

ONE CHRISTINA CRESCENT

125 S. West Street
Wilmington, Delaware



Technical Assignment 1: Existing Lighting Conditions & Design Criteria

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TABLE OF CONTENTS

Executive Summary..... 3

Existing Conditions.....4

 Second Floor Open Office.....4

 Second Floor Auditorium.....6

 Lobby.....7

 Second Floor Café/Dining Area.....9

 Outdoor Space.....11

Design Criteria.....11

 Second Floor Open Office.....11

 Second Floor Auditorium.....12

 Lobby.....13

 Second Floor Café/Dining Area.....13

 Outdoor Space.....14

Existing Lighting Design Analysis.....14

Appendix

EXECUTIVE SUMMARY

This report is a survey of the existing lighting conditions for One Christina Crescent, and includes a listing of design criteria which will be pertinent to the future redesign of the lighting system. The survey consists of a detailed description of the existing lighting systems and major hardware (including luminaires, lamps, ballasts, control devices, and daylight elements). Also present in this report is a review of the general conditions and finish specifications for the five spaces to be redesigned. These five spaces consist of the second floor open office, second floor auditorium, lobby, second floor café/dining area, and the outdoor space where the structural tripod is located.

Appropriate design criteria are considered and presented for each of the five spaces to be redesigned. In general the design criteria are dictated by the specific use of the space with consideration that the building is used as a corporate office for a prominent bank. VDT use, as well as employee mood and fatigue guide the criteria for the open office. The most critical space for design criteria is the auditorium which has specific requirements for the various types of programs that take place within the room. Daylight is a major factor in all of the interior spaces due to the fact that most of the building consists of aluminum and glass curtain walls. ASHRAE/IESNA Standard 90.1 requirements for power consumption are presented for each of the spaces for use in analysis and future redesign.

Finally, this report includes an evaluation and critique of the existing lighting conditions for One Christina Crescent. Evaluation is based upon the design criteria which are introduced in this report. Detailed performance analyses were conducted for both the second floor open office and auditorium using AGI32 software. In general, the existing lighting conditions are more than sufficient in terms of proper illuminance and ambient light levels. However, uniformity within the lighting design is very noticeable. This can be an issue with corporate offices with regard to productivity and employee mood. Most employees at this building spend long hours at a cubicle primarily working with a personal computer. Accent lighting and some non-uniformity would greatly improve the existing lighting design by reinforcing a sense of pleasantness and relaxation.

One Christina Crescent is a project that offers the opportunity to consider those aspects of lighting design which apply to corporate offices. Lighting designs for this category of buildings must always consider productivity as well as the impression of the company that is inferred through the visual appearance.

EXISTING CONDITIONS

This section is a thorough description of all existing conditions, including luminaires and finishes, within the five spaces to be redesigned. See Appendix for drawings.

I. SECOND FLOOR OPEN OFFICE

Luminaires

- 1) 2' x 4' Recessed fluorescent indirect fixture with low gloss matte white finish, perforated side baskets, (1) <20% THD 277V electronic ballasts and (2) 32 watt T-8 lamps

Focal Point #FBX24B2T8E277GPSL835WH

- 2) 2' x 2' recessed fluorescent indirect light fixture with low gloss matte white finish, perforated side baskets, (1) <20% THD 277V electronic ballasts and (2) 40 watt biax lamps

Focal Point #FBX22B2BX40E277GPSL835WH

- 3) 9" diameter recessed fluorescent downlight with (1) 26 watt quad tube, clear, disc, decorative trim and a 277V Lutron Hi-Lume dimming ballast

Wila #10812277WHDFSHDIM
Lutron #FDB-T426-277-1-S (Ballast)

- 4) Recessed fluorescent downlight with (2) 13 watt 2-pin compact fluorescent lamps, 100% acrylic pattern 32 lens, clear recessed trim and 277V electronic ballast

Edison Price #LL/8-277COL

The 2' x 4' and 2' x 2' recessed fluorescent indirect fixtures provide ambient light over the areas where the cubicles are. The downlights can be found in the building core area, where the ceiling soffit height and ceiling finish is different than in the open area.

