FHWA REGION NO.	STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
7	KANSAS	37 N-0047-01 STP-N 004(701)	19	10	21

CONSTRUCTION AND MATERIAL REQUIREMENTS FOR TRAFFIC SIGNAL INSTALLATIONS

NOTE: WHENEVER THE PLAN SPECIFICATIONS CONFLICT WITH THE LATEST EDITION OF THE KANSAS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS, THE PLAN SPECIFICATIONS SHALL GOVERN. AND WHEN THE PLAN NOTES CONFLICT WITH PLAN SPECIFICATIONS, THE PLAN NOTES SHALL GOVERN.

CONSTRUCTION

SEE STANDARD SPECIFICATIONS, "LATEST EDITION, SECTION 681, 'ELECTRIC LIGHTING AND TRAFFIC SIGNALS'".

THE LOCAL POWER COMPANY SHALL BE NOTIFIED BY THE CONTRACTOR PRIOR TO ANY SERVICE CONNECTION TO DETERMINE THE PROPER TYPE AND METHOD OF HOOK UP FOR THE PARTICULAR LOCATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYMENT OF ANY COSTS ASSOCIATED WITH THE POWER HOOK UP, REGARDLESS WHETHER THESE COSTS HAVE BEEN LISTED ON THE BILL OF MATERIALS.

MATERIALS

ALL MATERIALS USED IN THE FABRICATION OR ASSEMBLY OF THE ITEMS LISTED BELOW SHALL BE NEW AND SHALL COMPLY WITH THE APPLICABLE PARTS OF SUBSECTION 1703 'ELECTRIC LIGHTING AND TRAFFIC SIGNAL EQUIPMENT' OF THE STANDARD SPECIFICATIONS AND THE LATEST EDITION OF THE NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION STANDARD NO. 15-1.

ALL SIGNS, SIGNALS, AND MARKINGS SHALL CONFORM TO THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

SEE SUBSECTION 1608 'STRUCTURAL STEEL TUBING' OF THE STANDARD SPECIFICATIONS FOR THE BASIS OF ACCEPTANCE FOR MATERIAL FURNISHED UNDER SUBSECTION 1606.

SEE SUBSECTION 1613 'ANCHOR BOLTS FOR STRUCTURAL USES' OF THE STANDARD SPECIFICATIONS FOR THE BASIS OF ACCEPTANCE OF ANCHOR BOLTS FOR TRAFFIC SIGNAL POLES. IF TYPE 'B' CERTIFICATION IS NOT PROVIDED ACCORDING TO SECTION 2600 'MATERIALS CERTIFICATIONS' OF THE STANDARD SPECIFICATIONS, THE ENGINEER MAY REQUIRE TESTING OF AN ANCHOR BOLT. ANCHOR BOLTS FOR CONTROLLER CABINETS AND TRAFFIC SIGNAL PEDESTALS SHALL MEET THE REQUIREMENTS OF THE LATEST EDITION OF THE AMERICAN SOCIETY FOR TESTING AND MATERIALS SPECIFICATION A36 'SPECIFICATION FOR STRUCTURAL STEEL'.

ALL OTHER MATERIALS FURNISHED WILL BE APPROVED BY SHOP DRAWINGS, CATALOG CUTS, BRAND NAMES OR OTHER REQUIREMENTS AS SHOWN ON THE PLAN OR STATED IN THE PROPOSAL. SEVEN COPIES OF ALL THE ABOVE SHALL BE SUBMITTED TO THE ENGINEER TO BE FORWARDED TO THE TRAFFIC ENGINEER, BUREAU OF TRAFFIC ENGINEERING, DOCKING STATE OFFICE BUILDING, TOPEKA, KANSAS 66612.

VISUAL INSPECTION WILL BE PERFORMED AT THE DESTINATION FOR CONDITION AND CONFORMANCE WITH REQUIREMENTS AS INDICATED BY THE APPROVED DOCUMENTS.

MAJOR ITEMS OF ELECTRONIC EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL BE OF THE SAME TYPE AND CONSIST OF PRODUCTS OF THE SAME SUPPLIER IN ORDER TO SECURE UNIFORMITY, SINGLE RESPONSIBILITY, AND MOST SATISFACTORY SERVICE.

