can produce unacceptable speech intelligibility in highly reverberant spaces. To overcome this, clusters may need to be larger than aesthetics will allow. EAW has addressed this issue, creating small-format 2- and 3-way loudspeakers that offer wide bandwidth pattern control.

Where a central or L/C/R cluster design is inappropriate, a distributed sound system made up of ceiling or wall mounted loudspeakers can be employed. By putting the loudspeakers closer to the listeners, speech intelligibility from distributed systems can be excellent but this comes at the expense of source localization. EAW systems engineered for distributed use offer high definition, high output nearfield sound reinforcement allowing the total distributed system to reproduce music with exceptional fidelity.

Auxiliary Systems

Balconies, underbalcony areas, overflow rooms, cry rooms, lobbies, fellowship halls, and private chapels not covered by the main reinforcement system will require coverage from auxiliary systems. In areas that will receive partial coverage from the main system, application of properly configured digital delay technology can eliminate multiple arrival times and improve source localization.

Finally, the total sound system may need to provide foldback monitoring to choirs, musicians, and other performers. If conditions permit, a main cluster's off-axis radiation may adequately cover the main platform area. Properly placed wedge-style floor monitors offer optimized coverage for celebrants and musicians. These can be easily reconfigured by the user to meet the needs of each specific service. If aesthetics rule out the use of floor wedges at altars or lecterns, a concealed distributed system can be installed.

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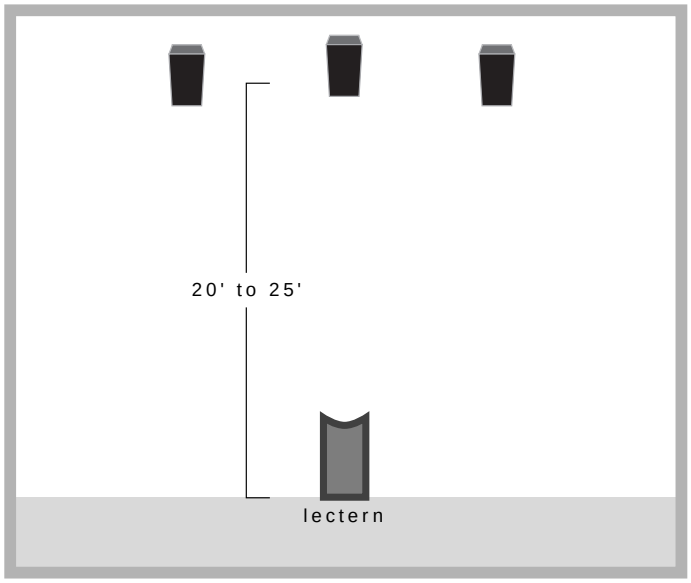
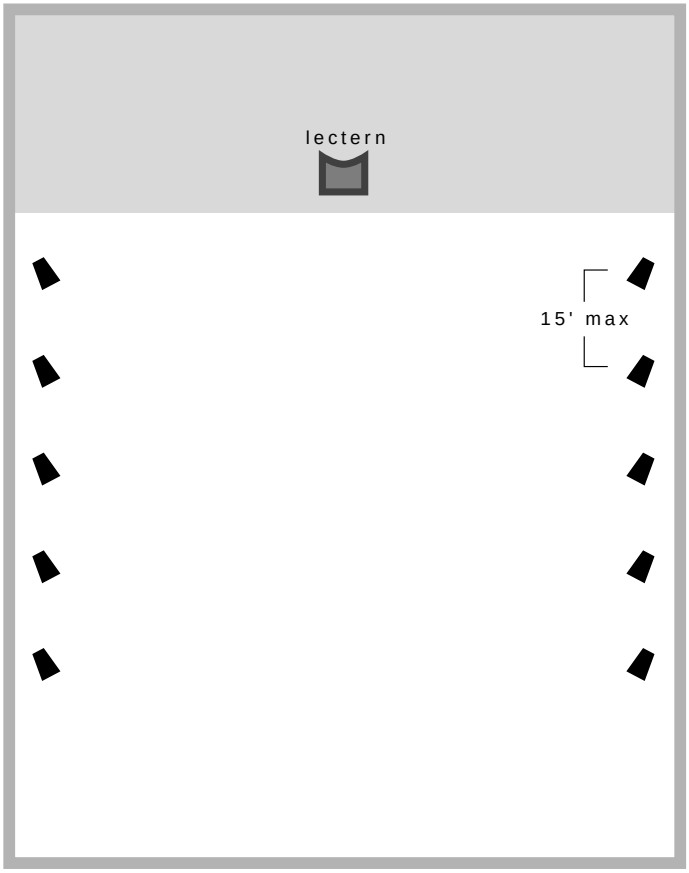
Small Community Church

Generally less than 500 seats and rectangular in shape, its acoustics vary little from example to example. Level demands typically fall well within the capabilities of small- to medium-sized enclosures/clusters.

