

Lighting/Electrical Proposal

AE 897G AE Thesis

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Lighting/Electrical Option

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Wentz Concert Hall and Fine Arts Center
171 E. Chicago Avenue
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Executive Summary

The Wentz Concert Hall and Fine Arts Center is a part of North Central College, in Naperville Illinois. It provides the college with a 605-seat auditorium, a black box theater, offices, and other spaces. My work for the spring semester will include a lighting depth of finalizing lighting designs for the facade, main lobby, concert hall, and rehearsal room with the objective of making the building welcoming to both visitors and students. My MAE study will be an analysis of daylighting in the main lobby performed using Radiance.

The electrical depth will include recircuiting the four spaces where I have designed lighting, a limited short circuit analysis, a comparison of a centralized transformer for 208 and 120V loads to the existing distributed transformers, and a proposal and analysis of a photovoltaic array.

The acoustical breadth will consider alternatives to the curtains used for acoustical control in the auditorium, with an architectural depth analyzing other changes to unify the auditorium's design with the new acoustical solution.

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Background

The Wentz Concert Hall and Fine Arts Center, completed in 2008, is a new architectural showpiece at North Central College in Naperville, Illinois. Its primary function is to house the Wentz Concert Hall, a 605-seat space with high-end acoustics. Additionally, the building includes a black box theater, art gallery, rehearsal room, offices, and music practice spaces.

Lighting Depth Proposal

The lighting depth work will consist of fully developed lighting designs for four of the building's spaces: the façade, main lobby, concert hall, and rehearsal room. The designs will be based on schematic lighting designs completed during AE 481, which will be further refined based on comments from the panel of lighting designers, and tested to confirm that they meet the requirements defined in Technical Report 1.

The main objective of the new lighting designs will be to create welcoming spaces, which will help bring guests back to the concert hall, as well as serving as a recruiting tool for potential applicants to North Central College.

Designer Comments

Overall

- Renderings sometimes appear washed out. Be sure to show contrasts between materials, or clients won't understand the appearance of the spaces.
- Focus on feeling of the space, also show how it meets other criteria.
- Large pictures make an effective presentation, but overlaid text should have a more opaque background.

Façade

- Make it about special events at night.
 - The colored uplight component will highlight this.

Main Lobby

- How else could the signage be lit? Backlighting would be another option.
- Reverse the order of images, the portion with the curtain wall is the focus of the lobby, and should be highlighted in the presentation.

- Include more contrast here, if everything is lit nothing will stand out
- What direction does the glass face? Consider daylight and electric lighting with daylight harvesting.
- This is an expensive space, how can the lighting best showcase it?

Concert Hall

- Mentioned shadowing on side walls. Address this more fully: what shadows are you trying to avoid, and how?
- Linear design option is the most interesting, and works well with the architecture. It could include more lights than the rendering shows.
 - Consider source type options. Probably LED for fluorescent. How is it built into the architectural elements?

Rehearsal Room

- The uplights for the second floor should help the space feel bright, as well as adding some visual interest.

Facade (outdoor space)

The building's facade should draw guests' attention, and help to identify the building as a landmark, since many guests will not have seen it before. However, a large portion of its recognizability comes from the light in interior areas, particularly in the main lobby. In order to preserve contrast between the inside and outside of the building, I will avoid lighting entire facade surfaces near the curtain walls. Instead, they will be selectively uplit, with some edges framed by narrow beam LED grazers. A colored wash on the upper enclosure of the concert hall will mark the building at night during events, making it identifiable from a distance.

Main Lobby (circulation space, MAE)

The main lobby serves several functions: a circulation space, a gathering area, and part of the building's identity from outside. Above the balcony level, large metal lettering marks it as the Wentz Concert Hall, and will be lit either by spots or backlit to ensure visibility through the curtain wall.

The balcony and lower level have warm wood walls, which will be lit with a scalloped pattern to create visual interest on the wall toward the concert hall. General

downlighting provides illumination for congregating and circulation, with important destinations marked by wall washers.

As part of the MAE requirements, the main lobby work will include an analysis of daylighting performed using Radiance techniques learned in Flux Transfer Theory.

