

# Section 11 | Exterior Lighting

UNIVERSITY of  
**HOUSTON**

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FACILITIES PLANNING AND CONSTRUCTION

**April 2023**

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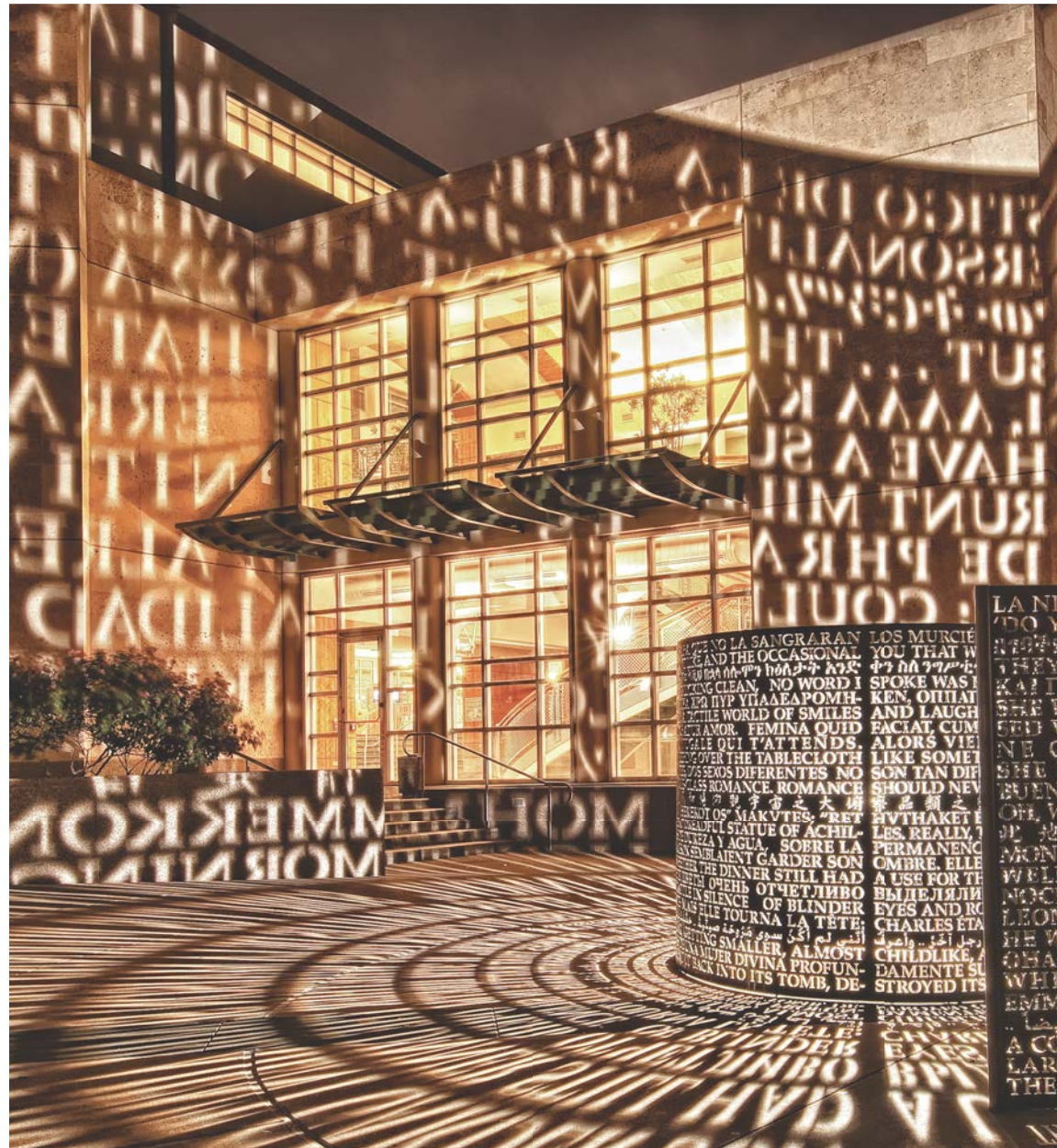
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# Section 11

## Exterior Lighting

### Applicable Codes and Standards

- ❑ Comply with engineering standards from the latest edition of Illuminating Engineering Society of North America's (IESNA), Lighting Handbook.
- ❑ Refer to the pages that follow for Exterior Lighting Standards for the following types of spaces:
  - Campus Roads
  - Parking Lots
  - Sidewalks
  - Outdoor Stairs and Ramps
  - Plazas
  - Bus Stops
  - Blue Light Phones
  - Flagpoles
  - Public Art
- ❑ Design lighting layouts to meet standards for quantity, evenness and quality of light (as measured by average foot-candles and "max to min" ratios).
- ❑ Specify fixtures to produce light with a temperature of 4000 Kelvin and a Color Rendering Index (CRI) of 85 or better.
- ❑ Where the University's Exterior Lighting Standards do not cover a situation, use IESNA standards.



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## Exterior Lighting

### Design Review Process

- Submit a photometric report that demonstrates compliance with the University's required light and evenness levels at the following stages of design:
  - 100% Design Development
  - 50% Construction Documents
  - 90% Construction Documents
- Include a plan view, photometric "design intent" sheet in the 100% Construction Documents submission. Show the intended lighting levels and requirements. Submit elevation views as needed if building facades will have special lighting.
- Analyze the relevant lighting typologies included in the project (e.g., roads, sidewalks, parking lots, etc.) Break down each typology into reasonably sized zones for analysis.
- Include a table that shows manufacturer, catalog number, lumens per fixture, light loss factor, wattage and mounting height for each fixture.
- Also include a table listing the University's FC standards for each spatial typology.



