1000 - STREETLIGHTING INSTALLATION

1000.1 DESCRIPTION

a. Work

This work shall consist of furnishing all labor, materials and equipment to complete in place the streetlighting system as shown on the plans (including standard details), as directed by the Engineer, according to the applicable sections of the standard specifications of the City of Overland Park, Kansas, and the Kansas Department of Transportation, that are either directly or by reference included herewith. Streetlighting materials shall include, but not be limited to, street light poles, luminaires, lamps, breakaway base assemblies, pole and bracket cable, distribution cable, conduit, fuse holders, electrical connector kits, service and junction boxes, foundations and miscellaneous hardware.

b. Plans

The plans that accompany these specifications shall be considered a part thereof. Whenever any part of the plans shall be in conflict with any other part or parts of the plans, or any part of these specifications shall be in conflict with any other part or parts of these specifications or any of the items proposed to be constructed shall appear to be impracticable, or impossible to construct, then the matter shall be immediately brought to the attention of the Engineer or their agent. The Engineer's decision in the matter shall be final, and the Contractor shall follow their directions to avoid any such conflict in the plans or specifications.

All incidental parts which are not shown on the plans or specified herein and which are necessary to complete the streetlighting system shall be furnished and installed as though such parts were shown on the plans or specified herein. All systems shall be complete and in operation to the satisfaction of the Engineer at the time of acceptance of the work.

All appurtenances shall be located as shown on the plans. Any deviations must be established by the Engineer in the field. The Contractor shall have a copy of the plans and specifications at the job location at all times and accessible to the Engineer or their authorized representative.

Prior to the acceptance of the work, the Contractor shall submit an "As Built" or corrected plan showing in detail all construction changes, especially location and depth of conduit.

c. Grades

All work shall conform to line, elevation and grades as shown on the plans.

d. Regulations and Code

All electrical equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA). In addition to the requirement of these specifications and the plans, all material and work shall conform to the requirements of the National Electrical Code (NEC), the Standards of the American Society for Testing Materials (ASTM), the American Standards Association (ASA), and local ordinances. Requirements of Underwriters' Laboratories, Incorporated shall be followed for all items installed where applicable. Pertinent requirements of the local utility company shall be followed. Wherever reference is made in these specifications or in the standard provisions to the code, the safety orders, the general order, or the standards mentioned above, the reference shall be construed to mean the code, order, or standard that is in effect at the date of advertising of these specifications.

e. Qualifications of Installers

For the actual fabrication, installation, and testing of the work of this Section, use only thoroughly trained and experienced personnel who are completely familiar with the requirements for this work and with the installation recommendations of the manufacturers of the specified items. In acceptance or rejection of installed electrical system, no allowance will be made for lack of skill on the part of installers.

f. Preliminary Schedule of Equipment and Material

Prior to commencement of construction activities, the Contractor shall submit a complete schedule of materials and equipment proposed for installation for the approval by the Engineer. This schedule shall include catalog cuts, diagrams, drawings, and other such descriptive data as may be required by the Engineer. Any item not listed on the Approved Manufacturer's List shall also require the submittal of catalog cuts, diagrams, drawings, technical specifications, and a physical sample of the item

for evaluation by the Engineer. In the event any items of material or equipment contained in the schedule fail to comply with specification requirements, such items may be rejected.

g. Rejected Materials

Rejected materials shall be immediately removed from the project site by the Contractor and shall not again be brought upon the project site. Work shall be commenced and continued at such points as may be approved by the Engineer and shall be carried on diligently and without unnecessary or unreasonable delay.

h. Coordination with Existing Utilities

All existing conduit/conductor runs and other utility information were obtained from existing office records. It shall be the Contractor's responsibility to locate all utilities, whether above, on, or below the ground, and to protect the City against any and all damages arising from work under this project.

No new infrastructure shall be constructed as part of this contract which is in conflict with any existing utilities' facility or the code required thereby, unless approved by the Engineer

i. Notification

The Contractor shall notify the Engineer before beginning work on the project. The Contractor shall keep the Engineer advised as to the progress of the project and the Contractor's proposed schedule. The Engineer may, at their option, require any work completed without their knowledge or inspection to be dismantled and inspected to their satisfaction. The contractor shall notify each property owner at least one day in advance of construction activity being started in front of the respective property.

j. Protection of Work and Cleanup

The Contractor shall care for all work until final completion and acceptance by the City. All damage done to existing improvements by the Contractor shall be repaired by the Contractor. The Contractor shall remove all surplus material and rubbish from the work as it accumulates and before the Contractor makes application for the acceptance of the work.

k. Turn-on and Testing

The Contractor shall notify the Inspector for a Safety Inspection as soon as the system(s) is (are) ready. Upon approval with this inspection, the City of Overland Park will provide clearance to Evergy and notify them as to when the system would need to be energized.

All streetlighting system elements shall function properly as a complete system for a minimum period of fifteen (15) days before acceptance by the City. The fifteen (15) day test period shall be continuous with streetlights cycling on and off similar to normal operation.

Any malfunction, observed or recorded, shall stop the test period as of the time of the malfunction. A new fifteen (15) day test period shall start when the malfunction has been repaired to the satisfaction of the Inspector. The fifteen (15) day test period can be initiated at any time during the project and may be required to be initiated early, at the discretion of the Engineer, to maintain existing streetlighting systems. However, successful completion of the test period shall not imply City acceptance at that time.

The contractor shall be required to perform utility locates on any cable/conduit that was installed as part of the construction project until the entire project has been accepted and final payment issued, unless otherwise approved by the Engineer.

Final acceptance of the streetlighting system will generally not occur until the completion of the project, unless otherwise approved by the Engineer. The fifteen (15) day test period shall be successfully conducted prior to the completion date of the contract unless otherwise approved by the Engineer.

1000.2 MATERIALS

The material for streetlighting shall be in accordance with this specification. All materials used in the fabrication or assembly of the items listed below shall be new and of the best grade and shall be approved by the Engineer.

a. Approved Materials List

All material for streetlighting used by the Contractor shall be from the City’s approved list of vendors. It is important that users be completely knowledgeable of all application requirements and

procedures prior to product application. It is the responsibility of the installer to contact the supplier of all streetlighting materials if questions regarding application procedures or conditions arise.

Manufacturers interested in pre-qualifying material under this specification shall submit a sample of the material along with a complete materials specification for each item to be considered. The sample will be reviewed for compliance with all requirements of this specification. No material shall be used unless the material has been pre-qualified. A complete list of pre-qualified materials is maintained by the Traffic Services Engineering Division of the Department of Public Works.

b. Streetlight Poles

The type of pole shall be as specified on the plans. This pole specification is in addition to the pole detail sheet included in the plans. Refer to the pole detail sheet, which describes the pertinent design details.

(1) Aluminum standards

The aluminum lighting standard including anchorage with luminaire properly installed shall be in accordance with the 2013 edition of the American Association of State Highway and Transportation Officials (AASHTO) for continuous 90 mph wind and a maximum luminaire size of 1.3 square feet effective projected area and maximum 55 lbs and shall meet the following material requirements:

Component	Aluminum Alloy Designation	Specification
Shoe Base	356-T6, Cast	ASTM B26 or B108
Bolt Covers	356 F or 443, Cast	ASTM B26 or B108
Pole Shaft	6063-T6, Extruded	ASTM B221
Ground Lug	6061-T6, or 6063-T6	ASTM B221
Reinforced Handhole Frame	356-T6 or 6061-T6	ASTM B26, B221, or B241
Handhole Cover	6063-T6	ASTM B209, B221, or B241
Luminaire Arm Plate	6061-T6 or 6063-T6	ASTM B221
Pole Cap	356 F or 443, Cast	ASTM B26 or B108

All welding shall be completed with 4043 weld wire. All hardware (bolts, nuts, washers, except anchor bolts) not otherwise specifically designated shall be stainless steel per ASTM A193 Class I B8.

(2) Pole shafts 30' and 40' in length (OP Series 300 and 400)

The aluminum lighting shaft assembly shall be spun from one piece of seamless tubing and after fabrication, it shall have mechanical strength of not less than T6 temper and conform to the 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The cross section of the pole shall be round, and the shaft shall be fabricated in a continuous true taper from at least 6" above the handhole to the top of the shaft. The shaft shall have no longitudinal or circumferential welds, except at the lower end joining the shaft to the base.

Pole dimensions shall be as specified in the City of Overland Park Standard Details. 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 pole detail sheet.

Pole dimensions shall be as specified in the City of Overland Park Standard Details. The aluminum shoe base shall be a permanent mold casting. 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 base shall be cast with four (4) slotted holes to receive the anchor bolts or threaded studs and shall have tapped holes for attaching the four (4) cast aluminum alloy removable bolt covers provided for 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.

(3) Pole shafts 14' in length (OP Series 14)

The 14' aluminum lighting shaft shall be spun from one piece of seamless tubing and after fabrication; it shall have mechanical strength of not less than T6 temper and conform to the 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The cross section of the pole shall be round, and the shaft shall be fabricated in a continuous true taper from at least 6" above the handhole to within a maximum of 12” from the top of the shaft. The shaft shall have no longitudinal or circumferential welds, except at the lower end joining the shaft to the base.

Pole dimensions shall be as specified in the City of Overland Park Standard Details. 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 pole detail sheet. The pole shall have a 3” ± 1/16” outside diameter slipfitter, without a tenon, for mounting the post-top luminaire.

