



ONE CHRISTINA CRESCENT

Wilmington, Delaware

Lighting System Conceptual Design

Kevin Michael Danna

Penn State Architectural Engineering Senior Thesis

ONE CHRISTINA CRESCENT

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BUILDING OVERVIEW

One Christina Crescent is a six story office building located in Wilmington, Delaware and is home to Barclays Bank Delaware, the U.S. credit card operations of Barclays PLC. The building was constructed by Pettinaro Construction Company, Inc. of Newport, DE and is owned by Christina Crescent LLC.



Building Name: One Christina Crescent

Building Location: 125 S. West Street, Wilmington, Delaware

Building Occupant: Barclays Bank Delaware

Occupancy Type: Corporate Offices/Retail

Size: 279,376 SF

Height: 6 stories, 88'-0" above grade

Dates of Construction: Winter 2006 to Summer 2007

Cost: \$40 million

Project Delivery Method: Design-Build

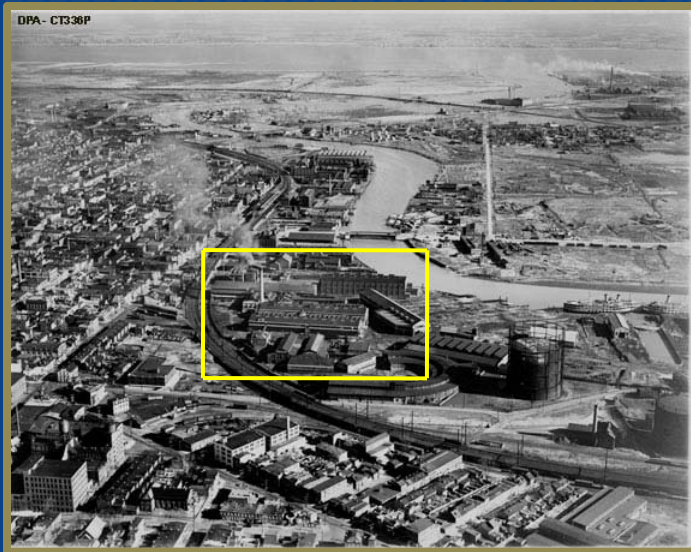
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RIVERFRONT WILMINGTON

One Christina Crescent is located in an area of Wilmington known as 'Riverfront Wilmington' which is on the banks of the Christina River. The building's site is redeveloped brown field which was multi-parcel industrial wasteland. Decades ago, the area was a thriving industrial center, but was left abandoned for many years. Since the mid 1990s, the Riverfront Development Corporation of Delaware (RDC) has been revitalizing the area.



Wilmington Riverfront (1950s)



Wilmington Riverfront (Present Day)

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BUILDING DESIGN

Design Architect: Paul Guggenberger, AIA, Moeckel Carbonell Associates, Inc.

Architect of Record: Mark G. Hitchcock, AIA

Interior Design: Mitchell Associates

Structural Engineer: O'Donnell Naccarato Macintosh

Civil Engineer: Rummel, Klepper, Kahl LLP

Environmental Engineer: Brightfields Inc.

Geotechnical Engineer: Duffields Associates, Inc.

There were aspirations during design for the building to be LEED certified. This was never realized, but aspects were retained. The green roof is the most prominent feature of the building originally part of the LEED design.



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THESIS CONCEPTUAL DESIGN

AREAS TO BE REDESIGNED

- Open Office
- Auditorium
- Lobby
- Dining Area
- Tripod (Outdoor)

OVERALL DESIGN GOALS

- Maximize energy efficiency
- Minimize environmental impact
- Reinforce a positive image of Barclays Bank Delaware
- Attention to employee well-being and office productivity

