FHWA REGION NO.	STATE	PROJECT NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	KANSAS	618-34	1998	92	100

B. SHIELDED DETECTOR LEAD-IN ELECTRICAL CABLE, 4/C:
The conductor wires shall be tinned copper wires. The four #18 AWG color coded conductors shall be spirally laid and enclosed in an aluminized polyester shield within a polyethylene jacket. The interior of the cable shall be filled with an amorphous moisture penetration barrier to prevent hosing, siphoning, or capillary absorption of water along cable interstices.

In addition, the cable shall meet the following requirements:

18	AWG (stranded)
025	Insulation thickness (.001 inch)
032	Jacket thickness (.001 inch)
236	Nominal O.D. (.001 inch)
Black, red, white, green	Conductor color code
100	Percent shield coverage
30	Nominal * Capacitance (PF/FT)
27	Nominal ** Capacitance (PF/FT)
600	Suggested working voltage

* Capacitance between conductors (adjacent pairs)
** Capacitance between conductors (diagonal pairs)

C. LOOP DETECTOR WIRE: Unless otherwise specified, loop detector wire shall be stranded, #14 AWG, Type THHN-75 degrees Celsius, meeting the requirements of ASTM B-8 and U.L. Standard 44. When specified on the plans, the loop wire shall be inserted into polyvinyl chloride (PVC) tubing prior to installation (one wire per section of tubing). The tubing shall have a nominal 3/16" inside diameter, a nominal 1/32" wall thickness, and shall be continuous.

D. MULTI-CONDUCTOR CABLE: All conductor cable for intersection signalization and intersection interconnection shall be multiconductor cable of the size specified on the plans for operation on a 600V maximum and suitable for use at conductor temperatures not exceeding 75 degrees Celsius. Material, construction and tests shall be in accordance with the applicable requirements of the Insulated Cable Engineers Association standard S-61-402 "Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy."

Conductors shall be stranded, annealed, uncoated copper or annealed, coated copper. Copper wire before insulating or stranding shall meet the requirements of the latest edition of ASTM B-33 (for coated wire) or ASTM B-3 (for uncoated wire). Stranding shall be class B in accordance with the latest edition of ASTM B-8.

Insulation for the individual conductors shall consist of a 20 mil thickness of polyethylene, and an insulation covering of a polyvinyl chloride compound with a 10 mil thickness.

The polyethylene insulation shall meet the requirements of paragraph 3.9 of ICEA Standard S-61-402 before application to the conductor, and paragraph 3.9.1 after application to the conductor.

The polyvinyl chloride insulation covering shall meet the requirements of paragraph 4.3.1 of ICEA Standard S-61-402, and it shall be color coded in accordance with method 1, part 5 of ICEA Standard S-61-402.

The overall cable jacket shall consist of a polyvinyl chloride compound which will provide a tough, heat, moisture, ozone, and flame resistant covering meeting the requirements of paragraph 4.3.1 of ICEA Standard S-61-402. The overall jacket thickness shall be in accordance with Table 18, Part 4, ICEA Standard S-61-402.

Conductor cable used for the signal control circuits shall be #14 AWG multi-conductor cable meeting the above requirements.

Conductor cable used for intersection interconnection shall be #12 AWG multi-conductor cable meeting the above requirements.

E. POWER SUPPLY WIRE: Intersection signalization power supply wire shall be single conductor wire for operation on a 600V maximum, and it shall be suitable for use at conductor temperatures not exceeding 75 degrees Celsius. Material, construction and tests shall be in accordance with the applicable requirements of the ICEA Standard S-66-524 "Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy."

Conductors shall be stranded, annealed coated copper. Copper wire before insulating or stranding, shall meet the requirements of the latest edition of ASTM B-33 (for coated wire). Stranding shall be Class B, in accordance with the latest edition of ASTM B-8.

Refer to drawings for size and type of wire required.

8.0 STEEL MAST ARM TYPE TRAFFIC SIGNAL STANDARDS: The following specification shall govern the design of steel mast arms with poles and bases unless otherwise specified on the plans.

A. COMPLETE ASSEMBLY:

All items for complete assembly shall be furnished including, but not limited to:

(1) Arm with support shaft and base
(2) Flange plates and bolts for attachment of mast arm to shaft
(3) Anchor bolts with nuts and washers
(4) Cover(s) for the exposed anchor bolts
(5) Cap for top of pole

B. DESIGN:

The complete assembly shall be designed to support standard one-way, multi-section signals rigidly mounted in the specified locations. All traffic Signal Poles shall conform to latest edition of AASHTO "Standard Specification for Structural Support for Highway Signs, Luminaries and Traffic Signals" Handbook with a wind load of 80 MPH and 1.3 gust factor.

