

## **CHAPTER 13: RIGHT-OF-WAY LIGHT DESIGN AND CONSTRUCTION STANDARDS**

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### **13.00 INTRODUCTION**

The purpose of this section is to provide the basis for design and construction of fixed lighting for rights-of-way, including streets, adjacent sidewalks, bikeways and alleyways in Champaign. All Right-of-Way lights owned or leased by the City of Champaign shall be designed and built in accordance with this section.

### **13.01 REFERENCED STANDARDS**

Right-of-Way lights in Champaign shall be designed in accordance with standards contained in this chapter. The illumination standards contained in the City of Champaign Manual of Standard Practice are based on the American National Standard for Roadway Lighting as prepared and approved by the Illuminating Engineering Society of North America on August 8, 1999, and approved by the American National Standards Institute on June 27, 2000. Right-of-Way lights shall be constructed in accordance with Section 800, "Electrical Requirements" and Section 1085, "Electrical Materials," or the latest edition of the Standard Specifications for Road and Bridge Construction prepared by the Illinois Department of Transportation, except as modified herein. Further modifications to the standard specifications may be made by light-design engineers provided the modifications are approved by the City Engineer.

All work and materials shall be fabricated and installed in complete accordance with:

- A.** National Electric Code (NEC), latest edition.
- B.** National Electric Safety Code, (N.E.C.S.), latest edition.
- C.** Underwriters Laboratories (UL).
- D.** Illinois Power Company.
- E.** National Electrical Manufacturers Association.

13.02 DESIGN

City of Champaign Right-of-Way lights shall be designed to meet the following requirements:

- A. **Illumination Standards For Right-of-Way Lighting:** Right-of-Way lighting systems shall be designed for each specific location. Standard plans shall not be acceptable. Right-of-Way light systems shall be designed to provide not less than the level of intensity and uniformity defined in Table 13-1. Designers may provide higher levels of intensity (brighter) and lower uniformity ratios (more uniform) on specific projects provided the changes in illumination characteristics are approved by the City Engineer. Reductions in the Right-of-Way Lighting Illumination Standards for specific projects must be approved by resolution of the Champaign City Council.

<p style="text-align: center;"><b>Table 13-1</b>  <b>Illumination Standards For Right-of-Way Lighting in</b>  <b>Champaign, Illinois</b></p>				
Right-of-Way Class	Pedestrian Conflict Range (See Note iv)	Example Rights-of-way	Average Maintained Illumination in Foot-Candles	Uniformity Ratio ( $E_{avg}/E_{min}$ ) (See Note v)
Arterial Class Right-of-Way	High	<ul style="list-style-type: none"> <li>• Green from State to Wright</li> <li>• University from State to Wright</li> <li>• Springfield from State to Wright</li> <li>• First from Park to Kirby</li> </ul>	1.7	3:1
Arterial Class Right-of-Way	Low	<ul style="list-style-type: none"> <li>• Green from Prospect to State</li> <li>• University from Mattis to State</li> <li>• Springfield from Duncan to State</li> <li>• Kirby from Duncan to Neil</li> <li>• Prospect from Olympian to Windsor</li> </ul>	0.9	3:1
Collector Class Right-of-Way	High	<ul style="list-style-type: none"> <li>• Sixth from University to Pennsylvania</li> <li>• Randolph from Green to Washington</li> </ul>	1.2	4:1
Collector Class Right-of-Way	Low	<ul style="list-style-type: none"> <li>• John from Prospect to Duncan</li> <li>• McKinley from Springfield to Bradley</li> </ul>	0.6	4:1
Local Class Right-of-Way	High	<ul style="list-style-type: none"> <li>• Daniel from Oak to Wright</li> <li>• Second from University to Gregory</li> </ul>	0.9	6:1
Local Class Right-of-Way	Low	<ul style="list-style-type: none"> <li>• Charles from Russell to Pine</li> <li>• Centennial from Lawndale to Sheridan</li> </ul>	0.4	6:1

- B. Illumination Standards for Intersection Lighting:** Intersection lighting systems shall be designed for each specific location. Standard plans shall not be acceptable. Intersection light systems shall be designed to provide not less than the level of intensity and uniformity defined in Table 13-2. Designers may provide higher levels of intensity (brighter) and lower uniformity ratios (more uniform) on specific projects provided the changes in illumination characteristics are approved by the City Engineer.

