

UNIFIED GOVERNMENT OF KANSAS CITY, KANSAS AND WYANDOTTE COUNTY

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

&

KANSAS CITY BOARD OF PUBLIC UTILITIES



STREET LIGHTING DESIGN GUIDE

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# STREET LIGHTING DESIGN REQUIREMENTS

## PART 1 – GENERAL

- 1.01 APPLICABILITY:** The criteria outlined in this document shall be adhered to for the design of all publicly and/or privately financed street lighting systems to be installed in the public street right-of-way or on other public property under the jurisdiction of the Unified Government, the City of Kansas City, Kansas (UG/KCK), and the Board of Public Utilities (BPU).
- 1.02 LIGHTING SYSTEM SCOPE:** The Design Engineer shall be responsible for establishing the scope of a street lighting system and the phasing of construction. The Design Engineer shall clearly communicate the scope, critical design elements, and phasing of the lighting system with the City Traffic Engineer/BPU Engineering and receive approval prior to commencement of design. Refer to the Design Engineer's Checklist in Part 6 of this document.
- 1.03 SYSTEM CONFIGURATION:** Street lighting systems shall be composed of all electrical equipment required to provide a complete, operable system. This shall include, but is not limited to power supplies, luminaires, poles, distribution cables, conduit, foundations and related appurtenances.
- 1.04 DESIGN CRITERIA AMENDMENTS:** It is the intention of these criteria to provide consistent procedures, methodologies, and standards for the design engineer to conform to while preparing improvement plans for projects for the UG/KCK. These criteria, however, are not intended to hinder design innovations that may be beneficial for the project budget, public safety, and/or character of the lighting environment. Only with prior authorization of the City Traffic Engineer/BPU Engineering may these criteria be amended.
- 1.05 DESIGN REFERENCE STANDARDS:** For new roadway designs, the Design Engineer shall utilize the current edition of American National Standard Practice Manual for Roadway Lighting by the Illumination Engineering Society, *ANSI/IES RP-8-14*. For lighting designs that are part of a phased, on-going project and/or were designed by previous criteria, the criteria outlined in *ANSI/IES RP-8-00 (R2005)* may be utilized to design a comparable lighting environment and uniform corridor. When designing for a roundabout controlled intersection, the Design Engineer should reference the *ANSI/IES DG-19-08 Design Guide for Roundabout Lighting*.

The Design Engineer shall provide a lighting system design that conforms to the guidance outlined in the National Electrical Code (NEC, NFPA 70) and National Electric Safety Code (NESC, ANSI C2). Additionally, all lighting designs shall follow the electrical guidelines and policies required by BPU.

## PART 2 – DESIGN CRITERIA

- 2.01 GENERAL:** The criteria outlined below shall be followed when specifying the type and placement of equipment for a street lighting system. Generally it is the anticipation of the UG/KCK and BPU that L.E.D. luminaires will be utilized for designs, however, high intensity discharge (H.I.D.) luminaires may be required for design in certain cases/areas. The design engineer shall confirm the luminaire

type with the City Traffic Engineer/BPU Engineering prior to commencement of design. The standard plans, details, and material specifications for street lighting are available through the Engineering Division of the Public Works Department or at the UG/KCK's website: <http://www.wycokck.org/>.

**2.02 LIGHTING DESIGN METHODOLOGY:** Street lighting design for continuous lighting systems shall be based upon the criteria proposed by the Project Design Engineer and approved by the City Traffic Engineer/BPU Engineering. If a project is determined that it should use the criteria outlined in the *ANSI/IES RP-8-00 (R2005)*, it shall therefore be based on the ILLUMINANCE design methodology. Alternatively, if a project is determined that it should utilize the criteria outlined in the *ANSI/IES RP-8-14*, it shall therefore be based on the LUMINANCE design methodology. Each design methodology shall take into account the photometric output of the luminaires chosen for the specific project and approved by UG/KCK and BPU.

**2.03 LIGHTING DESIGN CRITERIA:** The Design Engineer should reference the appropriate *ANSI/IES RP-8* publications as established above as a basis for design. The street lighting design elements and values for both the illuminance and luminance methodologies are outlined below. UG/KCK may require that the Design Engineer submit photometric evaluation drawings and calculations to illustrate conformance with the design criteria.

**A. FACILITY LIGHTING DESIGN TYPES:** Every street lighting project presents unique challenges that require the Design Engineer to consider the most optimum design type for a particular facility. Street lighting design types should be chosen based on road user safety and economic value given the overall project improvements and potential utility conflicts. Lighting design types consists of the following: Single-sided, double-sided, staggered, and median. Some projects may require the Design Engineer to incorporate more than one design type to accomplish the lighting criteria set forth within this document. The UG/KCK prefers that a median design type not be used where the median width may create maintenance and/or safety impacts due to vehicle collisions. Median mounted street lighting design will require preapproval by the City Traffic Engineer/BPU Engineering to be evaluated on a case-by-case basis.

**B. ILLUMINANCE & LUMINANCE DESIGN VALUES:** The following information is intended to provide the Design Engineer with guidance for determining the design values for illuminance and luminance values as set forth in the *ANSI/IES RP-8* publications. The Design Engineer shall coordinate with the City Traffic Engineer/BPU Engineering to determine the street and pedestrian conflict area(s) of a given project prior to commencement of design. City adopted Code of Ordinances, Chapter 27, Article VII, Division 2, Section 27-288 outlines criteria for street classifications as a basis for design. Additionally, pavement classification shall be determined based upon the proposed pavement design of new or reconstruction projects or of the existing pavement for street lighting retrofit projects. The tables below should be used to assist in the determination of the proper design criteria for each project.

Illuminance Methodology Criteria (Source ANSI/IES RP-8-00 (R2005))					
Street & Pedestrian Conflict Area Classification		Pavement Classification (Minimum Maintained Average Values)			Max. Uniformity Ratio $E_{ave}/E_{min}$
Street Classification	Pedestrian Conflict Area	R1 (fc)	R2 & R3 (fc)	R4 (fc)	
Expressway	High	1.0	1.4	1.3	3.0
	Medium	0.8	1.2	1.0	3.0
	Low	0.6	0.9	0.8	3.0
Major (Arterial)	High	1.2	1.7	1.5	3.0
	Medium	0.9	1.3	1.1	3.0
	Low	0.6	0.9	0.8	3.0
Collector	High	0.8	1.2	1.0	4.0
	Medium	0.6	0.9	0.8	4.0
	Low	0.4	0.6	0.5	4.0
Local	High	0.6	0.9	0.8	6.0
	Medium	0.5	0.7	0.6	6.0
	Low	0.3	0.4	0.4	6.0
Luminance Methodology Criteria (Source ANSI/IES RP-8-14)					
Street & Pedestrian Classification		Avg. Luminance $L_{avg}$ (cd/m <sup>2</sup> )	Avg. Uniformity Ratio $L_{avg}/L_{min}$	Max. Uniformity Ratio $L_{avg}/L_{min}$	Max. Uniformity Ratio $E_{ave}/E_{min}$
Street Classification	Pedestrian Classification				
Expressway	N/A	1.0	3.0	5.0	0.3
Major (Arterial)	High	1.2	3.0	5.0	0.3
	Medium	0.9	3.0	5.0	0.3
	Low	0.6	3.5	6.0	0.3
Collector	High	0.8	3.0	5.0	0.4
	Medium	0.6	3.5	6.0	0.4
	Low	0.4	4.0	8.0	0.4
Local	High	0.6	6.0	10.0	0.4
	Medium	0.5	6.0	10.0	0.4
	Low	0.3	6.0	10.0	0.4

Street Surface Classifications ( <i>Source ANSI/IES RP-8-00 (R2005)</i> )			
Class	Q <sub>o</sub> *	Description	Mode of Reflectance
R1	0.10	PCC street surface. Asphalt street surface with a minimum of 12% of the aggregates composed of artificial brightener (e.g., Synopal) aggregates (e.g., labradorite, quartzite).	Mostly diffuse
R2	0.07	Asphalt street surface with an aggregate composed of minimum 60% gravel [size greater than 1 cm (0.4 in.)]. Asphalt street surface with 10% to 15% artificial brightener in aggregate mix. (Not normally used in North America).	Mixed (diffuse & specular)
R3	0.07	Asphalt street surface (regular and carpet seal) with dark aggregates (e.g., trap rock, blast furnace slag); rough texture after some months of use (typical highways)	Slightly specular
R4	0.08	Asphalt street surface with very smooth texture.	Mostly specular
* Q <sub>o</sub> = representative mean luminance coefficient			

Pedestrian Conflict Area Classifications ( <i>Source ANSI/IES RP-8-14</i> )		
Pedestrian Conflict Area Classification	Number of Pedestrians (Peds/hour)	Description
High	>100	An area where a significant number of pedestrians are expected. E.g. downtown, retail areas, stadiums, etc.
Medium	1 - 100	An area where fewer pedestrians are expected at night. E.g. office areas, apartments, parks, etc.
Low	<10	An area where very low pedestrian volumes are expected. E.g. residential dwellings, rural and semi-rural regions.

- C. **LIGHT LOSS FACTOR:** The light loss factor (LLF) that shall be used for design of L.E.D. street lighting facilities is 0.90. The LLF for the design of any H.I.D. luminaires shall be 0.69. The UG/KCK reserves the right to modify this factor as determined by actual field performance of the luminaires installed on previous projects. Any desired deviation from the LLF will be communicated to the Design Engineer prior to commencement of design.

- D. **OPTICAL DISTRIBUTION TYPE:** The UG/KCK & BPU prefer that Type III optical distribution be used as the basis for design on most roadway projects. Other distribution types may be utilized for projects in which the Design Engineer determines that a Type III distribution is not the optimal spread, or if it creates excess light trespass. The Design Engineer should avoid designing a lighting system that may negatively impact adjacent residential property owners with excess light trespass. Optical distributions outside of the typical Type III shall be approved by the City Traffic Engineer/BPU Engineering.
- E. **CORRELATED COLOR TEMPERATURE (CCT):** The Design Engineer should design L.E.D. lighting systems using a standard color temperature to maintain uniformity of light source appearance with adjoining L.E.D. lighting systems. A 4000K CCT should be used for design while conducting photometric analysis of the system and be labeled as such on the plans.
- F. **VOLTAGE DROP CALCULATIONS:** The Design Engineer shall design the electrical lighting system such that the inefficient voltage losses to the system loads are prevented. Voltage drops for distribution systems, or branch circuits, are allowed up to a maximum of 5% voltage drop. Service feeder voltage drops, however, are allowed up to a maximum of 3% voltage drop. Refer to Part 4 - Street Lighting Electrical System Design Guidance for information regarding service, distribution, and pole & bracket cable size and type as a basis for voltage drop calculations. Note that the resistance of service and distribution cables should reflect the properties of aluminum (not copper) URD triplex cable. The UG/KCK and/or BPU may require that voltage drop calculations be submitted for review on any given project.

### PART 3 – STREET LIGHTING EQUIPMENT DESIGN GUIDANCE

- 3.01 **GENERAL:** The Design Engineer should factor the standard materials into the design of a street lighting system. The standard materials have some flexibilities and limitations that should be acknowledged in order to accurately and efficiently design the system. Additionally, the Design Engineer should be mindful of the customary placement and setbacks of electrical street lighting equipment
- 3.02 **STREET LIGHT POLES:** Street light pole height for a given project should be selected based upon the type of facility and needs of that facility to perform as required above. There are 2 standard mounting heights allowed to achieve the proper lighting design: 30 feet and 35 feet. The pole features, dimensions, and mounting heights are illustrated in the Standard Details.

The City Traffic Engineer/BPU Engineering may require that some projects utilize decorative street lighting poles for lighting projects that occur within environments designated for greater character. Environments which would warrant decorative poles include, but are not limited to, the Legends, Village West, Rosedale, Downtown, and Central Business Districts (CBD). In this case, the Design Engineer should consult with the City Traffic Engineer/BPU Engineering to establish which decorative pole to specify and refer to the Standard Drawings for design of the decorative H.I.D. and L.E.D. luminaires.



**3.03 BRACKET ARMS:** Bracket arm lengths should be selected such that the luminaires are positioned in a straight line when looking down the roadway. The bracket arms should be oriented 90 degrees, or perpendicular, to the traveled way. The standard lengths for bracket arms consist of a 6 foot and 12 foot arm. The bracket arm features and dimensions are shown in the Standard Details.

**3.04 L.E.D. LUMINAIRES:** Luminaires of the light emitting diode type shall be selected to meet the lighting criteria outlined above. The luminaire should be capable of multi-tap voltage selection ranging from 120–277V. Dimmable drivers and 7-pin photocells that meet *ANSI C136.41-2013* standards for dimming receptacles should be specified for all projects with federal funding requiring ‘as equal’ options. The following L.E.D. cobrahead style luminaires may be specified ‘as equals’: GE’s Evolve, Cooper’s Navion, AEL’s Autobahn, and LED2’s Alpha. The following L.E.D. decorative post top style luminaires may be specified ‘as equals’: Eaton’s Generation, Holophane’s GranVille II, and GE’s Avery StreetDreams. Refer to the Pre-Approved Luminaire Product List for more information on qualified L.E.D. luminaire models.

For street lighting projects in which a 30 foot mounting height pole is suitable, the Design Engineer can typically expect to utilize a 150W - 250W equivalent L.E.D. luminaire. In contrast, when a 35 foot mounting height pole is best suited for a project, the Design Engineer can typically expect to utilize a 250W - 400W equivalent L.E.D. luminaire. Pole spacing shall be determined by photometric analysis based on roadway classification, geometric characteristics, and other lighting environment considerations.

Note that for projects utilizing federal funds and requiring a minimum of 3 ‘as equal’ luminaires to be specified on the plans, the designer should perform a photometric check on each of 3 approved luminaires to determine which yields the shortest (conservative) spacing design. Although the approved product list outlines “equivalent” luminaires, their individual photometric performance will vary to some degree. The lighting design should be representative of the most conservative luminaire (of the 3 provided by the designer in the plans) with the intent that if a contractor selects it for construction, the minimum lighting design criteria will still be met.

**3.05 H.I.D. LUMINAIRES:** High intensity discharge type luminaires, where approved by UG/KCK & BPU, shall be specified to meet the lighting criteria outlined above. The luminaire should be capable of multi-tap voltage selection ranging from 120-277V. High Pressure Sodium (H.P.S.) luminaires shall be 250W for the general roadway design. Decorative poles include both H.P.S. luminaires and metal halide (M.H.) lamps. Refer to the decorative pole standard drawings for details. The following H.P.S. luminaires may be specified ‘as equals’: Cooper OVZ and American Electric’s Roadway Series 115. Refer to the Pre-Approved Product List for more information on approved H.I.D. luminaire models.

Pole spacing for 250W H.P.S. luminaires, whether it be a 30’ or 35’ mounting height, shall be determined by photometric analysis. Similarly, pole spacing for decorative poles with H.I.D. luminaires shall be based off the photometric analysis that factors the lighting environment needs and characteristics.

**3.06 POLE BASES:** Pole bases will consist of a screw-in anchor base and/or concrete bases, as required by project subsurface conditions. Wherever possible, the preferred street lighting pole base is a screw-in anchor base. Should rock be encountered and a screw-in anchor base cannot be conventionally screwed into the ground, a predrilled hole with flowable fill may be used to install a screw-in anchor base, or a concrete base may be used. Concrete bases should be installed in areas of fill (embankment) or areas of otherwise disturbed soils where soil settlement may occur. Both screw-in and concrete anchor bases require a ground rod to be installed as indicated on the standard drawings.

