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Trade Show and Conference

# Designers Lighting Forum

## Light on Crime

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03.19.2024


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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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# Learning Objectives

At the end of this course, participants will be able to:

1. Understand the Relationship Between Lighting and Safety Perceptions : Explore how lighting environments influence pedestrian safety and the perception of crime in urban settings, with a focus on the East Village in Manhattan.

2. Analyze Deficiencies in Urban Lighting Infrastructure : Identify key shortcomings in current urban lighting systems through field surveys, illuminance measurements, and questionnaire analyses.

3. Propose Innovative Lighting Design Solutions : Develop alternative lighting designs aimed at improving pedestrian safety and reducing fear of crime, based on empirical data and research findings.

4. Bridge the Gap Between Theoretical Standards and Practical Applications : Evaluate how theoretical lighting standards align with real-world safety perceptions, offering recommendations for urban planners, policymakers, and lighting designers.

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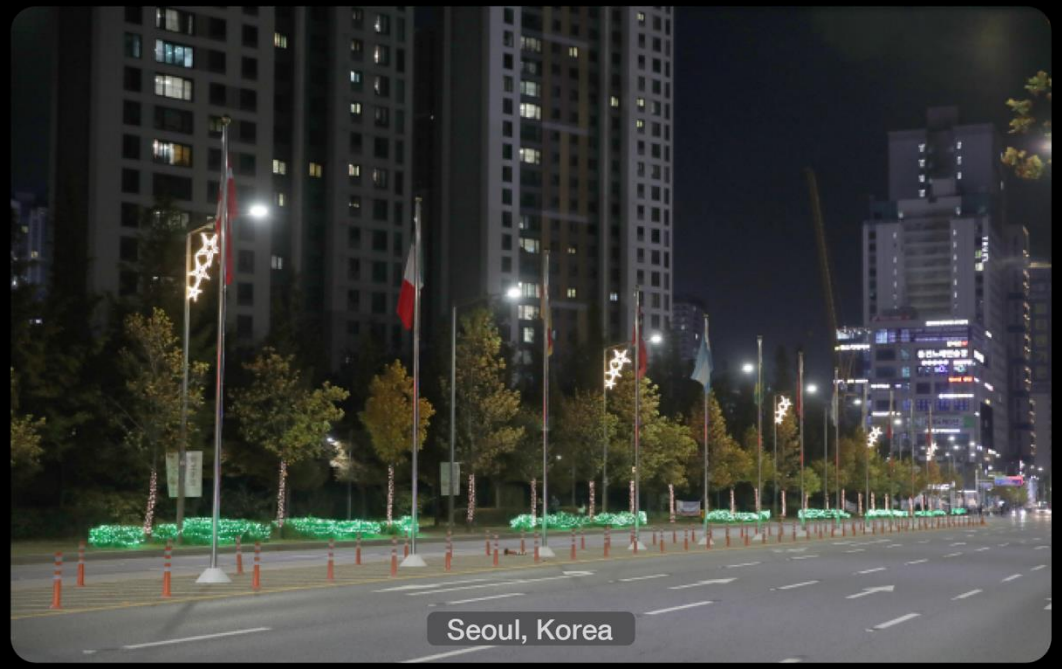
Seoul, Korea


Manhattan, New York

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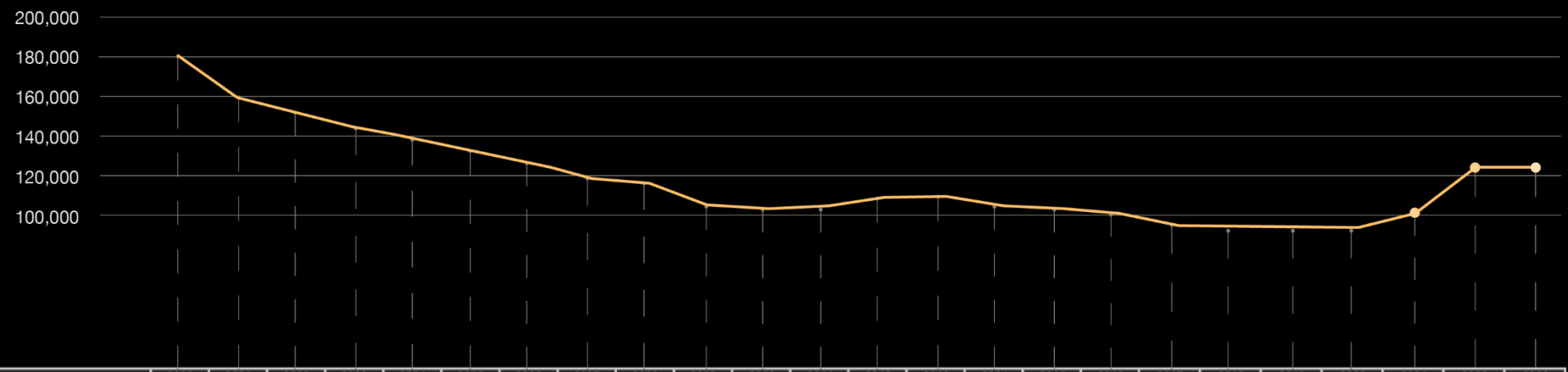
# Seven Major Felony Offenses




| OFFENSE | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MURDER & NON-NEGL. MANSLAUGHTER | 673 | 649 | 587 | 597 | 570 | 539 | 596 | 496 | 523 | 471 | 536 | 515 | 419 | 335 | 333 | 352 | 335 | 292 | 295 | 319 | 468 | 488 | 438 | 391 |
| RAPE | 2,068 | 1,981 | 2,144 | 2,070 | 1,905 | 1,858 | 1525 | 1351 | 1299 | 1205 | 1373 | 1420 | 1445 | 1378 | 1352 | 1438 | 1438 | 1449 | 1794 | 1755 | 1427 | 1491 | 1617 | 1455 |
| ROBBERY | 32,562 | 28,202 | 27,229 | 25,989 | 24,373 | 24,722 | 23739 | 21809 | 22401 | 18601 | 19486 | 19717 | 20144 | 19128 | 16539 | 16931 | 15500 | 13956 | 12913 | 13371 | 13106 | 13831 | 17411 | 16910 |
| FELONY ASSAULT | 25,924 | 23,453 | 21,147 | 19,139 | 18,622 | 17,750 | 17309 | 17493 | 16284 | 16773 | 16956 | 18482 | 19381 | 20297 | 20207 | 20270 | 20847 | 20052 | 20208 | 20698 | 20572 | 22835 | 26063 | 27876 |
| BURGLARY | 38,352 | 32,763 | 31,275 | 29,110 | 26,976 | 24,117 | 23143 | 21762 | 20725 | 19430 | 18600 | 18720 | 19168 | 17429 | 16765 | 15125 | 12990 | 12083 | 11687 | 10783 | 15478 | 12811 | 15746 | 13773 |
| GRAND LARCENY | 49,631 | 46,329 | 45,771 | 46,751 | 48,763 | 48,243 | 46625 | 44924 | 44242 | 39580 | 37835 | 38501 | 42497 | 45368 | 43862 | 44005 | 44279 | 43150 | 43558 | 43250 | 35505 | 40870 | 51565 | 50586 |
| GRAND LARCENY OF MOTOR VEHICLE | 35,442 | 29,531 | 26,656 | 23,413 | 20,884 | 18,246 | 15745 | 13174 | 12482 | 10670 | 10329 | 9314 | 8093 | 7400 | 7664 | 7332 | 6327 | 5676 | 5428 | 5430 | 9037 | 10415 | 13749 | 15795 |
| **TOTAL SEVEN MAJOR FELONY OFFENSES** | 184,652 | 162,908 | 154,809 | 147,069 | 142,093 | 135,475 | 128,682 | 121,009 | 117,956 | **106,730** | **105,115** | **106,669** | **111,147** | **111,335** | **106,722** | **105,453** | **101,716** | **96,658** | **95,883** | **95,606** | **95,593** | **102,741** | **126,589** | **126,786** |

**STATISTICAL NOTES**

1. 2000-2005 Data Source-Historical Comfinal data including Complaint Follow-Up data. Compiled from aggregated monthly tapes 2000 thru 2005.
2. 2006-2023 Data Source-CDW Omniform System and S-DD5 System (Complaint Follow Up) data by record create date.
3. Murder & Non-Negligent Manslaughter data source: 2000-2005 Historical Comfinal Data, 2006-2023 Shooting & Homicide Database.
4. 2000-2009 data as of 12/8/2010. 2010 data as of 1/18/2011. 2011 data as of 1/18/2012. 2012 data as of 1/15/2013. 2013 data as of 1/17/2014. 2014 data as of 1/16/2015. 2015 data as of 1/18/2016. 2016 data as of 1/16/2017. 2017 data as of 1/17/2018. 2018 data as of 1/14/2019. 2019 data as of 1/15/2020. 2020 data as of 1/15/2021. 2021 data as of 1/17/2022. 2022 data as of 1/16/2023. 2023 as of 1/15/2024.