The aluminum shoe base shall be a permanent mold casting. 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 base shall be cast with four (4) slotted holes to receive the anchor bolts or threaded studs and shall have tapped holes for attaching the four (4) cast aluminum alloy removable bolt covers provided for 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.

(4) Handhole Opening and Cover

Poles for 30’ and 40’ mounting heights (OP Series 300 and 400) shall include a 4" x 8" handhole centered 18" above the bottom of the shaft. Residential style poles (OP Series 14) for 14’ mounting heights shall have a 4” x 6” handhole centered 18” above the bottom of the shaft. The dimensions for the handhole opening shall be clear of any interference from the handhole reinforcing frame. The handhole shall be reinforced with a cast frame of aluminum alloy 356 per ASTM B26 or B108. The clear opening dimensions shall be as indicated in the standard details for the specific pole series designated. The handhole opening shall be ground smooth and free of all burrs and sharp edges. Handholes shall be located 90 degrees clockwise from the plane of the bracket arm as viewed from the top, except light poles on bridge structures shall have the handhole located at 0 degrees from the plane of the bracket arm.

An aluminum cover with two ½” long x ¼”, 20NC nylon hex head cap attachment screws shall be provided for the handhole. The cover shall be universal in size and shape and fit tight with no gaps regardless of which end is placed up or which pole it is installed on. All screw holes in the cover shall be over drilled and not tapped or threaded so the nylon screw slips through. A 12” long #35 aluminum keeper chain shall be mechanically attached to the inside center of the handhole cover and the inside bottom edge of the handhole frame.

(5) Ground Lug

Each pole shall contain an internal aluminum ground lug welded inside the pole opposite the handhole and centered on the opening for the purpose of attaching a grounding connector. The ground lug shall have a 3/8” diameter tapped hole, oriented such that the ground screw can be tightened with a socket driver inserted through the handhole perpendicular to the pole shaft.

(6) Cable Hook

Each pole, excluding the 14’ poles, shall also contain a 3/8” diameter aluminum cable hook welded inside the pole opposite the arm plate near the top of the pole shaft.

(7) Pole Cap

Each pole, excluding the 14’ poles shall include a cast, ornamental cap of aluminum alloy 443 or 356F. The cap shall be fastened to the shaft by means of stainless steel set screws.

(8) Pole Damper

Each pole, excluding the 14’ poles, shall include a factory installed pole vibration damper installed internally to each pole. The damper should be attached to the pole at approximately the midpoint by a factory weld.

(9) Rivnuts for Arm Attachment

Each pole, excluding the 14' poles shall be equipped with aluminum rivnuts for arm attachment. The location shall be standard between all different pole manufacturers to allow interchangeability of arms on a specific pole. The rivnuts shall be sized and located according to the standard details for either single member arms or truss style arms.

(10) Pole Identification

Each pole shall have a stainless steel or aluminum identification tag securely fastened to the pole shaft below or above the handhole. The information on the tag shall include the manufacturer's name, abbreviation, shaft wall thickness, date of manufacturer, catalog numbers, lot numbers or other identifying numbers, or symbol engraved on the shaft, baseplate, handhole or other means such as to be readily visible after installation and for future tracking.

(11) Pole Finish

(a) Standard Finish

The standard pole shaft shall be provided with a satin finish accomplished by mechanical rotary grinding. All materials shall be cleaned and free from dents and unsightly scratches. No surface preparation or painting of any type shall be required at the time of installation unless plans specify other finish.

(b) Powder Coat Finish

If a streetlight pole is specified to be colored with a powder coating, the following steps shall be taken during surface preparation and powder coating.

Poles shall be prepared using a mechanically or chemically abrasive process. Poles shall proceed continuously and immediately to the powder coating process within the same facility where the poles are prepared for powder coating. Poles shall be visually inspected and touched up as required, to ensure a consistent, high performance final coating. Touch up can be by hand sanding, or spot cleaning using denatured alcohol. This is followed by a tack cloth wipe down.

If a prime coat is called out, ATP High performance powder coat primer is applied per the manufacturer's technical data sheet and the coating placed in the cure oven long enough to 'gel' the primer coat. It is not brought to full cure.

Power coating material shall be a thermosetting polyester powder. Powder is applied per the manufacturer's technical data sheet and then brought to full cure, again per the manufacturer's technical data sheet. Poles shall be cooled and inspected visually.

(12) Shipping

To protect the shaft during shipping, the assembly shall be spirally wrapped with a non-staining protective paper secured in place with tape and shall be equipped with a ripcord for quick, easy unwrapping. All small parts shall be boxed.

c. Luminaire Arms

This specification covers aluminum luminaire arms of varying lengths and style in accordance with the standard details. The type of arm and length shall be as specified on the plans. This pole specification is in addition to the pole detail sheet included in the plans. Refer to the pole detail sheet, which describes the pertinent design details. The luminaire arms shall meet the following requirements:

Component	Aluminum Alloy Designation	Specification
Luminaire Arm – Tubing	6063-T6	ASTM B221 or B241
Luminaire Arm – Pipe*	6063-T6	ASTM B429
Luminaire Arm Plate	6061-T6 or 6063-T6	ASTM B221
Luminaire Arm, Strut*, and Connector*	6061-T6 or 6063-T6	ASTM B221, B241, or B429

* Truss-Type Luminaire Arms (Type B) Only.

(1) Single Member Arms

The single member arm shall be tapered by cold working from round tubing. After tapering, the member shall be flattened to produce an elliptical cross-section with the major diameter in the vertical plane, perpendicular to the wind. The outboard end of the arm shall remain round with a two-inch (2") slipfitter for mounting the luminaire. The single member arm shall be designed to meet given design factors and mounting dimensions.

(2) Truss Type Arm

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 tapered 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 outboard end of the lower arm (brace) shall be covered by an end cap.

(3) Welding

All welding shall be done by the inert gas shielded metal arc method with consumable electrode. Aluminum alloy 4043 electrode shall be used. Welding shall be in accordance with AWS Specification D1.2, Structural Welding Code - Aluminum.

(4) Miscellaneous Hardware

All nuts, bolts, and washers used in the fabrication of the pole shall be stainless steel per ASTM A193 Class 1 Grade B8 except for anchor bolts.

(5) Arm Finish

(a) Standard Finish

The standard arm shall be finished to match the pole shaft. All materials shall be cleaned and free from dents and unsightly scratches. No surface preparation or painting of any type shall be required at the time of installation unless plans specify other finish.

(b) Powder Coat Finish

If a streetlight pole is specified to be colored with a powder coating, the arms shall also be painted to match with the same process as the poles.

(6) Shipping

To protect the arms during shipping, they shall be wrapped with a non-staining protective paper secured in place with tape and shall be equipped with a ripcord for quick, easy unwrapping. All small parts shall be boxed.

d. High Pressure Sodium Cobra Head Luminaire

High pressure sodium (HPS) cobra head style luminaires shall meet the following requirements:

(1) Luminaires, 250 Watt and Above:

The luminaire shall be pre-wired, requiring only connection of service wires to a terminal board. The luminaire shall be equipped with a multi-tap regulator, high power factor of 0.90 or better, ballast for high-pressure sodium at a voltage of 120/208/240/277 volts. The ballast shall be capable of reliably operating the lamp with a line voltage varying plus or minus 10 percent from normal. The entire ballast, including condensers, shall be easily removable and replaceable with gloved hands and without tools through the use of quick disconnecting mechanical devices and electrical plugs. The ignitor shall be the protected, plug-in style.

(2) Luminaries, 150 Watt:

The luminaire shall be pre-wired, requiring only connection of service wires to a terminal board. The luminaire shall be equipped with a multi-tap HPF reactor, high power factor of 0.90 or better, ballast for high-pressure sodium at a voltage of 120/208/240/277 volts. The ballast shall be capable of reliably operating the lamp with a line voltage varying plus or minus 5 percent from normal. The entire ballast, including condensers, shall be easily removable and replaceable with gloved hands and without tools through the use of quick disconnecting mechanical devices and electrical plugs. The ignitor shall be the protected, plug-in style.

(3) Housing

Cobra Head style luminaires shall be constructed of a single piece die-cast aluminum upper housing and two-piece bottom door, hinged at the back and latched on the street side. The two-piece bottom door shall have a separate door enclosing the optical assembly and a separate removable door for the ballast tray. The optical assembly housing door shall be hinged at the back of the optical assembly and latched on the street side. The ballast door shall also be hinged at the back near the slipfitter and fastened with a screw or latch at the other end to secure the door of the electrical assembly to hold the door securely closed during wind load. The luminaire shall not be provided with a photocell receptacle unless otherwise noted on the plans or special provisions.

(4) Slipfitter

The luminaire shall be equipped with an integral slipfitter for 2-inch luminaire arm mounting. The mounting device shall allow the luminaire to be mounted absolutely level and shall have either four (4) fasteners serving both the leveling and clamping functions or two (2) fasteners for clamping and a stepped level feature cast into the housing with built in stops at the end of the luminaire arm. It shall allow one man to install the luminaire by simultaneously holding it in position and tightening the fasteners, such that the luminaire will be properly level at the first attempt. A factory installed bird guard shall fit snugly around the mounting device.