TRAFFIC SIGNAL SPECIFICATIONS

I. GENERAL

A. TRAFFIC SIGNAL IMPROVEMENT POLICIES: THE WORK INCLUDED IN THIS PROJECT MAY INVOLVE MODIFICATION OF EXISTING TRAFFIC SIGNAL EQUIPMENT AT A LOCATION WHICH IS PRESENTLY CONTROLLED BY OPERATING TRAFFIC SIGNALS. IF PORTIONS OF THE EXISTING TRAFFIC SIGNAL INSTALLATION ARE TO BE INCORPORATED IN THE PROPOSED SIGNAL INSTALLATION, THE FOLLOWING POLICIES ARE TO BE OBSERVED DURING THE INSTALLATION OF THE PROPOSED MODIFICATION AND IMPROVEMENTS:

1. EXISTING OPERATION: THE EXISTING SIGNAL CONTROLS SHALL BE KEPT IN OPERATION AS LONG AS PRACTICABLE DURING INSTALLATION OF THE SIGNAL MODIFICATIONS AND IMPROVEMENTS EXCEPT FOR SHUTDOWNS TO ALLOW FOR ALTERATIONS AS REQUIRED FOR INSTALLATION OF THE PROPOSED IMPROVEMENTS.

2. PERIODS OF DISRUPTION: SOME PERIODS OF DISRUPTION OF EXISTING SIGNAL OPERATION CAN BE TOLERATED DURING INSTALLATION OF THE PROPOSED IMPROVEMENTS; HOWEVER, THE CONTRACTOR SHALL COORDINATE ANY PLANNED DISRUPTION OF SIGNAL OPERATIONS WITH THE ENGINEER A REASONABLE TIME IN ADVANCE OF SUCH DISRUPTION OF OPERATIONS.

3. DISRUPTION TIMES: PLANNED DISRUPTION OF SIGNAL OPERATIONS SHALL BE LIMITED TO THE HOURS BETWEEN 9:00 AM AND 4:00 PM. THE SIGNAL CONTROLS SHALL BE OPERABLE DURING ALL OTHER PERIODS.

4. EXISTING WIRING: ALL EXISTING WIRING WITHIN EXISTING CONTROLLER CABINETS SHALL BE IDENTIFIED BY THE CONTRACTOR AND EACH CONDUCTOR PROPERLY LABELED PRIOR TO DE-ENERGIZING THE EXISTING CONTROLLER TO INSTALL THE PROPOSED MODIFICATIONS AND IMPROVEMENTS.

B. SALVAGED EQUIPMENT

1. REINSTALLED: WHEN SALVAGED EQUIPMENT IS TO BE REINSTALLED, THE CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY MATERIALS AND EQUIPMENT INCLUDING ANCHOR BOLTS, NUTS, WASHERS, CONCRETE, ETC. REQUIRED TO COMPLEMENT THE SALVAGED EQUIPMENT IN THE NEW INSTALLATION.

2. NOT REINSTALLED: WHEN SALVAGED EQUIPMENT IS NOT TO BE REINSTALLED, IT SHALL BE STORED ON SITE FOR REMOVAL BY THE OWNER OF THE EQUIPMENT.

3. REMOVAL OF EXISTING BASES: EXISTING TRAFFIC SIGNAL BASES, PEDESTAL BASES, AND/OR CONTROLLER BASES SHALL BE REMOVED A MINIMUM OF 24" BELOW FINISHED GRADE.

C. TURN ON

1. FLASHING OPERATION: AT LOCATIONS WITHOUT PREVIOUS TRAFFIC SIGNAL CONTROL, THE NEW TRAFFIC SIGNALS SHALL BE FLASHED APPROXIMATELY TWO TO THREE DAYS PRIOR TO FULL SIGNAL SYSTEM TURN ON.

2. SYSTEM TURN ON: THE SIGNAL SYSTEM TURN ON SHALL NOT OCCUR ON FRIDAYS, WEEKENDS, OR HOLIDAYS AND SHALL BE COMPLETED PRIOR TO 3:00 PM ON THE DAY OF THE TURN ON.

3. SUPPLIER REPRESENTATIVE: THE SUPPLIER OF CONTROL EQUIPMENT SHALL HAVE A REPRESENTATIVE PRESENT AT THE SIGNAL SYSTEM TURN ON.