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## Exterior Lighting

### Design Review Process: Photometric Criteria

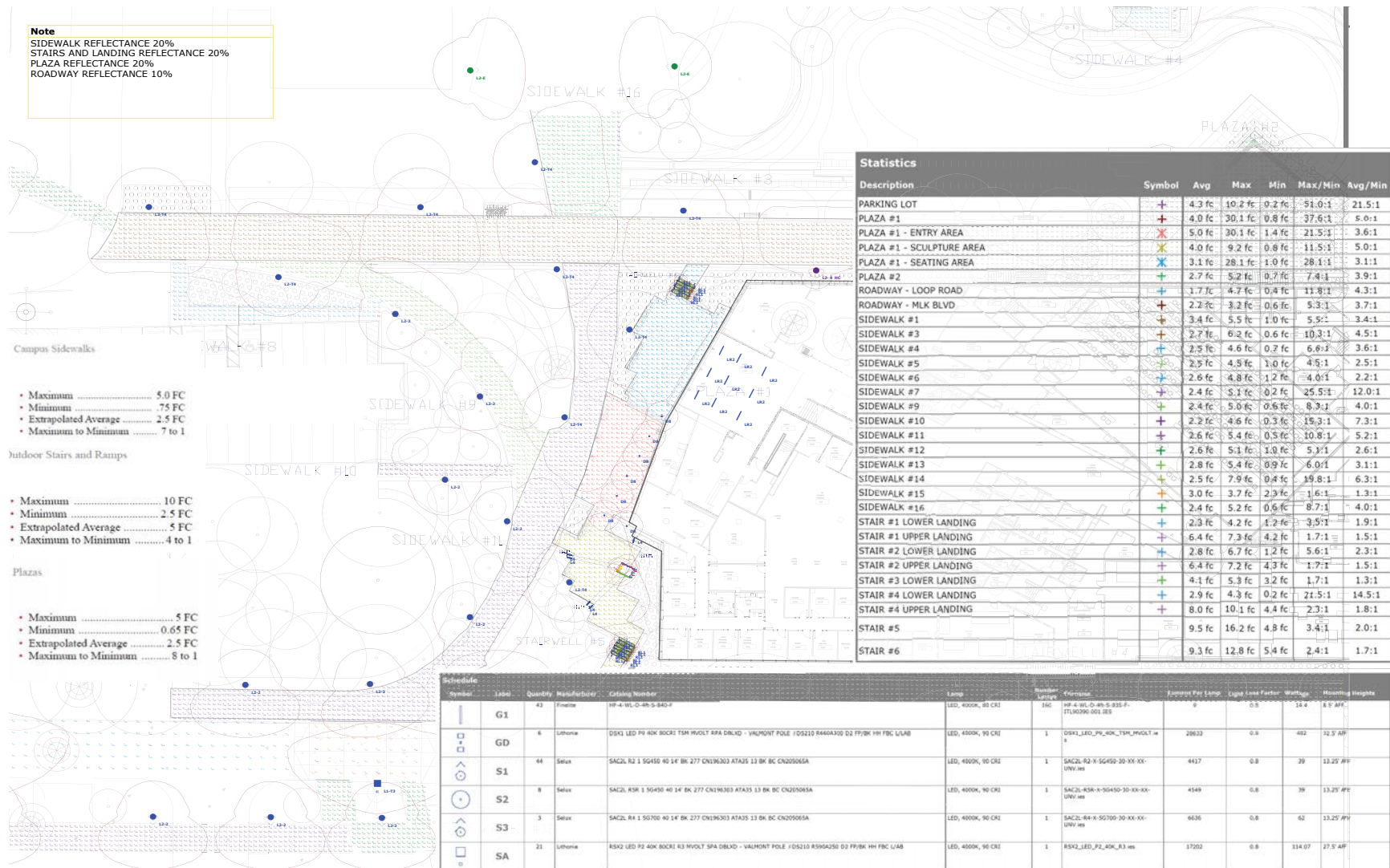
Use the following criteria when preparing photometric analyses:

- ❑ Calculate all exterior photometrics at grade
- ❑ Assume the following:
  - 10% light loss for dirt and depreciation
  - 10% light loss for lumen depreciation for LED sources, 10% for fluorescent sources and 25% for HID sources (metal halide, high pressure sodium, low pressure sodium)
  - Sidewalk reflectance of 20%
  - Roadway reflectance of 10%
- ❑ Sample light levels on the following calculation grids:
  - Roadways and parking lots on 5 foot grid with no point more than 2 feet 6 inches from any edge
- ❑ Parking garages on 3 foot grid with no point more the 1 foot 6 inches from any edge.
- ❑ Sidewalks on 2 foot grid with no point more than 1 foot from any edge.
- ❑ Public stairways, steps and ramps on 6 inch grid on both the horizontal and vertical planes. Stairs must be fully modeled in the photometric analysis with no point more than 6 inches from any edge.
- ❑ Facades on 5 foot grid with no point more than 2 feet 6 inches from any edge.
- ❑ When lighting Public Art, request a design intent statement from the artist or architect addressing light, contrast and Dark Sky implications.
- ❑ Do not allow light above 75 degrees from nadir. Provide a beam of light that extends no more than 35 degrees from nadir. Exceptions include building lighting, flags, art and monuments.

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## Exterior Lighting

### Design Review Process: Photometric Report Example



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## Exterior Lighting

### Construction Administration Process

- ❑ During the submittal process, review a photometric report submitted by the Contractor along with light fixture information. A +/- 5% foot candle variance from the design intent plan is allowed. Compliance with maximum to minimum foot-candle levels is required.
- ❑ At Substantial Completion, evaluate exterior lighting both physically and photometrically. Take spot readings at 5% of the photometric points of each lighting zone to confirm light levels within 5% of the data points on the Contractor's submittal.
- ❑ Document light level readings per IESNA recommended practices at night.
- ❑ Document any deviations as either "acceptable" or corrected prior to certification of Substantial Completion.



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## Exterior Lighting

### Space Typologies: Campus Roads

- ❑ Interior Campus Road
  - Maximum ..... 3.0 FC
  - Minimum ..... 0.3 FC
  - Extrapolated Average ..... 1.4 FC
  - Maximum to Minimum ..... 10 to 1
  
- ❑ Use medium height street lights spaced regularly to illuminate roads
  
- ❑ Locate poles in planting strips between the road and sidewalks
  
- ❑ Provide evenly-spaced pedestrian lights to illuminate the sidewalks
  
- ❑ Specify the Lithonia RSX2 LED fixture for a consistent campus image

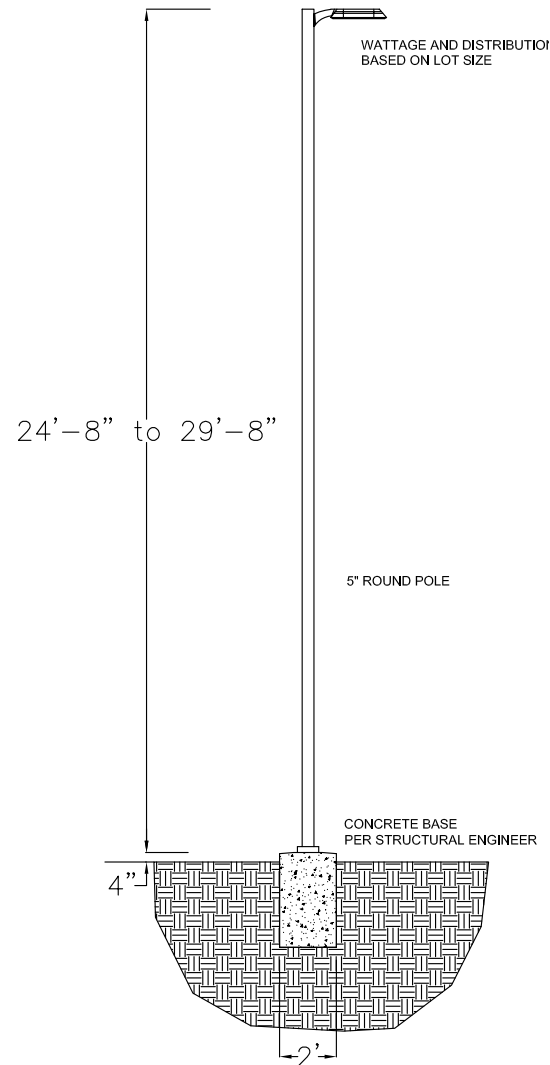


# Section 11

## Exterior Lighting

### Space Typologies: Street Lights at Roads

- ❑ Provide Lithonia RSX2 LED light fixture at smaller parking lots and campus roads
- ❑ All fixtures to be black
- ❑ Provide fixture with cast aluminum body mounted to a round pole with the fixture face at 25' or 30' above finished grade depending on parking lot size
- ❑ Provide LED light producing between 12,000 and 22,000 lumens depending on height
- ❑ Specify 4000K color light with a CRI of 85 or better
- ❑ Specify lights to be Dark Sky compliant with no light above 75° from nadir and with a beam of light 35° from nadir
- ❑ Refer to pole base details on Page 10