The shaft and mast arm shall each be made of only one length of best grade hot rolled, basic open hearth steel of not less than #7 manufacturer's steel gauge. Only one longitudinal weld, and no transverse welds shall be permitted in the fabrication of the shaft and mast arms. After begin formed and welded, the shaft shall then be longitudinally cold rolled under sufficient pressure to flatten the weld, form a round tapered tube and increase its physical characteristics so the metal will have a guaranteed minimum yield strength of 50,000 psi. The shaft and arms shall have a uniform taper of 0.14 inches of diameter change per foot of length. As an alternate, mast arms in excess of 38 feet in length may be made in two pieces which shall assemble by the outer piece telescoping over the inner piece with a firm tapered fit. The joint shall be secured against movement with a through bolt or stud and lock nuts.

C. ANCHOR BOLTS:

Four high-strength steel anchor bolts, each fitted with two nuts and two washers shall be furnished with each pole. Each anchor bolt shall have an "L" bend at the bottom end and shall be threaded at the top end. Only the top ten inches on the threaded ends of the anchor bolts need be galvanized. The manufacturer shall properly machine or otherwise ensure that the nuts and washers shall easily fit the anchor bolts after the galvanizing process. The bolts, nuts and washers shall be delivered soon after receipt of order.

D. ANCHOR BASE:

A one-piece steel anchor base with 16" bolt circle except where otherwise noted of adequate strength, shape and size shall telescope and be welded to the lower end of the shaft using two continuous welds.

E. POLE SHAFT:

A handhole with a minimum area of 25 square inches shall be welded into the shaft a short distance above the base. A cover shall be provided for the handhole.

Pole top caps shall be provided and shall be secured in place with set screws or other suitable fasteners. A "J-hook" wire support shall be provided in each pole shaft.

Provision shall be made for a grounding attachment.

F. MAST ARM:

The mast arm shall have a horizontal length as called for on the plans.

A 1 1/2" through hole shall be drilled in the arm at the location of each signal head or other required fixture. The hole shall be well reamed and fitted with a wiring grommet to prevent the chafing of cables.

G. MAST ARM ATTACHMENT:

Arm and pole mounting plates shall be provided. The mast arm plate shall telescope the mast arm and be circumferentially welded inside and out. The pole plates shall be attached to the shaft by welded gusset plate to bottom and sides. Four high-strength bolts meeting ASTM A-325 shall be furnished fully threaded into pole plates to attach the arm to the shaft. Smooth holes shall be provided in the two plates to allow the signal cable to go from the shaft to the arm without exposure to the outside weather.

H. IDENTIFICATION:

The manufacturer shall permanently mark each mast arm and bolt to identify them with their corresponding Traffic Signal Pole Summary item number.

I. FINISH:

The manufacturer shall provide an information sheet showing design details of the mast arm, pole, anchor bolts, flange construction, orientation of anchor bolts to mast arm and pole, and any other pertinent installation instruction.

All members and hardware shall be hot-dipped galvanized according to ASTM A153 for hardware.

J. JOINT USE:

When a joint-use pole is specified, the length shall be a minimum of 35 feet. In addition to the mast arm(s), it shall be designed to support truss-type luminaire arms with a five foot upsweep (40 foot mounting height) with each arm supporting a 70 pound luminaire with 3.2 square feet of wind load area. Two simplex-type fittings shall be provided for each luminaire arm. The distance between the bolt holes on the simplex fittings shall be 27 9/16" . The directional alignment of the luminaire arm(s) shall be as shown on the plans.

K. STREET NAME SIGNS:

When specified, the complete assembly shall also be designed to support a rigid mounted reflective street name sign mounted as shown on the plans. The sign will be mounted to the mast arm in such a manner that torsion or torque forces acting on the mast arm shall be held to a minimum.

9.0 STEEL SPAN WIRE POLES: The following specification shall govern the design of steel span wire poles and appurtenances unless otherwise specified on the plans.

A. COMPLETE ASSEMBLY:

The complete assembly shall include, but not be limited to:

(1) Tapered steel shaft with base
(2) Handhole with cover
(3) Cap for top of pole
(4) Span wire clamps
(5) Steel wire entrance (weatherhead)
(6) Anchor bolts with nuts and washers
(7) Covers for exposed anchor bolts

B. DESIGN:

The total assembly shall be designed to support, by means of a span wire and tether, the various equipment shown on the plans. The pole shall provide a minimum clearance of seventeen (17) feet (at mid span) from the pole base elevation to the tether wire with a span wire sag of five percent.

Corner poles shall be tapered and have a minimum section modulus at the base of the pole 23.0 cubic inches. The minimum length of the corner pole shall be twenty-six (26) feet for standard installations and thirty-five (35) feet for joint use installations unless otherwise shown on the plans. (See paragraph H below for other joint use requirements).

