S-804 STREET LIGHTING: This work shall consist of furnishing all labor, materials and equipment to complete, in place, the street lighting system as shown on the plans and as specified in these Specifications. A complete list of pre-approved street lighting materials is available at the office of the City Engineer or can be found on the City of Lenexa's internet website at ***www.lenexa.com***.

All appurtenances shall be located as shown on the plans. Any deviations must be approved by the Engineer. All electrical equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA). In addition to the requirements of these Specifications and the plans, all material and work shall conform to the requirements of the National Electrical Code and local ordinances. No new fixture shall be constructed as part of this contract which is in conflict with any existing utility's facility or the code required thereby, unless approved by the Engineer.

A. MATERIAL SPECIFICATIONS: All materials used in the fabrication or assembly of the items listed below shall comply with the applicable parts of these Specifications with the additions stated herein. All lighting equipment shall be new and of the best grade and shall be approved by the Engineer.
   1. The Light Standard shaft shall be spun from one piece of seamless tubing, Aluminum Association Alloy 6063; and after fabrication, it shall have mechanical strength of not less than T6 temper. The cross section of the shaft shall be round and shall be fabricated in a continuous true taper. The shaft shall have no longitudinal or circumferential welds, except at the lower end joining the shaft to the base.
   2. Aluminum light standards shall meet the following dimensions:

Pole Designation	Mounting Height	Base O.D.	Top O.D.	Min. Wall Thickness	Shaft Length	Bolt Circle
14*	14	6"	3.0"	0.156"	14'-0"	9.50"
20	20	6”	4.5”	0.188”	19’-8”	9.50”
30-A-6	30	7"	4.5"	0.188"	27'-6"	11.00"
30-A-8	30	7"	4.5"	0.188"	27'-6"	11.00"
30-A-10	30	8"	6.0"	0.188"	26'-8"	11.00"
30-A-8-8	30	8"	4.5"	0.188"	27'-6"	11.00"
30-A-10-10	30	8"	6.0"	0.219"	26'-8"	11.00"
40-A-6	40	8"	4.5"	0.219"	37'-6"	11.00"
40-A-8	40	8"	4.5"	0.219"	37'-6"	11.00"
40-A-10	40	8"	6.0"	0.219"	36'-8"	11.00"
40-B-12	40	8"	6.0"	0.219"	36'-8"	11.00"
40-B-15	40	8"	6.0"	0.219"	36'-8"	11.00"
40-B-8-12	40	10"	6.0"	0.219"	36'-8"	14.50"
40-B-12-12	40	10"	6.0"	0.219"	36'-8"	14.50"
40-B-15-15	40	10"	6.0"	0.219"	36'-8"	14.50"

***Use of this pole requires special approval by the Engineer.**

   3. An opening shall be furnished near the top of the shaft to provide a cable entrance from the shaft into the bracket arm. Bracket arms shall be securely

fastened to the shafts with stainless steel bolts and rivnuts. The top of the shaft shall be equipped with a cast aluminum removable shaft top held securely in place by means of set screws. Lighting standard shafts shall have a minimum 4" x 6" hand hole with frame and cover and a grounding lug opposite the hand hole. Standards shall have internally-mounted vibration dampers. The manufacturer, supplier and Contractor shall guarantee that the shafts and arms provided on this project shall remain without defect for a period of five (5) years.