4. TRAFFIC ENGINEERING NOTIFICATIONS: THE BUREAU OF TRAFFIC ENGINEERING SHALL BE NOTIFIED AT LEAST ONE WEEK IN ADVANCE OF THE DATE OF SIGNAL TURN ON.

D. GUARANTEE: ALL EQUIPMENT FURNISHED ON A PROJECT BY THE CONTRACTOR SHALL BE GUARANTEED AGAINST ANY IMPERFECTIONS IN WORKMANSHIP AND MATERIALS, SHOULD ANY DEFECT DEVELOP UNDER NORMAL AND PROPER OPERATING CONDITIONS DURING A 30 DAY TESTING PERIOD FOLLOWING COMPLETION OF ALL ELECTRICAL APPARATUS, HOOK UPS AND PRIOR TO ACCEPTANCE BY THE STATE, THIS MALFUNCTION SHALL BE CORRECTED BY AND AT THE EXPENSE OF THE CONTRACTOR, INCLUDING ALL LABOR, MATERIALS AND ASSOCIATED COSTS. THE CUSTOMARY MANUFACTURERS' WARRANTIES SHALL BE ASSIGNED TO THE MAINTAINING AGENCY.

II. TRAFFIC SIGNAL CONTROLLERS

A. GENERAL

1. MANUALS: A MINIMUM OF TWO MANUALS SHALL BE PROVIDED FOR EACH CONTROLLER AND SHALL INCLUDE COMPLETE NOMENCLATURE, WIRING DIAGRAMS, SERVICE SHOWING TEST VOLTAGES, FUNCTIONAL DESCRIPTION OF CIRCUITS, PARTS LIST AND CROSS REFERENCE TO STANDARD PART NUMBERS, APPROPRIATE TESTING PROCEDURES, AND OTHER PERTINENT DATA.

2. CONFLICT MONITOR: THE CONFLICT MONITOR SHALL AS A MINIMUM MEET THE REQUIREMENTS OF THE LATEST EDITION OF SECTION 6 OF THE NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION STANDARD 15-1. THE CONTROLLER SHALL NOT OPERATE WITH THE CONFLICT MONITOR DISCONNECTED. THE CONFLICT MONITOR SHALL BE MICROPROCESSOR BASED WITH A LIQUID CRYSTAL DISPLAY. IN ADDITION, THE UNIT SHALL PERFORM THE FOLLOWING:

A. MINIMUM CLEARANCE MONITOR: ABSENCE OF A MINIMUM 3.0 SECOND PERIOD OF AN ACTIVE YELLOW INPUT ON A CHANNEL AFTER A GREEN SHALL CAUSE A FAILURE.

B. WATCHDOG MONITOR: DURING FLASHING OPERATION, ABSENCE OF A CHANGE OF STATE FOR GREATER THAN 1.5 SECONDS SHALL CAUSE A FAILURE.

C. YELLOW MONITORING: THE CONFLICT MONITOR SHALL MONITOR FOR GREEN OR WALK VERSUS AN ACTIVE YELLOW INDICATION ON ONE CHANNEL. THIS CONDITION SHALL CAUSE A FAILURE.

D. RED MONITOR: THE CONFLICT MONITOR SHALL MONITOR FOR GREEN OR WALK OR YELLOW VERSUS AN ACTIVE RED INDICATION ON ONE CHANNEL. THIS CONDITION SHALL CAUSE A FAILURE.

E. RESETS: IF A RESET COMMAND IS RECEIVED FROM EITHER THE FRONT PANEL CONTROL OR THE EXTERNAL RESET INPUT FOR A CONTINUOUS DURATION OF MORE THAN 120 SECONDS, THE UNIT SHALL IGNORE THE RESET COMMAND AND BEGIN NORMAL MONITORING FUNCTIONS.

F. CLOCK: AN INTERNAL CLOCK SHALL BE PROVIDED TO MARK THE DATE AND TIME WHEN THE UNIT IS TRIGGERED BY A FAILURE. BACKUP POWER SHALL ALLOW THE CLOCK TO MAINTAIN TIMING DURING POWER INTERRUPTIONS. AUTOMATIC ADJUSTMENTS SHALL BE MADE TO THE TIME OF DAY AND DATE TO ACCOMMODATE LEAP YEARS AND DAYLIGHT SAVINGS TIME.

