



HLD



Hagerstown Light Department

Street Light Installation Specifications

425 East Baltimore Street
Hagerstown, MD 21740
Phone: (301) 790-2600
Fax: (301) 739-7958

Effective: JANUARY 2016

Table of Contents

I. Introduction	3
II. Definitions	4
III. Procedures for Development	5 - 7
IV. Installation Requirements with Spec. Drawings	8 - 22
V. Materials	23 - 26
Appendix A - Materials Purchase Specifications	27 - 45

I. INTRODUCTION

These specifications are published as a reference for Contractors, Architects, Engineers, and other interested parties to outline the City of Hagerstown's standard requirements for roadway lighting. They apply **ONLY** to lighting installations for roads, streets, and alleys that are or will be dedicated to the City of Hagerstown, Maryland.

The specifications are subject to revision from time to time without notifications to keep pace with lighting developments and improvements.

In order to have an available supply of replacement parts, HLD has standardized on certain luminaries, poles, and other materials. Only these standard materials are to be used on new lighting systems. See **Section IV and Appendix A** for more details.

For new subdivisions or roadway projects, the Developer must contact HLD prior to finalizing the site design for any additional specific requirements that may apply.

II. DEFINITIONS

Unless the context clearly indicates otherwise, certain words and phrases when used in this booklet shall be defined as shown below. For additional definitions, see the latest edition of the National Electrical Code.

AMPACITY - Current carrying capacity expressed in amperes.

APPROVED - Indicates approval by HLD Engineering Dept.

CITY - The City of Hagerstown, Maryland.

CONTRACTOR - Any individual paid by the Developer that would be responsible for the installation of the Streetlights.

DEVELOPER - Any present or prospective user of HLD or Potomac Edison services or their representative that will be required to install streetlights in a new or existing development or other project within the City of Hagerstown, Maryland.

FURNISHED AND INSTALLED BY DEVELOPER - Materials so specified shall be purchased and installed by the Developer at the expense of the Developer.

FURNISHED AND INSTALLED BY HLD - Either HLD or an authorized agent acting on its behalf shall provide labor and material at the expense of HLD for the items so specified.

FURNISHED BY HLD, INSTALLED BY DEVELOPER - Materials so specified shall be provided by HLD at no expense to the Developer and be installed at the expense of the Developer.

HLD - The City of Hagerstown, Maryland Light Department

NEC - National Electrical Code, NFPA 70E.

SERVICE POINT - Point of connection between the facilities of HLD or Potomac Edison and the Developer's wiring.

SUPPLIED AND INSTALLED BY HLD AND PAID FOR BY THE DEVELOPER - Either HLD or an authorized agent acting on its behalf shall provide labor and material at the expense of the Developer. Costs will be paid for in full before work is completed by HLD.

III. PROCEDURES FOR NEW DEVELOPMENT

A. INITIAL DESIGN

1. The Developer should first become familiar with these standards and requirements. The Developer must decide which type of lighting system to install (post-top, cobra head, etc).
2. The Developer next must complete the layout of a lighting system that provides adequate illumination and determine the locations and types of light poles and fixtures as well as the underground wiring system. Consult HLD to determine the required foot-candle and uniformity levels before starting detailed system design.
3. Design must be coordinated with HLD and possibly Potomac Edison, particularly as to the location of power supply point(s) for the system.
4. Easements shall be provided at no cost to the City for all facilities located outside of dedicated City rights-of-way.

B. SUBDIVISION PLAT AND SITE PLAN APPROVAL

HLD approval of the proposed lighting system will be necessary for the final approval of the Developer's subdivision plat and/or site plan. Furthermore, HLD approval must be secured prior to purchasing any materials or beginning any construction.

When getting bid prices for materials, the Developer must provide his suppliers with copies of the enclosed HLD purchase specifications to ensure that the correct materials are purchased.

The following information must be submitted to HLD for approval:

1. System layout drawing (to scale) showing locations of all light poles and underground junction boxes, location and depths of wiring and conduit runs, ground rods, and other major facilities.
2. Detailed constructions and installation drawings:
 - a. Typical pole and/or foundation installation.
 - b. Conduit and wire installations and sizes.
 - c. Wiring connection diagram and schematic; identifying each leg of the supply system as RED or BLACK, showing the neutral (WHITE), showing the ground (GREEN), and showing which leg each light is connected to. Also show fuse locations and sizes on the diagram.

3. List of proposed major materials, giving Manufacturer and Catalog No. of each item, including the following items:
 - a. Luminaries
 - b. Lamps
 - c. Photoelectric Controls
 - d. Poles
 - e. Anchor bolts and nuts (if any)
 - f. Junction Boxes
 - g. Wire and Cable
 - h. Connectors
 - i. Ground Rods and Clamps
 - j. Fuses and Fuse Holders

NOTE: Only HLD standard materials for new installations may be used. See **Section IV and Appendix A**.

4. Subdivision Plat or Site Plan drawing showing easements for lighting facilities located outside dedicated rights-of-way.
- C. Prior to construction, if the lighting system resides within the Potomac Edison electric service territory, the Developer must obtain the electrical layout drawings from Potomac Edison, indicating transformer, secondary, service, and distribution line locations, for HLD so that the electrical service connections to the lights can be obtained. HLD will not be held responsible for additional road crossings that may be needed to connect to the Potomac Edison padmounted transformer(s).
 - D. During construction, HLD Engineering approval must be obtained for any field changes from drawings or material lists as submitted to and approved by HLD. The Developer and his Contractor are responsible for keeping records necessary for preparation of as-built drawings.
 - E. During construction, HLD Engineering must inspect and approve the system installation, including the following:
 1. Verification that all materials being installed are as approved by HLD.
 2. ALL underground conduit and wiring installations must be approved prior to backfilling. One working day advance notice required.
 3. ALL pole holes must be approved (particularly hole depth) prior to setting poles. One working day advance notice required.
 4. Any foundation or other concrete installation must be approved prior to pouring concrete. One working day advance notice required.

- F. The following items must be completed prior to energizing the streetlight circuits. NOTE: Final connections of lighting system to power supply shall be made ONLY by HLD or Potomac Edison personnel.
1. The completed installation must receive final approval and acceptance of HLD Engineering and the City Engineer.
 2. The Electrical Inspector must approve the installation.
 3. The Developer must furnish HLD with complete as-build drawings showing the information outlined in **Section B.2** above. In particular, locations and depths of underground conduits and wiring connections must be included. Show which leg of the supply (RED or BLACK) each light is connected to.
- G. When the lighting system is energized, HLD will amp-probe each leg to ensure lighting loads are properly balanced. The Developer must make any adjustments necessary to balance the loads at that time.
- H. The Developer is responsible for the purchase and installation, to approved HLD specifications, of the street light system. HLD shall furnish or contract to furnish electrical power during this time, at no charge to the Developer, and shall assume all operation and maintenance costs of the entire installed system; one (1) year after the City of Hagerstown assumes ownership of all streets and rights-of-way within the development. Until that ownership transpires, the Developer will be responsible for all aspects of the street light system. Upon assuming ownership, HLD has the manpower and equipment resources to serve this area. Electrical service will be provided by HLD or Potomac Edison being location dependent. Any maintenance problems not corrected by the Developer will be repaired by HLD, with the cost of all such work charged against the Developer's Guarantee Bond. Should any hazardous conditions develop, HLD reserves the right to disconnect the power supply until the problem is corrected.
- I. Approximately one (1) month following the conditions set in H above, a final field inspection will be made by HLD. Any problems such as leaning poles, unsatisfactory connections, burned-out lamps, etc. shall be corrected by the Developer or the necessary work will be performed by HLD with the costs charged against the Developer's Guarantee Bond.

IV. INSTALLATION REQUIREMENTS

A. GENERAL

The street lighting system layout should generally be as shown in **Drawing H2**. Facilities are normally located in the grass utility strip between curb and sidewalk. Wiring is to be underground, in conduit, with an underground junction box at each light installation. Luminaries (light fixtures) are to be 120-Volt, complete with ballast and individual photoelectric control receptacle.

Streetlight supply will be 120/240 volt single phase 4-wire for the layout shown in **Drawing H2**. Connected load on one leg must not exceed 24A per leg. Maximum fuse size: 30A.

The locations of and spacing between lights will depend on the required average illumination levels and illumination uniformity as specified in **Appendix B**, and on the types of luminaries used.

A minimum 4' horizontal clearance must be provided between any poles or junction boxes and other utilities at grade or underground (fire hydrants; water, sewer, or gas lines; other electric power lines; etc.). Maintain at least 6' clearance between poles or junction boxes and edges of driveways.

The entire lighting system must conform to the latest edition of the National Electrical Safety Code.

B. POLE INSTALLATIONS

1. GENERAL

All poles shall be vertical and plumb. Poles shall be located such that the closest part of the pole is not less than 2'-0" behind the curb. All poles and lights must be located close enough to the roadway to permit re-lamping and other maintenance by HLD's vehicles and equipment. Handholes (in fiberglass and aluminum poles) shall not be located on the side of the pole facing the curb.

In locations not protected by standard concrete curbs, only anchor base type poles are permitted.

HLD must approve all pole excavations before the poles are set.

2. DIRECT BURIAL FIBERGLASS POLES FOR POST-TOP LUMINARIES SEE **DRAWING H11**

This type of installation is permitted only in grass areas where protected by concrete curb. It is not acceptable in paved areas, such as where the sidewalk is continuous out to the curb.

Wiring from the junction box to the pole may be direct buried. Install a spare UF cable from junction box to the pole.

C. LUMINAIRE INSTALLATIONS

Luminaires shall be installed in accordance with manufacturer's instructions. Cobra-head type luminaries must be properly leveled, and post top Luminaires must be securely fastened to the light pole in a vertical position.

Cobra head luminaries shall be installed at 25'-30' mounting height. Post top luminaries shall be installed at 14' mounting height.

D. JUNCTION BOX INSTALLATIONS

SEE DRAWING H4.

Junction boxes placed shall be of the type specified in Section V, - Line F.

A junction box must be provided adjacent to each light pole installation, and at each end of all street crossings.

