



Thesis Proposal

The Frederick College of Cardiology

Arlington Heights, IL

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Lighting/Electrical

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Executive Summary

The Frederick College of Cardiology is a mainly an education facility for physicians and physicians in training. This building houses an education center and an auditorium where conferences and seminars are held. The concept for my lighting design stems from the complexity of the human body in the sense that it is made of many diverse parts that work together to form the whole being. Architecture is similar to the human body in this way because of its many forms and materials, which combine to form the places that we inhabit. My lighting design will highlight this similarity between the parts of the human body and the parts of architecture and will make you feel that you are within a complex system. I will focus on redesigning the following four spaces:

- i. Building Façade and Grounds
- ii. Lobby (3 schematic designs)
- iii. Open Office
- iv. Auditorium

I will begin to bring my schematic design further towards design development in the spring semester as I hash out my lighting layouts, design energy consumption to meet IES/ASHRAE joint Standard 90.1 and ensure my designs meets prescribed illuminance levels. My electrical depth will focus on the design of a Photovoltaic panel system which can supplement conventional electrical energy usage during peak daytime hours. I will calculate the benefit vs. cost for this system to determine its feasibility. I will also redesign lighting and distribution panel sizes to respond to changes in electrical loads.

For my first breadth topic I will perform a detailed energy usage simulation of the Lobby. I will test different fenestration types to compare their varying energy saving abilities. A cost analysis will be performed to see if using higher efficiency glass is economical.

My second breadth topic will be an acoustic study of the auditorium before and after redesigning the ceiling. I will compare any significant changes in the acoustics and I will ensure that the new ceiling does not create an unsuitable acoustic environment.

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Building Information

Name: *The Frederick College of Cardiology Building*

Location: *Arlington Heights, IL*

Occupant: *The Frederick College of Cardiology d*

Type of Building: *Office, Professional Learning Facility*

Size: *48,500sf*

Number of stories above grade: 2

Primary Project Team

Owner - The Fredrick College of Cardiology

Architect - Perkins and Will

General Contractor – Pepper Construction Company

MEP – WMA Consulting Engineers

Lighting Depth

My redesign for the Frederick College of Cardiology will focus on the exterior and grounds, the lobby, open office and auditorium. These four spaces are the main event and main work spaces in the building. I believe these spaces will have the greatest visual impact and can be used to positively influence a visitors' experience. The schematic design solutions, which I have developed, will be implemented and worked out with the final product being a full set of construction documents which will comply with codes and regulations (Standard 90.1).

Concept

The most important function of The Frederick College of Cardiology is its training for physicians. A special manikin with life like features and internal parts is used for physicians to practice procedures upon. These activities mostly occur in the education wing where special rooms are set up to imitate the operation room, but also demonstrations are conducted in the auditorium.

The human body is the focus of the occupant and this should be reflected in the way the lighting design accentuates the architecture of the space. One of the most striking things about the human body and one that doctors must frequently deal with is the diverse number of separate parts that come together to function as a body. These parts are all very different and perform their own unique functions but still come together to form the most complex and deep phenomenon which is life. Architecture is also a combination of many materials and forms that join together to create the spaces in which we inhabit. The lighting design for the four spaces will reflect the coming together of separate parts and the wholeness which is created. The architecture will be perceived as continuous and the occupant will feel the synergy of separate parts in the design of the building.

i. Exterior

The exterior of the college is very long and narrow. Being only two stories high, the exterior takes on a low profile and fades into the ground naturally. The building's lines are very angular with a very slight curve in plan on the southern wing. The parking lot leads up to an outdoor walkway and seating area near the main entrance to the building. Lighting this path and outlining the form of the building are goals of greatest importance.

Lighting to the exterior façade will be fairly minimal. The internal illumination from the building will shine out from the extensive fenestration along both sides of the southern wing and lobby. The only exterior lighting will be a soft wash of light upon the aluminum fascia which runs the length of the building. This fascia exists in multiple planes and ties together the

southern façade and terrace with the east and west facades through a strip of light. This lit surface will reveal the extents of the architecture and will help orient the visitor. Marker lights and down lighting under the terrace will be employed for way finding. Stone walls along the pathway will be grazed to show their texture. Light levels will begin to increase as one nears the building - drawing the visitor to the inside. The lantern effect from interior lighting will be inviting.

The design will be in compliance with specific local ordinances. Fixtures will be below a 90 degree cutoff angle. Luminance on the façade must be minimal. The residential surroundings necessitate a curfew that dictates when non-essential exterior lighting must be extinguished.

ii. Lobby

The lobby is the central hub of the college as it leads visitors to the education wing, auditorium, and office space. A memorable and visually interesting experience will be created in this space. Light will also be used to aid in way finding and orientation by increasing light levels on objects and pathways. Visual comfort is considered for individuals entering the building and waiting in the seating area. The lobby will be lit by daylight the majority of the day and this is considered in the design and control narrative for the space. A daylight study will be performed to determine sunlight's contribution to this space. Three schematic designs have been developed for lighting the lobby

SD 1 - Light Circles

Beginning at the entrance of the building, light circles will form paths through the lobby. They will lead to the reception desk, the seating area, the stair case and the education wing. Near the seating area the circles will proceed up the wall and will continue on the vertical glass surface along the seating area. The circles cover multiple surfaces in different planes showing how these two planes come together to form a whole living environment. The individual circles will join together to form a continuous pathway to destinations. The glass wall will appear inviting and mysterious as the circles will be illuminated by a hidden source behind the glass. Relatively warm color temperature (2700K) will be used to highlight color tones of wood and stone finishes.