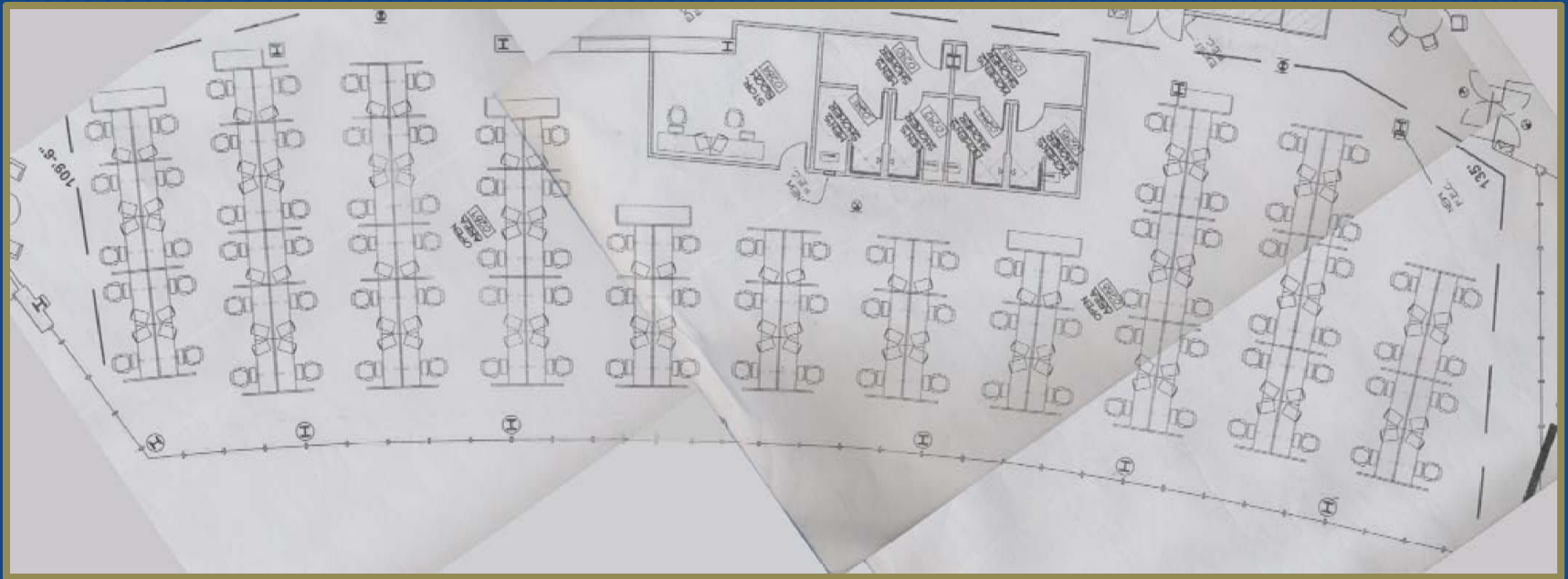


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OPEN OFFICE



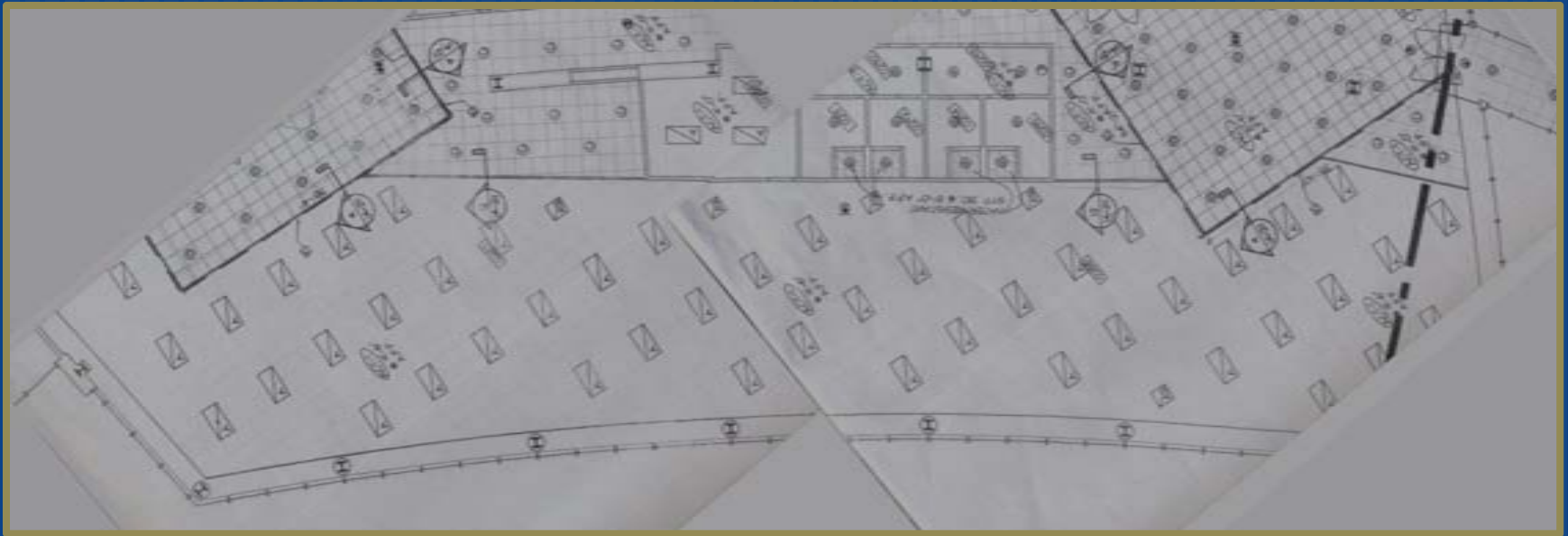
SECOND FLOOR OPEN OFFICE FLOOR PLAN

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OPEN OFFICE



SECOND FLOOR OPEN OFFICE REFLECTED CEILING PLAN

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OPEN OFFICE

- Target Illuminance: 35-50fc (Horizontal), 5fc (Vertical)
- Wall Luminance = 30 cd/m²
- Light Distribution - 3:1 (ceiling:walls)
- Uniform light on task plane

DESIGN ISSUES

- Long hours at cubicle with intensive VDT use can lead to fatigue, feeling of isolation, eye strain
- Desk lighting needs to be of an optimal level, glare-free, and most of all comfortable
- There is a considerable amount of daylight entering the space. Daylight and outdoor views tend to improve mood, increase productivity, and nurture a general feeling of well-being
- Nighttime provides the extremes of fatigue, depression, feelings of isolation
- Intermittent conversation amongst employees can improve office morale and mood

DESIGN CRITERIA & SOLUTIONS

- Provide visually stimulating areas away from the desk at the peripheries (but not distracting)
- Desk lighting should be soft and smooth providing optimal task visualization without glare. Individual control of desk lighting would be ideal
- Integrate and control daylight in the design in order to lower energy consumption and nurture a pleasant mood among employees
- Integrate outdoor view during the night and provide artificial light that mimics day conditions
- Incorporate a 'conversation light' between cubicle rows with a more intense desk light that focuses overall attention on work

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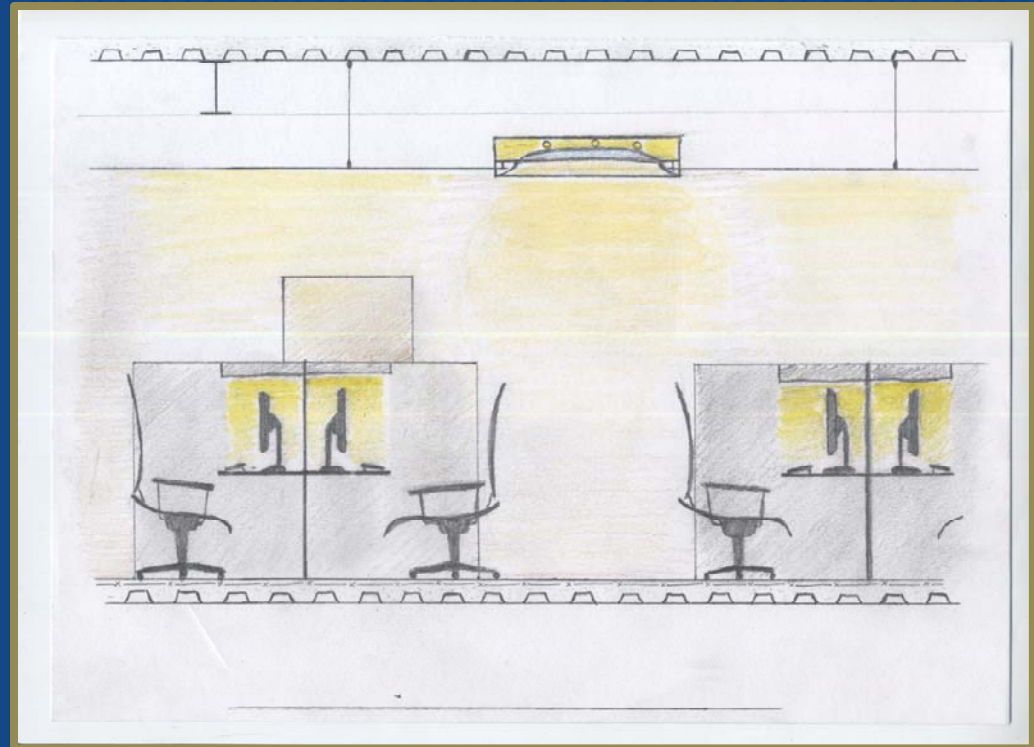
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OPEN OFFICE



Open Office Lighting Sketch (Plan View)



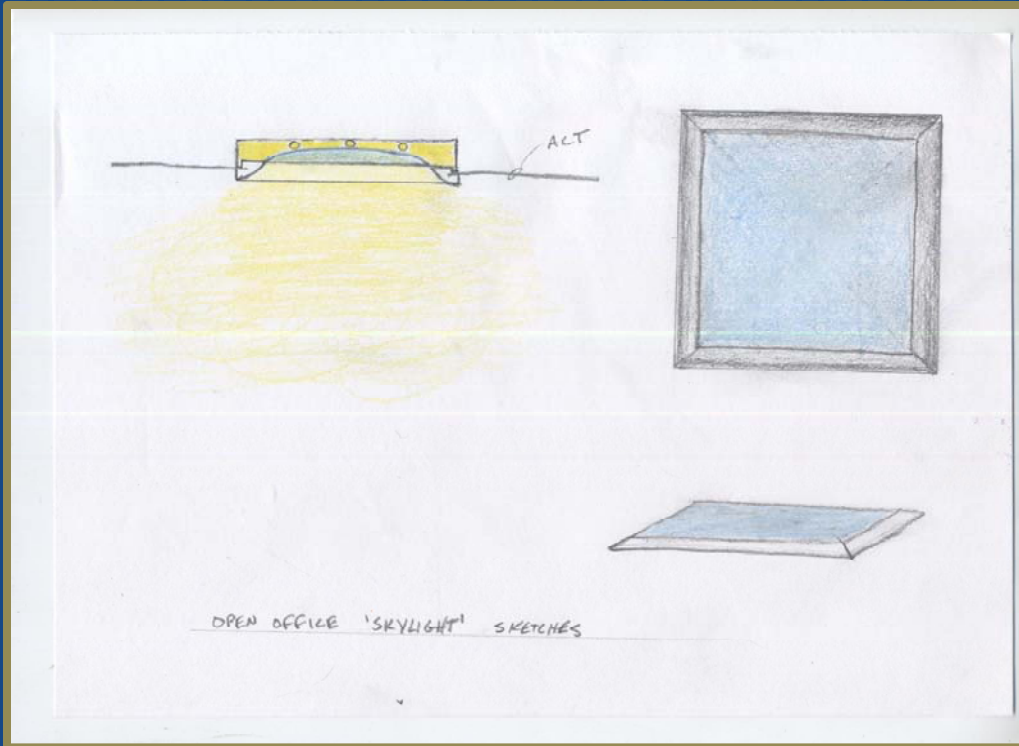
Open Office Lighting Sketch (Elevation View)

