Roadway Illumination Design

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Outline

- Schematic development
- Photometric analysis
- LED lighting basics
- Electrical design
- Check illumination warrants
- Continuous lighting versus safety lighting
- Existing lighting system
  - Field visit; As-builts
Schematic Development

- Preliminary pole placement
  - Avoid underground and overhead utilities
  - Check for proximity to airports (FAA flight path)
- Power provider coordination
  - Centrally located services
Design Guidelines

- TxDOT Highway Illumination Manual
- IESNA RP-8
- AASHTO Roadway Lighting Design Guide
Photometric Analysis

- Lighting Level Calculations
- Pole spacing and placement
- Minimize light trespass

Source: AASHTO Roadway Lighting Design Guide
Photometric Analysis
Photometric Analysis
Photometric Analysis
LED Lighting Basics

Source: GreenStar Products, Inc.
LED - Advantages

- Longer life and less maintenance
- Higher efficacy with more lumens per watt
- More directed light so light trespass can be controlled
- Better light quality with cleaner, white light
- Better color rendering index
- Dimmable by using special driver within bulb
- Green, mercury free product
- Gradual failure, unlike the sudden burn out of incandescent bulbs
- Light up quickly to their full brightness
- Ideal for frequent on-off cycling applications
LED - Disadvantages

- Higher initial cost
- Temperature dependent so needs heat dissipater arrangement for LED array
- Blue light pollution from blue light emitted
## Electrical Design

### LED Equivalent

0.25 A

0.40 A

0.65 A

### Design Amperes for Various Luminaires

<table>
<thead>
<tr>
<th>Lamp Wattage and Type*</th>
<th>120 V</th>
<th>240 V</th>
<th>480 V</th>
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</thead>
<tbody>
<tr>
<td>100 W MV</td>
<td>1.2 A</td>
<td>0.6 A</td>
<td>0.3 A</td>
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<tr>
<td>175 W MV</td>
<td>1.8 A</td>
<td>0.9 A</td>
<td>0.5 A</td>
</tr>
<tr>
<td>100 W HPS</td>
<td>1.2 A</td>
<td>0.6 A</td>
<td>0.3 A</td>
</tr>
<tr>
<td>150 W HPS</td>
<td>1.8 A</td>
<td>0.9 A</td>
<td>0.5 A</td>
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<tr>
<td>200 W HPS</td>
<td>2.4 A</td>
<td>1.2 A</td>
<td>0.6 A</td>
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<td>250 W HPS</td>
<td>3.0 A</td>
<td>1.5 A</td>
<td>0.75 A</td>
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<td>400 W HPS</td>
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<td>2.2 A</td>
<td>1.2 A</td>
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<td>40 W F</td>
<td>0.37 A</td>
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<td>150 or 165 W IF</td>
<td>1.4 A</td>
<td>0.71 A</td>
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Source: TxDOT highway Illumination Manual
Electrical Design

- Follow the National Electrical Code (NEC)
- Locate and Coordinate Electrical Service
  - Verify operating voltage with Electric Utility
  - Identify Utility Power drop location
Electrical Design

- Circuit Routing
  - Minimize Total Length of Circuits (“H” layout pattern)
  - Minimize ‘backtracking’
  - Maintenance access
- Voltage Drop Calculations
  - Size wires
  - Smaller wire sizes away from the service
- Conduit fill calculations (40% max)
## Electrical Design

### Electrical service and breaker size calculations

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<td>ES01**</td>
<td>C8.04</td>
<td>ELEC SERV TY A (240/480)060 (NS)AL (E)PS (U) 2*</td>
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<td>N/A</td>
<td>2P/60</td>
<td>60</td>
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<td>A</td>
<td>2P/20</td>
<td>13.0</td>
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<td>(EXISTING)</td>
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*Note: *2* indicates the service size.
Thank You

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