Finishes

Walls:

- 1) Manufacturer: Sherwin Williams
Color: SW7008 Alabaster
Location: Field Paint; Eggshell Finish

- 2) Manufacturer: Sherwin Williams
Color: SW6108 Latte; Eggshell Finish
Location: Field Paint (Building Core)

Base:

- 1) 12" high wood base stained to match designer's controlled sample

Floor:

- 1) Manufacturer: Bentley Prince Street
Custom Development Sample
Style: Charlemont
PDS # 128119/050 KR333 w/ space dyes 5162/5162
Style # 8CH3006301
Carpet Tile Monolithic Installation
Location: Field Carpet
- 2) Manufacturer: Bentley Prince Street
Style: Heath
Style # 8HT2606301
Color: Brightman 888836
Location: Field Carpet (Brown Pattern)
- 3) Manufacturer: Bentley Prince Street
Custom Development Sample
PDS # 131083/009
Style # 8BU3006301 Blue Highway
Location: Accent Carpet

Ceiling:

- 1) Manufacturer: Armstrong World Industries
Product: HI-LR Optima RH90 with foil back
#3352
Surface Texture: Fine
Face Pattern: Plain White
Edge Profile: Square edge lay-in for interface with Prelude XL 15/16"
exposed tee
Color: White (grid & tile)
Size: 24" X 24"

- 2) Manufacturer: Armstrong World Industries
Product: Woodworks Natural
#6821 Vector Beech Perforated tile with Woodworks Vector infill panel
(Fiberglass infill) #820-01-00
Surface Texture: Smooth
Species: Beech
Edge Profile: Vector for interface with Prelude XL 15/16" exposed tee
(black grid)
Size: 24" X 24"

Daylight Elements

Pilkington Eclipse Advantage Arctic Blue reflective Low-E glass outer lite and clear float glass inner lite with transmittance of 35%

II. SECOND FLOOR AUDITORIUM

Luminaires:

- 1) 5" diameter incandescent downlight with 120 watt PAR38 lamp, 277V magnetic 2 wire stepdown transformer, champagne gold reflector and semi-specular/low iridescent lamp

Focal Point #FBX24B2T8E277GPSL835WH

- 2) White LED encapsulated lamps. The encapsulation is transparent UV stabilized PVC with 120V LED drivers and power feed

Bruck #135401 (Orion Belt)
Bruck #D-300WDC (LED driver)
Bruck #70424 (100W transformer)

The downlights provide ambient light to the entire space, while the LED lamps are installed on the ceiling soffit where ceiling height changes.

Finishes

Walls:

- 1) Manufacturer: Sherwin Williams
Color: SW7008 Alabaster
Location: Field Paint; Eggshell Finish

- 2) Manufacturer: Sherwin Williams
Color: SW6108 Latte; Eggshell Finish
Location: Field Paint (Building Core)

Base:

- 1) 12" high wood base stained to match designer's controlled sample

Floor:

- 1) Manufacturer: Bentley Prince Street
Style: Forsyth (Custom Color)
PDS # 128119/044
Style: 8FY3006301
Forsyth Light Green with KR 330
DPU 128119/003

Ceiling:

- 1) Manufacturer: Armstrong World Industries
Product: Optima Open Office Plan – Large Sizes
Surface Texture: Fine
Grid Face: Square Tegular
Color: White (grid & tile)
Size: 48" X 48"

- 2) Painted Gypsum Wall Board

Paint: Sherwin Williams
Cobble Brown # SW60082; Flat Finish
Location: Ceiling and soffits

Daylight Elements

Pilkington Eclipse Advantage Arctic Blue reflective Low-E glass outer lite and clear float glass inner lite with transmittance of 35%

III. LOBBY

Luminaires

- 1) Fluorescent pendant mounted fixture with (2) 54 watt T-5 lamps and 120V electronic ballast

Deltalight #271-64-21/Jeti-Luster

- 2) 6" diameter metal halide light fixture with lower wattage pulse lamp 50 watt lamp and 277 volt ballast

Kirlin #HRR-04050T-43-277

- 3) Pendant mounted light fixture with (1) 25 watt compact fluorescent lamp and 120V electronic ballast

Deltalight #271-61-21/Jeti-S

- 4) Recessed fluorescent downlight with (2) 13 watt 2-pin compact fluorescent lamps, 100% acrylic pattern 32 lens, clear recessed trim and 277V electronic ballast

