Lighting
<table>
<thead>
<tr>
<th>NO.</th>
<th>DATE</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LI-101</td>
<td>10-21-14</td>
<td>Light Pole Location</td>
</tr>
<tr>
<td>LI-103</td>
<td>04-19-22</td>
<td>Conduit and Precast Handholes</td>
</tr>
<tr>
<td>LI-104</td>
<td>10-21-14</td>
<td>Junction box (cast Iron)</td>
</tr>
<tr>
<td>LI-110</td>
<td>04-19-16</td>
<td>Lighting Tower</td>
</tr>
<tr>
<td>LI-120</td>
<td>10-21-14</td>
<td>Underdeck Lighting</td>
</tr>
<tr>
<td>LI-130</td>
<td>10-17-17</td>
<td>Temporary Floodlighting Luminaires</td>
</tr>
<tr>
<td>LI-141</td>
<td>10-21-14</td>
<td>Electrical Installation (Roadway Ducts)</td>
</tr>
<tr>
<td>LI-142</td>
<td>04-21-15</td>
<td>Electrical Installation (Bases)</td>
</tr>
<tr>
<td>LI-151</td>
<td>10-21-14</td>
<td>Control Cabinet (Pole-Mounted)</td>
</tr>
<tr>
<td>LI-152</td>
<td>10-21-14</td>
<td>Control Cabinet (Pad-Mounted)</td>
</tr>
<tr>
<td>LI-201</td>
<td>04-18-17</td>
<td>Light Pole Foundation</td>
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<tr>
<td>LI-210</td>
<td>10-21-14</td>
<td>Transformer Base (Cast Aluminum)</td>
</tr>
<tr>
<td>LI-211</td>
<td>10-20-15</td>
<td>Slip-Base for Light Poles</td>
</tr>
</tbody>
</table>
Mounting Height (MH) is the dimension measured vertically from the center of end of mastarm to the top of foundation as shown. Allowable tolerance on MH for final installation is from ±3 inches to ±3 inches.

Overhang (OH) is the horizontal dimension from the edge of traveled way to the Luminaire center. Unless specifically designated otherwise, design OH is zero, with an allowable tolerance of ±6 inches.

Lateral clearance will be controlled by luminaire dimensions, and by specified overhang and mastarm dimensions. Unless directed otherwise by the Engineer, clearance of adjacent poles having identical mastarm lengths is not to vary by more than ±3 inches.

Orientation: If not specified otherwise, angular orientation of mastarm is 90° ± 2° to the respective centerlines or baselines, or to the respective edges of the pavement along acceleration and deceleration tapers.

Twin-Mastarm Angles: Included angle is to provide required acceleration and deceleration tapers. If not specified otherwise, angular orientation of mastarms having identical mastarm lengths is not to vary by more than ±3 inches.

Twin-Mastarm Angles: Included angle is to provide required acceleration and deceleration tapers.

Orientation: If not specified otherwise, angular orientation of mastarm is 90° ± 2° to the respective centerlines or baselines, or to the respective edges of the pavement along acceleration and deceleration tapers.

Edge of traveled way is considered to be the edge line.

Foundation offset (FO) is measured to the centerline of foundation. If the foreslope is steeper than 6:1, FO should be between 2 and 3 feet. If the foreslope is 6:1 or flatter, the FO will vary based on specified mastarm length.

Spill-base only. May be placed behind pole. Meet the requirements of Article 2523.03, O of the Standard Specifications.

Possible Contract Item: Lighting Poles
Possible Tabulation: 108-1

**LAYOUT LEGEND**
- **Lighting Unit**: Represents the location of lighting units along the traveled way.
- **Station 000+00**: Specifies the station location for the lighting unit.
- **Lighting Unit No.**: Identifies the specific lighting unit number.
- **Vertical Light Distribution**: Indicates the vertical light distribution pattern.
- **Lateral Light Distribution**: Shows the lateral light distribution pattern.
- **Mastarm Length (ft.)**: Provides the length of the mastarm in feet.
- **Mounting Height (ft.)**: Specifies the mounting height in feet.
Added option for conduit to enter through the bottom of handhole.
**HANDHOLE DIMENSIONS TABLE**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>L</th>
<th>W</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>30&quot;</td>
<td>17&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>III</td>
<td>36&quot;</td>
<td>24&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>IV</td>
<td>48&quot;</td>
<td>30&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

1. Potential conduit entry through bottom of handhole.
2. For conduit behind curb, place 24 to 48 inches below top of curb. For conduit under roadway, place 30 to 60 inches below the gutter line.

**Conduit in Trench**

- Compact Backfill Material
- Ensure backfill material is free of cinders, concrete, or other rubble.

