



Street Light Installation Specifications

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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 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, 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.

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 Allegheny Power services or their representative that will be required to install streetlights in a new or existing development 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 70.

SERVICE POINT - Point of connection between the facilities of HLD or Allegheny Power 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 SUBDIVISIONS

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 Allegheny Power, 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), 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 drawing showing easements for lighting facilities located outside dedicated rights-of-way.
- C. Prior to construction, if the lighting system resides within the Allegheny Power electric service territory, the Developer must obtain the electrical layout drawings from Allegheny Power, 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 Allegheny Power 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 Allegheny Power 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 Allegheny Power. 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, burnt-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 3-wire for the layout shown in **Drawing H2**. Connected load on one leg must not exceed 50A. Maximum fuse size: 60A.

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 in grass areas should be rectangular fiberglass units with diamond plate steel lids. Junction boxes in sidewalk areas are to be round 18" diameter fiber tubes with cast iron ring and cover, similar to water meter vaults.

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

ALL junction box lids shall be grounded. Note that cast iron lids for sidewalk areas must be drilled to accommodate grounding connector.

E. CONDUIT INSTALLATIONS

SEE DRAWING H13.

All wiring runs shall be in Schedule 40 PVC Conduit. 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.

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 a 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 Allegheny Power 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 Allegheny Power personnel.

3. FUSING

a. General

Fuses shall be sized for 80% of connected load.
Maximum fuse size shall be 60A.

b. Overhead Power Source

Where the source is overhead secondary lines atop a power pole, the street light fuses are to be located atop the pole at connections to the secondaries. Use Kearney Indicating Type tubular secondary fuses.

c. Where the supply source is a 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 Allegheny Power padmount transformers are to have the fuses located within the first lighting junction box. On systems fed from HLD padmount transformers or service handholes, the fuses will be located within HLD padmount transformer or service handhole.

e. Each lighting fixture shall be fused with a 10 or 15 Amp 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 to the system neutral and/or 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, 3-Wire feeders between lights are to be either #2 or 1/0 aluminum URD triplex cable. 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. Throughout the entire system, the Neutral shall be colored WHITE, 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, 2-wire. Wiring from HLD's padmount, transformer, service handhold, 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

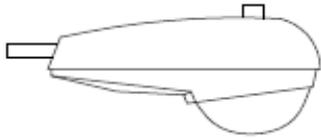
other materials to HLD and should coil up enough UF cable in the streetlight junction box to reach HLD's power supply point.

c. GENERAL

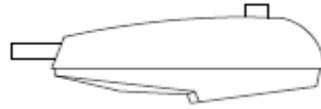
All wires shall be extended at least 30" into the underground junction boxes; coil up the slack.

All connections involving the hot and neutral legs shall be insulated and made watertight with 3-4, half-lapped layers of Scotch Type 130 High-Voltage Self-Fusing Tape, with an exterior wrap of 2-3 half-lapped layers of Scotch Type 33+ vinyl electric tape.

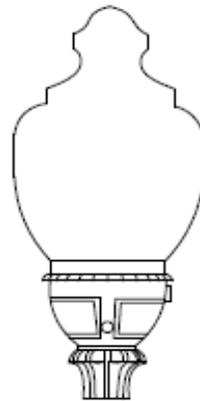
Grounding connections between bare COPPER grounding wires, to ground rods, and to junction box covers need not be taped.



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**

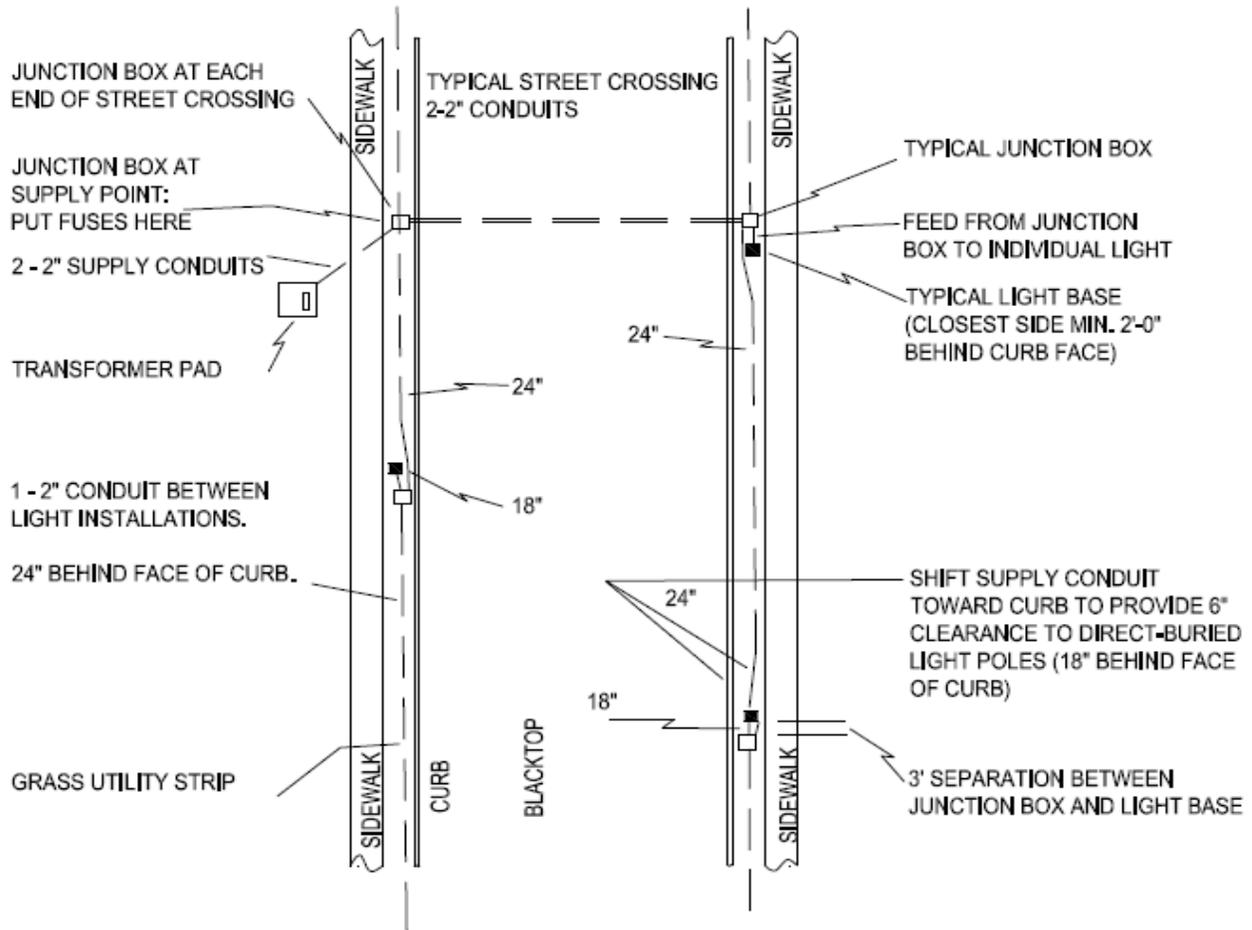
CITY OF HAGERSTOWN, MD.
 ELECTRIC SYSTEM

