Front Canopy Lighting Redesign

Introduction

The front canopy of the new West Wing addition is located adjacent to the existing front entrance of the hospital. The new entrance to the hospital provides shelter for about 5224 sq ft of exterior space. As you can see from the picture below, the materials used for the canopy’s façade follow the rest of the hospital’s façade design of using mainly brick and limestone. Also, the back wall of the canopy contains a lot of transparent glass which follows the design of the glass curtain wall above the canopy, with the exception of the curtain wall not being transparent.

Design Concept

The Front Canopy of the addition serves as the new entrance to the new and existing hospital. This new entrance will be used mainly as a drop-off and pick-up area and a place to find shelter from the weather. Therefore, the lighting design for this area should strongly tell people that this is the new entrance to the hospital. The existing lighting design for the DuBois Regional Medical Center is that light escapes out of the building from the inside, making the brick façade of the existing building quite dark. The new West Wing’s façade is no different from this, with the exception of a small amount of uplight on the front glass curtain wall. The Front Canopy’s lighting redesign will generally follow this design by keeping strong light patterns off the building back brick and glass wall. The variant from the general dark building façade will happen at the canopy’s exterior, where decorative lighting will be used to alert incoming pedestrians and automobiles of the hospital’s entrance and its building elements. As for the general lighting under the canopy, it should provide an evenly illuminated ground to avoid confusion of the elder occupants as well as provide a clear definition of the separation between pedestrian and vehicular areas.
Design Criteria

Task Descriptions:
Drive through drop-off and pick-up location.
Entrance to hospital.

Illuminance Levels:
- Horizontal Illuminance Level on Ground.
  Recommended value from IESNA 9\textsuperscript{th} addition is Category B
  \textbf{Category B = 5 fc}
  \begin{tabular}{ll}
    \textbf{Adjustments} & \\ 
    Age>55 & +1 \\ 
    Important & 0 \\ 
    <30\% & -1 \\ 
    & 0 \\
  \end{tabular}
  No adjustments necessary.

- Vertical Illuminance on Columns and Walls.
  Recommended value from IESNA 9\textsuperscript{th} edition is Category B
  \textbf{Category B = 5 fc}
  No adjustments necessary

Design Considerations:
- It is important that this space look welcoming and well illuminated so that the person entering the building feels safe and comforted.
- Light columns and front entrance façade so people are well aware of their surroundings.
- Avoid direct glare from luminaries by using small aperture down lights.
- Also avoid reflected glare by using down lights with a narrow distribution and surfaces with a matte composition.
- Provide even light distributions under canopy to eliminate confusion that elder visitors may encounter.
- Illuminate perimeter to keep motorists and pedestrians aware of hazards in their peripheral vision.
- Avoid using luminaires that provide significant light onto areas outside of canopy, like windows, that could attract people away from the entrance.
- Use lighting system that can withstand cold weather conditions.
- Use luminaries with CRIs of 70 or above to provide healthy-looking skin tones.
- Use lamp with a CCT around 3500 to bring out the red in the brick façade as well as the color appearance of the limestone. Also this will give the entrance a warm inviting feeling at night.

Control System:
System should be an on/off system controlled by the dedicated photocells. There should also be a manual on/off switch in case of photocell failure.
Equipment

Luminaire CL – Pedestrian Area Luminaires

Architektur
6" Vertical One Lamp MH

<table>
<thead>
<tr>
<th>Luminaire</th>
<th>Initial Lm</th>
<th>Mean Lm</th>
<th>Cleanliness</th>
<th>Cleaning Cycle</th>
<th>CIE Category</th>
<th>LDD</th>
<th>RSDD</th>
<th>LLD</th>
<th>BF</th>
<th>Total LLF</th>
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<tbody>
<tr>
<td>CL</td>
<td>2300</td>
<td>2025</td>
<td>Mod. Clean</td>
<td>2 Year</td>
<td>Direct</td>
<td>0.88</td>
<td>0.9</td>
<td>0.88</td>
<td>0.9</td>
<td>0.63</td>
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Luminaire CH – Vehicular Area Luminaires

Architektur
8" PAR MH Downlights

<table>
<thead>
<tr>
<th>Luminaire</th>
<th>Initial Lm</th>
<th>Mean Lm</th>
<th>Cleanliness</th>
<th>Cleaning Cycle</th>
<th>CIE Category</th>
<th>LDD</th>
<th>RSDD</th>
<th>LLD</th>
<th>BF</th>
<th>Total LLF</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH</td>
<td>5500</td>
<td>3960</td>
<td>Mod. Clean</td>
<td>2 Year</td>
<td>Direct</td>
<td>0.88</td>
<td>0.9</td>
<td>0.72</td>
<td>0.9</td>
<td>0.51</td>
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</tbody>
</table>
Luminaire CG – Column Uplights

<table>
<thead>
<tr>
<th>Luminaire</th>
<th>Initial Lm</th>
<th>Mean Lm</th>
<th>Cleanliness</th>
<th>Cleaning Cycle</th>
<th>CIE Category</th>
<th>LDD</th>
<th>RSDD</th>
<th>LLD</th>
<th>BF</th>
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</thead>
<tbody>
<tr>
<td>CG</td>
<td>850</td>
<td>See IESNA</td>
<td>Dirty</td>
<td>2 Year</td>
<td>Indirect</td>
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<td>0.8</td>
<td>0.93</td>
<td>N.A.</td>
<td>0.6</td>
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</table>