<p align="center"><b>Table 13-2</b>  <b>Illumination Standards for Intersection Lighting on</b>  <b>Continuously Lighted Rights-of-way in Champaign, Illinois</b></p>				
Intersection Class	High Ped Conflict Average Maintained Illumination in Foot-candles	Low Ped Conflict Average Maintained Illumination in Foot-candles	Example Intersection	Uniformity Ratio ( $E_{avg} / E_{min}$ ) (See Note v)
Arterial – Arterial	3.4	1.8	<ul style="list-style-type: none"> <li>• High Ped: Neil &amp; University</li> <li>• Low Ped: Mattis &amp; University</li> </ul>	3.0
Arterial – Collector	2.9	1.5	<ul style="list-style-type: none"> <li>• High Ped: Fourth &amp; Gregory</li> <li>• Low Ped: Mattis &amp; Devonshire</li> </ul>	3.0
Arterial – Local	2.6	1.3	<ul style="list-style-type: none"> <li>• High Ped: Fourth &amp; John</li> <li>• Low Ped: Mattis &amp; Alton</li> </ul>	3.0
Collector – Collector	2.4	1.2	<ul style="list-style-type: none"> <li>• High Ped: Gregory &amp; Sixth</li> <li>• Low Ped: John &amp; Kenwood</li> </ul>	4.0
Collector – Local	2.1	1.0	<ul style="list-style-type: none"> <li>• High Ped: Sixth &amp; Daniel</li> <li>• Low Ped: John &amp; Fair</li> </ul>	4.0
Local – Local	1.8	0.8	<ul style="list-style-type: none"> <li>• High Ped: Fifth &amp; Daniel</li> <li>• Low Ped: Alton &amp; Western</li> </ul>	6.0

Notes for Tables 13-1 and 13-2:

- i. Reference Table 2: Illuminance Method – Recommended Values, American National Standard Practice for Roadway Lighting, ANSI/IESA RP-8-00, approved June 27, 2000. For other lighting conditions not defined in Table 13-1, please refer to the cited document.
- ii. Illumination standards are based on an asphalt road surface after some months of use identified as Class R2 or R3 by ANSI.
- iii. Refer to the Transportation Element of the Comprehensive Plan for Right-of-Way classification designation.
- iv. Pedestrian Conflict Ranges:
  - High – Areas with significant numbers of pedestrians expected to be on the sidewalks or crossing the rights-of-way during darkness. Examples are in Central Business District and the University District, bounded by University Avenue, Wright Street, Windsor Road, the Canadian National Illinois Central Railroad. The University District includes the Wright Street Right-of-Way, but does not include rights-of-way on University Avenue.
  - Low – Areas with very low volumes of night pedestrian usage. These can occur in any of the cited roadway classifications but may be typified by suburban single family rights-of-way, very low-density residential developments, or semi-rural areas.
- v. The uniformity ratio is defined as the ratio of the density of the average luminous flux ( $E_{avg}$ ) incident on a surface to the minimum luminous flux ( $E_{min}$ ) incident to the surface.