Edison Price #LL/8-277COL

Finishes

Walls:

- 1) Manufacturer: Sherwin Williams
Color: SW7008 Alabaster
Location: Field Paint; Eggshell Finish
- 2) Manufacturer: Sherwin Williams
Color: SW6108 Latte; Eggshell Finish
Location: Field Paint (Building Core)

Base:

- 1) 12" high wood base stained to match designer's controlled sample

Floor:

- 1) Sealed Concrete Floor

Ceiling:

- 1) Manufacturer: Armstrong World Industries
Product: HI-LR Optima RH90 with foil back
#3352
Surface Texture: Fine

Face Pattern: Plain White
Edge Profile: Square edge lay-in for interface with Prelude XL 15/16"
exposed tee
Color: White (grid & tile)
Size: 24" X 24"

- 2) Manufacturer: Armstrong World Industries
Product: Woodworks Natural
#6821 Vector Beech Perforated tile with Woodworks Vector infill panel
(Fiberglass infill) #820-01-00
Surface Texture: Smooth
Species: Beech
Edge Profile: Vector for interface with Prelude XL 15/16" exposed tee
(black grid)
Size: 24" X 24"

- 3) Painted Gypsum Wall Board

Paint: Sherwin Williams
Cobble Brown # SW60082; Flat Finish
Location: Ceiling and soffits

IV. SECOND FLOOR CAFÉ/DINING AREA

Luminaires:

- 1) 10" diameter recessed fluorescent downlight with low iridescent champagne gold reflector, (2) 32 watt compact fluorescent lamps and (2) 277V electronic dimming ballasts

Infinity #PH10-232T-2DIM-CG

- 2) 9" diameter recessed fluorescent downlight with (1) 26 watt quad tube, clear, disc, decorative trim and a 277V Lutron Hi-Lume dimming ballast

Wila #10812277WHDFSHDIM
Lutron #FDB-T426-277-1-S (Ballast)

Finishes

Walls:

- 1) Manufacturer: Sherwin Williams
Color: SW7008 Alabaster
Location: Field Paint; Eggshell Finish

- 2) Manufacturer: Sherwin Williams
Color: SW6108 Latte; Eggshell Finish
Location: Field Paint (Building Core)
- 3) Manufacturer: Sherwin Williams
Color: SW0032 Needlepoint Navy; Eggshell Finish
Location: Accent Walls

Base:

- 1) 12" high wood base stained to match designer's controlled sample
- 2) Manufacturer: Marca Corona
Color: Brown
Size: 3" X 18"
Base Tile Location: 2nd floor hospitality area

Floor:

- 2) Manufacturer: Bentley Prince Street
Style: Shoton
#8SW44000SA
Color: Yigong 888696
Carpet tile monolithic installation

Ceiling:

- 1) Manufacturer: Armstrong World Industries
Product: Optima Open Office Plan – Large Sizes
Surface Texture: Fine
Grid Face: Square Tegular
Color: White (grid & tile)
Size: 48" X 48"
- 2) Manufacturer: Armstrong World Industries
Product: Woodworks Natural
#6821 Vector Beech Perforated tile with Woodworks Vector infill panel
(Fiberglass infill) #820-01-00
Surface Texture: Smooth
Species: Beech
Edge Profile: Vector for interface with Prelude XL 15/16" exposed tee
(black grid)
Size: 24" X 24"

Daylight Elements

Pilkington Eclipse Advantage Arctic Blue reflective Low-E glass outer lite and clear float glass inner lite with transmittance of 35%

V. OUTDOOR SPACE

Luminaires:

- 1) Recessed lensed metal halide downlight within upper soffits for ambient lighting of circulation, 277V

Kirlin #HRR-06052-15
Lamp: CDM150/T6/830

- 2) Recessed lensed metal halide downlight within lower soffits for ambient lighting of circulation, 277V

Kirlin #HRR-04050-43
Lamp: CDM70/T6/830

- 3) Recessed lensed metal halide adjustable accent within upper soffits for accenting the 'tripod' columns, 277V

Kirlin #HRR-06056
Lamp: CDM150/T6/830

DESIGN CRITERIA

I. SECOND FLOOR OPEN OFFICE

Illuminance: Horizontal – 30 fc; Vertical – 5 fc

Design Issues:

- Direct glare from luminaires (bare lamp visibility) and from exterior windows
- Luminance of room surfaces. Wall luminance of about 30 cd/m^2 . There should not be dark spots at the top of walls. Deliver both direct and diffuse light.
- Source/Task/Eye Geometry as it relates to the angular relationship between office workers, the task, and the luminaires.
- Minimize reflected glare from glossy surfaces, computer screens and exterior windows (night).
- Color appearance should be excellent for performance of visual tasks. Use lamps with high CRI. Sufficient contrast on computer screens and paperwork.

