



Wentz Concert Hall and Fine Arts Center

Will Lesieutre

Lighting / Electrical Option

Advisors: Dr. Mistrick, Prof. Dannerth



Wentz Concert Hall and Fine Arts Center

Will Lesieutre

Project Introduction

- **Introduction**
- Design Concept
- Lighting Designs
 - Main Lobby
 - Concert Hall
 - Facade
 - Rehearsal Room
- Electrical Depth
- Conclusion
- **North Central College**
171 E Chicago Ave
Naperville, Illinois
- **Size: 57,000 ft²**
- **Completed in 2008**
- **605 seats**
- **Second performing arts facility**
- **Built for outstanding acoustics**

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Naperville, IL

Wentz Concert Hall

Home > Venues > Wentz Concert Hall



The 13,000-square-foot Concert Hall was designed to create an intimate feel—yet crafted to provide the superior clarity, warmth and liveliness of sound that are essential to enjoy music of all genres. The acoustics in Wentz Concert Hall have been designed by the Talaske Group, acoustical consultants for Chicago's critically acclaimed Pritzker Pavilion at Millennium Park. Its space encompasses 84,000 cubic feet, or 2,200 square feet of additional volume, just to meet the most demanding acoustical standards. The perfect acoustics are on par with New York's Carnegie Hall.

Architecturally unique as an intimate hall able to accommodate large sound, the Wentz Concert Hall can be "tuned" through the motorized extension and retraction of sound-absorbing curtains. Two massive sound chambers, one on each side of the stage and invisible to the audience, enhance the audio characteristics and allow sound to bounce off multiple planes as it is directed to the audience.

The Wentz Concert Hall showcases concerts by the Chicago Symphony Orchestra to recitals by soloists with the Lyric Opera of Chicago and Salzburg Chamber, and all types of performances in-between. The 605-seat hall is also *the* place for award-winning bands, orchestras and choirs of area high schools to perform, as well as the College's multitude of music groups and soloists.

At the corner of Chicago Avenue and Ellsworth Street, the Wentz Concert Hall is named in honor of **Dr. Myron Wentz**, a visionary scientist, entrepreneur and lover of music who provided the lead gift for the Fine Arts Center. Dr. Wentz is also a North Central College alumnus of the Class of 1963.

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April 2012

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15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Wentz Concert Hall
[Dedication](#)

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- "One of the most 'live' rooms in the area, its acoustics proved vivid and vibrant at all volume levels...Better still, the Wentz offered a clarity of orchestral detail lost in many other concert halls
-Howard Reich, Chicago Tribune
- Campus/Downtown location
- Naperville's first art gallery



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- **Owner: North Central College**
 - **Architect: Loeb Schlossman and Hackl**
 - **Lighting: Schuler Shook**
 - **Acoustics: Talaske**
 - **Construction: Gilbane**



Wentz Concert Hall and Fine Arts Center

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Lighting Redesign Concepts

- Introduction
- **Design Concept**
- Lighting Designs
 - Main Lobby
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- Conclusion

- Design with linear architecture
- Energy efficiency
- Community landmark
- Welcoming environment



Image Credit:

<http://raoulpop.com/2010/02/09/cfl-vs-led-rate-of-adoption/>

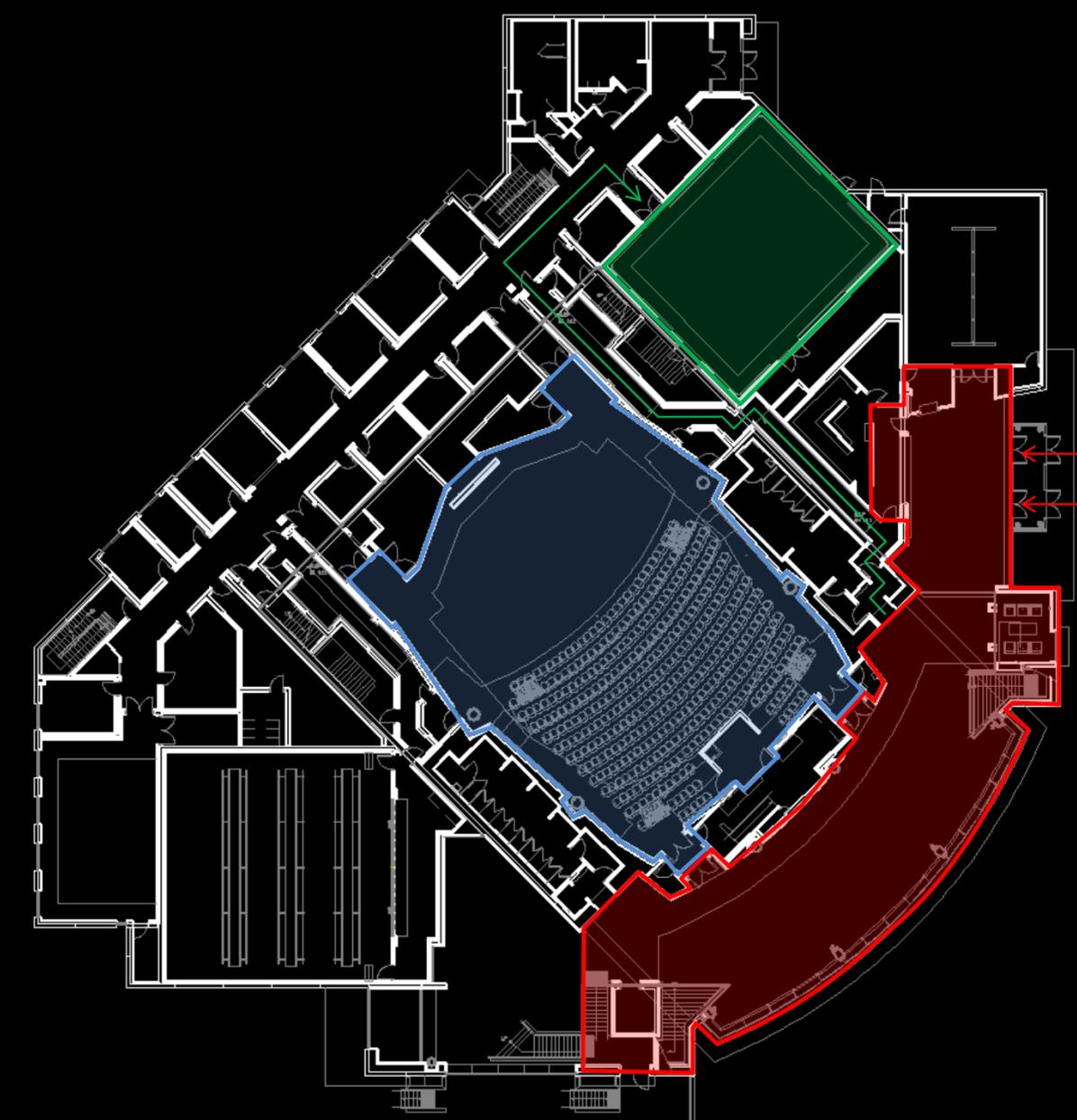
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Lighting Redesign Spaces

