

Westwood Community Church Chanhassen, Minnesota

Overview

- Introduction
- Waiting / Gathering Space
 - Lighting Design
- Worship Space
 - Introduction
 - Structural Breadth
 - Lighting Design
- Open Office Plan
 - Lighting Design



About Westwood Community Church

- Former Westwood Church existed only on paper
- Created by church leaders to allow for an expanding congregation



Building Characteristics

- Owner.
 - Westwood Community Church

- Architect / Engineer.
 - Hammel, Green and Abrahamson

- Building Cost.
 - \$18,000,000

- Construction Dates.
 - February 2002 – August 2003

- Building Size.
 - 70,000 Square Feet



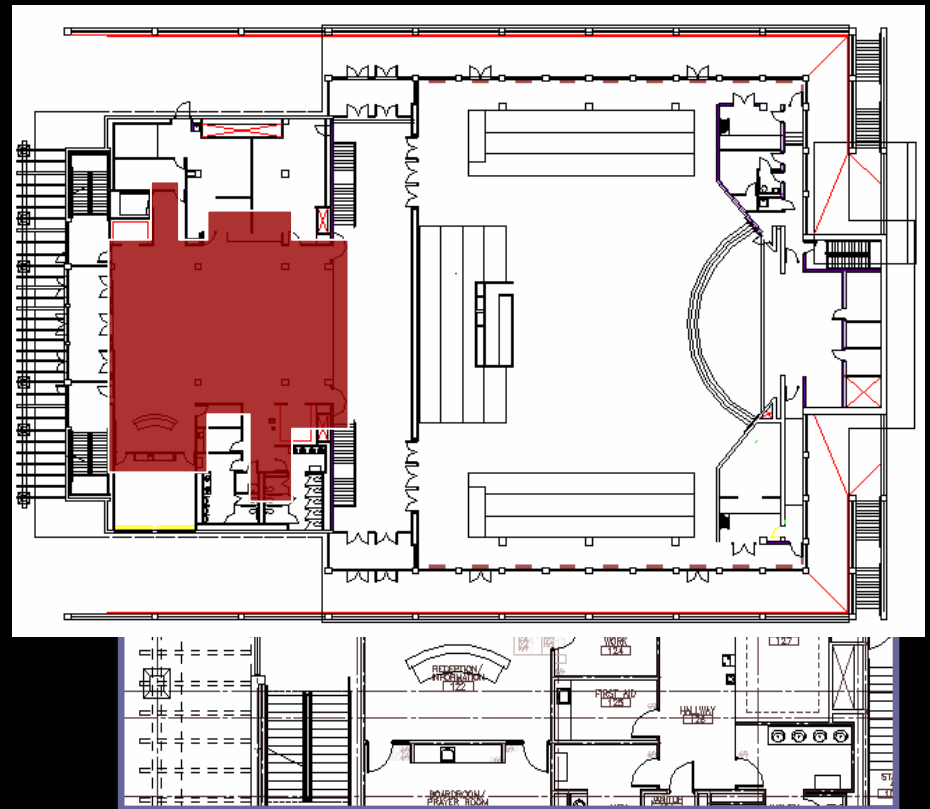
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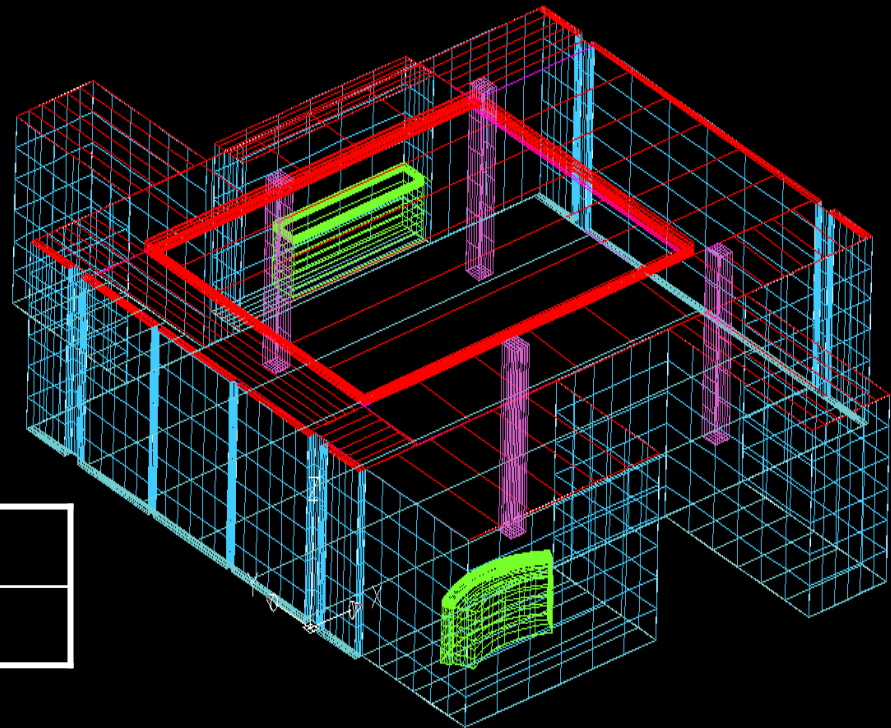
Waiting / Gathering Space

- Immediate entrance space
- Used primarily for gathering and waiting
- Space is modeled to include hallways both north and south of the lobby



Design Goals / Criteria

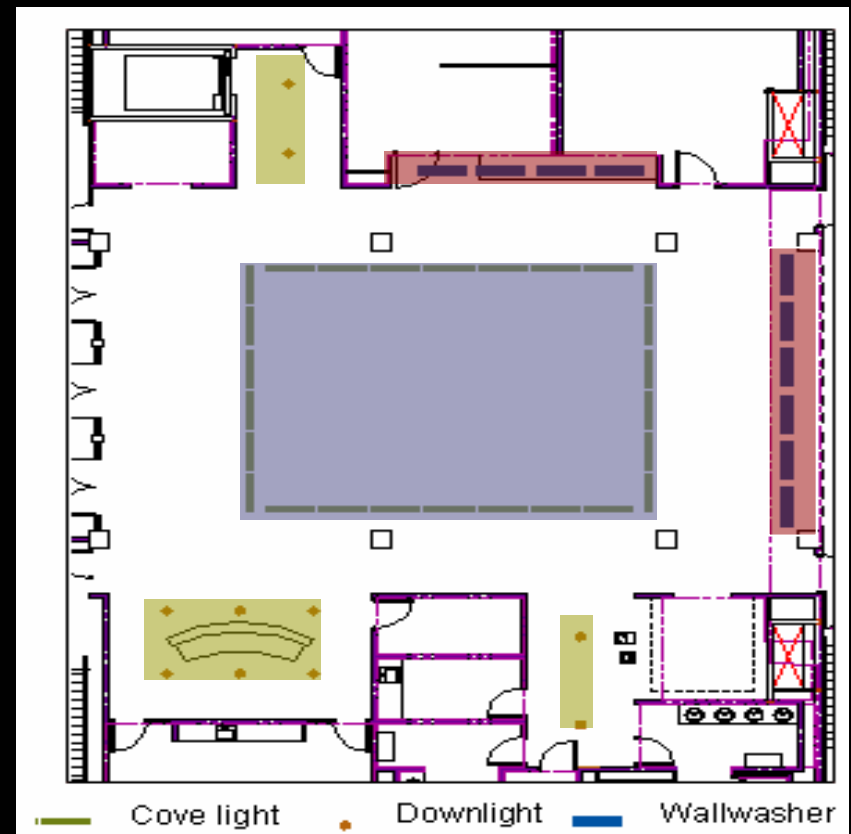
- Appearance of the space should be comfortable / non-threatening
- Use light as a guide
- Ensure light is diffuse enough for facial modeling



