ST FRANCIS FRIARY

PROPOSAL

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lIGHTING/eLECTRICAL oPTION

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EXECUTIVE SUMMARY

The following proposal develops the scope of work for thesis in the Spring of 2008.
The Saint Francis Friary's current lighting design will be redesigned in four of the main spaces. These include the Library, Foyer, Chapel, and Courtyard. This design will be unified throughout the four spaces with the goal of representing the ideals of the Catholic Church.
The electrical system for the Friary will be redesigned to distribute power throughout the building at 480/277V. This will allow for more efficient mechanical equipment to be used. A new mechanical system that consumes less energy will be researched and designed under the mechanical breadth.
This thesis will also explore the use of a Magnegas system to supply power to the St. Francis Friary. Magnegas technology controls the problem of excess agricultural waste by using the liquid waste to create useful by-products such as green energy.
The construction of St. Francis Friary has been put on hold due to funding. The hopes of this project are to research and develop ideas that may be considered as ways to enhance the existing design.

BACKGROUND

The Saint Francis Friary in Hanceville, Alabama is designed for the use of 20 to 30 friars. A friary is a house or place of residence occupied by a community of persons living in seclusion under religious vows. The site was cleared October of 2006. The project was put on hold but is predicted to continue during the summer of 2008.

The building consists of a variety of spaces laid out on two floors. The first floor has offices, a conference room, refectory, and the double heighted chapel. Extending from the chapel is an exterior courtyard where twelve stations of the cross are positioned along an outer walkway continue the design to the exterior. The second floor has bedrooms, referred to as “cells”, a gathering space, music room, laundry room, and study.

DEPTH 1| LIGHTING

CURRENT SOLUTION:

The interior lighting, comprised of incandescent and fluorescent lamps, provides a warm and welcoming appearance to the spaces. The bronze finished fixtures give the atmosphere a rustic and antique feel. The exterior lighting uses metal halide to provide a crisp and cool light to wash the stone façade while incandescent spotlights accent the statues of the stations of the cross that surround the courtyard.

PROPOSED SOLUTIONS:

1) As a prominent symbol in the catholic religion, the ideals of a candle will be the underlying theme used to unify all the spaces.
2) The library, located in the southeast corner of the building, will be used to read and write with different mediums. The age and quality of the material will need to be researched to determine the appropriate lighting conditions for the bookshelves. Illuminance levels recommended by the IES Handbook will be met for the study area.
3) The foyer, located outside the Chapel is one of the most heavily trafficked circulation spaces. This space should provide direction by applying higher illuminance levels to the entrance of the chapel. Light should also be used in this space to create a sense of anticipation of what is about to come.
4) The chapel is a grand and holy space that will be used for worship and prayer. The lighting should be used in this space to give the chapel a sense of purity. As such, it should be a seamless design that distributes light to areas of interest and necessity with no visible indication of a fixture.
5) The courtyard, which surrounds three sides of the chapel is where the stations of the cross are located. It is a quiet escape, with stations of the cross evenly spaced along the outer walkway. This space should give a sense of triumph over sin and a pride in Jesus. Candles will line the walkway on the journey out to where the stations are positioned. Bright spotlights directed towards the statues will indicate that the destination has been reached.

DEPTH 1| LIGHTING(CONT'D)

TASKS AND TOOLS:

1) Complete 3D CAD files for all four spaces.
2) Tailor design to incorporate comments made by lighting professionals during presentations at Lutron.
3) Select equipment to accomplish lighting goals.
4) Render spaces to display the lighting designs.

DEPTH 2| ELECTRICAL

CURRENT SOLUTION:

The current system for the Saint Francis Friary has a primary service delivered by Cullman Electrical Cooperative that is stepped down to 208Y/120V and distributed throughout the entire friary. This 208Y/120V, 3P, 4W system feeds the panelboards which serve the lighting, receptacles, heating and cooling equipment, kitchen equipment, and the elevator. An automatic transfer switch located in the main electrical room switches to the emergency generator in the event of a failure of the main distribution equipment. The 125 KW generator is powered by natural gas and a 12V battery start-up motor. The emergency power serves the receptacles, lighting, and mechanical equipment for the chapel, kitchen, and corridors.