: NYPD HISTRORICAL NYC CRIME DATA (2000~2023)

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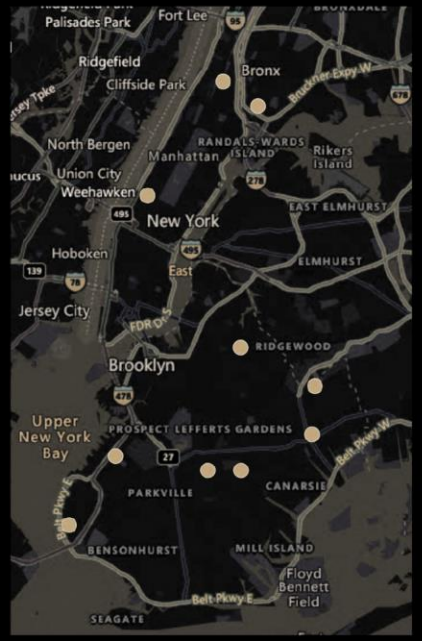
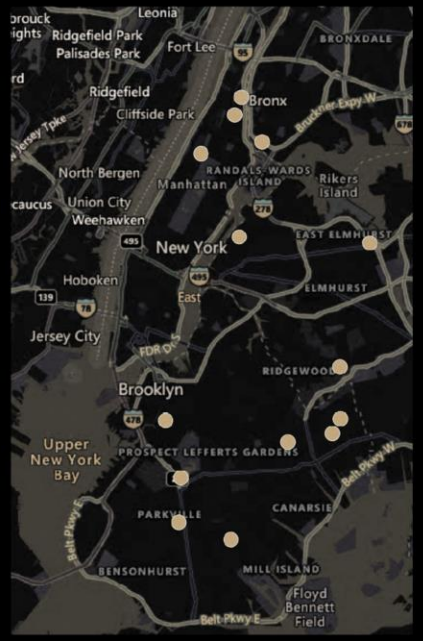
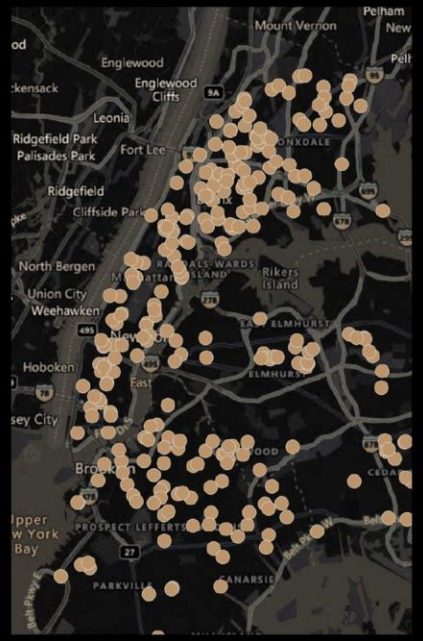
: NYPD COMPSTAT 2.0 (03/11/2022 ~ 14/12/2023)



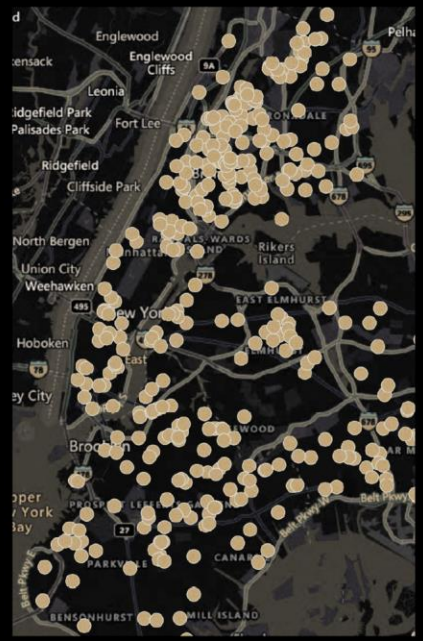

Murder




Rape




Robbery




Felony Assault


Burglary (Property Crime)

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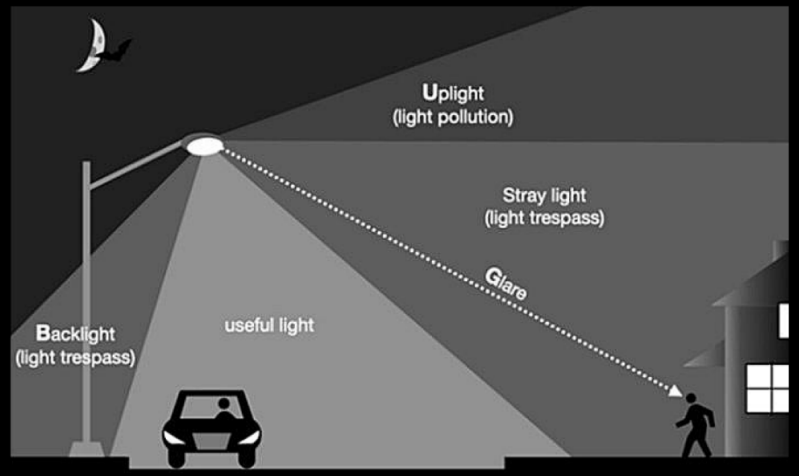


"Better lighting specifications involve factors like **illuminance, uniformity, glare control, and light spectrum**. Public pedestrianized areas benefit from **illuminance of 10~50 lux, a uniformity ratio over 0.25, a glare rating below 50, and the use of good color-rendering sources**."

Human Factors in Lighting - Boyce PR, Boyce PR. 2014.

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## NYCDOT

DOT Street Lighting evaluates LED luminaires using the IES BUG rating system as part of its specifications.

| | Average Illuminance (fc) | Illuminance Uniformity |
|---|---|---|
| **Roadways** | | |
| Collector | 1.0 - 1.2 | 4:1 |
| Local | 0.8 - 1.0 | 4:1 |
| **Instersections** | | |
| Collector/Collector | 2.0 - 2.5 | 4:1 |
| Collector/Local | 1.5 - 2.0 | 4:1 |
| Local/Local | 1.5 | 4:1 |
| **Plazas, Under the El** | 2.0 | 4:1 |
| **Pedestrian Sidewalks** | 0.6 - 0.8 | Up to 6:1 |
| **Shared Bikeways** | 0.8 - 1.0 | 4:1 |

**DOT's lighting division generally classifies cross streets as local roadways
*DOT's lighting division generally classifies avenues and boulevards as collector road-

## IES Recommendation

| Type of Area | FC |
|---|---|
| Primary Walkways - Commercial | 0.9 ~ 2.0 |
| Secondary Walkways - Residential | 0.2 ~ 0.5 |
| Major Streets (Artetial) | |
| Commercial | 1.2 ~ 1.7 |
| Intermediate | 0.9 ~ 1.3 |
| Residential | 0.6 ~ 0.9 |
| Parking Lots | |
| High Traffic | 3.6 avg.<br>0.9 min |
| Medium Traffic | 2.4avg<br>0.6 min |
| Low Traffic | 0.8 avg<br>0.2 min |

Recommended Illuminance Levels for Exterior Areas, adapted from IES RP-33-99: Lighting for Exterior Environments, Illuminating Engineering Society of North America,

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1. Are the existing lighting standards and regulations appropriate, or are there areas that require improvement?

2. What aspects need improvement to enhance the lighting design on pedestrian pathways?

3. Is the current lighting design installed on the streets suitable for making people feel safe? Is there a need for change?