(5) Removable Ballast Tray

The luminaire shall have a removable ballast tray power-pad/module with quick-connect electrical hookup for easy installation. The ballast tray shall be included with the ballast door. The ballast tray shall be securely fastened and hinged so as to be completely removable with a screw driver or thumb screw. The ballast tray assembly shall not loosen during wind loading. Top housing mounting or a bridge assembly configuration will not be accepted. The luminaire shall provide a moisture proof and dust proof chamber and weather protection for the ballast.

(6) Optical Assembly

The lens shall be a single piece of optically clear, flat, heat-resistant, impact resistant glass. The lens shall be held firmly in place to the lower housing using screws, clips or other approved methods. A fiber gasket filter shall be firmly attached to the reflector to provide a tight seal when the lower housing is in the closed position. The filter shall prevent insects, dirt and moisture from penetrating the optical assembly.

The reflector shall be natural unpainted anodized aluminum or a thin, transparent, flexible coating of very high quality glass which is chemically cured and bonded to the aluminum surfaces of the reflector. The reflector shall be secured to the top housing. The sealed optical assembly shall be a true 90° cutoff. The lamp socket shall be pre-set at the factory to provide I.E.S. Type III Medium Cutoff light distribution.

e. LED Cobrahead Luminaire

All LED cobrahead luminaires shall be as listed on the Approved Materials List and rated as Class A, B, C, D, or E as indicated. The luminaire shall have a correlated color temperature (CCT) of 4000K with a minimum color rendering index (CRI) of 70. The driver shall be multi-volt capable of operating between 120V and 277V and have an L70 rating of greater than 100,000 hours at 25 degrees C. The driver shall be capable of providing 700 mA to the LED chips. The fixture shall have built-in surge protection device (SPD) rated 10kV/5kA at a minimum. The SPD shall have a fuse that protects the fixture by disconnecting the luminaire from the power at the end of life. It shall have an indicator light that is lit when the SPD is fully functional and dark when it needs to be replaced. Optical systems or LED light engines shall be IP66 rated. The fixture shall have an ANSI 7 pin photocell receptacle and a shorting cap. The distribution shall be a roadway Type II. A bubble level shall be located internal to the fixture for easy leveling at installation. A label shall be affixed to the luminaire housing to clearly indicate the luminaire classification which shall be visible from the ground as identified by the City of Overland Park. The fixture shall have a 10 year minimum warranty. The cobrahead luminaire shall adhere to LM79 testing and LM80 standards following TM-21 methods.

(1) Housing

Cobra head style luminaries shall be constructed of a single piece die-cast aluminum housing and a one-piece bottom door as further described herein. The bottom door shall allow access to the terminal block, quick disconnects, and driver. The door shall be hinged at the back near the slipfitter with a slotted hex head screw or latch to secure the door. All electrical connections shall be quick-connect type. A built in wildlife shield shall be cast into the housing and fit snugly around the mounting device. The finish shall meet scribe creepage rating 8 per ASTM D1654 after over a minimum of 1000 hours exposure to salt fog chamber (operated per ASTM B117). Color shall be standard gray unless otherwise specified.

If a luminaire is to be colored with a powder coating, the following steps shall be taken during surface preparation and powder coating. A five-step pre-treatment and painting process shall yield a finish that achieves a scribe creepage rating of 7 (per ASTM D1654) after over 5,000 hours exposed to salt fog chamber (operated per ASTM B117).

(2) Slipfitter

The luminaire shall be equipped with an integral slipfitter for 2-inch luminaire arm mounting. The mounting device shall allow the luminaire to be mounted absolutely level and shall have either four (4) fasteners serving both the leveling and clamping functions or two (2) fasteners for clamping and a stepped level feature cast into the housing with built in stops at the end of the luminaire arm. It shall allow one man to install the luminaire by simultaneously holding it in position and tightening the fasteners, such that the luminaire will be properly level at the first attempt.

(3) LED Assembly

The LED assembly shall be made of optically clear, heat-resistant, impact resistant material. The LED assembly shall be held firmly in place to the housing using screws, clips or other approved methods.

f. HPS Post Top Luminaire

All components including the luminaire housing, base and finial to be of high-strength ASTM 356.1 die cast aluminum. The luminaire shall be fully welded creating one integral housing. The die cast aluminum hood shall be hinged to allow for easy relamping. All exposed metallic surfaces shall be finished with a high performance coating consisting of high gloss super durable polyester powder coat paint to be applied utilizing a multi stage process that includes phosphate pretreatment, electrostatic power application, and a convection curing. Paint shall be weather, corrosion, abrasion, and UV resistant in compliance with the American Architectural Manufacturers Associations' specification AAMA 2604 05. The exterior color shall be black unless otherwise specified. The inside of the hood shall be painted white. The ballast shall be a high power factor (90% minimum), constant wattage autotransformer type for high-pressure sodium at a voltage of 120/208/240/277 volts. The ballast components shall be housed in a totally enclosed integral compartment, and the optical section of the unit shall be completely sealed and gasketed. The pressed prismatic refractive globe shall be one piece polycarbonate plastic. The refractor shall be for I.E.S. Type III asymmetrical distribution or Type V symmetrical distribution as

specified on the plans. Mounting shall be via a 3" diameter by 2.5" tall tenon. 3 3/8"-16 UNC stainless steel Allen head cup point set screws secure luminaire to post top tenon. All mounting hardware shall be stainless steel. Electrical shall meet UL 1598 standard for safety. Luminaire shall have a porcelain mogul style lamp socket which is rated for 600V with 4KV pulse and uses a nickel-plated screw shell with spring-loaded center contact and lamp grips.

g. LED Post Top Luminaire

All components including the luminaire housing, base and finial to be of high-strength ASTM 356.1 die cast aluminum. The luminaire shall be fully welded creating one integral housing. The die cast aluminum hood shall be hinged to allow for easy relamping. All exposed metallic surfaces shall be finished with a high performance coating consisting of high gloss super durable polyester powder coat paint to be applied utilizing a multi stage process that includes phosphate pretreatment, electrostatic power application, and a convection curing. Paint shall be weather, corrosion, abrasion, and UV resistant in compliance with the American Architectural Manufacturers Associations' specification AAMA 2604 05. The exterior color shall be black unless otherwise specified. The inside of the hood shall be painted white. The fixture, being equipped with an LED lamp, does not require a ballast, starter or driver assembly. Luminaire shall have a porcelain socket which is rated for 600V with 4KV pulse and uses a nickel-plated screw shell with spring-loaded center contact and lamp grips. The mogul style lamp socket shall be located such that the center beam position of the LED lamp mimics the HID light center length. The lamp socket shall be firmly supported in the fixture at the same height as an HPS lamp without relying on a ballast assembly to mount to. The luminaire shall be able to be operated at 120/208/240/277 volts. The electrical components shall be housed in a totally enclosed integral compartment, and the optical section of the unit shall be completely sealed and gasketed. The pressed prismatic refractive globe shall be one piece polycarbonate plastic. The refractor shall be for I.E.S. Type III asymmetrical distribution or Type V symmetrical distribution as specified on the plans. Mounting shall be via a 3" diameter by 2.5" tall tenon. 3 3/8"-16 UNC stainless steel Allen head cup point set screws secure luminaire to post top tenon. All mounting hardware shall be stainless steel. Electrical shall meet UL 1598 standard for safety.

h. High Pressure Sodium (HPS) Lamps

Lamps shall be high pressure sodium (HPS) rated with a 24,000 hour average life with a mogul base. The wattages and lumen rating shall be as follows:

400 watt lamps shall be rated at 50,000 lumens
250 watt lamps shall be rated at 30,000 lumens
150 watt lamps shall be rated at 16,000 lumens
100 watt lamps shall be rated at 9,500 lumens
70 watt lamps shall be rated at 5,800 lumens

i. LED Lamps

LED lamps shall have a mogul base and built in minimum 10kV surge protection. They shall be RoHS compliant and UL listed. It shall comply with Part 15 of the FCC rule and not cause interference. The correlated color temperature (CCT) shall be 3,000K with a minimum 70 color rendering index (CRI). The lamp shall have a Type V light distribution with a minimum 5,000 lumen rated output based on photometric testing consistent with IES LM-79. The lamp shall also have a minimum 5 year warranty.

j. Wire and Cable

All cable used in the construction of the streetlighting system shall be in accordance with the following:

(1) Power Distribution Cable and Electrical Service Cable

All wire and cable shall be type USE-2 / RHH / RHW-2, soft drawn, stranded annealed copper, single conductor of 7 strands with 60 mil thick cross linked polyethylene insulation suitable for operation at 600 volts or less in wet or dry locations, including direct burial in the earth. It shall meet ASTM B8, UL 44, UL 854, ICEA S-95-658/NEMA WC70 and other applicable standards. Power distribution cable shall be #4 AWG with black insulation. Electrical service cable shall be #2 AWG and be supplied with

black, white and green insulation for hot, neutral and ground, respectively. Parallel conductors on the same cable reel is permitted as long as the cables are not twisted or braided together.