**C. Tall Pole Right-of-Way Lights:**

1. *Pole Shape:* Tall Right-of-Way light poles shall be a spun-aluminum truss-arm pole. Truss-arm poles shall be of the general shape and dimensions as shown in Figure 13.1, "Tall Pole Right-of-Way Light." Poles shall have a maximum diameter at the base of 8 in., minimum wall thickness of 0.250 in., 8 ft. or 12 ft. truss arm depending upon mounting height, and an internal vibration damper.
2. *Luminaire Mounting Height:* The standard luminaire mounting height for arterial-class rights-of-way located in any zoning district, and collector- or local-class rights-of-way located in commercial/office or commercial/industrial zoning districts<sup>1</sup> shall have a nominal 40-foot mounting height above the top of foundation. The standard luminaire mounting height for collector-class rights-of-way and local rights-of-way located outside commercial/office or commercial/industrial zoning districts shall be 22 ft., 6 in. above the top of foundation.
3. *Luminaire and Light Source:* The standard luminaire shall be of a cobra-head design, shall have full cut-off optics and shall have a distribution pattern and lamp wattage to produce illumination levels required in this chapter. The standard light source shall be high-pressure sodium.
4. *Coating and Color:* All exposed metal parts shall be coated with a long-life coating system such as a polyester-powder coating system or an epoxy-polyurethane gloss paint system. Long-life systems are those with a 15-year useable life before re-coating is necessary. The color shall be standard black on all non-residential local- and collector-class rights-of-way and all residential and non-residential arterial rights-of-way. On all residential local- and collector-class rights-of-way, the pole color shall be dark forest green.
5. *Decorative Holiday Lighting Receptacle:* An outlet receptacle, GFI protected, shall be installed at those pole locations directed by the City Engineer. The outlet shall be installed 12 ft. above the foundation unless otherwise directed by the City Engineer. The electrical system for the holiday lighting receptacle shall be designed to accommodate a nominal 2-ampere electrical load per pole. The holiday lighting receptacles shall be connected to an electrical supply circuit separate from lighting circuits. The holiday lighting receptacles shall have a separate control switch located inside the lighting controller cabinet. In most installations, outlet receptacles will be required on rights-of-way where decorative holiday lighting may be installed by business associations or neighborhood improvement groups.
6. *Special Event Electrical Supply:* At locations designated by the City Engineer, the Right-of-Way lighting designer shall include special event electrical supply receptacles. The location, number and load capacity of the special event electrical supply receptacles shall be determined by the City Engineer based on the specific uses planned for the site.

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<sup>1</sup> Champaign Municipal Code, Chapter 37, "Zoning," Article III, Division 2, "Establishment of Districts."

