LA DOTD’s Nighttime Standards for Construction Operations

Presented by: Tom Ervin
Traffic Solutions, Inc.
NIGHTTIME CONSTRUCTION OPERATIONS (02/06):

- Section 105, Control of Work, of the 2000 Standard Specifications is amended to add the following.
- 105.20 NIGHTTIME CONSTRUCTION OPERATIONS.
  - (a) Description: This work consists of furnishing, installing, operating, maintaining, moving, and removing portable light towers and equipment-mounted fixtures for nighttime construction operations. Nighttime construction operations are defined as work performed after sunset and before sunrise.
  - (b) Equipment Requirements: Materials and equipment shall be in good operating condition and in compliance with applicable OSHA, NEC, and NEMA codes.
  - The contractor shall furnish, to the engineer, two light meters capable of measuring the level of illuminance. These light meters will be used by the engineer to check the adequacy of illumination throughout the nighttime construction operations. The light meters will become the property of the contractor after final acceptance.
Illuminance

- The amount of light falling on an object
- Measured in lux or footcandles with an “illuminance meter”

Illuminance is different from “Luminance” ("brightness") which measures how bright an object appears to the driver.
Portable Trailer-Mounted Light Tower

In position

Being transported
Vehicle Headlights

- All construction vehicles must be equipped with conventional vehicle headlights to permit safe movement in non-illuminated areas.

Headlights **should not** be permitted as the sole means of illumination while working.
Flashing Rotating Beacons

- Recommended for all nighttime vehicles
- Use in pairs for better visibility
- Amber color for warning
- 360-degree visibility
Markings on Vehicles
Classification of Illumination Requirements by Task

- Each work area, task or both must be categorized as to what level lighting is required.
- The TCP may specify the required "illuminance levels" for the type and location of work.
Illuminance Levels

- Depend on the type and location of the work
- Three levels are defined:
  - Level I
  - Level II
  - Level III
Level I Illuminance

- General illumination of all work operations by personnel in areas of general construction operations, including:
  - Layout and measurement ahead of the actual work
  - Excavation
  - Cleaning and sweeping
  - Landscaping (planting and seeding)
Level I Illuminance

- Needed where crew movement may take place
- Limited to tasks requiring:
  - Low accuracy
  - Slow-moving equipment
  - Large objects
  - Setup and removal of closures

Tapers require Level I illumination!
Remote Area
Illuminated at Level I
Level II Illuminance

- Recommended for areas on or around construction equipment
- Necessary both for:
  - Safety in operating equipment
  - Attaining an acceptable level of accuracy
- Examples:
  - Asphalt paving and milling
  - Concrete placement and removal
Level III Illuminance

- Suggested for tasks requiring:
  - A higher level of visual performance
  - A higher level of difficulty

- Examples:
  - Pavement crack/pothole filling
  - Patching
  - Installation of electrical equipment
Rule of Thumb

“Separation between luminaires should not exceed 2-4 times the mounting height.”
# Illumination Criteria

<table>
<thead>
<tr>
<th>Level</th>
<th>Min. Illuminance Level, lux (footcandle)</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>54 (5)</td>
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<tr>
<td>II</td>
<td>108 (10)</td>
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<tr>
<td>III</td>
<td>216 (20)</td>
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</tbody>
</table>
## Recommended Min. Illuminance Levels & Categories for NWZ

<table>
<thead>
<tr>
<th>LEV.</th>
<th>Min. Illuminance Level (lx (fc))</th>
<th>Area of Illumination</th>
<th>Examples of Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>54 (5)</td>
<td>Throughout spaces</td>
<td>Excavation, sweeping &amp; cleanup, movement area in work zone, movement between two tasks</td>
</tr>
<tr>
<td>II</td>
<td>108 (10)</td>
<td>Of tasks and around equipment</td>
<td>Paving, milling, concrete work, around paver or miller</td>
</tr>
<tr>
<td>III</td>
<td>216 (20)</td>
<td>Illuminance on task</td>
<td>Crack filling, pot filling, tasks requiring extreme accuracy and attention</td>
</tr>
</tbody>
</table>
Glare

- Interference with the visual perception caused by an uncomfortably bright source

- Two types:
  1. Discomfort glare
  2. Disabling glare
1. Discomfort Glare

- Results in fatigue which may have a deleterious effect on vision
2. Disabling Glare

- Results from light scatter within the eye which effectively reduces contrast and therefore the visibility of objects
Minimizing Glare

- Locate luminaires so that the axis of maximum candlepower is located away from the line of sight of motorists
  - Looking ahead
  - Looking at signs
Factors Affecting Angle Between Luminaire’s Beam and Line of Sight

- Distance between driver and the luminaire
- Height of the luminaire
- Direction the luminaire is aimed

*Adjusting these factors can control glare!*
Controlling Glare

- Tower-mounted luminaires should be aimed either parallel or perpendicular to the roadway
Controlling Glare

- All luminaires should be aimed such that the center of the beam axis is no greater than 60° above the vertical (straight down)
Controlling Glare

- None of the luminaires should provide a luminous intensity greater than 20,000 candela at an angle of 72° above the vertical (straight down).
TCS Responsibilities During Nighttime Operations

- Make sure illuminance called for in the plans is provided
- Minimize glare
- Protect workers
- Enhance layouts for nighttime
- Proper visibility of devices and hazards
Operational Requirements

- Lighting plan 30 days prior to construction
- Lighting inspections nightly
  - Light meter measurements
  - Observation of glare potential for drivers & workers
  - Physical check of lighting equipment
Good News/Bad News

- Failure to meet lighting requirements shall result in suspension of construction operations until required level of illumination is restored
Thank You!

Be Safe!