Floor illuminance	10 fc
Desk Illuminance	50 fc

Lighting Design

- T5 high output lamps in cove
- Wall washers along south and east walls
- Downlights over reception desk and down halls



Renderings



View upon entering the space



Looking back into the Gathering Space

Renderings



View from information desk



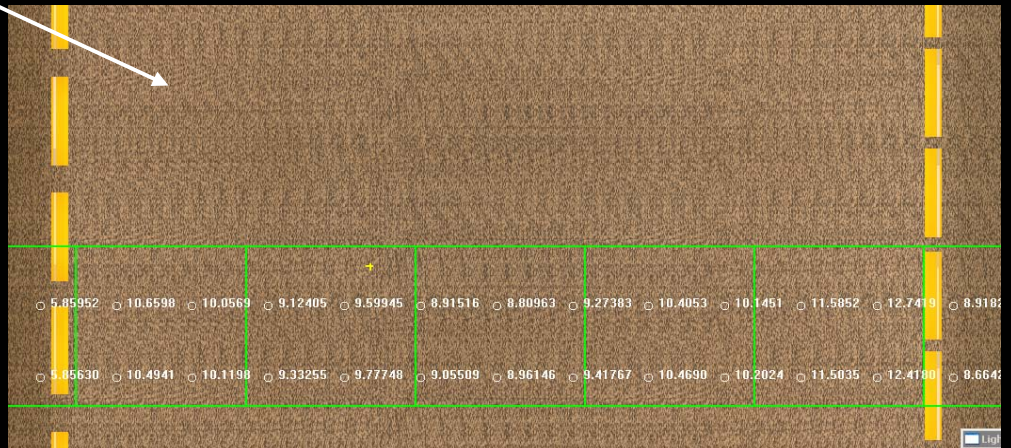
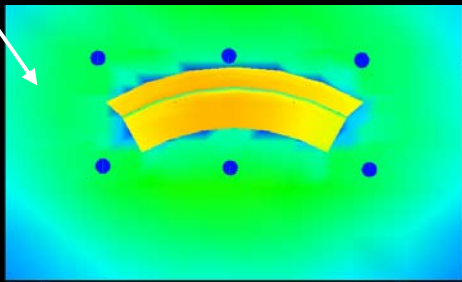
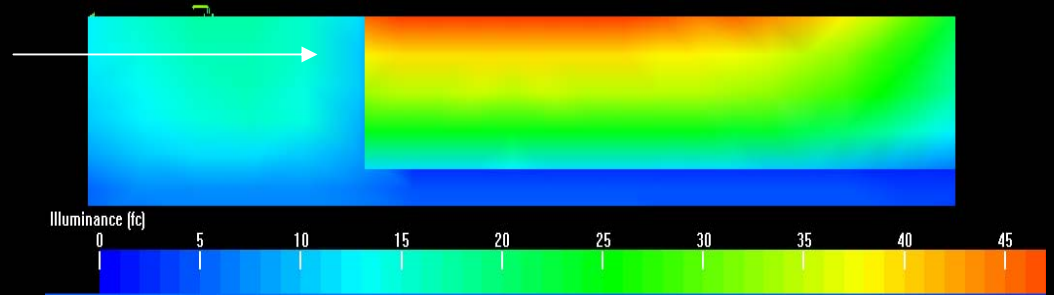
View from reception desk

Light Values

Information Table = 38 fc

Reception Desk = 43 fc

Floor = 10 fc



Power Density

Lamp	#	Input Power	Total Power
Cove	28	59	1652 W
Wall washer	11	38	418 W
Downlight	10	52	520 W

Area of Lobby space: 3290 ft²

Power Density: $2590 \text{ W} / 3290 \text{ ft}^2 = .79 \text{ W/ft}^2$

Allowable Power Density: 1.72 W/ft²

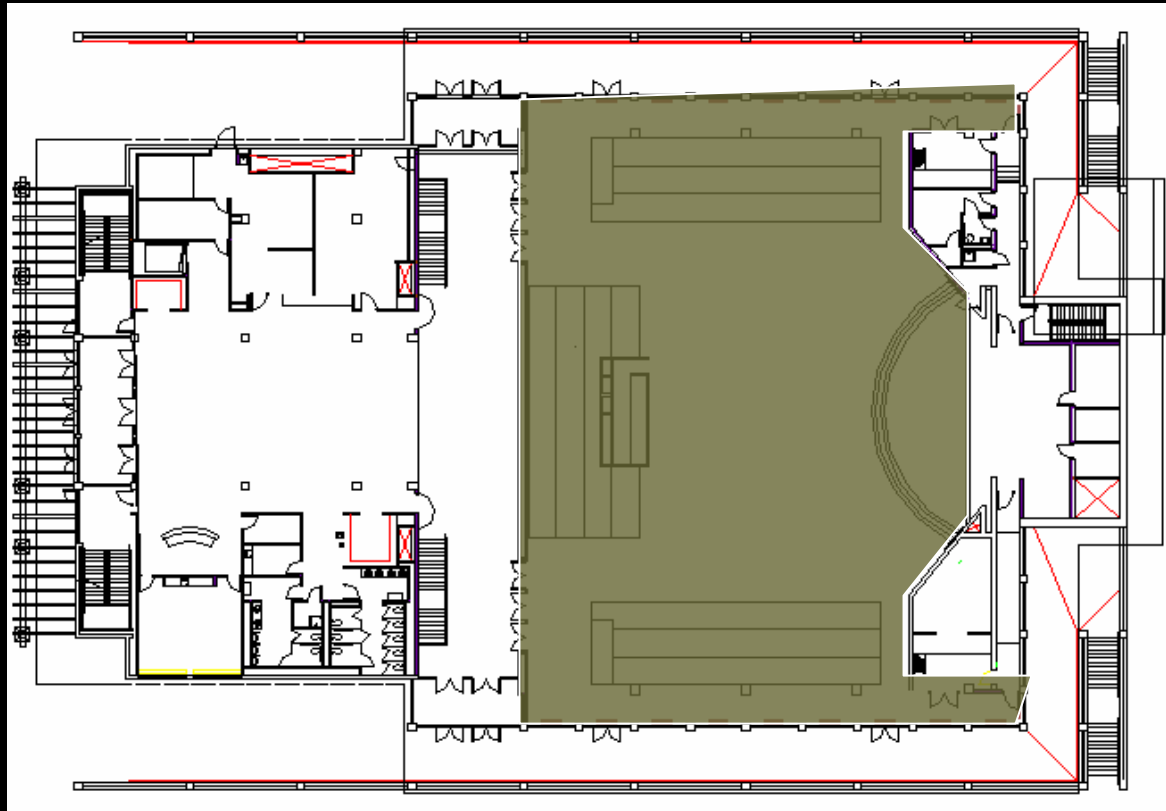


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Worship Space



Worship Space Intentions

- Current Proposition:
 - Structural Steel Truss
 - Hanging Acoustic Panels
- My Proposition
 - Structural Timber Truss
 - Removal of Acoustic Panels
 - Relocation of Acoustic System