- Introduction
- Design Concept
- **Lighting Designs**
 - Main Lobby
 - Concert Hall
 - Facade
 - Rehearsal Room
- Electrical Depth
- Conclusion

- **Main Lobby (Red)**
- **Concert Hall (Blue)**
- **Façade**
- **Rehearsal Room (Green)**



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Main Lobby

- Introduction
- Design Concept
- Lighting Designs
 - **Main Lobby**
 - Concert Hall
 - Facade
 - Rehearsal Room
- Electrical Depth
- Conclusion



- Two stories high
- Lower ceiling by main entry
 - Coat check
 - Box office
 - Art gallery
- Large curtain wall
 - Interior visible from outside



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Design Considerations

- Introduction
- Design Concept
- Lighting Designs
 - **Main Lobby**
 - Concert Hall
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- Conclusion



- Illuminance
 - 15 fc horizontal at floor
 - Avg:Min 3:1
 - 7.5 fc vertical at 5 ft. AFF
 - Avg:Min 3:1
- Dimmable to < 5 fc
- Avoid glare
- Reduce energy use



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Solution

- Introduction
- Design Concept
- Lighting Designs
 - **Main Lobby**
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- Conclusion



- Primarily compact fluorescent
- General illumination from downlights
- Wall washers lighting wood wall
- Linear LED arch to mark transition to concert hall



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Performance

- Introduction
- Design Concept
- Lighting Designs
 - **Main Lobby**
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- Conclusion



- **Average illuminance**
 - 14.6 fc horizontal
 - Target 15 fc
 - 5.0 fc vertical
 - Target 7.5 fc



Magenta: 10 fc

Red: 15 fc

Wentz Concert Hall and Fine Arts Center

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[MAE] Flux Transfer Theory

- Introduction
- Design Concept
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 - **Main Lobby**
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- Conclusion



- Main lobby rendered using Radiance
- Daylight is December 21st, 2 PM local time
- Shows significant daylight penetration

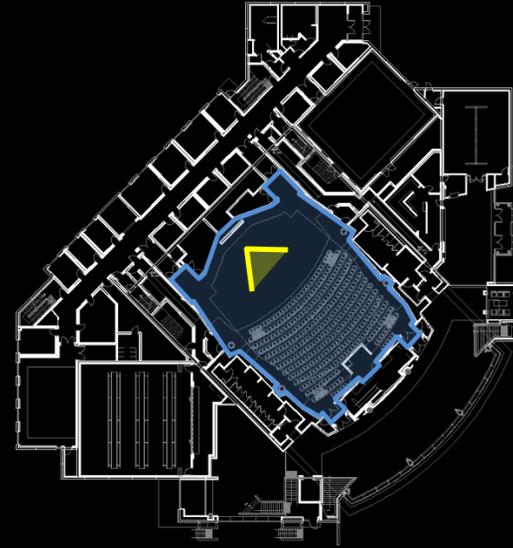


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Concert Hall

- Introduction
- Design Concept
- Lighting Designs
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 - **Concert Hall**
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- Electrical Depth
- Conclusion



- First floor and balcony level seating
- Entrances at rear of first floor and sides of balcony
- Levels separated by angular shelf
- Control booth at rear below balcony

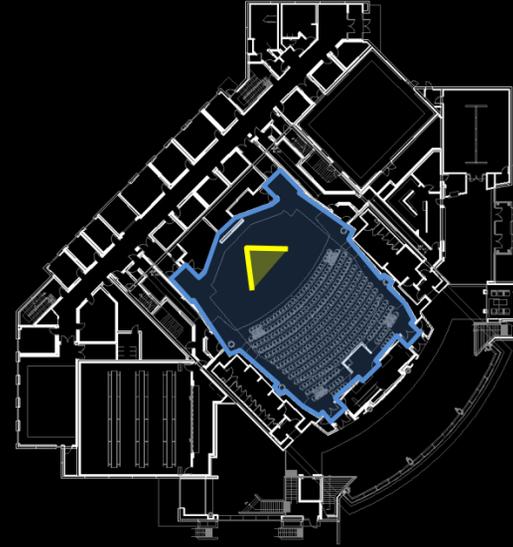


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Design Considerations

- Introduction
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- Illuminance
 - 10 fc horizontal at floor
 - Avg:Min 2:1
 - 3 fc vertical at 5 ft. AFF
 - Avg:Min 2:1
- Smooth dimming to 0%
- Consistent color rendering
- Noise sensitive space
- Upper lighting positions restricted by catwalks