(2) Pole Wiring

Pole wiring from the electrical connectors in the pole to luminaire(s) shall be shall be UL-listed Type THHN/THWN-2 gasoline and oil resistant II, suitable for operations at 600 volts in all installations as specified by the National Electric Code. It shall be #10 AWG soft drawn, stranded, annealed copper, single conductor of 19 strands, insulated with high-heat, moisture-resistant, and lead-free, minimum of 20 mil thick PVC and jacketed with a minimum 4 mil thick abrasion, moisture, gasoline and oil resistant nylon or UL-listed equivalent. It shall meet ASTM B3, B8, and UL-83 standards. The pole wiring cables for twin luminaire poles shall be colored red for the north or west oriented luminaire and colored black for the south or east oriented luminaire.

(3) Equipment Ground Wire

Equipment ground wire shall be annealed, soft drawn, solid, bare, copper #6 AWG meeting ASTM B3.

k. Multiple Tap Connectors

Multiple tap connectors shall be a compact, aluminum, mechanical connector that accepts a maximum 1/0 AWG cable on the main tap and a range of 12 AWG to 8 AWG on the minor taps by means of Allen head hex socket screws. It shall be equipped with two taps to accept the #4 AWG distribution cable, and two taps to accept #10 AWG pole and bracket cable. It shall be moisture resistant with rubber insulation to ensure an insulated connection.

l. Breakaway Fuse Holder (Fused and Un-fused)

The in-line fused or un-fused connectors shall be rubber insulated, waterproof and have wire entry ports with cut-off design to accommodate #10 AWG THHN/THWN-2 cables with a copper crimp. The “Line Side” and “Load Side” shall be clearly labeled and shall be rated for 30 amps and 600 volts. They shall have spring loaded contacts to compensate for thermal expansion to maintain integrity of connection. The built in “breakaway” design prevents broken wires and the de-energization of a complete circuit when one component, such as a light standard, fails due to vehicular impact. The fused kit shall separate safely under tension, retaining the fuse in the harmless load side, eliminating danger and electrical shock. The un-fused connector shall have a slug provided, instead of a fuse.

m. Fuses

Fuses shall be 8-amp fast-acting, high-interrupting capacity, current-limiting type with melamine tube construction and nickel-plated or copper alloy end caps. Fuses shall be rated 600 volts AC with an amperage range from 1/10 to 30 amps and a 100kA interrupting rating. They shall be sized to fit breakaway fuse holder and shall be UL listed to standard 248-14.

n. Anchor Bolts

All streetlight poles that are mounted on concrete foundations shall have anchor bolts conforming to the following specifications.

(1) Anchor Bolts for Poles with 30’ and 40’ Mounting Heights

A set of four 1" diameter, 36” long steel anchor bolts with a 4” hook shall be supplied with each lighting pole when mounted on a concrete foundation. Anchor bolts shall meet ASTM F1554, Grade 55 or AASHTO M314-90, Grade 55 with a minimum yield strength of 55,000 psi and tensile strength from 75,000 to 95,000 psi. They shall have Unified National Coarse (UNC) rolled threads, per ANSI B1.1, Class 2A. A minimum of the last 12” of the threaded end shall be hot dipped galvanized per ASTM A153. No welding is allowed on anchor bolts. Hardware shall include two ASTM A563, ANSI B18.2.2 heavy hex head nuts, and two ASTM F436 flat washers. All hardware shall be galvanized per ASTM A153.

(2) Anchor Bolts for 14’ Poles

A set of four ¾”-10NC x 18” long steel anchor bolts with a minimum 3” hook shall be supplied with each lighting pole when mounted on a concrete foundation. Anchor bolts shall meet ASTM A36 Gr 50 steel with a minimum yield strength of 36,000 psi. They shall have Unified National Coarse (UNC) cut threads and be hot dipped galvanized the entire length per ASTM A153. Hardware shall include one

ASTM A36 2” minimum O.D. or 2 ¼” square flat washer and one ASTM A563 Gr DH heavy hex head nut per anchor bolt. All hardware shall be galvanized per ASTM A153.

o. Control Center

Control center shall be an underground service type 120/240 VAC, 1-phase, 3-wire, 100 amp maximum, unless otherwise noted. It shall have an exposed, continuous 200 amp, 240 volt rated, 5 terminal, ringless meter socket with horn bypass and ringless cover meeting requirements of the local electrical utility. It shall be UL listed for 5,000 amp short circuit current rating. All terminals for wiring from the utility shall be approved for copper or aluminum wire from #6 to 350 MCM AWG. All factory installed wire shall be 600 V rated copper conductors. Panelboard shall have silver plated copper buss and shall accept a minimum of twelve 1-inch plug in breakers. It shall be provided with four 2-pole, 30 amp breakers, in addition to the service disconnect. Panelboard compartment shall contain a 120V lighting control photocell receptacle wired into the cabinet with a test switch. The photocell receptacle shall be located adjacent to a photocell window with a clear plastic, polycarbonate or Lexan cover in the side of the cabinet. One 60 amp, 3 pole, electrically held contactor, rated at 10,000 amp short-circuit current rating (SCCR) and 2-position terminal block shall be provided for each circuit. A ground bar and isolated neutral bar shall be located convenient to the entering cable, for easy hookup.

The Type 3R pedestal shall be fabricated from 0.125 corrosion resistant aluminum with stainless steel hardware. A mounting collar, designed to be embedded in the concrete foundation, shall be included with the cabinet. The service pedestal must have separate, isolated sections for metering equipment, utility termination and customer equipment. The metering section must be a lift-off, ringless cover that can slip over the meter without having to remove the meter. The utility termination panel must also be a lift-off type provided with a stainless steel handle. Through tabs shall be provided for both the meter section and the utility termination section for pad locking. The customer section shall have distribution and control equipment behind an internal dead-front door with a quarter turn security latch and have a piano type hinge to open to a minimum of 120 degrees. It shall be equipped with a door stop to keep the dead-front door in an open position. The external door shall also have a full length, stainless steel piano hinge that opens to 180 degrees. It shall have shall be equipped with Corbin lock assembly designed for standard No. 2 key with tapered latch to allow the door to be closed without using the key. Pedestal finish shall be natural aluminum unless otherwise indicated in the plans.

p. Conduit

Conduit shall meet the following specifications for the type of conduit material as indicated on the plans.

(1) PVC Conduit Material

Rigid nonmetallic conduit shall be polyvinyl chloride (PVC) conduit manufactured from PVC compounds complying with the UL651 standards (latest version) and sized according to the plans. The conduit shall bear an Underwriters' Laboratories label. It shall also meet NEMA TC2, National Electric Code (NEC) for nonmetallic raceway for wires and cables, and rated for use with 90 degree C conductors or cable. Schedule 40 PVC conduit shall be used underground and schedule 80 PVC conduit shall be used above ground or exposed on the underside of bridge decks.

(2) HDPE Conduit Material

The conduit shall exhibit good workmanship and be free from holes, blisters, inclusions, cracks, and homogenous throughout. There should not be any foreign particles embedded in the plastic as a result of the extrusion process. There should not be any surface distortions that penetrate either internally or externally into the conduit wall greater than 10% of the minimum wall thickness. The conduit shall be constructed of polymeric materials which are lightweight, flexible, corrosion resistant and nonconductive. The base material shall be clean, virgin grade high-density polyethylene (HDPE) which conforms to ASTM D3350, most recent edition, Type III. Any regrind material shall be non-wide specification, reworked from the same virgin material from the same manufacturer as the original conduit. The conduit shall have a controlled outside diameter with the cross-sectional dimensions meeting SDR 13.5 manufactured to ASTM D3035 specifications and having a minimum ASTM cell classification 334480E.

The conduit shall be smooth walled inside and out with a minimum coefficient of friction of 0.35. The conduit shall meet the following minimum requirements:

Density	> 0.940 g/cc	ASTM D-1505
Melt Index	< 0.4 gm/10 min.	ASTM D-1238(E)
Flexural Modulus	> 80,000 psi	ASTMD-790
Tensile Strength	> 3,000 psi	ASTM D-638
Slow Crack Growth		
ESCR (Bell Test)	10% Igepal	ASTM D-1693
Test Duration	192 hours min	ASTM D-1693
Failure	10% max	ASTM D-1693
Molded Plaque	3	ASTM D-1693
Hydrostatic	NPR	ASTM D-2837
Strength Class		
Color and UV Stabilizer	E > 2%	ASTM D-3350
Ultimate Elongation	>400 %	ASTM D-638

Minimum wall thickness shall be in accordance with the following table:

Diameter	Wall Thickness
2” SDR 13.5	0.176”
3” SDR 13.5	0.259”

Streetlighting conduit shall be sized according to the plans. The conduit for streetlighting cable shall be pigmented throughout the entire cross-section so as to produce a uniform grey color, forming an integral part of the product. HDPE conduit used for Evergy electrical service to connect the streetlight controller to the Evergy power source shall be black with three red longitudinal stripes. All colors shall be produced from light stabilized pigments, which are further protected from ultra-violet (UV) degradation by the incorporation of Hindered Amine Light Stabilizers (HALS) allowing protection for up to two years of outside storage. The conduit shall be sequentially marked and identified along its outer length in contrasting color and with a print of at least 0.125” height. The print interval shall not exceed five feet and shall include: 1) Manufacturer’s name, 2) Product name/number, 3) Production code and 4) Length of Conduit (in feet).