**PRECAST CONCRETE COMPOSITE HANDHOLE**

- Stainless Steel Bolt
- One Piece Lid (Type II or III)
- Pull Slot
- Skid Resistant Surface

- Stainless Steel Bolt
- Two Piece Lid (Type IV)
- Pull Slot
- Skid Resistant Surface

- Cable Hooks (4) Required
- Extend granular base 8" beyond walls of handhole.

- Conduit Entry Through Side of Handhole

- Conduit Depth

- Trench 4" min.
Alternate design may be submitted to the Engineer for approval.

Approved galvanized steel covers may be substituted for cast iron.

Fit grounding buttons with 3/8" x 3/4" brass screws unless specified otherwise.

Type, size and location of holes will be shown on the plans.

Use slip holes only for junction box drains unless specified otherwise.

In locations subject to pedestrian traffic, install junction box covers with approved anti-skid pattern.

Contract Items:

Handholes and Junction Boxes

<table>
<thead>
<tr>
<th>Conduit Size</th>
<th>Minimum Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
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</tr>
<tr>
<td>1 1/2&quot;</td>
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<td>3&quot;</td>
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<tr>
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<tr>
<td>3/8&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

MINIMUM SPACING BETWEEN CONDUIT CENTERS - "E"

<table>
<thead>
<tr>
<th>Size</th>
<th>2&quot;</th>
<th>1 1/2&quot;</th>
<th>1&quot;</th>
<th>3/4&quot;</th>
<th>1/2&quot;</th>
<th>3/8&quot;</th>
<th>1/4&quot;</th>
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<td>3/4&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td></td>
</tr>
</tbody>
</table>
Anchoring Nut
Leveling Nut
6'' min.
6'' min.
6'' min.
5'' min.
10'' min.
5'' min.

Jam Nut
Anchoring Nut
Leveling Nut
Double Plate
(5'' min. thickness)
Cover Plate

ELEVATION

SECTION B-B
(Anchor Bolts not shown for clarity)

SECTION A-A

WIRE FABRIC CLOSURE

Removal of venting and caulking requirements for Doubler Plate.

Continuous backing ring or backing ring made continuous by a complete joint penetration weld.

Possible Contract Item:
Lighting Tower

Seal joints using a brown or colorless non-sag urethane caulking sealer marketed for outdoor use as approved by the Engineer.
Alternate designs may be submitted to the Engineer for approval.

Furnish luminaires that provide ballast housings to be attached to, or integral with, luminaire housings.

<table>
<thead>
<tr>
<th>HOLE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>(Min.) Mounting Hole</td>
</tr>
<tr>
<td>B</td>
<td>Entry for 1½&quot; conduit</td>
</tr>
</tbody>
</table>

Possible Contract Item: Underdeck Lighting
Circuit Duct (Sch 40 PVC)

Handhole

Roadway Crossing Duct (Sch 80 PVC)

Median

Circuit Duct (Sch 40 PVC)

Handhole

Shoulder

Profile Grade

Roadway Crossing Duct (Sch 80 PVC)

Roadway

Handhole

Light Pole

Mastarm

PROFILE GRADE

Handhole

Light Pole

Mastarm

Handhole

Light Pole

Mastarm

Typical Handhole

Min. Depth 5'-0''

Pavement

Edge of Shoulder

Min. Clearance 5'-0''

Typical Handhole

Min. Depth 3'-0''

Pavement

Roadway Crossing Duct (Sch 80 PVC)

Design Length

Typical Handhole (as specified)

Foreslope

Profile Grade

2'-0'' - 3'-0'' Clearance

(as specified)

THROUGHHAND

Light Pole

LI-141

NEW

10-21-14

LI-141

STANDARD ROAD PLAN

ELECTRICAL INSTALLATION

(ROADWAY DUCTS)

CONNECT TO LIGHT POLE FOUNDATION, HANDHOLE, OR CIRCUIT DUCT AS SHOWN ON PROJECT PLANS.
Alternate designs may be submitted to the Engineer for approval.

Lighting circuits consist of single conductor phase lines with bare ground wires installed in continuous underground ducts.

Locate standard trenches for lighting distribution circuits 3 feet outside the line of the light pole foundations, except for roadway crossings, access to connection points, or other cases detailed on the project plans or approved by the Engineer.

The Engineer may allow variation from minimum depths for roadway crossings, access to connection points, soil conditions, or other special cases. Where rock is encountered, a minimum trench depth of 2 feet is required.

Ducts installed under pavement slabs, drives, and other similar locations detailed in the project plans are designated as "crossings" and distinguished from other underground circuit ductwork. Refer to LI-141 for additional details.

Use Y-1 connectors for all load taps in phase lines and use Y-3 connectors for all circuit branch taps, unless specified or detailed otherwise. When the method of in-line splicing is not specified on the project plans, the Engineer may approve the use of connector assemblies or field molded splices.

Provide 600 volt fuses as specified, 5 amperes for each Type Y-1 connector.