ALL junction box lids shall be grounded if metallic in nature. Note that cast iron lids for sidewalk areas must be drilled to accommodate grounding connector. This note is for older streetlight handhole installations where metallic handhole lids may have been installed.

E. CONDUIT INSTALLATIONS

SEE DRAWING H13.

All wiring runs shall be in Schedule 40 PVC Conduit unless otherwise noted. Normally, the installations will be:

1. Conduits between lights: Two 2" conduits, 24" minimum cover.
2. Conduit from power source to first junction box: Two 2" conduits, 24" cover.
3. Street crossings: two 2" conduits, 24" minimum cover, **Schedule 80.**

Conduit runs shall be as straight as possible between junction boxes. No single run may exceed 300' in length or 270° total bends (including the 90° ells up into the junction boxes). Red "Caution" Tape must be furnished in the backfill 12" below final grade.

At least 12" vertical (at a crossing only) or 36" horizontal separation must be maintained between lighting conduits and other underground utilities (e.g. water, gas, telephone, power, etc.). In EXTREME cases, depending on the type of other utility, vertical separation at crossings may be reduced to 6", but only with the approval of HLD Engineering.

No foreign facilities such as private electrical wiring, telephone lines, etc. may be placed in the trench with the lighting facilities.

Note that HLD must inspect and approve all installations before backfilling. One working day advance notice is required.

F. ELECTRICAL WIRING AND GROUNDING

1. GENERAL

The maximum number of lights that can be connected to a single line depends on the light wattage and the spacing between lights. The connected load on either leg of the system must not exceed 50A. In addition, the voltage drop from the power source to the last light at the end of the wiring run must not exceed 5%. One circuit cannot normally run more than about 1800' from the power source.

If possible, the power source should be located toward the center of lighting system rather than at one end.

2. POWER SUPPLY

The Developer must consult HLD to determine how electricity will be supplied to the lighting system.

In some cases where an HLD underground power distribution system runs along the street, individual lights may be tapped directly into the HLD secondary handholes depending on the design.

Elsewhere and in Potomac Edison electric service territory the Developer must install a completely separate lighting circuit, fed from a single supply point (see **Drawing H2**). Such systems shall be fused at the supply point and at each individual light fixture.

In all cases, the final connections to the power supply will be made ONLY by HLD or Potomac Edison personnel.

3. FUSING

- a. General:
Fuses shall be sized for 80% of connected load.
Maximum fuse size shall be 30A.
- b. Overhead Power Source:
Where the source is overhead secondary lines atop a pole, HLD will install a street lighting relay or fuse box at cost to the developer. Consult HLD if this type of connection is necessary.
- c. Where the supply source is an HLD padmounted transformer or service handhole, both hot legs of the supply circuit are to be fused with cartridge fuses placed in waterproof fuse holders located within the first lighting junction box determined by HLD Engineering.
- d. Lighting systems fed from Potomac Edison padmount transformers are to have the fuses located within the first lighting junction box.
- e. Each lighting fixture shall be fused with a 10A fuse within each lighting handhole.

4. GROUNDING

A ground rod shall be provided for each streetlight, to be installed in each handhole. See **Drawing H5.1 or H5.2** for additional grounding details.

Ground rods should be installed in junction boxes with the head approximately 8" below the closed junction box lid. Rods should be driven before conduits are placed. A bare #6 copper jumper shall be connected from each ground rod and grounding conductor within the junction box, as shown on Drawings **H5.1 or H5.2**.

The following shall be grounded:

- a. All Metal Poles
- b. All Junction Box Covers. Note that the round cast iron lids for 18" fiber junction boxes must be drilled to accommodate a grounding connector.
- c. ALL Luminaires.
Luminaires should be grounded using the ground wire in the UF supply cable.

5. WIRING

a. SYSTEMS WITH A COMMON LIGHTING SUPPLY CIRCUIT (per **Drawing H2**).

The 120/240 Volt, 4-Wire feeders between lights are to be either #2 or 1/0 aluminum URD triplex cable with separate ground conductor or 4-#6 THHN CU wire. Wiring from the junction box to each individual light is to be copper #10-2 UF cable (with ground).

At each access point (e.g. each junction box), exposed portions of the wiring shall be color-coded by tape to identify the neutral and each hot leg unless colored THHN is used. Throughout the entire system, the Neutral shall be colored WHITE, ground shall be colored GREEN, one Hot Leg shall be colored RED, and the remaining Hot Leg can be left without tape, this will be called BLACK on the drawings. Wiring must be color coded at the connection to the power supply, at the fuses, and at each individual light connection.

Lighting loads are to be evenly balanced on the two legs of the 120/240 supply. Alternate lights shall be connected to alternate legs of the triplex feeders.

SEE DRAWING H5.1 or H5.2 FOR WIRING CONNECTION DETAILS.

b. SYSTEMS WITH LIGHTS INDIVIDUALLY CONNECTED TO HLD LINES.

The supply to each individual light will be 120-volt, 3-wire. Wiring from HLD's padmount, transformer, service handhole, etc. To the light is to be copper #10-2 UF cable (with ground). At each access point (e.g. each junction box), exposed portions of the wiring shall be color coded to identify the neutral and the single hot leg. Color the neutral WHITE, and color the Hot Leg BLACK.

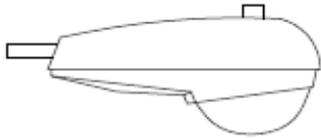
To facilitate the wiring installation, HLD will pull-in the run of UF cable from the Developer's last street light junction box into HLD's padmount transformer or service handhole and make any connections and/or fuse installations needed inside the transformers or service handhole. The Developer should furnish the fusing and other materials to HLD and should coil up enough UF cable in the streetlight junction box to reach HLD's power supply point.

c. GENERAL

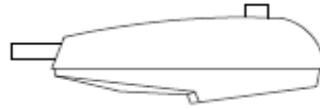
All wires shall be extended at least 30" into the underground junction boxes; coil up the slack.

All connections involving the hot and neutral legs shall be insulated and made watertight with TYCO GTAP-1 or GTAP-2 connectors depending on wire size, see section V – Line H.

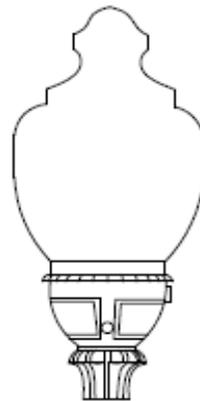
Grounding connections between bare COPPER grounding wires, to ground rods, and to junction box covers need not be taped.



COBRAHEAD NON-CUTOFF
 STYLE 150 WATT & 250
 WATT HIGH PRESSURE
 SODIUM



COBRAHEAD CUTOFF STYLE
 250 WATT
 HIGH PRESSURE SODIUM



WASHINGTON POST TOP
 ACORN 150 WATT
 HIGH PRESSURE SODIUM

**STANDARD HLD
 LUMINAIRES**

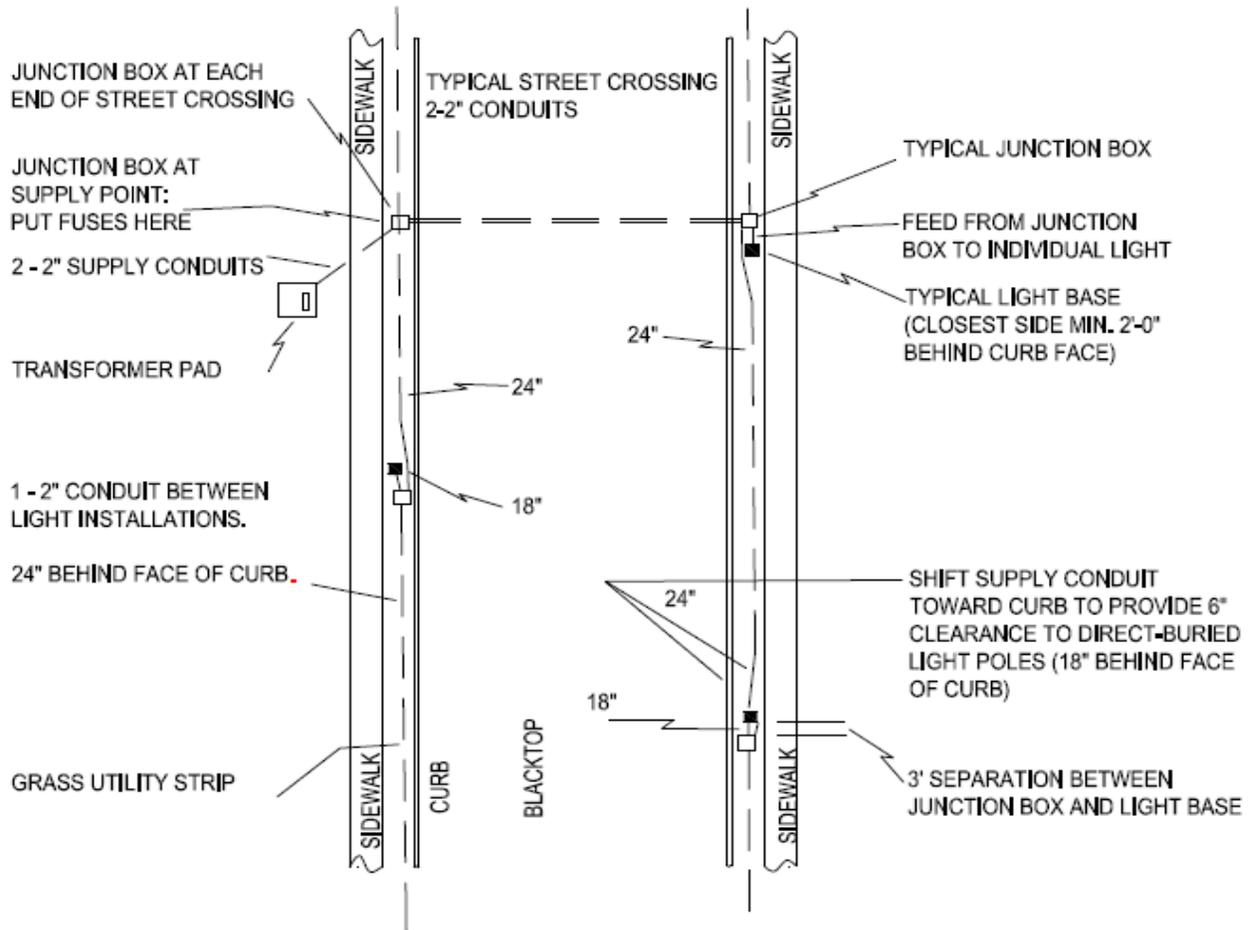
CITY OF HAGERSTOWN, MD.
 ELECTRIC SYSTEM

DATE: 12-13-06 DWN: JMB APP:

SCALE
 NONE

CONSTRUCTION
 STANDARDS

H1



NOTES:

1. SEE ALSO DETAIL DRAWING OF INDIVIDUAL INSTALLATIONS
2. ALL CONDUITS SHALL HAVE 24" MIN. COVER
3. CONDUITS ALONG THE STREET SHALL BE LOCATED 24" BEHIND THE FACE OF THE CURB, EXCEPT AT DIRECT-BURIED LIGHT POLES, LOCATE CONDUITS 18" BEHIND FACE OF CURB TO ALLOW 6" CLEARANCE TO THE POLE.