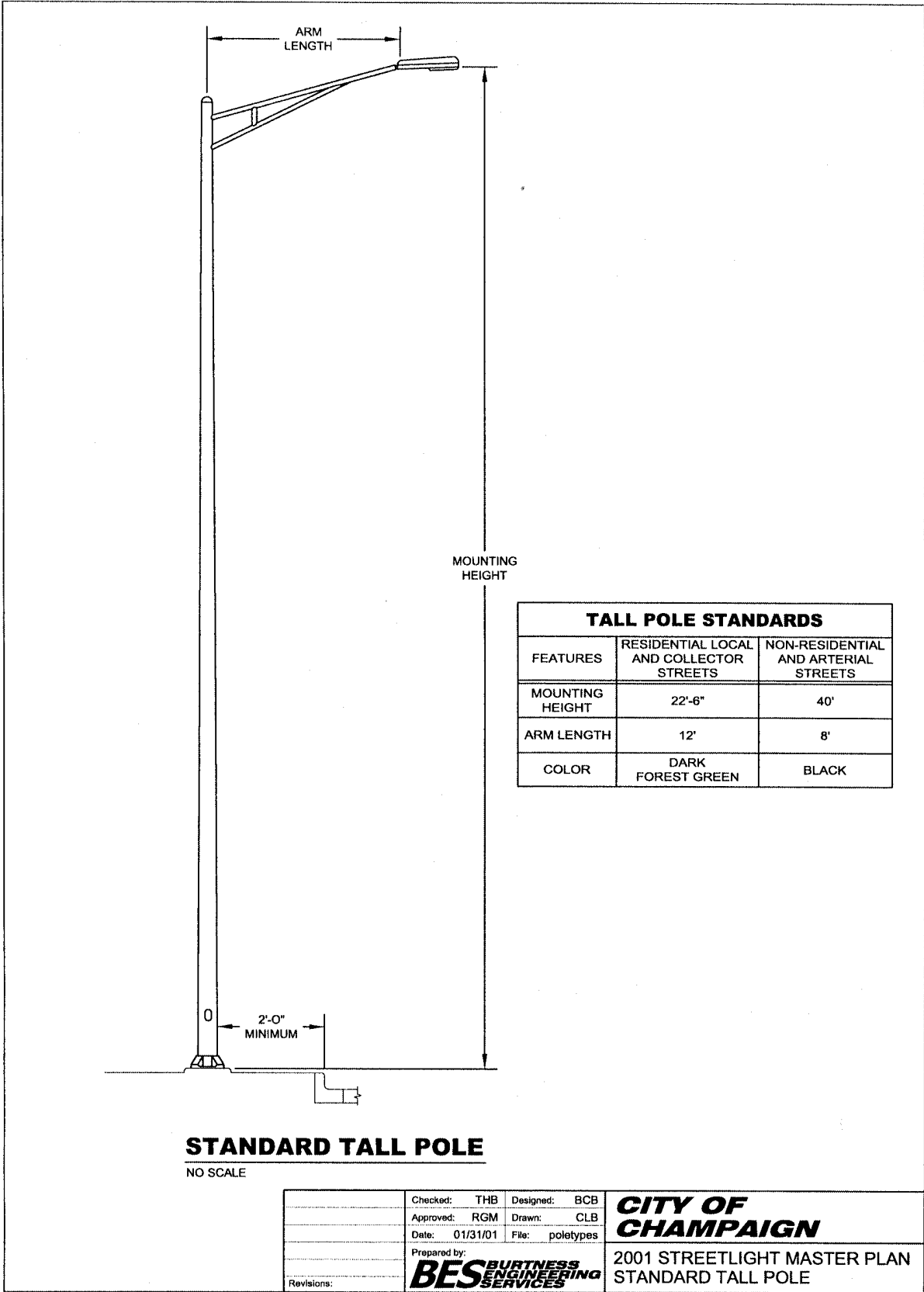


Figure 13.1: "Tall Pole Right-of-Way Light."

**D. Short Pole Right-of-Way Lights:**

1. *Pole Shape:* Short Right-of-Way light poles shall be a tapered, octagonal, cast-aluminum pole with architectural details to accentuate the base and capital. The short pole shall be of the general shape and dimensions as shown in Figure 13.2, "Short Pole Right-of-Way Light." Contact the City Engineer for pole manufacturers known to produce this pole design.
2. *Luminaire Mounting Height:* The standard luminaire mounting height shall be 12 ft. A house-side shield may be installed to reduce the amount of light directed towards houses.
3. *Luminaire and Light Source:* The standard luminaire shall be an 18-in. diameter, partially-obscured, non-diffracting (POND), acrylic globe. The standard light source shall be high-pressure sodium mounted inside a refractor cone. The lamp wattage shall be selected to produce illumination levels required in this chapter. Exceptions to this standard may be approved by resolution of the Champaign City Council.
4. *Coating and Color:* All exposed metal parts shall be coated with a long-life coating system such as a polyester-powder coating system or an epoxy-polyurethane gloss paint system. Long-life systems are those with a 15-year useable life before re-coating is necessary. The color shall be standard black on all non-residential rights-of-way, and dark forest green on all residential rights-of-way.
5. *Decorative Holiday Lighting Receptacle:* An outlet receptacle, GFI protected, shall be installed at those pole locations directed by the City Engineer. The outlet shall be installed 11 ft., 6 in. above the foundation unless otherwise directed by the City Engineer. The electrical system for the holiday lighting receptacle shall be designed to accommodate a nominal 2-ampere electrical load per pole. The holiday lighting receptacles shall be connected to an electrical supply circuit separate from lighting circuits. The holiday lighting receptacles shall have a separate control switch located inside the lighting controller cabinet. In most installations, outlet receptacles will be required on rights-of-way where decorative holiday lighting may be installed by business associations or neighborhood improvement groups.
6. *Pole Orientation Relative to Curb:* Note that the octagonal pole shall be installed so one of the eight flat sides of the pole shall be parallel to the curb. The points between the flats shall not be pointed at the curb. To achieve this orientation, care must be exercised during construction or installation of the foundation to assure proper foundation and pole orientation.
7. *Special Event Electrical Supply:* At locations designated by the City Engineer, the Right-of-Way lighting designer shall include special event electrical supply receptacles. The location, number, and load capacity of the special event electrical supply receptacles shall be determined by the City Engineer based on the specific uses planned for the site.