Small Community Church, elevation



Small Community Church, plan



Most designers favor the central cluster approach for this type of space for its optimized source localization and highly controllable dispersion/coverage. Either two way or three ways designs can be employed depending on the musical needs. Sub-woofers can be placed almost anywhere space permits, due to the non-directional nature of the low frequency information.

Note the high trim height to minimize feedback through the celebrant's microphone.

RECOMMENDED LOUDSPEAKERS:

AS460 or
AS490
  w/AS415 or
  w/AS422
AS660i
AS690i
ASR660
ASR690
ASR665
ASR695
JF100e
JF200e
JF260z
JF290z
JF560z
JF590z
KF300e
KF650e
KF695e
MK2164
MK2194
MK5164
MK5194

Some spaces - those with low ceilings, for example - require the use of distributed sound systems. Properly aimed nearfield loudspeakers should be placed no more than 15 feet apart to ensure complete coverage without "holes" where multiple arrivals obscure speech intelligibility.

RECOMMENDED LOUDSPEAKERS:

DS122e
DS123e
DS153e
JF60
JF80
JF100e
LS432
LS832
MK8196
UB12Se
UB22i
UB80
UB82

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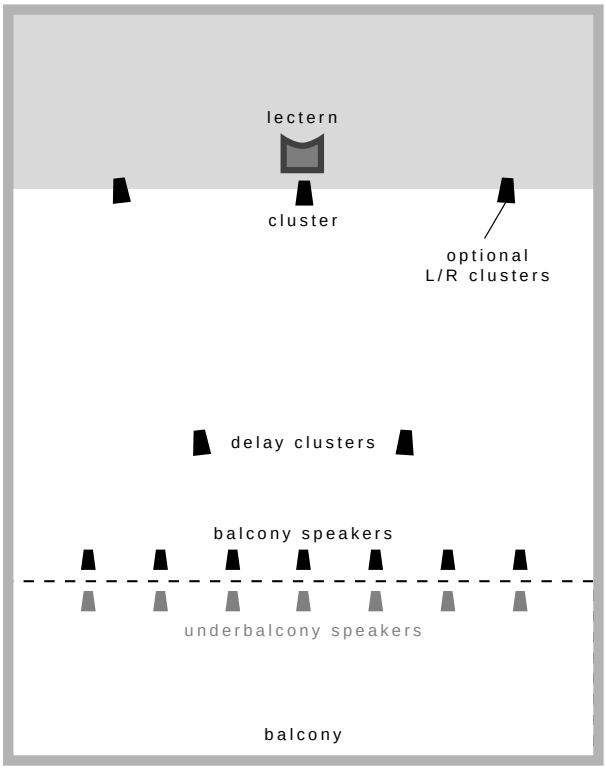
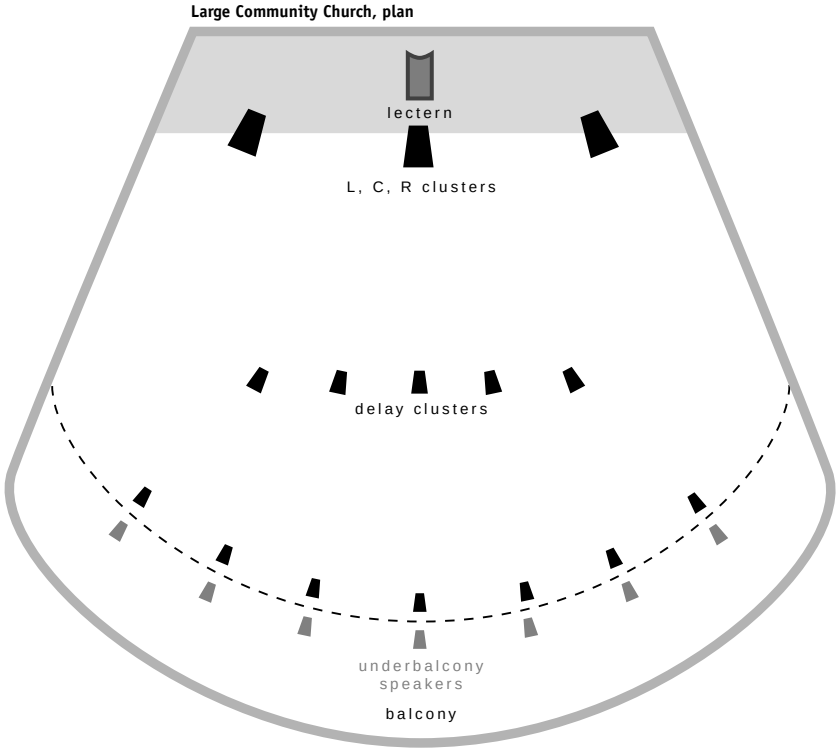
Large Community Church