**3.07 EQUIPMENT PLACEMENT:** Lighting equipment, with the exception of the service feed, shall be installed only within a public street right-of-way or on other public property. Typically such equipment, excluding conduits under street pavement, shall be positioned in a shoulder area. Lighting equipment, including street lights, junction/pull boxes, and power supplies, are at higher risk of being damaged when positioned within the curb return of a roadway intersection. Lighting equipment should therefore be positioned beyond the curb return of an intersection, or adjacent to a property line at other mid-block locations. The Design Engineer should avoid placing electrical equipment directly in front of residential properties unless the City Traffic Engineer/BPU Engineering deems that no other practical alternative exists.

At roundabout controlled intersections where residential or collector roadways meet, a minimum of two (2) street lights should be located diagonally across the circular intersection from one another. Where arterial roadways intersect, a minimum of four (4) street lights should be placed around the outside of the circular intersections. The poles at roundabouts should be equally spaced and in a manner that provides uniform lighting in accordance with guidance of the *IES DG-19-08 Design Guide for Roundabout Lighting*.

Street lights should be strategically placed and noted on the plans to maintain a minimum clearance of ten feet (10') from all overhead utilities. Where no high voltage overhead lines exist, the Design Engineer may seek approval from BPU to maintain a minimum clearance of six feet (6').

**3.08 EQUIPMENT SETBACKS:** Generally, street lighting equipment should be positioned at a consistent setback as outlined below:

- A. STREET LIGHT POLES:** On a curbed roadway, the pole setback should typically be thirty inches (30") measured from the back of curb to the center of the pole base. The City Traffic Engineer/BPU Engineering may authorize a greater setback on heavily traveled streets. For non-curbed roadways, the setback should not be less than six feet (6') measured from the edge-of-pavement to the center of the pole base. At locations where a different setback is required to avoid an underground utility or other obstruction, the Design Engineer shall specify a mast arm of appropriate length to place the luminaire at or near the curb, pavement edge, and/or consistent with other adjacent luminaires.

Where median mounted street lights are preapproved, street lights should be positioned a minimum of 15' behind the nose of the median and along the median centerline.

- B. **DISTRIBUTION SYSTEM:** Typically the distribution system setback from a curbed roadway shall be the same as that specified for the street light poles, or thirty inches from the back of curb to center of the conduit, except where a different setback is required to avoid a utility or other obstruction. Non-curbed roadways shall also be the same as that specified for the street light poles, or not less than six feet (6') from the edge-of-pavement to the center of the conduit.
- C. **JUNCTION/PULL BOX:** Typically the setback of a junction/pull box from a curbed roadway shall be the same as that specified for the distribution system, or thirty inches from the back of curb to center of the box. Non-curbed roadways shall also be the same as that specified for the distribution system, or not less than six feet (6') from the edge-of-pavement to the center of the box.
- D. **POWER SUPPLY:** Setbacks for power supplies along all roadways shall be a minimum of six feet (6') measured from the back of curb to the center of the pedestal. Power supplies should remain within the right-of-way boundary, and in most cases near the limits of the right-of-way to maintain a safe distance from vehicular traffic. Power supplies located near intersections should be positioned outside of curb returns and such that intersection sight distance is not hindered.

## PART 4 – STREET LIGHTING ELECTRICAL SYSTEM DESIGN GUIDANCE

- 4.01 **GENERAL:** The street lighting electrical system shall comply with the NEC (NFPA 70), NESC (ANSI C2), and the service standards of BPU. The Design Engineer shall also ensure that the street lighting electrical system complies with the street lighting electrical system component requirements as outlined below. Any deviation from these system component requirements must be justified by the designer and approved by BPU.
- 4.02 **POWER SUPPLY VOLTAGE, AMPERAGE, PHASE, & CIRCUITS:** Power supplies shall be pre-approved by BPU and capable of operating at 120/240VAC and 100 amperes and 5,000 ampere short circuit current rating (SCCR). Single phase power shall energize all power supplies and corresponding branch circuits. BPU prefers that 120VAC be used to design branch circuits, however, 240VAC may be utilized to energize circuits requiring lengthy spans.
- 4.03 **SERVICE FEED (LEAD-IN CABLE):** The Design Engineer shall coordinate with BPU to determine a service point location and ensure availability of 120/240VAC service to the power supply. Service feed cables shall be #2 AWG URD aluminum triplex cable. The service feed cable quantity should be determined by accounting for all center-to-center horizontal and vertical distances, including eight feet (8') of slack, to connect the power supply to the service point. The contractor shall be required to coordinate connection of the service feed cable with BPU.

**4.04 DISTRIBUTION CABLE (SECONDARY CABLE):** Distribution cables for branch circuits shall consist of #2, #4, #6, or #8 AWG URD aluminum triplex cable. The distribution cables shall be sized by the Design Engineer such that the voltage drop does not exceed 5%. Breakaway fused and non-fused connectors shall be utilized to connect the distribution cable to the pole and bracket cable within the pole bases. Two (2) fused connectors shall be utilized for the hot leads, and one (1) non-fused connector shall be used for the ground as illustrated in the standard drawings. Compression in-line splice kits shall be used to connect distribution cables within junction/pull boxes as illustrated in the standard drawings.

**4.05 POLE & BRACKET CABLE:** Pole wiring from the distribution cables to each luminaire shall be two conductor copper #10 AWG (2c#10 AWG) for H.I.D. luminaires or #12 AWG (2c#12 AWG) for L.E.D. luminaires, both rated as THHN/THWN-2. For L.E.D. luminaires, a copper #12 AWG ground cable is required from the luminaire to the pole grounding lug. The length of the pole and bracket cable is calculated by adding the nominal pole height, the length of bracket arm, and five feet (5') of slack. This quantity would be doubled for poles with dual luminaires.

**4.06 DISTRIBUTION SYSTEM:** Electrical conduit shall be underground in two inch (2") or three inch (3") diameter polyvinyl chloride (PVC) conduit or high density polyethylene (HDPE) conduit. A three inch (3") Schedule 80 conduit shall be used from the power supply to the service point, including up the utility pole to the transformer. Two inch (2") schedule 80 PVC shall be used under roadways and commercial driveways, or as otherwise needed to meet conduit fill. All other underground distribution runs, including branch circuits, shall be installed in two inch (2") schedule 40 PVC or HDPE conduit.

Galvanized rigid steel (GRS) conduit shall also be incorporated in the distribution system where required to traverse structures such as bridges or retaining walls. Galvanized conduit hanger supports and stainless steel hardware shall be used to attach the GRS to the structure.

Conduit can be trenched or plowed in unpaved areas. Where conduits are required to cross under sidewalks, driveways, or streets, it shall be directionally bored. Borings under roadways shall be perpendicular to the roadway, or the shortest possible crossing distance.

The Design Engineer should calculate the length of conduit by adding the center-to-center distances between equipment. All of the center-to-center distances should be subtotaled and multiplied by 102% to allow for bending of conduit to avoid obstructions.

## **PART 5 – STREET LIGHTING PLAN REQUIREMENTS**

**5.01 GENERAL:** The street lighting improvement plans should include all pertinent information required to build and check the design of the system. The plans should be arranged as outlined below, or as required by the City Traffic Engineer/BPU Engineering. The Design Engineer responsible for preparing the plans should be a Kansas registered professional engineer and is required to sign and

seal the title page. Plans should be submitted to the City Traffic Engineer/BPU Engineering for review and approval prior to construction.

**5.02 SHEET SIZE:** The suggested sheet size for street lighting improvement plans is twenty-four inches by thirty-six inches (24"x36"), although sheets twenty-two inches by thirty-four inches (22"x34") may be used. If the street lighting plans are submitted as part of a roadway improvement project, the sheet size should match the roadway improvement plan sheets.

**5.03 SHEET TYPES:** A complete set of improvement plans shall consist of the following sheets and elements:

**A. TITLE SHEET**

- a. Scaled project location vicinity map with north arrow
- b. Signed & sealed signature block
- c. Approval block for signature and date by the County Engineer

**B. STREET LIGHTING PLAN SHEETS**

- a. North arrow, legend, and minimum 1"=50' bar scale
- b. General Notes on 1<sup>st</sup> plan sheet (see Section 5.04)
- c. Plan view of street lighting improvements relative to roadway
- d. Schedule of poles, boxes, power supplies, etc
- e. Station and offset of street lighting equipment
- f. All existing and proposed utilities (underground & overhead)
- g. Street Light Pole # ID's by power supply #, circuit #, and pole # (ie. 2-1-6)
- h. Bid Items and quantities on last page of plan sheets (see Section 5.05)

**C. WIRING DIAGRAM SHEETS**

- a. Schematic wiring diagram with distribution system for each power supply
- b. Size and center-to-center distance of service distribution cables
- c. Summary table illustrating the distribution cable size, circuit raceway length, input amperage, percent voltage drop, and circuit breaker trip rating for each circuit

**D. STANDARD STREET LIGHTING DRAWINGS**

- a. Drawings are available for download via <http://www.wycokck.org/>
- b. Revisions forbidden unless approved by City Traffic Engineer/BPU Engineering for special applications.

**5.04 GENERAL NOTES:** The following is the minimum list of general notes to the contractor that should be included on the first page of the street lighting plan sheets. These notes are not meant to be all-inclusive; project specific notes may be required by the Design Engineer.

**GENERAL NOTES:**

Unified Government & Board of Public Utilities Street Lighting Design Criteria

1. THE UG/KCK TECHNICAL SPECIFICATIONS, DESIGN CRITERIA, AND STANDARD DRAWINGS FOR L.E.D. STREET LIGHTING SHALL GOVERN THE CONSTRUCTION OF ALL LIGHTING IMPROVEMENTS FOR THIS PROJECT.
2. THE CONTRACTOR SHALL HAVE ONE (1) SIGNED COPY OF THE IMPROVEMENT PLANS, APPROVED BY UG/KCK & BPU, AT THE PROJECT SITE AT ALL TIMES.
3. THE CONSTRUCTION OF THE IMPROVEMENTS SHOWN OR IMPLIED BY THESE PLANS SHALL NOT BE INITIATED, OR ANY PART THEREOF UNDERTAKEN, UNTIL THE CITY TRAFFIC ENGINEER IS NOTIFIED OF SUCH INTENT, AND ALL REQUIRED PERMITS AND FEES, PROPERLY EXECUTED BONDS, AND CONTRACT AGREEMENTS ARE RECEIVED AND APPROVED BY THE CITY TRAFFIC ENGINEER.
4. THE CONTRACTOR SHALL CONTACT THE ENGINEERING INSPECTOR AT LEAST FORTY-EIGHT (48) HOURS IN ADVANCE TO SCHEDULE A REQUIRED INSPECTION.
5. THE CONTRACTOR SHALL NOT WORK ON SUNDAYS OR HOLIDAYS. WORK ON SATURDAYS IS ALLOWED WHEN REQUESTED AT LEAST FORTY-EIGHT (48) HOURS IN ADVANCE AND WHEN APPROVED BY THE CITY TRAFFIC ENGINEER/BPU ENGINEERING.
6. ALL WORK SHALL BE CONFINED WITHIN THE RIGHT-OF-WAY OR DEFINED CONSTRUCTION LIMITS. WORK OUTSIDE OF THESE BOUNDARIES SHALL REQUIRE APPROVAL BY THE CITY TRAFFIC ENGINEER/BPU ENGINEERING.
7. THE CONTRACTOR SHALL STAKE THE LOCATIONS FOR ALL POLES, CONDUITS, POWER SUPPLIES, PULL BOXES, AND JUNCTION BOXES TO BE INSTALLED. THE STATIONS AND OFFSETS PROVIDED ARE TO THE CENTER OF THE STREET LIGHTING EQUIPMENT. THE CONTRACTOR SHALL PROVIDE ELEVATIONS. IF OBSTRUCTIONS ARE ENCOUNTERED DURING INSTALLATION, THE CONTRACTOR WILL RE-STAKE THOSE LOCATIONS AFFECTED BY THE OBSTRUCTION. THE CONTRACTOR SHALL CONTACT THE ENGINEERING INSPECTOR TO INSPECT THE STAKING PRIOR TO COMMENCING ANY EXCAVATION OR CONSTRUCTION WORK.
8. THE PLACEMENT OF CONDUIT SHALL BE COORDINATED WITH ALL PAVING OPERATIONS WITHIN THE PROJECT LIMITS. CONDUIT INSTALLATION AND CONDUIT CONNECTIONS SHALL BE INSPECTED AND APPROVED BY THE ENGINEERING INSPECTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXTRA COSTS OF INSTALLING CONDUITS BY ALTERNATE CONSTRUCTION METHODS AFTER THE STREET PAVEMENT HAS BEEN PLACED AND FOR ANY DAMAGE TO THE PAVEMENT THAT MAY OCCUR DURING CONDUIT INSTALLATION.
9. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING EXISTING EQUIPMENT AS NOTED AND DELIVERING ALL SALVAGEABLE EQUIPMENT TO THE BPU OPERATIONS CENTER. THE CONTRACTOR SHALL CONTACT THE CITY TRAFFIC ENGINEER/BPU ENGINEERING AT LEAST TWENTY-FOUR (24) HOURS IN ADVANCE TO COORDINATE THE DELIVERY. ALL EQUIPMENT SHALL BE DISASSEMBLED PER THE INSTRUCTIONS OF THE CITY TRAFFIC ENGINEER/BPU ENGINEERING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE OR LOSS OF SALVAGEABLE EQUIPMENT.
10. ALL EXISTING UTILITIES SHOWN ON THESE IMPROVEMENT PLANS ARE ACCORDING TO THE BEST INFORMATION AVAILABLE TO THE DESIGN ENGINEER; HOWEVER, ALL UTILITIES ACTUALLY EXISTING ON-SITE MAY NOT BE SHOWN. UTILITIES DAMAGED THROUGH THE NEGLIGENCE OF

THE CONTRACTOR TO OBTAIN THE LOCATION OF SAME SHALL BE REPAIRED OR REPLACED AT THE EXPENSE OF THE CONTRACTOR.

11. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO MINIMIZE THE DOWNTIME OF AN EXISTING STREET LIGHTING SYSTEM TO BE MODIFIED. ALL EXISTING EQUIPMENT DAMAGED THROUGH THE NEGLIGENCE OF THE CONTRACTOR DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED, AS DIRECTED BY THE CITY ENGINEER, AT THE EXPENSE OF THE CONTRACTOR.
12. ALL EXISTING DRIVEWAYS, PARKING LOTS, SIDEWALKS, FENCES AND UNDERGROUND SPRINKLER SYSTEMS DAMAGED THROUGH THE NEGLIGENCE OF THE CONTRACTOR DURING CONSTRUCTION SHALL BE RESTORED TO THEIR ORIGINAL OPERATING CONDITION AT THE EXPENSE OF THE CONTRACTOR. ALL AFFECTED SURFACES, FENCES, PIPES AND FITTINGS SHALL BE REPLACED WITH NEW MATERIALS AT THE ORIGINAL LOCATION. ALL RESTORATION WORK SHALL BE ACCEPTABLE TO THE ENGINEER INSPECTOR AND THE PROPERTY OWNER.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COST AND COORDINATION WITH BPU TO SUPPLY POWER HOOK-UP TO POWER SUPPLIES.
14. MINOR RELOCATION OF STREET LIGHT POLES, JUNCTION/PULL BOXES, AND POWER SUPPLIES TO AVOID CONFLICTS WITH EXISTING UTILITIES AND FEATURES MAY BE ALLOWED UPON APPROVAL OF THE ENGINEERING INSPECTOR.

