SECTION 9000 - STREET LIGHTING

9001 **SCOPE.** This section applies to all street light construction and shall consist of furnishing all labor, materials and equipment for the complete installation of street lighting systems. A complete list of pre-approved street lighting materials is available on the City of Gardner public website at www.gardnerkansas.gov.

9002 **GENERAL.** The standard street light details that accompany these specifications shall be considered a part thereof. These standard details are available on the City of Gardner public website at www.gardnerkansas.gov.

When a conflict arises with the plans or specifications and the proposed work, the Contractor shall immediately notify the City Engineer. The City Engineer will review the plans and provide direction to the Contractor.

All incidental parts which are not shown on the plans or specified herein and which are necessary to complete the street lighting 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 City Engineer at the time of acceptance of the work.

All appurtenances shall be located as shown on the plans. Any deviations must be approved by the City Engineer.

The Contractor shall always have a signed copy of the plans and specifications at the job location.

Prior to the acceptance of the work, the Contractor shall submit an "as-built" or corrected plan showing all construction changes in detail, including location and depth of conduit. As-builts shall be provided in Adobe pdf format.

9003 **GRADES.** All work shall conform to line, elevation and grades as shown on the plans.

9004 **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, the plans and the lighting specifications, all material and work shall conform to the requirements of the National Electric Code (NEC), the Standards of the American Society for Testing Materials (ASTM), the American Standards Association (ASA), the Illuminating Engineering Society (IES) and all local ordinances.

The approved plans and applicable codes adopted at the time of advertisement for bids shall govern the work unless otherwise required by the City Engineer.

9005 **PRELIMINARY SCHEDULE OF EQUIPMENT AND MATERIAL.** Within twenty (20) days following the date of the approval of a final plan, the Contractor shall submit a complete schedule of materials and equipment proposed for installation. This schedule shall include catalog cuts, diagrams, drawings, and other data as may be required. In the event any material or equipment contained in the schedule fail to comply with specification requirements, such items may be rejected.

In lieu of submitting catalog cuts, the Contractor may utilize pre-approved materials as shown on the City of Gardner Approved Materials List. The Contractor shall then list the materials from the pre-approved list that are proposed for use and submit to the City for approval.

9006 **REJECTED MATERIALS.** Rejected materials shall be immediately and permanently removed from the project site by the Contractor. Work shall be commenced and continued at such points as may be approved by the City Engineer and shall be carried on diligently and without unnecessary or unreasonable delay.

9007 **EXISTING UTILITIES.** The Contractor shall locate all utilities, whether above, on, or below the ground, and shall be responsible for any and all damages arising from his negligence to protect existing utilities.

No new fixture shall be constructed which is in conflict with any existing utility facilities or the approved plans, unless otherwise approved by City Engineer.

9008 **PERMITS.** The Contractor shall have a set of plans signed by the City Engineer before the commencement of any work, which will authorize the Contractor to work within the right-of- way.

9009 **NOTIFICATION.** The Contractor shall notify the City Engineer five (5) days before beginning work on the project. The Contractor shall provide the City Engineer weekly, or more frequent as requested, written progress reports with estimated completion dates. The City Engineer may require any work completed without inspection to be dismantled for inspection and reassembled as required.

9010 **PROTECTION OF WORK AND CLEANUP.** The Contractor shall be responsible for all work until final completion and acceptance by the City. All damage done to existing infrastructure shall be repaired by the Contractor. The Contractor shall remove all surplus material and rubbish from the work site as it accumulates and before the Contractor makes application for the acceptance of the work.

9011 **TRAFFIC CONTROL.** All traffic control shall be in conformance with the General Provisions of the City of Gardner *Technical Specifications and Design Criteria for Public Improvement Projects*.

9012 **TURN ON AND TESTING.** The Contractor shall contact the City of Gardner, Public Works Department, for an electrical inspection as soon as the control center(s) is/are installed. Prior to the inspection, the Contractor shall coordinate with the electrical service provider to ensure electric service is available to energize the system.