Seal all unused connector openings against entry of moisture as directed by the Engineer.

1. Use a separate access duct for each connection to pole foundation.
2. Refer to NEC requirements for trench depth.
Duct Access connectors

Type Y-1

Type L-1

Duct (As Required)

Typical Additional 1/C cable No.10 AWG

Normal Trench Location

Handhole

To Roadway Crossing

Foundations

Shoulder Line

TRAFFIC

Typical Ground Rod

Circuit Duct

Trench

Fundation

Handhole

Circuit Ducts

Ground Rod

Handhole

Access Duct

Type Y-1 connectors

2'-0'' Min.

No. 10 AWG 1/C cable

Foundation

WIRING DIAGRAM

PLAN VIEW

3

2

1

Typical Additional Duct (As Required)

1. Use a separate access duct for each connection to pole foundation.
2. Refer to NEC requirements for trench depth.
3. Handhole may be placed behind pole. Meet the requirements of Article 2523.03, O, of the Standard Specifications.
Alternate designs may be submitted to the Engineer for approval.

Locate handholes where shown on plans, as well as where control cabinets are at low points in the conduit system, which could result in the low points becoming flooded with water entering at other points in the conduit system.

Possible Contract Item:
Control Cabinet.

Possible Contract Item:
Surge Protection Device

Possible Contract Item:
Breakers (2P.)

Possible Contract Item:
Control Fuse

Possible Contract Item:
Contactor (2P.)

Possible Contract Item:
Line Breaker (2P.)

Possible Contract Item:
Test Switch (Pole-Mounted)
The Type A Foundation is the normally required foundation construction. Where rock, shale, sandstone, broken or shattered rock, or other similar material is encountered, the Engineer may approve the use of the Type B or C Foundation. Dispose of all excavations in the area adjacent to the foundation and shape to the natural contour unless directed otherwise by the Engineer.

Minimum diameter of foundation is determined by the Anchor Bolt Circle required for the diameter of the pole being installed. Where dimensional requirements indicated cannot be met with normal foundations, arrange the foundation as necessary to accommodate the required diameter at no additional cost to the Contracting Authority.

Provide minimum 2" clear for all reinforcement.

Cap open ends of conduit during construction to prevent infiltration of foreign material. After the cable is installed, seal the upper end of the ducts against entry of moisture by a method approved by the Engineer.

For Transformer Base foundations, install a minimum of two access ducts, unless specified otherwise. Also install a 1" nominal inside diameter duct for the ground wire duct.

For access ducts, use a 2" nominal inside diameter duct.

For Transformer Base foundations, install a minimum of two access ducts, unless specified otherwise. Also install a 1" nominal inside diameter duct for the ground wire duct.

1. #4 bars lapped a minimum of 1'-6" as indicated. Ties may be welded to vertical bars.
2. Use full length galvanized anchor bolts. Four for Transformer Base, three for Slip Base. Refer to the light pole manufacturer’s requirements for anchor bolt, nut, and plate dimensions. Obtain a template from the light pole manufacturer for anchor bolt placement. Do not weld anchor bolts.
3. Place 12 equally spaced bars. Use #6 bars for 27 inch diameter drilled shaft. Use #7 bars for 30 inch diameter drilled shaft. Use #8 bars for 36 inch diameter drilled shaft.
4. Refer to light pole manufacturer’s recommendations for Anchor Bolt dimensions.
If the excavation for a Type B Foundation is left open for more than 1 calendar day, install temporary barrier rail if any part of the excavation is located within the clear zone. Temporary barrier rail layout requires the Engineer’s approval. Temporary barrier rail is incidental to the Type B Foundation and will not be paid for separately.

1. #4 bars lapped a minimum of 1'-6" as indicated. Ties may be welded to vertical bars.
2. Use full length galvanized anchor bolts: four for Transformer Base, three for Trip Base. Refer to the light pole manufacturer’s requirements for anchor bolt, nut, and plate dimensions. Obtain a template from the light pole manufacturer for anchor bolt placement. Do not weld anchor bolts.
3. Place 12 equally spaced bars. Use #6 bars for 27 inch diameter drilled shaft. Use #7 bars for 30 inch diameter drilled shaft. Use #8 bars for 36 inch diameter drilled shaft.
4. Foundation base may be thickened and pedestal omitted at the contractor’s option.

**Type B Foundation**

- #6 Vertical Bars
- Access Duct
- #4 Reinforcing Ties
- #4 Vertical Bars
- Anchor Bolts
- Rock
- 6'-0" Min. for Broken Rock
- 5'-0" Min. for Competent Rock
- 3'-0" Min. for Broken Rock
- 2'-0" Min. for Competent Rock
- Ties may be welded to vertical bars.

