FHWA REGION NO.	STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
7	KANSAS	87N-0080-01	1997	104	162

3.2.21.3. LETTERING. Copy size for the legends shall be as follows: 150 mm series E-Modified upper case for SW, ST, AV; 200 mm upper case with 150 mm lower case series E-Modified for names; 200 mm series E-Modified for numerals.

3.2.21.4. ACCEPTANCE. Before final fabrication and shipment, the manufacturer or supplier shall provide, for the Engineer's approval, a layout of each sign showing the exact street name lettering to be placed on the sign. The signs shall be visually accepted by the Engineer.

3.2.22. REGULATORY SIGNS. The design details (color, letter height and letter series) for all regulatory signs shall be as shown in the latest edition of the Standard Highway Signs Manual. Special signs not covered by the Standard Highway Signs Manual shall be as shown in the Plans. Sign blanks shall be a minimum of 2 mm thick aluminum alloy. The sign face shall be of high-performance retroreflective sheeting meeting the requirements of Subsection 2201 of the Standard Specifications.

3.2.22.1. ACCEPTANCE. Regulatory signs included in the Traffic Signal Installation bid item will be accepted in accordance with Section 3.3. of these specifications, with additional certification certification stating that the retroreflective sheeting used to manufacture the signs was pre-qualified under Subsection 2201 of the Standard Specifications.

3.2.23. BLANK OUT SIGNS. The blank out sign legend shall be as indicated in the Plans. When energized, the sign message shall be clearly legible under any lighting conditions. It shall completely blank out when not energized. No phantom legend shall be seen under any ambient light condition. The housing shall be durable and weatherproof. The sign face shall consist of fiber-optic glass bundles arranged to define the legend. The fiber-optic modules and associated components shall be assembled directly to the sign face and shall have an inside back cover to provide protection for the module. The fiber-optic bundles shall be ground smooth and optically polished at the input and output ends for maximum light transmission. The sign shall be lit by 42 Watt lamps operating at 10.8 volts AC. The lamps shall sustain an average 8,000 hour life. Transformers shall be used to reduce the incoming 120 volts AC to 10.8 volts AC. The transformers shall contain Class A insulation and weatherproofing, and shall be rated at 48.5 volt-amps. The sign shall be capable of continuous operation over a range in temperatures from −37 degrees to +74 degrees Celsius.

3.2.24. ENTRANCE HEAD. The entrance head shall be of cast aluminum and shall be of the clamp-on type for use with rigid conduit of the specified in the Plans. It shall be U.L. listed.

3.2.25. SERVICE ENCLOSURE. The service enclosure shall be watertight, and be of sufficient size and load rating to provide the number of circuits indicated in the Plans. The enclosure shall be provided with a hasp for a padlock. Padlocks will be provided by others.

3.2.26. CIRCUIT BREAKERS. The circuit breakers shall be standard plug-in, single pole, molded case, of the trip rating as shown in the Plans.

3.2.27. GROUND ROD. The ground rod shall be 19 mm diameter by 3 m long copper bonded steel rod and bear the U.L. label.

3.2.28. GROUND ROD CLAMP. The ground rod clamp shall be a 19 mm clamp cast of high strength copper alloy and be U.L. listed for direct burial.

3.2.29. SERVICE WIRE. The service wire shall be Type USE-2 standard, annealed, copper wire meeting the requirements of A.S.T.M. B-8, and be of the size specified in the Plans.

3.2.30. LIGHTING DISTRIBUTION WIRE. The lighting distribution wire shall be Type USE-2 stranded, annealed, copper wire meeting the requirements of A.S.T.M. B-8, and be of the size specified in the Plans.

3.2.31. POLE & BRACKET WIRE. The pole and bracket wire shall be Type USE-2 stranded, annealed, copper wire meeting the requirements of A.S.T.M. B-8, and be of the size specified in the Plans.

3.2.32. GROUND WIRE. The ground wire shall be No. 6 AWG solid bare copper wire meeting the requirements of A.S.T.M. B-3.

3.2.33. MULTICONDUCTOR CABLE. The multiconductor cable shall meet the requirements of IMSA 19-1 or IMSA 20-1. Conductors shall be stranded No. 14 AWG. The number of conductors shall be as indicated in the Plans.

3.2.34. SHIELDED DETECTOR LEAD-IN CABLE. Shielded detector lead-in cable shall meet the requirements of IMSA 50-2. Conductors shall be No. 14 AWG.

3.2.35. DETECTOR LOOP WIRE. The detector loop wire shall meet the requirements of IMSA 51-5. The conductor shall be No. 14 AWG, and the tube shall be of polyethylene.