Concert Hall (special purpose space)

The concert hall is an unusually shaped room, with a lot of architectural horizontals. The proposed lighting scheme will accent these, using linear strip and cove fixtures to create bright horizontal lines. General illumination is provided by incandescent downlights from the upper ceiling, where high intensity dimmable lights are required.

Safety lighting for movement in the aisles comes from linear LEDs along the walls near the floor. These fixtures will be shielded so that they are not directly visible, even when seated.

Dimming will be a critical component of the lighting in this space, and fixtures will be selected that can dim smoothly to a minimum of 1% brightness.

Rehearsal Room (large work space)

The rehearsal room is a relatively large two story space on the lower level, and is used as a music classroom as well as a rehearsal space. The most important features here will be lighting for the whiteboard and on music stands that can be used anywhere in the space. There is no fixed furniture; the space is used with movable chairs and tables.

Lighting will come partly from ceiling downlights, and partly from linear wall washers in the overhang between the lower and first floors. The reflected light from the walls will increase the vertical illuminance on sheet music, while being diffuse enough that it can't be easily shadowed. Uplights above the overhang make inverted scallops on the upper walls and keep the ceiling bright.

Electrical Depth Proposal

Relit Spaces

Facade

The exterior of the building, which has relatively few externally lit portions. A large portion of the facade is curtain walls, looking into the main lobby and the black box theater lobby.

Existing lighting is very limited, including only downlights at the building entrances. The proposed lighting solution will add several uplights, small LED fixtures, as well as a color changing wash of the top of the concert hall enclosure.

Main Lobby

The main lobby is a long space, with the part adjacent to the entrance giving access to the coat check, box office, and art gallery, while the portion with the curved curtain wall serves as a gathering space and path to the concert hall seating and the other parts of the building.

The current lighting scheme uses track lighting to illuminate the floor and walls, with suspended spotlights used to light the large lettering. My proposed design will use recessed downlighting, and may incorporate LED backlighting of the signage.

Concert Hall

The current concert hall design has general illumination from a series of recessed downlights in the ceiling. Walls are accented using incandescent socket strips, which will be replaced by linear LED or fluorescent fixtures in my design.

Rehearsal Room

The rehearsal room uses downlights from an overhang between the two floors, with more downlights in the center of the upper ceiling. Parts of the ceiling are lit by upward facing spotlights, while more spotlights aim at a low angle to increase vertical illuminance.

The redesigned layout will use fluorescent wall washers on the first floor, and uplights from the overhang to brighten the ceiling. Some general illumination still comes from downlights, and more horizontal lighting may be needed to meet illumination needs.

Short Circuit

The short circuit analysis will cover a path from the service entrance through the main switchboard, T1-TLDP-1, and 1-TLDP-1, to SP-1.

Depth 1: Photovoltaic Array

For my first electrical depth, I will explore the possible addition of a photovoltaic array to the building's electrical systems. It will likely be roof mounted, but other locations may be considered.

Depth 2: Central versus Distributed Transformers

The Wentz currently uses five transformers to supply 208Y/120 V to miscellaneous loads throughout the facility. I will study the cost, efficiency, and other implications of replacing these five transformers with a single transformer to meet all 208V and 120V needs.