**5.05 BID ITEMS & QUANTITIES:** Standard quantity items that specifically apply to the project in the following table should be illustrated on the last page of the street lighting plan sheets to callout quantities for the contractor's reference. These quantities will roll up to a lump sum price for the "LIGHTING SYSTEM" in the overall summary of project quantities.

<b>SUMMARY OF STREET LIGHTING MATERIALS &amp; QUANTITIES *</b>		
<b>ITEM</b>	<b>UNIT</b>	<b>QUANTITY</b>
DISTRIBUTION CABLE, #2 AWG ALUM. TRIPLEX	L.F.	
DISTRIBUTION CABLE, #4 AWG ALUM. TRIPLEX	L.F.	
DISTRIBUTION CABLE, #6 AWG ALUM. TRIPLEX	L.F.	
DISTRIBUTION CABLE, #8 AWG ALUM. TRIPLEX	L.F.	
SERVICE CABLE, #2 AWG ALUM. TRIPLEX	L.F.	
POLE & BRACKET CABLE, 2c#10 AWG COPPER	L.F.	
POLE & BRACKET CABLE, 1c#10 AWG COPPER GND.	L.F.	
POLE & BRACKET CABLE, 2c#12 AWG COPPER	L.F.	
POLE & BRACKET CABLE, 2c#12 AWG COPPER GND.	L.F.	
2" H.D.P.E. CONDUIT, SDR 11	L.F.	
2" P.V.C. CONDUIT, SCHEDULE 40	L.F.	
2" P.V.C. CONDUIT, SCHEDULE 80	L.F.	
3" P.V.C. CONDUIT, SCHEDULE 80	L.F.	
JUNCTION/PULL BOX	EA.	
SCREW-IN ANCHOR FOUNDATION	EA.	
TRANSFORMER BASES	EA.	
CONCRETE FOUNDATION	EA.	
STREET LIGHT POLE, 30' M.H.	EA.	
STREET LIGHT POLE, 35' M.H.	EA.	
STREET LIGHT POLE, DECORATIVE	EA.	
BRACKET ARM, 6'	EA.	
BRACKET ARM, 12'	EA.	
COBRAHEAD LUMINAIRE, H.I.D. 250W	EA.	
COBRAHEAD LUMINAIRE, L.E.D. 150W EQUIV.	EA.	
COBRAHEAD LUMINAIRE, L.E.D. 250W EQUIV.	EA.	
COBRAHEAD LUMINAIRE, L.E.D. 400W EQUIV.	EA.	
POST TOP LUMINAIRE, H.I.D. DECORATIVE	EA.	
POWER SUPPLY, 4-CIRCUIT 120/240VAC	EA.	
POWER SUPPLY, FOUNDATION	EA.	
BREAKAWAY CONNECTOR, FUSED	EA.	
BREAKAWAY CONNECTOR, NON-FUSED	EA.	
REMOVE & RELOCATE EXISTING EQUIPMENT	L.S.	
RIGHT-OF-WAY RESTORATION	L.S.	

\*These quantities are approximate and were prepared solely for the Contractors convenience and are not guaranteed to be a complete list of materials required for the project.



## PART 6 –DESIGN ENGINEERS CHECKLIST

**GENERAL:** The design engineer shall review the checklist below and confirm that each of the items have been satisfied. It is highly encouraged that the designer refer to this checklist at the onset of the project to ensure that all parties are on the same page and avoid unnecessary redesign/delays.

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### Lighting Design Engineers Checklist

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- ☐ Confirm lighting design criteria (luminance, illuminance, street class, ped conflict area) with City Traffic Engineer/BPU Engineering.
  - ☐ Refer to Pre-Approved Luminaire Product List for design and analysis; utilize most conservative 'As Equal Luminaire' spacing design.
  - ☐ Establish optimal pole height and spacing design (single, double, staggered) and lateral offset for poles in the right-of-way.
  - ☐ Perform photometric analysis and calculations to satisfy the design criteria. Designer to provide evidence of analysis, if requested.
  - ☐ Coordinate with BPU to determine where/if underground and/or overhead utilities will conflict and if proper clearance exist.
  - ☐ Coordinate with BPU to determine power supply locations, capacity of existing transformers, and/or installation of new transformers.
  - ☐ Perform voltage drop calculations for each circuit and 200A power supply. Designer to provide evidence of calculations, if requested.
  - ☐ Submit plans, quantities, and estimates in accordance with the Street Lighting Design Guide and Lighting Specifications.
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UNIFIED GOVERNMENT OF KANSAS CITY, KANSAS AND WYANDOTTE COUNTY

PUBLIC WORKS DEPARTMENT, ENGINEERING DIVISION

&

KANSAS CITY BOARD OF PUBLIC UTILITIES



STREET LIGHTING EQUIPMENT & MATERIAL SPECIFICATIONS

January 2019

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# STREET LIGHTING MATERIAL SPECIFICATIONS INTRODUCTION

## PART 1 – GENERAL

**1.01 SCOPE:** The specifications outlined in this document covers the furnishing of all materials, equipment, and labor for the installation and testing of the street lighting systems to be installed in the public street right-of-way or on other public property under the jurisdiction of the Unified Government and the City of Kansas City, Kansas (UG/KCK), and the Board of Public Utilities (BPU). The materials and equipment specifications outlined herein shall be strictly adhered to, or as otherwise directed by the plans or City Traffic Engineer/BPU Engineering.

**1.02 CODES AND STANDARDS:** All materials and work shall conform to the requirements of the National Electric Code (NEC, NFPA 70), the National Electrical Safety Code (NESC), the standards of the American Society for Testing Materials (ASTM) and the American Standards Association (ASA), as well as local ordinances and the Board of Public Utility (BPU) policies. Electrical equipment shall conform to the standards of the National Manufacturers Association (NEMA).

**1.03 PERMITS & INPECTIONS:** Contractors are responsible for obtaining a right-of-way permit from the UG/KCK's Public Works Department before any work within the City's right-of-way is conducted.

The City Traffic Engineer/BPU Engineering will assign an address for the power supply, which the Contractor shall use when requesting electrical service inspection through BPU. After an approved power supply inspection, Contractors shall coordinate with BPU to energize the system. The Contractor is responsible for all costs associated with the connection of power from the service point to the power supply.

Contractors shall contact the City Traffic Engineer/BPU Engineering once project work begins and to request final inspection. Contractor shall keep the City Traffic Engineer/BPU Engineering apprised of the project progress and the Contractor's proposed schedule. The City Traffic Engineer/BPU Engineering or Engineering Inspector reserves the right to require any work completed without their knowledge to be halted and dismantled, if necessary, to properly inspect the work.

**1.04 REFERENCES:** In addition to the specifications outlined herein, the following specifications should be referenced by the Contractor where required by the plans and/or contract documents:

- KDOT Standard Specification, Section 814 – Electrical Lighting Systems and Traffic Signals
- KDOT Standard Specification, Section 1703 – Electrical Lighting and Traffic Signal Equipment

**1.05 SUBMITTALS:** Prior to the start of construction, the Contractor shall submit two (2) copies of complete shop drawings for all manufactured equipment and materials to the City Traffic Engineer/BPU Engineering for approval. Manufacturer cut sheets, drawings, dimensions and other pertinent data required to confirm standard equipment should be submitted. The Contractor shall

clearly indicate specifically which item the contractor intends to use on the project on each cut sheet, drawing, or specification submitted. Items submitted that fail to comply with the specifications herein may be rejected by the City Traffic Engineer/BPU Engineering. The City Traffic Engineer/BPU Engineering may also require additional documentation for non-cataloged equipment or materials. The Contractor should not place orders for any project related equipment or materials until in receipt of written approval from the City Traffic Engineer/BPU Engineering.

If shop drawings are required to be resubmitted as a result of a proposed field modification of a structure, a registered professional engineer shall seal those shop drawings prior to submittal.

## PART 2 – MATERIALS & EQUIPMENT

**2.01 GENERAL:** All materials used in the fabrication or assembly of the items below shall comply with this specification and any applicable sections of the KDOT Standard Specifications as required by the plans and as referenced above. All lighting equipment is required to be new and consisting of a material grade that meets or exceeds these specifications.

**2.02 ALUMINUM STANDARDS:** The mounting height of street lighting poles and length of associated bracket arms shall be as specified in the plans and/or contract documents. The manufacturer, supplier, and Contractor shall guarantee that shafts and bracket arms provided on this project shall remain without defect for a period of five (5) years.

**A. POLE SHAFTS:** Aluminum lighting pole shaft (30' & 35' mounting heights) assemblies shall be spun from one piece of seamless tubing and after fabrication, it shall have a mechanical strength of not less than T6 temper. The cross section of the pole shall be round, and the shaft shall be fabricated in a continuous true taper without longitudinal or circumferential welds, except at the lower end joining the shaft to the base. The top of the pole shaft shall be equipped with a cast aluminum removable top held securely in place by means of set screws. Pole shafts shall be tire wrapped with a non-staining paper for protection during shipping.

Pole dimensions shall be as specified on the standard drawings. It is the responsibility of the fabricator to verify and attest that the material sizes proposed are structurally adequate and in full compliance with this specification and the standard drawing.

**B. SHOE BASE:** The four-bolt shoe base shall be a permanent mold casting made of aluminum alloy 356.0 T6. The base shall be free of cracks, pits, and blow holes and of sufficient size and strength to withstand full design loads. The base shall telescope the shaft; and the one weld shall be on the inside of the base at the end of the shaft, while the other weld shall be on the outside at the top of the base. The shoe base and the two (2) welds shall develop the full strength of the pole assembly. The shoe base flange shall have four slotted holes for anchorage. Four bolts, four nuts, four removable bolt covers, and eight washers shall be provided with each pole. The bolt covers shall attach to the upright portion of the body of the base. The bolt circle is provided in Table 1 of the pole detail sheet.

- C. **BRACKET ARMS:** The truss type member arm assembly shall be a one piece welded assembly consisting of an upper arm and lower arm (brace) securely joined by a vertical strut and a connector or weld at the outboard end of the arm assembly. The upper arm shall be a tapered-elliptical aluminum tubing by cold working from round tubing. After tapering, the upper arm shall then be flattened to produce an elliptical cross-section with the major diameter in the horizontal plane, parallel to the wind. The outboard end of the upper arm shall remain round with a two-inch (2") slipfitter for mounting the luminaire. The lower arm (brace) shall be 1.5" Schedule 40 pipe and the outboard end shall be covered by an end cap. The vertical strut shall be an arm connector and shall conform to aluminum alloy 6063-T4 extruded.
- D. **BREAKAWAY TRANSFORMER BASE:** Breakaway transformer bases (T-bases) shall be fabricated from aluminum alloy 356-T6. Breakaway T-bases shall also be approved by the Federal Highway Administration (FHWA) as satisfying up to the LTS-6 edition of the American Association of State Highway and Transportation Officials (AASHTO) *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*. An access door shall be provided along with stainless steel and galvanized steel hardware, per the Standard Drawings. Breakaway T-bases shall be supplied as shown on the plans and Standard Drawings.
- E. **FOUNDATIONS:** Foundations shall be screw-in or concrete and installed per the plans. Screw-in foundations are the preferred type of pole base and shall be of the size and type required by the plans and standard drawings.

Screw-in anchors shall be hot dip galvanized per ASTM-A153 with a baseplate that is perpendicular to the shaft axis (+/- 1 degree) and a hole centerline concentric to the shaft axis (+/- 0.188). Anchors shall also have two flame cut slots in the shaft perpendicular to the baseplate to allow for conduit access in and out of the foundation. The baseplate shall meet the latest edition of ASTM A36 structural steel. Shafts shall meet the latest edition of ASTM A252, grade 2 steel pipe piles. Helix shall meet the latest edition of ASTM A635 for 3/8 inch thick hot rolled steel plate or coil. The pilot point shall be the latest edition of ASTM A575 for 1-1/4 inch diameter hot rolled steel BA.

The anchors shall be screwed into the ground within the maximum and minimum torque ratings per the manufacturer's recommendations. Pre-drilling of holes for the anchor is prohibited unless otherwise approved by the City Traffic Engineer/BPU Engineering for areas where rock is encountered. The foundation shall be screwed straight into the ground and the baseplate shall be plumbed with a level and flush with the finish grade. Minor leveling adjustments may be made with the use of leveling shims or washers. Shims and washers shall be galvanized or cadmium-plated steel no more than 0.25" (6.35 mm) thick. Only one shim or washer will be allowed at any one anchor bolt with a maximum of two on any pole.

Where street light foundations are to be installed in areas of fill (embankment), resulting from roadway grading improvements or otherwise, a concrete foundation shall be installed. If screw-in foundations cannot be used for any reason, concrete foundations shall be installed at the contractor's expense.

**2.03 ILLUMINATION EQUIPMENT:** Luminaires shall be light emitting diode (L.E.D.) or high intensity discharge (H.I.D.) as specified on the plans and as pre-approved by KCK/BPU. Refer to the Pre-Approved Luminaire Product List for luminaires that are qualified to meet these specification requirements. Cobrahead luminaires shall contain a die cast aluminum housing and a corrosion resistant powder coated gray finish. A power door assembly with a removable trigger latch, or equivalent easy maintenance access door, shall be included with the luminaire. The luminaire shall be equipped with a slipfitter mounting design. Luminaires shall be prewired, requiring only connection of service wires to the terminal board. Terminal boards shall be capable of multi-tap voltage selection ranging from 120-277V. Optics for cobrahead luminaires shall be full cutoff with Type III distribution. Decorative post top luminaires housing and ribs shall made of cast aluminum with a black polyester powder coat paint finish. Mounting base casting should slipfit over a standard 3" outer diameter tenon with set screws. An internal terminal block shall be provided to support 120-277V operation. The optics shall include refractive and reflective prisms for efficiency of a Type III distribution.

For all L.E.D. luminaires, a driver adept for dimmable lighting shall be factory installed with a 7-pin receptacle (with shorting cap) that meets or exceeds ANSI C136.41-2013 standards for dimming. The operating frequency of the L.E.D. lamps shall range between 50-60 Hz with a Total Harmonic Distortion (THD) less than 20%. Surge protection rated for at least 6kV/3kA shall be integrated with the luminaire housing unit. The luminaire correlated color temperature (CCT) shall be 4000k unless otherwise approved by the City Traffic Engineer and indicated on the construction plans.