3.2.36. LOOP SEALANT. The loop sealant shall be a one-part polyurethane, moisture curing, elastomeric compound requiring no mixing, measuring, or application of heat prior to or during application. It shall be specifically designed for sealing and protecting detector loop wires in both asphalt and concrete pavements. It shall not chemically attack or damage the pavement, yet shall sufficiently bond with the pavement to effectively seal the saw cut and prevent the infiltration of moisture into the slot. The cured loop sealant shall exhibit resistance to the normally encountered effects of weather, vehicular abrasion, motor oils, gasoline, antifreeze solution, brake fluid, deicing chemicals and salt in such manner that the performance of the detector loop is not adversely affected. The loop sealant shall provide compressive yield strength to withstand normal vehicular traffic and prevent the intrusion of rocks, glass, and other road debris into the slot. It shall remain sufficiently flexible at all normally encountered temperatures to withstand normal movement in asphalt and concrete pavements while protecting the loop wire from fracture and shear.

3.2.37. PRE-FORMED LOOPS. Pre-formed loops shall be factory assembled loops having the dimensions and number of turns of wire specified in the Plans. The loops shall be constructed of a minimum No. 16 AWG Type TFFN/THWN copper wire meeting the requitrements of A.S.T.M. B-8, and encased in heavy duty tubing compatible with the paving material being used on the project. The tubing shall be completely filled with asphalt sealant material after the wire is installed. The loop tail shall be of flexible tubing of the length specified in the Plans and shall also be filled with asphalt sealant material. The detector wire within the loop tail shall be twisted a minimum of 10 turns per meter.

3.2.38. CONDUIT.

3.2.38.1. METALLIC CONDUIT AND FITTINGS. Metallic conduit shall be galvanized rigid steel conduit meeting the requirements of A.N.S.I. C80.1. Metallic conduit fittings shall be zinc coated and shall meet the requirements of A.N.S.I. C80.4.

3.2.38.2. PVC CONDUIT AND FITTINGS. PVC conduit shall be either Schedule 40 or Schedule 80 rigid polyvinyl chloride meeting the requirements of the latest edition of N.E.M.A. Standard TC-2. PVC conduit fittings shall meet the requirements of N.E.M.A. Standard TC-3 and shall be fabricated from polyvinyl chloride having the same chemical and physical properties as the conduit with which it is to be used. The conduit and fittings shall bear the U.L. label.

3.2.38.3. POLYETHYLENE CONDUITPolyethylene conduit shall be coilable, smooth wall, Schedule 40 or Schedule 80, high density polyethylene duct meeting the requirements of N.E.M.A. Standard TC-7.

3.2.39. EXPANSION FITTINGS. Expansion fittings shall be as detailed in the Plans.

3.3. BASIS OF ACCEPTANCE. Acceptance of materials furnished under these specifications will be based upon the following:

3.3.1. PRE-QUALIFICATION. The Bureau of Traffic Engineering maintains a list of Pre-Qualified Traffic Signal Materials. Any product called for in the Bill of Materials in the Plans that is being furnished for the project must be on that list, or must be approved as noted in Section 3.3.2.1 of these specifications. A manufacturer or supplier intending to supply traffic signal materials under these specifications shall submit an original copy of any catalog cuts, shop drawings, drawings, and/or data sheets on the material, and certification from the manufacturer or fabricator certifying that the material meets the applicable specifications. This information shall be submitted to the Bureau of Traffic Engineering, 217 SE 4th Street, 4th Floor, Topeka, KS 66603-3504.

3.3.2. TRAFFIC SIGNAL MATERIALS LIST. Items on the list shall include all items for which quantities are indicated in the Bill of Materials in the Plans. The list shall include the make, model and other descriptive data as may be required by the Engineer to identify the product. The Contractor shall sign the list certifying that the materials on the list, if approved, will be furnished for the project. The Engineer wil compare the items on the Traffic Signal Materials List to the Pre-Qualified Traffic Signal Materials List. If all of the items match, the Engineer will sign the list attesting that the materials are approved for use on the project. A copy of the list shall then be forwarded to each of the following: Chief of Materials and Research, Chief of Traffic Engineering, and the Maintaining Agency's contact person indicated in the Plans.

3.3.2.1. In the event the Contractor wishes to furnish any item that is not on the pre-qualified list, the Contractor shall furnish the Engineer with the information for pre-qualification per Section 3.3.1 of these specifications. This information will be forwarded to the Bureau of Traffic Engineering for review and approval, and the possible addition to the pre-qualified list.

3.3.3. VISUAL INSPECTION. Items will be visually inspected by the Engineer at the job site for condition and conformance with the requirements of these specifications.

3.3.4. ADDITIONAL REQUIREMENTS. There are additional requirements noted for specific items under Section 3.2. of these specifications.

NO.	DATE		BY	APP'D
3				
2				
1				

KANSAS DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL
SPECIFICATIONS

TE120DSI 04/28/98

FHWA APPROVAL	05/18/98			APP'D	Linda G. Voss, P.E.
DESIGNED	J.F.F.	DETAILED	J.F.F.	QUANTITIES	TRACED
DESIGN CK.	D.A.C.	DETAIL CK.	D.A.C.	QUAN. CK.	TRACE CK.