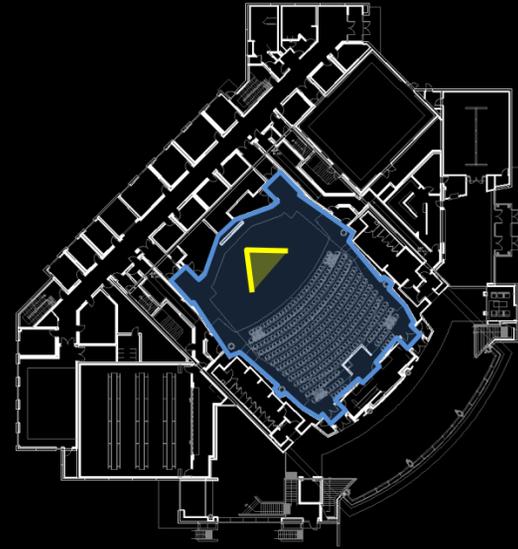


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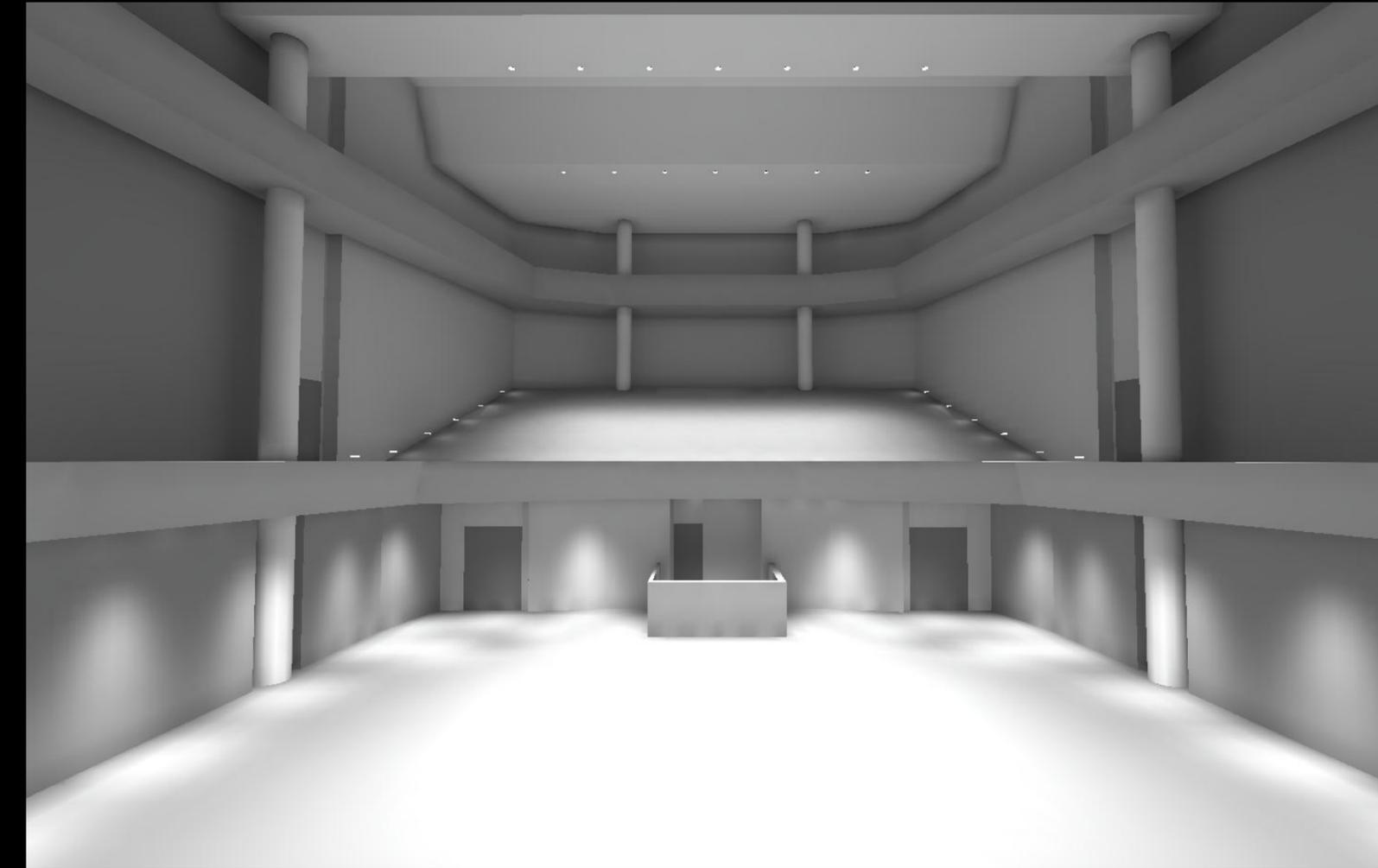
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Solution

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- General illumination by incandescent downlights
- Architectural accents using linear LEDs

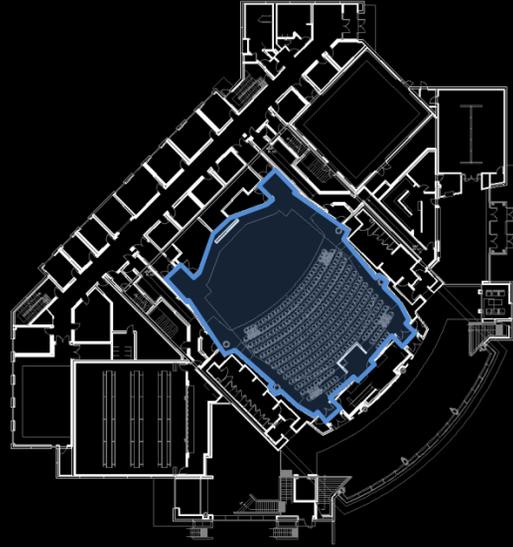


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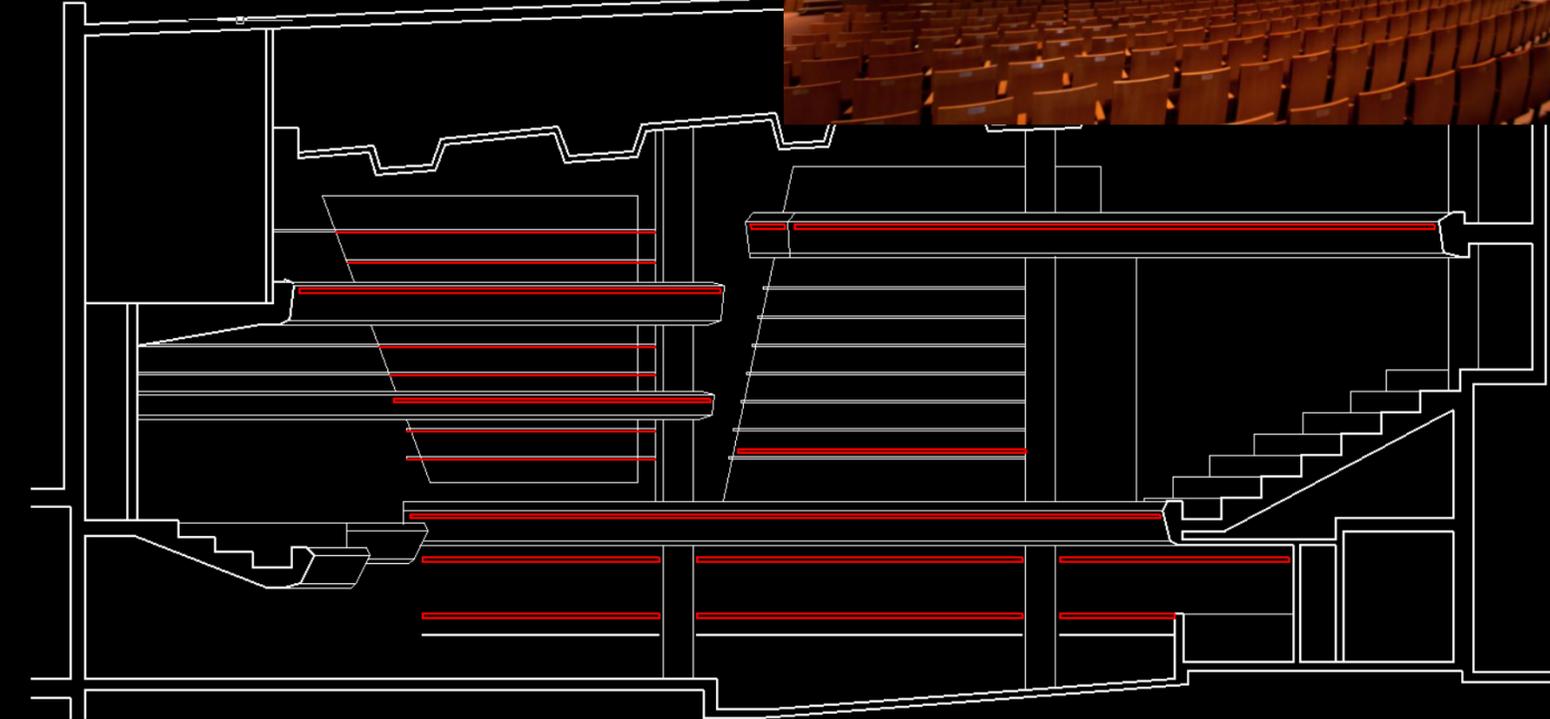
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Architectural Breadth