**2.04 ELECTRICAL CONDUCTOR MATERIAL:** The types and lengths of service feed, distribution, and pole & bracket cables shall be supplied as shown on the plans, Standard Drawings, or as specified in the Project Special Provisions. Cables shall meet the requirements outlined below:

- A. SERVICE FEED (LEAD-IN CABLE):** Aluminum triplex #2 AWG URD rated, capable of operating at 600 volts phase-to-phase. Service feed cable should meet or exceed all applicable requirements for ANSI/ICEA S-76-474. Additionally, it should at least meet ASTM specifications B-230, B-231, B-232, B-399, and B-901.
- B. DISTRIBUTION CABLE (SECONDARY CABLE):** Aluminum triplex #2, #4, #6, or #8 AWG URD rated, capable of operating at 600 volts phase-to-phase. Distribution cables should meet or exceed all applicable requirements for ANSI/ICEA S-76-474. Additionally, it should at least meet ASTM specifications B-230, B-231, B-232, B-399, and B-901.

- C. *POLE & BRACKET CABLES:*** Two (2) stranded annealed copper #10 AWG conductors, type THHN or THWN-2, capable of operating at 600 volts and meets applicable ASTM specifications. Additionally, UL Standards 83, 758, and 1063 shall be met. Along with the two (2) conductor leads (2 hot leads for 240V, 1 hot & 1 neutral lead for 120V), a #10 AWG copper grounding conductor shall be run from each luminaire to the grounding lug inside the pole. A solid copper ground conductor that meets or exceeds the size of the distribution cable shown on the plans for each particular circuit shall be bonded to a 5/8" x 10' ground rod at each pole.

**2.05 POWER SUPPLY:** Power supplies shall be an underground service type, rated for 100 amperes, 120/240VAC, unless otherwise noted and capable of operating fourbranch circuits. Branch circuits shall be configured for 120VAC operation unless otherwise indicated to be 240VAC on the construction plans. The pedestal shall be 0.125 aluminum #5052, rain-tight NEMA 3R construction with individual panel, contactor, and rear service pull "compartments." Meter and panel/contactor compartments shall have piano hinged doors with padlocking provisions. The panel and contactor compartments shall have an inside panel door. The outer front and inside panel doors shall be equipped with an approved doorstop. Meters are not required by BPU for street lighting power supplies, however, BPU reserves the right to demand meters for future monitoring purposes. Panelboard shall have silver plated copper buss and shall accept 12 - 1 inch plug-in breakers. Panelboard compartment shall contain a 7-pin photocell, convenience receptacle, and test switch. All factory installed wire shall be copper. Power supply shall be U.L. listed and bonded to a 5/8" x 10' ground rod.

**2.06 CONDUIT:** The type, size and length of conduit and fittings shall be supplied as shown on the Plans or Standard Drawings, or as specified in the Special Provisions. The contractor shall furnish and install high density polyethylene (HDPE) conduit and Schedule 40 and/or Schedule 80 polyvinyl chloride (PVC) for the distribution system. Galvanized Rigid Steel (GRS) conduit shall be used where conduit is to be installed on a structure.

- A. *POLYVINYL CHLORIDE (PVC):*** Rigid nonmetallic conduit shall be two-inch (2") or three-inch (3") Schedule 40 or Schedule 80 PVC conduit as indicated on the plans and standard drawings. The conduit shall bear an Underwriters' Laboratories label and shall conform to Federal Specification WC-1094A (latest version). Fittings shall be fabricated from PVC and have the same chemical and physical property as the conduit with which it is being used.

Two-inch (2") Schedule 80 PVC conduit is required under all road and commercial driveway crossings, or as otherwise shown on the plans. Three-inch (3") Schedule 80 PVC shall be used between the power supply and service point, including up the pole to the transformer.

- B. *GALVANIZED RIGID STEEL (GRS):*** Galvanized rigid steel conduit shall be in accordance with ANSI C80.1. GRS conduit shall be galvanized on both the inside and the outside surfaces. The weight (mass) of zinc coating shall be no less than 0.5 ounce per square foot of coated surface, as determined in accordance with AASHTO T 65. The interior or exterior surface, or both, may



be given a coating of suitable material to facilitate installation of wires and cables and to permit the conduit to be readily distinguished from pipe used for purposes other than electrical. All metal conduit ends shall be provided with a bushing to protect the cable from abrasion. Fittings shall be in accordance with ANSI C80.4. A sufficient number of conduit hangers shall be supplied to attach the GRS conduit to the structure, as recommended by the manufacturer. One (1) No. 6 AWG, bare copper ground wire shall be attached to each end of the GRS conduit with a grounding busing. The ground wire shall be connected to a ground rod at each end of a GRS conduit run, or extended to an adjacent GRS conduit or ground rod.

GRS conduit shall be installed where the distribution system is traversing structures such as bridges or retaining walls. Expansion fittings shall be installed at expansion joints on the structures.

- C. *HIGH DENSITY POLYETHYLENE (HDPE)*:** Flexible non-metallic conduit shall be high-density polyethylene conduit (HDPE). The conduit shall be smooth walled inside and out, and gray in color. The conduit shall be a plastic duct which is intended for underground use and which can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance. The conduit shall be manufactured to NEMA Standard TC-7 and ASTM D 3035 SDR11 specifications. The conduit shall be clearly and durably marked at least every 10 feet with the material designation, nominal duct size, and the name and/or trademark of the manufacturer. Fittings for the HDPE conduit shall be in accordance with ASTM D 2683. Epoxy used for the fittings shall be in accordance with the conduit manufacturer's recommendations.

An approved factory coupling shall be used for connection of the HDPE conduit to a 90° factory PVC elbow or between two lengths of HDPE conduit. The coupling shall be of high density polyethylene material. The coupling shall provide an airtight and watertight lock connection.

- 2.07 SERVICE/JUNCTION BOXES:** The type and size of service or junction boxes shall be supplied as shown on the Plans. All boxes shall meet a design load rating capable of withstanding operations and maintenance truck weight or an errant vehicle at a minimum of 22,500 lbs. The Contractor shall install an approved junction/pull box.

## **PART 3 – CONSTRUCTION EXECUTION**

- 3.01 GENERAL:** The Contractor shall conduct all construction activities in compliance with the Occupational Safety and Health Act (OSHA) rules and regulations. Only well trained, qualified laborers shall be allowed to perform construction activities related to street lighting and they shall be familiar with the applicable sections of the NEC. Prior to construction, the Contractor shall contact the City Traffic Engineer/BPU Engineering to set up a pre-construction meeting.

- 3.02 INSTALLATION:** The following equipment shall be installed by the Contractor as described herein, or as directed by the Plans, City Traffic Engineer/BPU Engineering or Engineering Inspector.

**A. POLE AND LUMINAIRE INSTALLATION:** Poles and luminaires shall be of the size and type required by the standard details for the pole(s) specified on the plans.

- a. **Pole Wiring:** Luminaire pole & bracket cables shall be connected to the secondary cables through in-line, waterproof, breakaway fuseholders. All secondary cable connections inside pole bases shall be made with approved multiple tap connectors. The Contractor shall install in-line waterproof breakaway fused and non-fused disconnects in each pole base. Two (2) fused disconnects shall be utilized for each “hot” and/or neutral lead and one (1) non-fused disconnect shall be used for the ground. The multiple tap connectors and fuseholders shall be installed convenient to the transformer base access door. One (1) foot of surplus cable shall be coiled at the line side of the multiple tap connector, between the connector and the fused disconnect, and on the load side of the fused disconnect.

The incoming distribution ground wire and ground rod grounding wire shall be fastened to the factory-installed grounding lug in the base of the pole. The ground rod grounding wire shall match the size of the incoming distribution wire. Additionally, a single conductor #10 AWG ground wire shall be run from each luminaire head to the ground lug.

The pole wiring shall be color coded (black = hot, white = neutral, green = ground) and without splices from the fuseholder to the connection at the luminaire.

- b. **Pole and Luminaire Erection On Screw-In Anchor Foundations:** The 30’ or 35’ pole shall be fastened to the foundation with a breakaway transformer base using pole manufacturer recommended bolts and nuts. The nut shall be on top. A washer shall be installed under the bolt head and another under the nut. The pole shall be checked for plumb, minor corrections made using galvanized or cadmium plated steel shim stock, the nuts tightened and the anchor bolt covers installed. Transformer bases access doors shall be situated so that they are on the house side, or opposite side from the adjacent traffic. For poles installed in a median, the transformer doors should be oriented away from one direction of oncoming traffic, facing North or East.
- c. **Pole and Luminaire Erection On Concrete Foundations:** No sooner than five (5) days after construction of the foundation, a nut and washer shall be installed on each anchor bolt. The 30’ or 35’ pole will be mounted to a breakaway transformer base using nuts, bolts, and washers as recommended by the pole manufacturer. Using the lower nuts, the pole shall be brought into vertical alignment (plumb), the top nuts tightened, and the anchor bolt covers installed. The opening between the pole base and the foundation shall be taped and grouted. Transformer bases access doors shall be situated so that they are on the house side, or opposite side from the adjacent traffic. For poles installed

in a median, the transformer doors should be oriented away from one direction of oncoming traffic, facing North or East.

- d. **Luminaire On Bracket Arms:** The luminaire slipfitter shall be installed on the davit supplied with the bracket arm. The luminaire and davit shall project from the street side of the pole and be perpendicular to the curb line, unless otherwise directed in the plans.
- e. **Luminaire Adjustment:** The luminaire shall be adjusted and leveled in accordance with the manufacturer's instructions. The nadir shall be placed directly below the light source center. Luminaire should typically be installed such that the frontal view of the luminaire is parallel to the road surface, while in the side view the luminaire should be horizontal.
- f. **Storage, Protection, & Clean Up:** Poles and mast arms shall be kept dry and out of the weather until time for erection. The manufacturer's protective paper wrapper may be removed for inspection upon receipt from the manufacturer. Poles and luminaires shall be cleaned of dirt, grease, etc. Scratches, abrasions or other surface damage shall be repaired to like new condition.

**B. FOUNDATIONS:** Foundation anchors and reinforcing steel shall be of the size and type required by the standard details for the pole(s) specified on the plans.

- a. **Screw-In Foundations:** The anchors shall be screwed into the ground. Pre-drilling of holes for the anchor is not allowed. During installation the foundation shall be plumbed with a level. The foundation shall be screwed straight into the ground and the base plate shall be level. Minor leveling adjustments may be made with the use of leveling shims or washers. Shims and washers shall be galvanized or cadmium-plated steel no more than 1/4 inch thick. Only one shim or washer will be allowed at any one anchor bolt with a maximum of two on any pole. If screw-in foundation anchors are not able to be used for any reason, concrete foundations shall be installed at the contractor's expense.
- b. **Concrete Foundations:** The bottom of the concrete foundations shall rest on firm ground; foundations shall be poured monolithic. Forms shall be true to line and grade. Top of footing for standards, except special foundations, shall be finished to curb, or sidewalk grade or as directed by the City Traffic Engineer/BPU Engineering. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position, to proper heights, and held in place by means of a template until the concrete sets. Anchor bolts shall be provided with hex head nut, flat washer and lock washer. Both forms and ground which will contact the concrete shall be thoroughly moistened before placing concrete.

Pole base and power supply foundations shall be KCMMB4K, air entrained, 28-day compressive strength Portland Cement Concrete. Aggregate shall be Kansas Class 1 or Class 6.

Reinforcing steel for concrete bases shall be accurately cut and bent to the dimensions and shapes shown on the standard details. Cutting and bending tolerances for reinforcing steel shall be in accordance with the latest edition of the Concrete Reinforcing Steel Institute's *Manual of Standard Practice*. Flame cutting of uncoated reinforcing steel may be permitted. Reinforcing steel shall be protected from damage at all times. When placed in the work and before concrete is placed, reinforcing steel shall be free from dirt, oil paint, grease, loose mill scale, thick rust, any dried mortar and other foreign substances. A thin layer of powdery rust may remain. Reinforcing bars shall be positively secured against displacement. The bars shall be firmly tied at alternate crossings or closer. The steel shall be spot welded or tied in the correct position with proper clearance maintained between the forms and reinforcement. Splicing of bars shall not be allowed. Concrete shall not be placed until forms and reinforcing steel have been checked and approved by the Engineering Inspector.

Concrete pole bases shall be consolidated by an internal type vibrator. The vibrator shall operate at frequencies of vibration not less than 4,500 cycles per minute under load. The amplitude of vibration shall be adequate to consolidate concrete properly. The concrete shall be cured with an approved moisture barrier such as wet burlap, polyethylene, etc., for a period of seventy-two (72) hours. Cold weather curing shall be such that the concrete temperature shall be maintained above freezing for the entire curing period. Forms shall not be removed until the concrete is thoroughly set.

The exposed portions of the foundation shall be finished to present a neat appearance. Finishing should be done with the positioning jig in place. If the jig must be removed for finishing, it shall be re-installed immediately after finishing and left in place throughout the cure period. A safety device (traffic cone, Type I barricade, etc.) shall be installed and secured firmly in place over each foundation immediately after finishing and remain in place until the pole or pedestal is installed. Prior to installing the pole or pedestal, the positioning jig shall be removed, loose concrete cleaned from around the anchor bolts and conduits, and the conduits trimmed to provide proper clearance for the pole or pedestal.

- C. **WIRING:** The roadway lighting conductor system shall be installed in 2"-3" HDPE and/or SCH 40 or 80 PVC conduit, or as otherwise sized in the plans, wired and installed as a 120 or 240 volt system as required and shown on the plans. Wiring shall conform to the appropriate articles of the National Electric Code. Wiring shall be continuous from street lighting appurtenance to street lighting appurtenance. No splices of cable will be permitted in conduit or outside of pull boxes, junction boxes, or pole bases. Conductors for service and branch circuits shall be Triplex

URD rated, sized in accordance with the plans by the Design Engineer. Conductors for all pole and bracket cables shall be copper 2c-#10 THHN/THWN-2 rated.

Powdered soapstone, talc or other approved lubricant shall be used when inserting conductors in conduit. All cable to be installed in one conduit shall be pulled by the Contractor in one operation, and all ends shall be taped to exclude moisture and shall be so kept until the splices are made or terminal appliances attached. Ends of spare conductors shall be taped.

All splices in junction boxes and pull boxes shall be made with appropriate in-line splice connectors. Such splices shall be carefully wrapped with three successive layers of Scotch (3M) No. 130C, "Linerless Rubber Splicing Tape" and then wrapped with three layers of Scotch (3M) No. 33+ "Electrical Tape". The total diameter of the taped splice shall be approximately 1 ½ times the diameter of the spliced conductor covering. 3M Scotchkote electrical coating shall be "Painted" over the splice. Two feet of slack shall be left at all power supplies, junction boxes and pull boxes for splicing and connecting wires. Wiring within boxes shall be neatly arranged and laced up. Wires shall be color-coded (black = hot, white = neutral, green = ground) and circuits permanently identified in accordance with designations used on the plans.

All distribution cable connections inside the base of the light pole shall be made with approved waterproof, breakaway fused and non-fused disconnects. Two disconnects for each hot lead (fused) and one disconnect for the ground ("dummy fuse") shall be installed. Two additional disconnects for the hot leads shall be provided for twin luminaire poles (ground disconnect is shared). Fuses shall be high interrupting, 8-amp and as approved by BPU. The breakaway disconnect fuseholders shall be installed convenient to the handhole at the base of the pole.