Typically between 500 and 1000 seats with a substantial variation in room acoustics from example to example. The two most common floor plans for this size church are rectangular and small 'fan' shaped.

Large Community Church, plan



Large Community Church, plan



The single cluster design is almost always employed for the main seating areas in rectangular spaces. Additional left and right cluster may be added according to room size and program material.

If the budget allows it, the L/C/R cluster approach will best serve a fan-shaped room.

In either case, delay clusters may be required, depending on size of the room. Loudspeaker with good midbass pattern control help maximize the direct-to-reflected sound ratio, enhancing speech intelligibility.

RECOMMENDED LOUDSPEAKERS:

AS460 or
AS490
  w/AS415 or
  w/AS422
AS660i
AS690i
ASR660
ASR690
ASR665
ASR695
JF200
JF260z
JF290z
JF560z
JF590z
KF650e
KF850EF
MQ1364 or
MQ1366 or
MQ1394
  w/MQ1312 or
  w/TD412
MK2164
MK2194
MK5164
MK5194
MK8196

In any space with an overhung balcony, distributed sound systems to cover both balcony and underbalcony areas must be installed. Well-designed nearfield loudspeakers should provide even off-axis frequency response (smooth power response) and wide-angled dispersion, especially of HF information.

RECOMMENDED LOUDSPEAKERS:

JF50S
JF60
JF80
MK8196
UB12Se
UB22i
UB42
UB80
UB82

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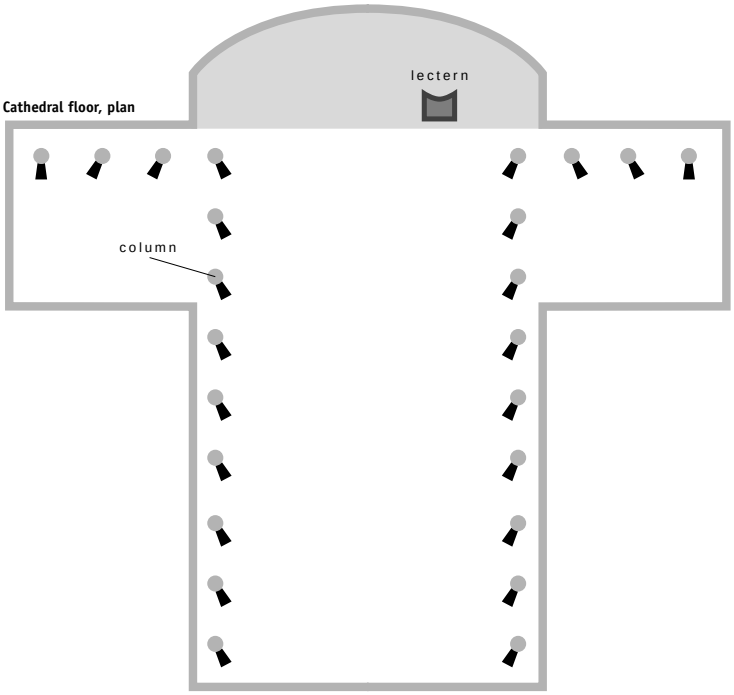
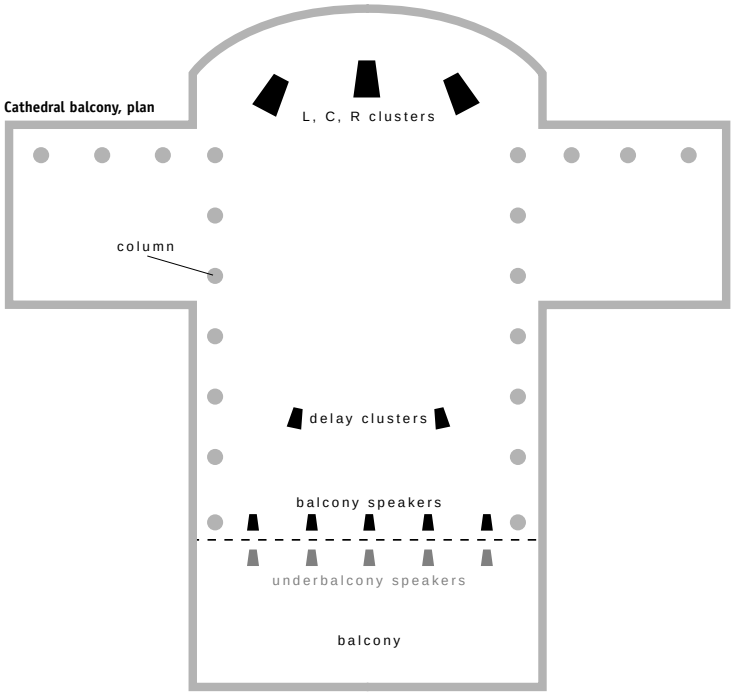
Cathedrals