- Daylighting control and integration considering extensive exterior windows throughout space.
- Flicker from fluorescent sources. Use high frequency electronic ballasts.
- Shadows on the work plane from shelves, hands, office equipment. Task lighting should not create shadows that are distracting.
- Light distribution on surfaces. 3:1 ratio between ceiling and walls. Uniformity on task plane; non-uniformity on peripherals for comfort.
- Modeling of the faces of employees within the space is somewhat important, especially near windows where dark silhouettes can appear without proper interior lighting.
- Lighting should be flexible for the movement of office furniture in the future.
- Noise from lamps and ballasts
- Building is occupied 24/7
- Alertness of employees as it relates to illuminance levels and light patterns

Power Allowance: $1.1 \text{ W/ft}^2 + 0.35 \text{ W/ft}^2$ (VDT lighting)

II. SECOND FLOOR AUDITORIUM

Illuminance: Horizontal – 10-30 fc; Vertical – N/A

Design Issues:

- Lighting system control and flexibility for various activities which may occur in the space
- Color appearance should be excellent for proper viewing of visual presentations on projection screens
- Daylighting integration and control considering that occupants are surrounded by exterior walls on three sides. Room is susceptible to southern solar exposure throughout the day.
- Direct glare from luminaires and exterior windows.
- Flicker from fluorescent sources; use high frequency ballasts.
- Luminance of surfaces, especially the projection screens.
- Modeling of faces during lectures and presentations.
- Noise from lamps and ballasts which may distract from presentations.
- Psychological and physiological comfort of audience during lengthy presentations

Power Allowance: 1.3 W/ft^2

III. LOBBY

Illuminance: Horizontal – 10 fc; Vertical – 3 fc

Design Issues:

- Appearance of space and luminaires considering that the lobby is the first impression that visitors receive; professional and corporate look
- Color appearance of surfaces and points of interest; furniture, artwork, company sign behind reception desk, finishes
- Direct glare from luminaires and exterior windows
- Points of interest: artwork, reception desk, company sign
- System control in relation to daylighting; building is occupied 24/7
- Daylighting integration and control; most of the walls are nearly 100% exterior windows
- Modeling of faces as visitors enter the building and approach reception desk
- Light distribution should be non-uniform to provide comfort and a warm pleasant reception
- Sparkle provided by decorative fixtures and finishes

Power Allowance: $1.3 \text{ W/ft}^2 + 1.0 \text{ W/ft}^2$ (decorative lighting)

IV. SECOND FLOOR CAFÉ/DINING AREA

Illuminance: Horizontal – 10 fc; Vertical – 3 fc

Design Issues:

- Color appearance of surfaces and points of interest; furniture, artwork, finishes
- Direct glare from luminaires and exterior windows
- Points of interest: artwork, café bar, food preparation area
- System control in relation to daylighting; building is occupied 24/7, varying moods depending on the time of day
- Daylighting integration and control; most of the walls are nearly 100% exterior windows
- Modeling of faces of occupants within space and seated at tables; conversation during meals
- Light distribution should be non-uniform to provide comfort and a pleasant relaxed feeling to provide relief from stress during meals/breaks
- Sparkle provided by decorative fixtures and finishes

Power Allowance: 0.9 W/ft^2 (seating area); 1.2 W/ft^2 (food preparation area)

V. OUTDOOR SPACE

Illuminance: Horizontal – 5 fc; Vertical – 3 fc

Design Issues:

- Appearance of space and luminaires is very important on building façade because it gives an overall impression of the company
- Light distribution on surfaces; uniform on traffic surfaces (sidewalks, roadway)
- Light pollution at night
- Points of interest: building entrance, steel tripod
- Reflected glare off glossy surfaces and windows
- Shadows; 3D impression of space; geometric complexity
- Source/Task/Eye Geometry
- Surface characteristics; proper illumination of finishes (provides impression of company according to how nice the building looks)
- Sparkle provided by decorative fixtures and finishes
- Modeling of faces and objects; pedestrians and moving vehicles

Power Allowance: 0.2 W/ft^2 for each illuminated wall or surface or 5.0 W/linear ft for each illuminated wall or surface

EXISTING LIGHTING DESIGN ANALYSIS

The overall lighting design for the entire building is more than sufficient in terms of ambient light and illuminance. However, in general, the design lacks the peripheral non-uniformity and accents that would take the spaces from good to outstanding. Monotony can be detrimental to an effective lighting design for corporate offices, as in the case of seriously affecting productivity.

Second Floor Open Office

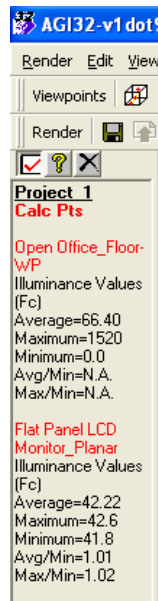
Analysis of this space was performed in AGI32. In general, horizontal illuminance on the workplane was a little bit higher than it should be for an open office plan with intensive VDT use. Target values for this type of space should be around 30 fc with illuminance up to 50 fc being acceptable, considering that some paperwork is also done within the space. The computer analysis resulted in illuminance values in excess of 60 fc in many places. Illuminance was highest near the windows with an average of 100 fc or more. This could be due to a deficiency in daylight integration and control, or may be a result of inaccuracy of the computer model as compared to the real space. Observations during a site visit would support the conclusion that illuminance levels are quite a bit higher than they need to be within this space. Illuminance values on the vertical plane (computer screen) were much higher than the target value of 5 fc with an average of 42 fc. This may

be a result of an inaccuracy in the computer model due to assumptions of surface reflectances.

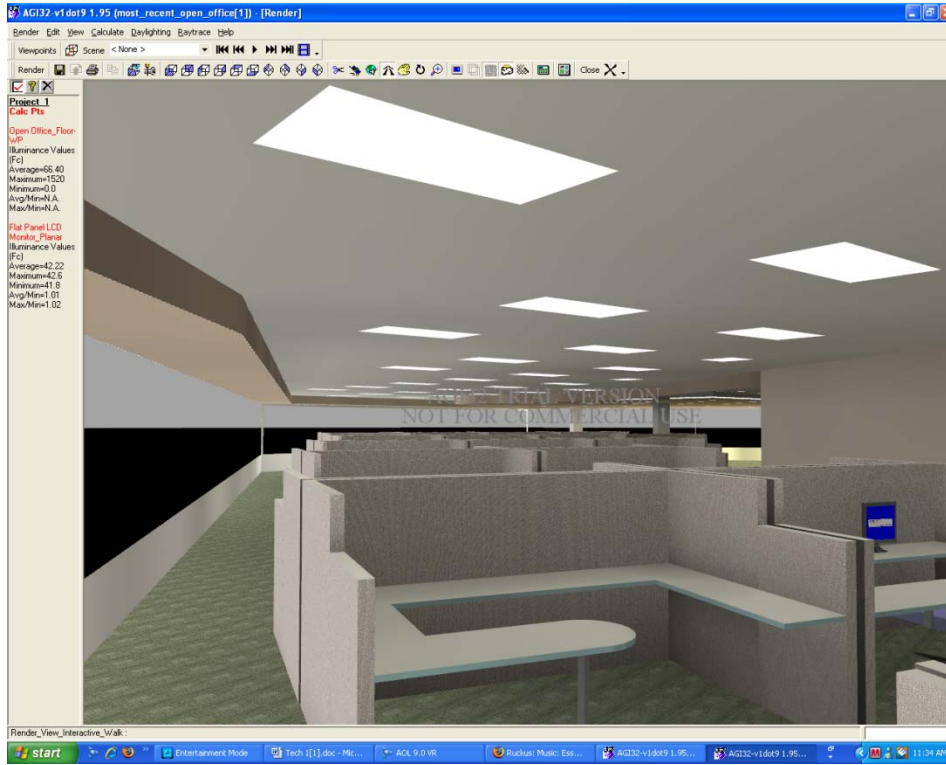
Direct glare is not a problem in this space because recessed indirect fixtures are used throughout the space. Luminance of room surfaces appear to be adequate and uniform. Shadows on the desks and work plane are minimal and do not appear to cause any distractions.



