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Mixed-Use Project
Metropolitan Eastern United States
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# PROPOSAL

**EXECUTIVE SUMMARY**

The proposed thesis will include new lighting designs for the residential lobby, fitness room, retail store, and the outdoor courtyard. These designs will utilize new lighting fixtures and controls to meet design criteria and goals for each space. An electrical study will include the re-design of the branch circuit distribution for these four spaces as well as a protective device coordination study for a single-path through the distribution system. Electrical studies will also include a comparison between the use of a bus duct and conduit and wire feeders, as well as a computer-aided short-circuit analysis.

Two breadth studies will be performed in the retail space in addition to the lighting/electrical requirements. The architectural breadth will consist of a tenant fit-out and will require the layout of merchandise and other areas pertaining to the function of the store. Finish material selection and building code analyses will be performed to complete this work. A mechanical breadth will be implemented to size equipment necessary for the cooling/heating of the space.

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**BACKGROUND**

The building is a 280,000 SF mixed-use project in a metropolitan area on the East coast. It houses about 180 apartment units for private residence, some retail spaces, offices, and underground parking. There are nine levels above grade. The building is located on the corner of a busy intersection. The appeal of this building lies within its views of the surrounding metropolis enhanced by its sections of angled window bays that appear above the ground level.

**ARCHITECTURAL BREADTH**

This breadth topic will include retail planning research, building code analysis, finish material selection, and furnishings. The architectural breadth will directly affect the lighting design for the retail space and should be complete before the design development stage is well underway.

A significant amount of research will go into the planning and layout of the retail space to effectively distinguish specific areas of the space (i.e. fitting rooms, sales area, merchandise displays, window displays). The spaces all need to fit in with each other and provide a natural flow through the store.

Selecting finish materials and furnishings will be challenging tasks due to the need for these to appropriately communicate the store's image. A building code analysis will be needed to determine wheelchair access and requirements for public restrooms.

**MECHANICAL BREADTH**

Designing the mechanical system necessary to cool and heat the space further integrates the systems of the retail space for an overall complete design. Issues related to thermal comfort in the occupant will be addressed as well as issues directly related to retail applications.

**LIGHTING DEPTH**

This mixed-use project is a 280,000 SF building that contains apartments, retail spaces, and office space. The building footprint rests on the corner of a busy intersection in a metropolitan area in the eastern United States.

The existing lighting systems use fluorescent, compact fluorescent, and halogen sources. The new designs will use similar sources in different luminaires and also integrate special controls where appropriate as an additional component in the system to better system performance and decrease energy costs as well. In the fitness room in particular, a daylight study will be performed to adjust interior lighting to work well with natural daylighting. In the retail space, a proposed tenant fit-out will take place (as an architectural breadth), allowing actual locations of light sources to be determined based on merchandise layout as well as special interest areas. In the courtyard, properly lighting the landscape and providing enough illumination for casual viewing and meeting tasks will be the focus. In all spaces, meeting energy code requirements will be an important concern. Occupant comfort will also be taken into consideration as part of this work.

**Solution**.

A break-down of the design initiatives for each space follows.

**Residential Lobby**. The main goals for the residential lobby deal with occupant comfort and atmosphere. A public impression will be pursued (but with subtle accents and highlights for communicating the visual hierarchy). Adequate light levels will be targets in certain areas according to tasks performed in those areas.

**Fitness Room**. A daylighting study will be performed to determine the feasibility of implementing daylighting controls to the space. At nighttime, the system will be required to provide sufficient lighting to the occupants, while not interfering with the courtyard scene. Intensities should not be overly bright and distributions near the window should not be directed at the windows. Glare considerations for occupants laying face-up on exercise equipment will also be a concern.

**Retail Space**. The lighting of the retail space will be extremely crucial in directing sufficient light onto merchandise, providing task light for employees, enhancing the new architectural features of the space, and providing contrast between circulation areas and areas which desire heightened attention. From the street, the window displays will be another important aspect of the design due to this being the “first impression” seen by potential customers. The store layout and materials will be modeled after high-end clothing stores to fit the overall theme of luxury throughout the building. Flexibility will be a strong concept in developing the lighting solution for this space and may incorporate the use of controls and/or moveable fixtures.

**Outdoor Courtyard**. The focus of this outdoor space will be the landscape materials – primarily the two different types of bamboo and Japanese maple trees. These will be showcased and accented to provide visual interest during the night both for the occupants of the courtyard and for the inhabitants of the fitness room (if window glare can be reduced). Enough illumination needs to be provided for viewing the ground and other people when users are circulating through the space. A balance between this light and the light from the fitness room will need to be found when the lights in the fitness room are on. Two different scenes should be rendered to determine this.

To promote the image of luxury in these spaces, careful selection of luminaires will need to take place. This will require the awareness of the specific look of each space (whether the luminaire is an important visual aspect itself or whether it should be hidden). To further promote this image, an overall clean appearance needs to be maintained with minimized clutter.

**Solution Methods**.

The first step in completing the design is the refinement of the conceptual phase. The professional feedback acquired at Lutron will be included to improve the understanding of concepts and help the progression of concepts into the next stages of design. Hand sketches and Photoshop renderings will be cleaned-up in this stage.