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1. FIELD RESEARCH

2. SURVEY

3. COMPUTATIONAL SIMULATION

ILLUMINANCE / LUMINANCE

CONTRAST RATIO

HUMAN PERCEPTION

CORRELATED COLOR TEMPERATURE

FIXTURE DETAIL

LIGHTING LAYOUT

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1. Time Square
2. East Village
3. Upper East Side
4. Greewich Village


2023 : 2024 :

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East Village, New York, 10009


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SPEED BUMP
15
RING BELL FOR ASSISTANCE


SPEED BUMP
15
RING BELL FOR ASSISTANCE

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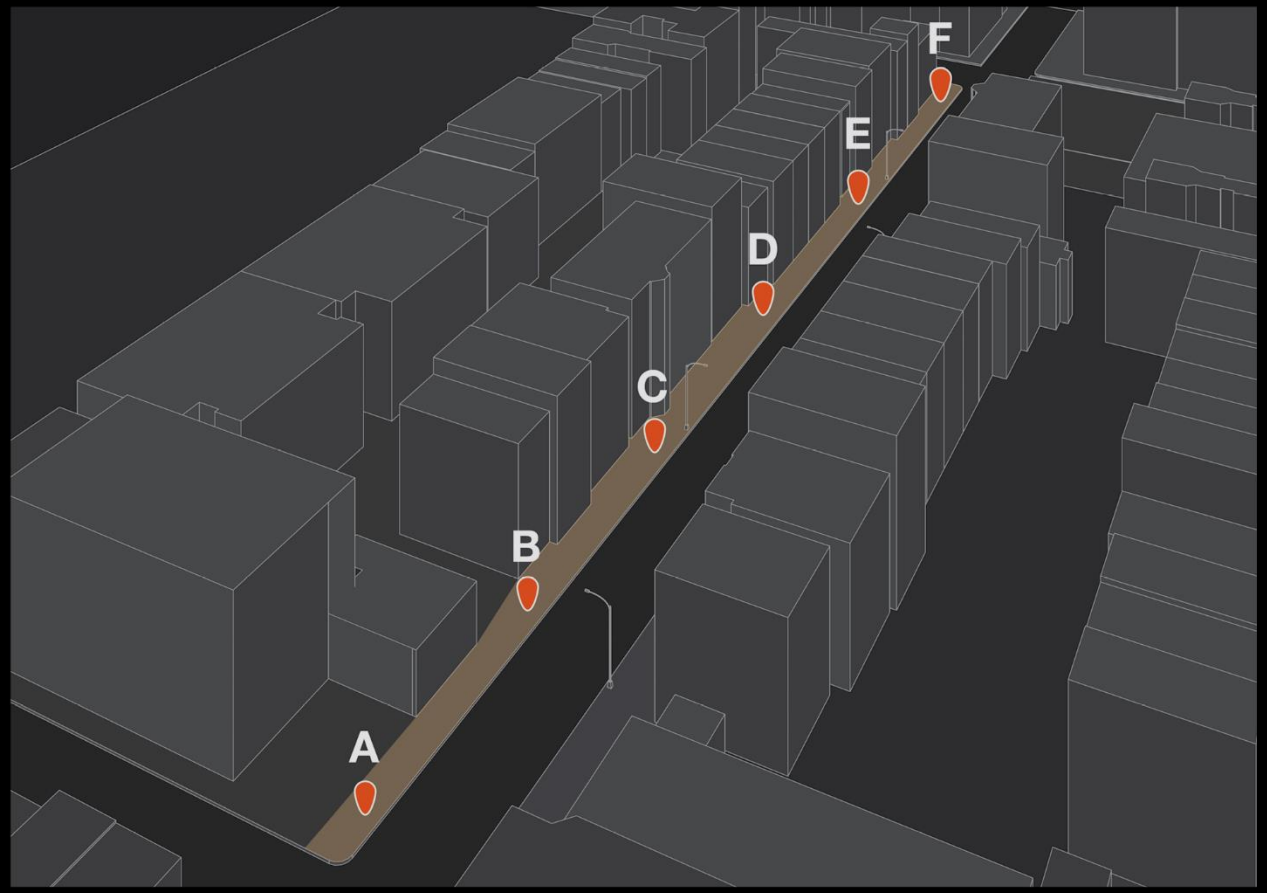


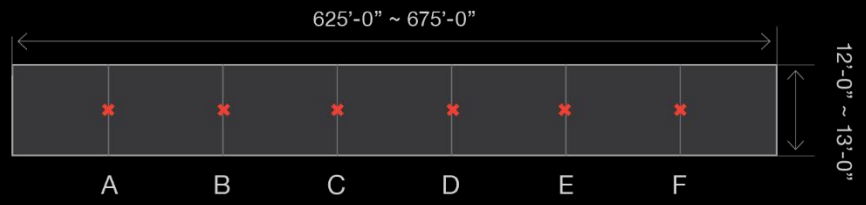



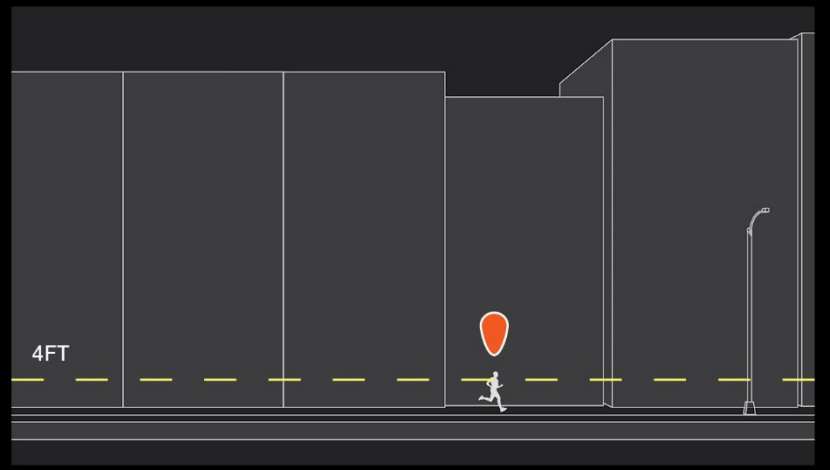


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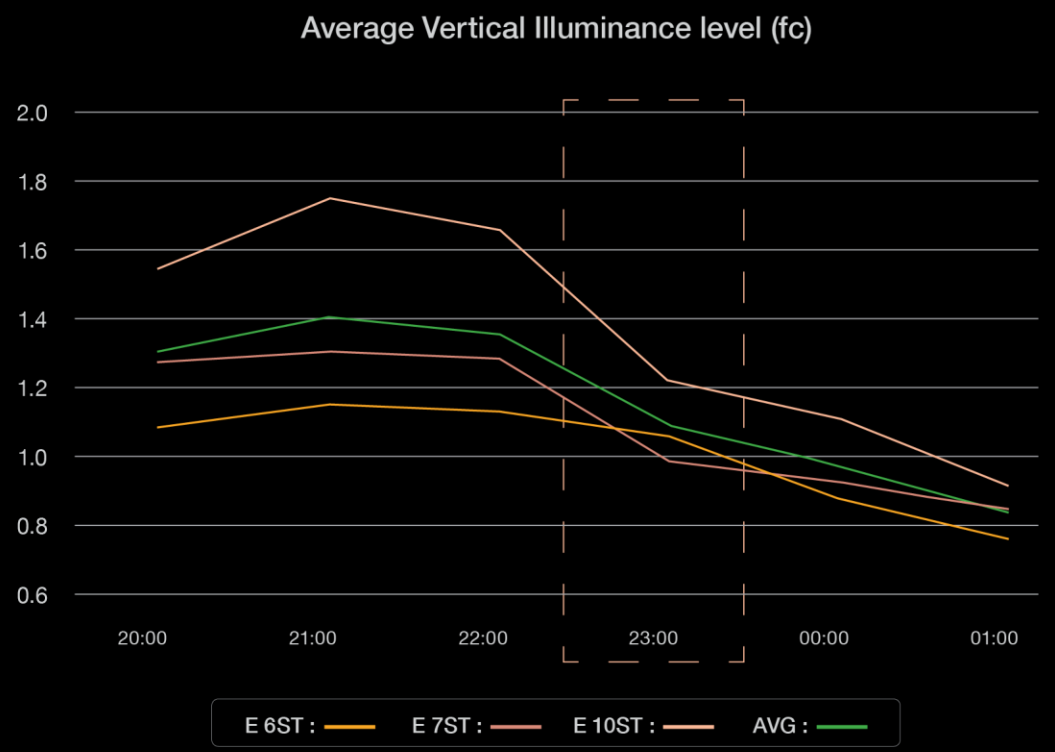
| E 10st | | Vertical Illuminance Level (fc) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | A | | B | | C | | D | | E | | F | |
| 2/17/24 | 20:00 | 1.3 | 1.2 | 3.4 | 2.2 | 1.2 | 1.5 | 0.7 | 0.7 | 1.0 | 1.8 | 2.2 | 1.3 |
| 2/1/24 | 21:00 | 1.5 | 1.1 | 4.3 | 2.8 | 1.1 | 1.4 | 0.6 | 1.1 | 0.9 | 2.2 | 2.8 | 1.1 |
| 2/10/24 | 22:00 | 1.2 | 1.2 | 4.2 | 2.6 | 1.6 | 1.1 | 0.8 | 0.5 | 1.4 | 1.8 | 2.1 | 1.4 |
| 2/19/24 | 23:00 | 1.0 | 1.4 | 2.4 | 1.1 | 1.4 | 0.9 | 0.8 | 1.0 | 0.8 | 1.2 | 1.4 | 1.2 |
| 2/15/24 | 00:00 | 1.1 | 1.4 | 2.0 | 0.8 | 1.2 | 0.6 | 0.7 | 0.6 | 0.8 | 1.4 | 1.6 | 1.1 |
| 2/15/24 | 01:00 | 1.0 | 1.1 | 1.8 | 0.9 | 0.5 | 0.6 | 0.5 | 0.5 | 0.9 | 1.0 | 0.8 | 1.3 |