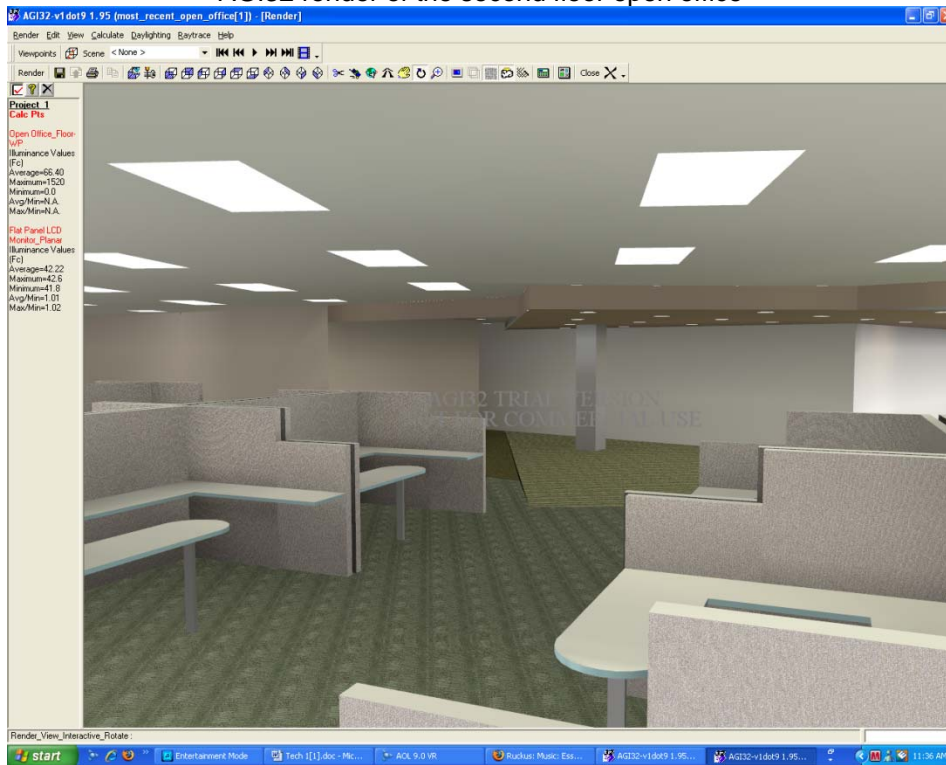
AGI32 raytraced image of the second floor open office



AGI32 illuminance values on the work plane and vertical plane (computer screen)



AGI32 render of the second floor open office



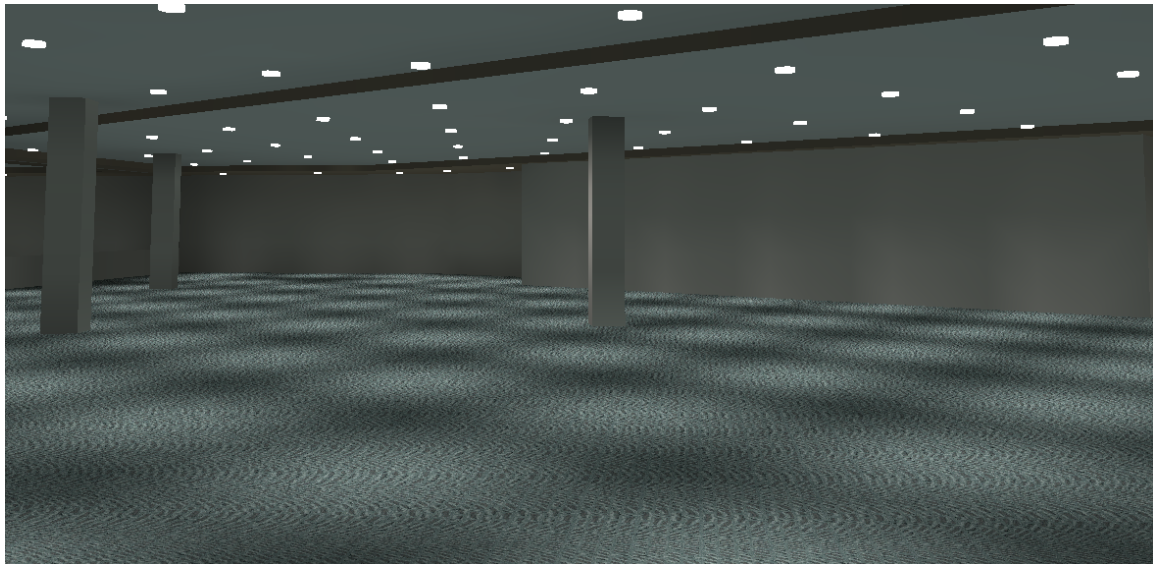
AGI32 render of the second floor open office showing different floor & ceiling finishes

