Thesis Proposal

Cassandra Watson | Lighting + Electrical
Electrical Advisor | Professor Dannerth
Lighting Advisor | Dr. Mistrick
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Executive Summary

The lighting redesign of Franklin Square Hospital Center focuses on four spaces: the emergency department lobby and waiting area, a team station, the gift shop and the main entrance and parking lot area. The hospital's main goals evolve around patient care. The lighting design of these spaces will reflect this main goal as well as other concepts that were influenced by lighting design professionals.

The electrical depth consists of a redesign of the branch circuit distribution within the spaces to be re-lighted. A short circuit analysis of a distribution panel will be performed. A comparison and cost comparison of copper vs. aluminum feeders will result in a recommendation for the project. Cost comparison of energy loss vs. increased feeder size will also be evaluated.

A mechanical breadth on the east facing façade will be performed. A new curtain wall material will be implemented to recalculate and consider if positive results occur. An acoustics breadth of the reverberation time will be calculated in the pediatrics waiting room. The materials will be changed accordingly and recommendations on the new design will result.

Background

The Franklin Square Hospital Center is medical institution that provides healthcare to the people of the Baltimore area as well as visiting patients. A new 356,000 square feet addition includes a six floor patient tower atop of new emergency and pediatric emergency departments.

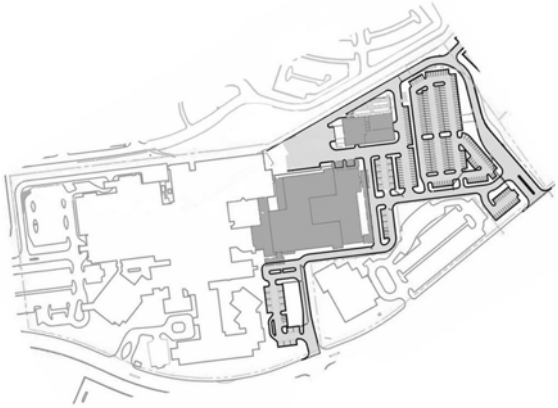

Fig. 1: Patient tower and emergency department addition shown in gray

Emergency Department Lobby and Waiting Area | Ground Floor

The first area the patients see when they enter the emergency department is the lobby and reception/security desk. Paperwork will be filled out and directions will be given to the patient. The waiting areas and pediatric waiting areas are located adjacent to the reception desk. Ample seating is located against the walls of the space.
Compact fluorescent downlights are located throughout the space in a very uniform design. Task lighting is found at the reception/security desk to provide further illumination. Proposed luminaires include indirect pendant fixtures with additional downlighting where needed for circulation. Linear fluorescent wall wash fixtures will be incorporated into the design as well as task lighting for the reception/security desks. A psychological impression of relaxation is desired.

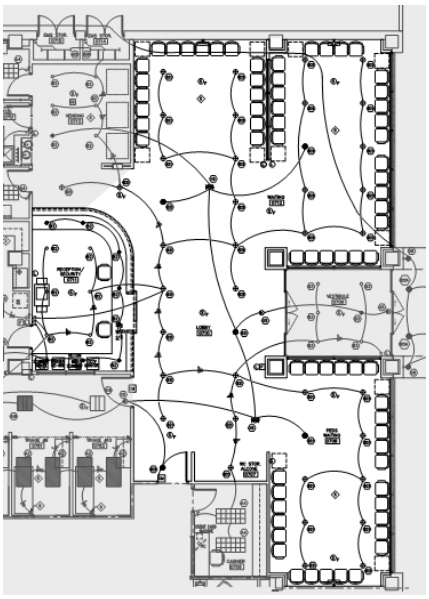

Fig. 21: Emergency department lobby and waiting area floor plan, not to scale (dwg. E04.0A)

Team Station | Ground Floor

The team station is located with the emergency department and is responsible for 12 treatment rooms. The station is a work area for many doctors and nurses twenty four hours a day to organize and file patient information and documents. Partition walls are 4.5 feet tall allowing for visual connects between patients and nurses.

A corridor surrounding the team station is illuminated with direct/indirect 2x2 fluorescent fixtures. The luminaires in the team station are parabolic 2x2 fluorescent fixtures. Proposed Lighting will incorporate a linear fluorescent cove fixture around the inside of the team station in addition to task lighting for the desk space throughout the station.