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

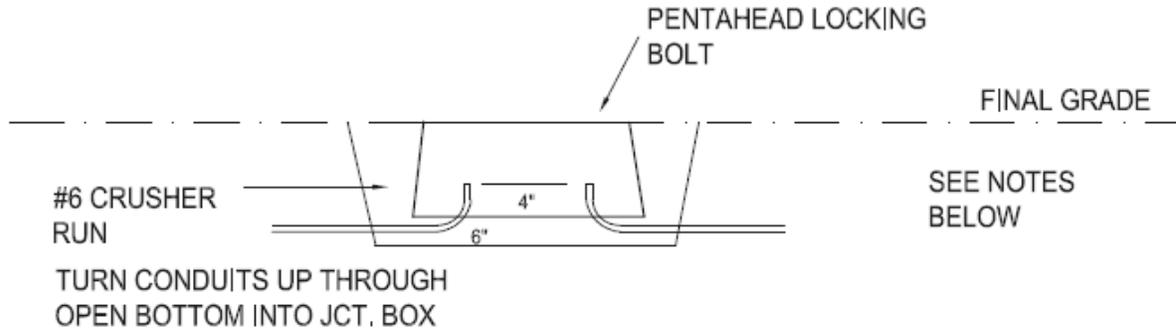
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SCALE
NONE

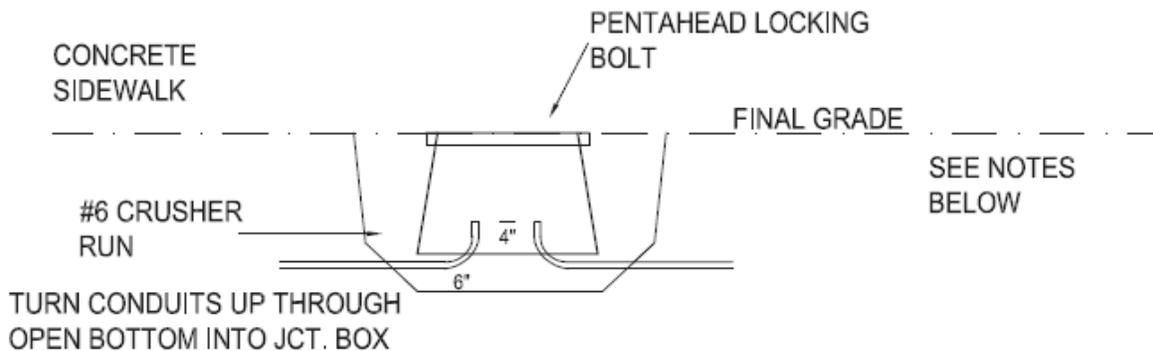
CONSTRUCTION
STANDARDS

H2

A. GRASS AREA: USE RECTANGULAR FIBERGLASS HANDHOLE WITH DIAMOND PLATE STEEL COVER



B. SIDEWALK AREA: USE 15"x15"x12" POLYCRETE CDR HANDHOLE.



C. 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

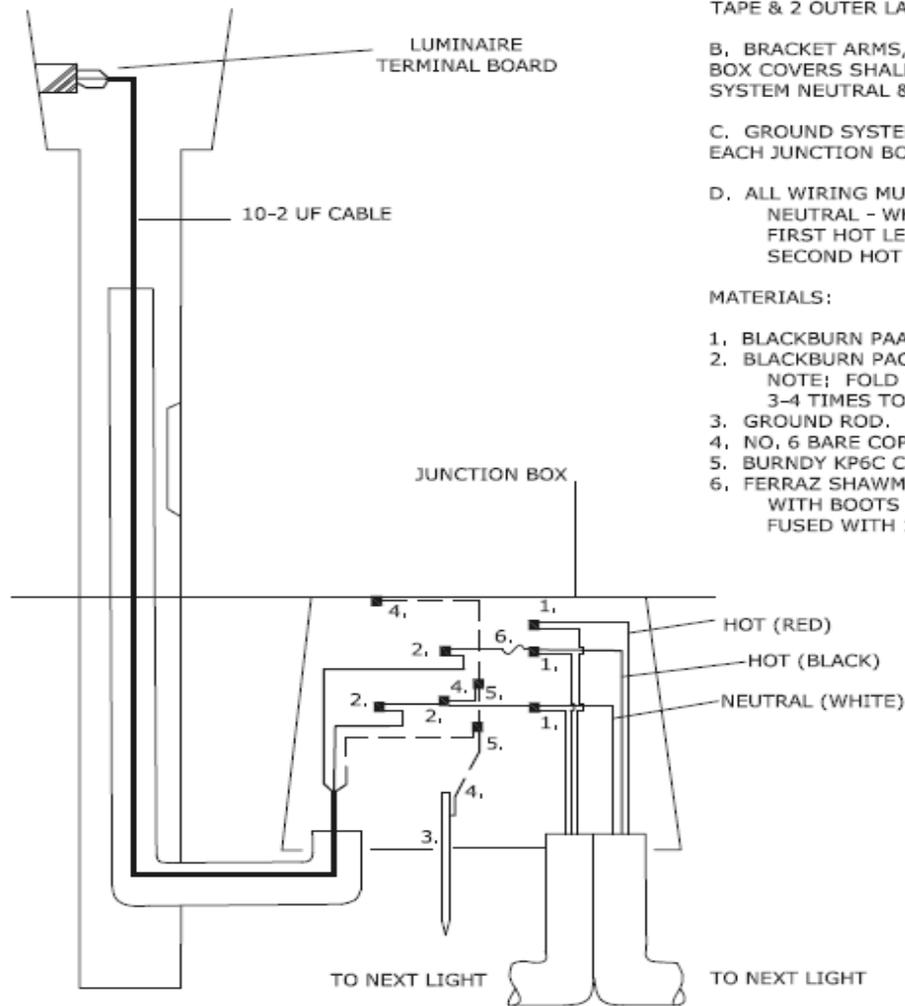
CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

