# Executive Summary

The following report contains a proposal for depth and breadth work that I will complete for my thesis on the Franklin Care Center. Depth work will be completed for lighting and electrical design. I have chosen to focus on the main entrance lobby, physical therapy suite, chapel and courtyard for the lighting depth. The lighting in these spaces will be redesigned to create a residential atmosphere while catering to the visual needs of the elderly. Energy efficiency of the design is imperative to earning LEED points. In the electrical depth I will relocate and increase the number of step down transformers. The feeders will then be resized and the cost of each system will be compared, serving as my construction management breadth work. Since the Franklin Care Center will be a LEED certified building, a LEED breadth work will also be performed. A perimeter control system will be layed out to earn LEED Indoor Environmental Quality Credit 6.1 Controllability of Perimeter Systems.

# Background of the problem

The Franklin Care Center is an existing elderly rehabilitation facility located in Franklin Lakes New Jersey. It is currently in the design phase for an addition and renovation. With the completion of the addition the Franklin Care Center will be approximately 150,000 sqft consisting of 2 stories and a cellar. The Center will include patient rooms, medical facilities, offices, and social spaces.

Patients occupying the rooms of the Franklin Care Center will be elderly, and may not be leaving the Center on a daily basis. It is crucial to design a space that will maintain a comfortable, residential atmosphere. Special needs of the eyes arise with age, consequently these needs must be taken into consideration when designing the lighting.

LEED certification is anticipated for the Franklin Care Center. The lighting and electrical design as well as breadth work should support LEED certification.

# Depth Proposal – Lighting

**Problem:**

The patients of the Franklin Care Center will be elderly. Visual complications arise with age, making the lighting needs for an elderly facility different from those of a typical building. Generally, the elderly suffer from reduced acuity and contrast sensitivity. To compensate for these eye problems increased illumination may be necessary, contrast should be used in hazardous areas, but avoided in general lighting, adjacent spaces should have relatively consistent illumination values, glare should be avoided and daylight should be taken advantage of. Since this will be a LEED certified building, it is imperative that the lighting design be as energy efficient as possible. The lighting design must address issues of the aging eye and be energy efficient while creating a residential atmosphere for the patients of the Franklin Care Center.

**Solution:**

The spaces I have chosen to redesign are the Main Entrance Lobby, Physical Therapy Suite, Chapel and Courtyard. The lighting in these spaces will address the problems associated with the aging eye while creating a comfortable, homey atmosphere for the residents. See Technical Assignment 3 for a full report on the design proposal.

**Solution Method:**

Luminaires will be chosen based on the application, potential for glare, aesthetics, and efficiency. Layout and spacing options will be explored and decided upon using AGI32 lighting calculation software. Daylighting will be taken into account based on the daylight analysis that was performed in Technical Assignment 1. The power density of the space will then be calculated and reviewed based on ASHRAE 90.1. Changes to the layout will be made if necessary to achieve LEED certification. After the layout has been finalized AGI32 will be used to produce high quality renderings to give the owner and architect a realistic idea of the atmosphere that will be created by the lighting. Photoshop diagrams will also be used to clearly show the distribution of light throughout the space.

**Tasks and tools:**

Luminaire selection

- Fixtures will be selected based on aesthetics, photometry, and potential for glare
- Warm color temperature, energy efficient lamps will be specified
- Compatible ballasts will be selected based on controls
- Luminaire information will appear in a fixture schedule

Luminaire Layout
- Calculations will be performed using AGI32 to determine the number and spacing of luminaries to provide the illuminance recommended by the IES for senior living facilities
- Photoshop diagrams will be created to show the placement of light

Modeling
- 3D model of the space will be built in either AGI32 or AutoCAD.
- Luminaires will be added in AGI32 and renderings will be created.

# Depth – Electrical Design

**Problem:**
Power must be provided to lighting, receptacles, mechanical and elevator loads. Service is provided throughout the building at 480/277 volts. Where necessary, transformers are used to step the voltage down to 208/120. These transformers are located in the utility rooms where the voltage is stepped down and then the feeders are run throughout the building. Since this building covers a large area, these feeders run a fairly long distance the wire size may be large.

**Solution:**
The existing transformers will be relocated from the utility room in the cellar, to the rooms where each panel is located. Additional transformers will be added so that the transformer is located directly before the panelboard, rather than having one transformer serves several panel boards.

**Solution Method:**
Two of the existing transformers will be relocated to closer to the panelboards. 10 addition transformers will be added to serve the remaining 208/120v panels that were served by the original two transformers. Wire size, conduit and overcurrent protection will then be resized based on the tables provided by the National Electric Code. This modification in the electrical system will require a greater number of transformers, but will result in smaller wire sizes.

**Tasks and Tools:**
Equipment Location
- Determine the location of each panel served at 208/120v
- Select location where new transformer will be placed

Load Calculation
- Determine the load for each panel that will be served at 208/120v. This will be based on updated electrical drawings, if updated drawings are not available assumptions will be made based on the outdated drawings.

Wire Sizing
- Size conductors based on tables provided in the NEC
- Size conduit based on tables provided in the NEC
- Size overcurrent protection devices

Riser Diagram
- Make modifications to current rise diagram using AutoCAD

# Breadth – LEED

The Franklin Care Center is currently in the design phase and anticipated to achieve LEED certification. Currently, 39 LEED points have been identified by the architect as "likely" to achieve. 39 is the minimum number of points for a gold certified building, so if everything does not go according to plan during the remaining design or construction phases and a point is not obtained, the building will only receive silver certification. 11 LEED points are currently identified as "possible" to achieve. By creating a design to achieve one of these points there is a better chance that the Franklin Care Center will be rewarded LEED Gold Certification.

A perimeter control system will be designed for the Franklin Care Center. An average of one operable window and one lighting control zone per 200 sqft for every regularly occupied area within 15' of the perimeter wall. The addition of this perimeter control system will earn Indoor Environmental Quality Credit 6.1 Controllability of Perimeter Systems. The addition of this point will amount in 40 likely LEED points, and help contribute towards a LEED gold building.

# Breadth – Construction Management

A detailed cost analysis of the existing and desesigned electrical systems will be performed to serve as a breadth work to the design. RS Means will be used to determine the pricing of existing and newly sized feeders, transformers, circuit breakers and distribution boards. These prices will be compared to determine the feasibility of the electrical redesign.

# Spring Semester Schedule

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| Christmas Break | Finalize 3D models for renderings of my chosen spaces |
| Jan 9 - 18 | Fixture selection – Collect all .ies files, cutsheets and ballast information |
| Jan 19 – 30 | Update AGI models with reflectances and textures<br>Run calculations or each space to determine luminaire layout and spacing required to achieve ideal illuminance values |
| Jan 31 – Feb 12 | Calculate new electrical loads<br>Resize feeders<br>Determine cost of additional transformers and newly sized feeders |
| Feb 13 –26 | Make adjustments to mesh size to create realistic renderings<br>Rerun calculations until realistic image in achieved<br>Finalize fixture schedule |
| Feb 27 - March 3 | Create control zones for breadth work<br>Perform cost analysis |
| March 4 – 12 | Spring Break |
| March 13 - 19 | Finalize lighting and electrical plans |
| March 20 - 26 | Finalize realistic renderings |
| March 27 – April 5 | Write thesis report |
| April 1 - 9 | Create power point presentation |
| April 10 - 12 | Thesis presentations |