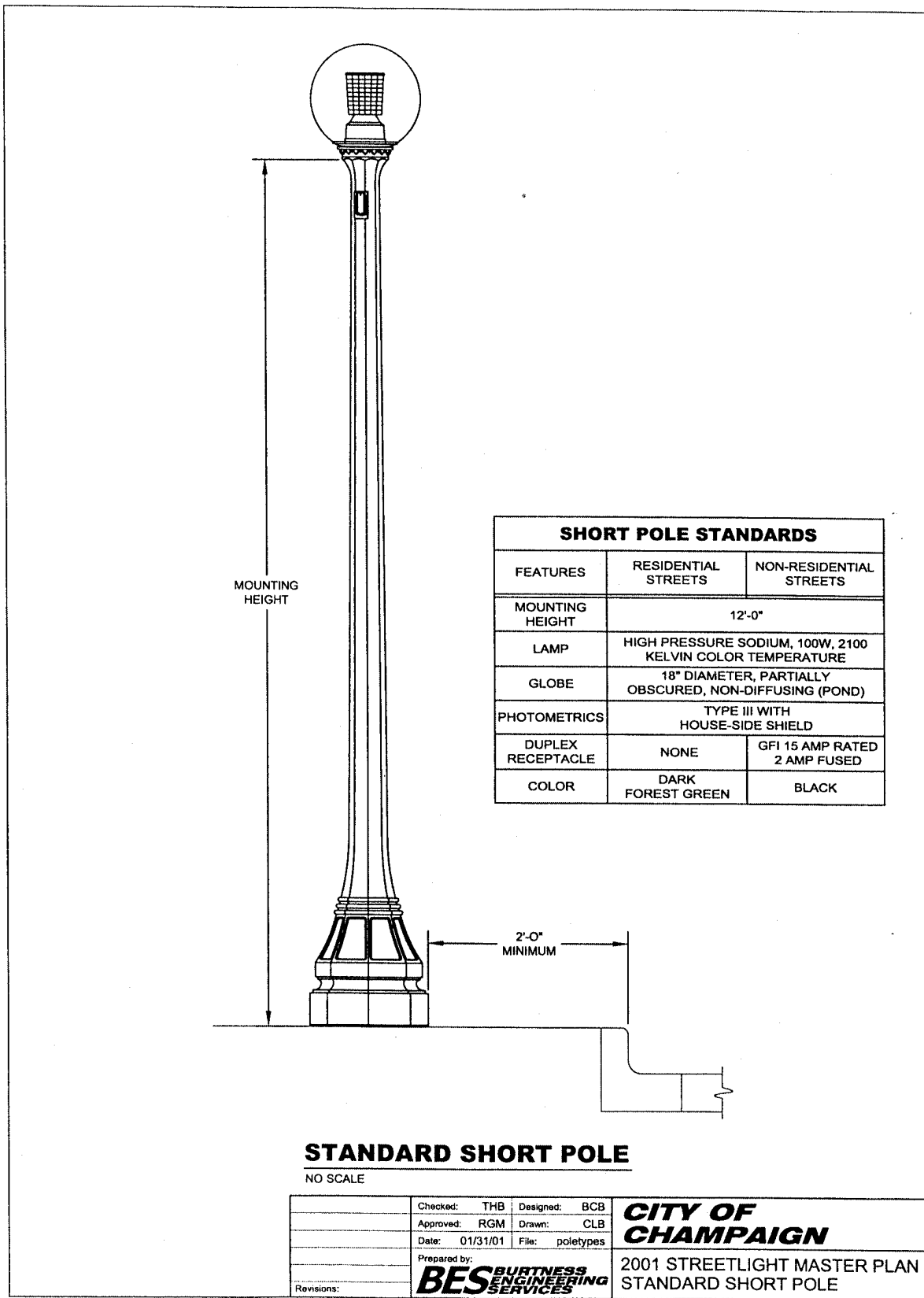


Figure 13.2: Short Pole Right-of-Way Light.

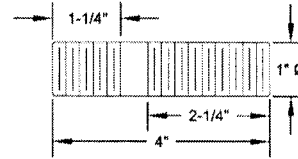
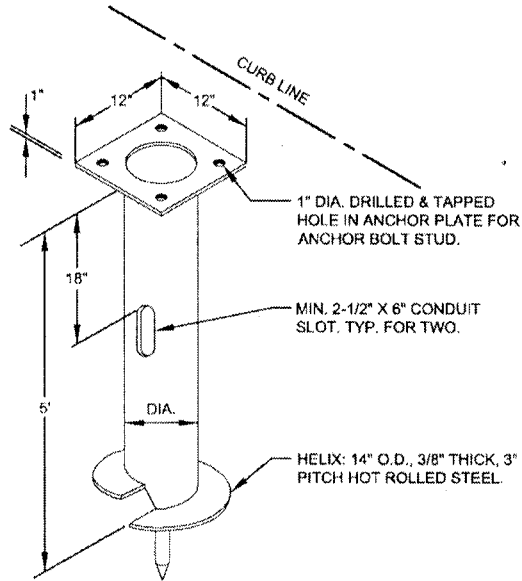