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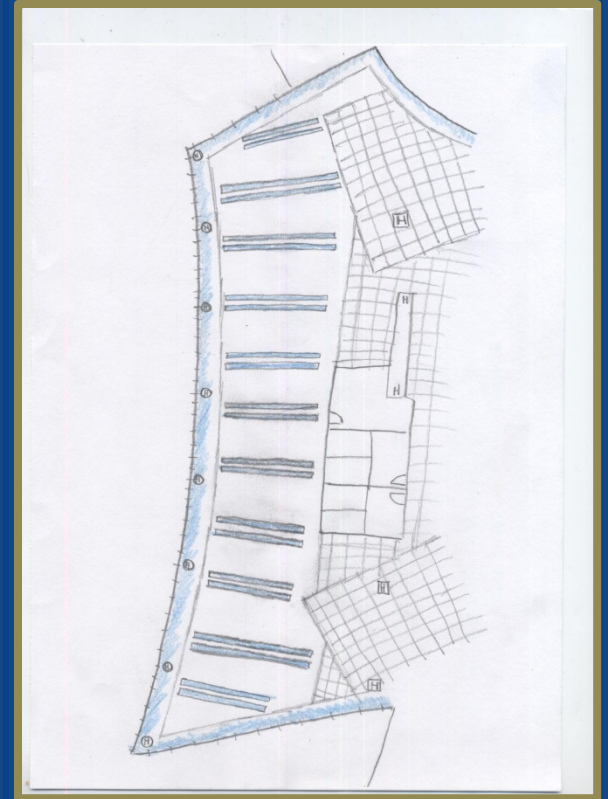
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OPEN OFFICE



Open Office Rectangular 'Skylight' Sketches



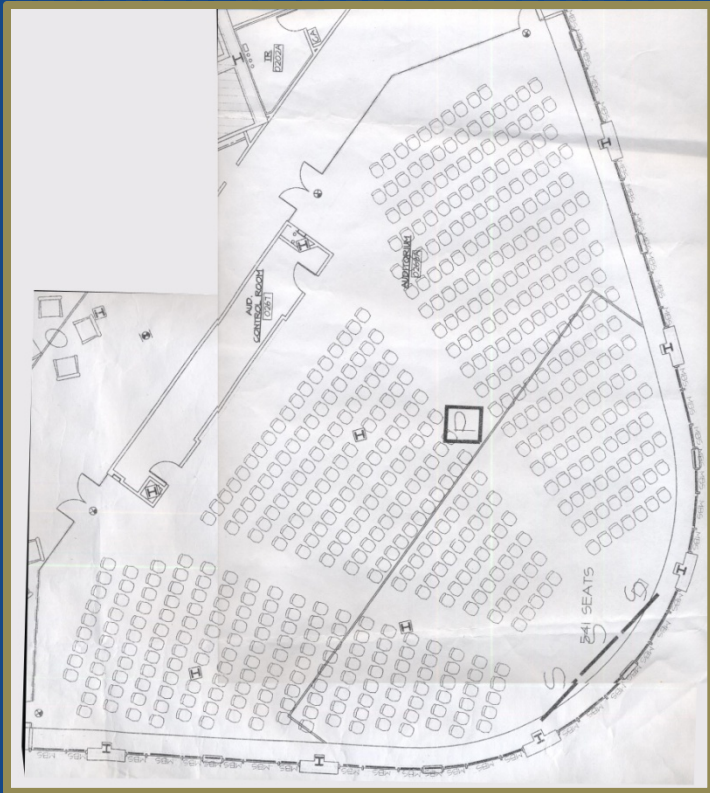
Open Office Alternate Lighting Sketch (Plan View)

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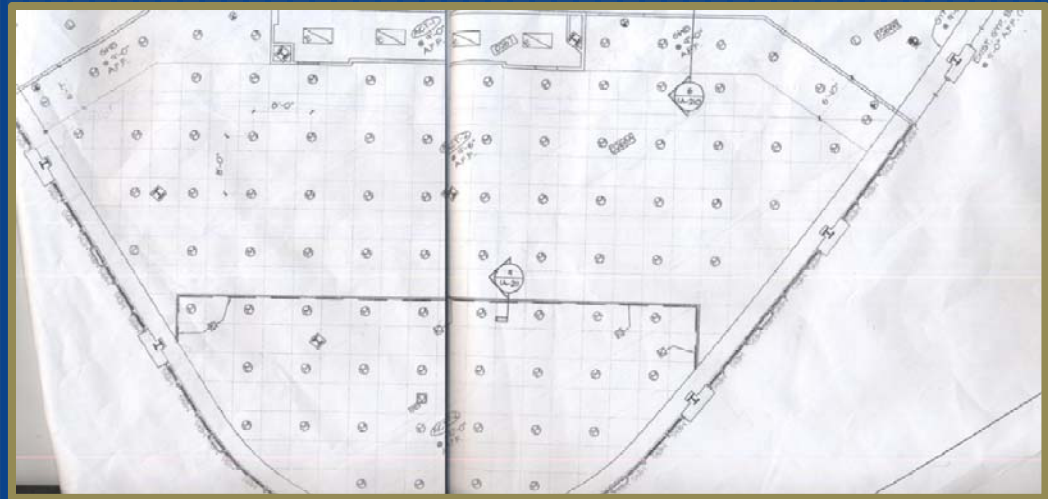
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AUDITORIUM



Auditorium Floor Plan



Auditorium Reflected Ceiling Plan

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AUDITORIUM

- Target Illuminance: 10-30fc (Horizontal)
- Control and Flexibility
- Luminance of surfaces
- Noise from lamps & ballasts

DESIGN ISSUES

- Large room filled with many people can get warm, stuffy and uncomfortable, especially when solar gain is present
- Difficulty seeing speaker and facial expressions in a large room
- Audience members may be taking notes
- Audience conversation should be minimal during presentation
- Extended periods of time in a dense audience can foster discomfort and claustrophobic conditions. Low ceiling in a large room can exacerbate these effects.

DESIGN CRITERIA & SOLUTIONS

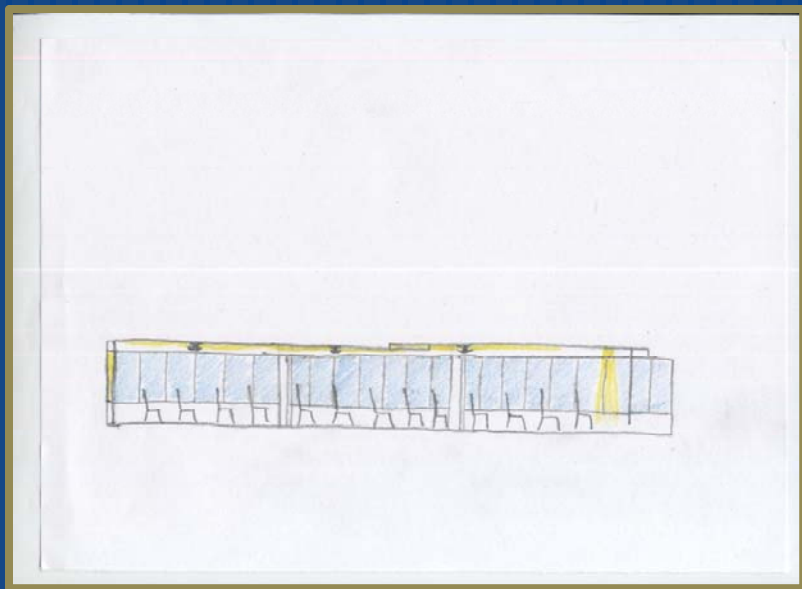
- Reduce solar gain with shading and utilize light sources which produce minimal heat
- A speaker should be accented and properly illuminated with excellent facial modeling
- Provide low level ambient light for note taking
- Provide low level light that is free of visual distractions. Low level of visual stimulation lighting system.
- Create a pleasant and relaxing atmosphere. Illuminate ceiling surface to invoke a sense of vertical spaciousness.