| E 7st | | Vertical Illuminance Level (fc) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | A | | B | | C | | D | | E | | F | |
| 2/17/24 | 20:00 | 1.0 | 1.6 | 1.1 | 1.1 | 1.2 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.8 | 1.1 |
| 2/1/24 | 21:00 | 1.2 | 1.4 | 0.9 | 1.4 | 1.2 | 0.9 | 1.6 | 1.1 | 1.4 | 1.3 | 2.0 | 1.2 |
| 2/10/24 | 22:00 | 1.1 | 1.3 | 1.2 | 2.4 | 0.8 | 0.7 | 0.9 | 0.9 | 1.6 | 1.7 | 2.0 | 0.8 |
| 2/19/24 | 23:00 | 0.7 | 0.3 | 0.6 | 1.6 | 0.7 | 1.2 | 1.0 | 0.9 | 1.2 | 1.1 | 1.8 | 0.7 |
| 2/15/24 | 00:00 | 0.6 | 0.3 | 0.6 | 1.4 | 0.8 | 1.1 | 1.2 | 0.6 | 1.0 | 0.8 | 1.6 | 1.1 |
| 2/15/24 | 01:00 | 0.5 | 0.6 | 0.8 | 1.4 | 0.7 | 1.0 | 0.7 | 0.5 | 0.5 | 1.0 | 1.6 | 0.8 |

| E 6st | | Vertical Illuminance Level (fc) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | A | | B | | C | | D | | E | | F | |
| 2/17/24 | 20:00 | 1.0 | 0.8 | 0.8 | 1.4 | 1.3 | 0.6 | 0.9 | 1.0 | 1.2 | 1.6 | 1.1 | 1.3 |
| 2/1/24 | 21:00 | 0.8 | 0.7 | 0.9 | 1.6 | 1.6 | 1.1 | 0.9 | 1.1 | 1.4 | 1.6 | 1.1 | 1.0 |
| 2/10/24 | 22:00 | 0.8 | 0.8 | 1.1 | 1.5 | 1.0 | 1.1 | 1.2 | 1.1 | 1.7 | 1.6 | 1.6 | 1.1 |
| 2/19/24 | 23:00 | 1.0 | 1.1 | 1.1 | 1.7 | 1.0 | 0.9 | 0.7 | 0.8 | 0.9 | 1.4 | 1.2 | 0.9 |
| 2/15/24 | 00:00 | 0.9 | 0.5 | 0.8 | 1.5 | 0.8 | 1.1 | 0.9 | 0.8 | 0.6 | 1.2 | 0.9 | 0.5 |
| 2/15/24 | 01:00 | 1.0 | 0.7 | 1.0 | 1.0 | 0.6 | 0.8 | 1.0 | 0.9 | 0.3 | 0.5 | 0.8 | 0.5 |

URCERI MT-912 Light Meter

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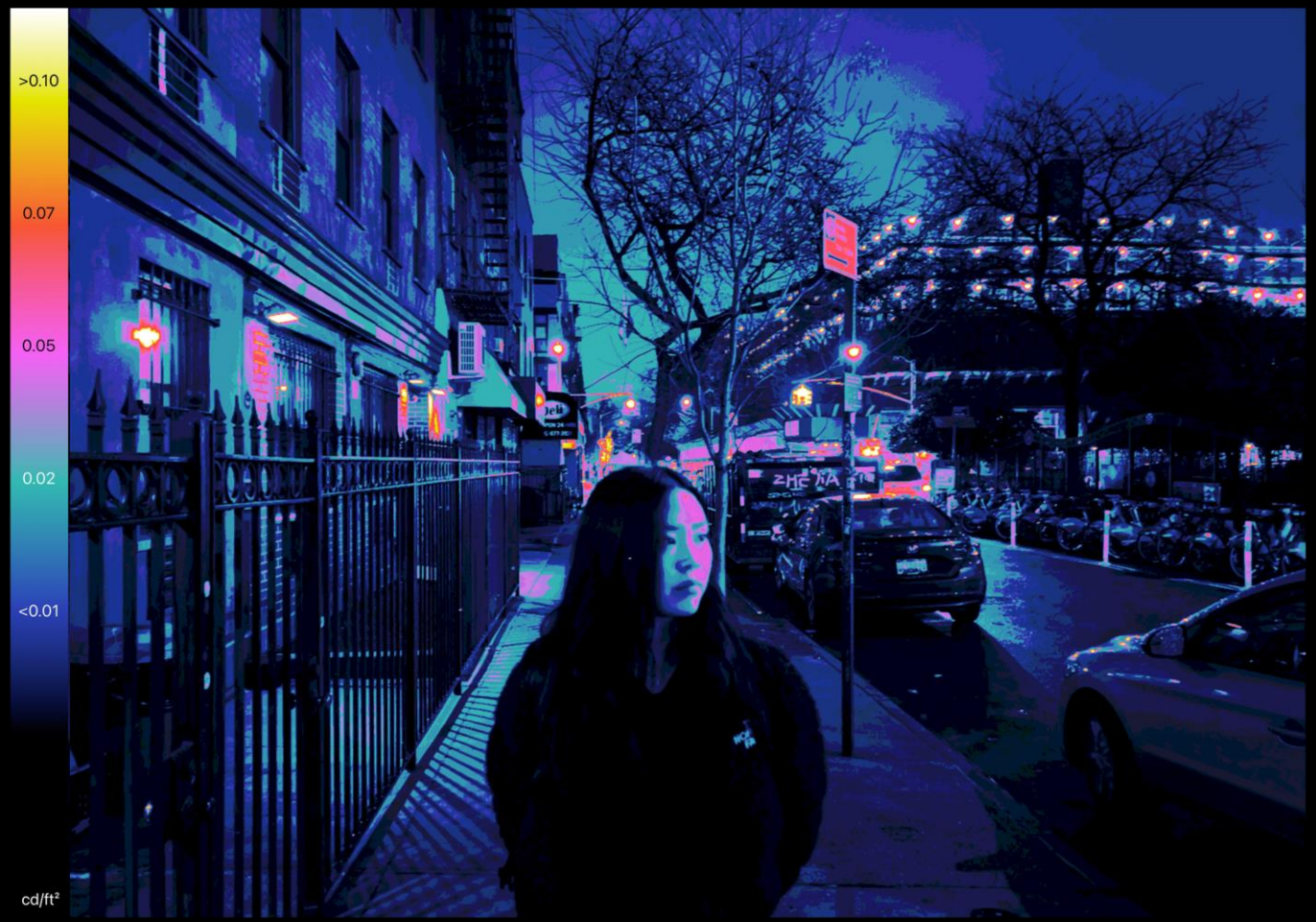