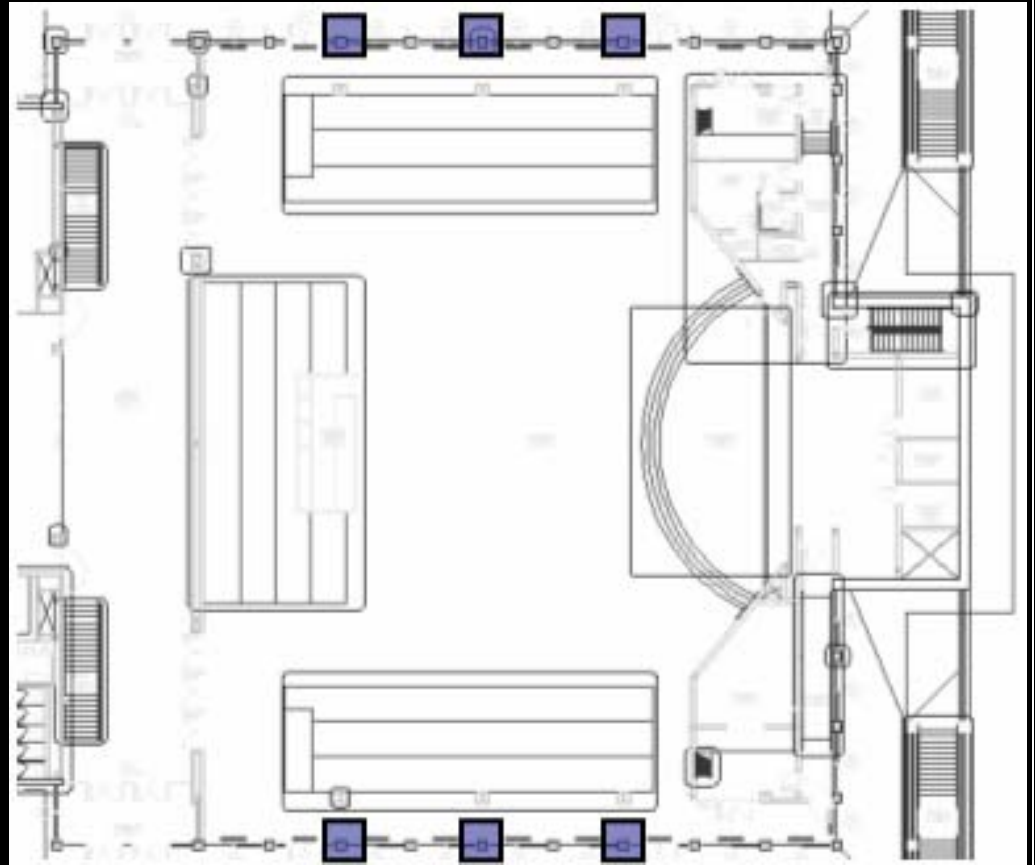
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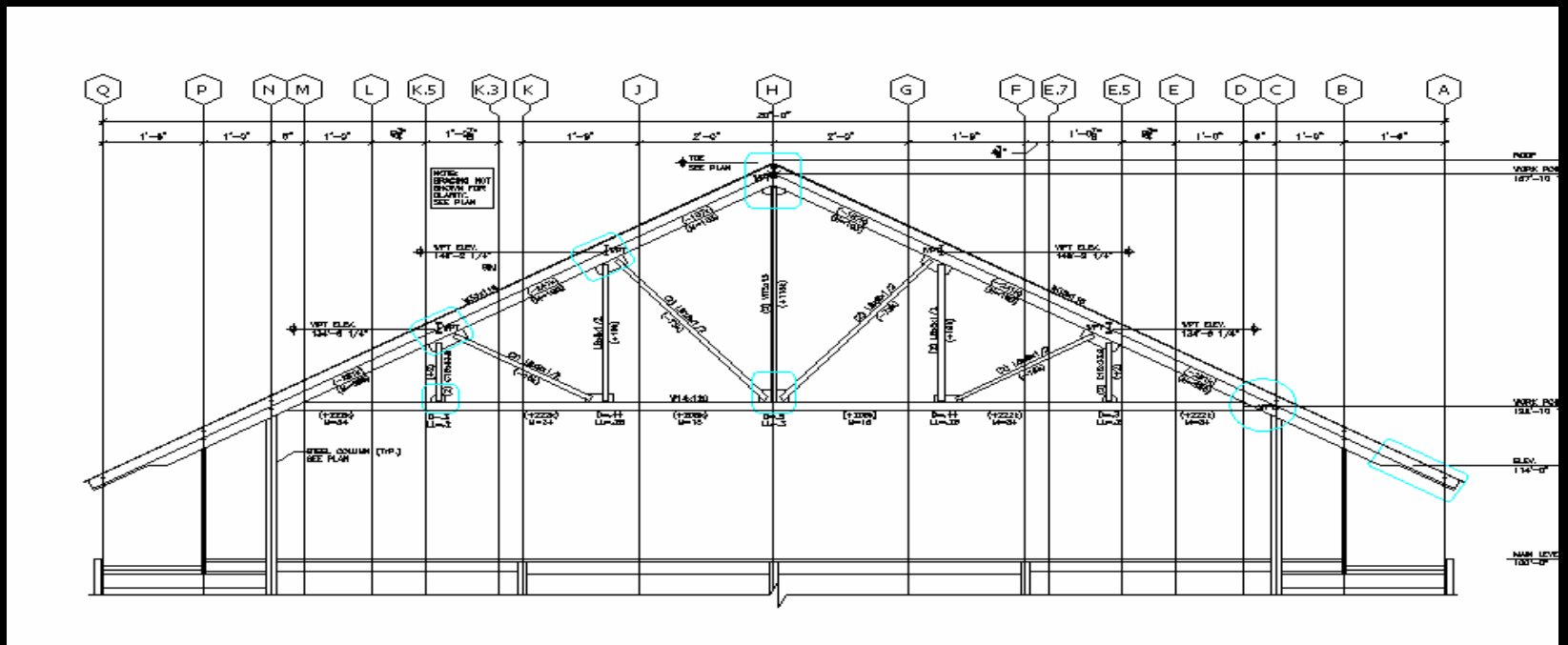


Structural Breadth

- Change trusses from steel to heavy timber
- Trusses located at three column lines