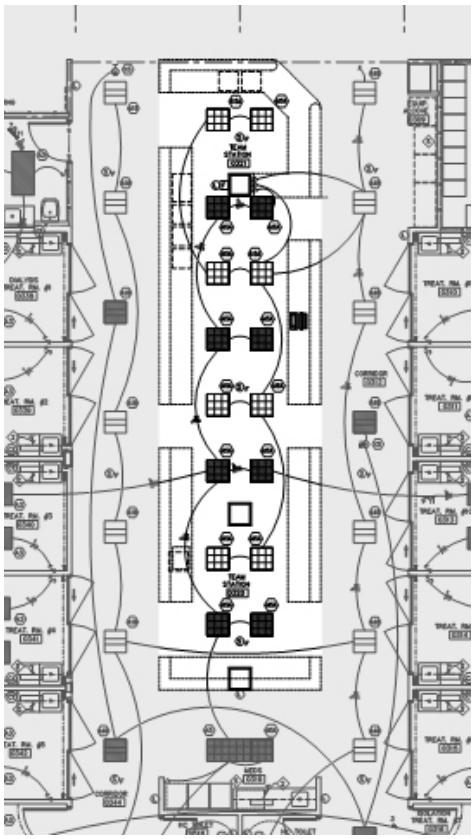

Fig. 2: Team station floor plan, not to scale (dwg. E04.0H)

Gift Shop | First Floor

A variety of different items are found within a hospital gift shop including flowers, stuffed animals, cards and balloons. All of these items are displayed on tables on the floor or on shelving units located along the walls. Centrally located in the space is a check out area. Along the eastern wall, a show window is located between the gift shop and the main entrance lobby.

Existing luminaires within the space include compact fluorescent downlights and MR16 track mounted fixtures. Proposed luminaires in the space include pendants, task lighting for the check out area and track mounted fixtures to highlight the display tables and shelving units.

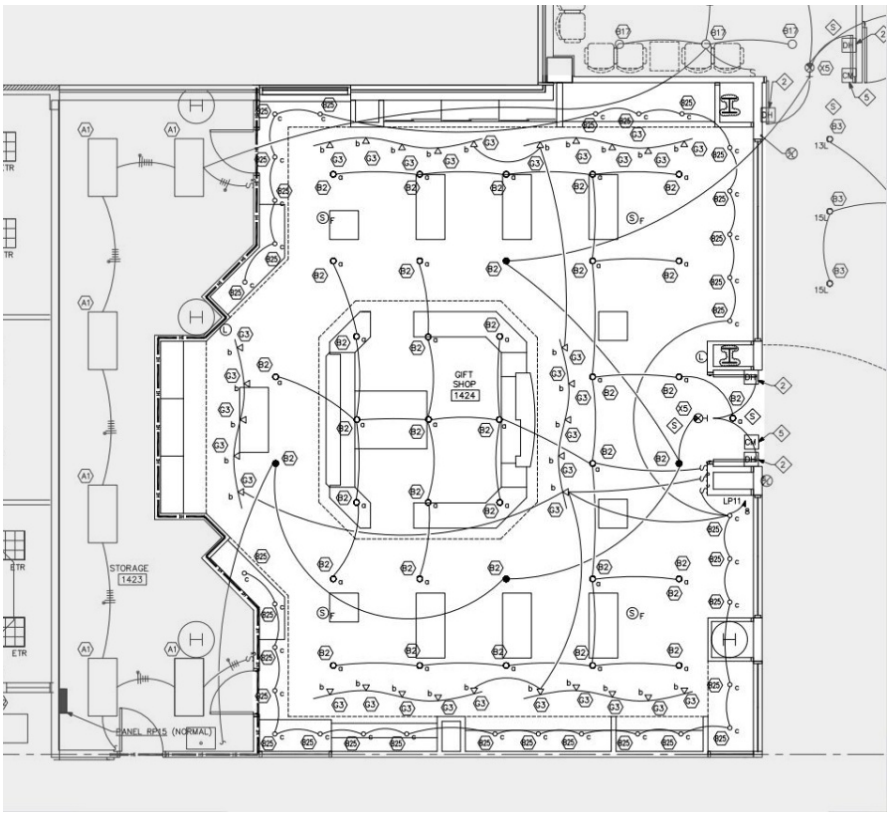

Fig. 12: Gift shop floor plan, not to scale (dwg. E4.1G)