Second Floor Auditorium

Analysis of this space was performed in AGI32. Average illuminance on the horizontal plane was slightly higher than the range suggested earlier in Design Criteria. The average illuminance in the AGI32 model was 35 fc. The IESNA Lighting Handbook recommends an illuminance of 10 fc on the horizontal plane for auditoriums. However, this is not a typical auditorium considering the types of presentations given in a corporate office. Audience members may be frequently taking notes and reading material at their seats. For this reason, the target illuminance on the horizontal plane should be raised, but should not greatly exceed 30 fc.

During a site visit it was observed that there are blackout shades on the windows in the auditorium. Therefore, solar gain and direct glare from the sun are not a problem during presentations making use of the projector screens in the room.

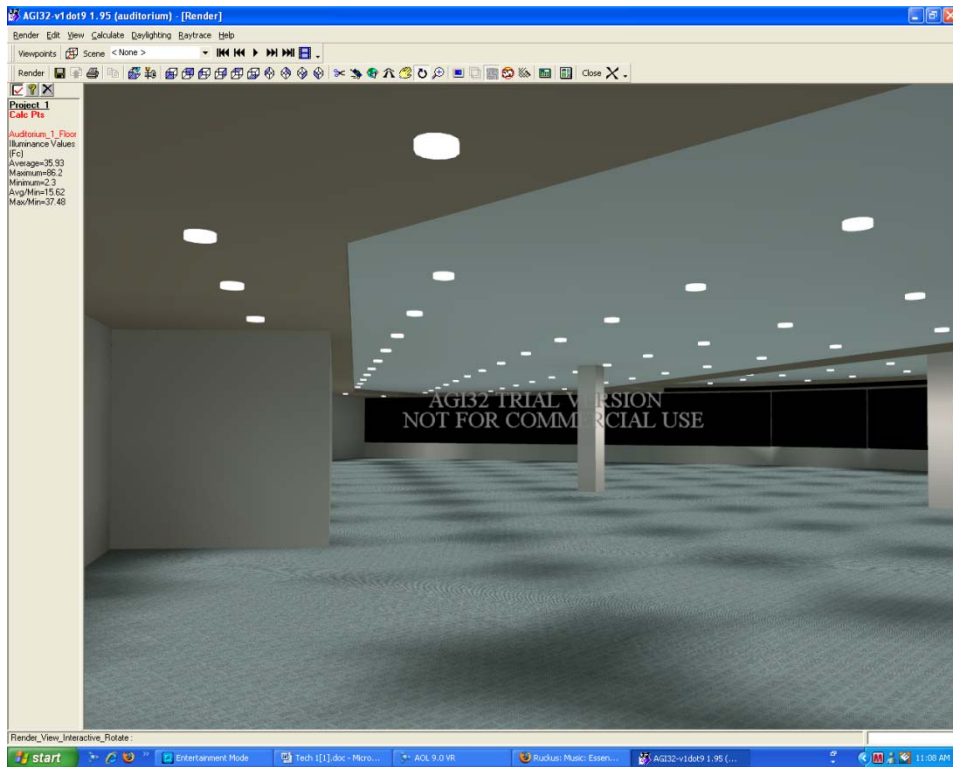
The LED strips mounted in the ceiling coves provide some visual interest to the space while illuminating the ceiling and giving the sense of some vertical spaciousness in a room that can appear vertical constricted because of its floor area and low ceilings.