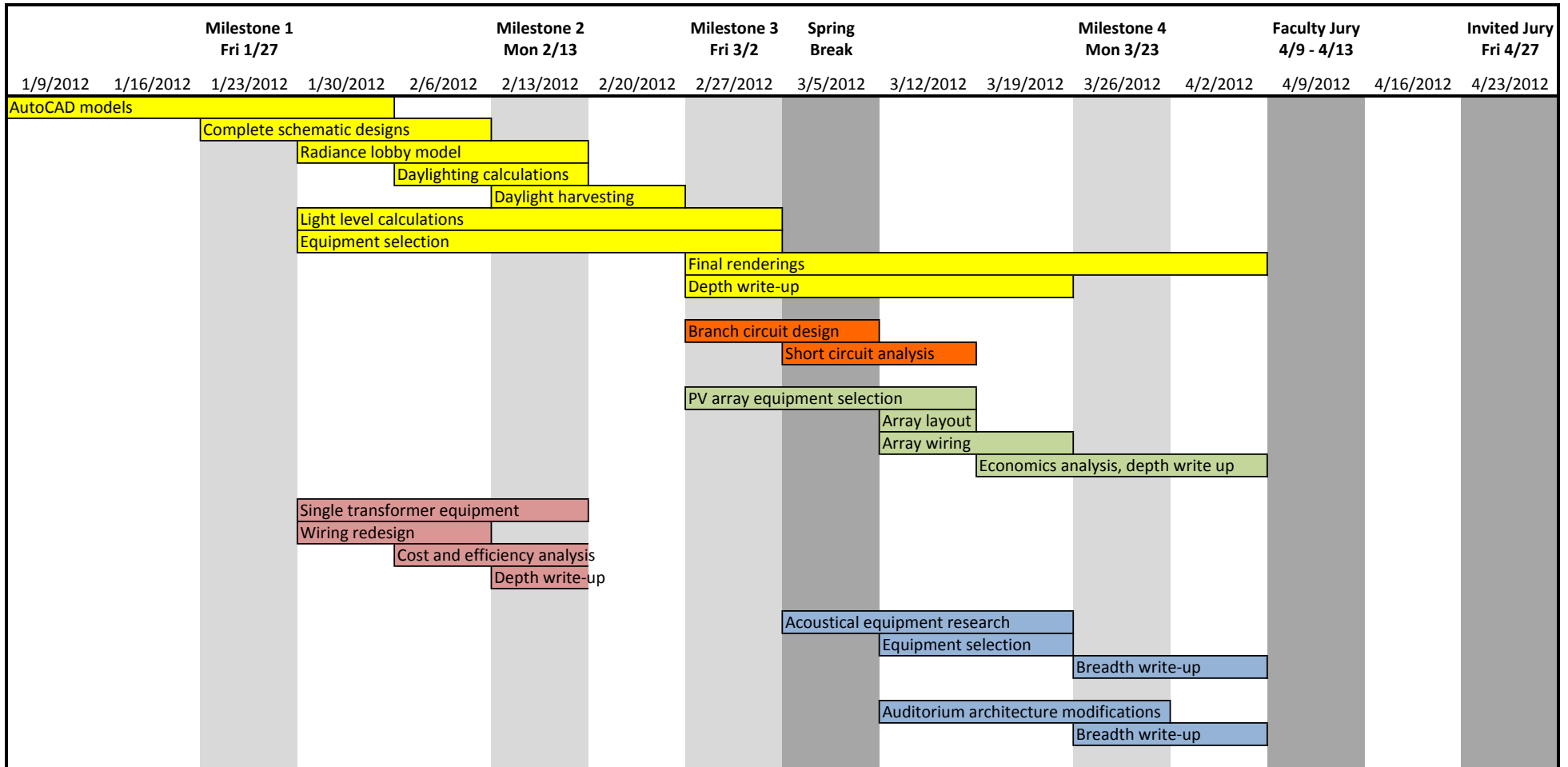
Acoustical Breadth Proposal

The acoustical depth will look at the concert hall, and acoustical control alternatives to the curtains used throughout the auditorium. This will be done with a focus on preserving the clean geometric forms of the concert hall architecture.

Architectural Breadth Proposal

Some architectural changes will be made to better work with the proposed acoustical and lighting changes in the concert hall. This breadth will allow for changes to the auditorium's architecture as needed so that it can be better lit by my new lighting scheme, and so that the architecture is as unified as possible with the new acoustical solution and lighting design. Specifically, this will entail the modification and addition of a number of horizontal elements to the space to be used in the lighting scheme. The design will be based on Scheme 2 from Tech Report 3, but taken further with more effective locations for lighting designed into the walls throughout.

Spring Schedule



Milestones

- 1 Complete 3D AutoCAD models
- 2 Complete transformer redesign depth
- 3 AGI calculations and equipment selection complete
- 4 Lighting depth and acoustical depth completed