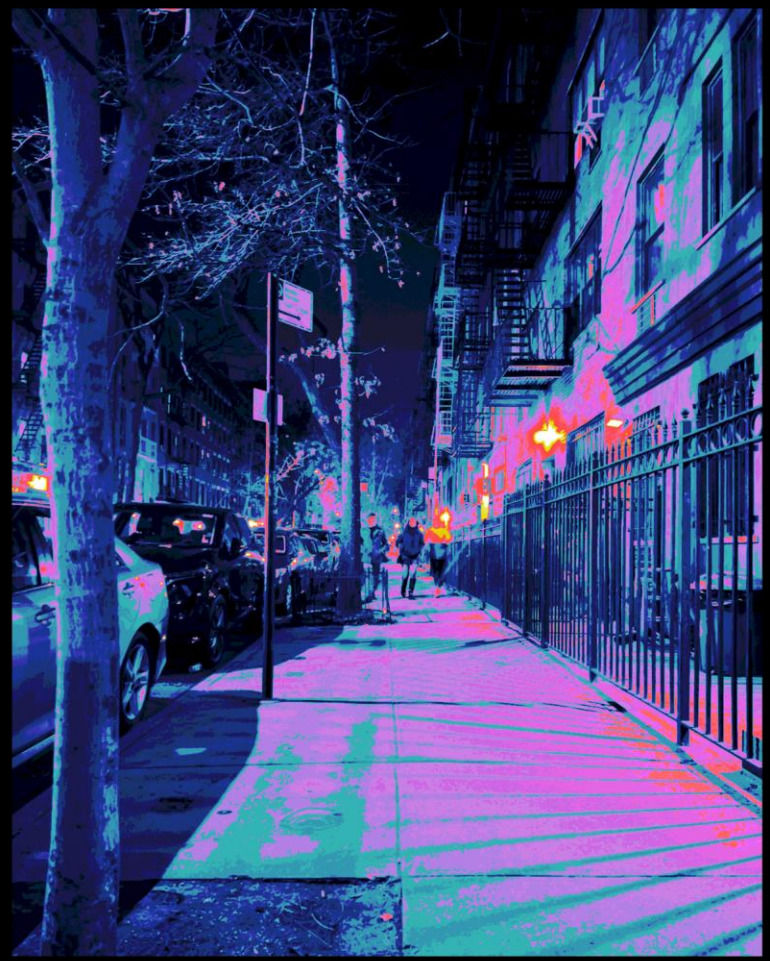

FUSION OPTIX
iPhone 13 Pro

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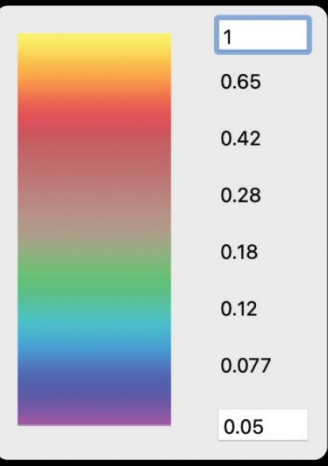
PHOTOSPHERE
CANON 80D KIT _ 016

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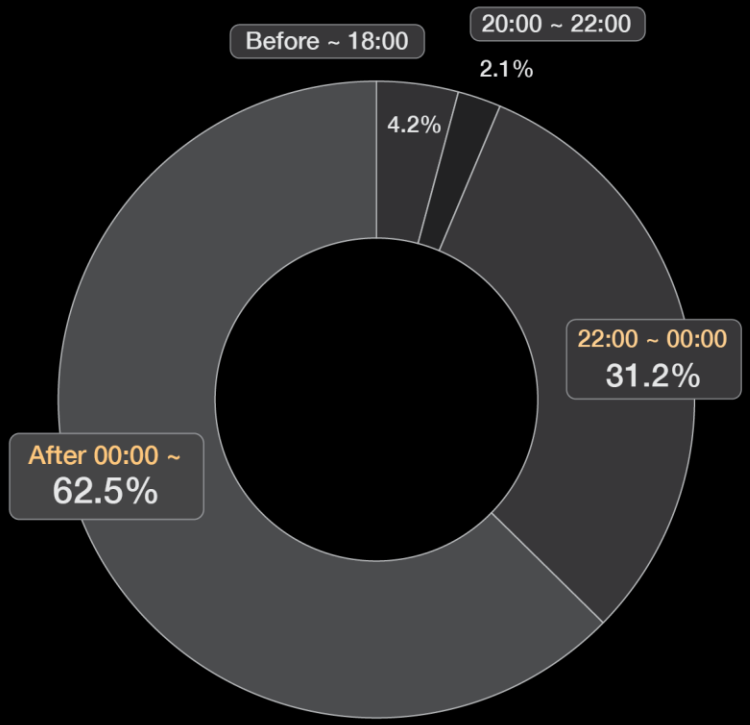
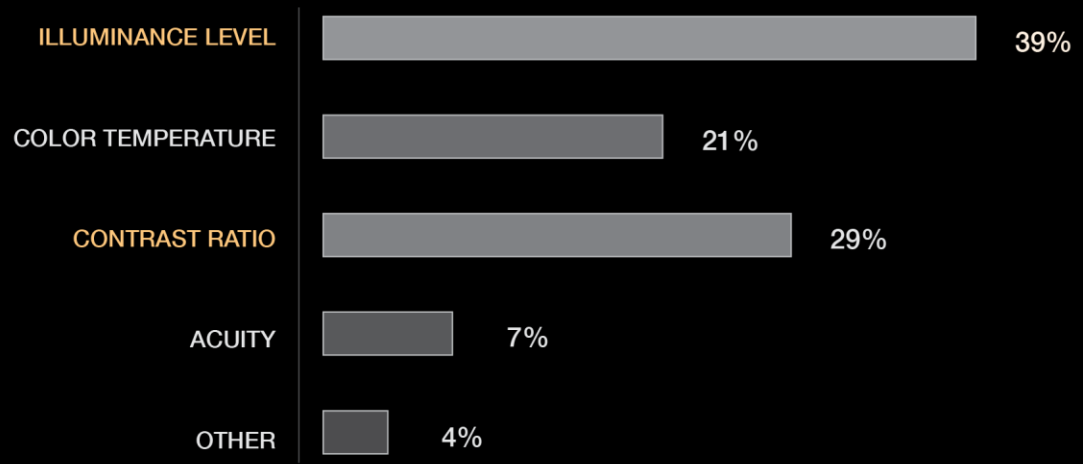
Q1. Are there specific time in your neighborhood when you feel more vulnerable to potential criminal activities?




Q2. Which factor of lighting do you think plays the biggest role in making you feel safe?




Google Survey “Light on Crime”
03/28/24 ~ 04/16/24 (41 Participants)

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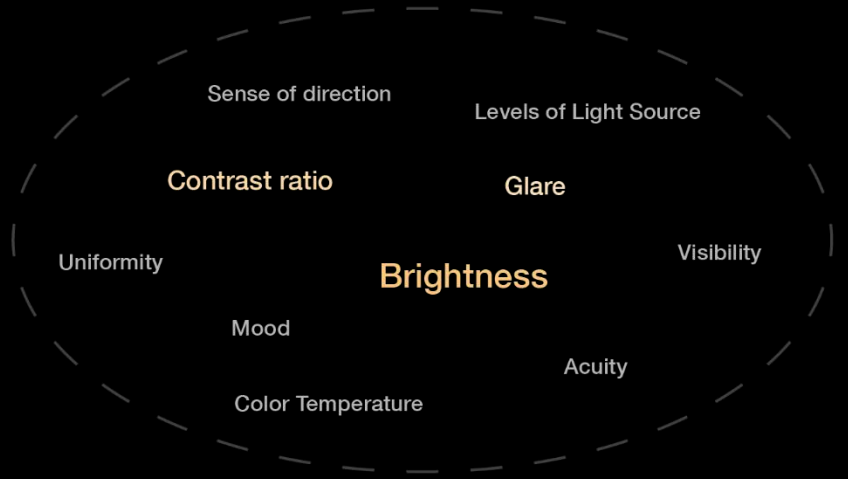
Q3. What aspects of lighting still need improvement in the ‘Edited image’?

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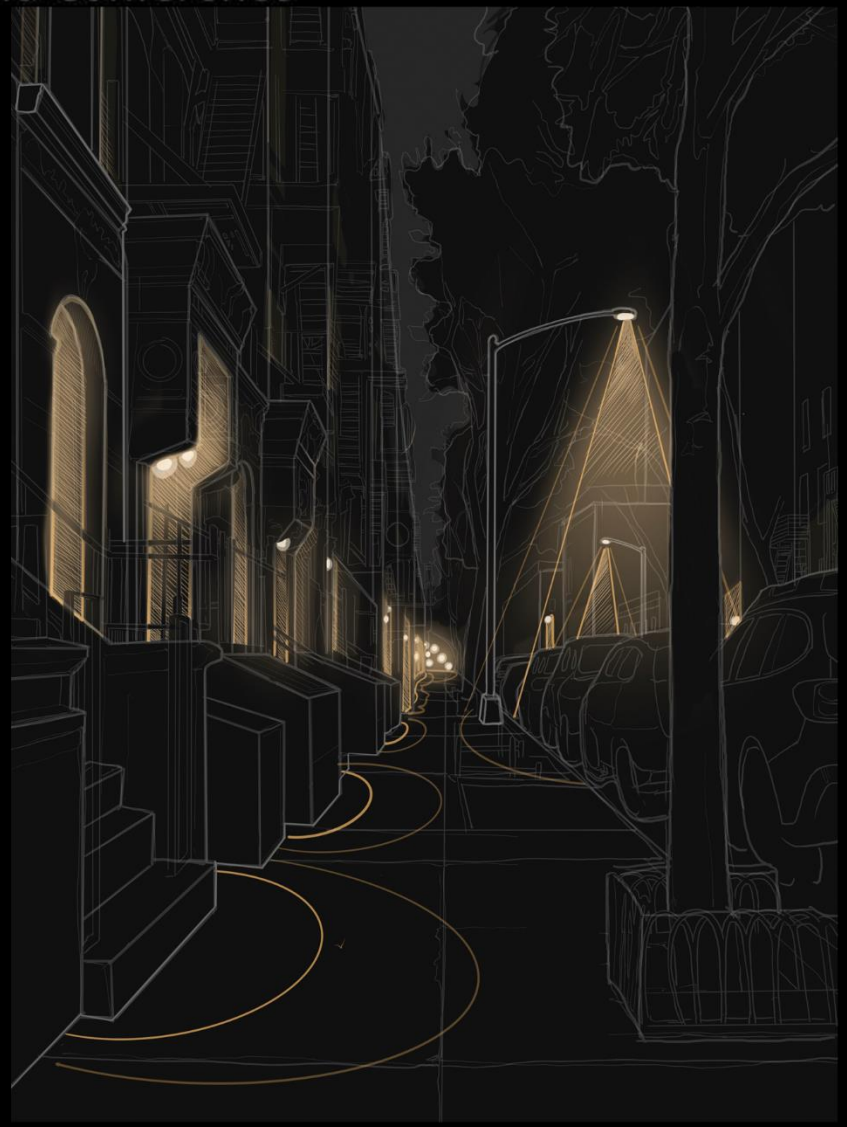