Main Entrance and Parking Lot | Exterior First Floor Entrance

A small seating area and walkway are located in the middle of the parking lot. In this area, the existing design calls for fluorescent bollards, and metal halide spot lights. Proposed Luminaires include fluorescent bollards and metal halide wall washing fixtures.
Pole mounted metal halide luminaires will provide illumination to the parking area and roadways.
A canopy stretches along the façade of the entry way to provide pathway illumination for pedestrians. The existing luminaire sources incorporated in the canopy are cold cathode cove and fluorescent sconces. The proposed sources are white LEDs strip luminaires and fluorescent sconces.

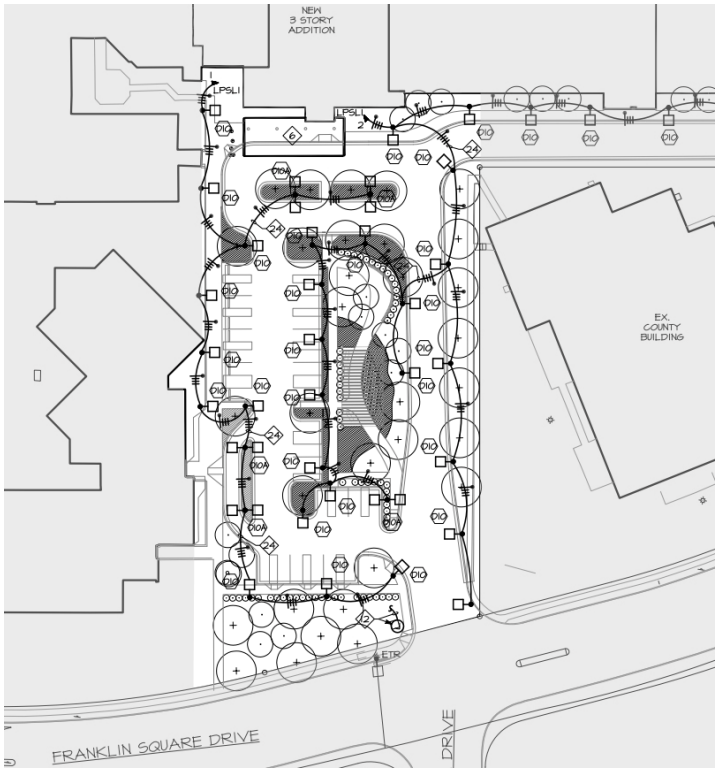

Fig. 31: Main entrance and parking lot site plan, not to scale (dwg. E02.SB)

Lighting Depth

Overview

Franklin Square Hospital Center Addition is a major project that will improve the high-quality hospital. The hospital protocol focuses on the patients needs as an overall goal. Green building starnards were not of any focus but should be incorporated into the redesign. The existing lighting conditions that will be addressed include three specified area within the space and one exterior space. By using the IESNA Handbook, ASHRAE Standard 90.1 and the LEED Accreditation Requirements, the redesign of the space will be more efficient and sustainable.

Lutron Comments

Lee Brandt

- Show floor plans to describe the different floors, first vs. second
- Not as many map plans are necessary
- Show the spaces vertically using sections and sketches
- Make sure there is proper illumination for reading at the reception desk
- In a plan view, show which way cove lighting is aimed and show this in section as well
- Extend the team station so the surrounding hall luminaires can be seen. These will contribute light into the space and need to be considered.
- Patients will not be in the gift shop
- Look at the flexibility of the gift shop
- Use less luminaires in the parking area
- Show the curtain wall at the main entrance illuminated at night
- Take advantage of the vertical brick wall and eyebrow around glazing on the façade.