DATE: 11-17-08 DWN: JMB APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

H4



NOTES:

- A. ALL CONNECTIONS ON THE HOT LEGS & NEUTRAL SHALL BE INSULATED & WATER PROOFED WITH 3-4 HALF-LAP LAYERS OF SCOTCH 130 HIGH VOLTAGE TAPE & 2 OUTER LAYERS OF SCOTCH 33+ VINYL TAPE.
- B. BRACKET ARMS, POLES, LUMINAIRES, & JUNCTION BOX COVERS SHALL BE GROUNDED AS SHOWN TO SYSTEM NEUTRAL & GROUND ROD.
- C. GROUND SYSTEM NEUTRAL WITH GROUND ROD AT EACH JUNCTION BOX LOCATION.
- D. ALL WIRING MUST BE COLOR CODED:
 NEUTRAL - WHITE (TAPE)
 FIRST HOT LEG - BLACK
 SECOND HOT LEG - RED (TAPE)

MATERIALS:

- 1. BLACKBURN PAA69 CONNECTOR.
- 2. BLACKBURN PAC49 CONNECTOR.
 NOTE: FOLD #10 SOLID CU BACK ON ITSELF 3-4 TIMES TO FILL UP TAP GROOVE.
- 3. GROUND ROD.
- 4. NO. 6 BARE COPPER, (#6CU)
- 5. BURNDY KP6C CONNECTOR.
- 6. FERRAZ SHAWMUT FEB-11-11 FUSE HOLDER WITH BOOTS FRZFSB1 (2).
 FUSED WITH 10 OR 15 AMP FUSE.

WIRING SPECIFICATIONS FOR FIBERGLASS POLE INSTALLATION

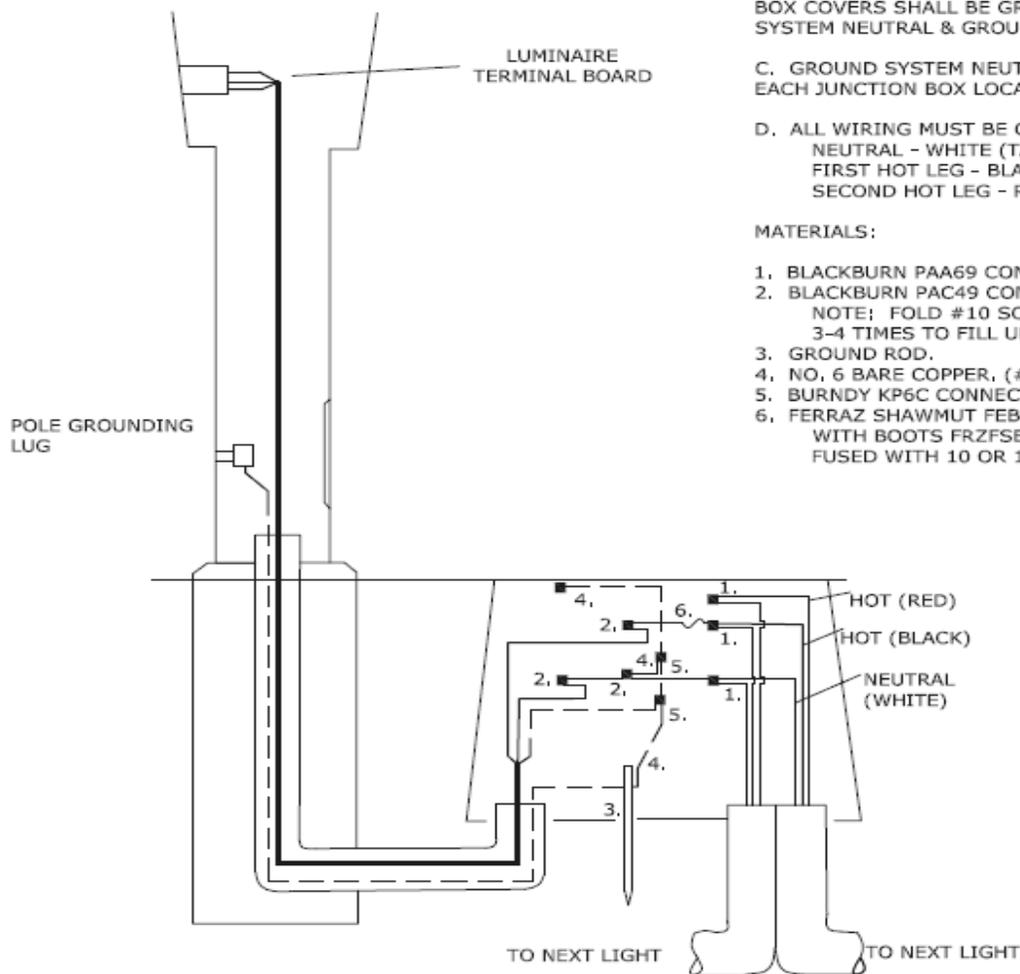
CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

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

SCALE
NONE

CONSTRUCTION
STANDARDS

H5.1



NOTES:

A. ALL CONNECTIONS ON THE HOT LEGS & NEUTRAL SHALL BE INSULATED & WATER PROOFED WITH 3-4 HALF-LAP LAYERS OF SCOTCH 130 HIGH VOLTAGE TAPE & 2 OUTER LAYERS OF SCOTCH 33+ VINYL TAPE.