All street lighting system elements shall function properly as a complete system for a minimum period of fifteen (15) consecutive days before acceptance by the City. Any malfunction observed or recorded shall stop the test period as of the time of the malfunction, and the test period shall not resume until all components are satisfactorily operating.

9013 **BONDING.** The Contractor shall submit a performance and maintenance bond on all projects

before beginning construction. The amount of the bond shall be for the full amount of the project and shall remain in effect for a period of two (2) years after the date of completion and acceptance by the City Council.

9014 **MAINTENANCE.** During a period of two (2) years from the date of project acceptance by the City, the Contractor shall make all needed repairs resulting from defective workmanship or materials. If within ten (10) days after providing written notification the Contractor neglects to make or to undertake with due diligence the required repairs, the City shall make such repairs at Contractor's expense. In case of an emergency where, in the judgment of the City Engineer, delaying the repair would cause serious loss, hazard, or damage, repairs may be made without notifying the Contractor, at Contractor's expense.

9015 **GENERAL MATERIAL SPECIFICATIONS.** All materials used in the fabrication or assembly of the items listed below shall comply with approved plans and Standard Details.

All lighting equipment shall be new and shall be approved by the City Engineer.

9016 **ALUMINUM STANDARDS.** The type of pole and length of luminaire arm (if any) shall be as specified on the approved plans. This pole specification is in addition to the Standard Details, which describes the material specifications and pertinent design details.

30', 20' and 40' Poles

1. Shaft. The aluminum lighting shaft assembly shall be constructed from one piece of seamless tubing with a mechanical strength of not less than T6 temper. The cross section of the pole shall be round, and the shaft shall be fabricated in a continuous true taper from at least six (6) inches above the handhole to the top of the shaft. The shaft shall have no longitudinal or circumferential welds, except to join the shaft to the base. The assembly shall be tire wrapped with a non-staining paper during shipping.

   Pole dimensions shall be as specified on the Standard Details. It is the responsibility of the fabricator to verify and attest that the poles are structurally adequate and in full compliance with this specification and the Standard Details.

2. Handhole. Each shaft shall be equipped with a minimum 4" x 6" (clear opening) handhole with frame and cover, and a grounding lug located opposite the handhole. The handhole opening shall be clear of any interference from the handhole reinforcing frame.

3. Shoe Base. The 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 one weld shall be on the inside of the base at the end of the shaft, while another 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-threaded studs and 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 the Standard Details.

4. Luminaire Arm. 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 2-inch slipfitter for mounting the luminaire. The single member arm shall be designed to meet all design factors and mounting dimensions.

   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 2-inch slipfitter for mounting the luminaire. The outboard end of the lower arm (brace) shall be covered by an end cap.

   Luminaire Arm for all 20’ poles shall be specified within the most recent approved products list for streetlights.

5. Breakaway Support. All 30 foot and 40 foot poles shall be equipped with breakaway supports. The support shall be a frangible base approximately nine (9) inches tall with a door on one side for both single and double arm poles.

14' Pole

1. Shaft The 14' aluminum lighting shaft shall be spun from one piece of seamless tubing and shall have mechanical strength of not less than T6 temper. The cross section of the pole shall be round, and the shaft shall be fabricated in a continuous true taper from at least six (6) inches above the handhole to the top of the shaft. The shaft shall have no longitudinal or circumferential welds, except to join the shaft to the base. The shaft shall be tire wrapped with a non-staining paper during shipping.

   Pole dimensions shall be as specified on the Standard Details. It is the responsibility of the fabricator to verify and attest that the proposed poles are structurally adequate and in full compliance with this specification and the Standard Details.

   The pole shall have a three (3) inch outside diameter (O.D.) slipfitter end, without a tenon, for mounting the post-top luminaire.

2. Handhole. Each shaft shall be equipped with a minimum 4" x 6" (clear opening) handhole with frame and cover, and a grounding lug located opposite the handhole. The handhole opening shall be clear of any interference from the handhole reinforcing framing.