- Introduction
- Design Concept
- Lighting Designs
 - Main Lobby
 - **Concert Hall**
 - Facade
 - Rehearsal Room
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- Conclusion



- Create more opportunities for lighting
- Enhance transition from seating to stage
- Added a middle level shelf
 - Produces an arched form on the side walls of the stage
 - Integrates with linear lighting in other shelves

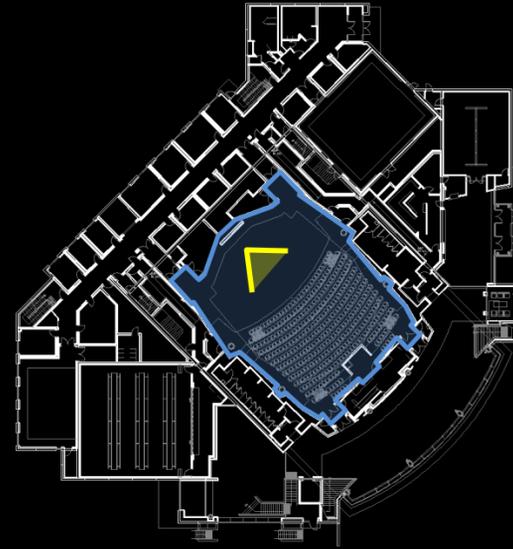


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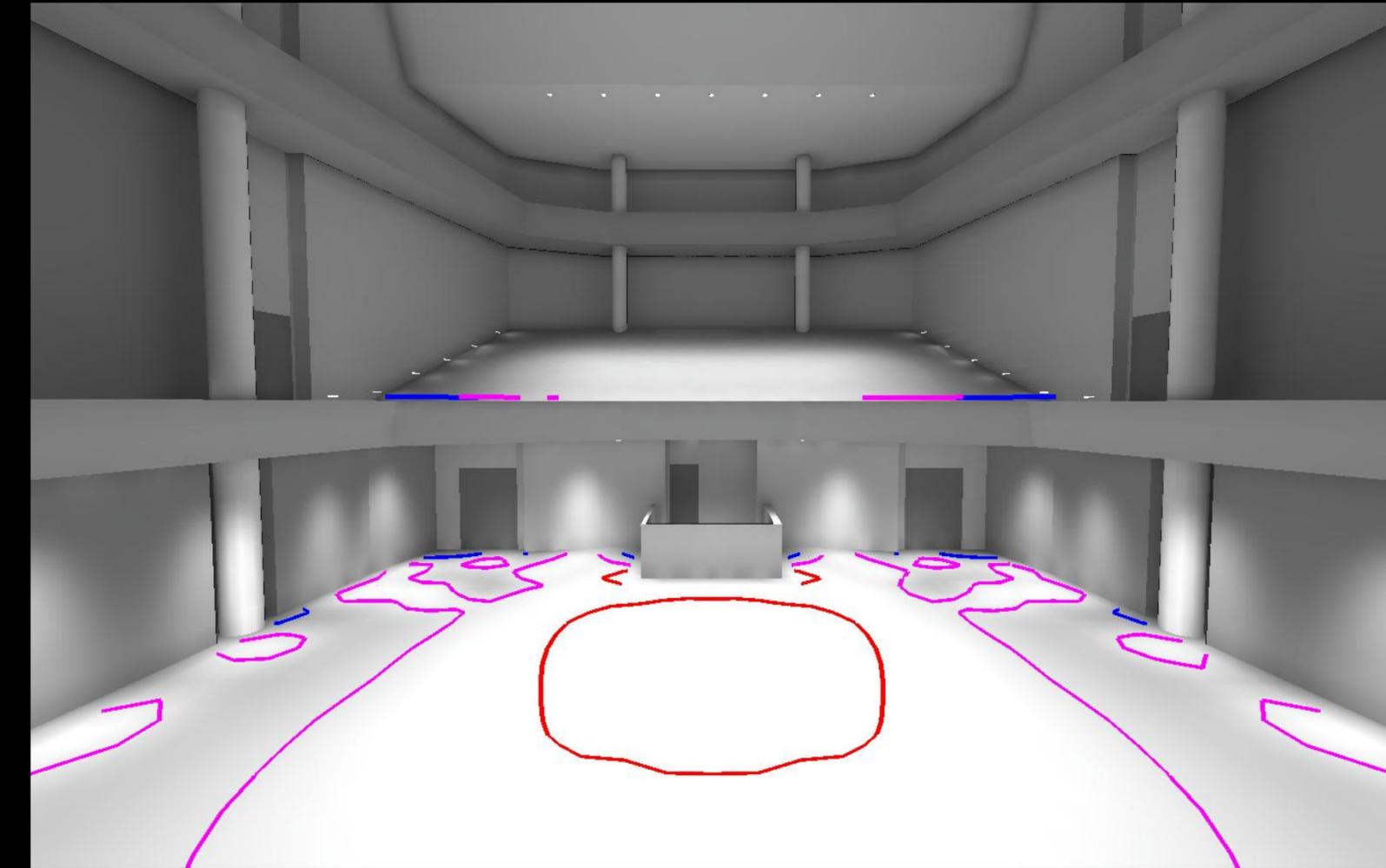
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Performance

- Introduction
- Design Concept
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 - **Concert Hall**
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- Conclusion



- Average illuminance
 - 11.2 fc horizontal
 - Target 10 fc
 - 2 fc vertical
 - Target 3 fc



Blue: 5 fc

Magenta: 10 fc

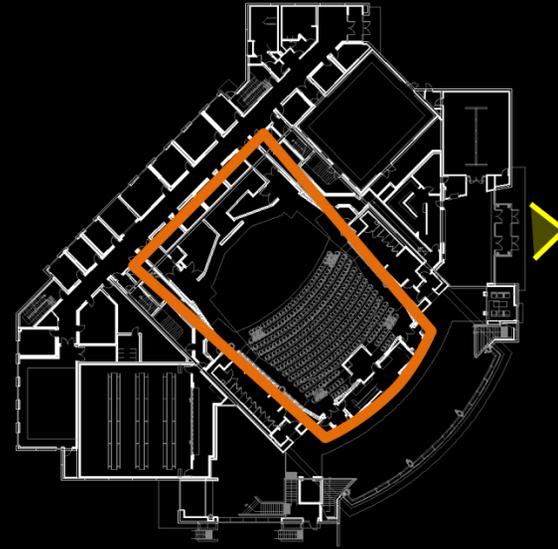
Red: 15 fc

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Facade

- Introduction
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 - **Facade**
 - Rehearsal Room
- Electrical Depth
- Conclusion



- Large curtain walls
 - Entries not in solid walls
- Architectural precast panels
- Metal cornice
- High concert hall block