B. BRACKET ARMS, POLES, LUMINAIRES, & JUNCTION BOX COVERS SHALL BE GROUNDED AS SHOWN TO SYSTEM NEUTRAL & GROUND ROD.

C. GROUND SYSTEM NEUTRAL WITH GROUND ROD AT EACH JUNCTION BOX LOCATION.

D. ALL WIRING MUST BE COLOR CODED:
 NEUTRAL - WHITE (TAPE)
 FIRST HOT LEG - BLACK
 SECOND HOT LEG - RED (TAPE)

MATERIALS:

1. BLACKBURN PAA69 CONNECTOR,
2. BLACKBURN PAC49 CONNECTOR,
 NOTE: FOLD #10 SOLID CU BACK ON ITSELF
 3-4 TIMES TO FILL UP TAP GROOVE,
3. GROUND ROD,
4. NO. 6 BARE COPPER, (#6CU)
5. BURNDY KP6C CONNECTOR.
6. FERRAZ SHAWMUT FEB-11-11 FUSE HOLDER
 WITH BOOTS FRZFSB1 (2).
 FUSED WITH 10 OR 15 AMP FUSE,

**WIRING SPECIFICATIONS FOR
 METAL POLE INSTALLATION**

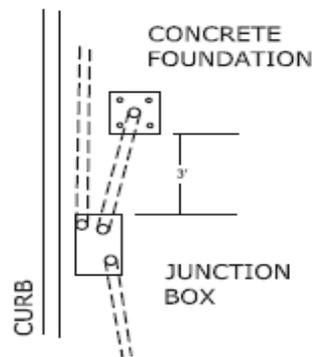
CITY OF HAGERSTOWN, MD.
 ELECTRIC SYSTEM

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

SCALE
 NONE

CONSTRUCTION
 STANDARDS

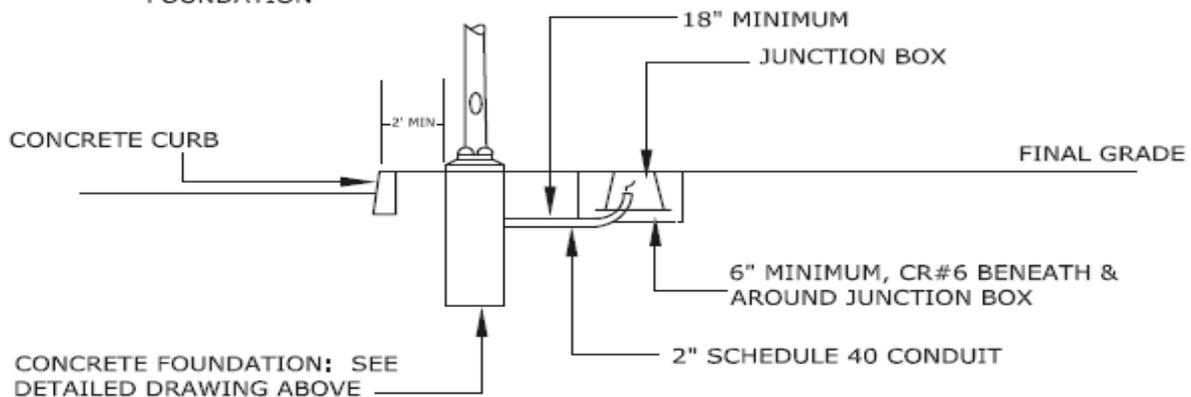
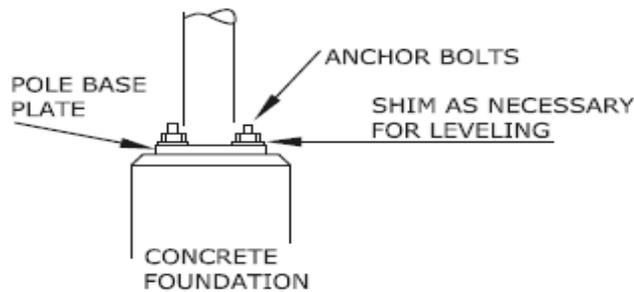
H5.2



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**

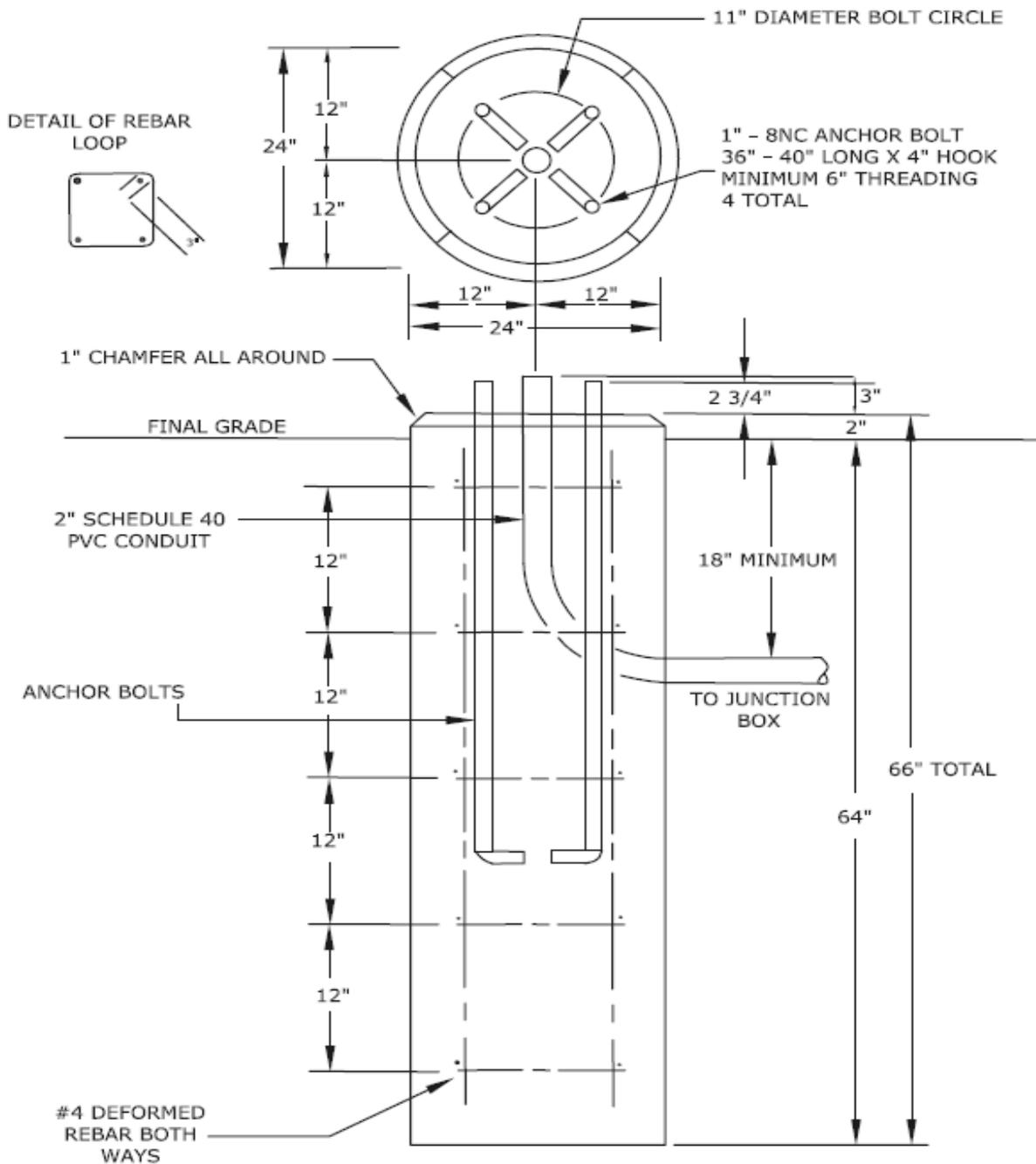
CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