**Type C Foundation**

- #4 bars lapped a minimum of 1'-6" as indicated. Ties may be welded to vertical bars.
- Use full length galvanized anchor bolts: four for Transformer Base, three for Trip Base. Refer to the light pole manufacturer’s requirements for anchor bolt, nut, and plate dimensions. Obtain a template from the light pole manufacturer for anchor bolt placement. Do not weld anchor bolts.
- Place 12 equally spaced bars. Use #6 bars for 27 inch diameter drilled shaft. Use #7 bars for 30 inch diameter drilled shaft. Use #8 bars for 36 inch diameter drilled shaft.
- Foundation base may be thickened and pedestal omitted at the contractor’s option.
Furnish hardware fabricated using stainless steel.

When the design of the base flanges requires the use of tapered mating washers, use washers of the design and material recommended by the manufacturer of the base.

1. Use double thickness flat washers only when tapered washer is not required.
2. Refer to LI-201 for foundation details.

Foundation

Locate weep hole at narrow flange section

Bolt Circle 1'-3'' Min. (unless specified otherwise)

Locate access door away from traffic flow as shown

Foundation

ELEVATION

 SECTION A-A

BOTTOM VIEW

TOP VIEW

LI-210

STANDARD ROAD PLAN

TRANSFORMER BASE
(CAST ALUMINUM)
Ensure the top Slip-Base Plate clears all Anchor Bolts.

Furnish wire fabric material complying with Materials I.M. 443.01. Place wire fabric around anchor bolt circle between concrete foundation and base plate. Fill the fabric tight to the bottom surface of the baseplate and the top surface of the foundation to prevent rodent entry.

Refer to LI-201 for foundation details.

Torque to 1000 in. lbs.

**LIST OF FASTENER HARDWARE**

- 1" anchor bolts: 3 total.
- 1" x 4" bolts for slip-base: 3 total.
- Plate washers: 6 total, 3 top plate and 3 bottom plate.
- Circular washers: 9 total, 3 middle washers, 3 washers for leveling nuts, and 3 washers for anchor bolt nuts.
- Lock washers: 3 total
- Nuts: 9 total, 3 leveling nuts, 3 nuts for anchor bolts, and 3 nuts for slip-base bolts.

**Foundation Materials I.M. 443.01**

- For foundation details.

Ensure tops of Anchor Bolts are below the Top Slip-Base Plate so they will not interfere with the operation of the Top Slip-Base Plate.

Place wire fabric around anchor bolt circle fabric tight to the bottom surface of the baseplate and between concrete foundation and base plate. Fit the foundation to prevent rodent entry.

Ensure the top Slip-Base Plate clears all Anchor Bolts.
**Anchor Plate (galvanized)**

**SLIP-BASE PLATE**
- 1/2" dia. Bolt Circle
- 1'-4" dia. Hole (3 required)
- 60° Rad.
- 5° dia. Center hole in Bottom Slip-Base Plate
- 120° Bottom Shaft dia.
- 1/4" in Top Slip-Base Plate
- 120°

**KEEPER PLATE**
- 1/2" dia. Bolt Circle
- 1'-4" dia. Hole (3 required)
- 60° Rad.
- 5° dia. Hole
- 120° Bottom Shaft Diameter
- 28 gage thickness galvanized sheet steel
- Keeper Plate, place on top of middle Circular Washer
- Bottom Shaft dia.
- 30° Rad.
- 16
- " Dia. Hole
- 8
- 16
- " Dia. Hole
- Drill 1 1/4" dia. hole
- 8
- 16
- 5
- 2

**ANCHOR PLATE**
- 1/2" hole (3 required)
- 1'-2" dia. Bolt Circle
- 1'-4" dia.
- 6" Dia. Center Hole
- Anchor Plate (galvanized)
- Bottom Slip-Base Plate welded to Anchor Plate
- 60° Rad.
- 5° dia. Center Hole
- 120° Slip-Base Bolt
- 6" dia. Center Hole
- Anchor Bolt
- 60° Rad.
- 5° dia. Center Hole
- 120°

**TYPICAL HALF SECTION 'A'**
- (Top Slip-Base Plate)
- 2 1/4" Dia. Hole
- High strength not required
- 3/8" THICK PLATE WASHER
- 120°
- Drill 1 1/4" Dia. Hole
- 8
- 16
- " Dia. Hole
- 8
- 16
- 5
- 2

**SLIP-BASE FOR LIGHT POLES**

**REVISIONS:**
- Removed lock washers.
- Switched anchor plate and slip-base call outs in PLAN view on Sheet 1.

**APPROVED BY DESIGN METHODS ENGINEER**

**REVISION:**
- 1 10-20-15

**STANDARD ROAD PLAN**

**LI-211**

**REVISIONS:**
- Switched anchor plate and slip-base call outs in PLAN view on Sheet 1.

**APPROVED BY DESIGN METHODS ENGINEER**