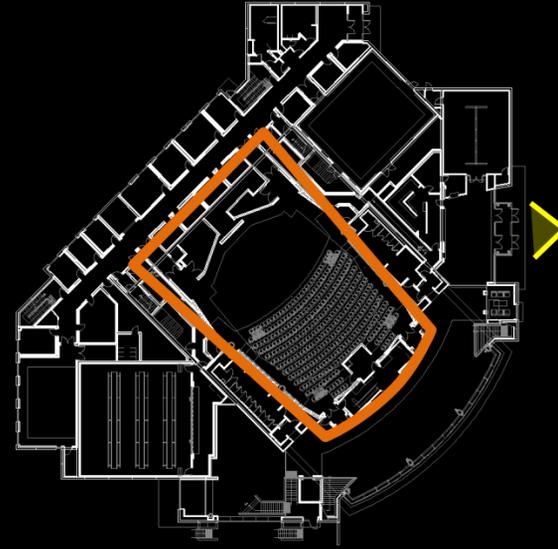
<http://www.educationdesignshowcase.com/view.esiml?pid=272>

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Design Considerations

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- Illuminance
 - 7.5 fc maximum to highlight façade features
 - 3 fc for large illuminated areas
- Create a landmark appearance
 - Should be recognizable from a distance at night



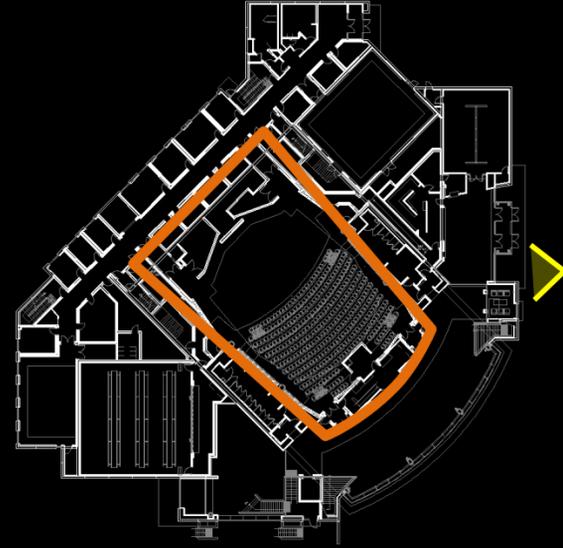
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Solution

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- Light upper wall with color changing LEDs
 - Makes the building highly visible
- Colored lighting uncommon in the area
 - Allows lobby interior lighting to maintain high contrast

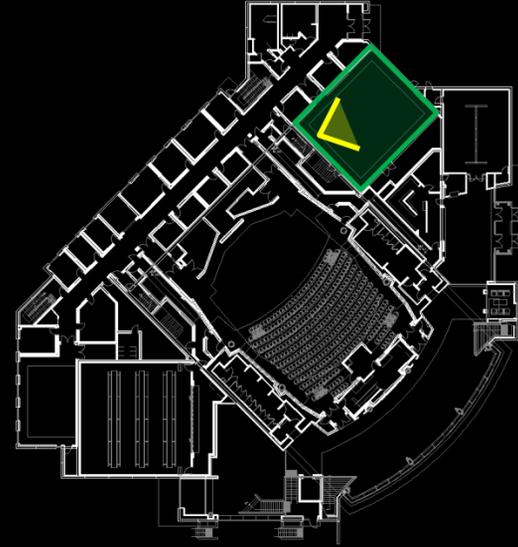


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Rehearsal Room

- Introduction
- Design Concept
- Lighting Designs
 - Main Lobby
 - Concert Hall
 - Facade
 - **Rehearsal Room**
- Electrical Depth
- Conclusion



- Multifunction space
 - Music classroom
 - Rehearsal space
- Two floors divided by technical shelf
- No fixed furniture
 - Seats and music stands are freely positionable