Luminaire CS – Decorative Luminaires

<table>
<thead>
<tr>
<th>Luminaire</th>
<th>Initial Lm</th>
<th>Mean Lm</th>
<th>Cleanliness</th>
<th>Cleaning Cycle</th>
<th>CIE Category</th>
<th>LDD</th>
<th>RSDD</th>
<th>LLD</th>
<th>BF</th>
<th>Total LLF</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>2300</td>
<td>2025</td>
<td>Dirty</td>
<td>2 Year</td>
<td>Dir./Ind.</td>
<td>0.88</td>
<td>0.85</td>
<td>0.88</td>
<td>0.9</td>
<td>0.54</td>
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</table>
Luminaire CD – Decorative
Will illuminate a diffusing sphere.

Power Density Calculation

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<tr>
<th>Luminaire</th>
<th>Initial Lm</th>
<th>Mean Lm</th>
<th>Cleanliness</th>
<th>Cleaning Cycle</th>
<th>CIE Category</th>
<th>LDD</th>
<th>RSDD</th>
<th>LLD</th>
<th>BF</th>
<th>Total LLF</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD</td>
<td>5500</td>
<td>3960</td>
<td>Clean</td>
<td>2 Year</td>
<td>N.A.</td>
<td>0.92</td>
<td>0.9</td>
<td>0.72</td>
<td>0.9</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Power Density = 3666W/ (5224 sq ft) = \(0.70\text{W/ft}^2\)

Power Density **DOES** comply with ASHRAE Standard 90.1 that says by using Table 9.4.5 for Exterior Canopy Spaces you should not exceed a power density of 1.25 W/ft^2.
Control System

The new canopy lighting system will be controlled by the existing Lithonia Lighting control panel located in the atrium. An exterior photosensor, located toward the entrance of the addition, will communicate with the control panel and tell it when to turn the exterior lighting system on and off. The control panel should be set to turn the system on and off without the system cycling around dusk and dawn hours.

<table>
<thead>
<tr>
<th>FIXTURE TYPE</th>
<th>CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>ON-OFF CONTROLLED VIA EXTERIOR PHOTO CELL #2</td>
</tr>
<tr>
<td>CH</td>
<td>ON-OFF CONTROLLED VIA EXTERIOR PHOTO CELL #2</td>
</tr>
<tr>
<td>CG</td>
<td>ON-OFF CONTROLLED VIA EXTERIOR PHOTO CELL #2</td>
</tr>
<tr>
<td>CS</td>
<td>ON-OFF CONTROLLED VIA EXTERIOR PHOTO CELL #2</td>
</tr>
<tr>
<td>CD</td>
<td>ON-OFF CONTROLLED VIA EXTERIOR PHOTO CELL #2</td>
</tr>
</tbody>
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Canopy Design Analysis

The following sections of the canopy lighting redesign provide visual and numerical evidence of the performance of the new lighting system. First, Calculations were run in AGI 32 to determine if the specified illuminance values from the design criteria were met. Below are calculation grids taken from AGI 32 to display the performance of the redesigned lighting system. The calculation grids were placed on the ground under the two low canopy areas, those being the pedestrian entrance area and the vehicular area. Following the calculation grids are several luminance pseudo color renderings which are used to show the different light levels on the back canopy walls.
Calculation Results
All Calculations were performed in AGI 32

Low Canopy 1 (Pedestrian Area 1)

Low Canopy 2 (Pedestrian Area 2)
Vehicular Area

Vehicular Illuminance Values (Fc)
Average=5.87
Maximum=7.0
Minimum=3.1
Avg/Min=1.89
Max/Min=2.26
Pedestrian Area at Entrance
Low Canopy 1 Area Pseudo Rendering

Pedestrian Entrance Pseudo Rendering
Low Canopy 2 Area Pseudo Rendering

Exterior Decorative Lighting

Some general non-detailed renderings of the canopy’s exterior were performed to help visualize the light distributions of the redesigned lighting system. Even though these renderings are not as realistic as they could be, they are still accurate renderings of the light distribution throughout the model, and can give designers, architects, and sometimes owners a good idea of what their lighting design will produce.

The picture to the right shows the sign for the DRMC canopy. This canopy is not displayed in any of the renderings but is actually illuminated during the nighttime hours.
**Design Results:**

As you can see from the calculation grids above, the illuminance values obtained from the new lighting redesign all seem to fall between four to seven foot-candles. The average values for each space fall around the five foot-candle range and therefore meet the desired illuminance design criteria. Also, from these calculation grids you can see that the light distribution across each of the floor areas is uniform and would not create any confusion for the elderly. When looking at the pseudo color rendering you can see that low luminance values were obtained for the back canopy wall, which was also specified in the design criteria for this space. The decorative lighting system showed that the canopy would really stand out from its dark façade surroundings, and would send a strong message to the incoming occupants that this is the new entrance to the DRMC.