STREET LIGHTING: TYPICAL LAYOUT AREA

CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

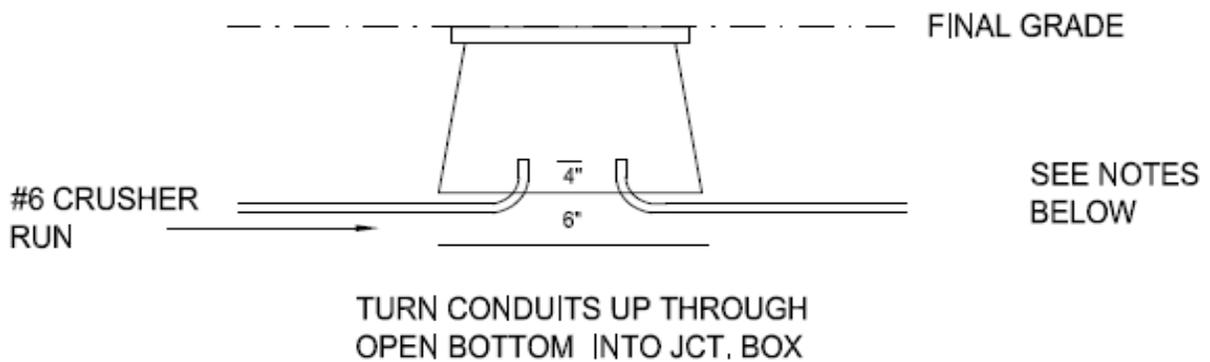
DATE: 08-28-06 DWN: JMB/NMF APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

H2

USE POLYCRETE CDR HANDHOLE, SIZE AS SPECIFIED



NOTES

1. PROVIDE MIN. 6" CRUSHED STONE BASE BENEATH & AROUND JCT. BOX FOR DRAINAGE.
2. SEAL ENDS OF ALL CONDUITS IN JCT. BOX WITH DUCT SEAL.
3. ALL WIRING SHALL EXTEND 30" MIN. INTO JCT. BOX, WITH EXTRA SLACK TO BE COILED IN BOX.
4. ALL CONNECTORS SHALL BE WATERPROOF.
5. SEE TRENCHING SPECIFICATIONS FOR 600V CABLE TRENCH DEPTH.

TYPICAL STREETLIGHT
JUNCTION BOX INSTALLATION

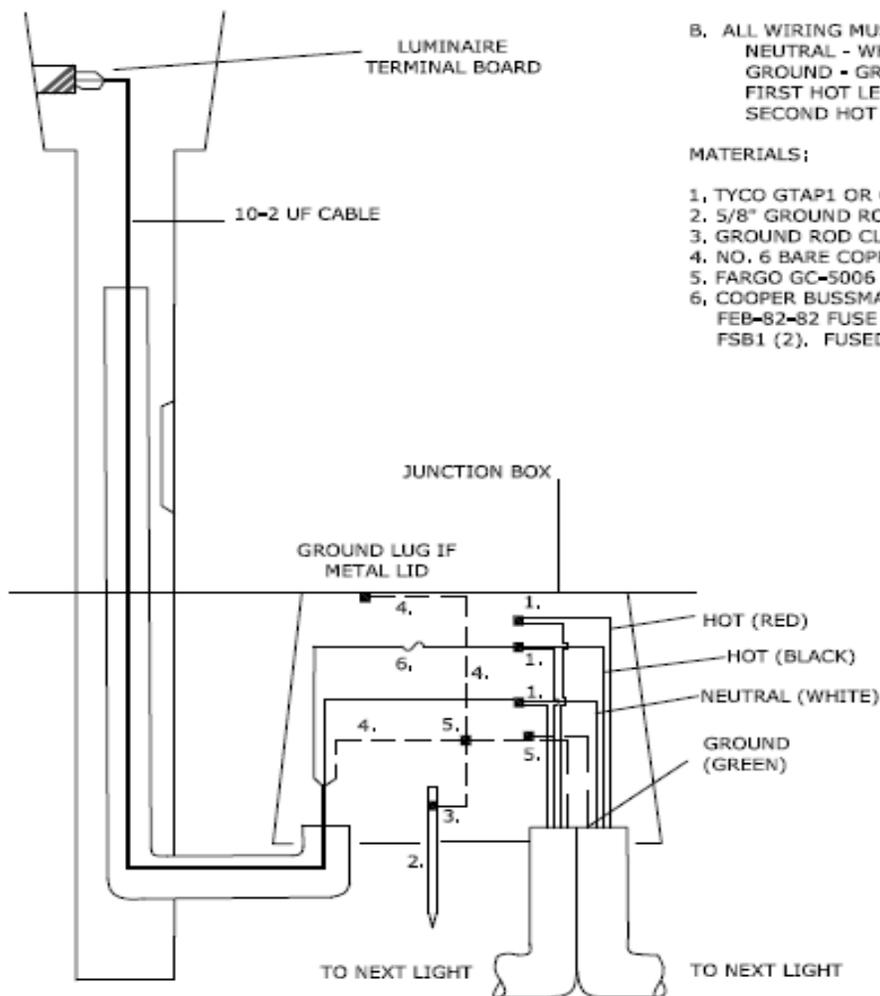
CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

DATE: 3/23/12 DWN: JMB APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

H4



NOTES:

- A. BRACKET ARMS, POLES, LUMINAIRES, & JUNCTION BOX LID IF METALLIC, SHALL BE CONNECTED TO THE GROUND ROD VIA #6 BARE COPPER.
- B. ALL WIRING MUST BE COLOR CODED:
 NEUTRAL - WHITE (WIRE OR TAPE)
 GROUND - GREEN (WIRE OR TAPE)
 FIRST HOT LEG - BLACK (WIRE OR TAPE)
 SECOND HOT LEG - RED (WIRE OR TAPE)

MATERIALS:

- 1, TYCO GTAP1 OR GTAP2 CONNECTOR,
- 2, 5/8" GROUND ROD,
- 3, GROUND ROD CLAMP ERICO CP58,
- 4, NO. 6 BARE COPPER. (#6CU),
- 5, FARGO GC-5005 BRONZE CONNECTOR,
- 6, COOPER BUSSMAN HEB-AA OR MERSEN FEB-82-82 FUSE HOLDER WITH BOOTS MERSEN FSB1 (2). FUSED WITH 10A FUSE.

WIRING SPECIFICATIONS FOR FIBERGLASS POLE INSTALLATION

CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

DATE: 12-02-2014 DWN: JMB APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

H5.1

TO LUMINAIRE
TERMINAL BOARD

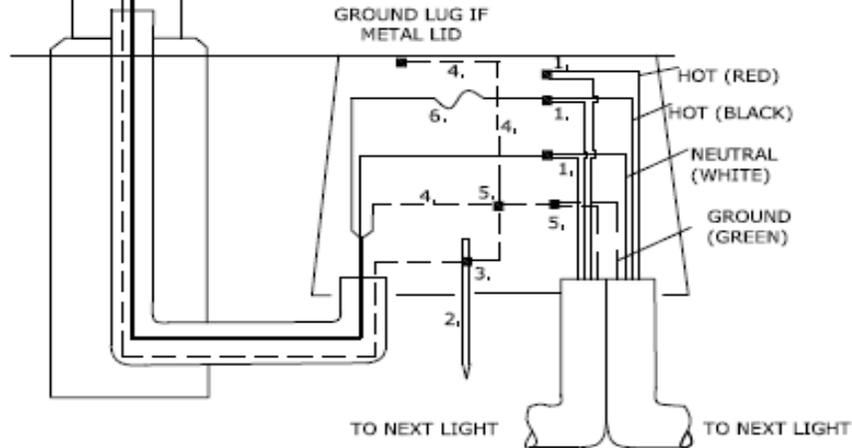
NOTES:

- A, BRACKET ARMS, POLES, LUMINAIRES, & JUNCTION BOX LID IF METALLIC, SHALL BE CONNECTED TO THE GROUND ROD VIA #6 BARE COPPER,
- B, ALL WIRING MUST BE COLOR CODED;
NEUTRAL - WHITE (WIRE OR TAPE)
GROUND - GREEN (WIRE OR TAPE)
FIRST HOT LEG - BLACK (WIRE OR TAPE)
SECOND HOT LEG - RED (WIRE OR TAPE)

MATERIALS:

- 1. TYCO GTAP1 OR GTAP2 CONNECTOR.
- 2. 5/8" GROUND ROD.
- 3. GROUND ROD CLAMP ERICO CP58,
- 4. NO. 6 BARE COPPER. (#6CU).
- 5. FARGO GC-5006 BRONZE CONNECTOR,
- 6. COOPER BUSSMAN HEB-AA OR MERSEN FEB-82-82 FUSE HOLDER WITH BOOTS MERSEN FSB1 (2), FUSED WITH 10A FUSE,