End poles shall be tapered and have a minimum section modulus at the base of the pole of 15.0 cubic inches. The length of the end pole shall be twenty-six (26) feet.

The manufacturer shall provide an information sheet showing design details of the pole, anchor bolts, flange construction, orientation of anchor bolts, recommendation for back rate and any other pertinent installation instructions.

C. ANCHOR BOLTS:

Four high strength steel anchor bolts, each fitted with two nuts and two washers, shall be furnished with each pole. Each anchor bolt shall have an "L" bend at the bottom end and shall be threaded at the top end. Only the top ten (10) inches in the threaded ends of the anchor bolts need be galvanized. The manufacturer shall properly machine or otherwise insure that the nuts and washers shall readily fit the anchor bolts after the galvanizing process.

D. ANCHOR BASE:

A one-piece steel anchor base conforming to requirements of ASTM A-36, of adequate strength, shape and size shall telescope and be welded to the lower end of the shaft using two continuous welds.

E. POLE SHAFT:

The shafts shall be fabricated from ASTM A-595 grade A steel.

A handhole with a minimum area of 25 square inches shall be welded into the shaft a short distance above the base. A cover shall be provided for the handhole.

Pole top caps shall be provided and shall be secured in place with set screws or other suitable fasteners.

A "J-Hook" wire support shall be provided in each pole shaft.

Provision shall be made for a grounding attachment.

Span wire clamps shall be provided to attach two (2) span wires meeting at 90 degrees and two (2) tether wires meeting at 90 degrees.

A steel, wire entrance (weatherhead) shall be provided for each pole.

F. IDENTIFICATION:

The manufacturer shall permanently mark each pole to identify it with the corresponding traffic signal pole summary item number.

G. FINISH:

All members and hardware shall be hot dipped galvanized according to ASTM A-123 for shafts and according to ASTM A-153 for hardware.

H. JOINT USE:

When a joint use pole is specified, the length shall be a minimum of thirty-five feet (35'). In addition to the span wire, it shall be designed to support truss type luminaire arms with a five foot (5') upsweep (40 foot mounting height) with each arm supporting a 70 pound luminaire with 3.2 square feet of wind load area. Two simplex type fittings shall be provided for each luminaire arm. The distance between the bolt holes on the simplex fittings shall be 27-9/16". The directional alignment of the luminaire arm(s) shall be as shown on the plans.

10.0 SERVICE BOXES: Installation of service boxes shall be at the locations shown on the plans and at additional points as the Contractor may desire, at his own expense.

The service boxes shall be cylindrical in shape and have minimum dimensions of three (3) feet deep, two and one-half (2-1/2) feet outside diameter, two (2) feet inside diameter and three (3) inch wall thickness.

A minimum eight (8) inch layer of one (1) inch aggregate shall be laid as a drainage bed for each service bed.

The ring and cover shall be cast iron unless otherwise noted on the plans, and they shall be capable of withstanding normal traffic loads.

11.0 JUNCTION BOXES: The enclosures and covers shall be concrete gray color, and shall have dimensions similar to those shown on the plans. Materials shall be polymer concrete reinforced by a heavy weave fiberglass. Enclosures shall be rated for no less than 8,000 pounds over a 10" x 10" area, and covers shall be rated for no less than 15,000 pounds over a 10" x 10" area. Material compressive strength shall be no less than 11,000 psi. The covers shall bear the logo "TRAFFIC SIGNAL" or similar approved wording, and they shall have a minimum coefficient of friction of 0.5.

12.0 12" POLYCARBONATE VEHICLE SIGNAL HEADS:

A. The signal housing shall be screw injection molded of polycarbonate resin and shall be of sectional construction to permit the installation of the number of sections as specified on the bid document and to allow the installation of additional sections for future needs. The top and bottom of each section shall include mounting holes sized to accommodate standard 1 1/2 inch signal mounting hardware. Each mounting hole shall be surrounded with molded in serrations to provide a positive lock between the individual sections of the signal and between the signal head assembly and the mounting bracketry. The serrations shall provide 5 degree increments of adjustment to allow proper aiming of the signal. Signal sections shall be joined together with a minimum of four bolts and locknuts located in a manner so as to distribute stress equally over the body ends. The inside surface of each body end shall be essentially smooth and flat. Any webbing or other protrusions which prevent the use of standard signal mounting hardware or which obstruct the use of normal installation tools shall be cause for rejection.

TRAFFIC SIGNAL SPECIFICATIONS

PREPARED BY
SEDGWICK COUNTY BUREAU OF PUBLIC SERVICES
HIGHWAY DIVISION
DAVID C. SPEARS, P.E. DIRECTOR/COUNTY ENGINEER

REVISED	SCALE	DESIGNED	TRACED	CHECKED	SHEET NO.
				WDH	
	DATE				
	PLANFILE		TOTAL SHEETS		

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