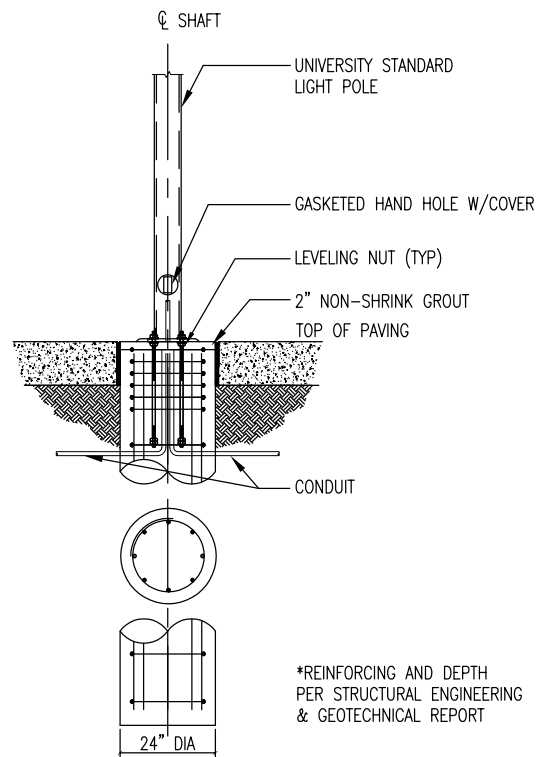
**Lithonia RSX2 LED**



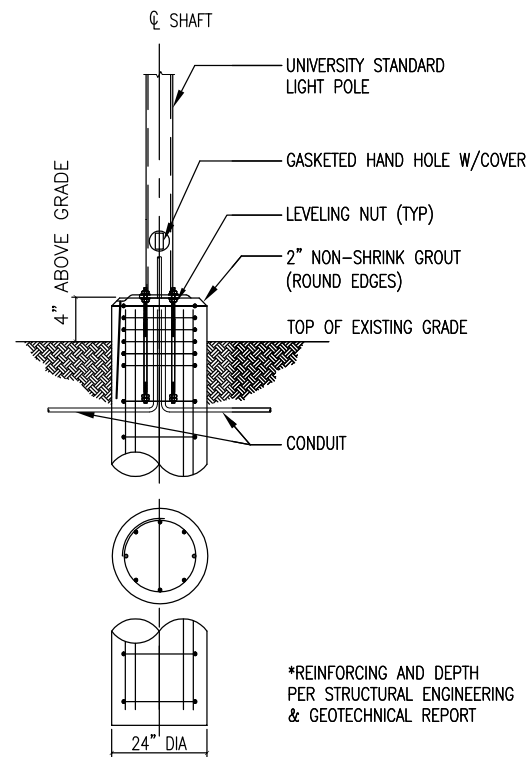
# Section 11

## Exterior Lighting

### Space Typologies: Street Light Poles - Footing Details



When Set in Plaza or other Pedestrian Paving



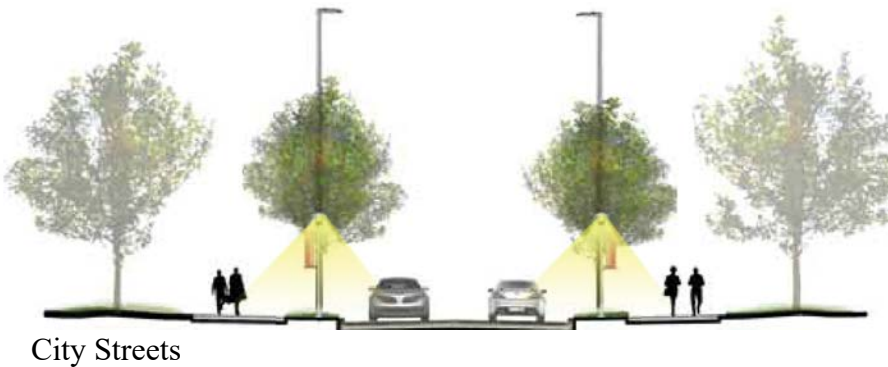
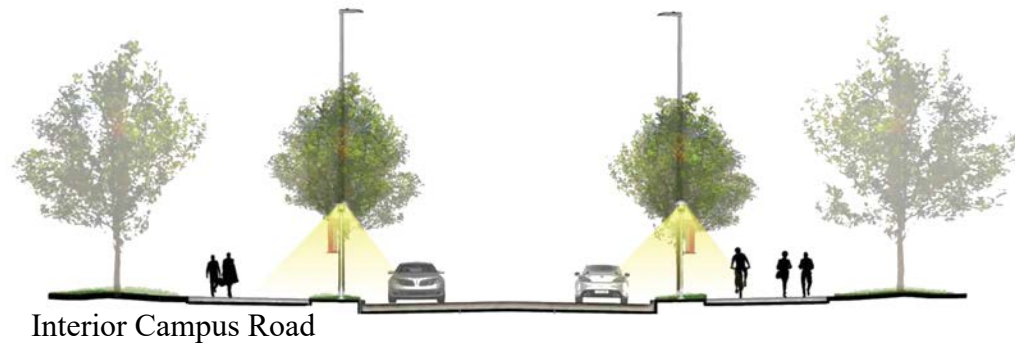
When Set in Planting Strip or other Landscaping

# Section 11

## Exterior Lighting

### Space Typologies: Sidewalks

- ❑ Sidewalks along Cullen, Wheeler, Elgin, Calhoun, Scott, MLK, Old Spanish Trail (City Streets)
  - Maximum ..... 7.0 FC
  - Minimum ..... 1.0 FC
  - Extrapolated Average ..... 4.0 FC
  - Maximum to Minimum ..... 7 to 1
  
- ❑ Sidewalks along Interior Campus Roads
  - Maximum ..... 5.0 FC
  - Minimum ..... 0.75 FC
  - Extrapolated Average ..... 2.5 FC
  - Maximum to Minimum ..... 7 to 1
  
- ❑ Provide evenly-spaced pedestrian lights at 40' min. to 60' max. on center, typical, to illuminate the sidewalks
  
- ❑ Locate pedestrian poles in planting strips between the roads and sidewalks
  
- ❑ Coordinate light pole and street trees to create a consistent even spacing along the road
  
- ❑ Locate poles a consistent 2 foot from the edge of the sidewalk

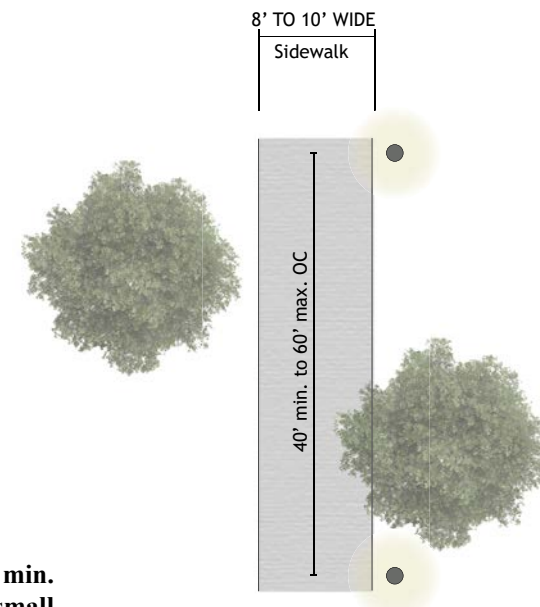


# Section 11

## Exterior Lighting

### Space Typologies: Sidewalks on Campus

- Maximum ..... 5.0 FC
  - Minimum ..... 0.75 FC
  - Extrapolated Average ..... 2.5 FC
  - Maximum to Minimum ..... 7 to 1
- ❑ Space pedestrian light poles at 40' min. to 60' max. feet on center, typical
  - ❑ Maintain consistent spacing along the length of the sidewalk
  - ❑ Locate light poles a consistent 2 feet from the edge of the sidewalk
  - ❑ See the accompanying diagrams for typical tree and pedestrian light layouts