4. The 20-foot round, tapered shaft and davit shall be made from a round seamless tube of aluminum alloy 6063-T6, free from longitudinal welds and with a duranodic (anodized dark bronze) finish. All aluminum parts and accessories for the 20-foot pole shall also receive the duranodic finish.
5. The aluminum breakaway anchor base shall be fabricated from extrusions of aluminum alloy 6061-T6. The fabricated extrusions will act as an anchor base meeting structural requirements and breakaway criteria specified in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals and shall be approved by the FHWA as meeting the change in velocity and stub height breakaway requirements adopted by AASHTO and the FHWA. The breakaway base shall be as indicated in the Standard Details. The hand hole cover will be secured to the pole shaft by means of a keeper chain. A grounding lug capable of accommodating up to a No. 2 AWG ground wire shall be provided on the inside of the shaft adjacent and accessible to the hand hole.
6. Single member-type mast arms shall consist of a tapered aluminum arm, elliptical in shape at the shaft end and tapering to 2-3/8" O.D. at the luminaire end, made of Aluminum Association Alloy 6063-T6 tubing.
7. Truss-type mast arms shall consist of an upper and lower member securely joined by means of vertical struts. The lower member shall be 2-inch IPS aluminum pipe, Aluminum Association Alloy 6060-T6. The upper member shall be tapered aluminum, elliptical in shape at the pole end and tapering to 2-3/8" O.D. at the luminaire end.
8. All hardware (bolts, nuts, washers, but not including anchor bolts) not otherwise specifically designated in these specifications shall be stainless steel. Handhold covers shall be attached with stainless steel hex head screws. Hand hole covers shall not be threaded. All materials not otherwise specifically designated in these specifications or on the plans shall be furnished in natural aluminum color. The shaft shall be furnished with a polished surface. The shaft shall have a factory applied protective paper wrapper conforming to the manufacturer's standard practice and shall be removed after delivery.
9. The 14-foot round, tapered shaft and davit shall be made from a round seamless tube of aluminum alloy 6063-T6, free from longitudinal welds and with a ground satin surface finish. Lighting standards shall have an oval hand hole (minimum size 4" x 6") and a grounding lug facing hand hole opening. The 14-foot round, tapered shaft shall have a 3-inch O.D. slip-fitter end and a 6-inch O.D. shaft base dimension with 0.156-inch wall thickness. The four-bolt shoe base for the attachment of the lighting standard to the concrete foundation or to the screw-in base shall be made of a casting in aluminum alloy 356.0 T6. The shoe base casting shall be fastened to the shaft of the lighting standard by means of two circumferential fillet welds, one externally at the top of the shoe base and the other internally at the bottom of the shaft tube. The shoe base flange shall have four oval holes for anchorage. Four removable bolts shall be provided when the screw-in base is used and shall be 1" x 3" steel bolts with one nut each and two

flat washers all galvanized to ASTM-153 standards. Four bolts, four nuts and eight washers shall be provided with each pole.

10. Screw-in foundations may be used, as shown on the plans, except when installed in the sidewalk or within 18 inches from the center of the pole to the edge of the sidewalk. In those cases, concrete foundations shall be used. If screw-in foundations cannot be used for any reason, concrete foundations shall be installed at the Contractor's expense. The foundations shall be of the size and type required in the details based on the pole mounting height. The anchors shall be screwed into the ground. Pre-drilling of holes for the anchor is prohibited, unless otherwise approved by the Engineer. The foundation shall be screwed straight into the ground and the baseplate shall be level. Minor leveling adjustments may be made with the use of leveling shims or washers. Shims and washers shall be galvanized or cadmium-plated steel no more than 0.25" thick. Only one shim or washer will be allowed at any one anchor bolt with a maximum of two on any pole.
11. Cobrahead-style luminaires shall be LED and shall be classified as Type A, B, C, D, E, F or Z as per the City's design criteria and plan requirements document. The luminaires shall have a housing of single piece aluminum alloy casting with integral slip fitter for a 2-inch bracket mounting. The mounting device shall allow the luminaire to be mounted absolutely level and shall have no more than four (4) fasteners serving both the leveling and clamping functions. 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. The housing finish for the Types A, B, C, D, E and Z luminaires shall be natural/silver, unless otherwise directed by the City. The housing finish for the Type F luminaire shall typically be finished with Bronze Integral Color, Aluminum Association Class I Anodizing (Duranodic or Kalcolor) and shall be mounted to the 20' pole with a tenon mounting arm. However, there are instances when the Type F luminaire will be approved by the City for installation on a natural aluminum light pole. In those instances, the Type F luminaire shall include a natural/silver housing finish. With the exception of the Type F luminaire, all luminaires shall have a correlated color temperature (CCT) of 4000K with a minimum color rendering index (CRI) of 70. Type F luminaires shall have a CCT of 3000K with a minimum CRI of 70. The driver shall be multi-volt capable of operating between 120V and 277V and rated for greater than 100,000 hours at 25 degrees C. The driver shall be capable of providing up to 700mA to the LED chips and shall be dimmable. The fixture shall have a built-in surge protection device (SPD) rated 10kV/5kA. 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. The fixture shall have an ANSI 7 pin photocell receptacle and a shorting cap. The distribution shall be a roadway Type II. A label shall be affixed to the underside of the luminaire housing to clearly indicate the type designation as described above. The fixture shall carry a 10-year warranty. The Contractor shall refer to the City's most current list of approved products for luminaire manufacturer information.
12. The post-top luminaire housing shall be constructed of cast aluminum and painted black. Post-top luminaires shall be LED and shall carry a 10-year warranty. The fixture shall have an ANSI 7 pin photocell receptacle and a shorting cap.. The color temperature (CCT) shall be 3000K with a minimum CRI