As many cathedrals are architectural landmarks, aesthetic requirements may limit design options. The floor plan is typically cruciform (rectangular with wings) and may include areas that are difficult to cover. These spaces are generally large and reverberant, with stone often the primary building material. Most audio pros consider Cathedrals one of the most acoustically difficult venue-types they encounter.





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Distributed systems offer excellent chances for success, aesthetically as well as acoustically. Close proximity of listeners to sources maximizes speech intelligibility. Since distributed loudspeakers can be integrated into architectural features, sound system "invisibility" is maximized.

Such a design should permit control of various loudspeaker groups – most particularly at the rear of the space – to accommodate varying audience sizes.

Recommended Loudspeakers:

DS123
DS153
JF60
JF80
JF100e
LS432
LS832
MK8196
UB22i
UB72
UB80
UB82

For an L/C/R cluster approach to work, loudspeakers must provide exceptional low frequency pattern control. To provide speech intelligibility, the clusters may need to be substantial is size.

EAW's VA4 loudspeakers are engineered to provide wideband pattern control and high output in installation-optimized enclosures. MQ Series mid/high systems require the use of MQ or TD Series LF systems. TD Series systems employ Tuned Dipolar Array Technology to control dispersion to 100 Hz (TD415).

Recommended Loudspeakers:

AS460 or
AS490
  w/AS415 or
  w/AS422
AS660i
AS690i
ASR660
ASR690
ASR665
ASR695
KF300e
KF650e
KF750
KF850EF
KF853/BH853
MQ1364 or
MQ1366 or
MQ1394
  w/MQ1312 or
  w/TD412
MQ2364 or
MQ2394
  w/MQ2412 or
  w/TD415

In any space with an overhung balcony, distributed sound systems to cover both balcony and underbalcony areas must be installed. Well-designed nearfield loudspeakers should provide even off-axis frequency response (smooth power response) and wide-angled dispersion, especially of HF information.

Recommended Loudspeakers:

JF50S
JF60
JF80
MK8196
UB12Se
UB22i
UB42
UB80
UB82

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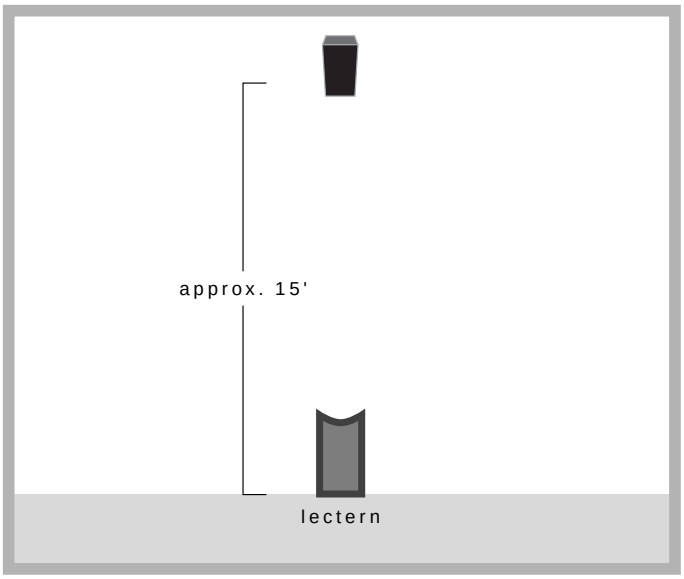
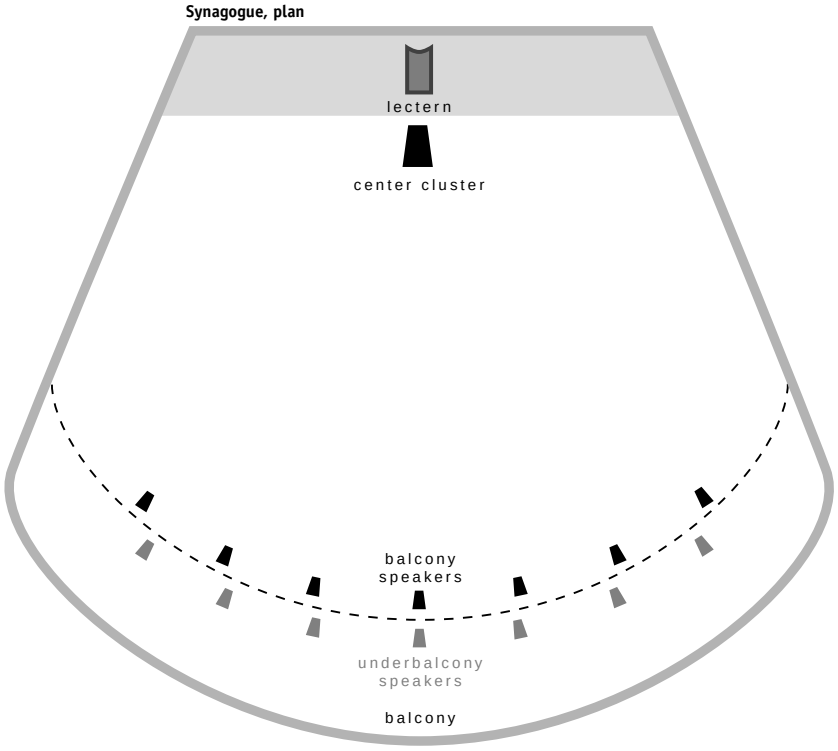
Chapels, Synagogues

Chapel, elevation



Synagogue, plan



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These small – often semi-private – spaces are not usually difficult acoustically. Minimal reinforcement is the norm, with one or two wide dispersion loudspeakers providing coverage. Finding mounting locations often presents the greatest obstacle.

Given the low output levels required, trim height is minimal.

Recommended Loudspeakers:

ASR660
ASR690
ASR665
ASR695
AS460 or
AS490
w/AS415 or
w/AS422
JF60
JF80
JF100e
KF300e
MM60
MM80
MK2164
MK2194
MK5164
MK5194
MK8196
UB22i
UB80
UB82

The typical fan-shaped Community Synagogue offers an acoustically well-behaved space. A central cluster with supplemental balcony/underbalcony coverage should be sufficient.

Recommended Loudspeakers:

ASR660
ASR690
ASR665
ASR695
AS460 or
AS490
w/AS415 or
w/AS422
JF100e
JF200e
MK2164
MK2194
MK5164
MK5194

On the other hand, most Mosques (not pictured) consist of stone surfaces and are rather reverberant. Fortunately, their needs are usually voice-only, so a well designed low level distributed system may be a first choice. If a central cluster is required, it must consist of loudspeakers with exceptional pattern control.