One (1) foot of surplus cable shall be coiled at the line side of the breakaway connector, between the connector and the fused disconnect, and on the load side of the fused disconnect. The connectors for the ground shall be installed with the male end of the connector on the line side. The ground wire shall be fastened to the factory installed ground lug in the base of the light pole. All poles shall be bonded to form a continuous system. At each pole and multiple service point, a ground rod shall be installed. The electrode shall be a copper rod not less than five-eighths (5/8) inch in diameter and ten (10) feet in length, unless otherwise noted on the plans, driven to a depth so the top is six (6) inches below the surface of the ground. The service equipment shall be bonded to the driven ground rod by a copper wire of equal size to the distribution cable on the plans, and enclosed in a one (1) inch diameter conduit.

- D. POWER SUPPLY PEDESTAL AND FOUNDATION:** The power supply assembly, including the pedestal, circuit breakers, fuses, contactors, photoelectric control, control wiring, meter socket, service feed, and foundation, shall be constructed and installed as shown on the Plans and Standard Drawings, and as specified in the Special Provisions or as directed by the Engineer. The Contractor shall coordinate his activities with BPU to insure delivery of power to the power supply when and where required by the plans. The power supply pedestal shall be cleaned of

wrapping, shipping material, dirt, grease, etc. Scratches, abrasions or other surface damage shall be repaired to like new condition. The photo cell shall be directed north unless southbound traffic may impact photo cell operation. Power supply foundations shall have two to four (2-4) 2 inch conduits for exiting cables (one per circuit), one (1) one inch conduit for grounding rod and cable, and one (1) 3 inch conduit for service cable. Grounding cable for the power supply shall be a bare copper #6 AWG. The direction of the existing conduit and the orientation of the power supply shall be approved by the Engineering Inspector.

- E. CONDUIT:** All labor, materials, and equipment shall be furnished with all distribution system work. All conductors shall be run in conduit between all lighting equipment locations. Conduit shall be installed as shown on the Plans and Standard Drawings, and as specified in the Special Provisions or as directed by the City Traffic Engineer/BPU Engineering to avoid underground obstructions. The size of the conduit used shall be as shown on the Plans, and as specified in the Special Provisions. Schedule 80 PVC conduits shall be used under existing/proposed street pavement, commercial driveways, PVC conduit bending locations, or any above ground conduit runs. HDPE SDR 11 or Schedule 40/80 PVC conduit may be used at all other locations.

- a. **Installation:** The conduit installed under all roadway surfaces shall be placed a minimum of forty-eight (48) inches below the top of curb elevation; under drives and within shoulders at a minimum depth of twenty-four (24) and a maximum of forty-eight (48) inches below finished grade. Street lighting conduit may be installed in the same trench with traffic signal or fiber optic conduit as long as the minimum depth requirements are met and a minimum of twelve (12) inches of vertical separation between the top of one conduit and the bottom of the other is maintained. Conduit set in standard bases shall extend approximately three (3) inches above the foundation vertically. Conduit entering through the bottom of a junction/pull box shall be located near the ends to leave the major portion of the box clear. Conduit entering junction/pull boxes shall terminate two (2) inches inside the box wall and shall be sloped to facilitate pulling of cable. At all outlets, conduit shall enter from the direction of the run.

The ends of all conduits shall be well-reamed to remove burrs and rough edges. Field cuts shall be made square and true so that the ends will butt or come together for the full diameter thereof. Conduit bends, except factory bends, shall have a radius of not less than six times (6x) the inside diameter of the conduit. Where factory bends are not used, conduit bends shall be made without crimping or flattening, using the longest radius practical and utilizing an appropriate conduit bending tool.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel and blown out with compressed air.

- b. **Trenching:** A trench crossing a proposed street shall be backfilled with clean one-half inch (½") crushed rock (CA-5) to two feet (2') behind the future curb. If the bottom of

the trench is in rock or rocky soil, the conduit shall be placed on a six-inch (6") protective layer of clean, tamped backfill material. Backfill within six inches (6") of the conduit shall be free of rock or other solid material likely to cause damage. All backfill material shall be compacted to a density at least ninety percent (90%) of the maximum density for the material used as determined by ASTM D-698. The six inches (6") of backfill nearest the conduit shall not be machine compacted.

- c. **Boring:** Conduit for a power service cable to be placed under an existing developed area outside a street right-of-way shall be installed using approved boring methods. Also, where a conduit is to be placed under an existing paved surface, it shall be installed using approved boring methods. No existing developed property outside a street right-of-way or existing paved surface shall be cut or otherwise disturbed without the written permission of the Engineer and then only in the event insurmountable obstructions are encountered. The conduit shall be bored at a depth of between twenty-four inches (24") and thirty-six inches (36") below the final grade. Boring pits shall be kept two feet (2') clear of the edge of any type of pavement wherever possible. Excessive use of water, such that the paved surface might be undermined or the subgrade softened, will not be permitted. Boring may be used instead of trenching at all other locations.

**F. BOXES:** Junction boxes and/or pull boxes shall be installed at the locations shown on the plans. However, boxes should not be located in sidewalks and driveways. A box shall also be installed at each end of a conduit run that crosses the road, unless intercepting a street light pole. The Contractor may install, at his own expense, additional boxes as may be desired to facilitate the work upon approval of the Engineer. Junction and pull boxes shall be installed on crushed rock (CA-5) at the designated depths shown on the standard details or as directed by the Engineer. Cinders, broken concrete, broken rock, or other hard or undesirable material shall not be used for backfilling. Unless otherwise directed by the Engineer, boxes shall be installed level to 1 inch (25 mm) above the finish grade.

**G. INSTALLATION LOCATIONS:** Unless otherwise noted on the plans, or obstructions exist, equipment shall be installed at the following locations:

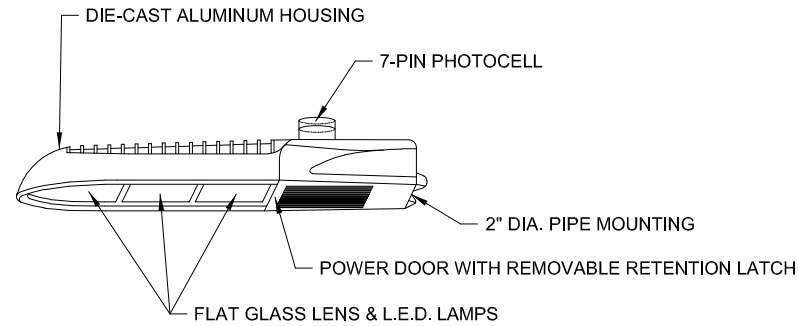
- a. **Conduit:** One (1) foot behind the back of curb.
- b. **Street Light Poles:** Three (3) feet behind the back of curb to center of pole and on property lines. Transformer base access doors shall be situated such that they are on the house side, or on the opposite side of adjacent traffic.
- c. **Junction/Pull Boxes:** Two (2) feet behind the back of curb to center of box and no closer than two (2) feet to any street light pole.
- d. **Power Supplies:** Located within the right-of-way and in accordance with BPU requirements and City ordinances.

- H. *SYSTEM TESTING:*** The Contractor is responsible for testing the completed street lighting system. Prior to acceptance, the Contractor shall notify the Engineering Inspector for an inspection as soon as the system(s) is (are) ready. All street lighting system elements shall function properly as a complete system for a minimum period of ten (10) days before acceptance will be granted. The ten (10) day period shall be continuous and initiated by the Engineering Inspector. Any malfunction observed or recorded shall stop the test period as of the time of the malfunction. A period shall start when the malfunction has been repaired to the satisfaction of the inspector. After the burn test is completed, the street light system(s) must remain in operation if the street is open to vehicle traffic.
- I. *MAINTENANCE WORK:*** The Contractor is responsible for making all repairs and replacements, including downed poles, damaged or cut cables, and burnt out lamps, to the street lighting system, regardless of the cause or responsible party, until the entire system is completed, inspected and accepted.
- J. *REPLACEMENT OF DAMAGED PROPERTY:*** The Contractor shall be held responsible for replacing or reconstructing in kind, any damaged property that result from construction activities including, but not limited to, sidewalks, curbs, gutters, Portland Cement concrete and asphaltic concrete pavement, grass, drainage structures and irrigation systems. The new work shall be restored to its original and serviceable condition satisfactory to the City Traffic Engineer/BPU Engineering. Whenever a part of a square or slab of existing concrete sidewalk, driveway or pavement is broken or damaged, the entire square or slab shall be removed and reconstructed at the expense of the Contractor.

## **PART 4 – MEASUREMENT & PAYMENT**

- 4.01 *METHODS OF MEASUREMENT:*** The street light installation as indicated on the plans, complete-in-place and accepted, will be measured as a unit lump sum quantity for all work necessary.
- 4.02 *BASIS OF PAYMENT:*** The street light installation measured as provided above will be paid for at the contract lump sum bid price for the “LIGHTING SYSTEM”.

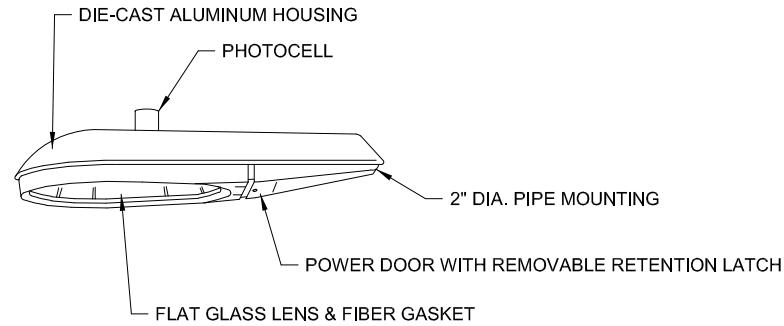




### L.E.D. LUMINAIRE

(150 WATT, 250 WATT, & 400 WATT HPS EQUIVALENT)

\*L.E.D. SHOWN IS SCHEMATIC ONLY, ACTUAL APPEARANCE MAY VARY

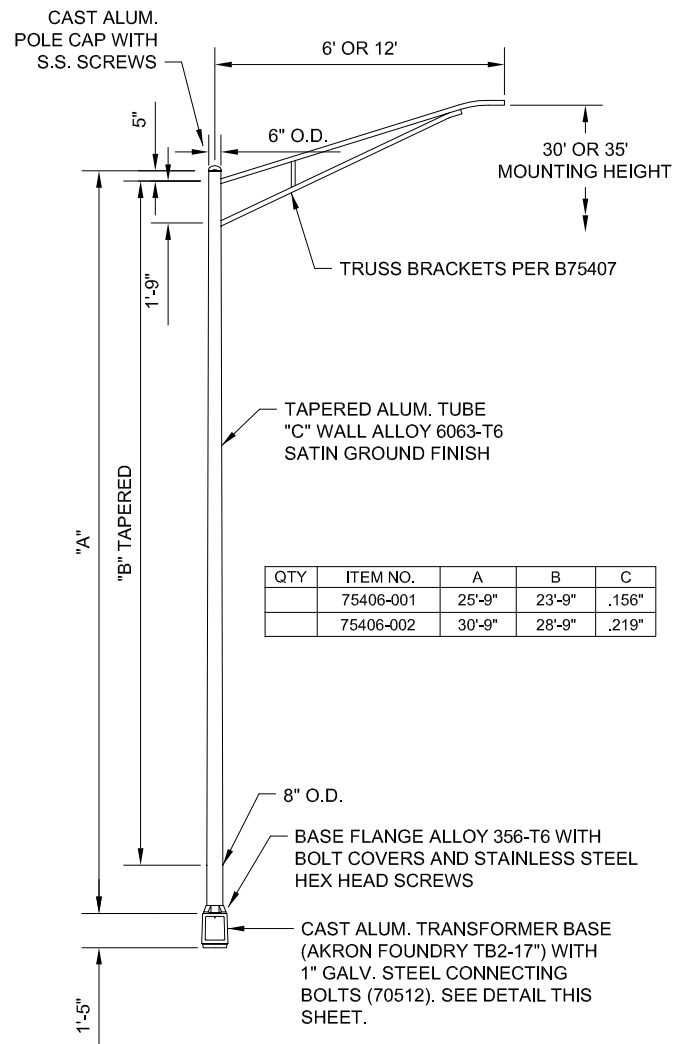


### H.P.S. LUMINAIRE

(250 WATT)

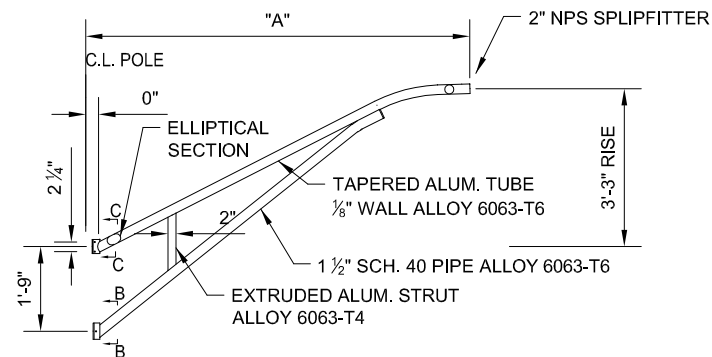
#### NOTES:

- LUMINAIRES SHALL POSSESS THESE GENERAL CHARACTERISTICS AND BE PROVIDED AS SPECIFIED ON THE PLANS.
- H.P.S. LUMINAIRES SHALL ONLY BE USED WHERE PRE-APPROVED BY UG/KCK & BPU.
- FOR DECORATIVE H.P.S. LUMINAIRES AND POLE DETAILS, REFER TO THE STANDARD DRAWING DETAILS FOR DECORATIVE LIGHT POLES.
- REFER TO THE APPROVED PRODUCT LIST FOR L.E.D. AND H.I.D. LUMINAIRES
- ALL L.E.D.'S SHALL HAVE A 4000K C.C.T.