SD 2 - Color Wall

The color wall concept will be powered by digitally controlled linear RGB fixtures illuminating the glass wall in the lobby. The fixtures will shine into a light box behind the wall which will then reflect the light through the glass into the room. The different changing colors will slowly flow by and will create a calm, relaxing atmosphere. The individual colors are the parts of white light that we see every day. Seeing them separated is strange but reveals how what we see is the combination of much more complex ingredients. The color will be bright enough to illuminate faces and features of visitors in the seating area. The lobby desk front panel and water feature will also use color in a similar fashion to lead people through the space. The water feature will reflect the color in its movement and will create playful dynamic shadows on the underside of the steps.

SD 3 - Liquid Light Show

This design will employ a projector system to create an organic and changing pattern on the floor of the lobby. This pattern may look like something you would see under the microscope when looking at the human body. It is meant to represent a small part of the body blown up to huge proportions. The projector will either display a digital video or it will shine through a physical media to create the desired images. One or several projects may be used to achieve this effect. The liquid lightshow will be a memorable experience for visitors. Additional lighting will highlight the front desk, seating area, and pathways to other functional areas.

Open Office

The open office is located on floors one and two of the southern wing of the building. Lighting must be designed with the desk worker and his comfort in mind. Direct glare from fixtures or the sun will be avoided although outdoor views will be accessible for relaxation. Daylight will be utilized to supplement artificial lighting during daylight hours. Building-length fenestration will let in daylight controlled by an automatic shading system. The office space will feel open and spacious due to the structurally exposed ceiling system. The deconstructed open ceiling will reveal the different parts of the structure and how they fit together. Ceiling panels will only be situated in two rows down the length of the space. Panels near the window will be effective in reflecting daylight farther into the space. Task lighting and down lighting will be used to create a suitable work plane illuminance. Up lighting will be located in the ceiling creating a spacious feel and providing general ambient illumination.

Auditorium

The auditorium is connected to the main lobby and accommodates around 160 people for lectures and demonstrations. The ceiling will be redesigned in this space to create fins that gradually increase in vertical slope as they move toward the back of the room. The fins will extend across the room parallel to the front of the room. There will be a break in the middle of the fins to accommodate a sky-fold wall to separate the auditorium into two sections that will be controlled individually.

The sloping fins make the ceiling appear deconstructed and will house linear fluorescent fixtures between the recesses in the panels. This will create a spacious feeling as light will be emanating from a hidden source behind the panels edges. The lighting will create ambient general illumination in the space. The panels will extend downward in the back of the room directing your attention forward. The walls will also be generally illuminated to increase the spacious feeling. Recessed down lights will be used to illuminate surgical demonstrations in the front of the room but must not wash out the A/V screens. Recessed down lights will be used throughout the space for task illumination.

Designer Comments

Mike Barber

- Convey overall concept more clearly and show how it relates directly to each space. "I want to explicitly know how everything fits together"
- Didn't get the concept
- Don't worry about outdoor up light on facade
- Mention schedule of the building in the presentation when discussing lobby
- Stick with one perspective view for the lobby
- Visual plane in office to cluttered/should be made more simple for visual comfort

Charles Stone

- Also didn't get the concept
- Great last slide
- Make sure you cite where images came from
- Up lighting façade likes the idea
- Likes graphical style
- Make sure you talk about what is on the slide shrink the rendering and put fixtures on the side
- Add plan/section/elevation to images
- Inverse sketch to be consistent graphically
- Daylighting through shades in lobby won't work with sun angle/time of day
- Office: like circles/be careful about wattages
- Rotate ceiling in auditorium to give visual brightness to front of room
- Be careful of scallops at front of auditorium
- Treat cove lighting as decorative allowance on color wall

Electrical Depth

The electrical depth portion of my thesis project will first respond to changes in loads and other electrical requirements due to new lighting designs for the four spaces. This will include calculating new total electrical loads, resizing wiring and panel boards, and redesigning branch circuits. Changes in fixture type and placement and changes to some control systems will make it necessary to redo these calculations. A copper feeder versus aluminum feeder study will also be performed.

In the second part of my electrical depth I will focus on the design of a photovoltaic panel system to supplement purchased electrical power for the building. The system capacity will be determined based on building load and a return on investment cost analysis will be performed.

Mechanical Breadth (#1)

For this breadth topic I will perform a detailed energy analysis of the lobby to maximize energy efficiency and economy. The lobby has only two outdoor facing surfaces which are both completely glass. Different types of glass will be tested to determine which type could be used to save the most energy without being cost prohibitive.

Acoustic Breadth (#2)

In this acoustics breadth I will evaluate how changes in the auditorium ceiling will affect the acoustics of the space. The ceiling will be redesigned to accommodate the new lighting design. The flat ceiling will be separated into panels that gradually slope down as they near the rear of the auditorium space. I will calculate the reverb time of this new design, compare it to the old design, and reference common acoustic benchmarks to determine the acceptability of the new conditions. If measurements are out of the common ranges I will provide solutions for creating an acoustically acceptable space.