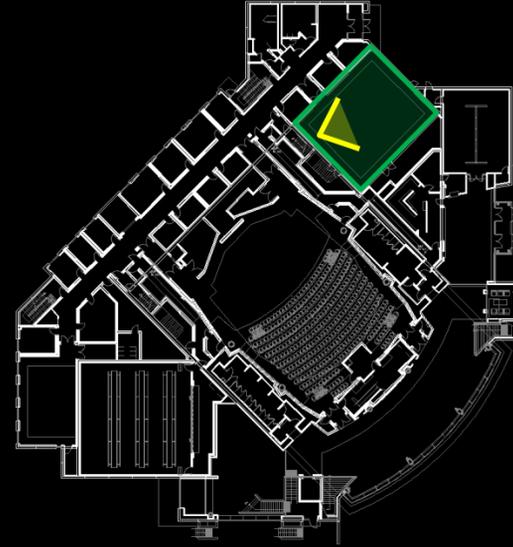


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- **Illuminance**

- 30 fc horizontal at floor

- Avg:Min 2:1

- 20 fc vertical at 4 ft. AFF

- Avg:Min 2:1

- High vertical illuminance is required for reading sheet music

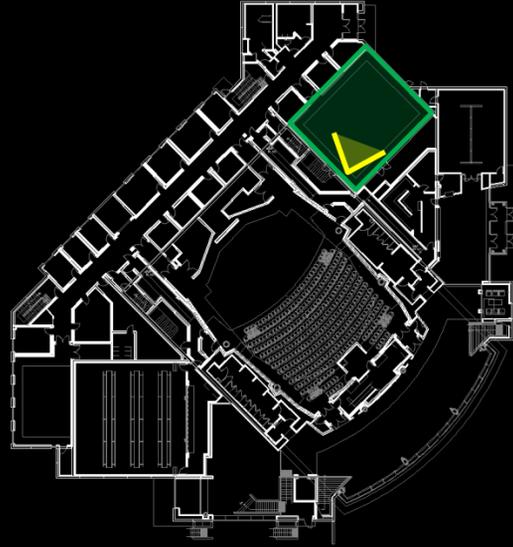


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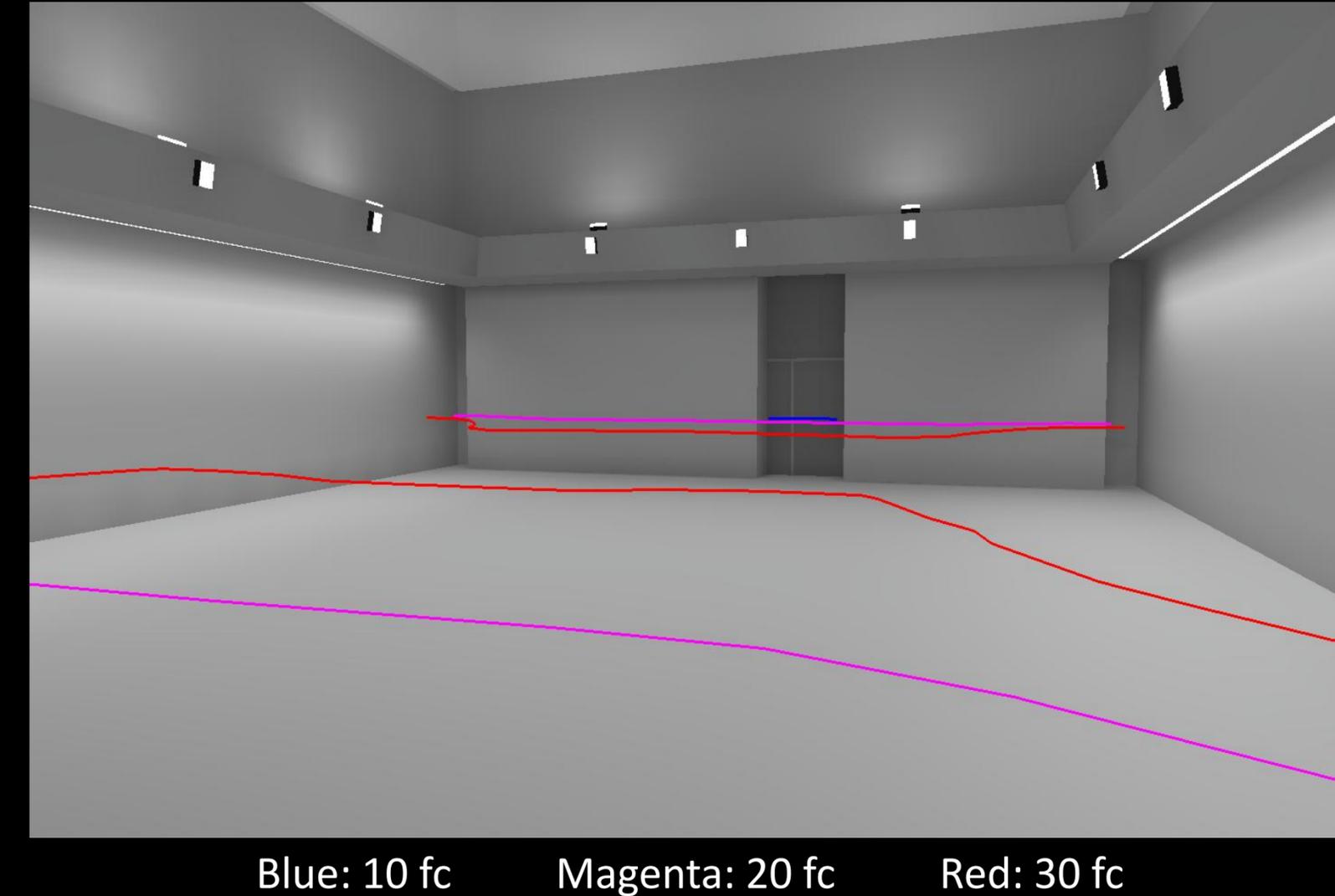
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- CFL downlights from ceiling
- CFL uplights and asymmetric side lights from shelf
- Linear fluorescent wall washers
- Average illuminance
 - 28.8 fc horizontal
 - Target 30fc
 - 20.1 fc vertical
 - Target 20 fc



Transformer Consolidation

- Introduction
- Design Concept
- Lighting Designs
 - Main Lobby
 - Concert Hall
 - Facade
 - Rehearsal Room
- **Electrical Depth**
- Conclusion

- As designed, there are five transformers to serve 208/120V loads
- Would it be more economical to use a single transformer?



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Transformers

- Introduction
- Design Concept
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- **Electrical Depth**
- Conclusion

- One isolation transformer
- Four eligible for replacement
- Sized based on new central panelboard
 - 500 kVA

Original Design		
Tag	Transformer Size	Cost
1-TLDP-1	225 kVA	\$8,624
1-TLDP-2	225 kVA	\$8,624
LL-ELP-1	30 kVA	\$2,800
LL-LDP-1	300 kVA	\$10,690.00
Total		\$30,738.00

Proposed Centralized Design		
Tag	Transformer Size	Cost
TLL-LDP	500 kVA	\$16,325

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Panelboards

- Introduction
- Design Concept
- Lighting Designs
 - Main Lobby
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- **Electrical Depth**
- Conclusion

- Original design requires one panel at the 120V side of each transformer
- Redesign to feed a single panel
 - Would still require some branch panels, this is an upper limit on savings

Original Design		
Tag	Panel Size	Cost
1-TLDP-1	800 A	\$ 4,375.00
1-TLDP-2	1400 A	\$ 5,625.00
LL-ELP-1	400 A	\$ 2,860.00
LL-LDP-1	1200 A	\$ 5,275.00
Total		\$ 18,135.00

Proposed Centralized Design		
Tag	Panel Size	Cost
LL-LDP	4000 A	\$ 12,200.00

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Feeders

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- Original 480/277V system can use smaller feeders
- Wire size for 208/120V must be increased
 - Higher material cost
 - Higher labor cost

Original Design									
Load	Type	Phase/N	Ground	Raceway	Length (ft)	Feeder cost / ft	Raceway cost / ft	Total cost	
T1-TLDP-1	THHN	(3) 350	3	2 1/2"	135	16.705	28.5	\$	6,102.68
T1-TLDP-2	THHN	(3) 350	3	2 1/2"	165	15.03	28.5	\$	7,182.45
LL-ELP-2	THHN	(3) 8	10	3/4"	15	4.28	10.25	\$	217.95
LL-LDP-1	THHN	(3) 500	3	3"	30	20.72	36.2	\$	1,707.60
FPC-ATS	THHN	(4) 1	n/a	1 1/4"	25	8.48	14.85	\$	583.25
LL-HDP-1	THHN	2x (4) 500	1/0	3 1/2"	15	50.8	44.9	\$	1,435.50
T1-DCTP-1	THHN	(3) 1	8	1 1/4"	155	7.515	14.85	\$	3,466.58
Total:									\$ 20,696.00

Proposed Centralized Design										
Load	Design KVA	Design A	Type	Phase/N	Ground	Raceway	Length (ft)	Feeder cost / ft	Raceway cost / ft	Total cost
1-TLDP-1	133	369	THHN	(4) 400	3	3"	135	24.235	36.2	\$ 8,158.73
1-TLDP-2	146	405	THHN	(4) 500	2	3"	165	27.075	36.2	\$ 10,440.38
LL-ELP-1	30	83	THHN	(4) 5	8	1"	15	9.7	12.21	\$ 328.65
LL-LDP-1	244	677	THHN	2x (4) 350	2x 3	3 1/2"	30	43.43	44.9	\$ 2,649.90
FPC-ATS	80	222	THHN	(4) 3/0	4	2"	25	14.13	20.15	\$ 857.00
LL-LDP	462	1282	THHN	3x (4) 500	3	(3) 2 1/2"	15	81.225	85.5	\$ 2,500.88
T1-DCTP-1	75	90	THHN	(3) 1	8	1 1/4"	165	7.515	14.85	\$ 3,690.23
Total:										\$ 28,625.75

Wentz Concert Hall and Fine Arts Center

Will Lesieutre

Overall Cost

- Introduction
- Design Concept
- Lighting Designs
 - Main Lobby
 - Concert Hall
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 - Rehearsal Room
- **Electrical Depth**
- Conclusion

- **Centralized system is cheaper, disregarding branch panelboards**
 - If branch panelboards are unmodified, it will be more expensive
- **Single point of failure**
 - Can't perform maintenance on part of system
- **Voltage drop**
 - Long connections at lower voltage may require larger feeders or branch circuits

