

Big Picture Intent

- Inform others of the Acoustic Task Force's presentation of options and gather feedback
- Stimulate better ideas
- Future-proof our systems
- Make as few mistakes as possible
- Focus (for now) on matters that affect building design and construction
- Plan for deploying in stages as funds become available
- Keep a decision log
 - Documents how and why decisions were reached
 - Provides accountability - with thanks to Milenko Matanovic
- Keep this document up-to-date

Charter

- Solicit congregational input
- Acoustical engineer Gary Cook, Richard Berg and the Aesthetics group will together optimize the sanctuary design for high-quality sound
- Design campus-wide sound, data, lighting and technology systems
- Adhere to QUUF Values
 - Control costs
 - Again, future-proof our systems
 - Provision 'hooks' for future use
 - Again, make as few mistakes as possible
 - Multipurpose facilities including disaster preparedness
 - Accessibility for disabled
 - Make accessible lighting, sound, video, website, technology services for those who need them
 - Volunteer labor
 - Build "green"
 - Buy local

Policy and Direction needed from Steering Committee

- Vision statement for sanctuary acoustics
- Vision statement for disaster preparedness
- Define extent of lighting charter

Intersections

- Aesthetics def. Concerned with beauty
 - Quality of sound - an aesthetic matter
 - Speaker Cluster
 - Projector positioning
 - Suspended microphones
 - Stage lighting
 - Surfaces for wall cavities

Disaster preparedness - parking lot as staging area

Amateur radio, microwave antennas

Building - numerous intersections

Green - control of equipment

ToDo

Get feedback

Get clarifications on policy

Resolve intersections

Write a requirements document

Highlights

Notion of acoustics and sound as aesthetic matters

Future-proofing

Notion of opening up access

Assistive listening

Noise suppression using staggered wall studs

Components

Acoustics

Develop the optimum balance between speech intelligibility and musical performance

Modeling using acoustics software

From conversations with QUUF acoustic engineer Gary Cook, Richard Berg has sufficient acoustic information to determine a suitable shape for the sanctuary.

Based on architectural drawings, use the simulation software to build a 3-D acoustic model of the building.

Assign acoustic absorption profiles for all internal surfaces. Pick the surface selections from hundreds of available materials profiles. Many of these are specific to manufacturer's products.

Once the model is made, add the speaker placements and orientations. The speaker simulations use modeling information provided by manufacturers for their specific hardware.

With the building/speakers system in place, evaluate the acoustic behavior of the space using the simulation software

Evaluation of acoustic behavior

The acoustic behavior can be modeled as sound intensity distribution on surfaces, usually just seating areas are chosen, at several discrete frequency bands. An iterative process follows where the speaker selections and orientations are refined to obtain the most even distribution. These plots are built by the software based on the

3-D interaction of the multiple speakers used and all the modeled surfaces in the space.

Another modeling option is ray tracing. Here sound output is modeled as straight lines without frequency input. The program creates hundreds of rays, like laser beams emanating from a speaker and the path of reflections that the sound takes within the space is displayed for analysis. This form of modeling can be useful for identifying problematic reflection patterns and modifying the shape of the room to deal with them.

An important characteristic of the room that can be modeled is reverberation time. Here the software is used to calculate how long sound introduced to the space remains perceivable. This has direct impact on intelligibility of speech and the perceived richness of music.

Example of speaker cluster: Image:

See allchurchsound.com

Reverberation demonstration from concerthalls.org:

www.kettering.edu—RT60.html

Sound

Goal: facilitate hearing desired sounds and suppress the rest
Assistive listening system for hard of hearing

Use inductive loop broadcast sound directly to hearing aids equipped with telecoil circuits

Provide headsets with telecoil circuits for hearing impaired without hearing aids

Higher quality sound than FM systems, affordable, unobtrusive

Modern hearing aids are equipped with telecoil sensors

Reference: Grace Lutheran Church

Reference: Pure Direct Sound in Bainbridge

Control of sound systems

Sound systems can be controlled from the pulpit as well as the sound room

Non technical people can control the sound systems to the extent that it is practical

Recording distribution point (Sunday service and meeting recordings)

Allocate panel space for USB flash drive distribution points.

USB Flash drive Image:

Position away from, but not too far from gathering points

Determine need for CD vs flash-drive distribution. Tapes will no longer be made once flash drive distribution working

Sound suppression

Diagram shows the proximity of the new sanctuary to San Juan Avenue. Concern is future traffic noise

Sound-proof sanctuary and rooms

Buildings whose walls face street need staggered studs that touch only on one side. We have access to additional soundproofing techniques.

Wall stud image:

Crying room for noisy children or parent education?

See glass window - Image:

Image:

Grace Lutheran designates rows near Crying Room as "Reserved for Parents with Small Children"

Ensure that entrance ways to sanctuary are quiet ie. not gathering places to chat

Two sets of doors?