3. Shoe Base. The aluminum shoe base shall be a permanent mold casting. The base shall be solution heat-treated and artificially aged to produce a final T6 temper. 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 one weld shall be on the inside of the base at the end of the shaft while another 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- threaded studs and 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 the Standard Details.

9017 ILLUMINATION EQUIPMENT.

LED Roadway Luminaire

LED luminaires with shorting caps shall be installed on all collector and arterial roadways in accordance with the Approved Materials List.

Post-Top
Luminaires

Post-top luminaires shall be in accordance with the Approved Materials List.

Lamp

Lamps shall be in accordance with the Approved Materials List.

9018 ELECTRICAL MATERIAL

Secondary Cable and Power Lead-in Cable

Power lead-in cable shall be 2/0 A.W.G. and secondary cable shall be #4 A.W.G. stranded annealed copper ground wire clearly marked the entire length for operation at 600 volts maximum. All secondary cable shall be installed in a 2-inch minimum inside diameter (I.D.) conduit conforming to the Standard Details and these Specifications. Material shall meet the applicable requirements of I.P.C.E.A. Standard S-19-81, with thermoplastic insulation of GRS-Rubber base meeting Appendix K (A) of Insulated Cable Engineers Association (I.C.E.A.) and listed by U.L. as Type U.S.E. for direct burial; or material shall meet the applicable requirements of I.C.E.A. Standard S-66-524, interim standard #2, with thermo setting insulation of cross link polyethylene meeting requirements of Column "A" of I.C.E.A. and listed by U.L. as Type U.S.E. RHW-75°C.

Pole and Bracket Cable

Pole and bracket cable above the handhole in pole to luminaire(s) shall be single conductor with minimum 600 volt rating, No. 10 A.W.G. Type THHN/THWN. The conductor shall be stranded annealed copper.

Control Center and Service Disconnect Pedestal

Control centers and service disconnect pedestals shall be in accordance with the Approved Materials List.

1. Control Center. The control center (street light cabinet) shall be an underground service type, rated for 200 A (as specified on the plans) and 240 volts. The pedestal shall be heavy-gauge aluminum raintight construction with an individual meter, panel,

conductor, and rear service pull compartments. The panel compartments shall have piano-hinged doors and include a Corbin Lock accessible with a #2 Traffic Signal key. The meter base shall be of the type used by the local utility. The panelboard shall have a copper bus and shall accept twelve 1-inch plug-in breakers in accordance with the Standard Details. The panelboard compartment shall contain a photocell and test switch. All factory installed wire shall be copper. The control center shall be U.L. listed. The pedestal finish shall be natural aluminum.

2. Service Disconnect Pedestal. The service disconnect pedestal (meter pedestal) shall be an underground service type, rated for 200 A and 240 volts for KCP&L services only, in accordance with the Standard Details.

Conduit

Rigid nonmetallic conduit shall be High Density Polyethylene (HDPE) Schedule 40 or Schedule 40 polyvinyl chloride (PVC) conduit. PVC will only be used for sweeping 90-degree bends at pole bases, control centers and boxes. All nonmetallic conduits shall be gray, black or red in color. The conduit shall bear an Underwriters' Laboratories label and shall conform to Federal Specification W-C-1094A (latest version).

9019 **EXCAVATION.** The Contractor shall perform all excavations for installing underground conduits, cable, boxes and pole bases to the depths indicated on the drawings unless otherwise approved by the City Engineer. During excavation, material suitable for backfilling shall be stockpiled in accordance with the Technical Specifications. All excavated materials not required or unsuitable for backfill shall be removed from the site by Contractor.

9020 **BACKFILLING.** All areas excavated shall be backfilled and compacted in accordance with the City of Gardner *Technical Specifications and Design Criteria for Public Improvement Projects*.

9021 **SODDING.** All areas will be sodded in accordance with the City of Gardner *Technical Specifications and Design Criteria for Public Improvement Projects*.