DATE: 11-14-06 DWN: JMB APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

H10.1



**CONCRETE FOUNDATION SPECIFICATION:
25' - 30' MOUNTING HEIGHT**

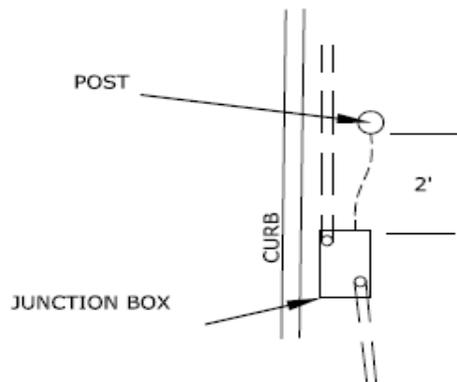
CITY OF HAGERSTOWN, MD.
ELECTRIC SYSTEM

DATE: 11-15-06 DWN: JMB APP:

SCALE
NONE

CONSTRUCTION
STANDARDS

H10.2

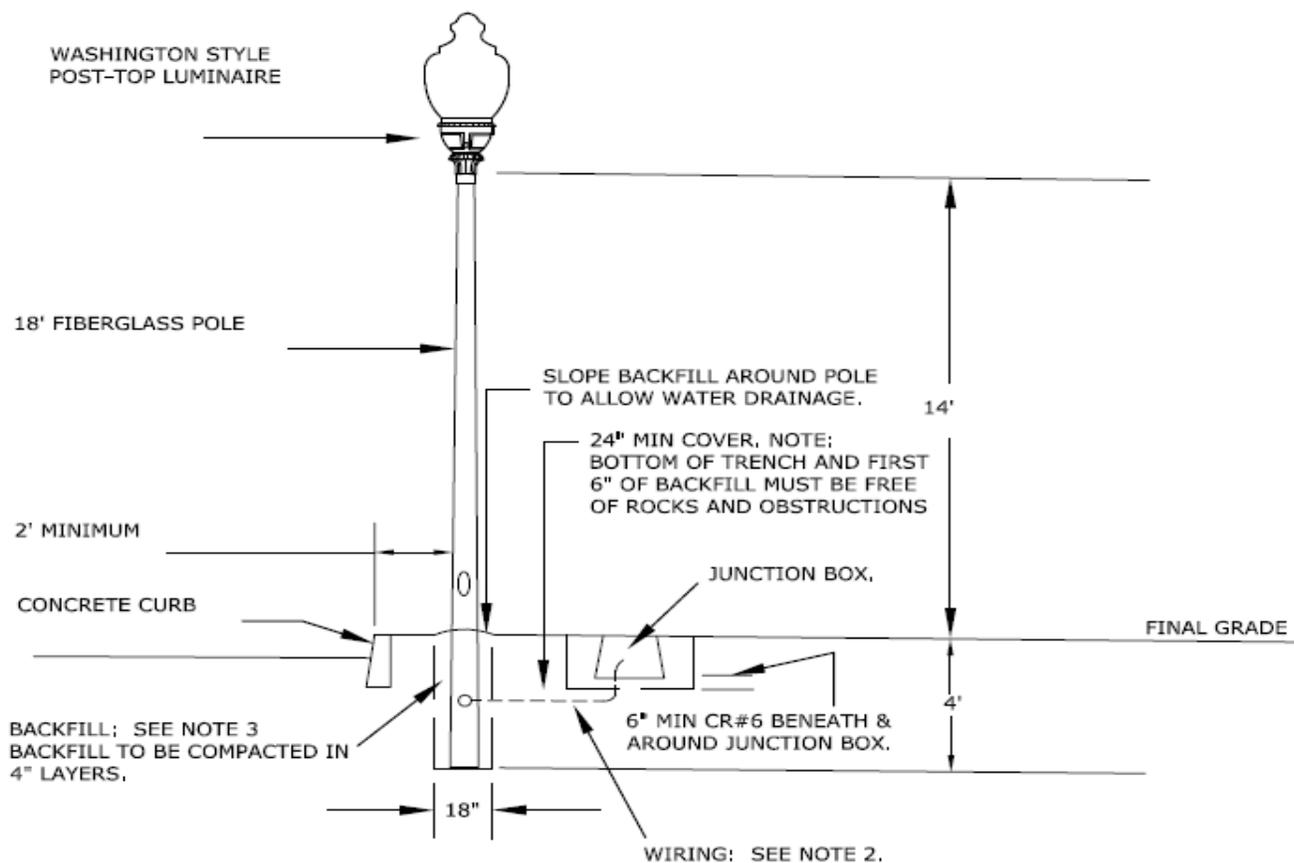


NOTES:

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

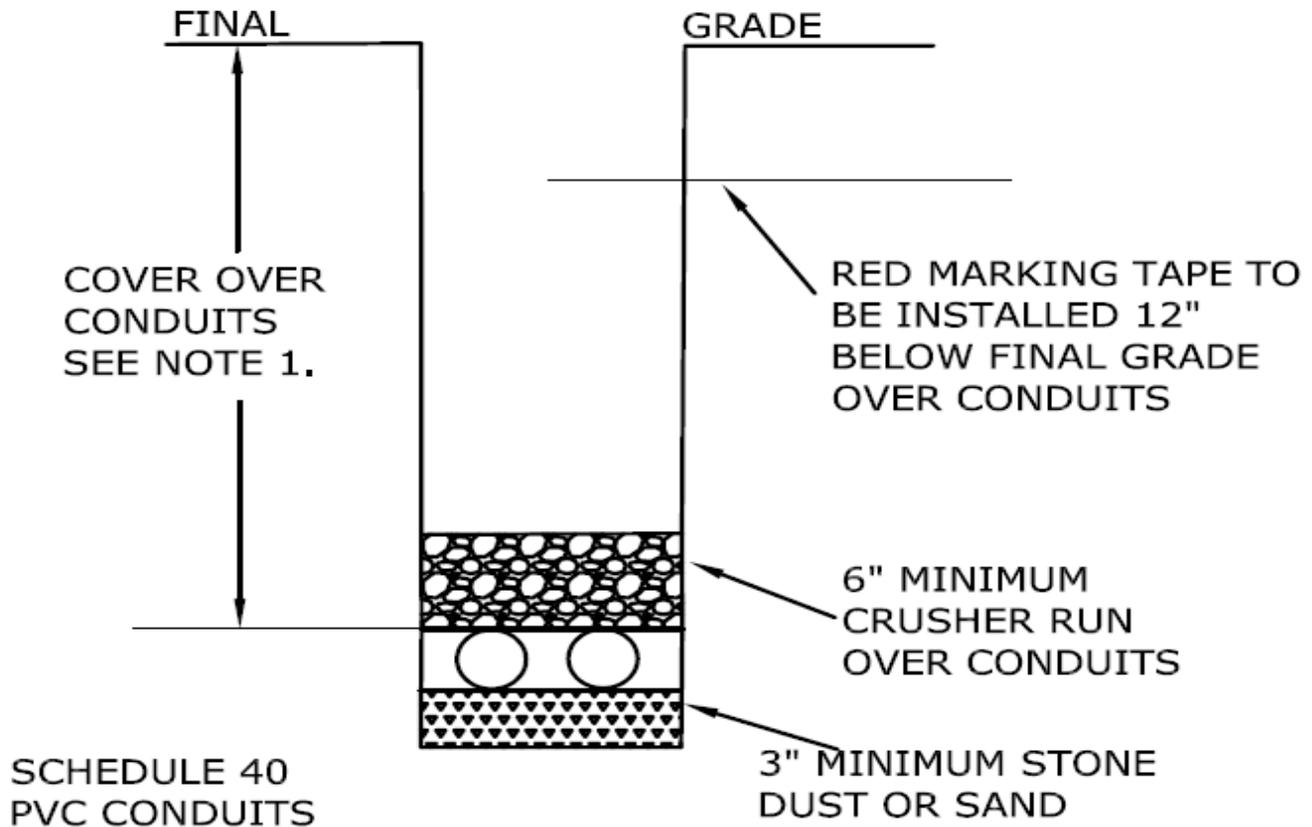
DATE: 11-13-06 DWN: JMB APP:

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 areas: Rectangular polyethylene enclosure, 15" deep with minimum 12" X 20" opening with diamond plate hot dip galvanized steel cover. Cover to include recessed penta-head locking bolt and grounding lug.

PenCell Catalog No. PE-20UXG
Burdny Cat. No. URD20G23
Blackburn Cat. No. SDRPGE

2. For sidewalk areas:
 - a. Box: 18" inside-diameter by 30"-36" long Bituminous Fiber or Structural Foam Polyethylene Water Meter Vault. Similar box used at Hagerstown's Water Dept.
 - b. Frame and Cover: Heavy-duty (traffic-type) cast iron frame and cover. Frame to be 20" diameter x 4-1/16" high, to fit an 18" I.D. Bituminous Fiber Junction Box. Cover to be 12-5/8" diameter, labeled "DTT CONDUIT", with brass penta-head locking bolt. Details to be per B & C Utility Supply Design No. R-10711. Available from B & C UtilitySupply Inc., Finksburg, Maryland.

G. WIRE AND CABLE

1. Supply Feeders: #2 or 1/0 aluminum triplex, 600 Volt URD Cable (insulation type RHH, RHW, USE). Black phase wires and yellow striped neutral wire.
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. #2, 1/0 Aluminum: aluminum parallel groove.

Blackburn Cat. No. PAA69

2. #2, 1/0 aluminum- to- #10 copper: aluminum parallel groove with copper liner.

Blackburn Cat. No. PAC3459

3. #10 Copper: Copper screw-type.

Burndy Cat. No. KP6C

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

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 Line and Load:

FERRAZ SHAWMUT No. FEB-82-82, Complete with 2 insulating boots FSB1.

- (2) 1/0 Aluminum Line and Load:

Same as above (remove 1-2 strands of 1/0 aluminum cable as necessary to fit into connector).

- (3) #10 Copper Line and Load:

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

- b. Waterproof In-Line 60A 600V Holder for 13/16" x 3" Cartridge Fuse, complete with insulating boots.

- (1) For #2 Aluminum Line and Load:

- Elastimold Cat. No. 62E1-E1

- (2) For 1/0 Aluminum Line and Load:

- Same as above ---- remove 1-2 strands of 1/0 aluminum cable as necessary to fit into connector.

- 2. Fuses---for Underground Holders

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

- FERRAZ SHAWMUT, Type ATDR

- b. 35-60A, 250V, one time, 13/16" x 3", cartridge fuse.

- Bussman One-Time, Type NON

- 3. Overhead Fuses--- for Feeds from overhead secondaries

- a. Indicating Type Tubular Secondary Fuses, with insulated leads.

- Kearney Series 83XX-5

- K. MISCELLANEOUS MATERIALS

- 1. Pole Line Hardware---shall be hot dip galvanized steel.

- 2. Electrical Tape for Connections

- a. Scotch Type 130 High Voltage Linerless Self-Fusing EPR Tape.
 - b. Scotch Type 33+ Vinyl Electrical Tape.