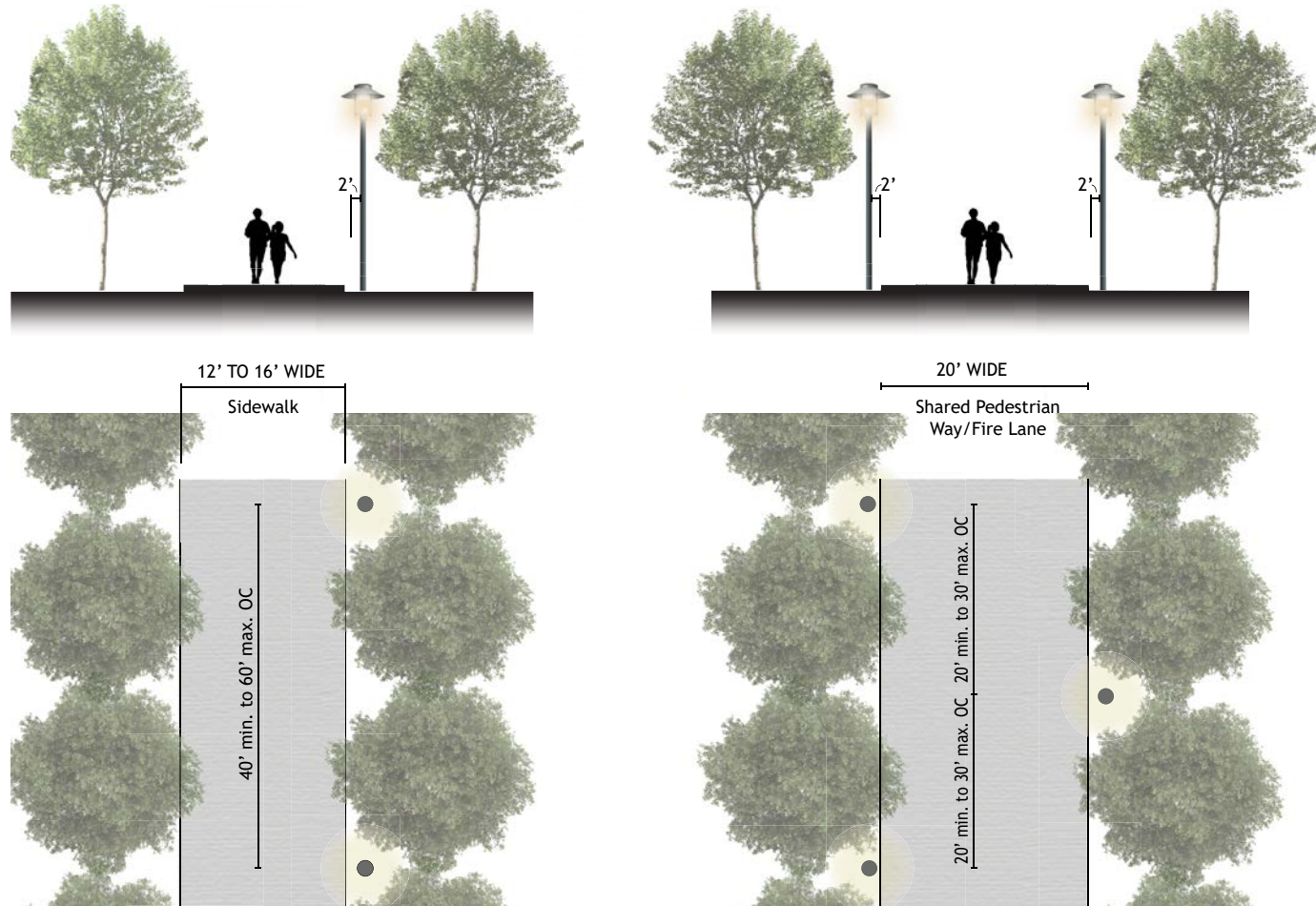


**Note: Pedestrian lights located at 40' min. to 60' max. feet on center along a small sidewalk with informal tree planting.**

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## Exterior Lighting

### Space Typologies: Sidewalks on Campus



Note: Trees spaced regularly at 20 to 30 feet on center, with pedestrian lights interspersed at 40 to 60 feet on center. R2 optics typical.

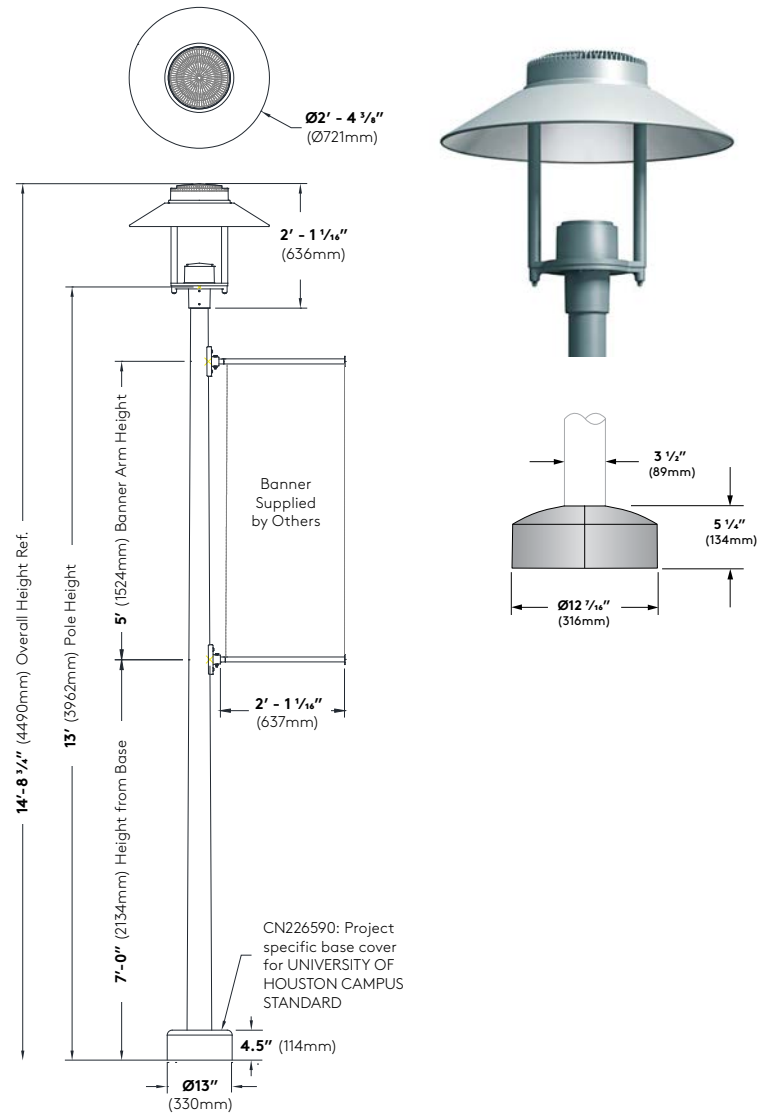
Note: Trees spaced regularly at 20 to 30 feet on center, with pedestrian lights located on alternating sides at 20 to 30 feet on center.