Kari Nystrom

- Project more confidence while presenting and look less at the screen
- Don't use a site plan when showing interior spaces
- Continue the main goal – Patient Care – throughout the presentation
- The team station was similar to the architects rendering so come up with a different design

Luke Tigue

- Thanks for a brief presentation
- The design concept sounded like a concept for an emergency wing but there were no design concepts or statements
- Tense vs. relaxed – since tension is not desired in the waiting area the expectations for relaxation should be met
- The pediatrics waiting area should be considered because children perceive the space differently than adults
- During the relaxed scene, visual clarity is mentioned but this is an entirely different Flynn impression.
- Consider the relationship between the wall and horizontal lighting schemes
- What out of the 3 concepts is part of the outcome?
- Expand the gift shop floor plan to see the surrounding spaces

Solutions

Emergency Department Lobby and Waiting Area

Focus will be brought to the psychological impression of relaxation. To achieve this, design concepts will need to be addressed for the different areas within the space. The perimeter walls will be non-uniformly illuminated to create a perception of a larger space and visual interest. Indirect and direct luminaires will be incorporated into the lighting design within the waiting areas. The waiting area and the pediatrics waiting area will both need to be looked into and designed specifically for the needs of the occupants. One wall is entirely covered with a mural that will be taken into account. The reception and security desk will require addition task lighting. Part of the wall behind the desk will be illuminated using a wall wash luminaire to highlight the piece of artwork that is there.

Team Station

The team station needs to be addressed for two different scene; day and night. The hallways and patients rooms surrounding the team station will be looked into. The light from the surrounding spaces will affect the team station because light can penetrate the space over the partition walls and between the circulation pathways. Task lighting will be placed over the desks and work alcoves to provide adequate illumination.

Gift Shop

The gift shop environment should be pleasing and aesthetically welcoming to friends and family of the patients. Task lighting over the check out area will provide added illumination for the employees. Shelving containing merchandise will be vertically illuminated by use of adjustable track fixtures. These fixtures will also be used to highlight the items for sale on the tables. Cove lighting will be incorporated into the redesign of the ceiling architecture to create a more appealing lighting design. Pendant fixtures will be incorporated into the space to catch the eye of people and draw them into the space. Display windows will be illuminated with multiple downlights in each window. Throughout the space, lamps of high CRI will be implemented.

Main Entrance and Parking Lot

At night, the main entrance of the hospital must be inviting to patrons. The canopy helps guide the people to the entrance. Vertical and horizontal illumination is a key design element for the canopy. Sconces and downlights will be incorporated to provide adequate pathway illumination in addition to the interior glow of the three story atrium space adjacent to the canopy. Pole mounted luminaires will be located throughout the parking area for safety and security reasons. Higher than normal footcandle levels will be implemented because visitors of all ages come to the hospital.

Solution Method

Integrating the comments and proposed solutions the design process will precede by ways of hand sketching, computer software and research. Conceptual and schematic designs will be expressed through Photoshop renderings and hand sketching techniques. 3D AutoCAD models will be exported to AGI32 to created more realistic models and renderings of the spaces. Levels of illumination are also calculated and analyzed by use of equipment files and AGI32.

Tasks + Tools

The IESNA Handbook, ASHRAE Standard 90.1, NEC 2008, LEED Accreditation Requirements will be used throughout the design process.

Conceptual and Schematic Design
Hand sketches and Photoshop renders will be produced using the comments from design professionals.

Model Spaces
Using 3D AutoCAD, the spaces will be modeled.

Select Equipment
Chose appropriate luminaires, ballasts, lamps and controls based on schematic design and available products.

Calculations
Illumination calculations will be performed of each space using AGI32.

Renderings
Final renders will be produced through AGI32 by adding proper materials to the model.

Documentation
Accurately document all materials including lighting plans, reflected ceiling plans, renders, cut sheets, and calculation summaries.

Electrical Depth

Overview

The main distribution of Franklin Square Hospital Center is a secondary selective system allowing for multiple paths of supply power. Two service entrances with separate transformers create two radial systems that are connected with a tie breaker. The tie breaker is located on the bus bar and remains open unless one of the feeders fails. When this happens the tie breaker closes and the entire load runs through a single feeder. Both substation feeders are sized to accommodate this increased load. Transformers located in substations step-down the voltage from 13.2KV to 480Y/277V, 3PH, 4W which is run throughout the building. Other transformers step this voltage down to 208Y/120V, 3PH, 4W for mostly lighting and receptacle loads. Three emergency generators fed by a 480Y/277V, 3PH, 4W voltage system are each rated at 2000KW along with another service entrance, supply power to equipment and life safety branches when needed. An uninterruptable power system (UPS) rated at 180KVA/162KW provides 208Y/120V, 3PH, 4W emergency power to the building.