APPENDIX A
MATERIALS PURCHASE SPECIFICATIONS

CITY OF HAGERSTOWN
HAGERSTOWN LIGHT DEPARTMENT

JANUARY 2007

**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—SEIMCUTOFF—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 no 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 EEL/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 footcandles
 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 25' - 30' Mounting Height.

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

1. 25' Mounting Height, 6' Arm (150 Watt HPS)
 - a. Hapco Co. Catalog No. 21-295
 - b. National Lighting Standards/Hi-Tek Catalog No. A40-8423-0621
 - c. Crouse-Hinds Lighting Catalog No. RTA7L25AAS16
 - d. Pole Light Catalog No. TEA-745-256S
2. 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 25 or 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.
 - a. On poles having 25' nominal mounting height, bracket shall be 6' long, and shall have a 2" pipe-size horizontal tenon for mounting luminaire.
 - b. On poles having 30' nominal mounting height, bracket shall be 8' long, and shall 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.

APPENDIX B
ROADWAY ILLUMINATION STANDARDS

CITY OF HAGERSTOWN
HAGERSTOWN LIGHT DEPARTMENT

JANUARY 2007

A. GENERAL PHILOSOPHY

1. FACTORS WHICH INFLUENCE SEEING AND VISIBILITY

Most aspects of traffic safety involve visibility. The fundamental factors which directly influence visibility are:

- a. The brightness of an object on or near the roadway.
- b. The general brightness of the background of the roadway.
- c. The size of an object and its identifying detail.
- d. The contrast between an object and its surroundings.
- e. The ratio of pavement luminance (photometric brightness) to surroundings as seen by the observer.
- f. The time available for seeing the object.
- g. Glare.

Good visibility on roadways at night results from lighting which provides adequate pavement brightness with good uniformity and appropriate illumination of adjacent areas, together with reasonable freedom from glare.

B. ROADWAY, WALKWAY, AND AREA CLASSIFICATIONS

1. Roadway and walkway classifications

Arterial-

The part of the roadway system that serves as the principal network for through traffic flow. The routes connect areas of principal traffic generation and important rural highways entering the city.

Collector-

The distributor and collector roadways serving traffic between arterial and local roadways. These are roadways used mainly for traffic movements within residential, commercial, and industrial areas.

Local-

Roadways used primarily for direct access to residential, commercial, industrial, or other abutting property. They do not include roadways carrying through traffic. Long local roadways will generally be divided into short sections by collector roadway systems.

Expressway-

A divided major arterial highway for through traffic with full or partial control of access and generally with interchanges at major crossroads. Expressways for non-commercial traffic within parks and park-like areas are generally known as parkways.

Freeway-

A divided major highway with full control of access and with no crossings at the grade.

Alleys-

A narrow public way within a block, generally used for vehicular access to the rear of an abutting properties.

Sidewalks-

Paved or otherwise improved areas for pedestrian use, located within public street rights-of-way which also contain roadways for vehicular traffic.

Pedestrian Ways-

Public sidewalks for pedestrian traffic generally not within rights-of-way for vehicular traffic roadways. Included are skywalks (pedestrian overpasses), sub-walks (pedestrian tunnels), walkways giving access to park or block interiors and crossings near centers of long blocks.

2. AREA CLASSIFICATIONS

Commercial-

That portion of a municipality in a business development where ordinarily there are large numbers of pedestrians and a heavy demand for parking space during periods of peak traffic or a sustained high pedestrian volume and a continuously heavy demand for off-street parking space during business hours. This definition applies to densely developed business areas outside of, as well as those that are within, the central part of a municipality.

Intermediate-

That portion of a municipality which is outside of a downtown area but generally within the zone of influence of a business or industrial development, characterized often by a moderately heavy nighttime pedestrian traffic and a somewhat lower parking turnover than is found in a commercial area. This

definition includes densely developed apartment areas, hospitals, public libraries, and neighborhood recreational centers.

Residential-

A residential development, or a mixture of residential and commercial establishments, characterized by few pedestrians and a low parking demand or turnover at night. This definition includes areas with single family homes, townhouses, and small apartments. Regional parks, cemeteries, and vacant lands are also included.

C. DESIGN OF ROADWAY AND PEDESTRIAN WALKWAY LIGHTING

1. GENERAL

The design of a lighting system involves many variables including economics, esthetics, and visibility related factors. This design process follows these major steps:

- a. Determination of the level of illuminations.
- b. Formulation of a tentative concept as to luminaire locations, lights sources, and mounting height relative to the area to be lighted.
- c. Selection of a luminaire distribution type classification to be used.
- d. Calculations using several tentative light source types and sizes, luminaries, mounting heights, and maintenance conditions to determine spacing, luminaire locations, and foot-candle levels achieved (average and minimum).
- e. Comparative calculations on several possible systems to determine relative factors of uniformity, economics, disability glare and pavement luminance.
- f. Selection of final design.

It is important that roadway lighting be planned on the basis of traffic information which includes the factors necessary to provide traffic safety and pedestrian security. Some of the factors applicable to specific problem which are to be carefully evaluated are:

- a. Type of lane used development (Area Classification) Abutting the roadway or walkway.
- b. Type of route (Roadway or Walkway Classification)
- c. Traffic accident experience
- d. Street crime experience
- e. Roadway construction features

ILLUMINATION REQUIRMENTS

They represent the average levels which are currently considered appropriate for the kinds of roadways or walkways in various areas. Furthermore, the recommendations assume design of proper uniformity and use of applicable types of luminaire distribution, lamp sizes, mounting heights, spacing and transverse locations. These values do not represent initial illuminations, but should be in-service values of systems designed with proper light loss factors.

ILLUMINATION DEPRECIATION

The state at which the luminaire loses it designed output. This condition occurs just prior to lamp replacement and luminaire washing.

UNIFORMITY

Uniformity may be expressed using the Average Level-to-Minimum Point method where the average illumination of the roadway design area between two adjacent luminaries is compared to (divided by) the lowest value at any point in the area.

Under this method the average-to-minimum ratio should not exceed 4 to 1 for any roadway, except for Local Residential streets, which should have a ratio not exceeding 8 to 1.