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## Exterior Lighting

### Pedestrian Light Fixture and Pole

- ❑ Provide LED luminaire, model: Saturn 2 color: black as made by Selux Lighting
- ❑ Provide consistent quality lighting by specifying 4000 K temperature and 85 or better CRI
- ❑ Use tapered round black poles that are 13 feet tall, hinged for ease of maintenance. Mount the luminaire so that the center of light to grade is approximately 14'-0" feet above grade
- ❑ Slope the top of concrete foundation base for adequate drainage
- ❑ Do not provide tenons
- ❑ Refer to UH Design Guidelines, section 11.0 for current standard fixture



**Selux Saturn Cutoff 2 LED pedestrian Light Fixture Head, black**

**Standard round base cover (BC)**

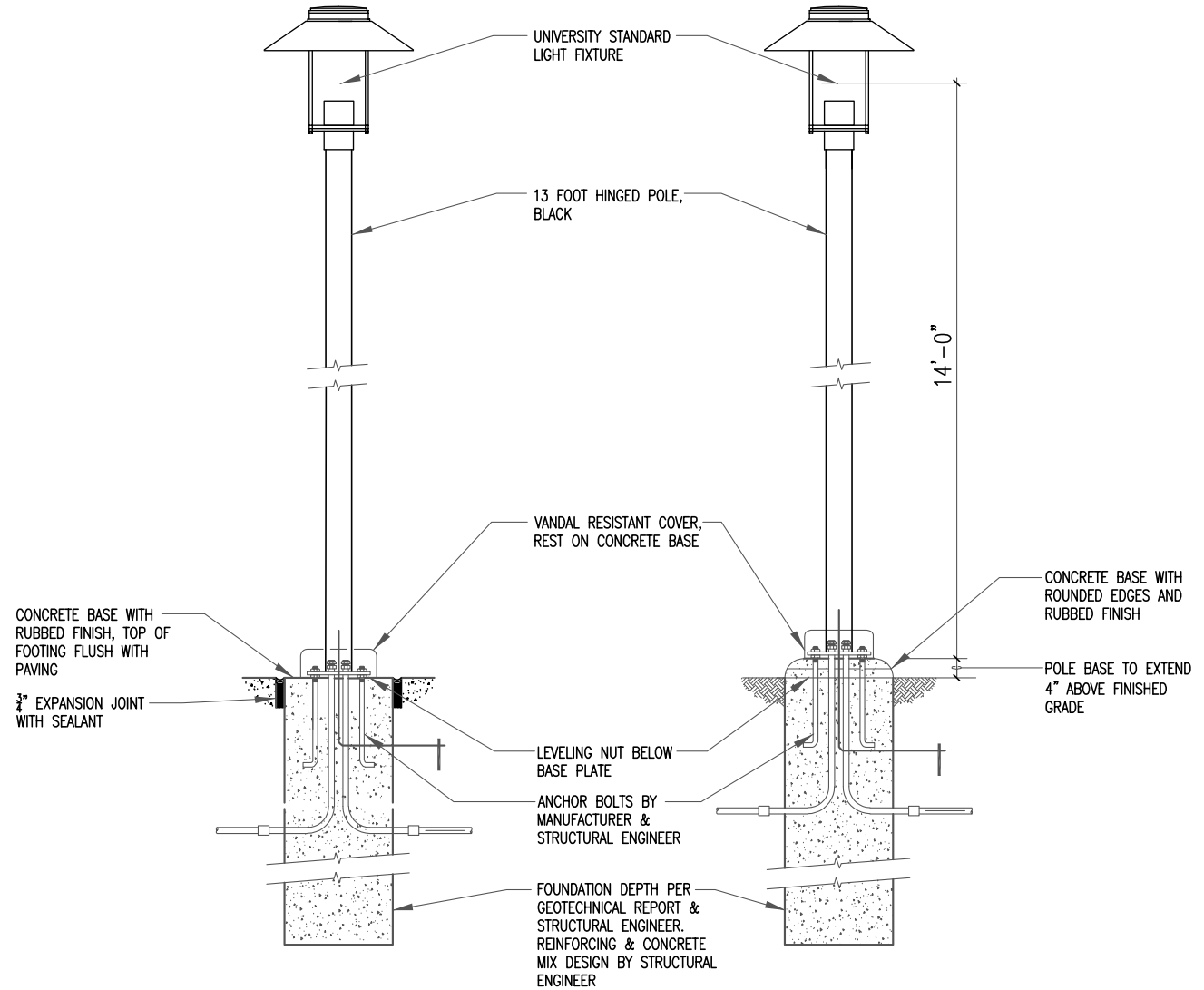
**Selux Saturn Cutoff LED pedestrian light pole - black, 13'-0" height**



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## Exterior Lighting

### Pedestrian Light Pole - Footing Details



**Pedestrian Pole located in Paving  
(Sidewalks or Plazas)**

**Pedestrian Pole located in  
Landscaping (Lawn or Planting Beds)**

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## Exterior Lighting

### Space Typologies: Plazas, Stairs and Ramps

- Maximum ..... 5 FC
  - Minimum ..... 0.65 FC
  - Extrapolated Average ..... 2.5 FC
  - Maximum to Minimum ..... 8 to 1
- Use pedestrian lights, lighted handrails or other special lighting to achieve illumination requirements.
- Avoid the use of wall-packs or other wall-mounted fixtures that create glare.



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## Exterior Lighting

### Preferred Plaza Light Pole

- ❑ Provide Selux Modular Column light fixture. All fixtures to be black. Specify 4000 K color light with a CRI of 85 or better
- ❑ Configure lights per photometric requirements on a case-by-case basis



Selux Modular Column light fixture



Optional light output fixture



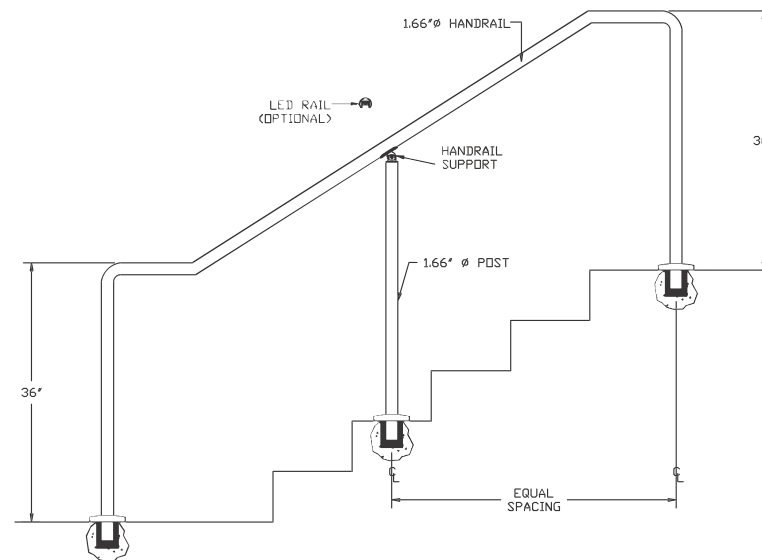
Optional light output fixture

# Section 11

## Exterior Lighting

### Space Typologies: Plazas, Stairs and Ramps

- ❑ Outdoor Stairs and Ramps
  - Maximum ..... 10 FC
  - Minimum ..... 2.5 FC
  - Extrapolated Average ..... 5 FC
  - Maximum to Minimum ..... 4 to 1
  
- ❑ Ensure that stairs and ramps in public spaces, and particularly those that form part of the egress path from a building, are well illuminated.
  
- ❑ Use pedestrian lights, lighted handrails or other special lighting to achieve illumination requirements.
  
- ❑ Do not use step lights in stair risers or walls.