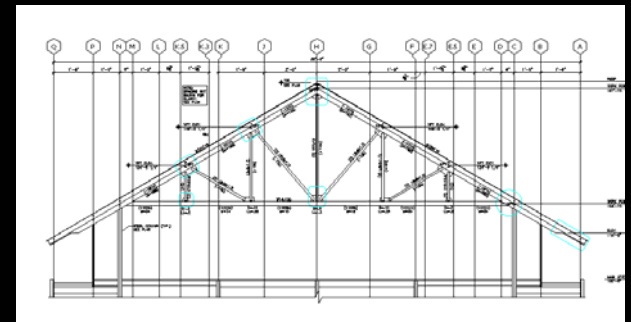
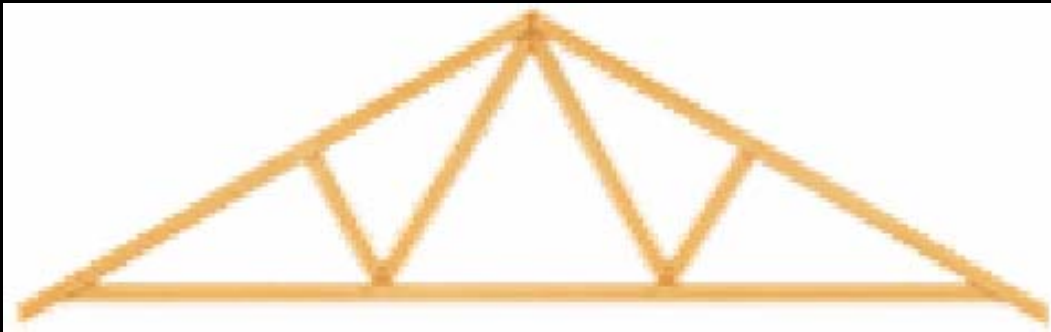
Structural Breadth



Bottom chord: W14x12 Top Chords: W33x18 Webs: Vary

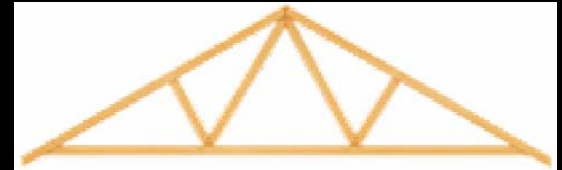
New Truss – Structural Breadth

- Fink truss
- Douglas Fir Larch timber
 - Modulus of elasticity = 1600 ksi
 - Density = 1.97×10^{-5} kips/in²
 - Poisson's Ratio = .292
- Live load = 40 psf
- Dead load = 14.18 psf
 - Shingle load = 3 psf
 - Decking load = 3.5 psf
 - Truss self-weight = 7.68 psf



New Truss – Structural Breadth

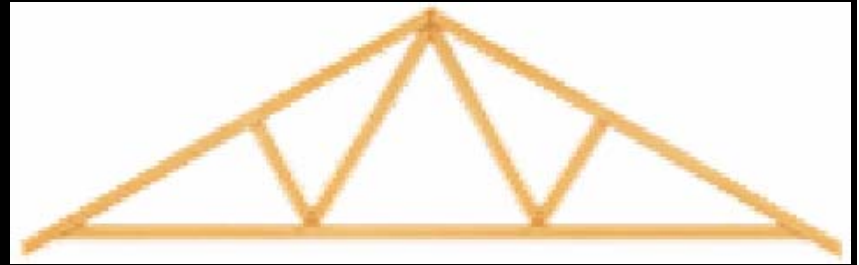
Truss Size Attempted: 8-3/4" x 19-1/2"