## STANDARD POLE

The tapered steel Octagonal pole, combined with the LED Cobra Head luminaire, constitutes a Standard Street Light (SSL).

Residential Street

78W maximum LED

IES Type II or III

NEW YORK CITY DOT
STREET DESIGN MANUAL, 2022

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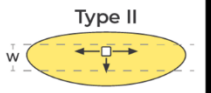
| | POLE LIGHT PATTERN | | WATTAGE | | POLE HEIGHT | | POLE SPACING | | ELEMENT |
|---|---|---|---|---|---|---|---|---|---|
| 1. | TYPE - 2S | - | 78W | - | 30’-0” | - | 130’-0” | | |
| 2. | TYPE - 3S | - | 78W | - | 30’-0” | - | 130’-0” | | |
| 3. | TYPE - 2S | - | 40W | - | 18’-0” | - | 90’-0” | | |
| 4. | TYPE - 3S | - | 40W | - | 18’-0” | - | 90’-0” | | |
| 5. | TYPE - 3S | - | 78W | - | 30’-0” | - | 130’-0” | - | Obstacles |
| 6. | TYPE - 3S | - | 78W | - | 30’-0” | - | 130’-0” | - | Wall Mount |

## IESNA Light Distribution Range

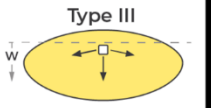
### Type II




A Type II light distribution is used to light wide walkways, sidewalks, and bike paths from the side. These lights direct light outwards to the sides similar to Type I, but also distribute light forward. The area width for Type II should be no more than 1.75 times the mounting height.

Our 90W LED Street/Roadway Light follows a Type II distribution pattern and is ideal for pathways and residential roads.

### Type III




The Type III light distribution illuminates areas such as roadways, parking lots, or intersections from the edge. It distributes light forward farther than Type II and is therefore used to light wider pathways and roadways. For installation, the area width should be no more than 2.75 times the mounting height.

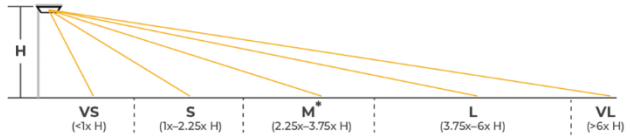
Our 300W LED Flood Light with Yoke Mount has a Type III distribution pattern and is used for lighting parking lots, roadways, and parks.

## IESNA Light Distribution Range

The IESNA distribution range shows the location of the light’s maximum intensity point. Calculate each distribution range using the equations below:

- VS Distribution Range= <1XH
- S Distribution Range= 1XH to 2.25XH
- M Distribution Range= 2.25XH to 3.75XH
- L Distribution Range= 3.75XH to 6XH
- VL Distribution Range= >6XH

Both the light distribution type and range are used to classify lights. For example, an ‘III-M’ light has a distribution type ‘III’ and a distribution range ‘M’. The default distribution range is “M” for most area lights.




*M is considered the standard and would be the default if no letter is represented.

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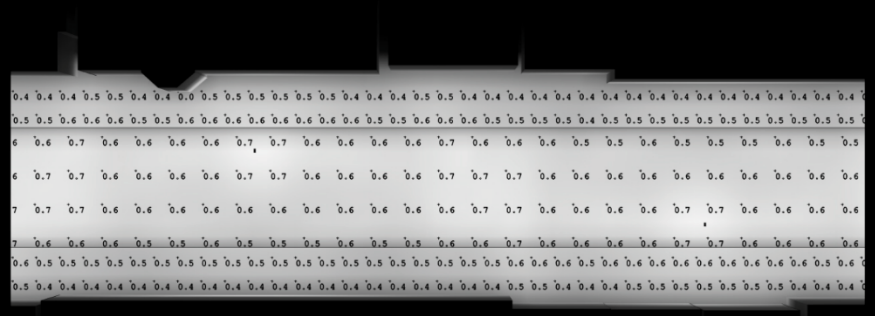
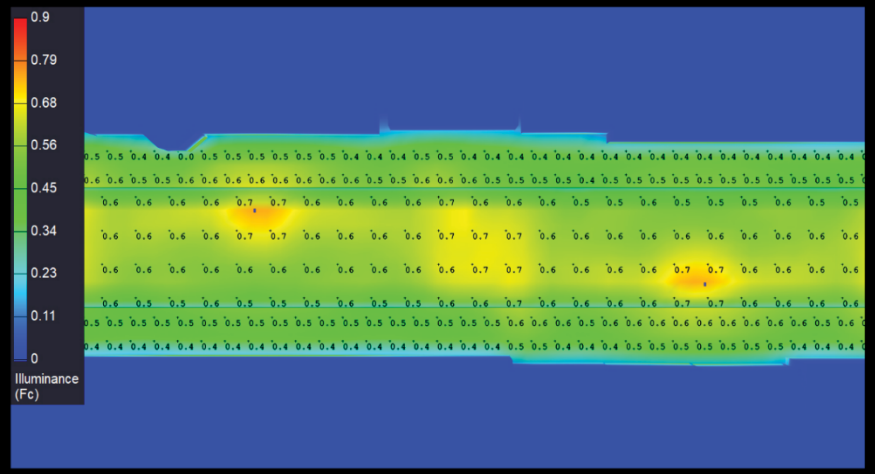
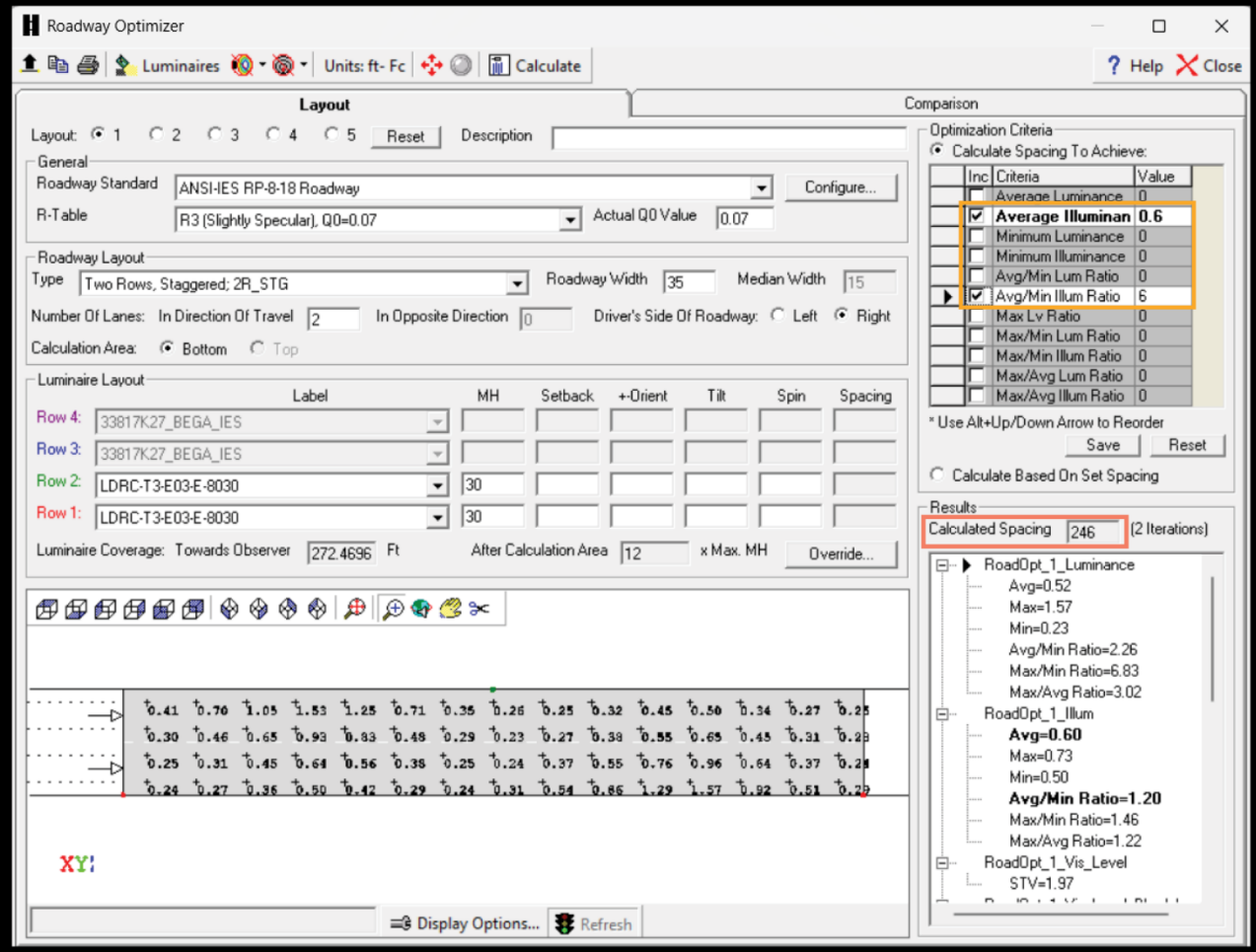
TYPE - 3S - 78W - 30’-0” - 130’-0”