**E. Foundation:**

1. All Right-of-Way lights shall be installed on foundations.
2. Prefabricated, galvanized, steel or screw-in foundations may be used in most cases, unless cast in place concrete foundations are less costly.
3. Refer to Figure 13-3, "Standard Foundation," for general details.
4. *Pole Orientation Relative to Curb:* Note that the octagonal pole shall be installed so one of the eight flat sides of the pole shall be parallel to the curb. The points between the flats shall not be pointed at the curb. To achieve this orientation, care must be exercised during construction or installation of the foundation to assure proper foundation and pole orientation.

**F. Junction Boxes:**

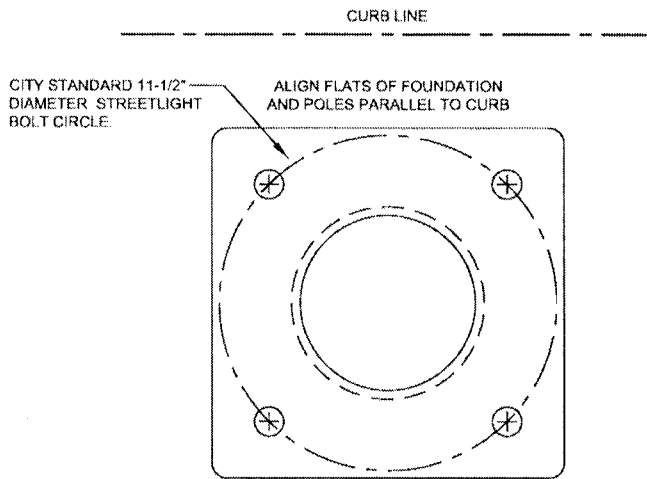
1. A junction box shall be installed in the parkway or sidewalk near the foundation for each pole.
2. The junction box shall provide a nominal 12 in. x 12 in. opening.
3. Refer to Figure 13-4, "Standard Junction Box," for general details.
4. This standard requires two important details:
  - a. A lip at the base of the box to resist upward motion during freeze-thaw cycles.
  - b. A self-centering corrosion-resistant nut in the cover bolt-down detail.



**ANCHOR BOLT STUD**

**STANDARD SCREW-IN FOUNDATION**

NO SCALE



<b>SCREW-IN FOUNDATION STANDARDS</b>	
POLE TYPE	SHAFT DIAMETER (DIA.)
12' SHORT POLE	6-5/8"
22-1/2' M.H. TALL POLE WITH 12' TRUSS	8-5/8"
30' M.H. TALL POLE WITH 8' TRUSS	6-5/8"
40' M.H. TALL POLE WITH 8' TRUSS	8-5/8"

FOUNDATION NOTES:

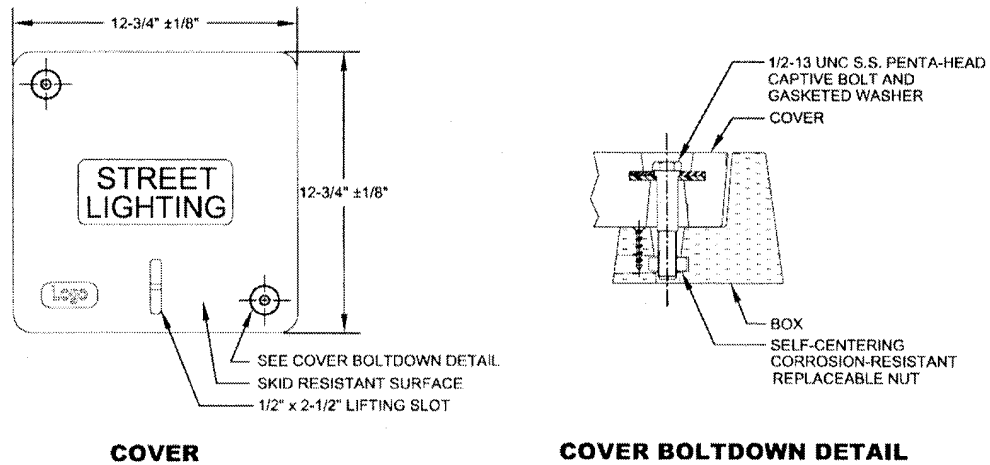
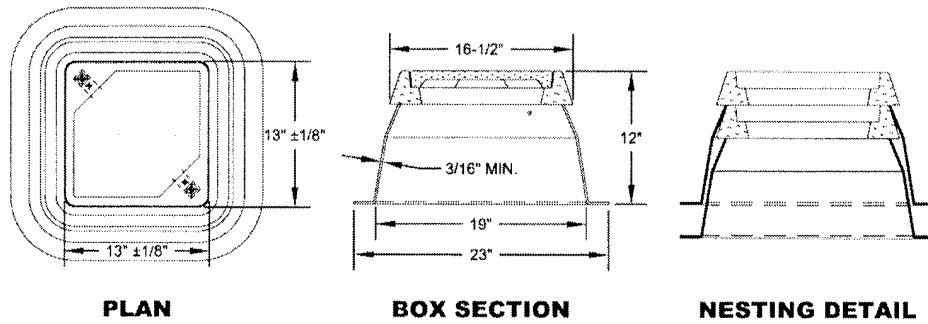
1. THE WELDED FOUNDATION SHALL BE CAPABLE OF WITHSTANDING A MINIMUM OF 10,000 FT-LBS OF INSTALLATION TORQUE APPLIED ABOUT THE AXIS OF THE FOUNDATION.
2. AFTER FABRICATION, THE FOUNDATION SHALL BE HOT DIPPED GALVANIZED PER ASTM-A 153.
3. A.B. CHANCE CAT. NO. C112-32JG4VL OR APPROVED EQUAL.

**STANDARD FOUNDATION ORIENTATION**

NO SCALE

Revisions:	Checked: THB	Designed: BCB	<b>CITY OF CHAMPAIGN</b>	
	Approved: RGM	Drawn: CLB		
	Date: 02/19/01	File: poletypes		
	Prepared by:			2001 STREETLIGHT MASTER PLAN STANDARD FOUNDATION
	<b>BES BURTNESS ENGINEERING SERVICES</b>			

Figure 13-3: Standard Foundation



### STANDARD JUNCTION BOX

NO SCALE

JUNCTION BOX STANDARDS	
MATERIAL:	FIBERGLASS-REINFORCED POLYMER CONCRETE & FIBERGLASS REINFORCED POLYMER
COLOR:	COVER & COLLAR SHALL BE MANUFACTURER'S DARK GREEN IN GRASSED AREAS AND STANDARD CONCRETE GRAY IN SIDEWALKS
LID:	BOX COVER SHALL HAVE THE WORDS "STREET LIGHTING" CAST INTO THE COVER. A MANUFACTURER'S TRADEMARK LOGO (2"x3" MAX) MAY ALSO BE CAST INTO THE COVER.
MODEL NO:	ACCEPTABLE MANUFACTURERS, CDR SYSTEMS CORP. COVER MODEL NO. PC10-1212-02 AND BOX MODEL NO. PB10-1212-12 OR APPROVED EQUAL.

Revisions	Checked: THB	Designed: BCB	<b>CITY OF CHAMPAIGN</b>
	Approved: RGM	Drawn: CLB	
	Date: 02/19/01	File: poletypes	
	Prepared by: <b>BES</b> BURNETT ENGINEERING SERVICES	2001 STREETLIGHT MASTER PLAN STANDARD JUNCTION BOX	