of 70. The Contractor shall refer to the City's most current list of approved products for luminaire manufacturer information.

13. Distribution cable shall be stranded annealed copper, single conductor cable for operation at 600 volts maximum and shall be the AWG size as listed on the plans. Cable shall be color-coded black/red/white. Material shall meet the applicable requirements of IPCEA Standard S-19-81, with thermoplastic insulation of GRS-Rubber base meeting Appendix K (A) of IPCEA and listed by UL as Type USE for direct burial; or material shall meet the applicable requirements of IPCEA Standard S-66-524, interim standard No. 2 with thermo setting insulation of cross link polyethylene meeting requirements of Column "A" of IPCEA and listed by UL as Type USE RHW-75° C.
14. Pole and bracket cable above hand hole in pole to luminaire(s) shall be No. 14 AWG 3-conductor stranded copper conforming to IMSA Specification 19-1. Green wire shall be installed from the luminaire and wired to the ground lug in the pole.
15. Tracing wire shall be installed on the inside of all empty conduits or conduits with only fiber optic cable to facilitate the locating of buried cable. The wire shall be either a No. 10 AWG stranded copper Type USE or THWN cable or a No. 12 AWG Copperhead cable. The trace wire shall be installed without splices. At each service or junction box, the trace wire shall be connected to a light duty Snake Pit device with an orange cap. Connection between the Snake Pit and the box shall be made with a 1-1/2" or 2" conduit sweep.
16. The feed point pedestal/control center shall be an underground service type, rated for 100 amps, 240 volts. The pedestal shall be a brushed aluminum rain tight construction with individual meter, panel, contractor, and rear service pull "compartments". Meter and panel compartments shall have piano-hinged doors. The cabinet shall be supplied with CORBIN #2 locks. Meter base shall be of the type used by the local utility. Panel board shall have copper buss and shall accept 12 one-inch plug-in breakers manufactured by GE, Westinghouse, or ITE. The panel board compartment shall contain a photocell and a test switch. All factory-installed wire shall be copper. One 3" conduit shall be installed from the feed point pedestal to a Type II junction box that is installed adjacent to the cabinet. All distribution cable for each of the lighting circuits shall be routed through this conduit to the junction box.
17. In cases where a proposed secondary service point requires the installation of a new transformer by KCP&L, the contractor shall pour the concrete transformer pad prior to KCP&L's installation of the transformer. Additionally, the contractor shall also be responsible for the installation of service cable and conduit from the secondary service point to the street lighting control center. The work and materials associated with the service cable from the secondary service point to the control center shall be subsidiary to the control center bid item.
18. Conduit shall be as specified in the section of these technical specifications entitled "Conduit".
19. Fuses shall be breaker-type.