Category	Original Cost	Centralized Cost
Panels	\$ 18,135.00	\$ 12,200.00
Transformers	\$ 30,738.00	\$ 16,325.00
Feeders	\$ 20,696.00	\$ 28,625.75
Total	\$ 69,569.00	\$ 57,150.75

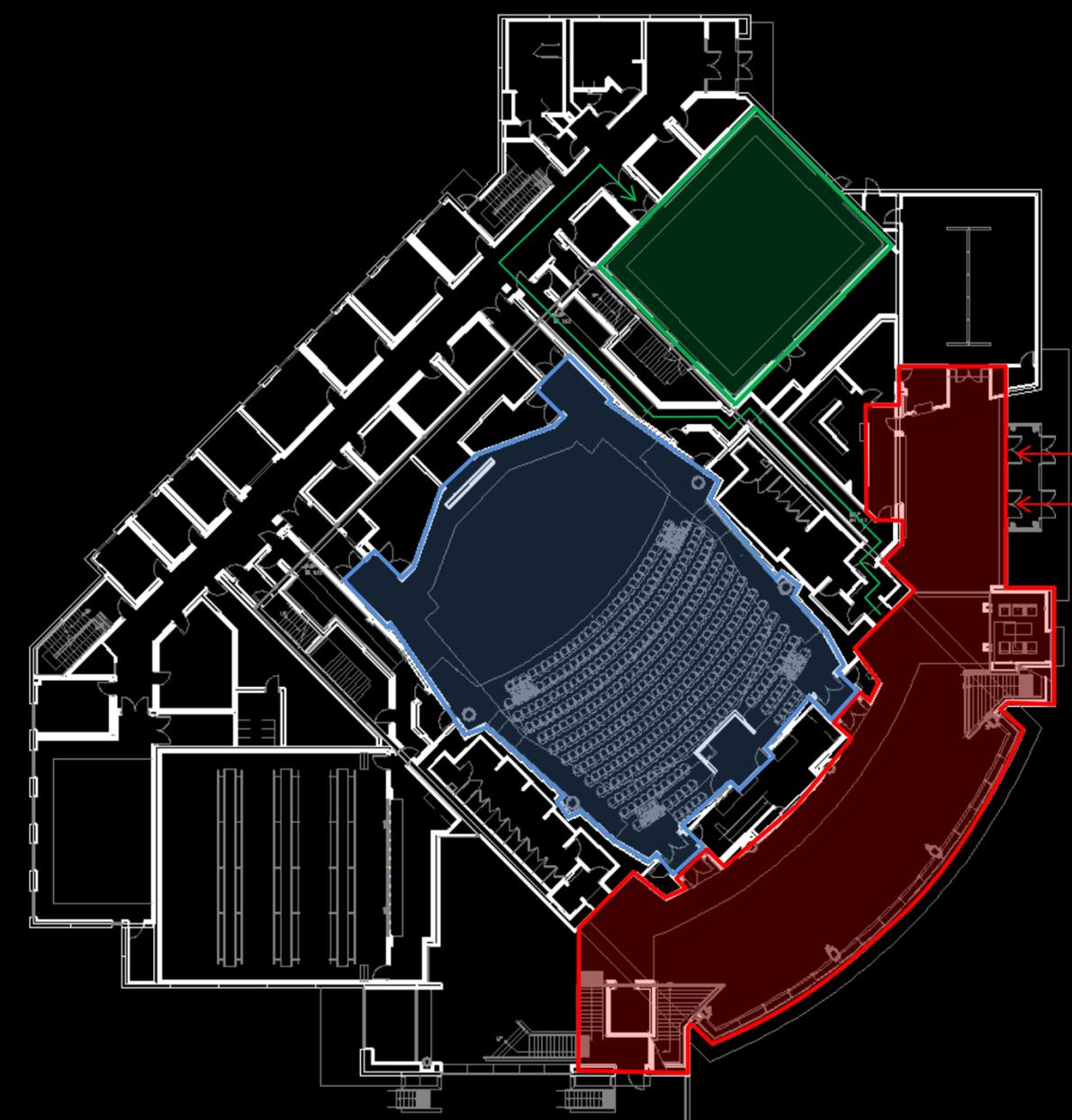
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Conclusions

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- **Conclusion**

- More efficient lighting system
- Accents architectural features
 - Modified concert hall to support lighting
- Creates a recognizable landmark
- Centralized transformer may provide cost savings

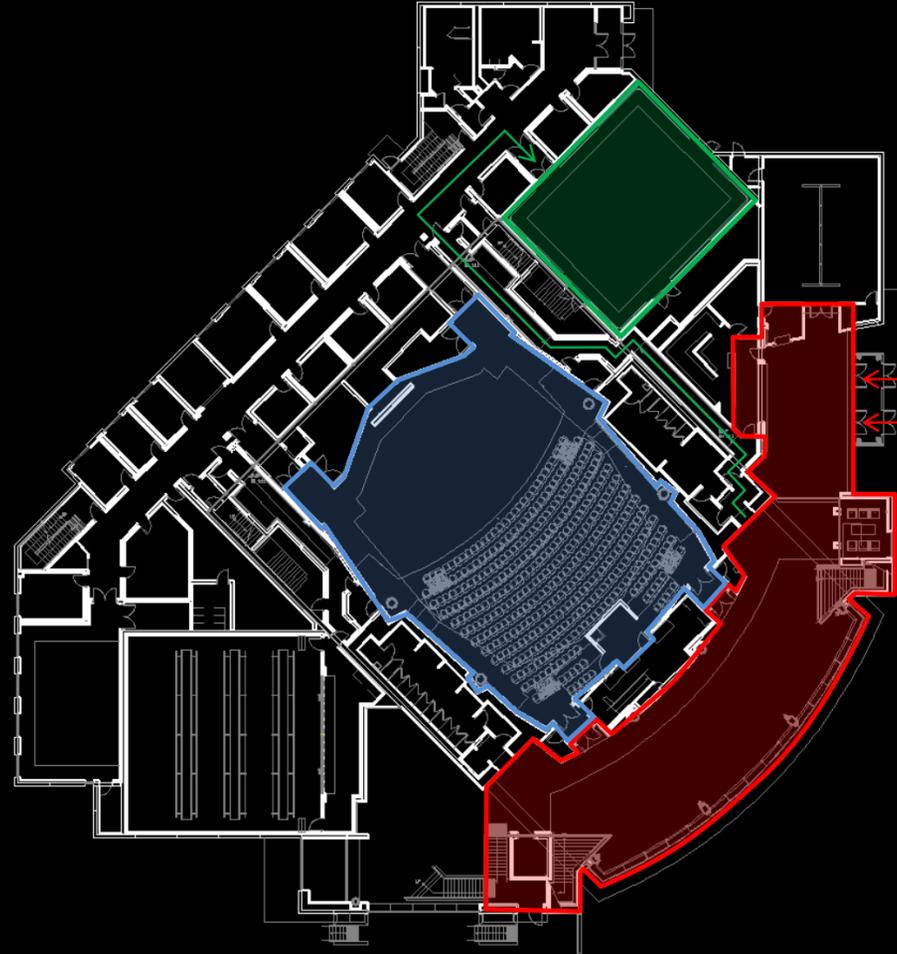


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Acknowledgements

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- **Conclusion**



Questions?