The conduit coming off the reel shall return to a circular shape upon the release of tension when it is unreeled. The conduit ovality as defined in ASTM D-2122 shall not exceed the percentage listed in the following table per ASTM F-2160:

Diameter	% Ovality
2”	7%
3”	10%

When conduit 3” or above in diameter exceeds 10% ovality, it may be used if the contractor uses re-rounding equipment until 10% ovality or less is achieved. The mean elongation defined as the change in length divided by the original length, multiplied by 100 at a given load shall not be more than 10%. The conduit shall recover to a minimum of 95% of its original outer diameter upon release of a 200 pound load or shall not deflect to more than 5% of its original inside diameter within 10 minutes after removal of the compressive load.

q. Conduit Couplings, Elbows and Fittings

Couplings for conduit shall be used to connect two runs of conduit, whether PVC to PVC, PVC to HDPE, HDPE to HDPE, PVC to RGC or HDPE to RGC as appropriate for field conditions and as outlined in the standard details and Approved Equipment List.

(1) PVC Conduit Couplings, Elbows and Fittings

Polyvinyl chloride (PVC) couplings, elbows and fittings shall be schedule 40 or schedule 80 for use with schedule 40 and 80 PVC conduit, respectively and shall be listed to UL-651 (latest revision). Standard PVC to PVC couplings shall have a center stop. Standard and special radius elbows shall either have a plain end or bell end.

(2) HDPE Conduit Fittings

An approved factory coupling or adhesive, as listed in the Overland Park Approved Equipment List shall be used for connection of the HDPE conduit to PVC conduit or between two HDPE conduits.

(a) Conduit Adhesive

The adhesive shall be capable of joining HDPE conduit to PVC, fiberglass and metal conduit using standard PVC couplings. It shall be a rapid cure, two-part resin adhesive supplied in a side-by-side mixing cartridge to form a durable, strong and watertight joint. The adhesive shall have the following minimum properties:

Color	Grey	
Peak Exotherm @ 70º F	< 200º F	
Hardness	70-80	Shore D Durometer
Flexibility	>2%	ASTM D-790
Dielectric Strength	450 Volts/Mil (Nonconductive)	ASTM D-149
Airtight (continuous)	120 psi	
Specific Gravity Part A	1.2	
Specific Gravity Part B	1.2	
VOC	0 g/L	ASTM D-1693
Operating Temperature	-60º F to 250º F	ASTM D-2837

(b) Mechanical Coupling

Couplings shall be able to join HDPE conduit to HDPE or PVC conduit. Couplings can be fabricated from either aluminum or high-density polyethylene and shall be able to mechanically connect to the conduits.

Aluminum body couplings for use on HDPE conduit shall contain a center stop and reverse threads to draw two conduits together and shall be able to be installed by hand. The sharp threads shall be able to withstand high pulling loads that meet or exceed the Bellcore tensile standard of 1,000 lbs. The coupling shall be machined with one degree of taper and have a long chamfered lead-in for straight, easy starting. They shall incorporate a wide, six pitch thread angle which greatly reduces the number of revolutions necessary to install the coupling.

Aluminum body couplings for use between HDPE and PVC conduit shall contain left hand threads on the HDPE end of the coupling that will cause, when installing the female pipe thread, them to tighten further on the conduit. The other end of the conduit shall be machined with regular IPS female pipe threads to accept a male to female PVC pipe adapter while gluing the PVC pipe into the female end of the adapter.

Polyethylene body couplings for use between HDPE conduits or between HDPE and PVC conduits shall have locking rings and external band clamps and 5/16” hex head tightening bolts that are all made from corrosion-resistant stainless steel. They shall be able to be re-entered without any special tools and shall be air and water tight by use of internal O-rings on each end. They shall meet UL-514B standards.

(c) Fusion Couplings

Electrofusion couplings shall be manufactured in accordance with ASTM F-1055 for use with pipe conforming to ASTM D2513/3035, F-714 and with Butt fittings conforming to ASTM D3261 as applicable. They shall be produced from a pre-blended virgin resin that has a PPI listing of PE3408 rating and Hydrostatic Design Basis of 1600 psi @ 73º F. The resin shall have a cell classification of 445574C which complies with ASTM D3350. The heating wire shall be copper, or nickel alloy. The terminal pins shall be machined or die swaged 70/30 brass or nickel-plated carbon steel.

(d) Conduit Expansion Fittings

Conduit expansion fittings shall be two-piece PVC. One piece shall telescope the other to accommodate thermal expansion and contraction along the conduit run. The spigot part of the joint shall slide through an internal O-ring to keep moisture and debris out of the fitting. Couplings for conduits sized through 2" in diameter shall expand up to 4". Couplings for conduits sized 2" through 6" shall expand up to 8".

r. Junction and Service Boxes

Material for junction and service boxes shall be a polymer concrete of select-grade aggregate consisting of sand and gravel bound together with a polymer resin system and reinforced with continuous woven glass strands. It shall have the following minimum properties:

Compressive Strength: 11,000 psi per ASTM C-109/D-3410
Tensile Strength: 1,700 psi per ASTM C-496/D-638/D-2343
Flexural Strength: 7,500 psi per ASTM C-580/D-790

All junction boxes, service boxes, and covers shall be rated at no less than 22,500 lbs. test load (Tier 15) per ANSI/SCTE-77. All boxes shall be stackable for extra depth. The box shall consist of straight sides and open on the bottom. The various types of junction and service boxes shall be sized according to the standard details.

The cover shall have a non-skid textured surface having a minimum coefficient of friction of 0.50 under wet or dry conditions. It shall have a slot with a lift pin for inserting a lift hook. There shall be two stainless steel hex head bolts and washers in opposite corners for bolting down the cover to the box. There shall be a cleanout hole in the box below the bolt to aid cleaning out debris. A logo with the words "Streetlighting" shall be either embossed or molded into the cover or on a name plate that can be permanently affixed to the recessed area in the box lid.

s. Photocells

The ANSI C136.10-1996 compliant photocell to be used in the streetlight controller cabinet shall have a silicon light sensor with a built in 30 second turn-off delay to minimize nuisance cycles. It shall be designed to turn the lights on at 0.25 Fc when installed inside of a streetlighting controller cabinet. It shall have a 320J/9500 Amp rated MOV surge protection and shall operate at a range of 105 to 205 VAC, 50/60Hz with a load rating of 1000 watts, 1800 VA ballast. The operating temperature shall be -40 to +70 degrees C ambient. It shall have a "fail-on" control which will keep the lights on in case of photo control failure. The photocell shall have a polypropylene cover with a neoprene gasket, brass legs and an acrylic window.

t. Screw-in Foundations

Screw-in streetlighting foundations shall be a pre-fabricated steel foundation assembly consisting of a hollow steel shaft having a square plate welded to the upper end and a helical auger and pilot point welded to the lower end. The baseplate shall be perpendicular to the shaft axis (±1º) and hole concentric (±0.188 I.D. FIM) to shaft axis. The pilot point and shaft axis shall be concentric (±0.125 FIM) and in line (±2 º).

One inch bolt holes shall be tapped into the baseplate at the corners based on the specified bolt circle to fit conventional transformer bases or poles. The holes shall be perpendicular to the baseplate. The threads shall be cleaned and chased after hot-dip galvanizing so that a bolt may be hand installed. There shall be two 3" x 12" flame cut slot openings located at 180 degrees in the hollow shaft to receive underground conduit. A notch in the baseplate shall be installed on the same side as the conduit openings to identify where the conduit opening is after installation of the foundation. Minor flame cut irregularities

are permissible such that: 1) valleys do not exceed 3/32 inch below nominal surface level, and 2) peaks or positive irregularities do not exceed 1/32 inch above nominal surface level or intersection of nominal surfaces.

All materials shall be new, unused, and mill traceable meeting the following specifications:

(1) Baseplate: ASTM A36-(Latest Revision) hot rolled steel plate.

(2) Shaft: Steel pipe piles, seamless or straight welded, grade 2 per ASTM A252. Alternate material: Steel pipe Type E or S, grade B per ASTM A53.

(3) Helix: ASTM A635-(Latest Revision) hot rolled steel plate.

(4) Pilot Point: ASTM A575-(Latest Revision) hot rolled steel.

(5) Stud: ANSI C 1045 hot rolled steel. Special 1-inch diameter hot dip galvanized studs, threaded at both ends, shall be provided for use with Type T and F foundations when used with breakaway couplings. The stud shall have a stop without threads that shall have a large enough diameter to avoid slipping through threaded hole.

(6) Bolt: ASTM A325 or grade 5 SAE J429 – 1-inch diameter hot dip galvanized hex head bolts shall be provided for use with Type R screw-in foundations or when Type T and F Type foundations are used with frangible breakaway bases. Each bolt shall include one galvanized lock washer and one galvanized flat washer, as required by the manufacturer for attachment of the frangible base to the base plate.

The baseplate, helix, and core and all welded areas shall be preheated to 70 degrees F, tumble blasted, hand ground and cleaned. The finish shall be hot dip galvanized per ASTM-A153 (Latest Revision) prior to welding with a galvanized repair compound being applied to the welds and affected areas. The manufacturer shall have in effect industry recognized written quality control for all materials and manufacturing processes.

All bases shall be identified by the manufacturer name, abbreviation, or symbol engraved on the shaft and/or top plate. The anchor type (R, T1, F1, and F2) shall be engraved into the top plate with ¼" to ½" lettering.

u. Breakaway Devices

Breakaway devices shall be either frangible bases or breakaway couplings as described herein.

(1) Breakaway Couplings.