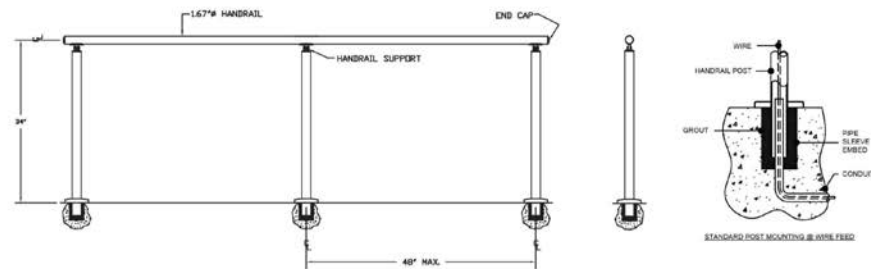


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## Exterior Lighting

### Space Typologies: Preferred Lighted Handrail

- ❑ Preferred fixture is by Efficient-Tec International, style: illuminated stainless steel handrail, 4000k illumination color with clear prismatic diffuser. Similar products by other manufacturers will be considered.
- ❑ Basis of Design: Efficient-Tec, stainless steel with high output led option



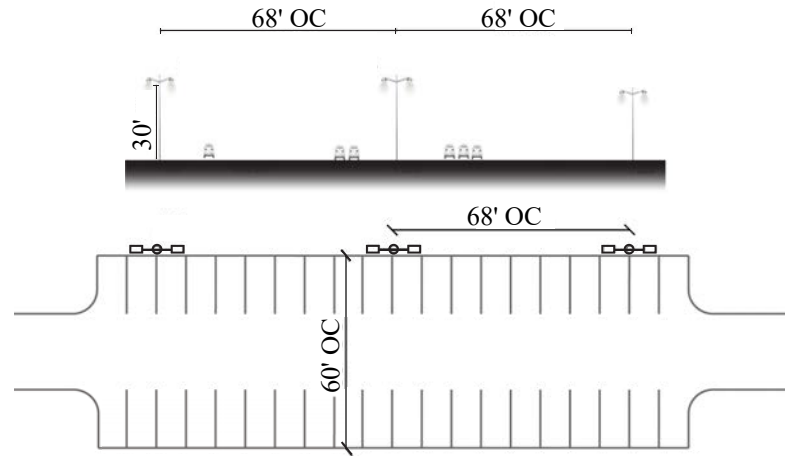


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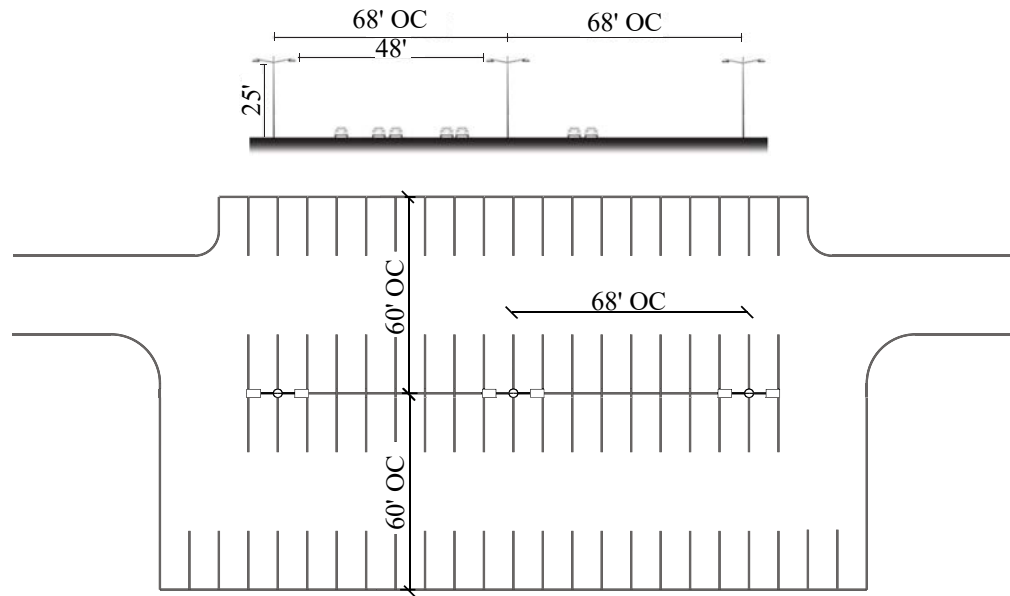
## Exterior Lighting

### Space Typologies: Small and Medium Parking Lots

- Maximum ..... 15.0 FC
  - Minimum ..... 1.5 FC
  - Extrapolated Average ..... 4.0 FC
  - Maximum to Minimum ..... 10 to 1
- ❑ Refer to the following diagrams for examples of proper light pole spacing and height. Pole heights and spacing will vary depending on the parking lot configuration.
  - ❑ Use 22'-6" or 27'-6" poles mounted to 2'-6" concrete bases.
  - ❑ Where appropriate, use 10 foot long davit arms to improve the distribution and evenness of light.
  - ❑ Coordinate light pole spacing with tree spacing