B. SUBMITTALS: Before commencing work, a complete schedule of materials and equipment proposed for installation shall be submitted to the Engineer for approval. This schedule shall include catalog cuts, diagrams, drawings, and other such descriptive data that may be required by the Engineer.

1. All submittals shall include the manufacturer brand name and part number where applicable. Where more than one item is present on a submittal sheet, the appropriate item or items shall be circled, not highlighted. All submittals shall be organized as much as practical in order with the summary of quantities sheet in the plans. An electronic copy in PDF format of each submittal shall be supplied. In the event that any materials or equipment contained in the schedule fail to comply with specification requirements, are not circled, or submittals are not packaged, such items may be rejected. New submittals on rejected items shall be supplied to the Engineer for review.
2. When it is required by these specifications that a test be made of the material to be used on the project, the Contractor shall furnish the Engineer a certified copy of such test prior to the installation of such material. When any reference is made in these specifications to any specification such as ASTM, IPCEA, AIEE, etc., or a related specification referred to by reference therein, or revision thereof which states that a certain test, or tests are to be made only at the request of the purchaser, it shall be considered that the Engineer does request such test or tests to be made at the Contractor's expense and one certified copy of same be furnished as above mentioned.

C. CONSTRUCTION REQUIREMENTS: Street lighting shall be constructed according to the plans, the Standard Details and these Specifications.
1. Conduit shall be as shown in the plans and shall conform to the section of this specification titled “Conduit”. Each lighting circuit shall be contained in a separate conduit, except between the controller and the adjacent junction box. Lighting systems that contain more than one circuit per conduit will not be accepted.
2. All concrete bases that are to be removed shall be broken up and removed to a depth of twenty-four (24) inches below grade. Screw-in foundations shall be removed entirely. Holes resulting from these operations shall be filled to the proper grade with suitable material approved by the Engineer.
3. Junction boxes shall be installed at the locations shown on the plans. However, boxes shall not be located in sidewalks and driveways. In the unlikely event that a box is placed in a sidewalk or a driveway, a traffic-rated box shall be used. See the pre-approved list of materials for approved traffic-rated boxes. A junction box shall also be installed at each end of a conduit run that crosses the road. The Contractor may install, at his own expense, additional boxes as may be desired to facilitate the work upon approval of the Engineer. Junction boxes shall be installed on 12 inches of crushed rock as shown on the plans or as directed by the Engineer. Unless otherwise directed by the Engineer, boxes shall be installed level to 1 inch above the finish grade.
4. The roadway lighting distribution system shall consist of street lighting cable 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 Electrical Code. No splices of cable will be permitted in conduit.
5. The Contractor shall attempt to install conduit at a constant offset from the back of curb or edge of pavement, preferably at the same distance as the pole setback unless a common trench is being used. Powdered soapstone, talc or other approved lubricants shall be used when inserting conductors in conduit. All cable to be installed in 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. The ends of spare conductors shall be taped.

6. Splices may be made with approval by the Engineer. All splices in junction boxes shall be made with set screw connectors enclosed in a reusable gel-filled waterproof kit. One foot of slack shall be left at all control centers and junction boxes for splicing and connecting wires. Wiring within boxes shall be neatly arranged and laced up. Wires shall be color-coded (black = hot; white = ground) and circuits permanently identified in accordance with the designation used on the plans. All circuit cables in boxes and poles shall be identified with color-coded tape as follows:

    From controller: Tape color code RED
    Into Light Pole: Tape color code RED
    Out of Light Pole: Tape color code BLUE
    Ground Cable: Tape color code WHITE

    When cable is numbered, the cable with the highest number shall be the ground cable.

7. All splices in light pole bases shall be made with multiple tap connectors. All leads shall be covered with a plastic boot or an enclosed connector. The Contractor shall install breaker-type fuses in each pole. Fuses shall be 8-amp high interrupting fuses. The multiple tap connectors and fuse holders shall be installed convenient to the hand hole at the base of the pole. Eighteen inches of surplus cable shall be coiled at the line side of the multiple tap connector and on the load side of the fused disconnect. One foot of surplus cable shall be coiled between the multiple tap connector and the fused disconnect.