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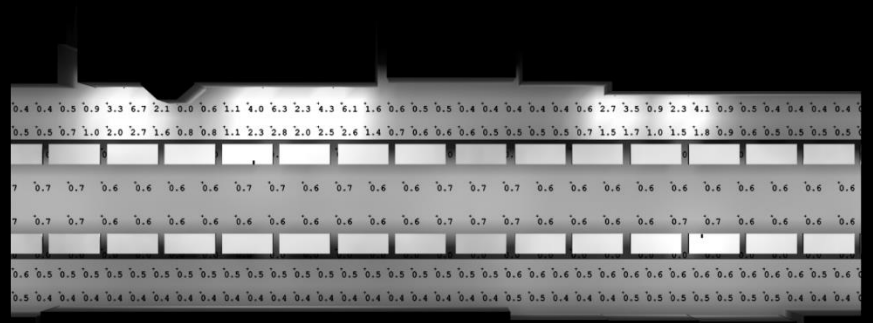
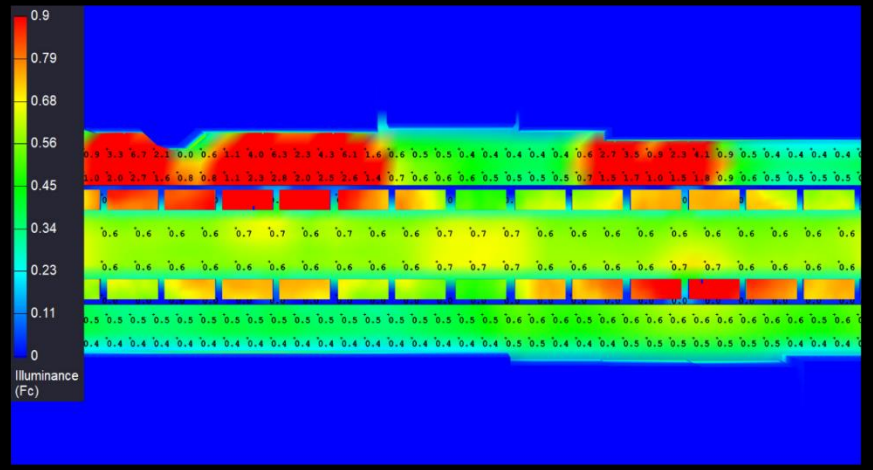
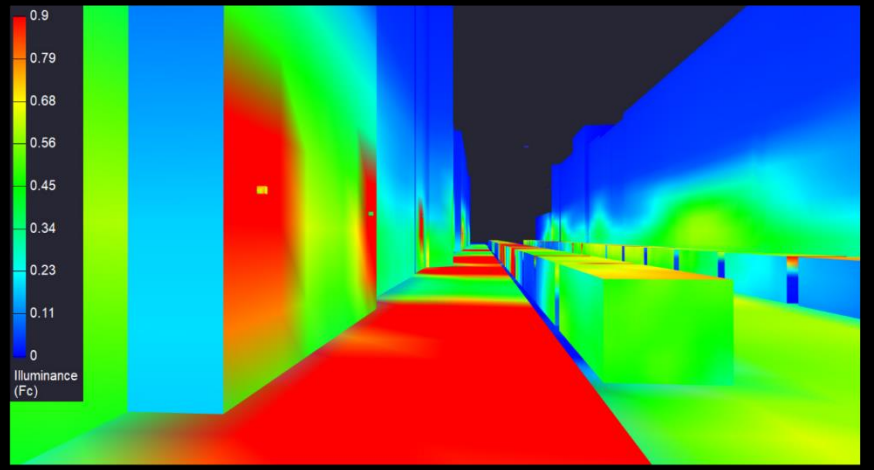
6. TYPE - 3S - 78W - 30’-0” - 130’-0” - Obstacles - Wall Mount



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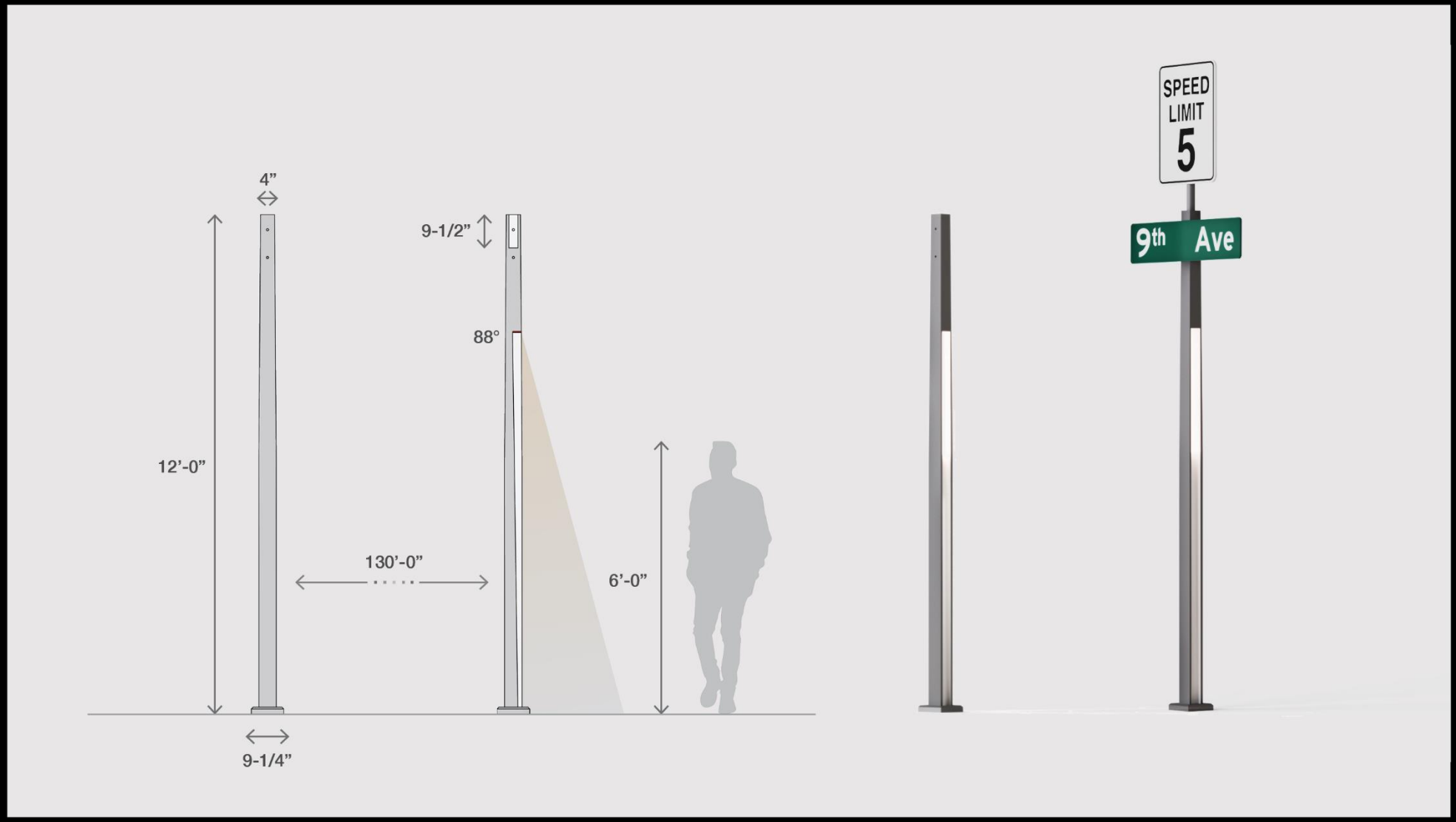
4”
9-1/2”
88°
12’-0”
130’-0”
6’-0”
9-1/4”
SPEED
LIMIT
5
9th Ave