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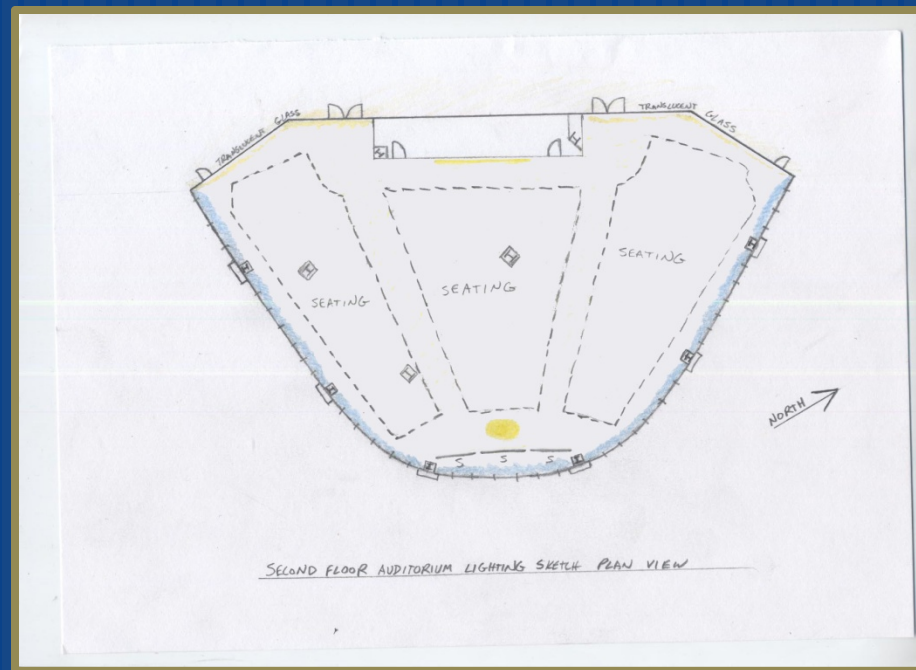
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AUDITORIUM



Auditorium Lighting Sketch (Elevation View)



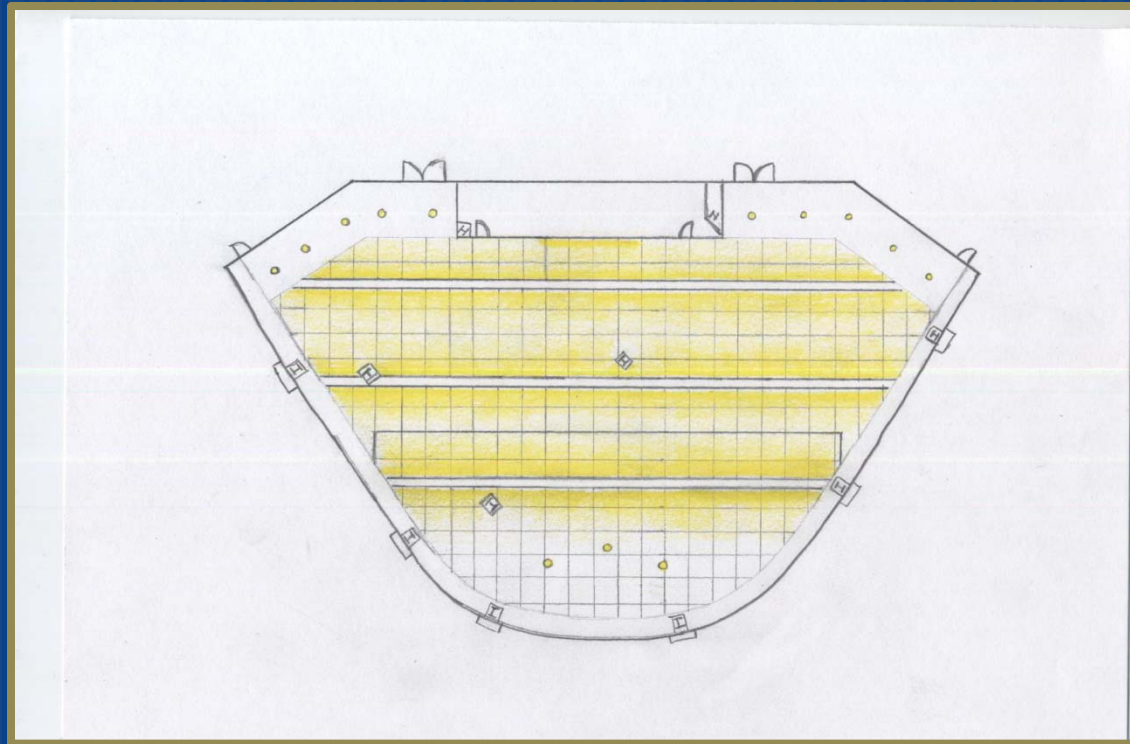
Auditorium Lighting Sketch (Plan View)

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AUDITORIUM



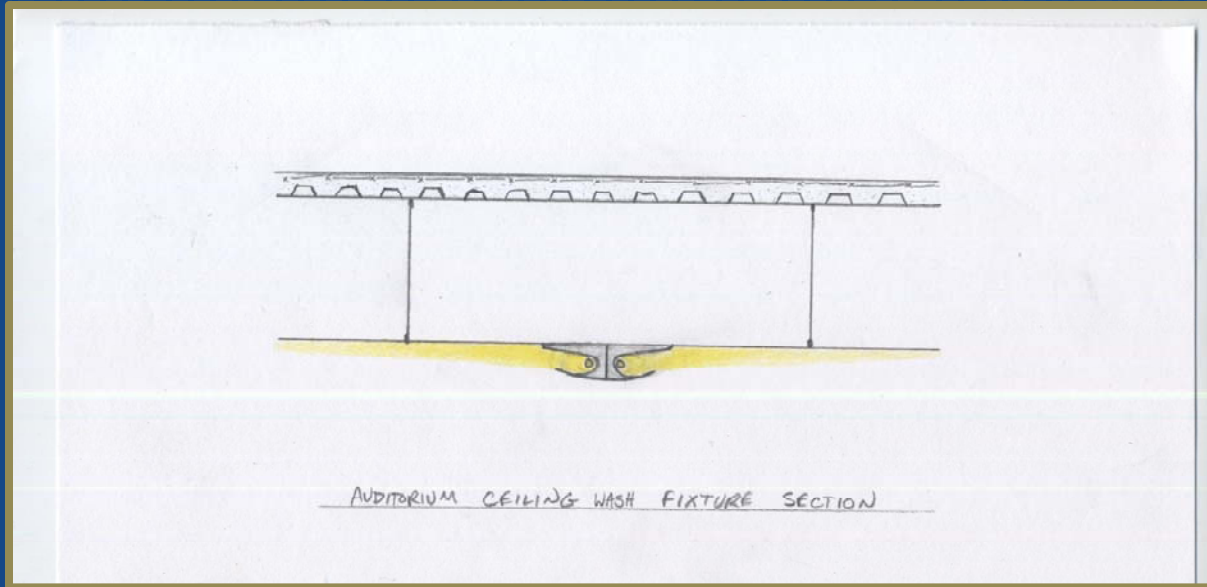
Auditorium Reflected Ceiling Plan Lighting Sketch

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AUDITORIUM



Auditorium Ceiling Fixture (Section View)

FIXTURE NOTES:

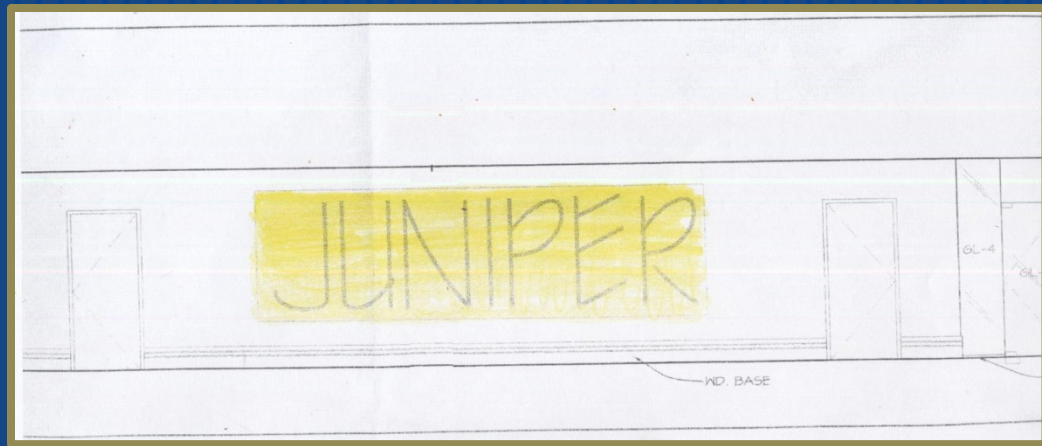
- **Very low ceiling profile**
- **Far throw of uniform light**
- **Completely concealed light source**

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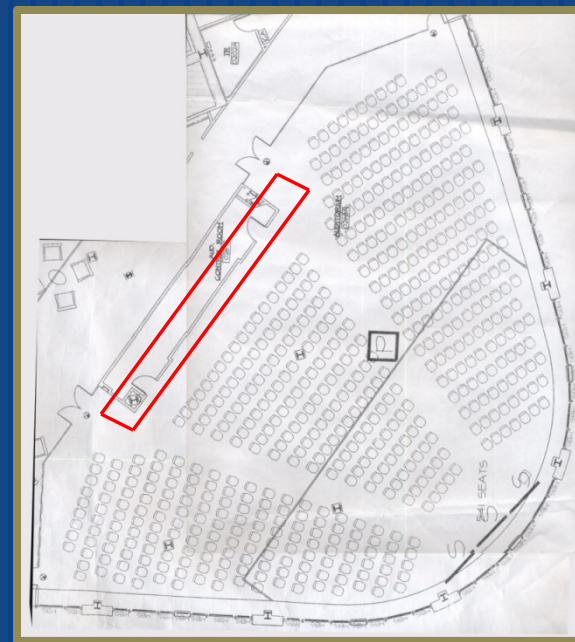
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AUDITORIUM



Auditorium Lighting Sketch (Elevation)



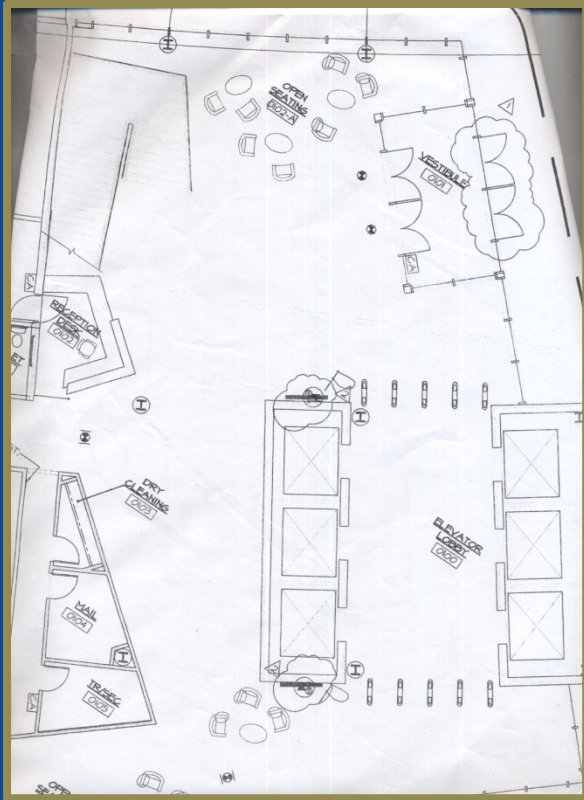
Auditorium Key

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LOBBY



Lobby Floor Plan



Lobby Reflected Ceiling Plan

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LOBBY

- Target Illuminance: 15-25 fc (Horizontal), 3 fc (Vertical)
- First Impression of Barclays
- Minimize Relamping
- Points of Interest
- Public Space

DESIGN ISSUES

- Reception desk should be visible and easy to find for visitors
- Grand staircase is a prominent feature of the lobby that occupies much of the empty vertical space
- Two full walls of glass up to second floor ceiling. Glass cannot be illuminated.
- The lobby is two stories high with much empty vertical space
- There is a large fresco on the wall adjacent to the elevator lobby

DESIGN CRITERIA & SOLUTIONS

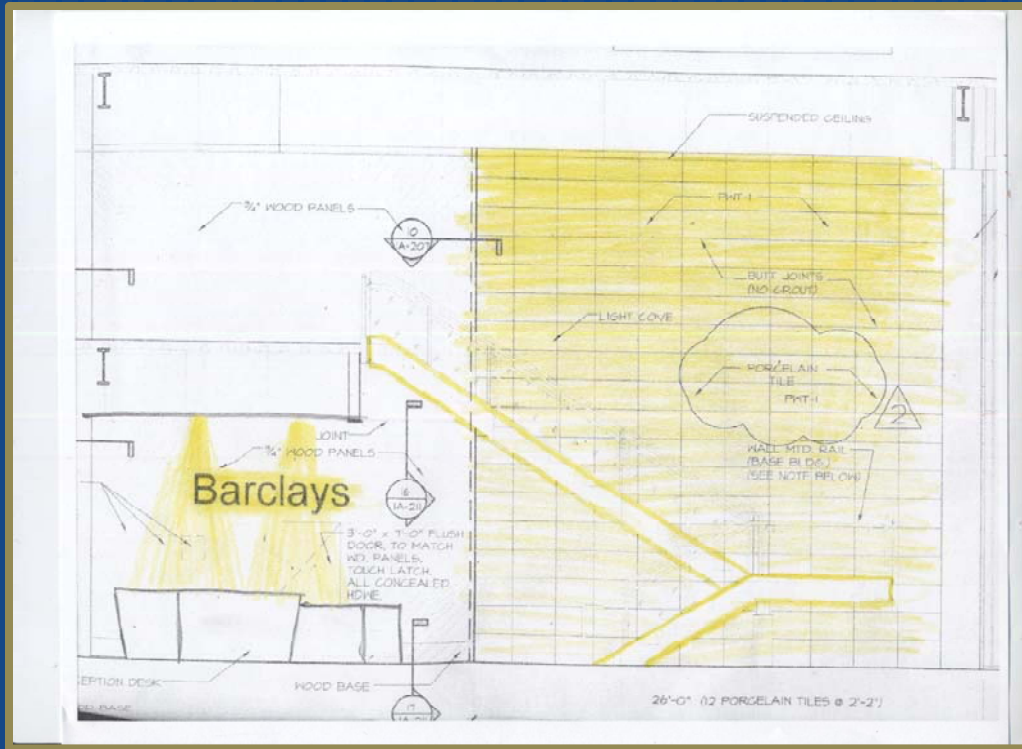
- Reception desk and corporate logo should be highlighted. Visitors eyes should be drawn to the reception desk.
- Staircase as a point of interest. Proper illumination on step surfaces.
- Wash interior walls with light
- Incorporate decorative pendants that provide ambient light as well as ceiling illumination
- Illuminate and accent the fresco as a point of interest