Breakaway couplings shall be a precision machined assemblage of components designed with a failure mode that meets all aspects of the 1985 American Association of State Highway and Transportation Officials (AASHTO) specification for sign, luminaire and traffic signal supports. The material shall be an aluminum alloy 6061-T6 body segments and 2024-T851 control rings. The body shall be designed to thread onto 1"- 8NC anchor bolts or threaded studs. It shall also have a 1"-8NC support stud bonded into the top portion of the coupling body. The coupling shall include two 3/8" thick galvanized washers. The 2-3/4" diameter washer shall install below the streetlight pole base plate and the 2" diameter washer shall install above the base plate. There shall be a 1" torque control nut that shears off at the required torque.

(2) Frangible Bases

Frangible bases shall be fabricated from ASTM B108 Alloy 356-T6 and conform to breakaway criteria of AASHTO Standard Specifications for structural supports for highway signs, luminaires, and traffic signals (Latest Edition). A 5" tall x 7 ¼" wide aluminum access door shall be provided on one side of the frangible base with a ¼" x 1 ¼" aluminum strap and nylon bushing for a locking mechanism to keep it closed. All structural fasteners are galvanized high strength carbon steel. It shall consist of a satin aluminum finish unless otherwise specified.

v. Ground Rods and Clamps

Ground rods shall be fabricated from a rigid, high carbon steel core and tip with a heavy, 99.95% pure, 10 mil minimum uniform coating of copper, metallurgically bonded to the core. They shall be UL-467 rated. The name, length, diameter, part number and UL logo shall be roll-stamped onto the ground rod.

Ground rod clamps shall be fabricated from high strength copper or bronze alloy meeting UL-467 standards with a hex head clamping bolt. It shall be able to accommodate a bare, solid #6 AWG copper ground cable or #10 AWG stranded locating/ground cable.

w. Concrete

All concrete used for concrete foundations shall meet the requirements of "Concrete Construction" and shall be KCMMB4K concrete. The contractor, or their supplier, shall at the contractor's expense, submit a concrete mix design for a 6" to 9" slump for approval by the Kansas City Metro Materials Board (KCMMB) prior to placement of any concrete. Additional information regarding KCMMB approved concrete mix designs is available on the following website: www.kcmmb.org

1000.3 CONSTRUCTION REQUIREMENTS

The contractor shall only use qualified laborers who are well trained to perform functions related to streetlighting, including familiarity with applicable sections of the National Electric Code.

a. Excavation

The Contractor shall perform all excavations for installing underground conduits, cable, boxes and pole bases in whatever substances encountered, to the depths indicated on the drawings or as otherwise approved. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the excavation to avoid slides. All excavated materials not required or unsuitable for backfill shall be removed and wasted at location obtained by the Contractor.

(1) Rock Excavation and Blasting

Where solid rock, shale, or similar material is found, the excavation shall be as shown in the plans or as directed by the Engineer. The areas shall be excavated in accordance with "Rock Excavation and Blasting". ABSOLUTELY NO BLASTING OF ANY KIND WILL BE ALLOWED.

(2) Backfilling

All areas excavated shall be backfilled and compacted. In no instance shall any lift or layer exceed six inches of compacted thickness. Compaction using the bucket of an excavator is not sufficient and shall not be allowed. Small areas shall require compaction with a pneumatic compactor or rabbit's foot tamper. After backfilling, all disturbed areas shall be kept well filled and maintained in a smooth and well-drained condition until permanent repairs are made or surface restoration is completed.

b. Replacing Damaged Improvements

Improvements such as sidewalks, curbs, gutters, Portland Cement concrete and asphaltic concrete pavement, bituminous surfacing base material and any other improvements removed, broken or damaged by the Contractor shall be replaced or reconstructed with the same kind of materials as found on the work or with materials of equal quality. The new work shall be left in a serviceable condition satisfactory to the Engineer. 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 the concrete reconstructed as above specified.

c. Screw-In Foundation Anchors

Screw-in foundation anchors shall be of the size and type required for the pole. The anchors shall be screwed into the ground so the bottom side of the base plate is flush with the finished ground surface. During installation the foundation shall be plumbed with a level in two directions. The foundation shall be screwed straight into the ground and the base plate shall be level. Minor leveling adjustments on poles with breakaway connectors may be made within manufacturer's recommendations. Minor leveling adjustments may be made with the use of leveling shims or washers when using breakable frangible bases. 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.

Screw-in foundations shall be installed such that the conduit slot is oriented in the direction of the conduit run. The screw-in foundation may be installed in a pre-drilled hole, in the event that rock is encountered and backfilled with low strength flowable fill to the bottom of the conduit slot.If screw-in

foundation anchors are not able to be used for any reason, concrete foundations shall be installed at the contractor's expense.

d. Concrete Foundations

The bottom of the concrete foundations shall rest on firm ground. The exposed portions shall be formed to present a neat appearance. Forms shall be true to line and grade. 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. All reinforcing steel shall be ASTM A615 GR60 and sized and arranged according to the standard details. All reinforcing steel shall be spot welded or securely wired to adjacent bars to keep it in place. If at any time, in the inspector's opinion that the cage is not sufficiently supported by wire ties, they can require spot welding instead. All reinforcing cages for pole foundations shall be constructed with reinforcing spacers and supports to maintain clearance from pier walls and floor. Pier wheels or drill shaft wheels shall be fabricated of non-corrosive plastic and capable of firmly snapping into place. Pier boots shall be fabricated from non-corrosive plastic

Both forms and ground which will contact the concrete shall be thoroughly moistened before placing concrete. Concrete shall not be placed until forms and reinforcing steel have been checked and approved by the Engineer. Placement of concrete shall be witnessed by the Engineer.

Concrete foundations shall be consolidated by an internal type vibrator. The vibrator shall operate at frequencies of vibration not less than 8,000 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.

(1) Concrete Streetlight Pole Foundations

Foundations for streetlight poles shall have a 6-inch square cap poured after pole is erected and plumbed and arms are attached. Top of footing shall be finished to curb, sidewalk grade, finished ground surface or as directed by the Engineer. Poles shall not be erected until concrete has reached 3,400 psi.

(2) Concrete Controller Foundations

The top slab of the landing pad shall be finished to curb, sidewalk grade, finished ground surface or as directed by the Engineer. Control center foundations shall have four conduits for exiting cable. Two conduits, for streetlight circuits, shall extend from the control center foundation to the adjacent type 2 junction box. One 3" conduit shall be used for the power lead-in cable from the utility source. One 1" conduit shall be installed for the grounding conductor. The direction of the exiting conduit and the orientation of the control center shall be determined by the Engineer prior to excavating and forming of the foundation. All exposed corners shall be constructed with chamfer strips to provide a neat appearance. All concrete surfaces shall be brushed and sealed with an approved curing compound.

e. Streetlight Control Center

The streetlight control center shall be installed on the concrete foundation, according to the manufacturer's recommendations. Silicon sealant shall be applied at the contact point between the mounting plate and the concrete foundation to seal out moisture. The photocell shall be inserted into the PE receptacle inside the cabinet. An address label, as indicated in the standard details, shall be applied to the exterior of the cabinet facing toward the street.

f. Streetlight Poles

Streetlight poles shall be erected plumb on the appropriate foundation as indicated in the plans. OP300 series and OP400 series poles shall be installed on break-away devices as indicated in the plans. OP14 series poles do not require break-away devices. The contractor shall securely fasten the luminaire arms to the poles using the hardware provided, being careful not to pinch the pole and bracket cable at the point of connection. The contractor shall firmly attach the pole cap using the set screws provided as well as the bolt covers. After the pole has been wired, the contractor shall attach handhole cover and the door of the frangible breakaway base, if applicable. An address label, as indicated in the standard details, shall be applied to all OP300 and OP400 series poles prior to acceptance of the project. It shall be applied on

both sides of median mounted poles and one side for poles mounted on the outside curb. The address labels shall be faced such that they are available from the adjacent traffic lane. The address numbers shall be as indicated in the streetlighting plans.

g. Breakaway Devices

Breakaway devices shall be used on every streetlight pole for 30’ and 40’ mounting heights. Either of the following are acceptable devices.

(1) Frangible Breakaway Pole Device

Frangible breakaway pole bases shall be installed plumb with minimal shimming. Mounting hardware, including hex head bolts, studs, thickened washers, lock washer and flat washers shall be coordinated between the manufacturer of the screw-in foundation and the manufacturer of the pole and breakaway device manufacturer to provide the correct hardware according to the standard details. Frangible bases shall be firmly installed on the concrete foundation or screw-in foundation. If installed on a concrete foundation, the contractor shall install the ½” thick washer and lock washer and tighten with a 1” galvanized hex head nut. If installed on a screw-in foundation, the contractor shall install the ½” thick washer and lock washer and tighten with a 1” hex head bolt, sized according to the standard details. Once the frangible base is plumb, set the pole in place and install the mounting hardware as indicated in the standard details. The hex head bolt shall be installed from the bottom up so the hex head nut is on the top. Tighten all nuts to the appropriate torque. Install the door on the frangible base using the hex head screw on the base plate door.