Recommended Loudspeakers:

(distributed)	*(cluster)*	*(cluster)*
DS123	AS460 or	MQ1364 or
DS153	AS490	MQ1366 or
JF60	w/AS415 or	MQ1394
JF80	w/AS422	w/MQ1312 or
JF100e	AS660i	w/TD412
MK8196	AS690i	MQ2364 or
UB22i	ASR660	MQ2394
UB72	ASR690	w/MQ2412 or
UB80	ASR665	w/TD415
UB82	ASR695	

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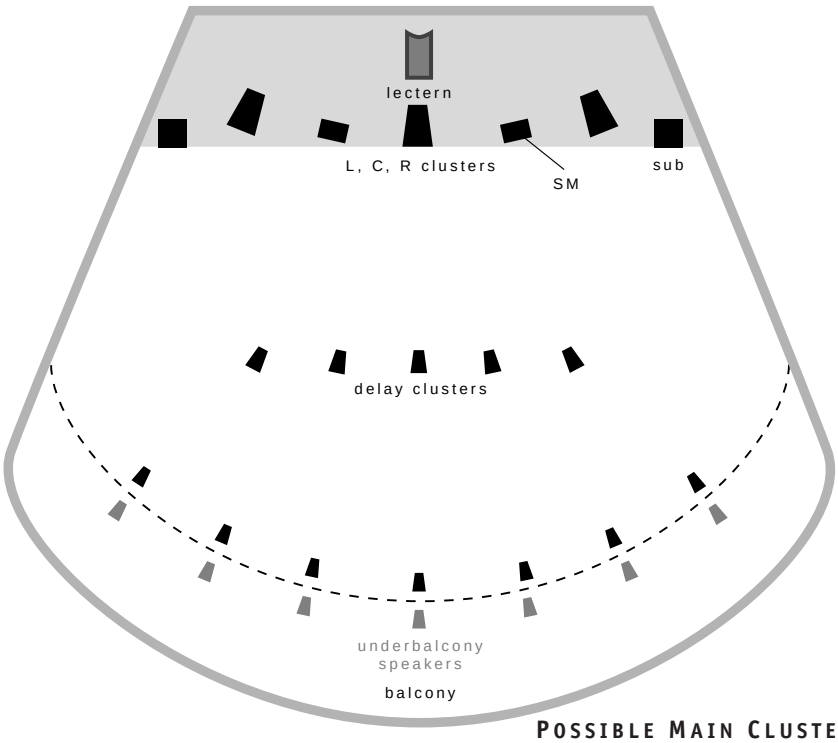
Large Evangelical Churches

Large Evangelical Church, plan



Large Evangelical Churches (2000-10,000 seat) – often the home of a television ministry – have more in common with performing arts spaces than with other Houses of Worship.

High energy music (performed live) may play an important role in the service. In fact, the production values of these services may be as high as those for Broadway shows, so the sound system designer must consider musical presentation to be as important as speech.

Three approaches to the main reinforcement system can be considered: central cluster, left/right clusters and left/center/right clusters.

In addition to high-volume main channel reinforcement, such a venue would require foldback monitoring for performers, subwoofers, delay clusters and balcony/underbalcony coverage that will vigorously reinforce this program material.

Possible Main Cluster Configurations:

A-2x MQ2364, 2x MQ1394, 2x TD415
B-2x MQ2364, 2x MQ1394, 1x MQ2412
C-2x KF300e, 1x SB330e, 2x JF200e

Recommended Main/Delay Loudspeakers:

AS460 or
AS490
  w/AS415 or
  w/AS422
AS660i
AS690i
ASR660
ASR690
ASR665
ASR695
KF300e
KF650e
KF695e
KF750
KF850
KF861/KF861
MK2164
MK2194
MK5164
MK5194
MQ1364 or
MQ1366 or
MQ1394
  w/MQ1312 or
  w/TD412
MQ2364 or
MQ2394
  w/MQ2412 or
  w/TD415

Recommended Delay Loudspeakers:

ASR660
ASR690
ASR665
ASR695
JF100e
JF260z
JF290z
JF560z
JF590z
MK2164
MK2194
MK5164
MK5194
MK8196

Recommended Subwoofers:

BH822E
SB250P
SB528P
SB850P
SB1000e

Recommended Balcony/Underbalcony Loudspeakers:

JF50S
JF60
JF80
MK8196
UB22i
UB42
UB80
UB82

Recommended Stage Monitors:

SM122e
SM155e
SM200iH
SM260iV

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