Short Circuit Analysis

An analysis of the short circuit current of the MDP-72 normal distribution panel will be performed. The source providing power to this distribution panel is transformer T-1S2 located in unit substation 2. All items fed by the distribution panel including switchgear and will be analyzed.

Depth Topic 1 | Copper feeders vs. aluminum feeders

Problem
Franklin Square Hospital Center utilizes copper feeders for their electrical distribution system which tend to be

Proposed Solution
Aluminum feeders are typically less expensive than copper feeder therefore a cost comparison of the feeders will be performed.

Methods
The NEC 2008 lists copper and aluminum feeder equivalents. The cost of said feeders will be researched through different manufacturer catalogs.

Tasks + Tools
The NEC 2008 will be utilized throughout this comparison process.

Feeder Equivalents
Determine the equivalent sizes of aluminum wire that will be needed for the building.

Cost Analysis
Determine market values between copper and aluminum feeders and calculate the price difference.

Documentation
Properly document the Analysis and process by use of a spreadsheet.

Depth Topic 2 | Compare energy savings vs. first costs for increasing feeder sizes

Problem
Feeders that are appropriately sized depending on the load that they carry, are usually warm to when touched. This heat is wasted energy that can be saved by increasing the feeder sizes.

Proposed Solution
Calculations will be carried out to find the amount of energy lost. This will then be compared to the cost difference between the increased feeder sizes and the design sizes.

Methods
The energy lost is also the resistance which will be calculated for the feeders of different electrical components such as panel boards, switch boards, and motors. A cost analysis between the feeder and the energy saved based on the BGE utility prices will be documented.

Tasks + Tools

Calculate Energy Loss
The energy loss through the feeders of different electrical components will be calculated using Ohm's law.

Cost Analysis
Analyze the cost differences of the energy saved between the electrical components studied.

Documentation
Create a spreadsheet of the results of the cost analysis.

Breadth 1: Mechanical

An east facing façade of the waiting area receives direct solar gain in the morning hours. The unwanted gain or loss from the building will be calculated for different days during the year. A new façade fritted glass material will be implemented and the heat gain/loss will be recalculated for the same days throughout the year. An analysis of the two materials will be performed and a recommendation will be made.

Breadth 2: Acoustical

The waiting area of any hospital is usually filled with noise created by people and audio visual equipment located within the space. An acoustical study of the reverberation time in the pediatrics waiting area will be performed. A low parameter is desired to absorb the noise within the space. Based on the reverberation time, the material properties in the room can be changes and a recalculation can be carried out. The sound transmission class of the walls will be analyzed and recommendations will be made if changes are necessary.

Schedule

Spring Work 2009		
Week of	**Area of Focus**	**Objective**
Winter Break	Lighting	Finish conceptual/schematic design
		Begin AutoCAD modeling
	Acoustical	Research acoustical and mechanical breadths
January 11	Lighting	Finish AutoCAD modeling
		Export spaces into AGI and assign materials
January 18	Lighting	Begin/finish equipment selection
		Begin AGI calculations
January 25	Lighting	Completion of lobby/waiting areas
	Mechanical	Begin calculations
February 1	Mechanical	Complete Breadth
	Acoustical	Perform calculations
	Electrical	Begin Depth 1
February 8	Electrical	Complete Depth 2
	Lighting	Completion of gift shop
February 15	Electrical	Short Circuit
	Lighting	Update AGI models
February 22	Electrical	Redesign of branch circuits
	Lighting	Documentation
March 1	Lighting	Completion of nurse station
	Electrical	Continue branch circuit redesign
8-Mar	-	Spring Break
March 15	Lighting	Renderings
	Electrical	Complete branch circuit redesign
March 22	All	Documentation
March 29	All	Complete Report
		PowerPoint presentation
5-Apr	All	Final summary report