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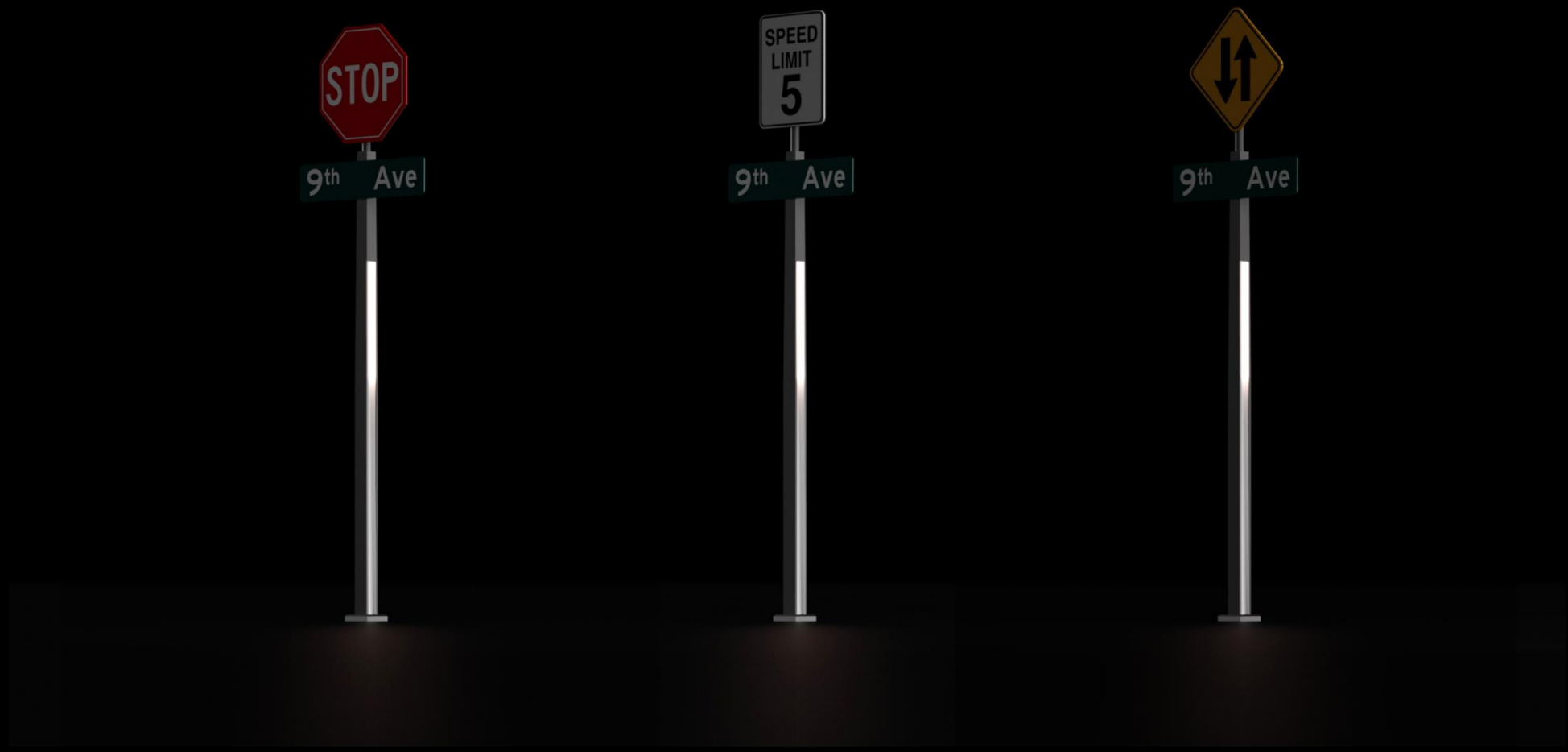


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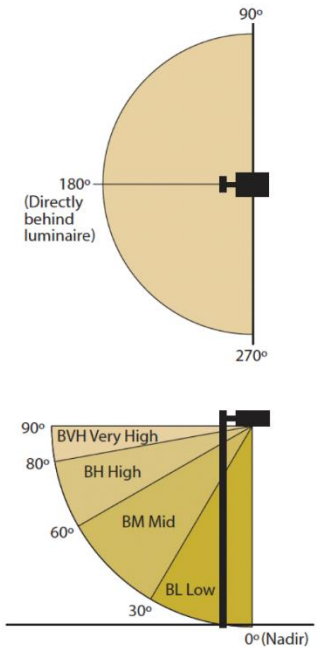


**Figure 3-4. Top: plan view for back light solid angle; bottom: section view for back light solid angle.**

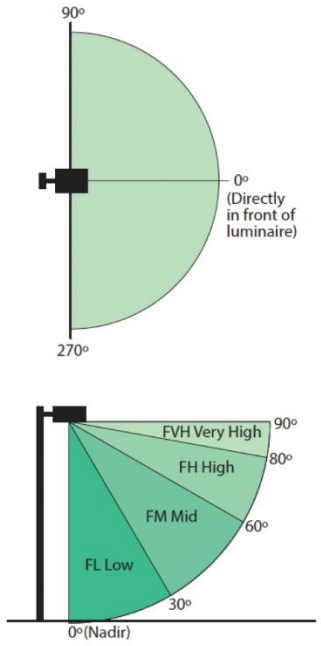


**Figure 3-3. Top: plan view for forward solid angle; bottom: section view for forward solid angle.**

(© Illuminating Engineering Society)

**Table 4-2. Optical Evaluation Examples of Decorative Street Lights**

| 175 W MH |  |  |  |  |
|---|---|---|---|---|
| | Fully shielded (Type III) | Glass tear drop (Type V) | Glass acorn internal optics (Type V) | Acrylic acorn (Type V) |
| **Forward Light** | | | | |
| Luminaire Lumens | 5,325 | 4,521 | 3,459 | 3,551 |
| % Lamp Lumens | 41.6% | 32.3% | 25.4% | 26.1% |
| FL (0°-30°) | 4.8% | 3.8% | 0.4% | 0.5% |
| FM (30°-60°) | 19.1% | 14.9% | 7.0% | 4.0% |
| FH (60°-80°) | 17.5% | 12.9% | 15.8% | 13.2% |
| FVH (80°-90°) | 0.2% | 0.7% | 2.2% | 8.4% |
| **Back Light** | | | | |
| Luminaire Lumens | 2,837 | 4,521 | 3,459 | 3,551 |
| % Lamp Lumens | 22.2% | 32.3% | 25.4% | 26.1% |
| BL (0°-30°) | 4.4% | 3.8% | 0.4% | 0.5% |
| BM (30°-60°) | 13.8% | 14.9% | 7.0% | 4.0% |
| BH (60°-80°) | 3.8% | 12.9% | 15.8% | 13.2% |
| BVH (80°-90°) | 0.2% | 0.7% | 2.2% | 8.4% |
| **Uplight** | | | | |
| Luminaire Lumens | 0 | 33 | 1,134 | 4,328 |
| % Lamp Lumens | 0.0% | 0.2% | 8.3% | 31.8% |
| UL (90°-100°) | 0.0% | 0.1% | 2.2% | 8.9% |
| UH (100°-180°) | 0.0% | 0.1% | 6.1% | 23.0% |
| **Trapped Light** | | | | |
| Luminaire Lumens | 4,638 | 4,924 | 5,549 | 2,170 |
| % Lamp Lumens | 36.2% | 35.2% | 40.8% | 16.0% |

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