PROPOSED SOLUTIONS:

1) The branch circuit distribution will be redesigned for the library, foyer, chapel, and exterior courtyard to supply power to the new lighting designs.
2) A protection device coordination study will be conducted on the path that leads from the main distribution panel or generator to the ATS to the EDP to the CHAP and ELSW.
3) The current system only has the option of 208/120V power supply. This not only minimizes options for equipment, but it also creates larger voltage drops. The proposed system will be transformed to a 480/277V, 3P, 4W system where it will be distributed and stepped down to 208/120V as necessary. This will allow for more options when choosing HVAC equipment. In addition, 277V lighting will be used in place of the 120V lighting especially in the Chapel where there is a larger distance between luminaires.
4) The HVAC equipment will be modified due to the benefit of the proposed 480/277V system. The added and modified HVAC loads for the first floor of the Friary, discussed in the Mechanical breadth, will be computed in order to select proper distribution equipment and protective devices. Since much of the HVAC equipment loads are supplied by the MDP, this will affect the main switchgear and transformer.

DEPTH 2| ELECTRICAL(CONT'D)

TASKS AND TOOLS:

1) Redesign the branch circuits in accordance with the new lighting design.
2) Conduct a protective device coordination study.
3) Redesign power distribution system to include 480/277V.
4) Calculate new HVAC loads for first floor and adjust power distribution equipment and protective devices accordingly.

BREADTH 1| MECHANICAL

CURRENT SOLUTION:

The mechanical system was designed to cause the least interference with the other design options. The under the slab system put in place allows for architectural features to be displayed in the chapel and refectory. Both double height spaces, because of this mechanical system, are able to boast their open design with exposed trusses. The mechanical system is composed of one 125 KW chiller and 8 AHUs that supply the building with 4380 cfm of outdoor air.

PROPOSED SOLUTIONS:

1) Because of the location of the project in Hanceville, Alabama, the chiller will be a significant piece of mechanical equipment. A new centrifugal chiller with a variable frequency drive will be researched since the occupancy will rarely require the chiller to be running at full load conditions.
2) With the introduction of the 480/277V system in the electrical depth, more efficient equipment should be available for the mechanical design.

TASKS AND TOOLS:

1) Research chillers.
2) Determine the standard conditions for the friary and calculate the energy savings that would result from using a variable frequency drive.
3) Research and choose most efficient mechanical equipment.

BREADTH 2| SUSTAINABLE DESIGN

CURRENT SOLUTION:

The Friary does not incorporate LEED concepts into its design. The design phase of the Friary has been completed however, since construction has not begun due to funding, there is still an opportunity to integrate sustainable technology into the design.

PROPOSED SOLUTIONS:

1) A Magnegas system will be looked into as a means of controlling the growth of agricultural waste from surrounding farms while producing the power supply needed by the Friary.
2) The mechanical equipment chosen for the mechanical breadth will be researched and selected to minimize energy consumption throughout the entire lifespan of the equipment.
3) The lighting equipment will also be selected under the same precepts.

TASKS AND TOOLS:

5) Research Magnegas technology.
6) Research and compare the energy consumption of mechanical equipment that is appropriate for the design proposed in the mechanical breadth.
7) Research and compare the energy consumption of lighting equipment that is appropriate for the design proposed in the lighting depth.
8) Determine if the new mechanical and lighting equipment can be supported by the proposed Magnegas system.

SCHEDULE

Christmas Break	
Jan 13-19	Finish 3D models in CAD. Fix conceptual design based on comments from Lutron presentation.
Jan 20-26	Find cutsheets and photometric files. Design custom luminaires. Import models into AGI or VIZ. Add materials and luminaires.
Jan 27-Feb 2	Finish adding materials and luminaires. Define lighting layout. Begin researching mechanical equipment.
Feb 3-9	Continue working on AGI models. Finalize fixture schedule. Finalize mechanical selections. Begin lighting and mechanical load calculations.
Feb 10-16	Continue working on AGI models. Photoshop. Finish lighting and mechanical load calculations. Redesign electrical distribution.
Feb 17-23	Continue working on AGI models. Photoshop. Redesign branch circuits. Protective Device Coordination Study.
Feb 24-Mar 1	Research magnegas properties. Calculate available waste. Calculate the power supplied by system.
Mar 2-8	Complete Renderings. Complete study and calculations on magnegas system.
Spring Break	Gather all files and information. Verify that all requirements are being met. Adapt schedule as necessary.
Mar 16-22	Begin putting together the report.
Mar 23-29	Continue with Report.
Mar 30-Apr 5	Finish up and Proofread Report. Work on Powerpoint.
Apr 6-12	Finalize and Proofread Presentation. Save, Print, Bind, and Submit.
Apr 13-19	Final Presentations!!
Apr 25	MY BIRTHDAY!!!!