POLE GROUNDING
LUG



WIRING SPECIFICATIONS FOR
METAL POLE INSTALLATION

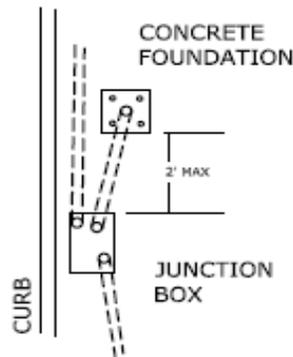
CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

DATE: 05-09-2014 DWN: JMB APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

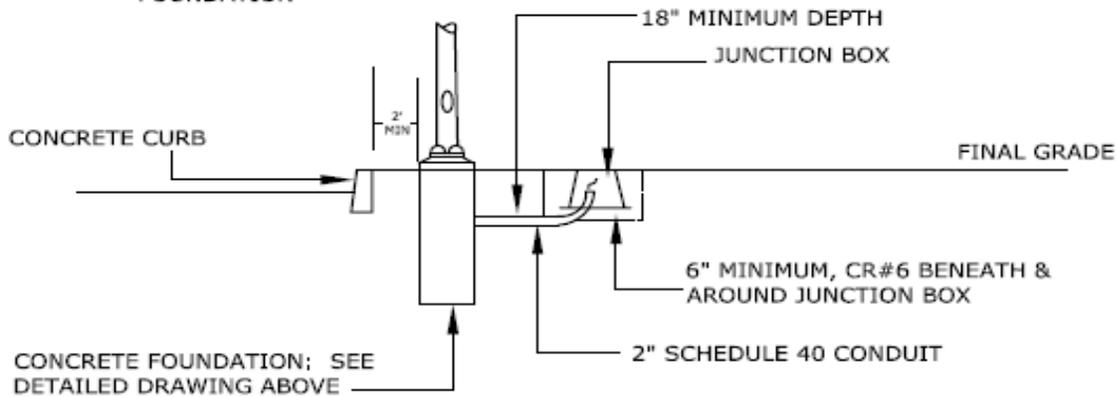
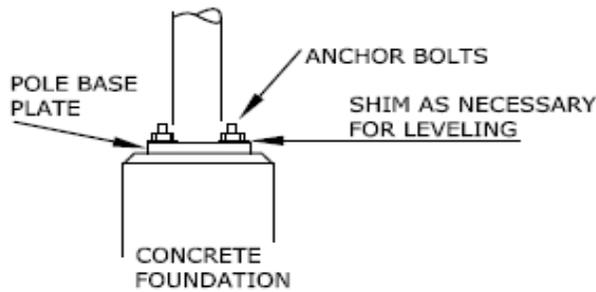
H5.2



NOTES:

1. ALL CONCRETE SHALL BE 3000 PSI MINIMUM.
2. ALLOW SUFFICIENT TIME FOR CONCRETE CURING BEFORE INSTALLING POLE. 7 DAYS MINIMUM.
3. OBTAIN ANCHOR BOLT TEMPLATE FROM POLE MANUFACTURER BEFORE STARTING CONSTRUCTION.
4. METAL POLE SHALL BE GROUNDED USING GROUND LUG PROVIDED WITHIN POLE.
5. CONCRETE FOUNDATION SHALL EXTEND UP AN ADDITIONAL 24" (TOP TO BE 28" A.F.G.) FOR INSTALLATIONS NOT PROTECTED BY CONCRETE CURBING.

ANCHORAGE DETAIL



**CONCRETE
FOUNDATION
INSTALLATION**

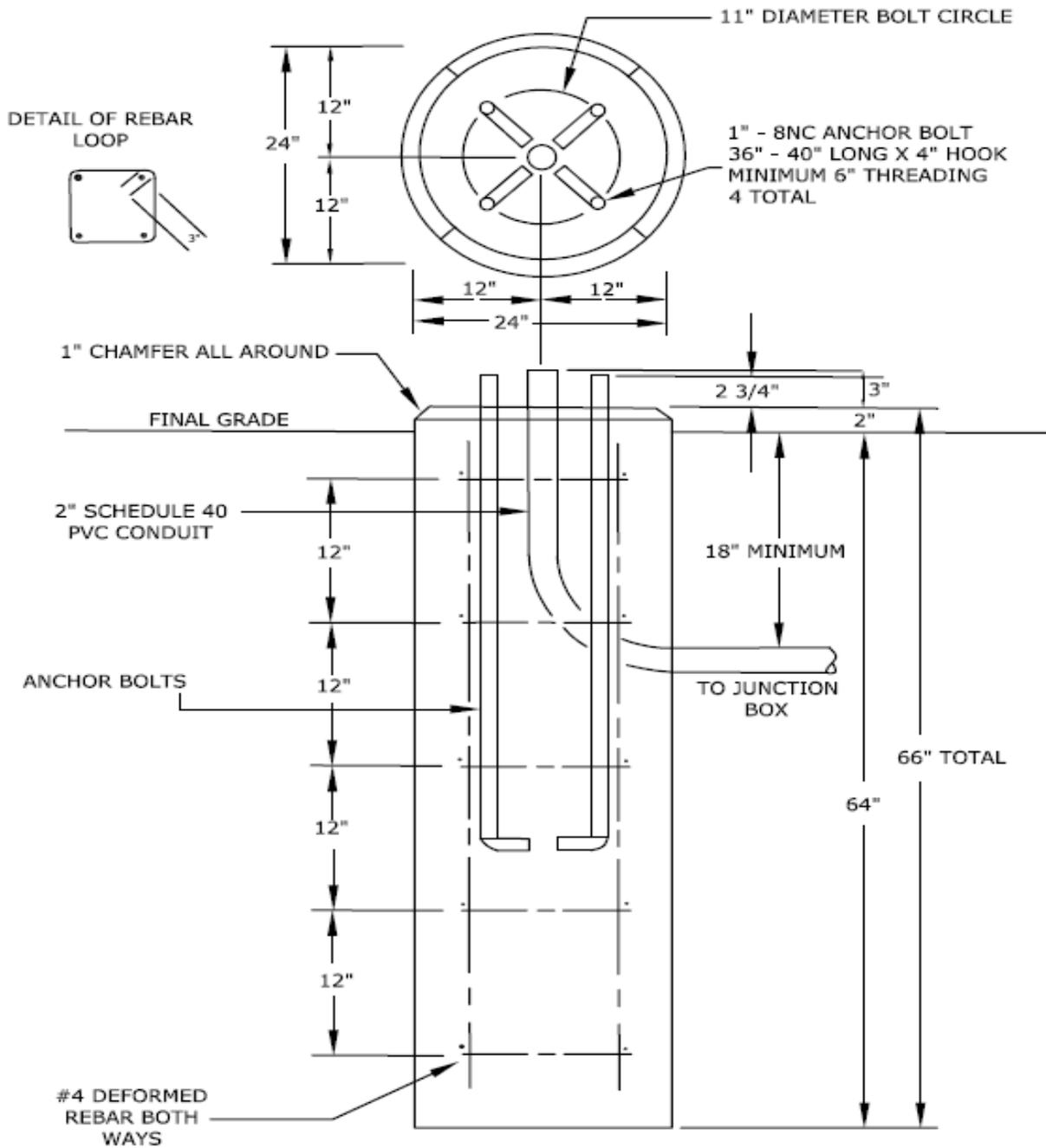
CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

DATE: 12-02-14 DWN: JMB APP:

SCALE
NONE

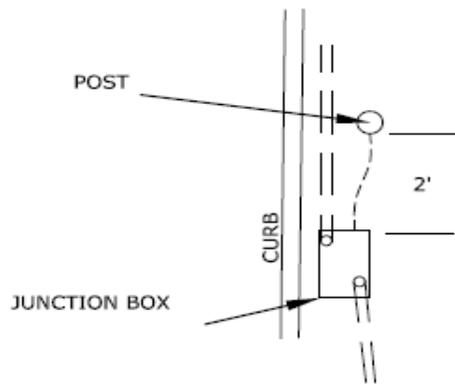
CONSTRUCTION
STANDARDS

H10.1



**CONCRETE FOUNDATION SPECIFICATION:
30' MOUNTING HEIGHT**

CITY OF HAGERSTOWN, MD. ELECTRIC SYSTEM		
DATE: 12-02-2014 DWN: JMB APP:		
SCALE NONE	CONSTRUCTION STANDARDS	H10.2

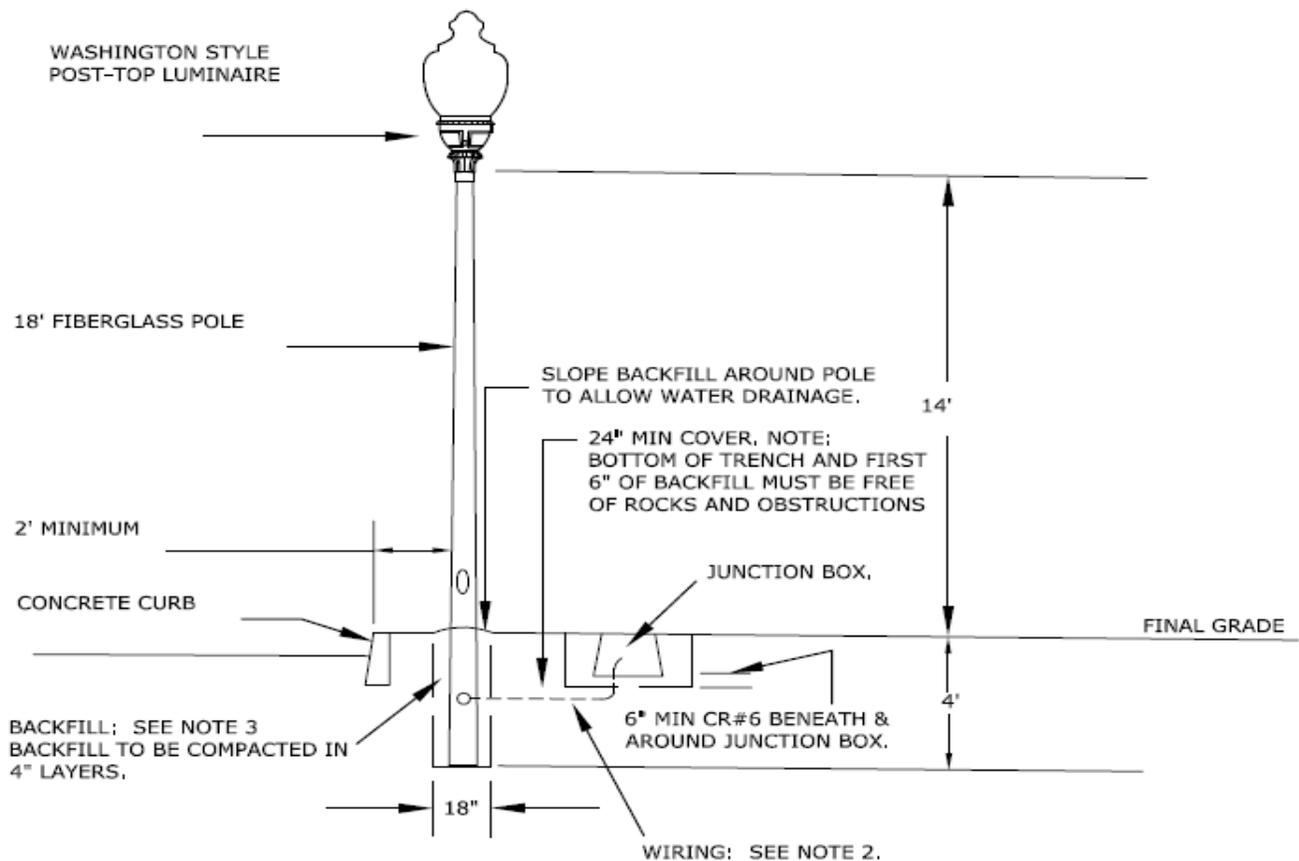


NOTES:

1. THIS DIRECT BURIAL INSTALLATION IS TO BE USED ONLY IN GRASS AREAS PROTECTED BY A CONCRETE CURB. OTHERWISE USE ANCHOR BASE, WOOD, OR CONCRETE LIGHT POSTS.

2. WIRING: INSTALL 2 - #10-2 (WITH GROUND) UF CABLES AND FUSES (SEE DRAWING H5 FOR MORE DETAILS). CONNECT FIXTURE WITH ONE. EXTEND SPARE UP POLE 2' BEYOND HANDHOLE IN SIDE OF POST.

3. POLES SHALL BE BACKFILLED WITH CRUSHED AGGREGATE BACKFILL CONSISTING OF 50% FINES AND 50% CHIPS WITH MAXIMUM OF 1½" CHIP SIZE. **DIRT REMOVED FROM HOLE IS NOT ACCEPTABLE BACKFILL!**



DIRECT BURIED FIBERGLASS POLE INSTALLATION.

CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

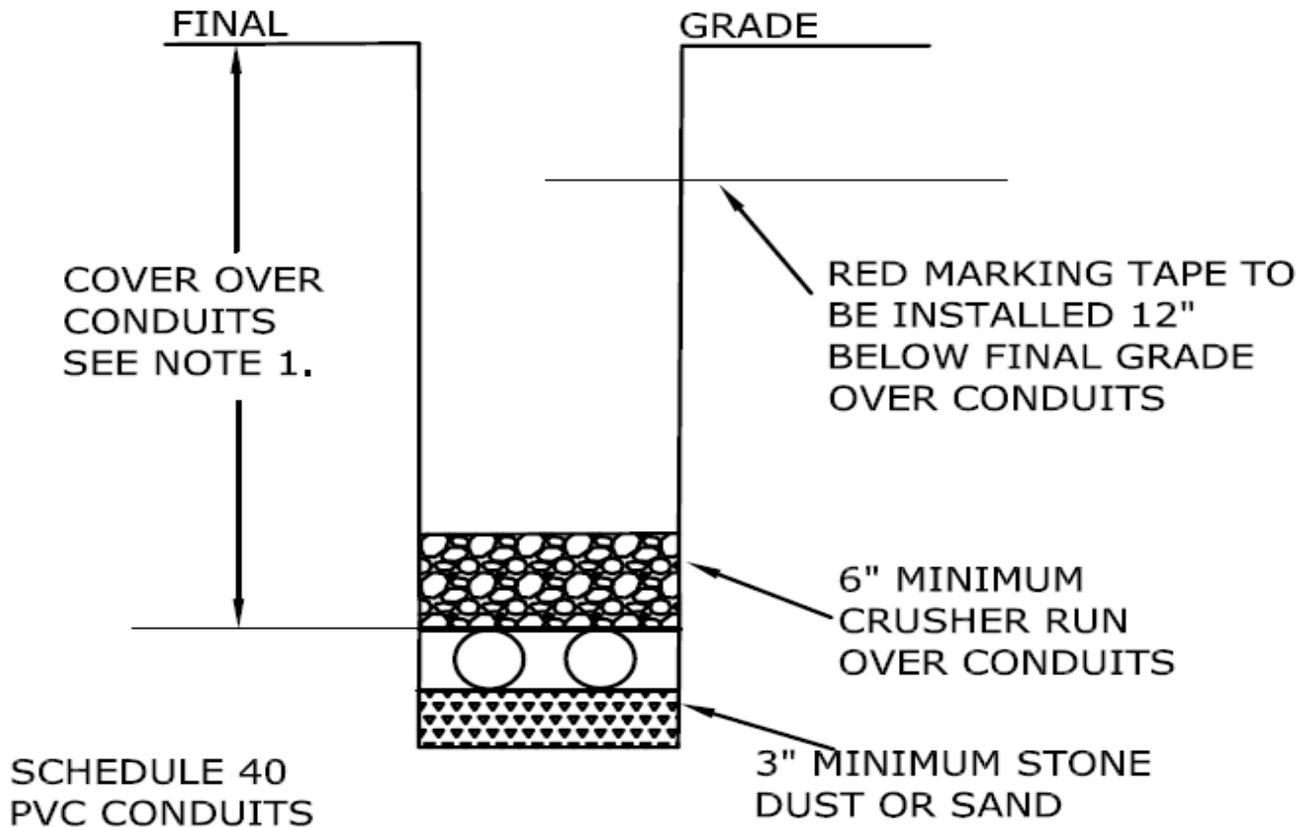
DATE: 11-13-06 DWN: JMB APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

H11

TYPICAL INSTALLTION OF CONDUIT WITHOUT CONCRETE ENCASEMENT



NOTES:

1. MINIMUM COVER IS 24" FOR 600 VOLT CIRCUITS, 36" MINIMUM COVER FOR 4160 - 13,800 VOLT CIRCUITS.
2. BACKFILL TO BE COMPACTED IN 6 INCH LAYERS TO AVOID SETTLING.
3. TRENCH TO BE 6 INCHES MINIMUM WIDTH.
4. WHERE WIDTH OF TRENCH PERMITS, CONDUITS ARE TO HAVE 2 INCHES OF HORIZONTAL SEPARATION.
5. IT IS PERMISSIBLE TO INCORPORATE COMMUNICATIONS CONDUITS IN TRENCH WITH HLD CONDUITS PROVIDED A 12" HORIZONTAL OR VERTICAL SEPARATION IS MAINTAINED.
6. CONDUITS USED FOR ROAD CROSSINGS SHOULD BE OF **SCHEDULE 80** THICKNESS, INCLUDING A SPARE.

TRENCHING SPECIFICATIONS

CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

DATE: 09-1-06 DWN: JMB APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

H13

V. MATERIALS

In order to have an available supply of replacement parts, HLD has standardized on certain materials for new lighting systems. Only the standard materials outlined below are acceptable.

All materials used shall be new, not rebuilt.

A. LUMINAIRES---All per specifications in **Appendix A**.

1. Bracket-arm Type

- a. 250 Watt High Pressure Sodium Cobra head Style; per specifications
- b. F250 Watt High Pressure Sodium Cobra head Style; FULL CUTOFF DESIGN, per specifications
- c. 150 Watt High Pressure Sodium, Cobra head Style; per specifications

2. Post-Top Style

- a. 150 Watt High Pressure Sodium--- Acorn Style; per specifications

B. LAMPS – All per specifications in **Appendix A**.

1. 250 Watt High Pressure Sodium—Type S50VA-250
2. 150 Watt High Pressure Sodium—Type S55SC-150.

C. PHOTOCELL CONTROL--- 120V per specifications in **Appendix A**.

D. POLES – All per specifications in **Appendix A**.

1. Poles for Post –Top Luminaires, per specifications.

- a. 18' Direct-Burial Fiberglass Poles, black, per specifications.

2. Aluminum anchor-base pole with bracket arm for cobra head luminaire, per specifications.

- a. 25' mounting height (for 150 Watt HPS Luminaire)
- b. 30' mounting height (for 250 Watt HPS Luminaire)

E. ANCHOR BOLTS AND HARDWARE

1. For 25' - 30' Bracket Arm Poles (4 bolts per pole): Anchor bolts shall be 36" - 40" long, with a 4" right-angle hook at the unthreaded end. They shall incorporate 1"-8NC threading for a minimum length of 6". Anchor bolts and nuts shall be 50,000 PSI yield steel. All nuts, washers, and exposed portion of anchor bolts shall be hot dip galvanized.

F. UNDERGROUND JUNCTION BOXES

1. For grass/sidewalk areas: Rectangular poly-crete enclosure, Cover to include recessed penta-head locking bolt and "Electric" logo, flared base design.

a. 12" x 12" x 12"

Cover: Hubble Catalog No. C10121202A017 "Electric"
Box: Hubble Catalog No. B10121212A

Or Approved Equal

b. 13" x 24" x 18"

Cover: Hubble Catalog No. C10132402A017 "Electric"
Box: Hubble Catalog No. B10132418A

Or Approved Equal

c. 17" x 30" x 18"

Cover: Hubble Catalog No. C10173002A017 "Electric"
Box: Hubble Catalog No. B10173018A

Or Approved Equal

G. WIRE AND CABLE

1. Supply Feeders: #2 aluminum tri-plex with single grounding conductor or (4) - #6 copper 600 Volt URD Cable (insulation type XLP, THHN). Black phase wires and yellow striped neutral wire for tri-plex. Hot legs shall be marked RED and BLACK at source and in handboxes with tape if tri-plex is used.
2. Individual Light Wiring: #10-2 solid copper Type UF Cable with full size ground.
3. Grounding Jumpers: #6 Solid Bare soft-drawn copper.