(2) Breakaway Couplings

All anchor bolts, or studs shall be cleaned to avoid all excess foreign material by running a 1”-8NC nut with zinc allowance to within ½” of foundation or foundation plate. Hand install the couplers to approximately 1/8” of the foundation or foundation plate. Install the 2 ¾” x 3/8” thick lower washer on the top of the coupling. Level the washers on all four couplers. Maintain 1/8” to 3/8” clearance between the bottom of the coupling and the top of foundation or foundation plate. Do not bottom out the couplers. Remove the nut, cardboard spacer and the 2” diameter washer. Set the pole in place so the coupler studs fit freely in the pole base opening without binding. Install the 2” diameter washers on the top of the pole base and the torque control nuts. Do not lubricate the stud in the coupler or the nut threads. Hold the coupler to prevent rotation and tighten the nuts hand tight. Check pole for plumb, leveling the couplers ad required while not exceeding 3/8” separation from the bottom of the coupler to the top of the foundation or foundation plate. When the pole is plumb, hold the couplers in place and tighten the torque nuts until separation of the hex part occurs.

h. Luminaires

Light emitting diode (LED) or high pressure sodium (HPS) cobrahead luminaires shall be firmly attached to the 2” luminaire arm slipfitter using the mounting configuration provided. After installation, the luminaire shall be properly leveled to the surface of the roadway and such that the luminaire does not point upward toward the houses that are adjacent to the roadway.

LED Post top luminaires shall be installed by inserting the slipfitter of the luminaire into the top of the pole and tightening with the set screws provided. After installing the LED lamp, the hood of the luminaire shall be closed and tightened with the provided hardware.

(1) Equipment Labeling

The contractor shall be required to place an installation date inside the housing of any LED cobrahead luminaire and on the surface of all LED lamps. The date shall be clearly written with an indelible marker.

i. Conduit

The location of conduit runs shown on the plans are for bidding purposes only and may be changed with permission of the Engineer in charge of construction to avoid underground obstructions. The conduit shall be installed continuous between the light poles, junction boxes, controllers, etc. and between all streetlighting appurtenances. Conduit shall generally be located between back of curb and sidewalk or within a raised median. Snaking the conduit under the road will not be permitted. Continuous

conduit shall be installed under all pavement crossings between streetlighting appurtenances. The number of bends in any run of conduit shall not exceed 360 degrees.

The conduit size for two streetlight circuits, consisting of six cables, shall be 2" in diameter. For more than two circuits, up to four circuits, the conduit size shall be 3" in diameter. It shall be the privilege of the Contractor at their own expense to use larger size conduit if desired; and where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings will be permitted.

The conduit installed under all roadway surfaces shall be placed a minimum of forty-eight (48) inches below the bottom of pavement elevation to the top of conduit; under drives at a depth of between twenty-four (24) and thirty-six (36) inches below top of pavement; and within park areas at a depth of between twenty-four (24) and thirty-six (36) inches below finished grade. Electrical service conduit shall be installed 30" below grade. Streetlighting conduit may be installed in the same trench with traffic signal or fiber optic conduit. When trenching multiple conduits, a minimum of 12" horizontal or vertical separation shall be maintained between nearest edges of conduits. Any conduit installed in a trench that will be below any paved surface shall be backfilled with AB-3 or crushed rock to a depth of 6" above the top of the conduit and then low strength flowable fill to below the proposed paved surface. When directional boring, only one conduit shall be pulled back at a time. Multiple conduits shall not be pulled through the same bore hole. As much as physically possible, a minimum of 12" horizontal and vertical separation shall be maintained between bored conduits.

The location of all conduits installed or used in this project shall be marked by aluminum markers placed in the top of curb, gutter, or wall, directly above the conduit. The markers shall either be embedded in fresh conduit or they shall be drilled with a recess such that the top of the marker is flush with the finished surface. When markers are installed in a drilled hole, they shall be set with epoxy. The City will provide the markers.

Conduit installed in standard foundations, shall extend above the foundation vertically to a height as specified in the standard details. Conduit entering through the bottom of a junction box or service box shall extend above the crushed rock base as specified in the standard details. At all outlets, conduit shall enter from the direction of the run. Existing underground conduit to be incorporated into a new system or newly installed conduit which will be left empty shall be cleaned with a mandrel and blown out with compressed air. A locating wire shall be placed in any conduit that would otherwise be empty. Duct seal shall be installed in the end of all conduits in junction and service boxes and at the control center.

(1) PVC Conduit

If PVC conduit is installed or used between the streetlighting control center and the Evergy service point, it shall be continuous without junction boxes. All joints in PVC conduit shall be glued. A factory 90° PVC large 36" radius conduit elbow shall be used for installation into a control center and at the Evergy power source. All PVC conduits shall be installed by the trenching method. Directional boring of PVC conduit will not be permitted.

(2) HDPE Conduit

It is desirable that the conduit be directional bored to minimize disruption to the existing improvements. Conduit shall be placed under existing pavement by approved boring methods. Pavement shall not be disturbed without the written permission of the Engineer and then only in the event insurmountable obstructions are encountered. Boring pits shall be kept twenty-four (24) inches clear of the edge of any type of pavement wherever possible. Excessive use of water such that pavement might be undermined, or subgrade softened, will not be permitted.

The conduit entering equipment shall be continuous from appurtenance to appurtenance (junction box, light pole or control center) or as otherwise shown on the plans. At streetlight poles, control centers, and Evergy power sources, HDPE conduit shall be transitioned to PVC conduit with approved couplings and PVC pipe nipples prior to the PVC radius as indicated in the standard details. At junction boxes and service boxes, it is desirable to sweep the HDPE conduit directly into the junction box. If approved by the Engineer, HDPE conduit may be transitioned to PVC according to standard details. Conduit bends or sweeps shall have a radius of not less than six (6) times the inside diameter of the conduit. Conduit bends

shall be made without crimping or flattening, using the longest radius practicable. 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.

j. Conduit Couplings

Conduit couplings between appurtenances, except immediately at the pole foundation or junction box, as indicated in the standard details, shall not be allowed unless fusion couplings or other fusion methods are used. No matter what coupling is used for the specific application, the end(s) of the conduit shall be round and shall be cut square using an appropriate tube cutters. The contractor shall measure the "stab" depth of the coupler and transfer this measurement on each conduit end with a permanent marker to ensure both conduit ends are fully inserted into the coupling when complete. The coupling shall be centered over the contact points of the two conduits.

(1) Fusion Couplings

Fusion couplings shall require installation by a skilled and certified installer. Proof of certification shall be made prior to installing the coupling. Installation of one test coupling shall be required before this method of coupling HDPE conduit is approved. The certified installer shall be present for every coupling. All heat fusion joining methods require that there is no water flowing or standing in or below the conduit that can reach the fusion surfaces. Conduit surfaces shall be dry prior to and during fusion and should be protected from moisture during rain or snow events. Electrofusion couplings can be installed at ambient temperatures ranging from -10 degrees F to 120 degrees F. Follow the recommendations of the manufacturer. The fusion surface of the coupling shall be clean and free from body oils or other substances that will prevent proper fusing. The ends of the conduit shall be cleaned with 90% or greater concentration of isopropyl alcohol, wiping in only one direction. The area to be cleaned shall be at least two times the full length of the coupling on each end of the conduit. Measure and mark the conduit slightly longer than ½ the length of the coupling to indicate the scrape/peel length needed. Scribe "witness marks" on the conduit surface. Each end of the conduits shall be scraped or peeled to remove the oxidation and contamination layer with a "peeler" type tool that removes a continuous and measureable ribbon of conduit surface. A minimum of 0.007" of material (thickness of two sheets of paper) shall be removed from each end. None of the "witness marks" shall be visible after scraping. Sandpaper, utility/emery cloth, wood rasps, metal files and abrasives/grinders shall never be used to scrape the conduit ends. Insert the conduit ends into the coupling to the stab depth (½ the length of the coupling). After the conduit has been inserted into the coupling, assembly clamps shall be used to align the ends. The electrical source shall be connected to the electrofusion control box. The contractor shall verify the control box inputs based on the model used. The control box shall acclimate to the jobsite weather conditions for a minimum period of 15 minutes prior to using. The power should be of sufficient output for the size and type of fitting being used. See the power requirements of the manufacturer of the coupling. If an extension cord is used, it should be of sufficient gauge and not more than the specified maximum length according to manufacturer's instructions. Connect the control box leads to the fitting and verify proper fusion time and voltage. Fusion time is different depending on the size of the coupling. After the fusion process is complete, allow proper cooling time while the conduit is still being held by clamps and additional cooling time before rough handling of conduit according to the manufacturer's instructions.