9022 **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 Contractor shall be replaced or reconstructed with the same kind of materials as found on site or with materials of equal quality. The replaced improvements shall be left in a serviceable condition satisfactory to City Engineer. Whenever a part of a square or slab of existing concrete sidewalk, driveway or pavement is damaged, the entire square or slab shall be removed and replaced at the Contractor's expense.

9023 **FOUNDATION ANCHORS.** Screw-in foundation anchors shall be in accordance with the Standard Details. All anchors shall include an integral theft device. The anchors shall be screwed into the ground; pre- drilling holes for the anchor shall not be permitted. During installation, the foundation shall be plumbed with a level and the base plate shall be level.

Minor leveling adjustments on poles shall be made with the use of leveling shims or washers. Shims and washers shall be galvanized or cadmium-plated steel no more than 1/4-inch thick.

Only one (1) shim or washer shall be allowed at any one anchor bolt, with a maximum of two (2) on any pole.

If installation of a screw-in foundation anchor is not feasible for any reason, concrete foundations shall be installed at Contractor's expense.

9024 **CONCRETE FOUNDATIONS.** The bottom of the concrete foundations shall rest on firm ground, and foundations shall be poured monolithically. The exposed portions shall be formed and finished to present a neat appearance and shall be true to line and grade. The top of footing elevation shall be established using the finished curb or sidewalk unless otherwise directed by City Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position to proper heights, and held in place by means of a template until the concrete sets. Anchor bolts shall be provided with hex head nut, flat washer and lock washer. The forms and ground which will contact the concrete shall be thoroughly moistened before placing concrete.

Concrete for pole base and control center foundations shall be KDOT Grade 4.0 AE.

Concrete shall not be placed until forms and reinforcing steel have been approved by the City Engineer. Placement of concrete shall be inspected by the City Engineer during construction.

Concrete pole bases shall be consolidated by an internal-type vibrator. The vibrator shall operate at frequencies of vibration not less than 4,500 cycles per minute under load. The amplitude of vibration shall be adequate to property consolidate concrete. 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.

Control center foundation shall have four (4) conduits for exiting cable. The direction of the exiting conduit and the orientation of the control center shall be determined by the City Engineer.

9025 **CONDUIT.** Conduit shall be of a rigid type conforming to the provisions and diameters specified in the approved plans. Installation shall conform to the appropriate articles of the National Electric Code. All street lighting cable shall be installed in two (2) inch Schedule 40 HDPE except two (2) inch Schedule 40 PVC will be used for sweeping 90-degree bends at pole bases, control centers and boxes. Where conduits connect from more than one direction, they should terminate in a Type II junction box in accordance with the Standard Details.

It shall be the option of the Contractor, at his 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. No reducing couplings will be permitted.

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 together throughout the entire circumference of the joint. Slip joints will not be permitted for coupling conduit. All couplings shall be fitted and tightened until the ends of the conduits are firmly joined.

The location of street crossings of all conduits installed or used on the project shall be marked by a saw cut arrow placed in the face of curb, gutter, or wall, directly above the conduit in accordance with the Standard Details.

All joints in PVC conduit shall be glued. HDPE to PVC adapters shall be permitted to connect HDPE and PVC conduits.

Conduit bends, except factory bends, shall have a radius of not less than six (6) times the inside diameter of the conduit. Where factory bends are not used, conduit bends shall be made without crimping or flattening, using the longest radius practicable.

Conduit shall be jacked under pavement sections at a depth of thirty-six (36) inches below bottom of pavement. Conduit installed in trenches in unpaved areas, shall be laid to a depth of thirty-six (36) inches below natural ground level.

Conduit shall be placed under existing pavement by approved jacking or drilling methods. Pavement shall not be disturbed without the written permission of City Engineer. Jacking or drilling pits shall maintain two (2) feet clear distance from the edge of any type of pavement. Excessive use of water shall not be permitted.