H. CONNECTORS

1. #14 - #2 AL or CU direct burial/handhole/pedestal/vault, four (4) port design, polypropylene, UV stable, snap-lock, impact resistant cover, silicone gel filled.

TYCO. No. GTAP-1

2. #14 - #2/0 AL or CU direct burial/handhole/pedestal/vault, four(4) port design, polypropylene, UV stable, snap-lock, impact resistant cover, silicone gel filled.

TYCO. No. GTAP-2

3. #10 Copper: Copper screw-type.

Blackburn Cat. No. 6N

I. GROUNDING

1. RODS: NEMA Standard 5/8" diameter x 8' long, hot dip galvanized steel.
2. Ground Rod Clamps: bronze collar-type.

Anderson Cat. No. GC-5

Erico Cat. No. CP58

J. FUSING

1. Fuse Holders-Underground

- a. Waterproof In-Line 30A 600V Holder for 13/32" x 1-1/2" fuses, complete with insulating boots.

(1) #2 Aluminum or #6 Copper Line and Load:

MERSEN, Cat. No. FEB-82-82-BA, Complete with 2 insulating boots FSB1.

(2) #10 Copper Line and Load:

MERSEN, Cat. No. FEB-11-11, complete with 2 insulating boots FSB1.

2. Fuses---for Underground Holders

- a. 5-30A, 600V, 100,000A interrupting, fast-acting small dimension (13/32" x 1-1/2") cartridge fuse.

MERSEN, Type ATDR(**)

APPENDIX A
MATERIALS PURCHASE SPECIFICATIONS

CITY OF HAGERSTOWN
HAGERSTOWN LIGHT DEPARTMENT

OCTOBER 2015

**Specifications for: 250W High Pressure Sodium Luminaire,
Horizontal Burning, Cobra head SEMICUTOFF Type**

A. Luminaire shall be one of the following or an approved equal:

1. General Electric Co. Type M-400A POWR/DOOR:

Catalog No. MDRA25S1M22RMS22

B. BASIC FEATURES

1. Luminaire shall be rated for use with a 250 Watt clear high pressure sodium, 100 Volt, mogul base, ANSI/IES Type S50VA-250 lamp.
2. Using the above lamp, the luminaire shall produce any of the following ANSI/IES light distributions by changing only the position of the lamp socket:
 - a. MEDIUM---SEMICUTOFF--- TYPE II***
 - b. MEDIUM---SEMICUTOFF--- TYPE III
 - c. MEDIUM---NONCUTOFF---TYPE III

***The luminaire shall be shipped with the socket in this position

3. Luminaire shall be rated for 120 VOLT line voltage.
4. Luminaire shall have an EEI-NEMA standard 3-terminal polarized twist-lock receptacle for a 120V. Photoelectric Control.
5. Luminaire shall have a PRISMATIC GLASS Refractor.
6. Luminaire shall have a slipfitter suitable to accept 1-1/4" through 2" size pipe, and shall contain a pipe stop.
7. Luminaire shall be the Two-Door design, with separate access doors for optical and ballast compartments. The ballast and other auxiliary equipment shall be mounted on the ballast compartment door, which shall be removable to facilitate replacement.
8. Luminaire shall have a 120 Volt ANSI/IES Type S50, High Power Factor Ballast. Ballast shall be a mag-regulator, contact wattage, or constant voltage.
High reactance, lag, reactor, regulated, auto-regulator, constant-wattage-autotransformer types of ballasts are NOT ACCEPTABLE.
9. Luminaire effective projected area shall not exceed 1.5 square feet.
Luminaire weight (including ballast) shall not exceed 65 lbs.

C. HOUSING

1. The housing shall be precision aluminum die-cast. This housing shall enclose the slipfitter, reflector, lamp, socket terminal board, and ballasts components.
2. Provision shall be made on the top housing to permit leveling of the unit.
3. Housing shall be able to withstand 1000 hour salt spray test, per ASTM 117.

D. SLIPFITTER

1. Slipfitter shall be a four-bolt design that provides secure mounting and leveling of the luminaire.

E. REFLECTOR

1. The reflector shall be of the aluminum hydro-form construction finished with the Alglas process. The Alglas Silicate film shall be chemically bonded to the interior and exterior surfaces of the reflector to seal these surfaces.
2. An ethylene propylene rubber gasket shall be provided between the reflector and glassware to assure proper sealing when the unit is closed.
3. The Optical assembly shall also contain a Charcoal Filter to be effective both mechanically and chemically and assure proper breathing of the optical assembly. This filter shall be located so as not to interfere with the light distribution.

F. REFRACTOR DOOR

1. The Refractor Door shall be secured and hinged to the upper housing at the back end, and latched to the upper housing at the front end with a spring-type latch that can be easily operated while wearing lineman's gloves.

G. HARDWARE

1. All hardware shall be of non-corrosive or suitably protected metal and plated where necessary to prevent electrolytic action by contact with aluminum. Components shall be secured to the luminaire frame with stainless steel hardware of the AISI, 300 series, chrome-nickel grade.

H. LAMP SOCKET

1. The lamp socket shall be a mogul multiple porcelain enclosed. The rating of the socket shall exceed the lamp starting voltage.
2. The screw shell of the socket shall be a split-shell design and shall grip the lamp to assure electrical contact under conditions of normal vibrations.

3. The socket shall be adjustable to produce the distributions indicated in **Section B.2** above.
4. Socket shall conform with TDJ-147 specifications of EEI standards.

I. TERMINAL BOARD

1. The terminal board shall be molded of Porcelain or Fiberglass Reinforced Polyester, with protective barriers between each terminal.
2. The terminal screws shall be of the captive type and each screw shall be equipped with wire grips which will automatically be raised and lowered as the terminal screw is operated. Terminals shall be capable of accepting #12 AWG solid through #8 AWG stranded conductors.
3. All components are to be pre-wired to a single terminal board requiring only Developer connections to clearly identified terminals.

J. BALLAST

1. The ballast shall be of the built-in design mounted within the luminaire in such a manner that it can be easily disconnected by simple disconnecting plugs.
2. Components to provide the high starting voltage required by the High Pressure Sodium lamp shall be installed in a separate plug-in assembly unit which is easily accessible and can be easily replaced without the use of tools.
3. Ballast shall have the following performance characteristics:
 - a. The ballast shall be capable of starting and operating the High Pressure Sodium lamp from the nominal 120 volt 60 Hz. Power source within the limits specified by the lamp manufacturer. The ballast, including starting aid, must protect itself against normal lamp failure modes. The ballast shall be capable of operation with the lamp in open or short circuit condition for six months without significant loss of ballast life. The ballast must reliably start and operate the lamp in ambient temperatures down to -30°F for the rated life of the lamp.
 - b. Ballast Power Factor—the power factor of the lamp-ballast system, shall not drop below 90% for 10% line voltage variations at any lamp voltage, from nominal through life.
 - c. Regulation --- At any lamp voltage, from nominal through life, lamp wattage regulation spread at that lamp voltage shall not exceed 18% for $\pm 10\%$ line voltage variation.
 - d. Lamp Wattage---For nominal line voltage and nominal lamp voltage, the ballast design center will not vary more than 5% from rated lamp watts.
 - e. Ballast primary current during starting must not exceed normal operating current.

- f. Capacitor Variance--- The ballast design shall be such that the normal manufacturing tolerance for capacitors of $\pm 6\%$ will not cause more than $\pm 8\%$ variation in regulation throughout rated lamp life for nominal line voltage.

Specifications for: 250W High Pressure Sodium Luminaire, Horizontal Burning, Cobra head FULL CUTOFF Type

A. Luminaire shall be one of the following or an approved equal:

- 1. General Electric Co. Type M-400A POWR/DOOR CUTOFF:

Catalog No. MDCA25S1M22FMC32

B. BASIC FEATURES

- 1. Luminaire shall be rated for use with a 250 watt clear high pressure sodium, 100 volt, mogul base, ANSI/IES Type S50VA-250 lamp.
- 2. Using the above lamp, the luminaire shall produce any of the following ANSI/IES light distributions by changing only the position of the lamp socket:
 - a. MEDIUM—CUTOFF---TYPE III***
 - b. SHORT---CUTOFF---TYPE II

***The luminaire shall be shipped with the socket in this position.

- 3. Luminaire shall be rated for 120 VOLT line voltage.
- 4. Luminaire shall have an EEI-NEMA standard 3-terminal polarized Twist-lock receptacle for a 120V. Photoelectric Control
- 5. Luminaire shall have a FLAT Glass lens.
- 6. Luminaire shall have a slipfitter suitable to accept 1-1/4" through 2" Size pipe, and shall contain a pipe stop.
- 7. Luminaire shall be the Two-Door design, with separate access doors for optical and ballast compartments. The ballast and other auxiliary equipment shall be mounted on the ballast compartment door, which shall be removable to facilitate replacement.
- 8. Luminaire shall have a 120 Volt ANSI/IES Type S50, High Power Factor Ballast. Ballast shall be a mag-regulator, constant wattage, or constant voltage type.
High reactance, lag, reactor, regulated, auto-regulator, contact-wattage-autotransformer types of ballasts are NOT ACCEPTABLE.
- 9. Luminaire effective projected area shall not exceed 1.5 square feet.
Luminaire weight (including ballast) shall not exceed 65 lbs.

C. HOUSING

1. The housing shall be precision aluminum die-cast. This housing shall enclose the slipfitter, reflector, lamp socket, terminal board, and ballast components.
2. Provision shall be made on the top housing to permit leveling of the unit.
3. Housing shall be able to withstand 1000 hour salt spray test, per ASTM117.

D. SLIPFITTER

1. Slipfitter shall be a four-bolt design that provides secure mounting and leveling of the luminaire.

E. REFLECTOR

1. The reflector shall be of the aluminum hydro-form construction finished with the Alglas process. The Alglas Silicate film shall be chemically bonded to the interior and exterior surfaces of the reflector to seal these surfaces.
2. An ethylene propylene rubber gasket shall be provided between the reflector and glassware to assure proper sealing when the unit is closed.
3. The optical assembly shall also contain a Charcoal Filter to be effective both mechanically and chemically and assure proper breathing of the optical assembly. This filter shall be so located so as not to interfere with the light distribution.