Three Goals

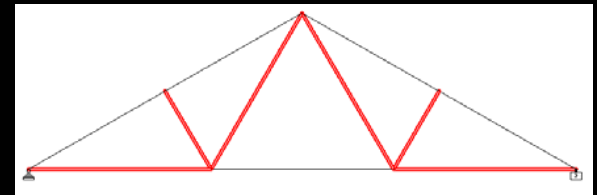
- Deflection
- Compression
- Tension

Design Goals



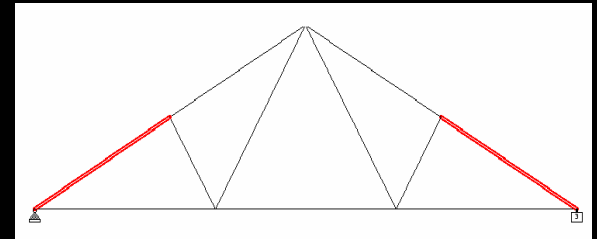
■ Deflection

- Allowable Deflection = $L / 360 = 4''$
- Max Deflection = $1.12''$ @ node 6, 7



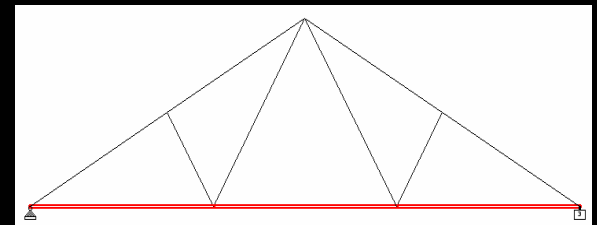
■ Compression

- Allowable Stress = 1600 psi
- Max Compression = 765 psi @ beams 4, 7



■ Tension

- Allowable Stress = 1250 psi
- Max Tension = 606 psi @ beams 1, 2, 3



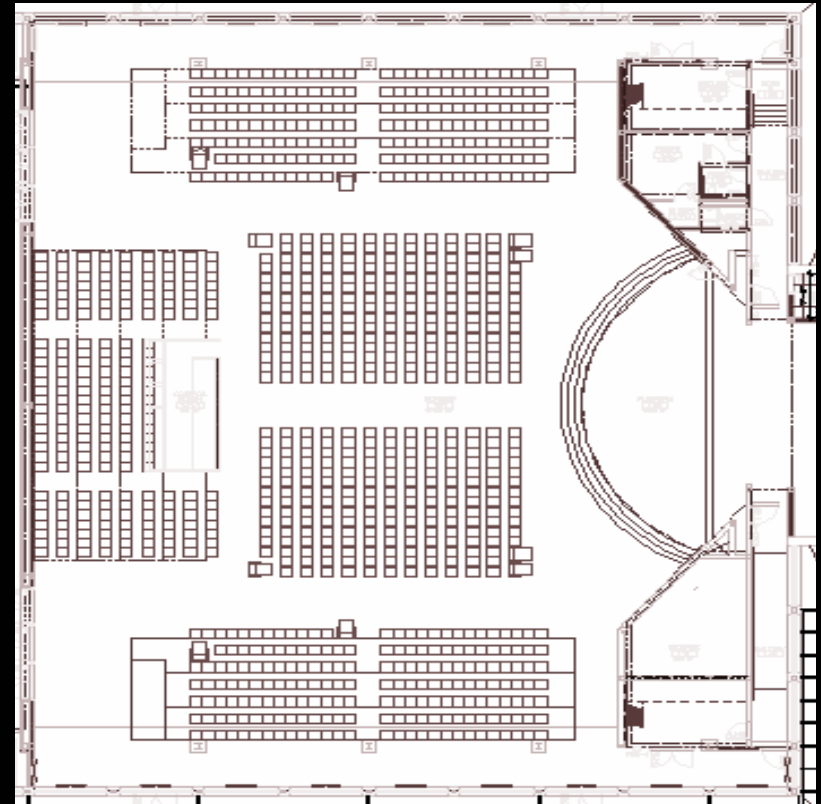
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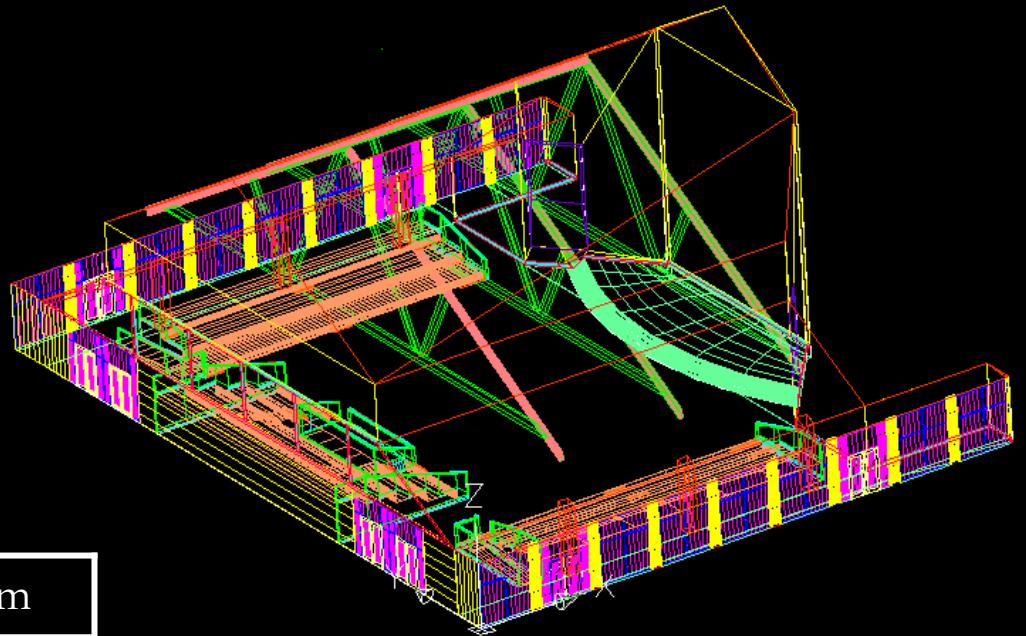
Design Criteria

- Used for worship activities and masses
 - Still a very multi-purpose space
 - All chairs in the center are movable



Worship Space

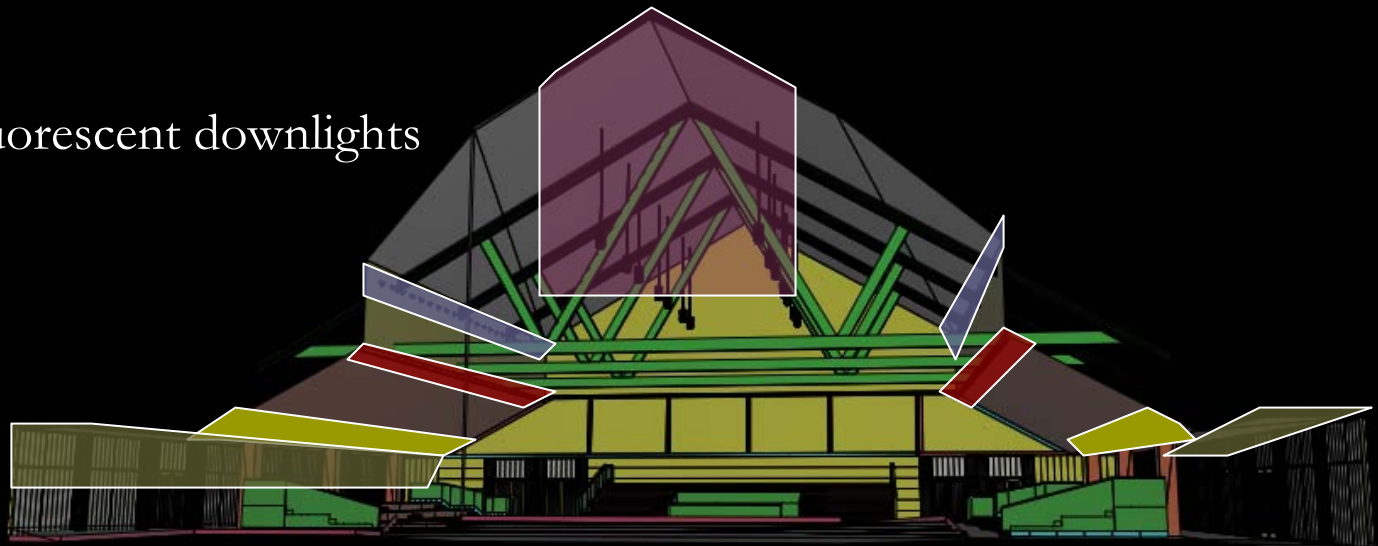
- Create a flexible environment
- Visual focus should be on stage
- Create atmosphere suitable for worship space (drop light level)



Seat illuminance	10 fc minimum
Wall Illuminance	3 fc minimum

Lighting Layout

- Metal Halide Pendants
- T5 Wallwashers
- 4'x7" T8
- 4'x2" T5
- Compact Fluorescent downlights



Lighting Layout



View upon entering the worship space

Renderings



Looking up at the Ceiling

Renderings



View from the Pulpit

Renderings



View from the risers during worship service

Power Density

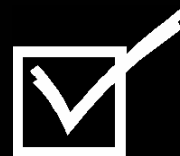
Fixture Type	Quantity	Number of Lamps	Watts / Lamp	Total Power
Pendant	14	1	100	1400
Ceiling Wash	46	1	150	6900 W
Cove Lamp	30	2	40	2400
T5	28	2	54	3024 W
Downlight	24	2	26	1248 W

Total Power = 14972 W

Total Area = 12959 ft²

Power Density = 1.155 W/ft² (before stage lighting)