**Small Parking Lot**  
Diagram shows a linear parking lot with a single tray of parking.

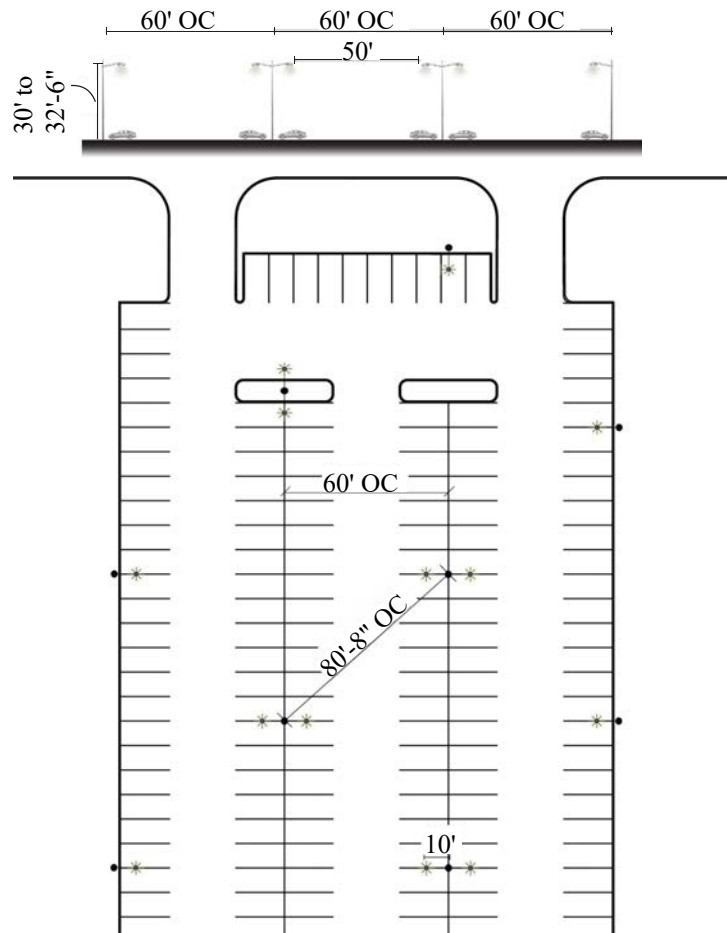


**Medium Parking Lot**  
Diagram shows a linear parking lot with more than one tray of parking.

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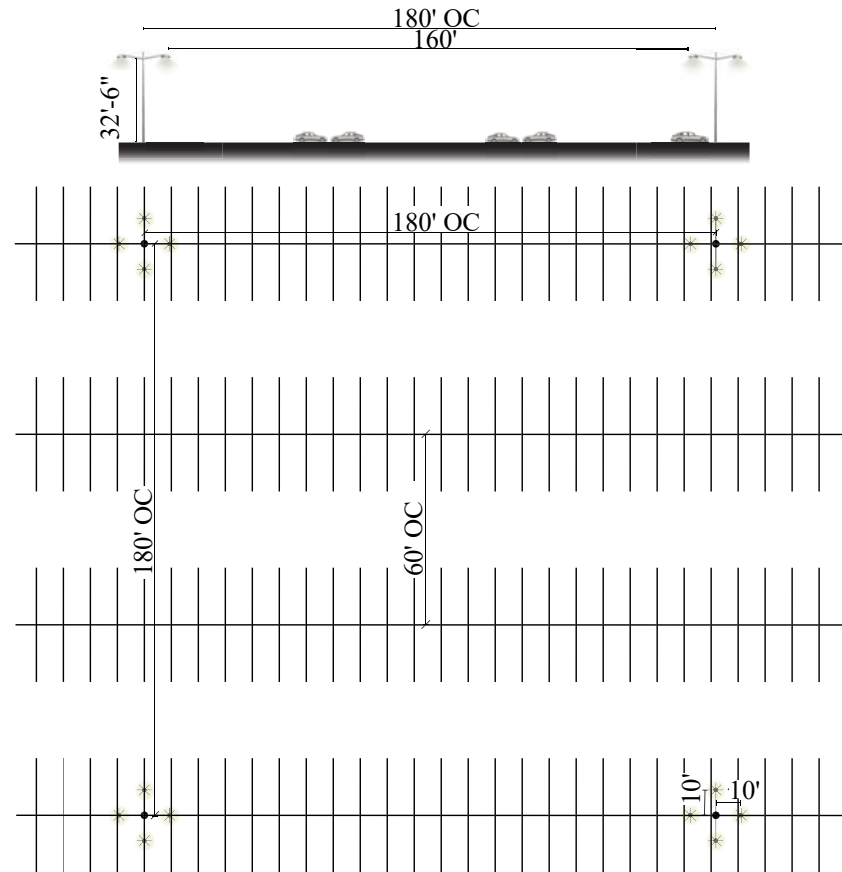
## Exterior Lighting

### Space Typologies: Medium and Large Parking Lots



#### Medium Parking Lot With Offset Grid

Diagram shows a large parking lot with an offset grid of light poles with 10' davit arms.



#### Large Parking Lot With Regular Grid

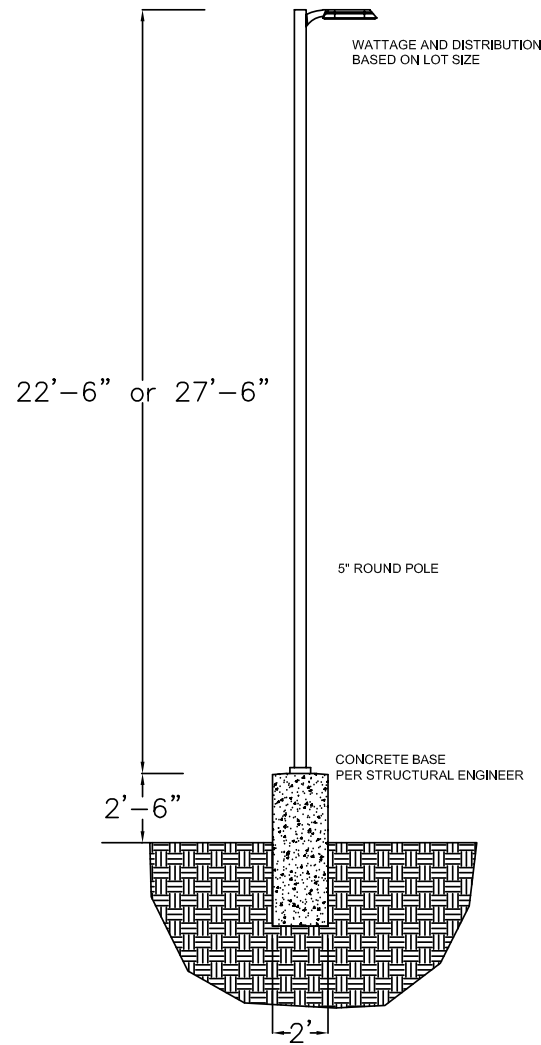
Diagram shows a large parking lot with a regular grid of light poles with 10' davit arms.

# Section 11

## Exterior Lighting

### Street Lights at Small to Medium-sized Parking Lots

- ❑ Provide Lithonia RSX2 LED light fixture at smaller parking lots
- ❑ Provide Lens that is flat and flush with bottom of fixture
- ❑ All fixtures to be black
- ❑ Provide fixture with cast aluminum body mounted to a round pole with the fixture face at 25' or 30' above finished grade depending on parking lot size
- ❑ Provide LED light producing between 12,000 and 22,000 lumens depending on height
- ❑ Specify 4000K color light with a CRI of 85 or better
- ❑ Specify lights to be Dark Sky compliant with no light above 75° from nadir and with a beam of light 35° from nadir
- ❑ Refer to pole base details on Page 24



Medium Height Parking Lot Fixture



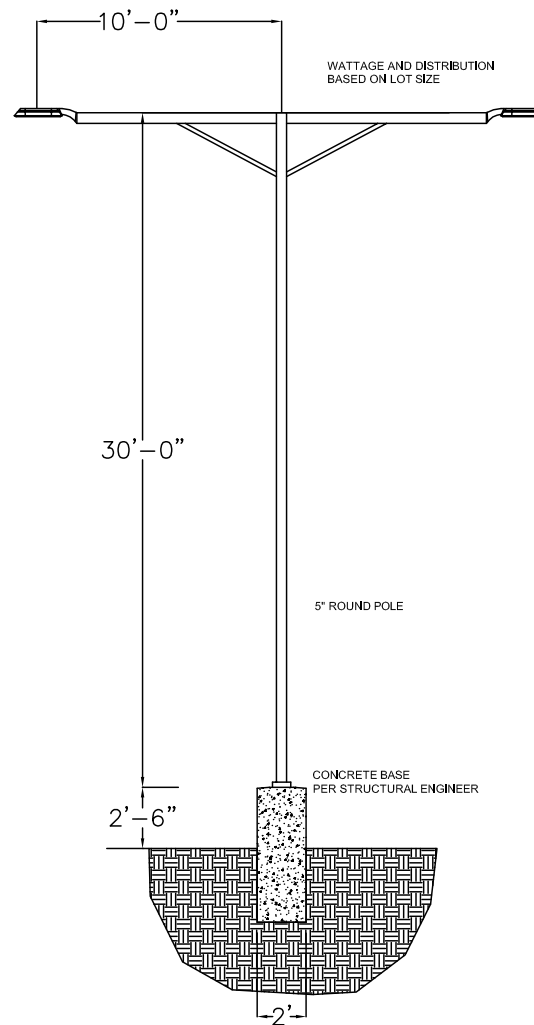
Lithonia RSX2 LED

# Section 11

## Exterior Lighting

### Large Parking Lots

- Provide high-mast parking lot pole with light fixture mounted 32'-6" above finished grade. Specify light fixture by Lithonia Lighting. All fixtures to be black. Provide lens that is flat and flush with bottom of fixture
- Mount fixture to 10'-0" strut arm extending from the pole with a supporting 45 degree diagonal from the bottom. All poles and arms to be black
- At large parking lots, provide LED light producing between 21,000 and 40,000 lumens depending on height. Specify 4000K color light with a CRI of 85 or better
- Refer to light pole base detail on Page 24