F. DOOR-GLASS AND HOLDER/DOOR

1. The door-glass holder/door shall be secured and hinged to the upper Housing at the back end, and latched to the upper housing at the front end with a spring-type latch that can easily be operated while wearing lineman's gloves.
2. The door-glass shall be heat-resistant, free from imperfections and striations.

G. HARDWARE

1. All hardware shall be of non-corrosive or suitable protected metal and plated where necessary to prevent electrolytic action by contact with aluminum. Components shall be secured to the luminaire frame with stainless steel hardware of the AISI, 300 series, chrome-nickel grade.

H. LAMP SOCKET

1. The lamp socket shall be a mogul multiple porcelain enclosed. The Rating of the socket shall exceed the lamp starting voltage
2. The screw shell of the socket shall be a split-shell design and shall Grip the lamp to assure electrical contact under conditions of normal vibrations.
3. The socket shall be adjustable to produce the distributions indicated In **Section B.2** above.
4. Socket shall conform to TDJ-147 specifications of EEI standards.

I. TERMINAL BOARD

1. The terminal board shall be molded of Porcelain or Fiberglass Reinforced Polyester with protective barriers between each terminal.
2. The terminal screws shall be of the captive type and each screw shall be equipped with wire grips which will automatically be raised and lowered as the terminal screw is operated. Terminals shall be capable of accepting #12 AWG solid through #8 AWG stranded conductors.
3. All components are to be pre-wired to a single terminal board requiring only Developer connections to clearly identified terminals.

J. BALLAST

1. The ballast shall be of the built-in design mounted within the luminaire in such a manner that it can be easily disconnected by simple disconnecting plugs.
2. Components to provide the high starting voltage required by the High Pressure Sodium lamp shall be installed in a separate plug-in assembly unit which is easily accessible and can be easily replaced without the use of tools.
3. Ballast shall have the following performance characteristics:
 - a. The ballast shall be capable of starting and operating the High Pressure Sodium lamp from the minimal 120 volt 60hz. power source within the limits specified by the lamp manufacturer. The ballast, including starting aid, must protect itself against normal lamp failure modes. The ballast shall be capable of operation with the lamp in an open or short circuit condition for six months without significant loss of the ballast life and the ambient temperature down to -30°F for the rated life of the lamp.
 - b. Ballast Power Factor—The power factor of the lamp-ballast system, shall not drop below 90% for 10% line voltage variations at any lamp voltage, from nominal through life.

- c. Regulation--- At any lamp voltage, from nominal through life, lamp wattage regulation spread at that lamp voltage shall not exceed 18% for $\pm 10\%$ line voltage variations.
- d. Lamp Wattage---For nominal line voltage and nominal lamp voltage. The ballast design center will not vary more than 5% from rated lamp watts.
- e. Ballast primary current during starting must not exceed normal operating current.
- f. Capacitor Variance---The ballast design shall be such that the normal manufacturing tolerance for capacitors of $\pm 6\%$ will not cause more than a $\pm 8\%$ variation in regulation throughout rated lamp life for nominal line voltage.

Specifications for: 150W High Pressure Sodium Luminaire, Horizontal Burning, Cobra head Type

A. Luminaire shall be one of the following or an approved equal:

- 1. General Electric Co Type M-250A2 POWR/DOOR SEMICUTOFF:

Catalog No. M2AR15S1M2GMS22

B. BASIC FEATURES

- 1. Luminaire shall be rated for use with a 150watt clear high pressure sodium, 55Volt, mogul base, ANSI/IES Type S55SC-150 lamp.
- 2. Using the above lamp, the luminaire shall produce any of the following ANSI/IES light distributions by changing only the position of the lamp socket.
 - a. MEDIUM—SEMICUTOFF—TYPE II**
 - b. MEDIUM—SEMICUTOFF—TYPE III

***The luminaire shall be shipped with the socket in this position.

- 3. Luminaire shall be rated for 120 VOLT line voltage.
- 4. Luminaire shall have an EEI-NEMA standard 3-terminal polarized twist-lock receptacle for a 120V. Photo-electric Control.
- 5. Luminaire shall have a PRISMATIC GLASS Refractor.
- 6. Luminaire shall have a slipfitter suitable to accept 1-1/4" through 2" size pipe, and shall contain a pipe stop.
- 7. Luminaire shall be the Two-Door design, with separate access doors for the optical and the ballast compartments. The ballast and other auxiliary

equipment shall be mounted on the ballast compartment door, which shall be removable to facilitate replacement.

8. Luminaire shall have a 120 Volt ANSI/IES type S55, High Power Factor Ballast. Ballast shall be a mag-regulator, constant wattage, or constant voltage type.
High reactance, lag, reactor, regulated, auto-regulator, contact-wattage-autotransformer types of ballasts are NOT ACCEPTABLE.
9. Luminaire effective projected area shall not exceed 1.5 square feet.
Luminaire weight (including ballast) shall not exceed 65lbs.

C. HOUSING

1. The housing shall be precision aluminum die-cast. This housing shall enclose the slipfitter, reflector, lamp socket, terminal board, and ballast components.
2. Provision shall be made on the top housing to permit leveling of the unit.
3. Housing shall be able to withstand 1000 hour salt spray test, per ASTM 117.

D. SLIPFITTER

1. Slipfitter shall be a four-bolt design that provides secure mounting and leveling of the luminaire

E. REFLECTOR

1. The reflector shall be of the aluminum hydro-form construction finished with the Alglas process. The Alglas Silicate film shall be chemically bonded to the interior and exterior surfaces of the reflector to seal these surfaces.
2. An ethylene propylene rubber gasket shall be provided between the reflector and glassware to assure proper sealing when the unit is closed.
3. The optical assembly shall also contact a Charcoal Filter to be effective both mechanically and chemically and assure proper breathing of the optical assembly. This filter shall be so located so as not to interfere with the light distribution.

F. REFRACTOR DOOR

1. The refractor door shall be secured and hinged to the upper housing at the back end and latched to the upper housing at the front end with a spring-type latch that can be easily operated while wearing lineman's gloves.

G. HARDWARE

1. All hardware shall be of non-corrosive or suitable protected metal and plated where necessary to prevent electrolytic action by contact with aluminum. Components shall be secured to the luminaire frame with stainless steel hardware of the AISI, 300 series, chrome-nickel grade.

H. LAMP SOCKET

1. The lamp socket shall be a mogul multiple enclosed. The rating of the socket shall exceed the lamp starting voltage.
2. The screw of the socket shall be a split-shell design and shall grip the lamp to assure electrical contact under conditions of normal vibrations.
3. The socket shall be adjustable to produce the distributions indicated in **Section B.2.** above
4. Socket shall conform to TDJ-147 specifications of EEI standards.

I. TERMINAL BOARD

1. The terminal board shall be molded of Porcelain or Fiberglass reinforced Polyester, with protective barriers between each terminal.
2. The terminal screws shall be of the captive type and each screw shall be equipped with wire grips which will automatically be raised and lowered as the terminal screw is operated. Terminals shall be capable of accepting #12 AWG solid through #8 AWG stranded conductors.
3. All components are to be pre-wired to a single terminal board requiring only Developer connections to clearly identified terminals.

J. BALLAST

1. The ballast shall be of the built-in design mounted within the luminaire in such a manner that it can be easily disconnected by simple disconnecting plugs.
2. Components to provide the high starting voltage required by the High Pressure Sodium lamp shall be installed in a separate plug-in assembly unit which is easily accessible and can be easily replaced without the use of tools.
3. Ballast shall have the following performance characteristics:
 - a. The ballast shall be capable of starting and operating the High Pressure Sodium lamp from the nominal 120 volt 60hz. Power source within the limits specified by the lamp manufacturer. The ballast, including starting aid, must protect itself against normal lamp failure modes. The ballast shall be capable of operation with the lamp in an open or short circuit condition for six months without significant loss of ballast life. The ballast must reliably

start and operate the lamp in ambient temperatures down to -30°F for the rated life of the lamp.

- b. Ballast Power Factor--- The power factor of the lamp-ballast system, shall not drop below 90% for 10% line voltage variations at any lamp voltage, from nominal through life.
- c. Regulation--- At any lamp voltage, from nominal through life, lamp wattage regulation spread at that lamp voltage shall not exceed 18% for $\pm 10\%$ line voltage variations.
- d. Lamp Wattage--- For nominal line voltage and nominal lamp voltage, the ballast design center will not vary more than 5% from rated lamp watts.
- e. Ballast primary current during starting must not exceed normal operating current.
- f. Capacitor Variance--- The ballast design shall be such that the normal manufacturing tolerance for capacitors of $\pm 6\%$ will not cause more than a $\pm 8\%$ variation in regulation throughout rated lamp life for nominal line voltage.

Specifications for: 150 Watt High Pressure Sodium Luminaire, Post-Top Acorn

A. Luminaire shall be one of the following, or an approved equal:

1. HADCO Catalog No. S8626A-AB5DRG150SP

B. BASIC FEATURES

1. Luminaire shall be rated for use with a 150 Watt Clear High Pressure Sodium, 55 Volt, Mogul base, ANSI/IES Type S55SC-150 Lamp.
2. Using the above lamp, the luminaire shall produce the Following ANSI/IES light distribution.

TYPE V

3. Luminaire shall be rated for 120 Volt line voltage.
4. Luminaire shall have an EEI/NEMA standard 3-terminal polarized twist-lock receptacle for a 120 volt photoelectric control.
5. Luminaire shall have Prismatic Polyacrylic Refractor Globe.
6. Luminaire shall have a pole-top slipfitter that will accept a 3" O.D. pole-top mounting tenon.
7. Luminaire shall have a 120 volt ANSI/IES Type S55, high power factor ballast. Ballast shall be a mag-regulator, contact wattage, or constant voltage type.
High receptance, lag, reactor, regulated, auto-regulator, constant-wattage-autotransformer types of ballasts are NOT ACCEPTABLE.
8. Luminaire effective projected area shall not exceed 2.6 square feet.
9. Luminaire weight (including ballast) shall not exceed 60lbs.