Table I RECOMMENDATION FOR AVERAGE MAINTAINED HORIZONTA ILLUMINATION (IN FOOTCANDLES)

Roadway and Walkway Classification	Area Classification		
	Commercial	Intermediate	Residential
Vehicular Roadways			
Freeway	0.6	0.6	0.6
Expressway	1.4	1.2	1.0
Arterial	2.0	1.4	1.0
Collector	1.2	0.9	0.6
Local	0.9	0.6	0.4
Alleys	0.6	0.4	0.2
Pedestrian Walkways			
Sidewalks	0.9	0.6	0.2
Pedestrian Ways	*	*	*

* - Park Walkways: 0.5 Footcandles

QUALITY

Quality in roadway lighting relates to the ability of the available light to provide a visual scene in such a manner that people may make quick, accurate, and comfortable recognition of the cues required for the seeing task. The quality of lighting of installation “A” is higher than that of installation “B” if, with the same average illumination level, visual recognition of typical tasks is faster, easier, and/or done more comfortable under installation “A”. Many factors are interrelated to produce improved quality of lighting. The following factors are involved, but quantitative values and relative importance cannot be given:

- a. Disability Glare
- b. Reflected glare
- c. Pavement luminance
- d. Light on vertical surfaces
- e. Uniformity of horizontal and vertical illumination, as well as uniformity of pavement luminance and other background areas

It should be recognized that in many instances, changes intended optimize one factor relating to quality will adversely affect another and the resultant total quality of the installation may be degraded.

LUMINAIRE SPACING

The spacing of luminaires is often influenced by the location of utility poles, block lengths, property lines, and the geometric configuration of the terrain features. It is generally more economical to use larger lamps at reasonable spacing and mounting heights than to use small lamps at more frequent intervals with lower mounting heights. This is usually in the interest of good lighting, provided that spacing-to-mounting height ratio is within the range of light distribution for which the luminaire is designed. The desired ration of lower illumination at nay point on the pavement to the average illumination should be maintained. Disregarding luminaire distribution characteristics and exceeding maximum spacing-to-mounting height ratios may cause loss of visibility of objects between luminaires.

TRAVERSE LOCATION OF LUMINAIRES

Luminaires are intended to be mounted over or near the edge of the roadway. Optimum luminaire location is best determined by reference to the photometric data showing illumination distribution and utilization. Other factors that should be considered are:

- a. Access to luminaire for servicing
- b. Vehicle-pole collision probabilities

- c. System glare aspects.
- d. The visibility (both day and night) of traffic signs and signals
- e. Esthetic appearance

LUMINAIRE SELECTION

Luminaire light distribution classifications are intended to service as a means of selecting a luminaire to determine if it is optically and economically suitable for lighting a particular roadway from the proposed mounting height and mounting location. The relative amount and control for light in areas other than the cone of maximum candlepower are equally important in producing good visibility in the final system and are not considered in the classification system.

TRAFFIC CONFLICT AREAS

The illumination within these areas should be at least equal to the SUM of the values recommended for each roadway which forms the intersection. They also include very high volume driveway connections to public streets and mid-block pedestrian crosswalks.

BORDER AREAS

There is value in illuminating areas beyond the roadway proper provided it is appropriate to the environment and not objectionable to the adjacent property use. It is desirable to widen the narrow visual field into the peripheral zone in order to reveal objects and enhance eye adaptation. It also improves depth perception and perspective this facilitating the judgment of speed, distance, etc. Such illumination should diminish gradually and uniformly away from the road.

TRANSITION LIGHTING

It is good to gradually decrease luminance in the driver's field of view when emerging from an adequately lighted section of roadway. This may be accomplished by extending the lighting system in each exit direction using approximately the same spacing and mounting height but graduating the size of the lamp used. A recommended procedure to achieve this graduation is to sector the extension of the best lighted portion of the principal roadway using the designed value of this section as the calculation base. Using the design speed of the roadway, the lowered level sectors should be illuminated for a 15 second continuous exposure to the sector illumination level of one-half of the preceding higher lighted sector, but the terminal illumination in the lowest sector should not be less than 0.25 foot-candle nor more than 0.5 foot-candle.

ALLEYS

Experience has proven that well-lighted alleys remove the criminal's opportunity to operate and hide under cover of darkness. Alleys should be adequately lighted to facilitate police patrolling from sidewalks and cross streets, especially in commercial areas. Generally, such lighting also meets vehicular traffic needs.

PEDESTRIAN WALKWAYS

General-

All sidewalk lighting provided as incidental to roadway lighting should be evaluated for adequacy independently of the level of illumination on the associated roadway. Levels should be verified in service to include reflections from building fronts, fences and walls, which can often contribute significantly to the illumination of walkway. The uniformity ratio should not exceed 6 to 1 for walks or pedestrian ways, except that in Residential areas a ration of 10 to 1 is acceptable.

To provide well-illuminated surroundings for such pedestrian ways as walkways through parks, the area bordering these pedestrian ways for a width of 8 feet on each side should be lighted to levels of at least one-third (1/3) that suggested for the walkway.

SECURITY PROBLEM LOCATIONS

For all walkways in areas with high crime experience, the recommended illumination levels should be doubled, but the average should not in any case be less than 0.5 foot-candles. Features closely adjacent to any walkway which offers unusual hazards should be well illuminated to the same level as the walkway or should be eliminated.

ROADWAY COMPEXITIES AND SPECIAL SITUATIONS

Railroad Crossings-

The direction and level of illumination should permit visual recognition of identification signs and pavement markings. The foot-candle level within 100 feet on both sides of the track should be twice the level of the adjacent area of the same roadway, whichever is higher, but never less than 1.0 foot-candle.

TREES-

Roadway lighting and tree foliage need not conflict. Judicious pruning will permit effective lighting, reduce system glare, and generally improve the

appearance of the street. Design compromises, involving deviations from preferred system layouts with respect to luminaire spacing, mounting height, and transverse locations, may be necessary. Any such deviation can generally be compensated for by resorting to lower mounting heights and closer spacing, with smaller lamp sizes and, if necessary, lower angle of maximum candlepower. Also, irregular spacing of individual luminaries up to 20 percent of average spacing can be tolerated, providing no two consecutive luminaire locations are involved. Transverse deviation of an individual luminaire should only be made where there is no other reasonable compromise. Although foliage interferences mostly affects roadway illumination, there may be instances on local traffic residential streets where it can also affect important sidewalk illumination. Generally this problem can be solved by altering the luminaire positions, by pruning, or a combination of both methods.