Allowable Power Density = 5.2 W/ft²



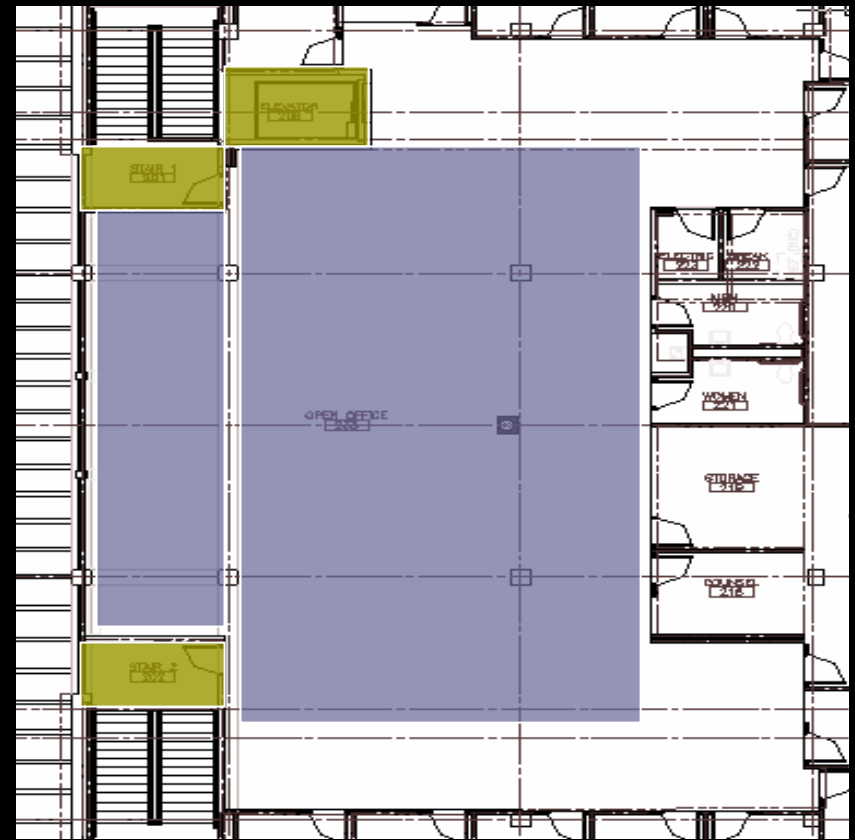
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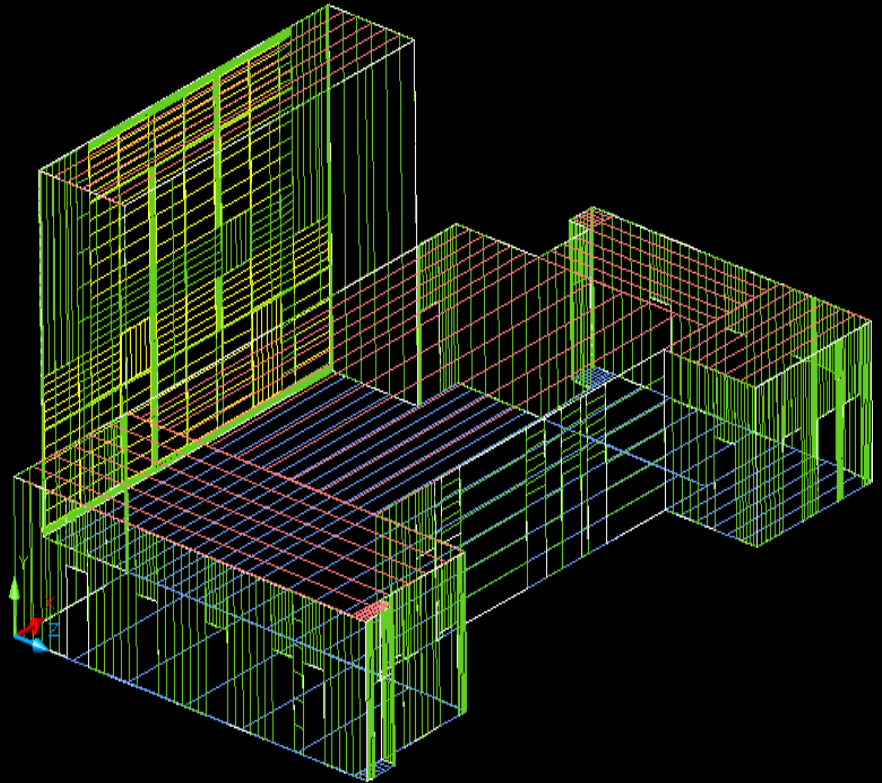
Open Office Space

- Can be entered from elevators and stairwells
- Space uses:
 - Circulation
 - Office work (writing, typing, calculating)
 - Meetings at table
- Points of interest:
 - Raised ceiling area over conference table
 - Cubicle area



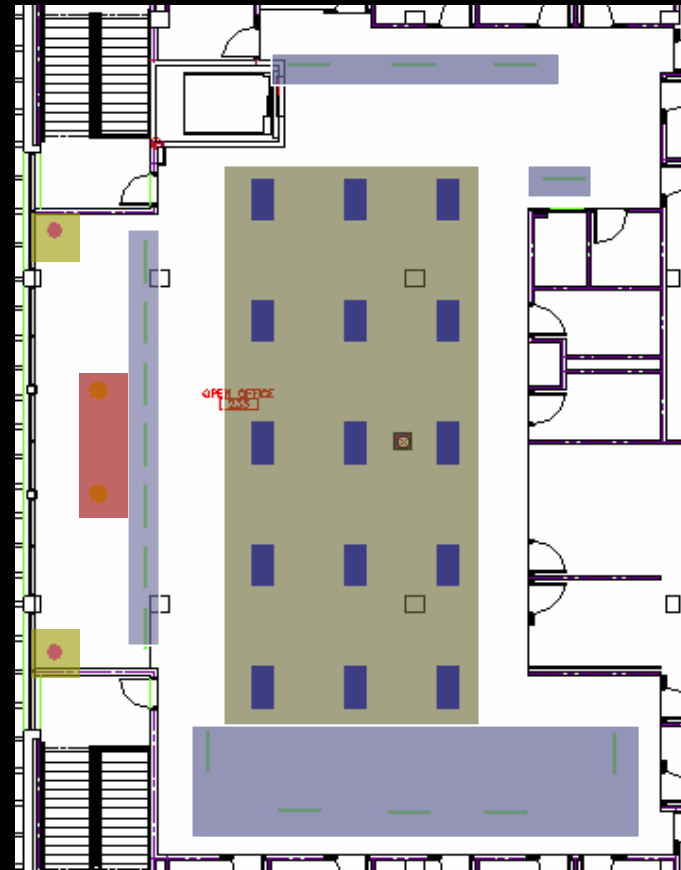
Design Criteria

- Visual environment should be free of clutter
- Keep direct and reflected glare to a minimum
- Ensure light is diffuse enough for facial modeling and reduction of shadows
- Ensure enough light is present on horizontal surfaces