Conduit set in standard bases shall extend vertically approximately three (3) inches above the foundation. Conduit entering through the bottom of a junction box shall be located near the ends to leave the major portion of the box clear. Conduit entering service boxes shall terminate two (2) inches inside the box wall and shall be sloped to facilitate pulling of cable. At all outlets, conduit shall enter from the direction of the run.

Conduit entering junction boxes shall be continuous into the box, and conduit elbows shall be provided to bring the conduit up into the box.

Wherever the end of a conduit is installed within five (5) feet of another conduit or junction or service box, the conduit shall be made continuous between the conduits or into the box.

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

The location of conduit runs shown on the plans are for bidding purposes only and may be changed with permission of City Engineer to avoid underground obstructions.

9026 **SERVICE AND JUNCTION BOXES.** Service boxes and junction boxes shall be installed at the locations shown on the plans in accordance with the Standard Details. The Contractor may install, at his own expense, additional boxes with written approval from the City Engineer.

Service boxes and junction boxes shall be installed on eighteen (18) inches and eight (8) inches of KDOT PB-2 aggregate, respectively, as shown on the plans or as directed by the City Engineer. 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.

9027 **WIRING.** Roadway lighting conductor cables shall be installed inside conduit, suitable for a

240 volt system in accordance with the approved plans. Wiring shall conform to the appropriate articles of the National Electric Code. Cable shall be laid to a minimum depth of thirty-six (36) inches below the bottom of the pavement or the natural ground level, whichever is applicable, and be installed in continuous lengths. 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 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 tight splice connectors in accordance with the Standard Details.

One foot of slack shall be left at all control centers, junction boxes and service boxes for splicing and connecting wires. Wiring within boxes shall be neatly arranged and laced. Wires shall be color-coded (Black = hot, green = ground) and circuits permanently identified in accordance with the approved plans.

All splices in light pole bases shall be made with multiple tap molded. The Contractor shall install in-line fused disconnects in each pole base. Fuseholders in all poles shall be crimped. Fuses shall be KTK, or approved equal, high interrupting fuses. Eight (8) amp fuses shall be used in poles with twin luminaires and five (5) amp fuses shall be used in poles with single luminaire. The multiple-tap connectors and fuse holders shall be installed convenient to the handhole at the base of the pole. One (1) foot of surplus cable shall be coiled at the line side of the multiple-tap connector, between the multiple-tap connector and the fused disconnect, and on the load side of the fused disconnect. The unfused connectors for the ground shall be installed with the female end of the connector on the line side.

Luminaires not equipped with terminal blocks shall be connected to the pole and bracket cable with the appropriate wire nut connectors.

9028 **GROUNDING.** All poles shall be bonded to form a continuous system. At each multiple service point, two (2) grounding electrodes shall be installed at least six (6) feet apart. The electrodes shall be a copper rod not less than one-half (1/2) inch in diameter and ten (10) feet in length, unless otherwise noted on the plans, driven to a depth so the top is six (6) inches below the surface of the ground. The service equipment shall be bonded to the driven ground rods by a No. 4 A.W.G. copper wire enclosed in a one (1) inch diameter conduit.

9029 **LOCATION.** Unless otherwise noted on the plans, or otherwise approved by the City Engineer, equipment shall be located as follows:

- Cable shall be kept a minimum of two (2) feet and a maximum of four (4) feet behind the back-of-curb.

- Street light poles shall be installed on property lines at a distance of three (3) feet, plus or minus one (1) foot, behind the back-of-curb.

- Junction boxes shall be installed a minimum of two (2) feet and a maximum of four (4) feet behind the back-of-curb and no closer than two (2) feet to any street light pole.

- Control centers shall be located adjacent to the sidewalk or a minimum of five (5) feet and a maximum of six (6) feet behind the back of curb if no sidewalk exists.

9030 STREET LIGHTING COMPLETION TIME

The street lights shall be installed and accepted prior to issuance of any occupancy permits.