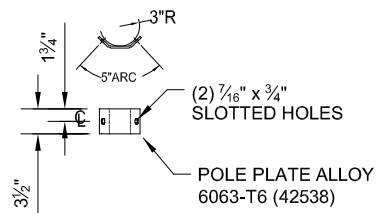


### STREET LIGHT POLE

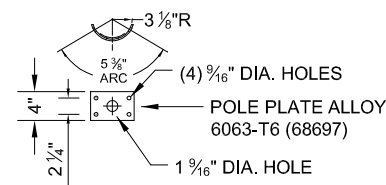
(HAPCO DRAWING B75406)



QTY	ITEM NO.	A	TUBE SIZE	ELLIPTICAL SECTION
	75407-001	6'	3" O.D.	2 3/8" x 3 1/2"
	75407-002	12'	3 1/2" O.D.	2 3/8" x 4 3/8"



#### VIEW B-B



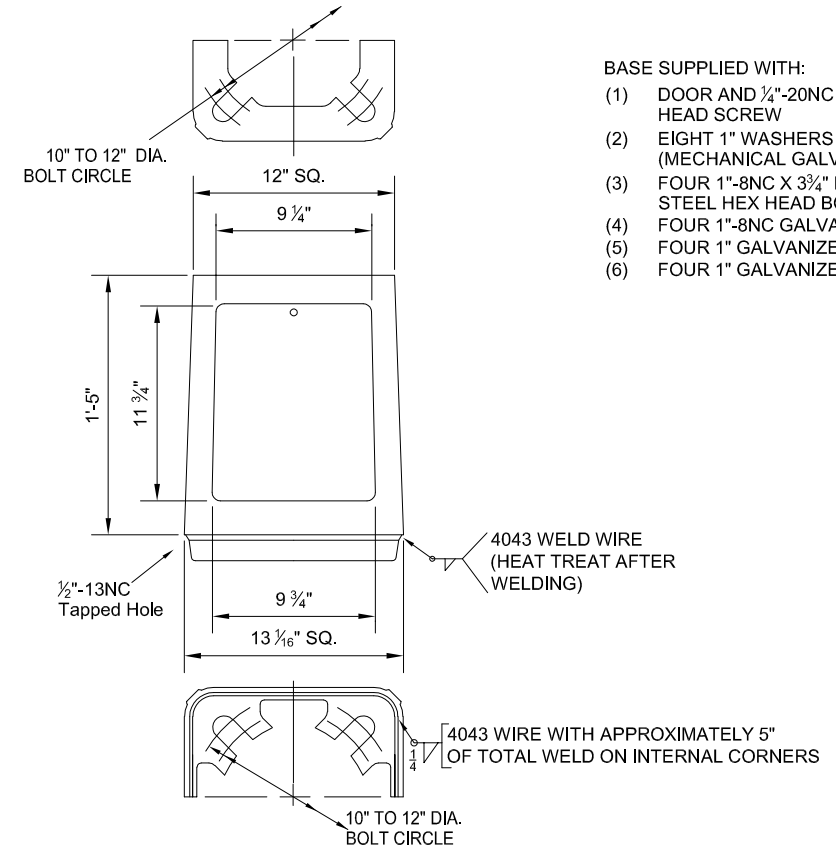
#### VIEW C-C

FURNISH THE FOLLOWING STAINLESS STEEL HARDWARE WITH EACH BRACKET:

- 1/2"-13NC X 1 1/2" LONG HEX. HEAD BOLTS
- 1/2" SPRING LOCKWASHERS
- 3/8"-16NC X 1 1/2" LONG HEX. HEAD BOLTS
- 3/8" SPRING LOCKWASHERS

### STREET LIGHT BRACKET ARM

(HAPCO DRAWING B75407)



AKRON FOUNDRY TB2-AF 1012-17 I.W.

(TB2-17")

MATERIAL: ALUM. ALLOY 356-T6

### TRANSFORMER BASE

(HAPCO DRAWING A70512)

BASE SUPPLIED WITH:

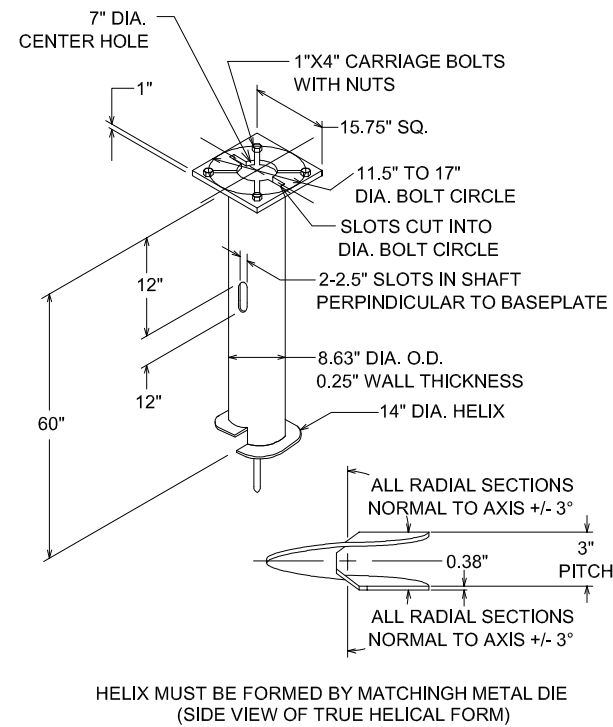
- DOOR AND 1/4"-20NC STAINLESS STEEL HEX HEAD SCREW
- EIGHT 1" WASHERS 1/2" THICK X 2 3/4" O.D. (MECHANICAL GALV. PER ASTM B454)
- FOUR 1"-8NC X 3 3/4" LONG GALVANIZED STEEL HEX HEAD BOLTS
- FOUR 1"-8NC GALVANIZED STEEL HEX NUTS
- FOUR 1" GALVANIZED STEEL LOCKWASHERS
- FOUR 1" GALVANIZED STEEL FLATWASHERS

STREET LIGHTING DETAILS 1 OF 4  
POLE, BRACKET ARM, LUMINAIRE, AND  
TRANSFORMER BASE DETAILS

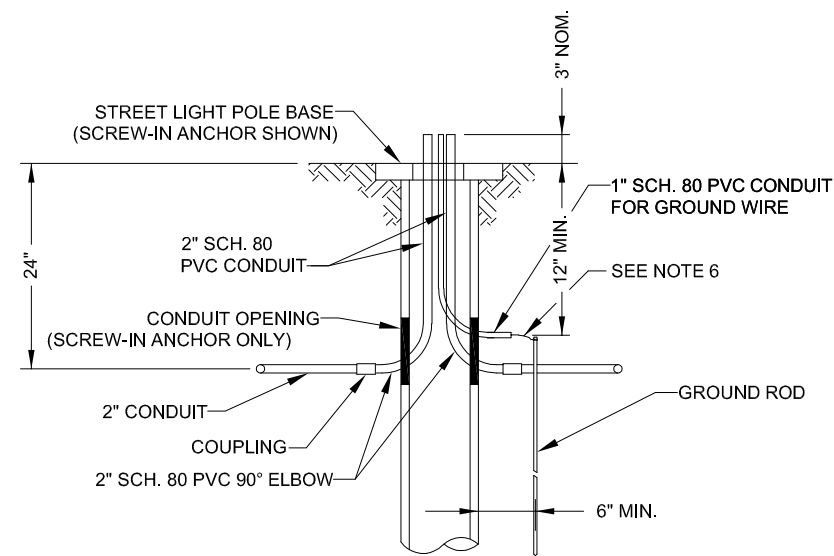
CITY OF KANSAS CITY, KANSAS  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION



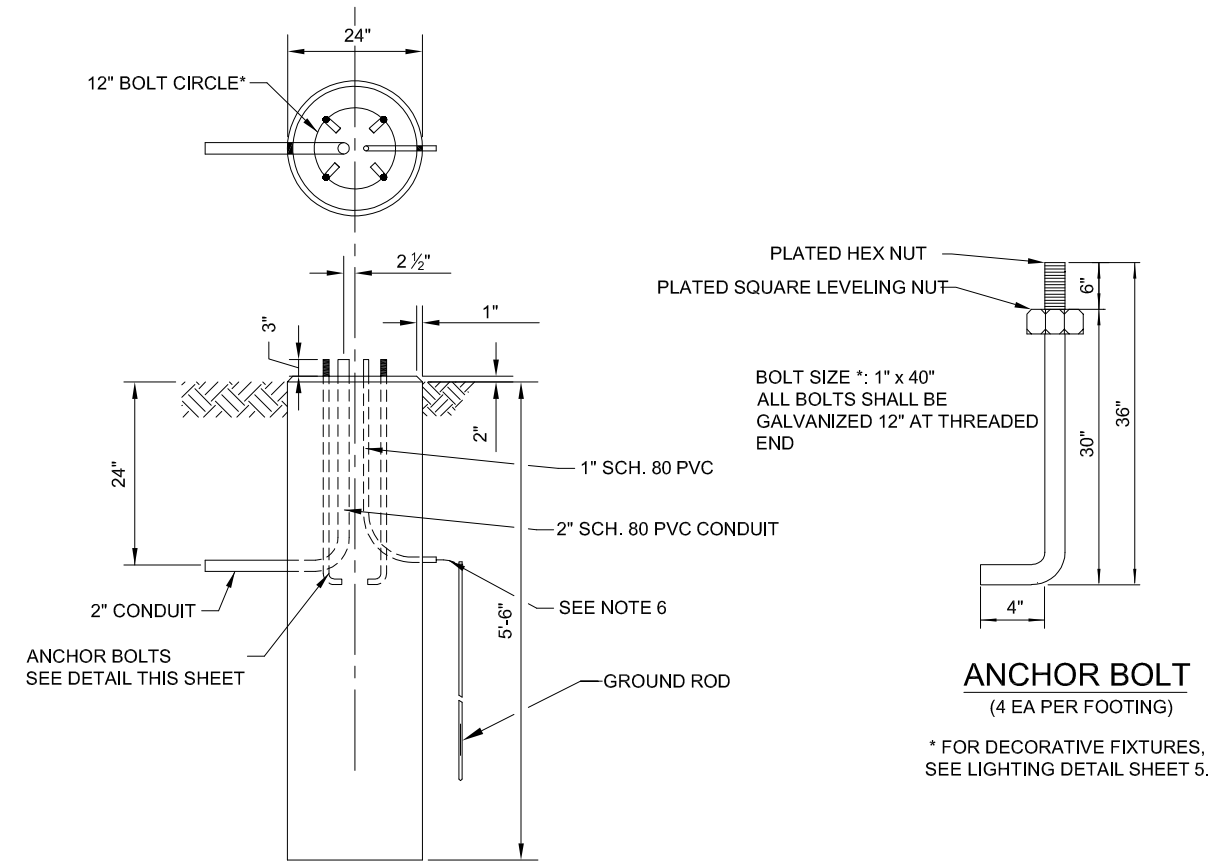
DESIGNED:	-	DRAWN:	-
CHECKED:	KCK	DATE:	10/16/18
SCALE:	N/A	SHEET NO.:	



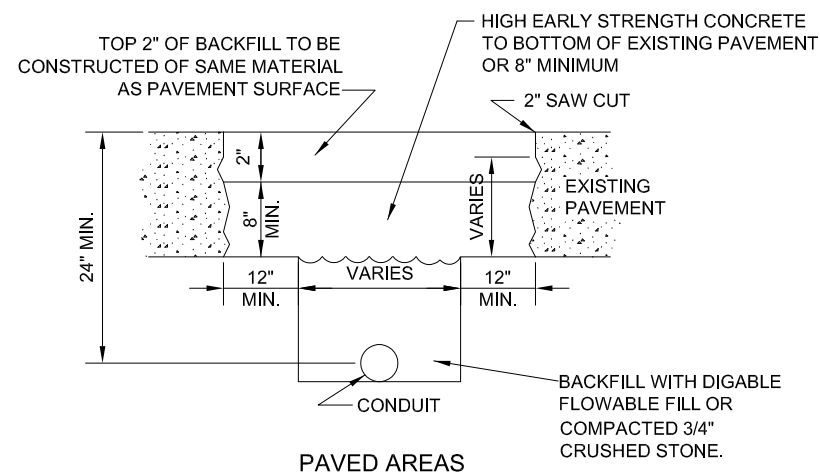
**SCREW-IN FOUNDATION**



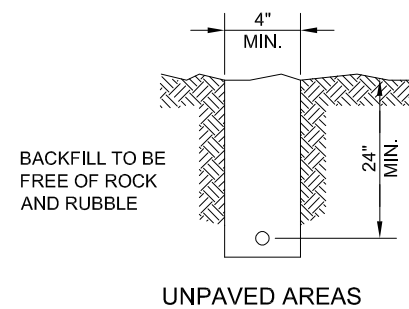
**CONDUIT ENTRANCE AND GROUNDING**



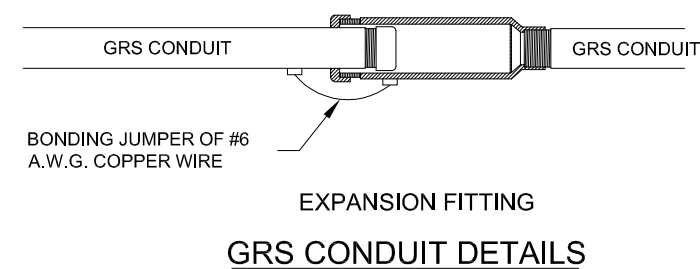
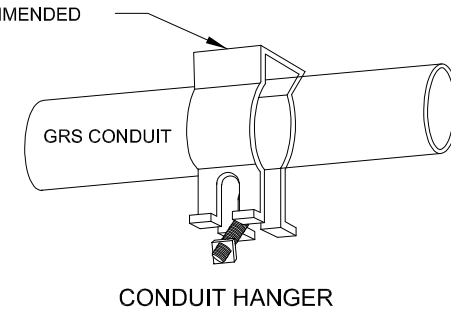
**CONCRETE FOUNDATION**



**TRENCHING**

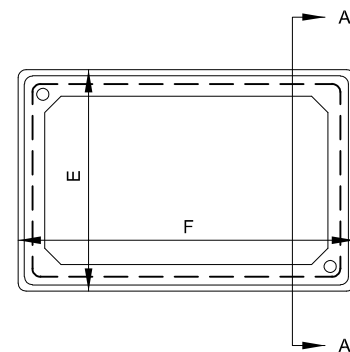
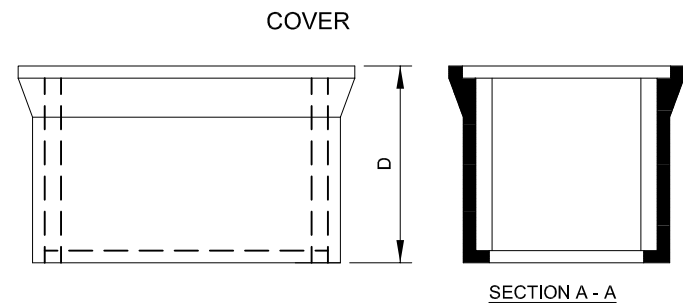
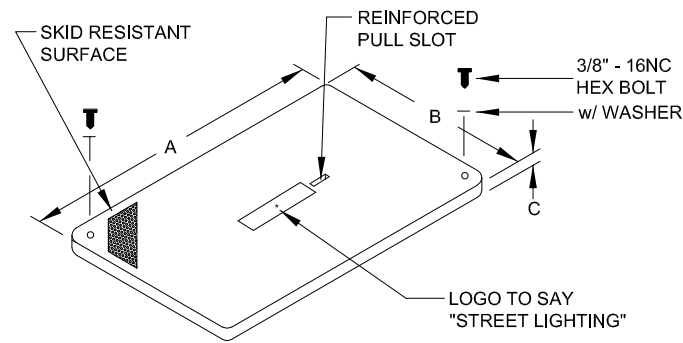


FASTEN TO BRIDGE AS RECOMMENDED BY THE MANUFACTURER



- NOTES:
1. ALL CONDUITS INSTALLED ABOVE GROUND SHALL BE GRS.
  2. CONDUIT ATTACHED TO BRIDGES SHALL HAVE EXPANSION FITTINGS INSTALLED AT EACH END OF THE BRIDGE AND AT EACH EXPANSION JOINT ON THE BRIDGE.
  3. ALL GRS CONDUITS SHALL BE ELECTRICALLY BONDED BY GROUNDING BUSHING AND GROUND WIRE AS DETAILED.
  4. INSTALL THE CONDUIT AND CONNECTOR ASSEMBLY TO PERMIT A 1/2" MINIMUM LONGITUDINAL TRAVEL IN EITHER DIRECTION.
  5. ALL CONDUIT & FOUNDATION ELEMENTS ON THE DESIGN PLANS SHOULD FOLLOW BPU/UG SPECIFICATIONS & DESIGN GUIDE
  6. INSTALL BARE COPPER GROUND CONDUCTOR SIZED EQUIVALENT TO THE DISTRIBUTION CABLE OF THE CORRESPONDING CIRCUIT AT EACH POLE.