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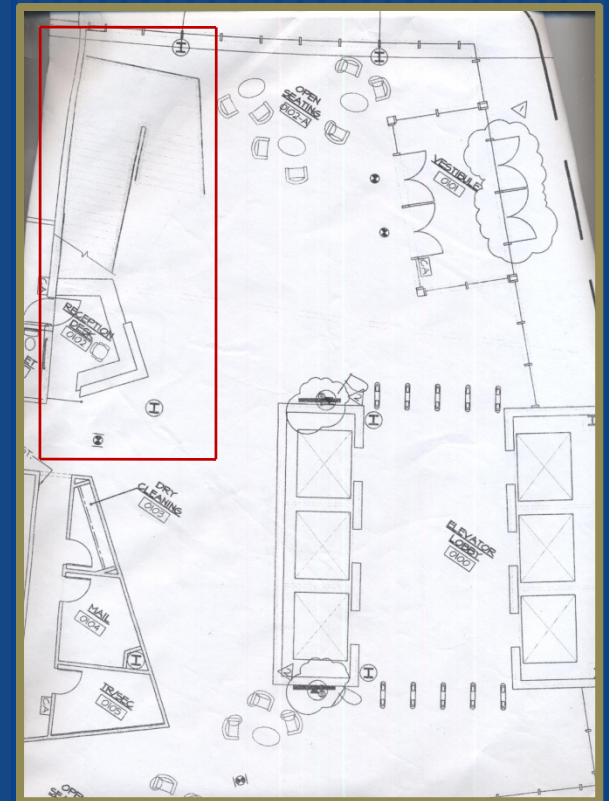
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LOBBY



Lobby Lighting Sketch (Plan View)



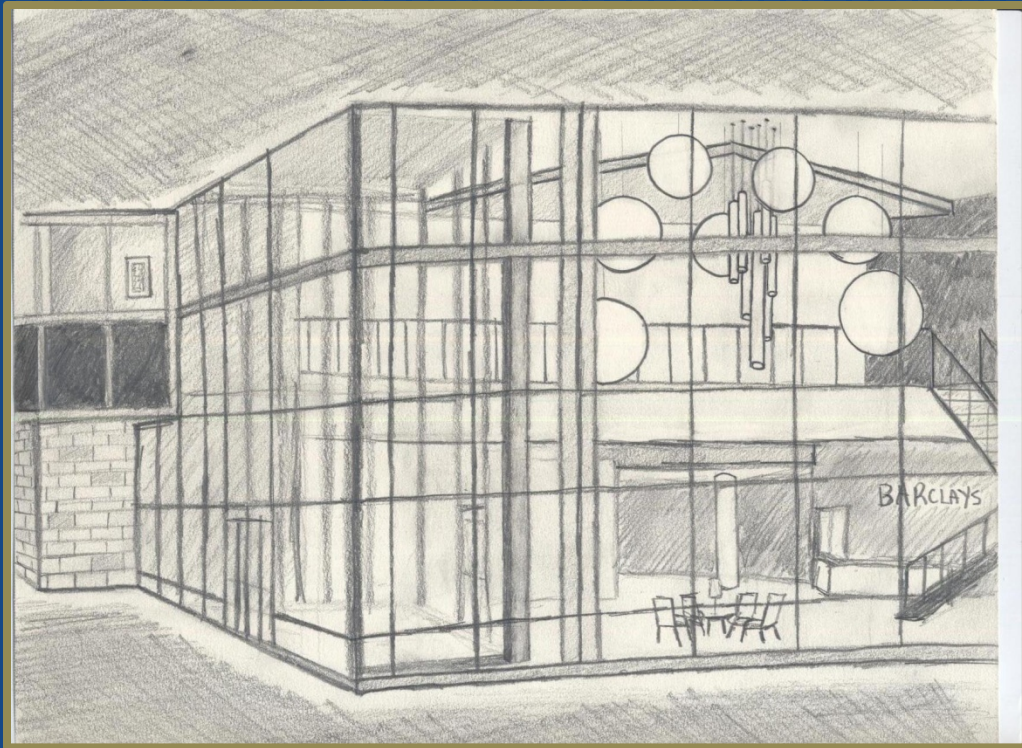
Lobby Key

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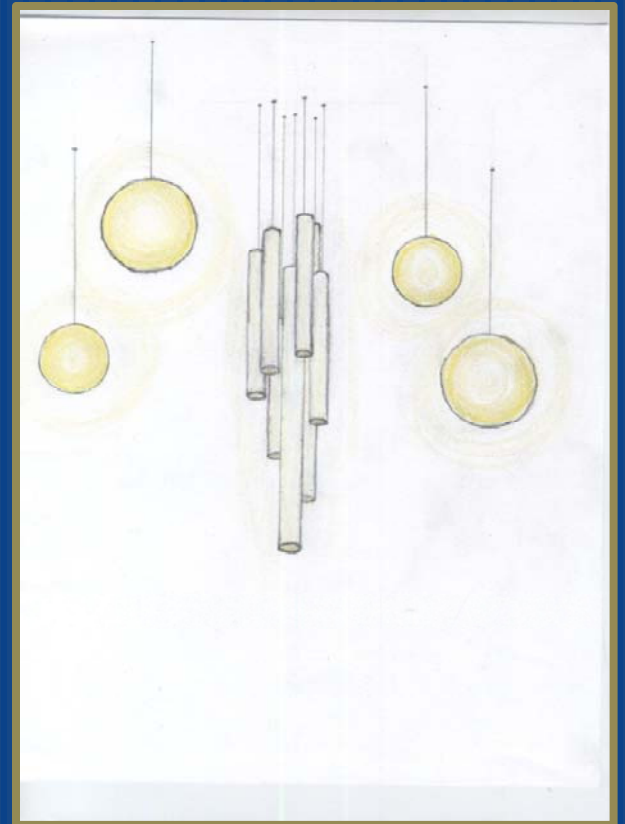
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LOBBY



Lobby Perspective (view from outside)



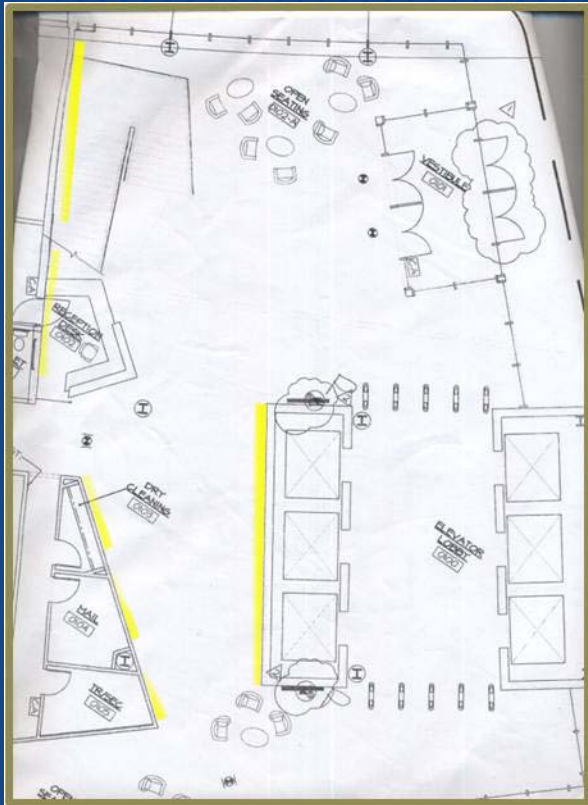
Lobby Pendant Fixtures

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LOBBY



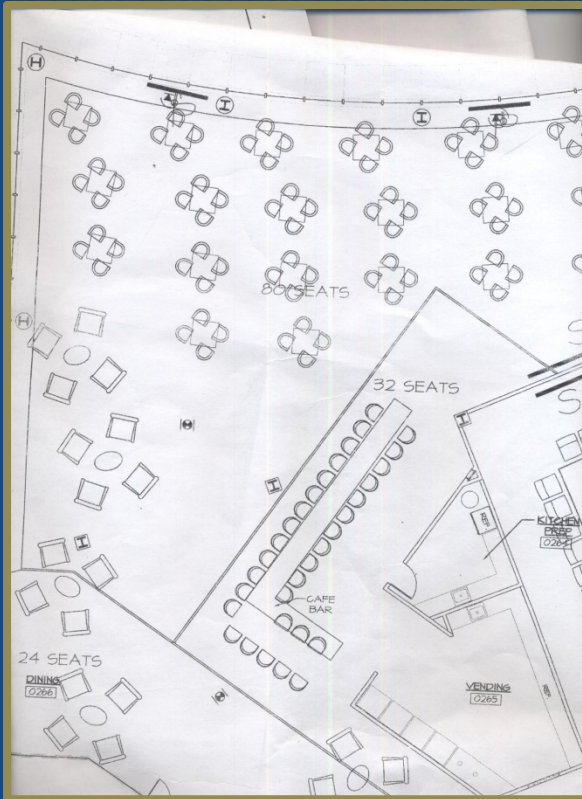
Lobby Accent Lighting Sketch (Plan View)