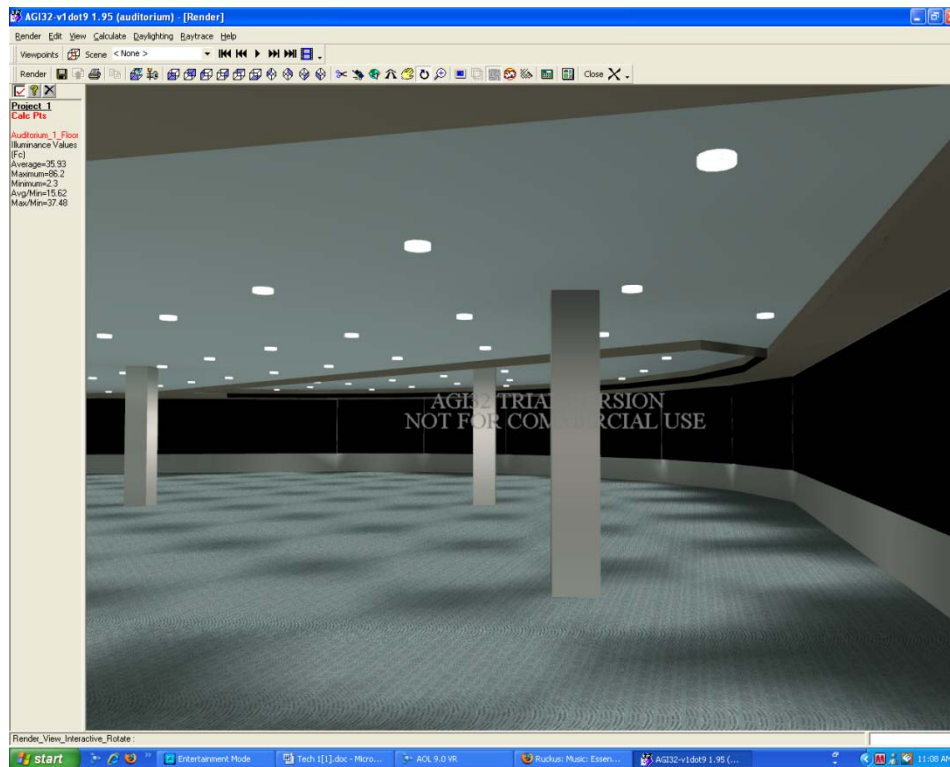
AGI32 raytraced image of the auditorium



AGI32 illuminance values on the auditorium floor



AGI32 render of the second floor auditorium looking in from the back of the room



AGI32 render of the second floor auditorium looking towards the front

Lobby

Illuminance levels in the lobby appeared to be sufficient when viewed during a site visit. The lobby is one of the better spaces in the building in terms of lighting. The appearance of the space is pleasing, especially at night. The main pendant fixture in the space provides a stunning impression as visitors enter the building. The fixture provides plenty of sparkle and visual interest, especially at night, as the well lit lobby can be seen from the exterior through the two story walls of glass that surround the space.

Second Floor Café/Dining Area

The levels of illuminance in this area were found to be adequate during a site visit. Daylight is integrated in the space, as most of the perimeter is composed of exterior windows. While illuminance is sufficient and some visual interest is provided by decorative fixtures, the lighting system is very uniform, not providing the interest that the space demands. The dining area is a very nice space with beautiful finishes, yet the lighting system seems to be subpar compared to the overall space. It would be beneficial for general look and effectiveness of the space if the lighting was not so uniform and monotonous. Ambient light is provided, but there is very little in the case of accent lighting.

Outdoor Area

During multiple site visits, both during day and night, the illuminance levels appeared to be appropriate. The lighting design is quite basic in this area, consisting only of 'can' style downlights. The steel tripod is highlighted by adjustable downlights. There is quite a bit of direct glare while standing under the fixtures. The steel tripod is the highlight of the exterior of the building, but the lighting does not provide as much visual interest as the space deserves. It would be beneficial to have some sparkle and decorative fixtures in this space.

APPENDIX

SECOND FLOOR OPEN OFFICE DRAWINGS