STREET LIGHTING DETAILS 2 OF 4 POLE FOUNDATIONS AND CONDUIT DETAILS			
CITY OF KANSAS CITY, KANSAS PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION			
DATE	DESIGNED:	CHECKED:	DRAWN:
REVISIONS		KCK	10/16/18
		SCALE:	SHEET NO.:
		N/A	

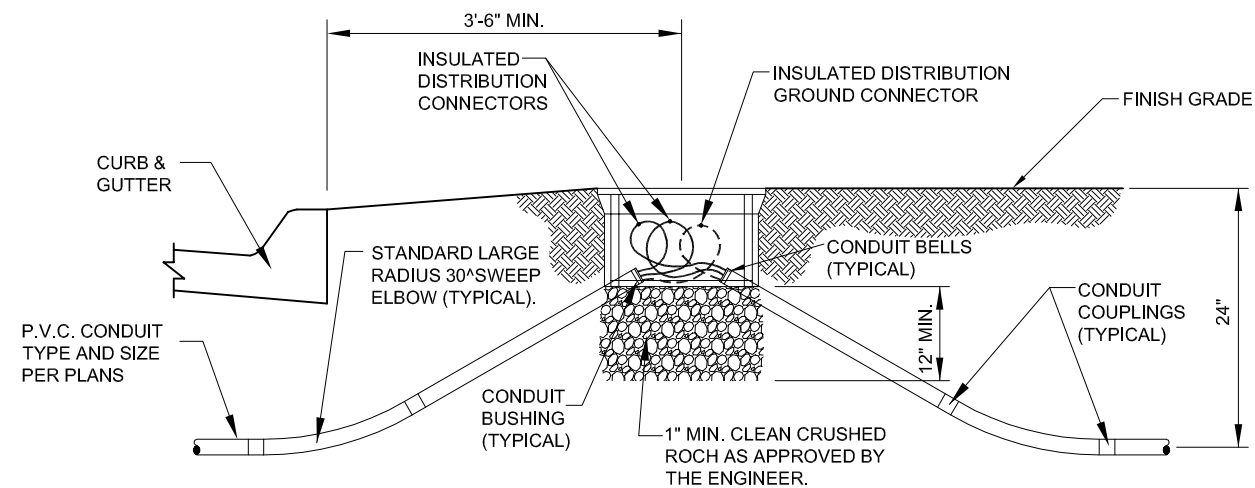


- NOTES:
1. BOXES SHALL BE STACKABLE FOR EXTRA DEPTH.
  2. BOXES AND COVERS SHALL HAVE A DESIGN LOAD RATING OF 22,500 LBS. MIN.

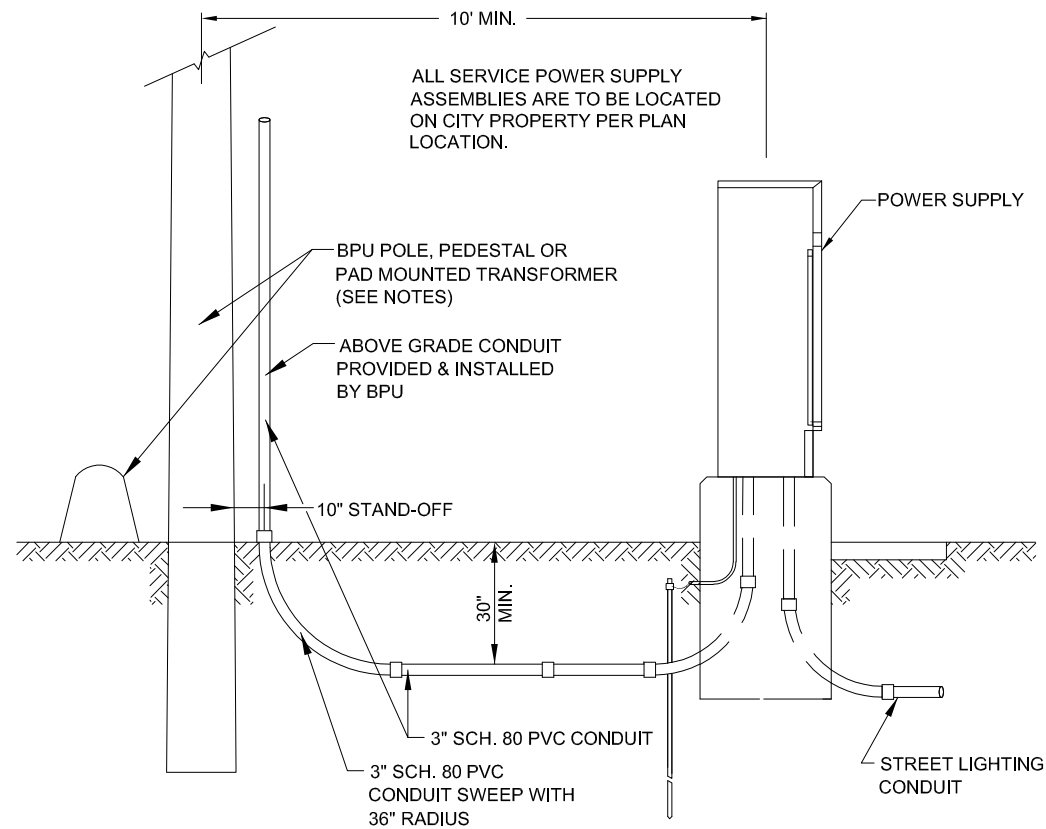
BOX

DIMENSIONS (IN.)					
A	B	C	D	E	F
30 1/2"	17 1/2"	2"	24"	19 7/8"	32 7/8"

## FIBERGLASS REINFORCED POLYMER CONCRETE JUNCTION/PULL BOXES



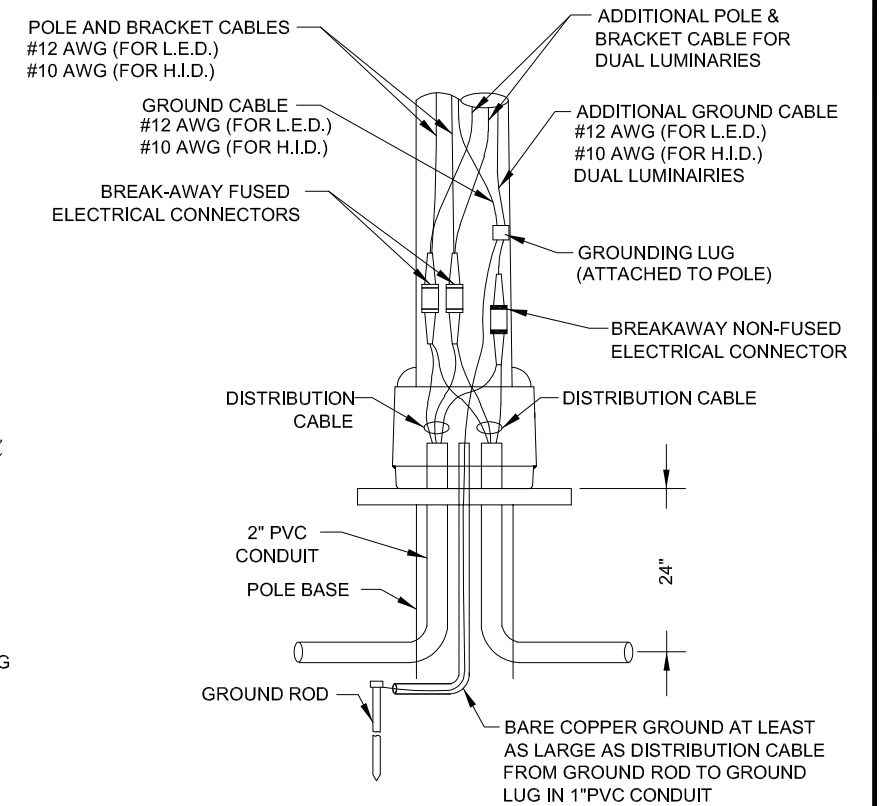
JUNCTION/PULL BOX WIRING DETAIL



## SECONDARY SERVICE CONNECTION

- NOTES:
1. FOR POLE MOUNTED TRANSFORMERS, CONTRACTOR SHALL INSTALL A 3" SCHEDULE 80 PVC CONDUIT SWEEP TO JUST ABOVE GRADE AND AT A 10" STAND-OFF FROM THE UTILITY POLE. THE CONDUIT SHOULD BE POSITIONED AT THE BASE OF THE POLE SUCH THAT A CONDUIT (BY BPU) WILL RUN DIRECTLY UP THE POLE WITHOUT CONFLICTING WITH UTILITIES.
  2. FOR GROUND MOUNTED PEDESTALS, CONTRACTOR SHALL INSTALL 3" SCHEDULE 80 PVC CONDUIT IN A TRENCH TO WITHIN 24" OF THE PEDESTAL OR PAD MOUNTED TRANSFORMER. AN ACCESS HOLE 36" x 36" x 36" IN SIZE SHALL BE PROVIDED. CONTRACTOR SHALL KEEP THE OPEN TRENCH COVERED AND PROMPTLY BACKFILL ACCESS HOLE WHEN SERVICE CONNECTION IS COMPLETE.

NOTE:  
ALL LIGHTING EQUIPMENT SHALL BE 120V OR 240V,  
DEPENDING ON DESIGN SHOWN IN PLANS.



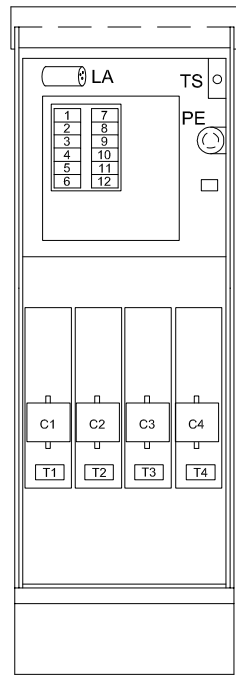
## POLE WIRING DETAIL

STREET LIGHTING DETAILS 3 OF 4  
LIGHT POLE WIRING, JUNCTION BOXES,  
AND SERVICE CONNECTION DETAILS

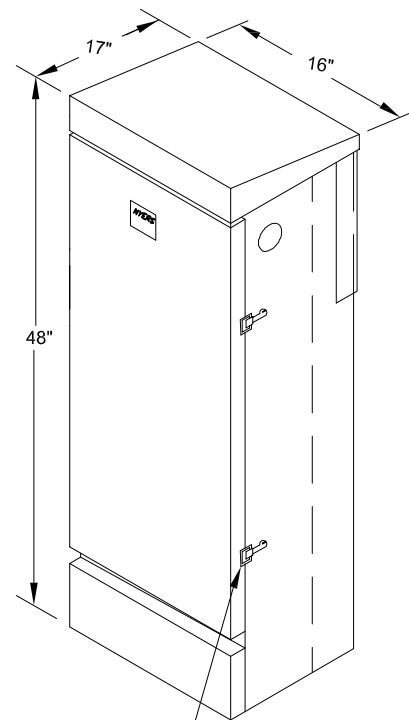
CITY OF KANSAS CITY, KANSAS  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION



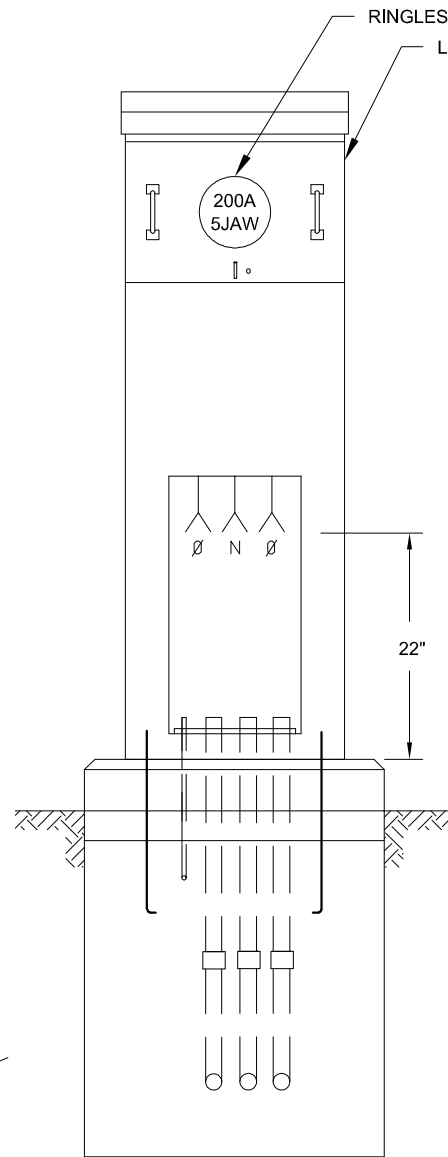
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SCALE:	N/A	SHEET NO.:	



INTERIOR VIEW  
(LESS COVERS)

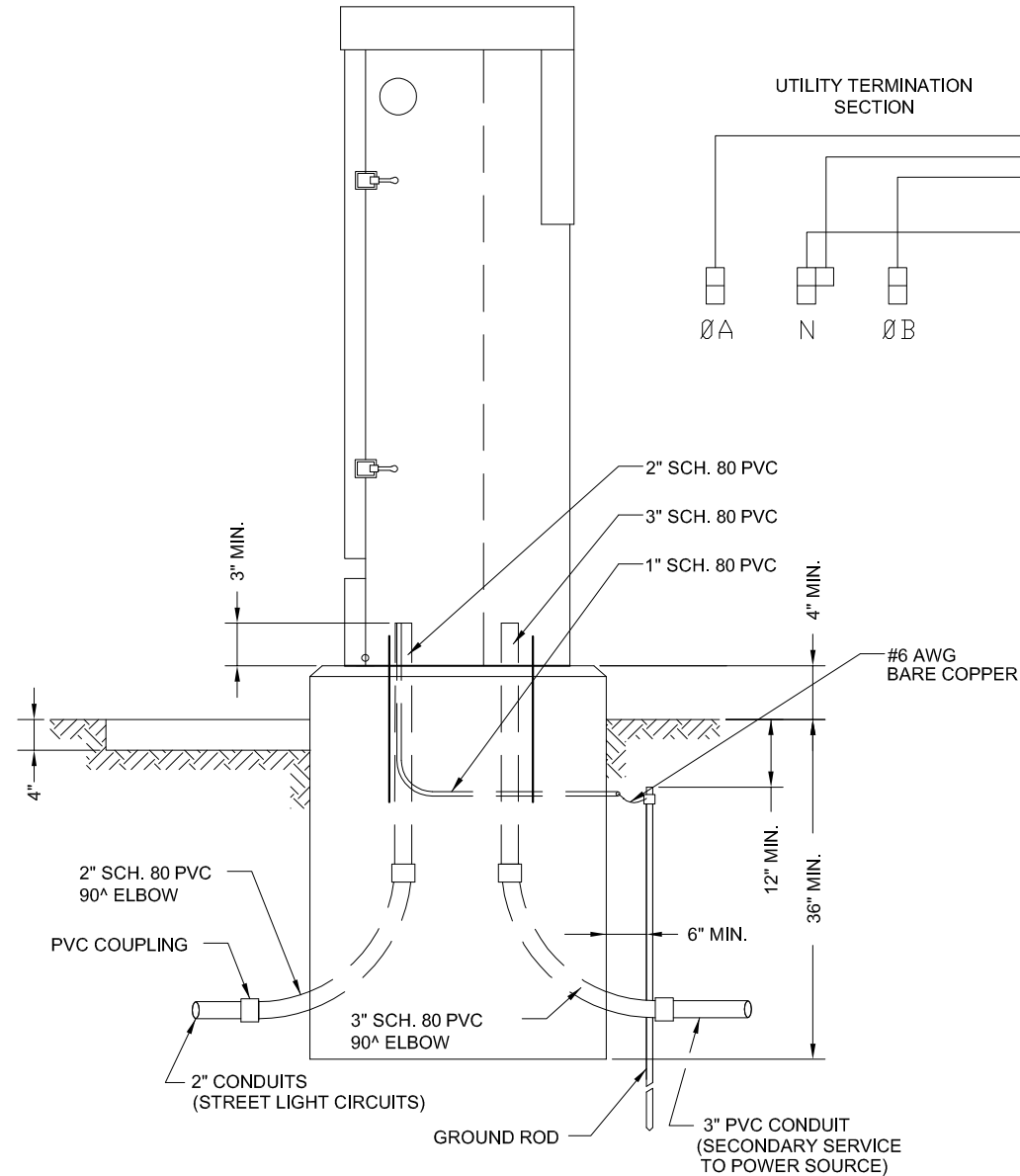


PADLOCKABLE  
LATCH (2)