C. HOUSING

1. Luminaire globe holder shall be cast aluminum. The unit shall be gasketed.
2. The ballast enclosure shall be cast aluminum with tool-less entry access door, including the site glass for the photocontrol, and shall hinge open for easy access. Hinges shall be stainless steel.
3. Globe holder and slipfitter shall have flat black finish

D. SLIPFITTER

1. The slipfitter shall have 3 set screws, 120° apart, for securing the luminaire to the pole.

E. REFLECTOR

1. Reflector shall have a durable anodized aluminum surface.
2. Reflector shall have a house-side shield and mounted on spring clips.

F. HARDWARE

1. All hardware shall be of non-corrosive or suitably protected metal and plated where necessary to prevent electrolytic action by contact with aluminum. Components shall be secured to the luminaire frame with stainless steel hardware of the ANSI, 300 series, chrome-nickel grade.

G. LAMP SOCKET

1. The lamp socket shall be a mogul multiple porcelain enclosed. The rating of the socket shall exceed the lamp starting voltage.
2. Socket shall conform with TDJ-147 specifications of EEI standards.

H. TERMINAL BOARD

1. The terminal board shall be molded of Porcelain or Fiberglass Reinforced Polyester, with protective barriers between each terminal.
2. The terminal screws shall be of the captive type and each screw shall be equipped with wire grips which will automatically be raised and lowered as the terminal screws are operated. Terminals shall be capable of accepting up to #8 AWG conductors.
3. All components are to be pre-wired to a single terminal board requiring only Developer connections to clearly identified terminals.

I. BALLAST

1. The ballast shall be of the built-in design mounted within the luminaire.
2. Components to provide the high starting voltage required by the High Pressure Sodium Lamp shall be installed in a separate assembly unit which is easily accessible and can be easily replaced without disturbing other components of the total ballast assembly.
3. Ballast shall have the following performance characteristics:
 - a. The ballast shall be capable of starting and operating the High Pressure Sodium lamp from the nominal 120 volt 60hz power source within the limits specified by the lamp manufacturer. The ballast, including starting aid, must protect itself against normal lamp failure modes. The ballast shall be capable of operation with the lamp in an open short circuit condition for six months without significant loss of ballast life. The ballast must reliably start and operate the lamp in ambient temperatures down to -30°F for the rated life of the lamp.
 - b. Ballast Power Factor--- The power factor of the lamp-ballast system, shall not drop below 90 % for 10% line voltage variations at any lamp voltage, from nominal through life.
 - c. Regulation--- At any lamp voltage, from nominal through life, lamp wattage regulation spread at the lamp voltage shall not exceed 18 % for $\pm 10\%$ line voltage variation.
 - d. Lamp Wattage--- For nominal line voltage and nominal lamp voltage, the ballast design center will not vary more than 5% from rated lamp watts.
 - e. Ballast primary current during starting must not exceed normal operating current.
 - f. Capacitor Variance The ballast design shall be such that the normal manufacturing tolerance for capacitors of $\pm 6\%$ will not cause more than $\pm 8\%$ variation in regulation throughout rated lamp life for nominal line voltage.

Specifications for: 250 Watt High Pressure Sodium Streetlight Lamp

A. Lamp shall be one of the following or an approved equal:

1. General Electric Catalog No. LU250.
2. Sylvania Catalog No. LU250.
3. Phillips Catalog No. C250S50

B. Lamp shall be ANSI/IES Type S50VA-250.

C. DESCRIPTION

4. Type= High Pressure Sodium
5. Wattage= 250W
6. Voltage= 100V
7. Finish= Clear
8. Base= Mogul
9. Initial Lumens= 27,500 Minimum

D Lamp shall have an average life of not less than 24,000 hours. Mean lumen depreciation shall not exceed 10%.

E. Lamp shall be rated for operation with a ANSI/IES Type S50 ballast.

Specifications for: 150 Watt High Pressure Sodium Streetlight Lamp.

- A. Lamp shall be one of the following or an approved equal:
 - 1. Phillips Catalog No. C150S55
 - 2. General Electric Catalog No. LU 150/55
 - 3. Sylvania Catalog No. LU 150/55
- B. Lamp shall be ANSI/IES Type S55SC-150
- C. Description
 - 1. Type= High Pressure Sodium
 - 2. Wattage= 150 Watt
 - 3. Voltage= 55 Volt
 - 4. Finish= Clear
 - 5. Base= Mogul
 - 6. Initial Lumens= 16,000
- D. Lamp shall have an average life of not less than 24,000 hours.
Mean lumen depreciation shall not exceed 10%.
- E. Lamp shall be rated for operation with a ANSI/IES Type S55 ballast.

Specifications for: 120 Volt Photoelectric Control for Streetlights

A. Photoelectric Control shall be one of the following or an approved equal:

1. ITT Catalog No. 8060-4
2. Fisher Pierce Catalog No. 6660-ESS
3. Area Lighting Research Catalog No. M120
4. Precision Multiple Catalog No. 8660MOV-1.5
5. Lampas Catalog No. 6120-AS2

B. Photoelectric control shall fit an EEI/NEMA standard 3-terminal polarized twist-lock type receptacle; and shall be furnished complete with a neoprene receptacle gasket.

C. ELECTRICAL RATINGS

1. Operating Voltage: 105-130 Volts
2. Contacts: Single-pole/single-throw; normally closed at night.
Contact load rating: 1000 Watts incandescent; 1800 VA H.I.D.
3. Surge Protection: Expulsion or Metal-Oxide-Varistor type arrestor.
Sparkover or operating rating not to exceed 2000 Volts on a 1.2 x 50 microsecond wave. 60-cycle follow current shall not exceed 1500A.

D. OPERATING LEVELS

1. Turn-on level: 1.0-1.5 foot-candles
2. Turn-on to Turn-off ratio shall be between 1:2 and 1:5

E. TEMPERATURE RANGE: -40°C TO +70°C.

Specifications for: Fiberglass Pole for Post-top Streetlight; Direct Burial; Black

A. Poles shall be one of the following, or an approved equal:

1. Shakespeare Co. Catalog No. BS18-01-N1-BE-08
2. Highline Products Catalog No. HL118-20-T-03-AA-D
3. W.J. Whatley, Inc. Catalog No. E3018-10-60-N1

B. BASIC FEATURES

1. Overall length: 18 Feet
Nominal Mounting Height: 14 Feet
2. Pole shall be round, tapered configuration, Pole shall have flared base to prevent rotation. Outside diameter at ground line: approx. 5".
3. Pole shall have steel or aluminum pole-top mounting tenon 3" O.D. by 3-1/2" long.
4. Furnish handhole (minimum 2" x 5"), located 66" above pole base.
5. Furnish 1-1/4" minimum diameter grommeted hole for wire entry, located approx. 24" above pole base.

C. STRUCTURAL

1. Poles shall be suitable for post-top luminaire having a weight of 100lbs. and effective projected area of 3.5 square feet; in an 80 MPH wind with a 1.3 gust factor.

D. MECHANICAL

1. Color shall be Black
2. Finish shall be natural textured.
3. Pole laminate shall contain colored pigment to match color of final coating. Coloration shall be uniform throughout entire length of pole. Pole shall have a final exterior coating of polyurethane minimum 2 mil. Dry thickness.
4. Pole shall be resistant to effects of weather and ultraviolet light.

Specifications for: Aluminum Pole with Bracket for Cobra head Streetlight; Anchor Base 30' Mounting Height.

A. Pole shall be one of the following or an approved equal:

1. 30' Mounting Height, 8' Arm (250 Watt HPS)
 - a. National Lighting Standards/Hi-Tec Catalog No. A40-9428-0831
 - b. Crouse-Hinds Lighting Catalog No. RTA7L30AAH18
 - c. General Electric Catalog No. C899H378
 - d. Hapco Co. Catalog No. 21-578

B. BASIC FEATURES

1. Luminaire Nominal Mounting Height shall be 30 feet.
2. Pole shall be round, tapered configuration. Shaft O.D. at base shall be 7" to 9". Shaft O.D. at top shall be: 3-1/2" to 4-1/2".
3. Pole shall have a single aluminum bracket arm for mounting luminaire. Bracket arm shall be tapered elliptical tube configuration or round pipe configuration. Bracket shall be 8' long and have a 2" pipe size horizontal tenon for mounting luminaire.
4. Pole shall have a handhole, minimum 3" x 5", approximately 18" above the base. A cover with stainless steel attachment screws shall be provided.
5. Pole shall have cast aluminum anchor base suitable for anchorage consisting of four 1" anchor bolts on an 11" diameter bolt circle, projecting 2-3/4" above the top of the concrete foundation.

C. STRUCTURAL

1. Pole and bracket shall be suitable for a luminaire heaving a weight of 65lbs. and effective projected area of 1.5 square feet; in an 80 MPH wind with a 1.3 gust factor.

D. MECHANICAL

1. Pole and bracket arm shall be aluminum alloy, with a natural aluminum satin brushed finish.
2. Pole shaft shall be a single piece seamless round tapered tube. Shaft wall shall have a minimum thickness of .135".
3. Pole shall be furnished with 4 anchor bolt covers and stainless steel screws for their attachment.
4. Each pole shaft shall contain an internal lug with a 3/8" diameter hole for attaching a grounding connector.
5. The top of the pole shaft shall be capped.

6. Suitable grommets shall be furnished at the point of attachment of the bracket arm to the shaft to accommodate the installation of the fixture wiring inside of both members.

E. ANCHOR BOLTS

1. A complete set of 4 anchor bolts, nuts, and washers shall be supplied with each pole
2. Anchor bolts shall be 36"-40" long, with a 4" right angle hook at the unthreaded end. They shall incorporate 1"-8 NC threads for a minimum length of 6". Anchor bolts and nuts shall be 50,000 PSI yield steel. All anchorage hardware shall be hot-dip galvanized.
3. Manufacturer shall furnish anchor bolts and template for 11" diameter bolt circle immediately upon receipt of order.