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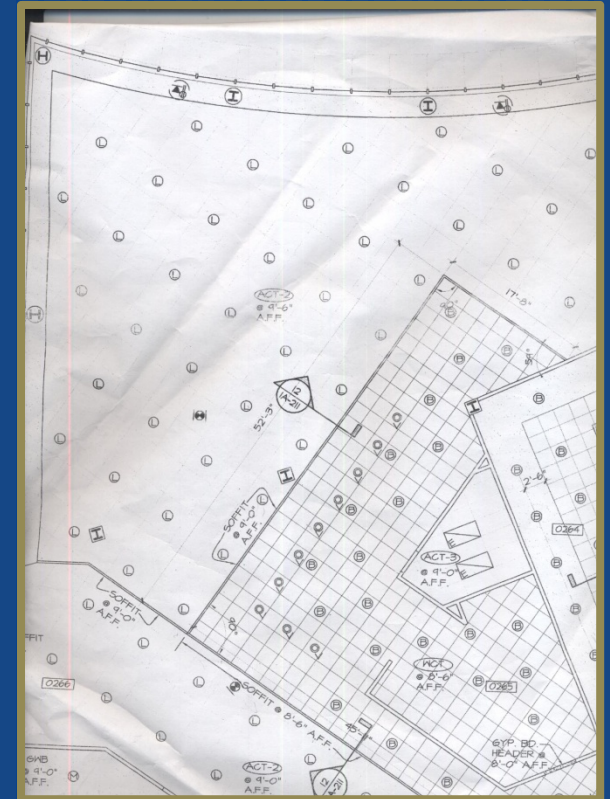
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DINING AREA



Dining Area Floor Plan



Dining Area Reflected Ceiling Plan

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DINING AREA

- Target Illuminance: 10 fc (Horizontal), 3 fc (Vertical)
- Color appearance of food
- System Control/Daylighting
- Points of Interest
- Public Space
- Minimize Relamping

DESIGN ISSUES

- Dining area is unique in that activities in this space are unrelated to work
- Appearance of food and facial modeling
- Café Bar is a prominent and central feature of the space
- Public space, but semi-private atmosphere at tables
- Changing moods throughout a 24-hour period

DESIGN CRITERIA & SOLUTIONS

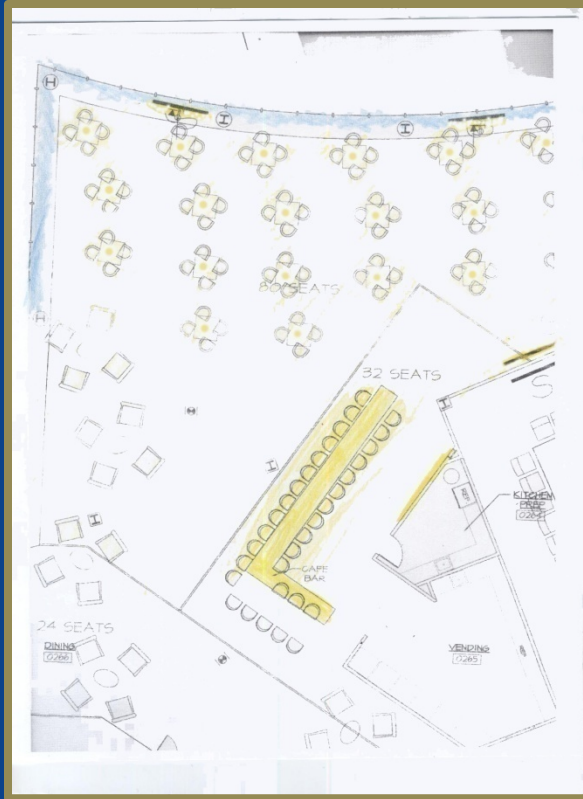
- Distinct look from other parts of building. Provide a relaxing atmosphere. A place to socialize and re-energize.
- High CRI sources for excellent rendering of food and faces. Provide a more enjoyable meal experience.
- Highlight bar and use decorative fixtures in bar area
- Bring light levels down at night with individual table illumination
- Control system integration with a lighting system that is capable of periodic change

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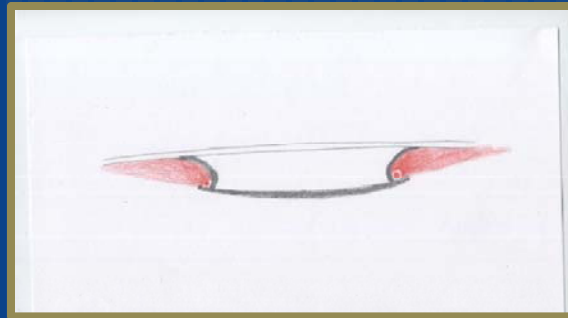
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DINING AREA



Dining Area Lighting Sketch (Plan View)



Ceiling Fixture Section View



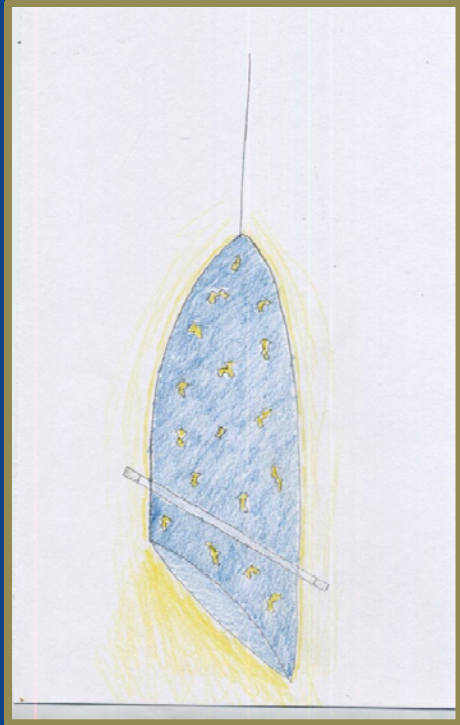
Dining Area Reflected Ceiling Lighting Sketch

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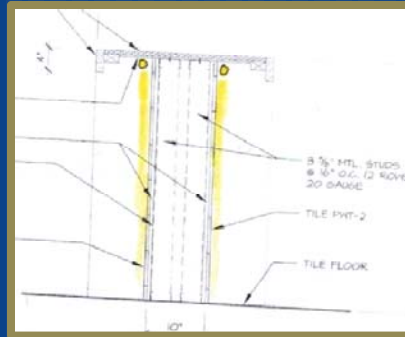
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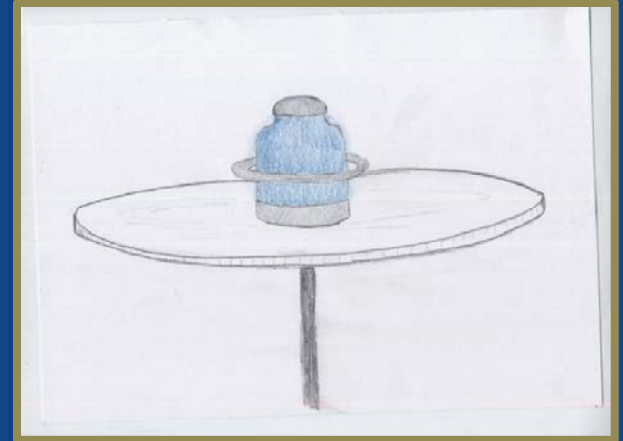
DINING AREA