(2) Butt Fusion Plates

Commercial fusion plate machines shall be used in this process. All points on both heating tool surfaces, where the heating tool surfaces will contact the conduit ends, shall be within the prescribed minimum and maximum temperatures. The temperature differentials between any two points on the heating tool fusion surfaces shall not exceed 20 degree F. Clean the inside and outside of the conduit ends by wiping with a clean, dry, lint free cloth or paper towel. Remove all foreign matter. Align the conduits in the machine by placing them in the clamps and tightening. Conduit ends should protrude past the clamps enough so that facing will be complete. Bring the ends together and check high-low alignment. Adjust the alignment as necessary by tightening the high side down. Place the facing tool between the component ends, and face them to establish smooth, clean, parallel mating surfaces. A complete facing

will produce continuous circumferential shavings from both ends. Face until there is minimal distance between the fixed and moveable clamps. Stop the facer before moving the pipe ends away from the facer. Remove the facing tool, and clear all shavings and pipe chips from the component ends. Do not touch the component ends with your hands after facing. Bring the component ends together, check alignment and check for slippage. Look for complete contact all around both ends with no detectable gaps. Verify that the contact surface of the heating tool is maintaining the correct temperature. Place the heating tool between the conduit ends, and move the ends against the heating tool. Bring the conduit ends together under pressure to ensure full contact. The initial contact pressure should be held very briefly and released without breaking contact. Pressure should be reduced when evidence of melt appears on the circumference of the conduit. Hold the ends against the heating tool without force. Beads of melted conduit will form against the heating tool at the component ends. When the proper melt bead size is formed, quickly separate the ends and remove the heating tool. The proper bead size is dependent upon the size of the conduit. During heating, the melt bead will expand out flush to the heating tool surface, or may curl slightly away from the surface. Immediately after the heating tool is removed, quickly inspect the melted ends, which should be flat, smooth and completely melted. If the melt surfaces are acceptable, immediately and in a continuous motion, bring the ends together and apply the correct joining force (or fusion pressure). The correct fusion pressure will form a double bead that is rolled over and contacts the conduit surface. Maintain fusion pressure until the joint is cool to the touch.

(3) Glued Couplings

Install glued couplings within the working temperature as specified by the manufacturer. For conduit over 3" in diameter, taper the end at 45 degrees with a rasp or knife. Abrade and clean both adhesion surfaces and wipe with a clean rag to remove dirt and grime. Sand the outside of the conduit ½" beyond the depth of insertion into the coupling with 80-grit sandpaper as well as the inside of the coupling. All polish shall be removed. Clean the adhesion surfaces with recommended cleaner. Dispense the adhesive material through the mixing tubes in a 1/8" to ¼" bead using a zigzag pattern the depth of the coupling insert. Squeeze out a small sample prior to applying to the conduit to ensure the product is properly mixed in the mixing tube. The pattern should be about 3/8" in width and extend to the outer edge of the conduit. The coupling shall immediately be twisted onto the conduit and held in place. The joint shall not be moved until the recommended working time is achieved based on the ambient air temperature according to the manufacturer's instructions.

k. Service and Junction Boxes

Service and junction boxes shall be installed at the locations shown on the plans. The Contractor may install, at their own expense, such additional boxes as may be desired to facilitate the work upon approval of the Engineer. Service and junction boxes shall be installed on eighteen (18) and eight (8) inches of crushed rock, respectively, as shown on the plans or as directed by the Engineer. Additional rock shall be installed around the base of the box such that the rock extends 2" above the bottom of the box. Boxes shall be installed so that the covers are level with the curb or sidewalk grade or level with the surrounding ground when no grade is established. Junction or service boxes placed in a paver median or island shall have a concrete border placed around them as indicated in the standard details.

l. Cable

Cable shall be carefully pulled through conduit without chafing the insulation jacket on the edge of the conduit or cable entries within the streetlight pole or luminaire arm.

(1) Power Distribution Cable

The roadway lighting conductor system shall be installed in conduit, wired, and installed as a 240 volt system where indicated and as required. Wiring shall conform to the appropriate articles of the National Electric Code. Wiring shall be continuous from streetlighting appurtenance to streetlighting appurtenance. No splices of cable will be permitted in conduit or outside of service boxes, junction boxes, or pole bases. 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

service boxes shall be made with appropriate water proof connectors. Wiring within boxes shall be neatly arranged and laced up. Wires and circuits acting as a ground shall be permanently identified using green electrical tape wrapped around each individual wire.

All distribution cable connections inside the base of the light pole shall be made with multiple tap connectors. In-line waterproof, breakaway fused and non-fused disconnects shall be installed in each light pole base as indicated in the standard details. One disconnect for each hot lead (fused) and one disconnect for the ground "slug" shall be used.

Surplus #4 AWG distribution cable shall be installed as follows:

One foot of slack shall be provided in all streetlight control centers. Two foot of slack (12” on each side of the center) shall be provided inside junction boxes and service boxes for splicing and connecting wires. At the base of each pole, additional slack shall be provided such that when extended upward, the top of the multiple tap connectors are no less than 1" and no more than 3" above the top of the hand hole opening located at the base of the pole.

(2) Pole and Bracket Cable

Pole and bracket cable shall be installed between the multi-tap connectors and the fused and un-fused connectors and to the luminaire(s). Post top luminaires not equipped with terminal blocks shall have the wiring pigtails connected to the pole wiring with approved butt connectors. Cable surplus for the #10 AWG pole and bracket cable on each side of the fused and un-fused connectors shall be as shown in standard details. The 1c#10 AWG green ground wire shall have one end connected to the ground terminal in the housing of every luminaire. The other end of the green ground wire shall be connected to the pole grounding lug with a 3/8" ring terminal and 3/8" – 16NC x 3/4" long hex bolt.

For poles with single arm and luminaires, the #10 AWG pole and bracket may have either red or black insulation. For poles with dual arms and luminaires, the cable shall be color coded as follows: One red insulated cable shall be connected to one tap of the multi-tap connector for each “hot” leg and one black insulated cable shall be connected to the other tap of the multi-tap connector for each “hot” leg. The red cables (one from each “hot” leg of the multi-tap connectors) shall be connected to the luminaire that is oriented west or north. The black cables shall be connected to the luminaire that is oriented east or south.

(3) Electrical Service Cable

The contractor shall install the electrical service cable from the controller to the Evergy power source. He shall connect the cables to the meter lugs and coil enough slack at the power source to extend up the pole or to connect in the power pedestal. It shall be the responsibility of the contractor to coordinate his work with Evergy in a timely manner.

(4) Equipment Ground Cable

The contractor shall connect one end of the bare #6 AWG copper ground cable to the equipment ground bus in the streetlighting controller cabinet and the other end to the copper ground rod. The equipment shall be properly grounded and inspected prior to energizing the controller cabinet.

m. Grounding

All poles shall be bonded to form a continuous system. At each multiple service point, a ground electrode shall be installed. The grounding electrode shall be driven to a depth so the top is six (6) inches is below the surface of the ground. The service equipment shall be bonded to the driven ground rod by a bare #6 AWG copper wire enclosed in a one (1) inch diameter conduit. The grounding conductor shall be inserted into the ground rod clamp such that the ground rod is between the hex head tightening bolt and the grounding conductor. The tightening bolt shall never be installed such that it crimps the grounding conductor against the ground rod. If a single ground rod is used and its resistance exceeds 25 ohms, it must be augmented by one additional ground rod located no less than six feet from the original ground rod. The contractor shall be required to test the resistance in the presence of the inspector.

n. Electrical Connector Kits

Electrical connector kits in the base of each pole shall consist of multiple-tap connectors, breakaway fused, and un-fused connectors and fuses. On the two hot legs of the circuit, install the breakaway fused connector such that the “line side” is connected to cable from the multiple tap connector and the “load side” is connected to the cable that extends to the luminaire. When the connection is broken,

the fuse shall stay in the “load side” of the connector. On the ground cable, install the breakaway un-fused connector such that the cable from the multiple tap connector is connected to the “load side” and the “line side” shall be connected to the cable from the ground lug in the pole. The “slug” shall remain in the “load side” when the connection is broken.

o. Location of Equipment

Unless otherwise noted on the plans, or physical obstructions exist, equipment installed on this project shall be located as follows:

(1) Conduit shall be kept a minimum of one foot behind the back of curb.

(2) Street light poles shall be installed at least three feet behind the back of curb (to center of pole).

(3) Junction boxes shall be installed at least two feet behind the back of curb (to center of box) and no closer than two feet to any street light pole.

(4) Control centers shall be located in accordance with the applicable City Ordinances and as shown on the plans.

p. Street Lighting Completion Time

The street lights shall be installed in time to insure that they will be on and functioning no later than one week after the placement of the final driving surface or as approved by the Engineer. The contractor shall not delay the installation of the final driving surface to comply with this requirement.

1000.4 MEASUREMENT AND PAYMENT

a. Lump Sum

The Engineer will measure the streetlighting installation as indicated on the plans, complete-in-place and accepted, as a unit lump sum quantity for all work necessary.

Payment for “Street Lighting Installation” at the contract lump sum price bid is full compensation for the specified work.

b. Unit Bid Prices

The streetlighting installation, repair, maintenance or modification as indicated on the plans or as directed by the Engineer will be measured by the units indicated herein, and shall include all items necessary to complete the work of a fully functional streetlighting system.

(1) The Engineer will measure all work related to furnishing and installing conduit of specified type and size by the linear foot.

(2) The Engineer will measure all work related to furnishing and installing electrical cable of specified type by the linear foot.

(3) The Engineer will measure all work related to furnishing and installing each junction box or service box of specified size and type.

(4) The Engineer will measure all work related to furnishing and installing each streetlight pole according to the particular pole series type, including bracket arm of specified size and type.

(5) The Engineer will measure all work related to furnishing and installing each luminaire according to the classification.

(6) The Engineer will measure all work related to furnishing and installing each screw-in foundation type.

Payment for “Conduit (Size) (Type)”, “Distribution Cable”, “Pole and Bracket Cable”, “Junction Box (Type)”, “Service Box (Type)”, “Luminaire (Class)”, “Aluminum Streetlight Pole (Series) (Arm Length)”, and “Screw-in Foundation (Type)” at the contract unit prices bid is full compensation for the specified work.