High Mast Fixture

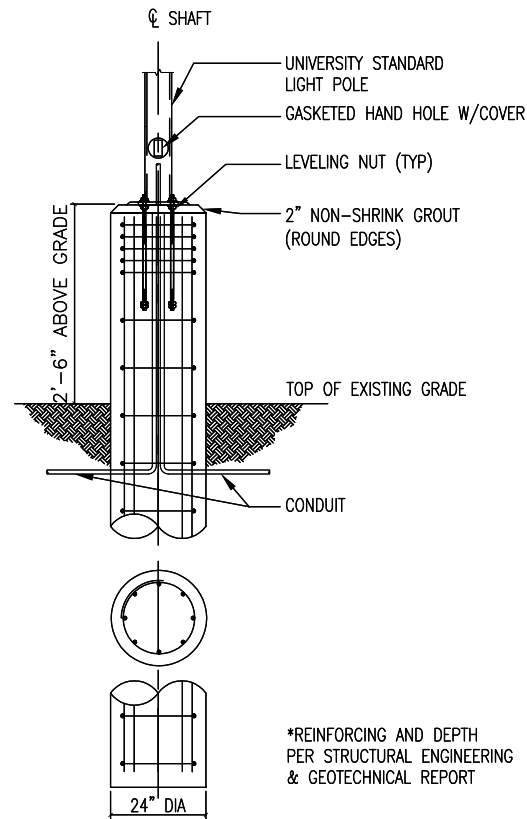


Lithonia D-Series Size 1

# Section 11

## Exterior Lighting

### Parking Lot Light Poles - Footing Details



When Set in Parking Lot



# Section 11

## Exterior Lighting

### Space Typologies: Specialty Lighting

- Bus Shelter
  - Average..... 10 FC
  - Minimum..... 1.5 FC
- Extend light distribution 20 feet from ends of bus stop parallel to street and 10 feet behind the structure.
- If no shelter exists, provide a 10 FC pool of light 20 feet in diameter.



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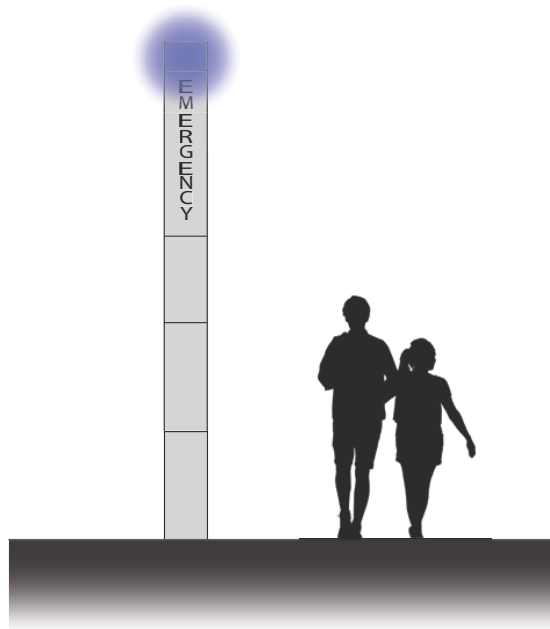
## Exterior Lighting

### Space Typologies: Specialty Lighting

- ❑ Blue light emergency call station
  - Minimum ..... 5.0 FC
  - Maximum to minimum ..... 4 to 1
- ❑ Extend pool of lighting 25 feet in all visible directions.
- ❑ Provide 4000K and 85 CRI or better
- ❑ Mount blue marker light at approximately 12 feet above finished grade.
- ❑ If blue marker light cannot provide necessary light levels, provide supplemental pedestrian light poles.



Poor execution (left) vs. successful emergency call station (right)

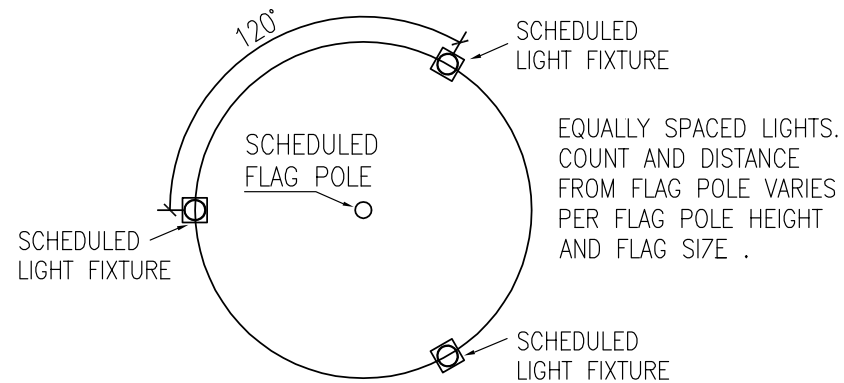
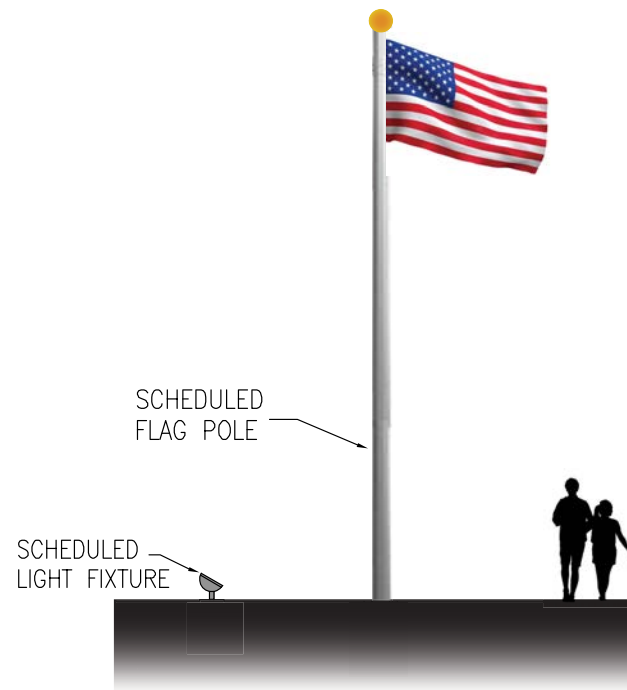


# Section 11

## Exterior Lighting

### Space Typologies: Specialty Lighting

- ❑ Flag Pole Lighting
- ❑ Comply with required lighting of U.S. Flag Code
- ❑ Section 6a of the U.S. Flag Code indicates that it is a "universal custom to display the flag only from sunrise to sunset on buildings and on stationary flagstuffs in the open - however, when a patriotic effect is desired, the flag may be displayed twenty-four hours a day if properly illuminated during the hours of darkness."
- ❑ Design lighting of flags, U.S. or other, in accordance with the adjacent diagram
- ❑ Avoid use of in-ground light fixtures



# Section 11

## Exterior Lighting

### Space Typologies: Specialty Lighting

- ❑ The campus art collection is an important portion of the campus identity and as such needs a uniform approach to illumination
- ❑ Highlight important campus monuments using lighting. The entry obelisks on Cullen Blvd. are an example
- ❑ Lighting levels for public art are determined on a case-by-case basis working closely with the artist
- ❑ Avoid in-grade lighting if possible