8. All poles shall be bonded to form a continuous system. At each multiple service point, a ground electrode shall be installed. The electrode shall be a copper rod not less than one-half (½) inch in diameter and 10 feet in length, unless otherwise noted on the plans. The rod shall be driven to a depth where the top of the rod is 6 inches below the surface of the ground. The service equipment shall be bonded to the driven ground rod by a minimum No. 6 AWG copper wire enclosed in a 1-inch diameter conduit.

9. Prior to the terminations of the connections, the Contractor shall contact the Engineer for an electrical inspection of the above-ground terminations. The Contractor shall also contact the Engineer for an electrical inspection as soon as the control center(s) is (are) ready. The Kansas City Power & Light Company (KCPL) or Westar Energy should be notified in advance as to when the system needs to be energized. The street light control center address shall be verified with the power company prior to installation. The power company will furnish source location at this time. In addition, the Contractor may be required to pour a transformer pad if KCP&L is installing a new transformer to energize the street lighting system. The transformer pad will be included in the plans as a bid item in this situation. The Contractor shall also be required to furnish and install the 2” conduit and service cable from the meter to the secondary service point, as per KCP&L requirements.

10. All street lighting system elements shall function properly as a complete system and under normal conditions for a minimum period of fifteen (15) consecutive calendar days. During this fifteen (15) day test period, the lighting operations shall be continuous and without malfunctions. Any malfunction observed or recorded shall stop the test period as of the time of the malfunction, and the test

period shall start over when all components are satisfactorily operating. The Contractor shall be responsible for any repairs to the lighting system, including the replacement of burned out lamps, etc., until the project has been accepted by the City.

11. All existing salvageable equipment (i.e. light poles, luminaires, control centers), as determined by the Engineer, in excess of the requirements of this project shall be completely removed from the project, and the Contractor shall deliver same equipment to the location determined by the Engineer. The Contractor shall be responsible for any damage or loss of salvageable equipment. The Contractor shall exercise care in the removal and delivery of any existing or new equipment to be delivered to the City. All salvaged equipment shall be re-usable. All non-salvaged items of existing equipment shall become the property of the Contractor.
12. All new equipment purchased as spare parts under the requirements of this project shall be delivered new and undamaged to the City of Lenexa Municipal Services Traffic Division and stockpiled as per the instructions of the Engineer.

D. METHOD OF MEASUREMENT: The "Street Lighting" installation as indicated on the plans, complete-in-place and accepted, will be measured as follows:
   1. Poles: per each (including base, luminaire and/or tenon mounting arm, luminaire, lamp, fuses, connectors, wire, bolts, nuts, and other appurtenances necessary for installation of the pole and functioning of the lighting fixture), installed and accepted. In addition, street light pole removal is subsidiary to the Street Light Pole bid item.
   2. Cable: per linear foot, measured from center of feed point to center of pole and from center of pole to center of pole. Required slack shall not be measured but shall be subsidiary to the wire. Pole and bracket cable shall be subsidiary to the pole, installed and accepted.
   3. Control Center: per each, (including concrete pad, electronic/electrical components and other components required for the proper functioning of the control center, service cable from service point to control center), installed and accepted.
   4. Junction/Service Boxes: per each, installed and accepted.
   5. Street Lighting Conduit: per linear foot, installed and accepted.
   6. Transformer Pad: per each, installed and accepted.

E. BASIS OF PAYMENT: The "Street Lighting" installation measured as provided above will be paid for at the contract unit price bid for each of the measured components, which price shall be full compensation for furnishing all equipment, materials, and all other work necessary or incidental to the construction of the complete "Street Lighting" installation and for all equipment, tools, labor and incidentals necessary to complete the work. In the case of a Traffic Signal Installation, all costs are to be subsidiary to the Lump Sum cost for the Traffic Signal Installation.