ILLUMINATION DESIGN FROM A TXDOT PERSPECTIVE

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Transportation Operations, Dallas District
Overview

1. Basic Types of Roadway Lighting
2. Roadway Elements Subject to Illumination
3. Common Pole Types
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7. Wire Theft Solutions
# Basic Types of Roadway Lighting

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<tbody>
<tr>
<td><strong>1</strong></td>
<td>Safety (Freeways)</td>
<td>Typically Requested by Cities on Roadway Reconstruction Jobs&lt;br&gt;Warranted, Funded, Operated, and Maintained by TxDOT</td>
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<td><strong>2</strong></td>
<td>Continuous (Freeways)</td>
<td>Typically Requested by Cities on Various Types of Roadway Jobs&lt;br&gt;Warranted &amp; Funded by TxDOT, Operated &amp; Maintained by City</td>
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<td><strong>3</strong></td>
<td>Continuous (Arterials)</td>
<td>Approved by TxDOT, Funded, Operated, &amp; Maintained by City</td>
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<td><strong>4</strong></td>
<td>Amenities</td>
<td>Approved by TxDOT, Funded, Operated, &amp; Maintained by City</td>
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Roadway Infrastructure Elements Subject to Lighting

1. Freeway Main Lanes
2. Arterial Streets / Highways
3. Intersections & Interchanges
4. Freeway Ramps & Direct Connectors
5. Ramp Gores and Acceleration / Deceleration Lanes
6. Underpasses & Overpasses
Common Pole Types

1. Conventional (30’ - 50’ Poles with Single or Dual Mast Arms)
   - Transformer Base (Breakaway)
   - Shoe Base (Bridges and Retaining Walls)
   - Oval Base (Concrete Safety Barrier)

2. High Mast (100’ – 175’ Towers)
   - Symmetric Type S (Circular) Light Pattern
   - Asymmetric Type A or B (Oval) Light Pattern
   - Need FAA Approval & Core Borings

3. Decorative & Ornamental
   - Various Non-Standard Designs to Meet City Aesthetics
**DETERMINATION OF NO HAZARD TO AIR NAVIGATION**

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

- **Structure:** High Mast Illumination HM-1
- **Location:** Conroe, TX
- **Latitude:** 30°48'08.000" NAD 83
- **Longitude:** 95°01'57.000" W
- **Height:**
  - 322 feet above ground level (AGL)
  - 377 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, (are) met:

- It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:
  - At least 10 days prior to start of construction (7460-2, Part I)
  - Within 5 days after the construction reaches its greatest height (7460-2, Part II)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory Circular 70/7460-1 & Change 2.

This determination expires on 10/05/2014 unless:

- (a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
- (b) extended, revised, or terminated by the issuing office.
- (c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.
Example Core Boring Logs
Common Fixture Types

1. HPS (High Pressure Sodium)
   - 150W (Underpasses)
   - 250W (Ramp & Intersection Safety Lighting)
   - 400W (Freeway Main Lanes & High Mast Rings)

2. LED
   - Specification Calls For HPS Equivalents

3. MH (Metal Halide)
   - Typically Used on City Arterials
   - Being Replaced by LED’s
# Reference Materials & Standards

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<td>3</td>
<td>NEC (2014)</td>
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<td>4</td>
<td>TxDOT Standards</td>
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- **ED (1 – 12) - 14**
- **RIP (1 – 4)–11, RID (LUM1 - 2)–07, RID (UP)–14, RID (FND)-11**
- **HMID (1 – 9)–03, HMIP (1 - 2)–98, HMIF (1 - 2)–98**
- **BL (1 - 2), RW (LB) (1 - 2), CSB (4)–10, SSCB (4) - 10**
Lighting Reference Manuals

Highway Illumination Manual

Texas Department of Transportation

November 2003

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Roadway Lighting Design Guide

October 2005

American Association of State Highway and Transportation Officials
Illumination Design

1. Conventional Poles – Follow TxDOT Pole Placements & Spacings

2. Arterial Street Medians – 30’ Poles, 5’ Min. Width Curbed, 45 mph Max.

3. High Mast Poles – Use AGi32 with TxDOT IES Photometrics for Placements

4. Clear Zone for High Mast Poles – Use MBGF or Locate Behind Rail or Walls

5. Elevation Details for Underpass Lighting

6. Services – Generally 240 / 480 Single Phase Overhead or Underground

7. Voltage Drop Calculations – 8% for HPS or LED at 480V
## Illumination Design Plan Requirements

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<tr>
<td>1</td>
<td>Show Power Sources, Service Locations, &amp; Electrical Service Data Chart</td>
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<tr>
<td>2</td>
<td>Show Poles with Logical Identification System (i.e. A-1, 1A-1, etc)</td>
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<tr>
<td>3</td>
<td>Show Ground Boxes at 500’ Maximum Spacings</td>
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<tr>
<td>4</td>
<td>Show Conduits with Consistent Numbering System</td>
</tr>
<tr>
<td>5</td>
<td>Show Conduit and Conductor Run Table</td>
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<tr>
<td>6</td>
<td>Show Pole / Fixture Chart with All Pertinent Data</td>
</tr>
<tr>
<td>7</td>
<td>Show Summary of All Bid Item Quantities on a Per Sheet Basis</td>
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<tr>
<td>8</td>
<td>Good Quality Assurance Checks (Provide Voltage Drop Calculations)</td>
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Example Safety Lighting Plan
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Example Safety Lighting Plan
Example High Mast Lighting Plan
Example High Mast Lighting Plan
Example Electrical Service Data Chart
Example Underpass Lighting Detail
Wire Theft Solutions

1. Polyurethane Foam in Ground Boxes and Conduits
2. Buried Ground Boxes for ITS Power
3. Concrete Caps over Ground Boxes
4. Lockable Ground Box Lids
5. Aluminum Wire (NEC Revision coming in 2017)