- Thesis Advisors
 - Richard Mistrick
 - Ted Dannerth
- Other Faculty
 - Kevin Houser
 - Moses Ling
 - Kevin Parfitt
 - Bob Holland
- Schuler Shook
 - Jim Baney
 - Emily Klingensmith
 - Giulio Pedota
- Friends and family
 - Including all of you L/E students

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Appendix A: Lighting Fixtures

Wentz Concert Hall and Fine Arts Center

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Main Lobby

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Type	Description	Manufacturer	Catalog Number	Lamp(s)	Input Watts
F1	Unlensed 42W compact fluorescent downlight with 6" nominal aperture, white trim, and wheat reflector	Kurt Versen	P927DM-120-W-WT	(1) F42TBX/827/A/ECO by GE	43.2
F2	Unlensed 26W compact fluorescent downlight with 6" nominal aperture, white trim, and wheat reflector	Kurt Versen	P626DM-120-W-WT	(1) F26DBX/827/ECO4P by GE	26.4
F3	Unlensed 42W compact fluorescent wall washer with 6" nominal aperture, white trim, and wheat reflector	Kurt Versen	P953DM-120-W-WT	(1) F42TBX/827/A/ECO by GE	43.2
F4	Unlensed 18W compact fluorescent wall washer with 4" nominal aperture, white trim, and wheat reflector	Kurt Versen	P919DM-120-W-WT	(1) F18TBX/827/A/ECO by GE	21.3
F5	Shielded 3' T5 wall sconce with diffuse white acrylic panel	Lightolier	48022ALU-21W-120	(1) F21W/T5/830/ECO by GE	25
F6	Continuous diffuse LED strip light with dimmable driver	Birchwood Lighting	JAKE-325-TR-1-HF2N-H-30-CRx-120-CU	54 3000K LEDs per 10" section	5 W/ft

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Concert Hall

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Type	Description	Manufacturer	Catalog Number	Lamp(s)	Input Watts
F6	Continuous diffuse LED strip light with dimmable driver	Birchwood Lighting	JAKE-325-TR-1-HF2N-H-30-CRx-120-CU	54 3000K LEDs per 10" section	5 W/ft
F7	Top relampable 250W PAR38 halogen downlight with white trim	Kurt Versen	C7302-W-WT	250PAR38HALFL30 by Sylvania	250
F8	Top relampable 90W PAR38 halogen downlight with white trim	Kurt Versen	C7302-W-WT	90PAR/FL25XL-EG by GE	90
F9	Top relampable 75W PAR30 halogen downlight with white trim	Kurt Versen	C7301-W-WT	75PAR30/H/FL35 by GE	75
F10	Linear LED neon-replacement with diffuse white light guide and dimmable driver	GE	GEWwxNLE1-30K-A	3000K LEDs	3.39 W/ft
F11	LED steplight with black front-plate, fully shielded aperture, and dimmable driver	Cole Lighting	L-2158-BLK	6W 3000K integrated LED	8

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Facade

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Type	Description	Manufacturer	Catalog Number	Lamp(s)	Input Watts
F12	Color changing linear LED fixture with 30x60 degree beam distribution in 2' nominal lengths. IP66 rated for outdoor use	Color Kinetics	123-000030-03	RGB LEDs	35
F2	Unlensed 26W compact fluorescent downlight with 6" nominal aperture, white trim, and wheat reflector	Kurt Versen	P626DM-120-W-WT	(1) F26DBX/827/ECO4P by GE	26.4
F13	Wall mounted LED grazer with 10° up and down beams	Beta-Calco	66-2201	(2) 3800K white LEDs	4.5
F14	Wet rated cylindrical up/downlight, wall mounted with convex lens	Delray Lighting	242-BM-CUV8242.1E-WL	(2) F42TBX/830/A/ECO by GE	43.2

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Rehearsal Room

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Type	Description	Manufacturer	Catalog Number	Lamp(s)	Input Watts
F15	Recessed linear T5 fixture in 4' lengths with low iridescent louver	Peerless Lighting	LAR9-28T5-LDL-U4-120-C200	(1) F28W/T5/830/ECO by GE	26.8
F16	Adjustable asymmetric CFL wall washer with lockable angle and semi gloss white finish	Winona Lighting	LS8-CFM142-120-P1-SGW-X-STD	(1) F42TBX/830/A/ECO by GE	43.2
F17	Semi-recessed asymmetric CFL with semi gloss white finish	Winona Lighting	LSRU-LR-CFM142-120-P1-SGW-X-STD	(1) F42TBX/830/A/ECO by GE	43.2
F18	Unlensed 42W compact fluorescent downlight with 6" nominal aperture, white trim, and wheat reflector	Kurt Versen	P927-120-W-WT	(1) F42TBX/830/A/ECO by GE	43.2

Wentz Concert Hall and Fine Arts Center

Will Lesieutre

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Appendix B: Power Density

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Type	Quantity	Watts/Fixture	Type Total	Notes
F1	83	43.2	3585.6 W	
F2	40	26.4	1056 W	
F3	2	43.2	86.4 W	
F4	29	21.3	617.7 W	
F5	2	25	50 W	
F6	73 ft	5 W/ft	365 W	Decorative

Area: 7,167 ft²

Power Allowance: 2.0 W/ft²

Total lighting power (kW) 5.40 kW

Space power allowance (kW) 14.334 kW

Total decorative power 0.365 kW

Space decorative allowance 7.167 kW

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Concert Hall

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Type	Quantity	Watts/Fixture	Type Total	Notes
F6	14	250	3500 W	
F7	7	90	630 W	
F8	24	75	1800 W	
F9	654 ft	5 W/ft	3270 W	Decorative
F10	280 ft	3.39 W/ft	949.2 W	Decorative
F11	22	8	176 W	

Area: 5,921 ft²

Power Allowance: 2.43 W/ft²

Total lighting power (kW) 6.106 kW

Space power allowance (kW) 14.388 kW

Total decorative power 4.219 kW

Space decorative allowance 5.921 kW

Wentz Concert Hall and Fine Arts Center

Will Lesieutre

Facade

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Type	Quantity	Watts/Fixture	Type Total	Notes
F12	37	35	1.295 W	

Illuminated Length 403 ft
Power Allowance 3.75 W/ft

Total lighting power (kW) 1.295 kW
Façade power allowance (kW) 1.511 kW

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Type	Quantity	Watts/Fixture	Type Total	Notes
F15	15	26.8	402 W	
F16	10	43.2	432 W	Decorative
F17	12	43.2	518.4 W	
F18	20	43.2	864 W	

Area: 2,045 ft²

Power Allowance: 1.24 W/ft²

Total lighting power (kW)	1.784 kW
Space power allowance (kW)	2.530 kW

Total decorative power	0.432 kW
Space decorative allowance	2.041 kW