Lighting Layout

- T8 2'x4' Troffers
- T5 High Output Wallwashers
- T5 Pendants
- Floor Lamps



Renderings



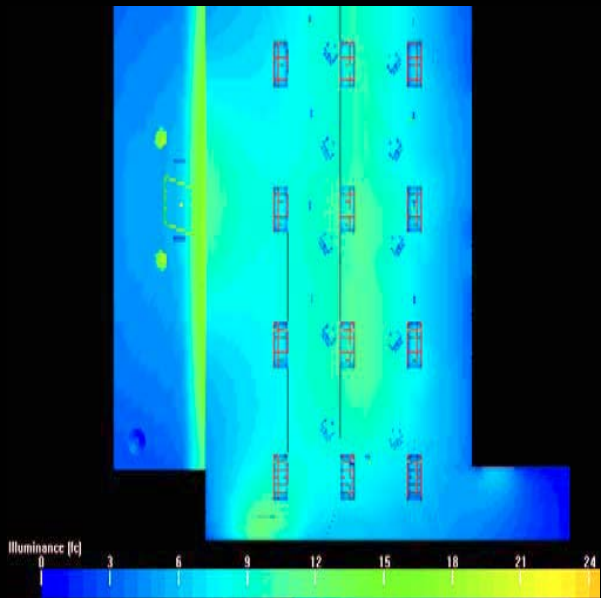
Coming out of the stairwell

Renderings

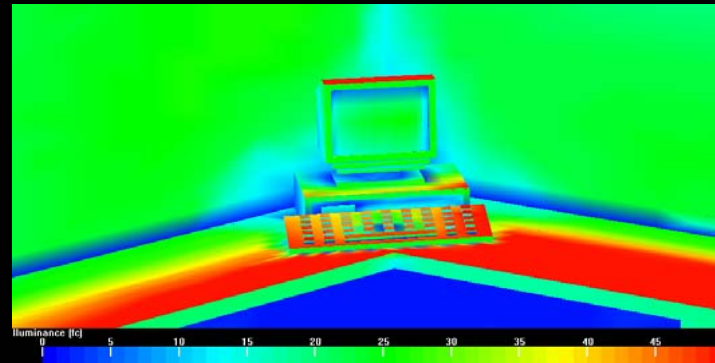


View from the corner conference room

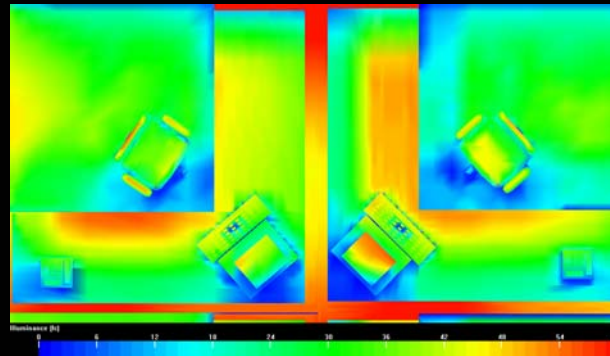
Light Values



3:1 ceiling ratio



2:1 VDT to desk ratio (max. 3:1)



35-55 footcandles on cubicle surface

Power Density

Fixture	#	Input Power	Total Power
T8 Pendant	15	85	1275 W
Wall washer	17	60	1020 W
T5 Pendant	2	176.4	352.8 W
Floor Lamp	2	60	120 W

Total Power = 2767.8 W

Area of open office space: 3265 ft²

Power Density: 2767.8 W / 3265 ft² = .85 W/ft²

Allowable Power Density = 1.3 W/ft²



Conclusions

- Lighting designs used to create a comfortable, organic atmosphere
- Switched trusses in worship space from steel to timber
- Power densities all very low

Room	Allowable	Designed
Gathering Space	1.7 W/ft ²	0.8 W/ft ²
Worship Space	5.2 W/ft ²	1.2 W/ft ²
Open Office Space	1.3 W/ft ²	0.8 W/ft ²



Thanks!

Dr. Moeck.
Professor Ling.

Professor Davidson.
Christa Henry.
Sandy Olson.

Mistrick.

Dr.

Structural students.

All other fifth years, especially the L/E and

Ed Wonderly.

My family!

Professor Parfitt.

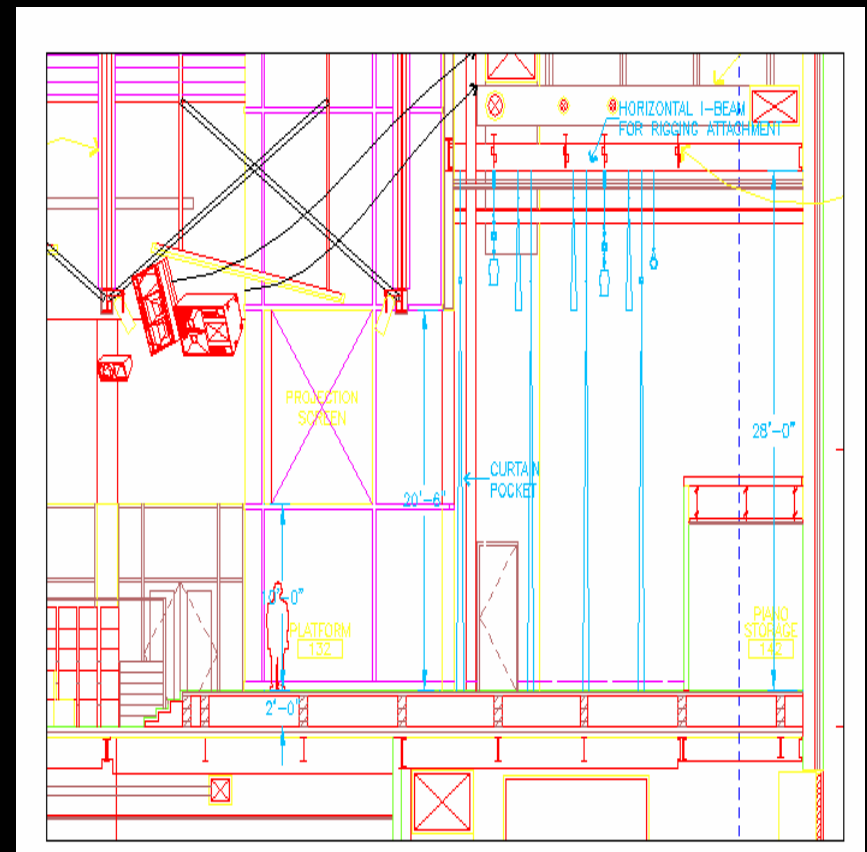
Everyone at the fall Lutron presentations.
Todd Kraft.

Questions?

Acoustic Breadth

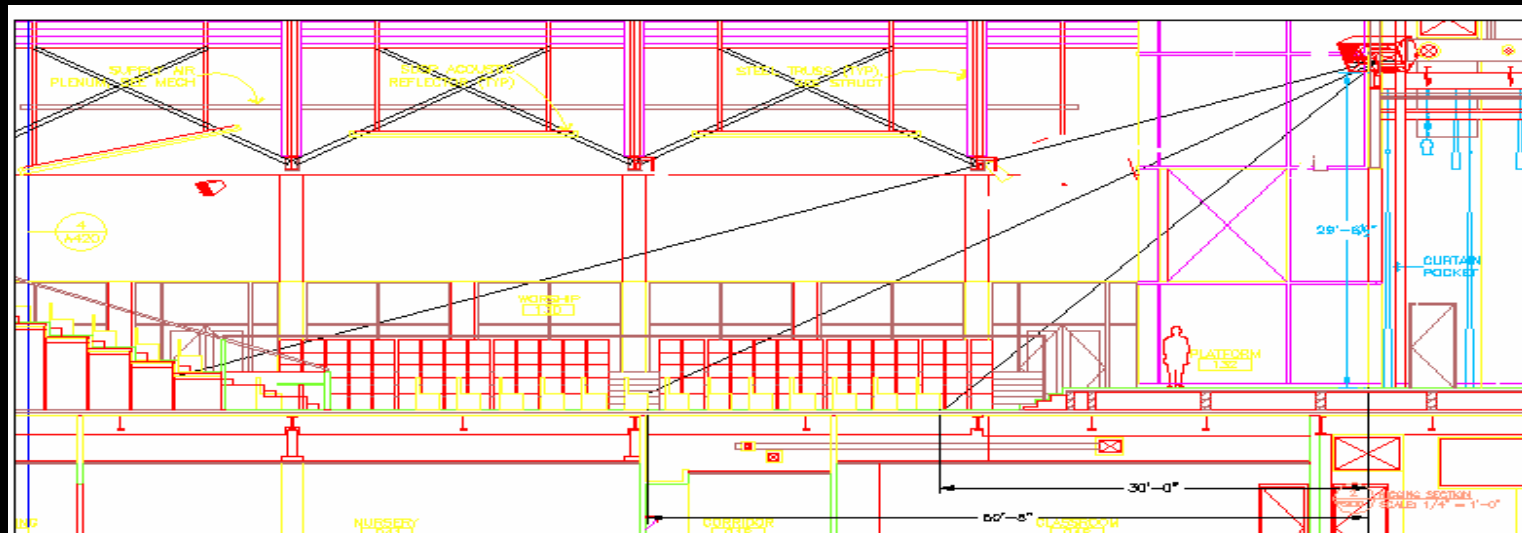
Three concerns:

- (1) Will speakers located behind the pulpit create feedback?
- (2) Is the central cluster capable of covering the entire central seating section?
- (3) Can the side fill speakers effectively fill the side seating areas?



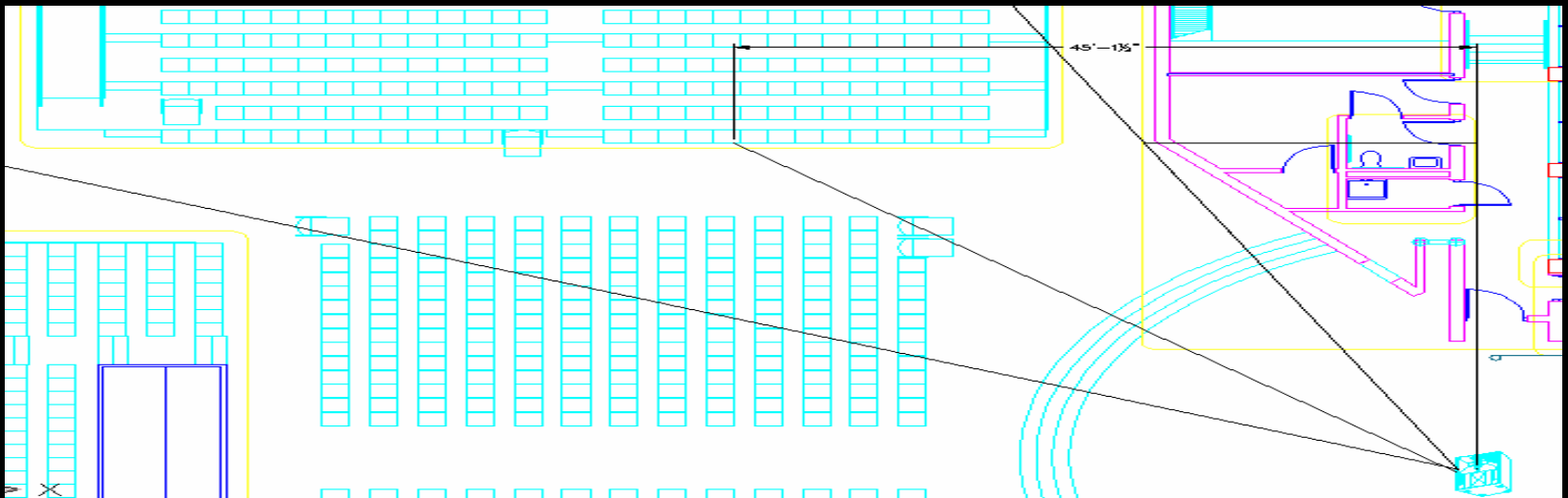
Acoustic Breadth

- Beam spread clears pulpit area
- Central clusters entire central seating area

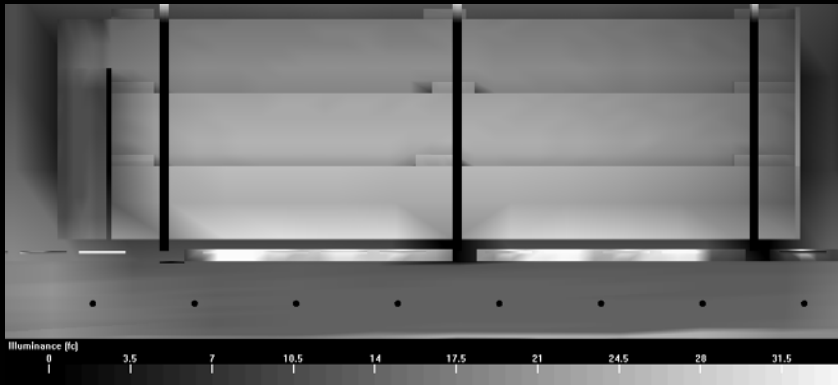


Acoustic Breadth

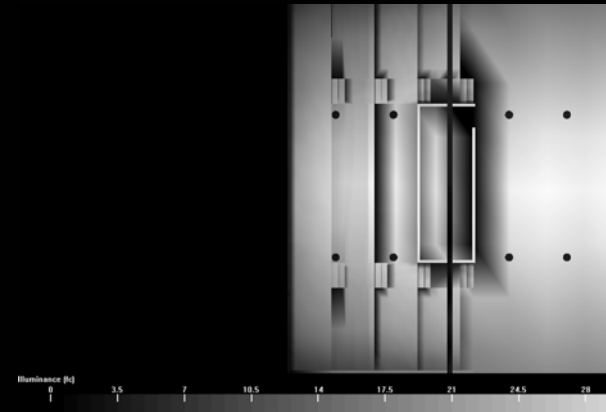
- Side fill speakers effectively fill side seating areas



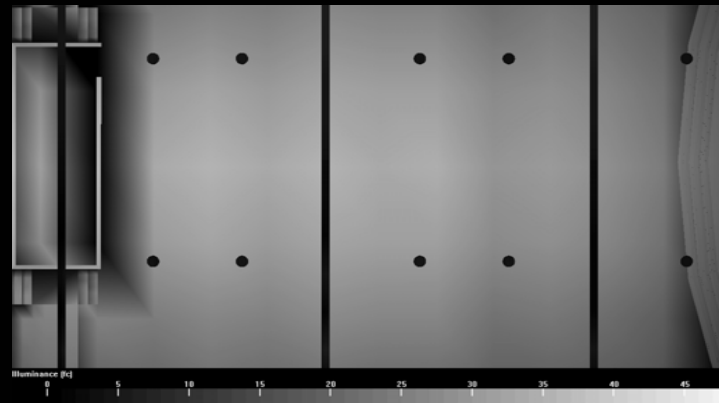
Light Values



Side Seating Sections



Back Seating Section



Floor