The design development stage will consist of using computer models to accurately portray the spaces three-dimensionally. Lighting fixture selection will take place here and preliminary calculations will be performed to approach target lighting levels and power densities. The results will be refined by an educated "trial and error" approach in selecting fixtures that are appropriate for the specific application. Troubleshooting the system by altering spacing and aiming angles will be another method to improve results.

The documentation stage will include the production of lighting plans, fixture schedules, product information sheets, and calculation data.

Final renderings will be produced in AGI32 to portray realistic images.

**Tasks and Tools**.

Task 1. Complete Schematic Design
- a) Fine-tune sketches and Photoshop renderings
- b) Add visuals to slides (luminaire photos, scene photos)
- c) Provide keys and orientation to plans
- d) Perform new research based on Lutron feedback

Task 2. Preliminary Work
- a) Production of 3D Models in AutoCAD
- b) Layout of Retail Space

Task 3. Fixture Selection
- a) Selection of appropriate luminaires
- b) Matching sources to luminaires

Task 4. First Renderings
- a) Importing the model into AGI32
- b) Importing fixtures with IES Photometric Files
- c) Calculating initial quantities of illuminance, luminance, power

Task 5. Design Review
- a) Compare calculated results to design criteria
- b) Compare aesthetics to design criteria
- c) Make changes and recalculate as appropriate

Task 6. Documentation
- a) Produce lighting plans, fixture schedules, calculation data, product sheets

b) Compose report

Task 7. Final Renderings

a) Produce final renderings of spaces including all materials, scale figures, and backgrounds

**ELECTRICAL DEPTH**

**Four Spaces for Re-Design**

The four spaces to be re-designed for lighting and electrical depths will be the residential lobby, fitness room, retail space, and outdoor courtyard. The retail space requires a tenant fit-out that will be the basis of the architectural breadth.

**Short Circuit Analysis**

The extend of the short circuit analysis will be panel P1. The path to this panel begins at the service entrance and goes to the main distribution panel MDP-P and then to Panel P1.

**Depth Topics**

1) Using bus duct vs. conduit and wire feeders.
2) Performing a short circuit analysis, protective device coordination, arc fault study for the entire distribution system, starting at the service entrance and covering all panelboards.

**Topic 1**

This topic will compare the use of bus duct to using conduit and wire feeders throughout the building. Since this building is nine stories above grade, it will be useful to compare these two wiring methods. There is a potential, one way or the other, to save cost on this equipment.

Methods used for this topic will be to determine loads and sizing of wires, conduit, and bus duct. A cost analysis will then be performed to determine the feasibility of altering the current design. Tools to be used during this study will be the National Electric Code, electronic documents, and material pricing research.

**Topic 2**

The second topic will consist of the same material in the short circuit analysis mentioned above, however, it will be applied to the entire distribution system, not just one path. A protective device coordination and arc fault study will be applied to these paths as well. The tools used for this topic will include the National Electric Code, SKM software, and electronic drawing documents.

# SEMESTER CALENDAR

| WEEK | DISCIPLINE | ACTIVITIES |
|---|---|---|
| 1/11-1/17 | LTG | Update schematic design, begin modeling |
| | ELEC | No work |
| | ARCH | Research retail planning, lighting |
| | MECH | No work |
| 1/18-1/24 | LTG | Continue modeling, apply design criteria, begin fixture selection |
| | ELEC | No work |
| | ARCH | Layout space, consult building codes |
| | MECH | No work |
| 1/25-1/31 | LTG | Complete modeling, fixture selection, preliminary calcs |
| | ELEC | No work |
| | ARCH | Layout, material selection |
| | MECH | No work |
| 2/1-2/7 | LTG | Calcs and fine-tuning |
| | ELEC | Branch circuit re-design |
| | ARCH | Complete layout, solidify material finishes |
| | MECH | Design goals |
| 2/8-2/14 | LTG | Calcs and fine-tuning |
| | ELEC | Branch circuit re-design |
| | ARCH | Construction Details |
| | MECH | Room calculations, heating/cooling loads |
| 2/15-2/21 | LTG | Design Review |
| | ELEC | Short Circuit Analysis |
| | ARCH | Renderings |
| | MECH | Final calculations, sizing equipment |
| 2/22-2/28 | LTG | Documentation |
| | ELEC | Protective Device Coordination |
| | ARCH | Touch-up |
| | MECH | Equipment sized, ceiling clearances |
| 3/1-3/7 | LTG | Documentation |
| | ELEC | Arc Fault Study |
| | ARCH | Touch-up |
| | MECH | Finalize Design |
| 3/15-3/21 | LTG | Final Renderings |
| | ELEC | Bus Duct vs Conduit and Wire Feeders |
| | ARCH | Touch-up, compose report |
| | MECH | Finalize Design |
| 3/22-3/28 | LTG | Final Renderings, report |
| | ELEC | Compose report |
| | ARCH | Compose report |
| | MECH | Compose report |
| 3/29-4/4 | LTG | Compose powerpoint, report |
| | ELEC | |
| | ARCH | |
| | MECH | |
| 4/5-4/11 | LTG | Powerpoint complete with revisions |
| | ELEC | Powerpoint complete with revisions |
| | ARCH | Powerpoint complete with revisions |
| | MECH | Powerpoint complete with revisions |
| 4/12-4/18 | LTG | Presentations to Jury |
| | ELEC | |
| | ARCH | |
| | MECH | |