Sanctuary doors close quietly. Latches also quiet

Detect, and quietly alert presence of turned-on cell-phones at sanctuary doorways

Facilities for choir, piano and musicians

Stage 1

In-the-floor jacks for sound and electricity

Stage 2

Suspend microphones from ceiling. Provide alternate suspension points

Audio Mixer

Provide separate audio channels for minister, choir, musicians, congregation and all public meeting rooms

Use existing mixer in new sanctuary until we need one that can be remotely controlled

Sanctuary chair selection

Ideally, chairs have the same acoustical properties as people so that light and full audiences do not change the acoustical properties of the sanctuary

Microphone and speaker placement

Describe microphone raising and lowering mechanism should we elect to suspend microphones

Sweetspot theory by De Buglio See "A Theory For Better Church Speaker System Installations"

A sanctuary should be designed to have a particular Reverberation Time, or RT60. Churches that worship with a choir and organ require a much longer RT60 than those using guitars and synthesizers, for example. All churches, however, should consider speech a priority, and this need has to be coordinated with the acoustic requirements for worship. Some spaces will host both traditional and contemporary worship, and these can be designed with acoustics that change the RT60 to some degree as well. Every church committee should ask the architect to predict the proposed sanctuary's RT60. If the answer is not given in a numerical value, then that committee and the architect might have no idea what acoustics will be like. Get the "Acoustic Advantage"

"The best sound is built-in sound" By Michael

Jarzabkowski

Admonitions from 52+ *Church Architecture, Church Construction,*

Church Acoustical and Church Sound System Tips by Joseph

De Buglio

Do not put the soundman's mixing desk outside of the seating area of the worship space.

Consider: dispense with the soundman's mixing desk in the sanctuary and instead put microphones (conduit and mounting place for now) in critical sound areas and bring the sound into the sound room.

Manage the mixing board remotely with a laptop to

Do not have an air return system that has a duct less than 20 feet long

Do not put (organ) speakers over the heads of the choir.

Do not accept new walls that are less than 2" x 6" inside the worship space. 2 x 8's are better. Every wall inside a church must be insulated.

If your church is built with steel beams and is boxed in with drywall, Please make sure the beams are insulated to keep them from ringing and insulate the drywall to keep the cavity from becoming a drum.

Air returns should be twice the size of the supply lines.

Do not drywall with less than 5/8th on 12 inch centers.

Do not drywall without adding insulation that is compressed at least 20%.

Lighting

Non technical people can control the lighting systems to the extent that it is practical

Use natural light wherever possible
Design exterior lighting for safety and security
Stage lighting
Room lighting
Lighting controls should be in the sound room, and some of the controls should be available at the pulpit
The minimum foot candles should be 60 foot candles for the seating areas and 140 foot candles for the stage area. *52 Tips*
De Buglio

Buildings

Conduit

What does conduit look like? Image:
Our principal future-proofing asset
Building ring (future fibre optics)
Equipment closet in each building where fibre optic conduit terminates
Satellite (built-in and invisible)
Point-to-point wireless (built-in and invisible) Image:
Inter-building for redundancy
Off-campus

Sound room requirements

Room is quiet - no noisy equipment
Room is not used for other purposes
Room access is restricted
Room's functions accessible remotely in the future
100 square feet floor space
Window with view of stage area
Window positioned and sized so that stage area is visible to two people seated behind a table.
Window has a sliding glass pane
No equipment visible through window when viewed from stage
Walk-around space needed for standard two post 6', 19" equipment rack

Allocate space for two equipment rack-mounts 47" wide with at least 41" to wall behind rack and open to the room in front. Total front-to-back distance 57"

Window for mounting for video camera inside sound room

Computer room requirements

Room may contain noisy, heat generating equipment
Room is not used for other purposes
80 square feet floor space
Termination point for data-cable conduits
Shares wall with sound room such that data and power cables accessible to either room

Temperature control needed

Duct filtered cool air from crawl space under church and duct warm air to attic or roof
Alternately provision space and power for conventional air conditioning

Noise from computer room should not be audible in sound room

Room access is restricted

Walk-around space needed for standard two post 6', 19" equipment rack

Define power budget

Determine location of sound and computer rooms

Technology

Remote access

Enable remote attendance for conference room meetings
Provide remote and campus audio and video access to sanctuary

On campus

Off campus

Provide campus intercom

Conduit

Again, conduit and 'cavities' are our most effective tools for future-proofing our systems. ('Cavities' are spaces at the ends of conduits that are accessible through the wall.)

Audio, video, alarm, environmental control, wireless access, radio, low-voltage lighting, telephone and data will be less expensive to maintain if their cabling is routed in conduit. Investigate whether to recommend that electrical power be routed in conduit.

Cabling

Use Ethernet cables instead of conventional phone cabling to facilitate future migration to IP digital telephones.

Campus

Provide an empty conduit "ring" and cavities around the campus for a future fiber-optic backbone ring.

Extend conduit to parking lot for disaster preparedness

Use parking lot for disaster staging area

Security

Building access control

Provide for future automated doorway access control

Burglary sensors, alarm and reporting system

Fire alert and reporting system

Internet

Multiple providers with differing fiber-optic paths off the Peninsula

Protected network

Ubiquitous and safe access

Website

Future proof so that our needs unlikely to eclipse the site's capabilities

Accessibility

Meet or exceed Section 508 and W3C WAI-AA standards for sight and motor impaired

Multi-lingual to accommodate foreign UU sister churches

Make it possible for those authorized to post in different parts of the site

Incorporate work flow for committee approval

Use standards based document formats rather than proprietary

Collaboration tools

Video

Non technical people can control the video systems to the extent that it is practical

Incorporate a projection screen into stage design

Use walls for screen or a motorized drop down screen

Determine the minimum size of projection screen needed (diagonal roughly 16 of distance to rear seating)

Sanctuary projector position - mostly dependent on screen placement

Conference room projector position. Ceiling mount likely.

Provide remote audio and video access to sanctuary