Figure 13-4: Standard Junction Box

- G. Conductors:** All conductors shall be made of copper. Aluminum conductors shall not be used. The sizes of all conductors shall be determined based on load and distance calculations performed by an electrical engineer licensed in the State of Illinois.
- H. Conduit and Polyduct:** All underground electric conductors shall be protected by conduit. Conduit materials may consist of galvanized rigid conduit, solvent welded schedule 40 PVC conduit or polyduct. The conduit or polyduct shall have a diameter of 1 1/2 in. or larger. Larger diameter conduit or polyduct may be required depending upon the number and size of conductors planned to occupy the conduit. In areas covered with pavement, sidewalk or established sod, conduit should be installed by means of directional boring unless otherwise approved by the City Engineer. The size of all conduits or polyduct shall be determined by calculations performed under the direction of an electrical engineer licensed in the State of Illinois.
- I. Ground Rod:** A 5/8-in. diameter by 10-ft. long, copper-clad steel ground rod shall be installed for each Right-of-Way light pole and at each controller. The ground rod should be installed through the junction box.
- J. Controllers:**
1. Right-of-Way lights should generally be controlled with a central controller. However, lights may be controlled by individual photocells if approved by the City Engineer. The basis of the choice between using a controller or individual photocells may include consideration of operation, maintenance or other economic factors.
  2. Right-of-Way light controllers shall be installed in aluminum, ground-mounted cabinets. All exposed metal parts shall be coated with a long-life coating system such as a polyester-powder coating system or an epoxy-polyurethane gloss paint system. Long-life systems are those with a 15-year useable life before re-coating is necessary. The color shall be coordinated with the color of poles installed at the same location as the controller.
- K. Traffic Signal Right-of-Way lights:** Right-of-Way lights shall be installed at all signalized intersections. Right-of-Way lights shall be mounted on combination mast-arm and luminaire-arm poles, and shall provide a 40-ft. mounting height. The mounting height may be varied at the discretion of the City Engineer to reduce conflicts with overhead electric transmission or distribution lines. The Right-of-Way light arms shall be installed in the same direction as the mast arm for traffic signals. In many cases, the Right-of-Way light arm will be used to support video detection equipment for the traffic signal system. Right-of-Way lights on traffic signals should be controlled by a Right-of-Way light controller mounted inside the traffic signal control cabinet. Lights may be controlled by individual photocells if approved by the City Engineer.

### **13.03 CONSTRUCTION:**

Right-of-Way lights shall be constructed in accordance with Section 800 of the latest edition of the Standard Specifications for Road and Bridge Construction prepared by the Illinois Department of Transportation. Site-specific construction requirements may be further defined in the special provisions in the contract documents for each project. Construction specifications shall be prepared by an electrical engineer licensed in the State of Illinois.

**13.04 MATERIALS:**

- A. Right-of-Way light poles shall be made of aluminum. Concrete, steel, or fiberglass poles shall not be used.
- B. All conductors shall be copper. Aluminum conductors shall not be permitted.
- C. Right-of-Way lights shall be constructed of materials meeting the requirements of Section 1000 of the latest edition of the Standard Specifications for Road and Bridge Construction prepared by the Illinois Department of Transportation.
- D. Site specific material requirements may be further defined in the special provisions in the contact documents for each project.

**13.05 TESTING AND INSPECTION:** The construction of all Right-of-Way light systems shall be observed by experienced electrical engineers and/or engineering technicians as may be employed by the City. The amount, frequency, intensity or duration of construction inspection shall be determined by the discretion of the City Engineer to assure that Right-of-Way light systems are installed in accordance with the plans and specifications.

**13.06 YARD LIGHTS:**

- A. **Goal:** The goal of yard lights is to provide sufficient illumination on the pedestrian walk ways or sidewalks to permit pedestrians to walk safely.
- B. **Location:**
  - 1. Yard lights shall be installed within 10 ft. of the midpoint of the lot width.
  - 2. Yard lights shall be installed within 15 ft. of property lines adjacent to public rights-of-way or easements that may be used for streets, mid-block pedestrian walkways, sidewalks, bikeways, or alleys.
  - 3. Corner lots with two or more frontages shall have two or more yard lights, one adjacent to each side of the lot touching a public right of way or public easement available for public access.
  - 4. Lots that touch a public alley along a back property line shall have a light on both the front and the back property lines.
  - 5. Public utility easements do not require illumination.
- C. **Height:** Yard lights shall be of sufficient height to provide illumination on the sidewalk. Generally, yard lights should not be taller than 8 ft.
- D. **Brightness:** Yard lights shall be equipped with a light source producing 1190 lumens, equivalent to a standard 75-watt incandescent light bulb. Alternative light sources such as high-pressure sodium, or fluorescent lamps that produce more light per watt of electrical energy consumed may be used.
- E. **Style:** No standards are established.
- F. **Operation:** Yard lights shall be photocell controlled to turn on at dusk and off at dawn.