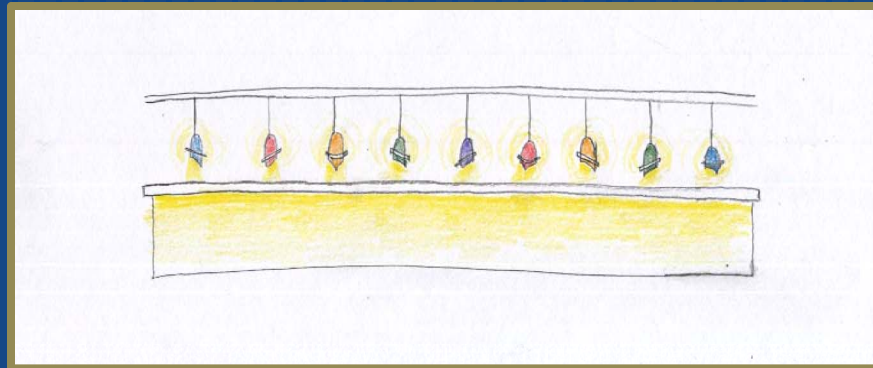
Café/Bar Decorative Pendant



Café/Bar Section View



Dining Area Table Fixture



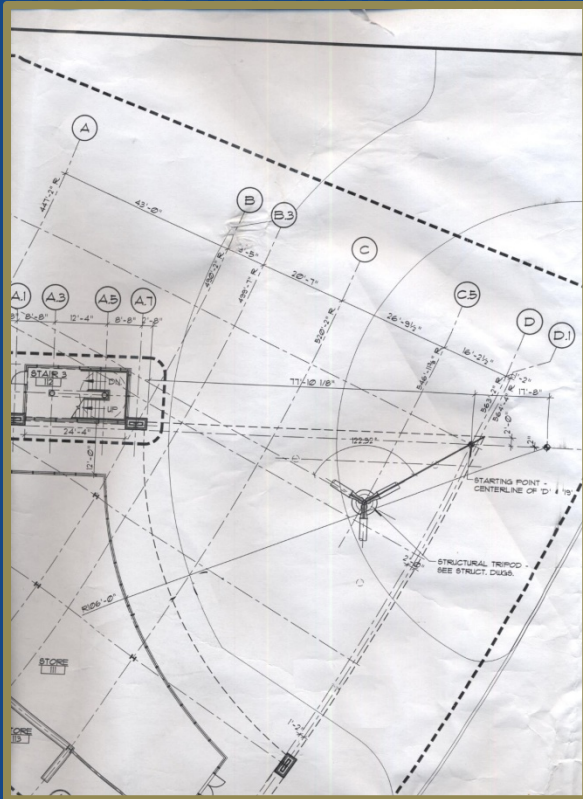
Café/Bar Elevation View

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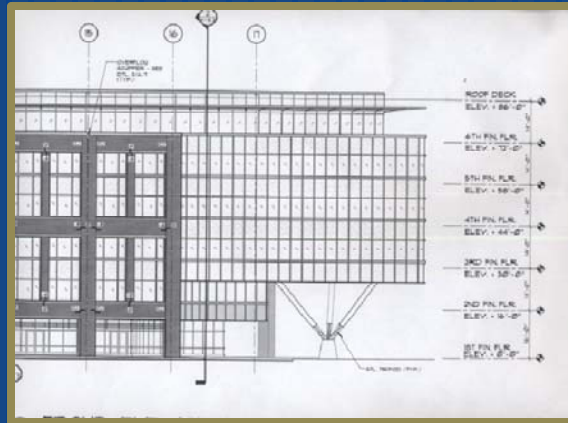
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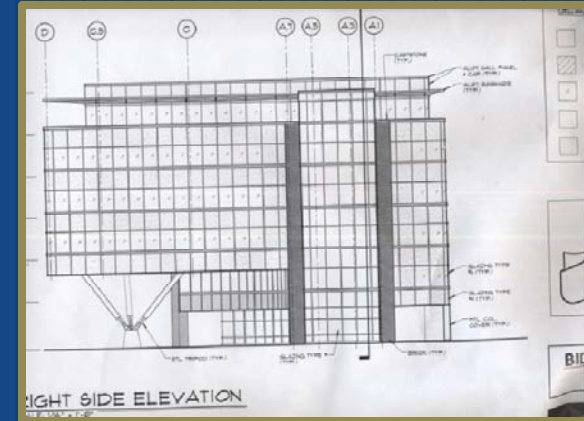
TRIPOD



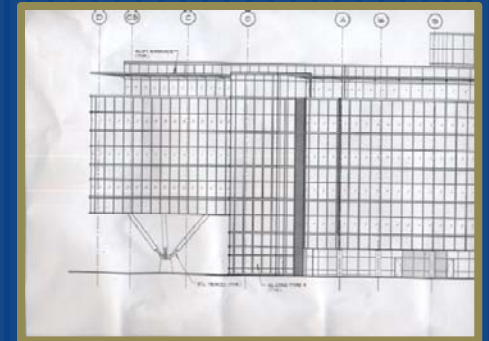
Tripod Area Floor Plan



Tripod Area Elevation View



Tripod Area Elevation View



Tripod Area Elevation View

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TRIPOD

- Target Illuminance: 5 fc (Horizontal), 3 fc (Vertical)
- Minimize light pollution
- Exterior Exposure (impression of Barclays)
- Points of Interest
- Minimize Reflected Glare
- Uniform distribution of light on traffic surfaces

DESIGN ISSUES

- The structural tripod is the most prominent feature and the highlight of this outdoor space
- Direct and Reflected Glare
- Roadway and sidewalk illumination/light distribution
- This outdoor space is highly visible from the street and surrounding areas

DESIGN CRITERIA & SOLUTIONS

- Structural tripod is a point of interest but also integrated with adjacent architecture
- Remove as many sources from direct sight as possible. Illuminate the underside of overhang and use it as a luminous surface
- Use low profile fixtures to properly illuminate traffic areas without disturbing the architectural purity of the space
- Draw attention and interest to the building and Riverfront Wilmington

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TRIPOD



Tripod Photoshop Rendering



Low Profile Roadway Lighting Example

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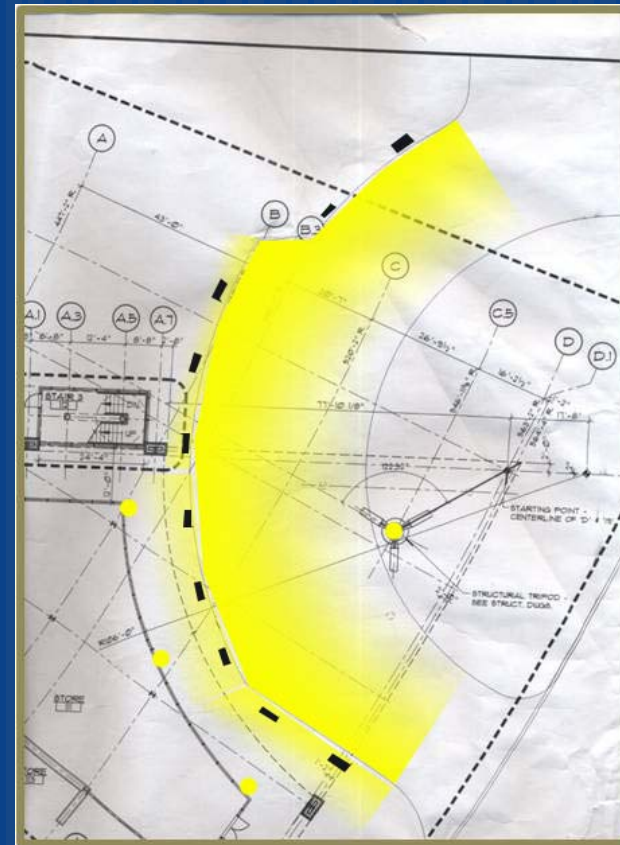
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TRIPOD



Tripod Spotlight & Roadway Light Positions



Tripod Lighting Sketch (Plan View)



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Questions or Comments?

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