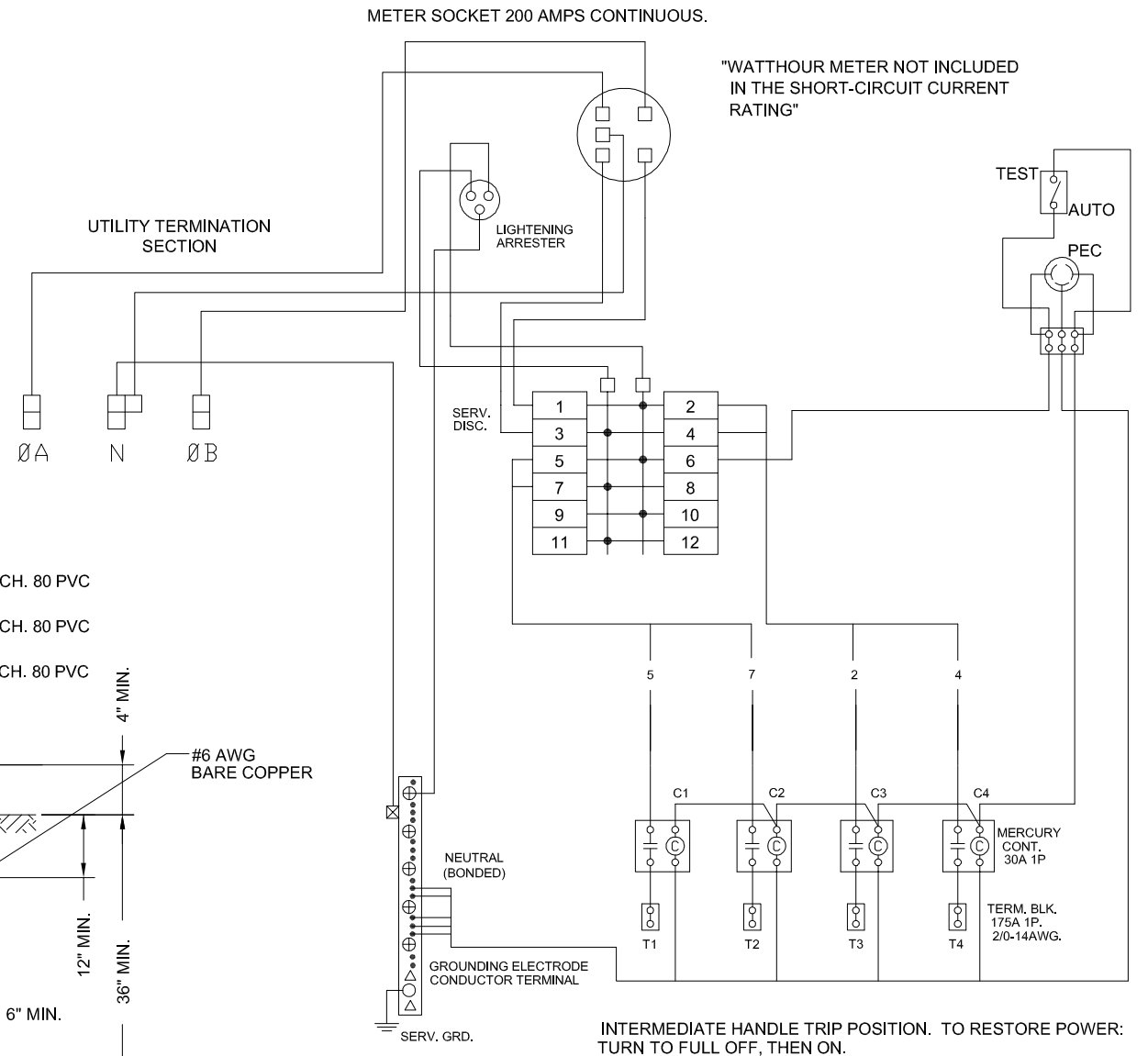


REAR VIEW  
(LANDING DETAIL, COVER REMOVED)

- NOTES:
1. PHOTOELECTRIC CELL SHOULD BE ORIENTED TO THE NORTH OR EAST.
  2. SEAL AROUND JOINT BETWEEN CABINET AND BASE WITH LIFETIME SILICONE CAULK.
  3. ALL EXPOSED EDGES OF THE BASE SHOULD HAVE A 1" CHAMFER.
  4. IF BASE IS ADJACENT TO A TRAFFIC SIGNAL CONTROLLER, RAISED PORTION OF BASE (ABOVE FINISHED GRADE) SHOULD BE CONSTRUCTED TO THE SAME HEIGHT AS THE SIGNAL CONTROLLER BASE.
  5. THE STREET ADDRESS WITH THE POWER SUPPLY NUMBER BELOW IT SHOULD BE LABELED ON THE UPPER PORTION OF THE CABINET FACING THE STREET. BPU WILL SUPPLY STICKERS FOR THE CONTRACTOR TO INSTALL.



RIGHT SIDE VIEW



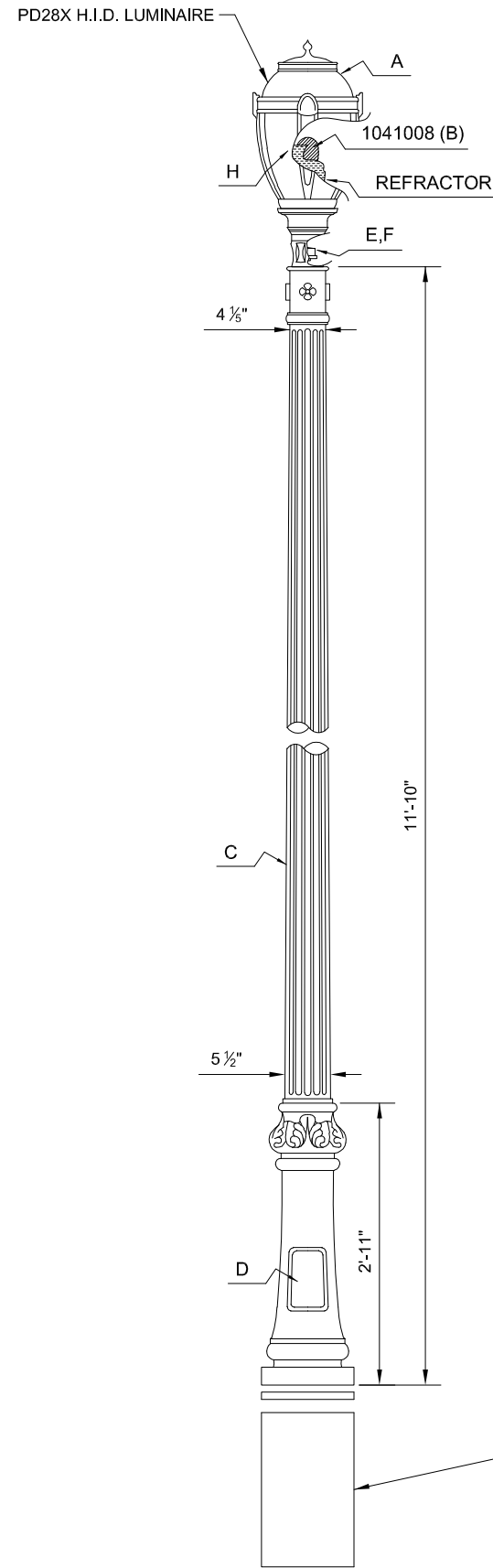
INTERMEDIATE HANDLE TRIP POSITION. TO RESTORE POWER:  
TURN TO FULL OFF, THEN ON.

STREET LIGHTING DETAILS 4 OF 4  
4-CIRCUIT POWER SUPPLY  
& FOUNDATION DETAILS

CITY OF KANSAS CITY, KANSAS  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION



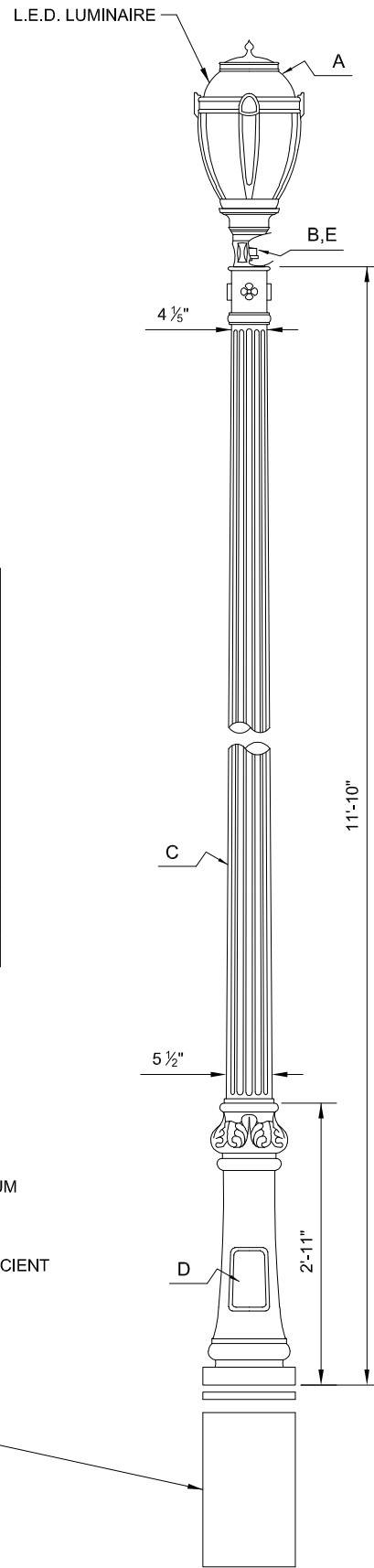
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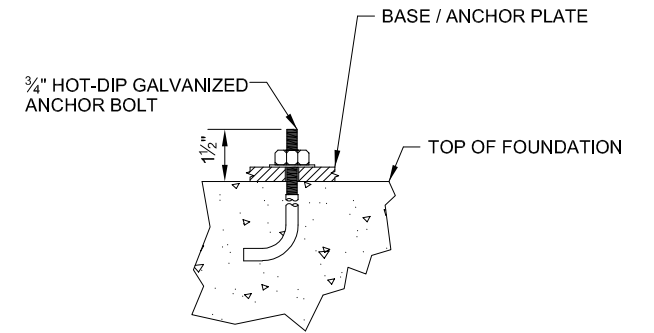
**DECORATIVE H.I.D. STREET LIGHT POLE**  
POST PA DW12 12 ANBK

H.I.D. MAINTENANCE PARTS ONLY			
ITEM	QTY.	STOCK NO.	DESCRIPTION
A	1	1040991	LUMINAIRE (FIXTURE W/ REFRACTOR, PHOTOCELL, & PHOTOCELL RECEPTACLE)
B	1	1041008	LAMP - ANTIQUE STREET LIGHTING #C150S55/ALTO
C	1	1040981	POLE - ANTIQUE STREET LAMP 12' CAST ALUMINUM
D	0	1041025	ACCESS DOOR- ANTIQUE STREET LIGHTING (FOR REPAIRS ONLY)
E	0	1041033	PHOTOCELL RECEPTACLE - ANTIQUE STREET LIGHTS (FOR REPAIRS ONLY)
F	0	1041019	PHOTOCELL - ANTIQUE STREET LIGHTING (FOR REPAIRS ONLY)
G	0	1041034	BALLAST KIT - ANTIQUE STREET LIGHTING (FOR REPAIRS ONLY)
H	0	1041018	GLOBE ANTIQUE STREET LIGHTING

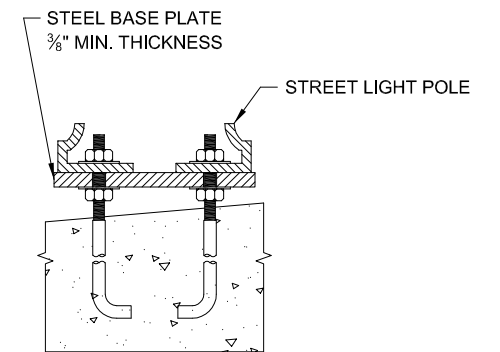
- DECORATIVE POLE FOUNDATION NOTES:**
1. FOUNDATION MUST BE AS LARGE AS BASE.
  2. FOUNDATION SURFACE MUST BE FLAT AND LEVEL.
  3. A 1/4" THICK GROUT BED OR AN APPROVED 3/8" MINIMUM THICKNESS STEEL BASE PLATE MAY BE USED AS REQUIRED FOR LEVELING.
  4. CONTRACTOR MUST ENSURE FOUNDATION IS SUFFICIENT FOR INTENDED INSTALLATION.



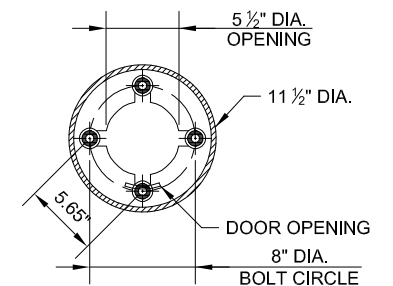
**DECORATIVE L.E.D. STREET LIGHT POLE**  
POST PA DW12 12 ANBK





**ANCHORAGE DETAIL**



**ANCHORAGE DETAIL  
NON-LEVEL APPLICATIONS**



**ANCHORAGE GUIDE**

REVISIONS		BY	
DATE	DATE	DESIGNED:	DRAWN:
		CHECKED:	DATE:
		SCALE:	SHEET NO.:
<b>STREET LIGHTING DETAILS 1 OF 1</b> <b>DECORATIVE LIGHT POLE, LUMINAIRES,</b> <b>AND ANCHORAGE DETAILS</b>			
<b>CITY OF KANSAS CITY, KANSAS</b> <b>PUBLIC WORKS DEPARTMENT</b> <b>ENGINEERING DIVISION</b>			
			
THE POWER OF COMMUNITY		KANSAS CITY PUBLIC WORKS DEPARTMENT	