G. DISPLAY AND LOG: A MINIMUM OF THE LAST NINE FAILURES WHICH CAUSED THE CONFLICT MONITOR TO TRANSFER SHALL BE LOGGED. THIS LOG SHALL NOT BE LOST DUE TO POWER INTERRUPTIONS. THE CONFLICT MONITOR SHALL DISPLAY THE LAST FAILURE UNTIL RESET. THE LOG BY TIME AND DATE THE FOLLOWING EVENTS: POWER ON/OFF OCCURRENCES, FAILURES AND TYPE, AND DISPLAY INDICATIONS AT THE TIME OF FAILURE.

3. CONTROLLER CABINET

A. HOUSING: THE CONTROLLER AND ALL ASSOCIATED EQUIPMENT SHALL BE FURNISHED COMPLETELY HOUSED IN A NEMA TYPE NATURAL ALUMINUM CABINET. THE CABINET SHALL BE OF CLEAN CUT DESIGN AND APPEARANCE HAVING NO SHARP EDGES, CORNERS OR PROJECTIONS. THE SIZE OF THE CABINET SHALL BE SUCH AS TO PROVIDE ADEQUATE SPACE FOR HOUSING THE CONTROLLER AND ALL ASSOCIATED ELECTRICAL AND AUXILIARY DEVICES.

B. DOOR: A HINGED DOOR SHALL BE PROVIDED PERMITTING COMPLETE ACCESS TO THE INTERIOR OF THE CABINET. THE CABINET IS TO BE WEATHERPROOF AND DUST-TIGHT. THE DOOR SHALL BE PROVIDED WITH A STRONG LOCK AND TWO SETS OF KEYS. THE DOOR HINGES AND PINS SHALL BE OF A NONCORRODING MATERIAL.

C. POLICE DOOR: IN ADDITION TO THE MAIN DOOR OF THE CONTROLLER CABINET, THERE SHALL BE AN AUXILIARY DOOR PROVIDED IN THE MAIN DOOR WITH A LOCK AND STANDARDIZED POLICE KEY. THE PANEL BEHIND THE AUXILIARY POLICE DOOR SHALL CONTAIN TWO SWITCHES TO ACCOMPLISH THE FOLLOWING FUNCTIONS: (1) CHANGE FROM NORMAL OPERATION TO FLASHING, AND VICE VERSA; AND (2) INTERRUPT POWER TO THE SIGNAL HEADS.

D. EQUIPMENT SUPPORTS: THE CABINET SHALL CONTAIN STRONG MOUNTING TABLES, SLIDING WAYS, OR OTHER SUITABLE SUPPORTS FOR THE CONTROLLER AND ASSOCIATED EQUIPMENT.

E. FAN AND FILTERS: THE CABINET SHALL CONTAIN A VENTILATING FAN CONTROLLED BY A THERMOSTAT AND SUITABLE DUST FILTERS FOR THE CAPACITY OF THE VENTILATING SYSTEM. THE FILTERS SHALL BE OF THE DRY TYPE AND EASILY REPLACED.

F. OUTLETS: TWO OUTLETS (A CONVENIENCE OUTLET AND TROUBLE LAMP RECEPTACLE) SHALL BE FURNISHED WITH EACH CABINET.

G. WIRING DIAGRAMS: A MINIMUM OF TWO FIELD WIRING DIAGRAMS OF EACH CABINET SHALL BE PREPARED AT THE COMPLETION OF THE INSTALLATION. COPIES SHALL BE KEPT WITH OTHER FIELD SERVICE INFORMATION ON FILE WITH THE PERMANENT RECORDS OF THE INTERSECTION AND IN THE CABINET.

4. WIRING

A. GENERAL: THE CONTROLLER SHALL BE EQUIPPED WITH AN ACCESSIBLE FIELD TERMINAL AND CONNECTING TERMINAL ASSEMBLY. ALL CABINET WIRING SHALL BE NEAT, TRAINED, SECURE, FIRM, AND CLEARLY IDENTIFIED AT TERMINAL POINTS BY LETTERS OR NUMBERS.

B. TERMINALS: AS A MINIMUM, THE FOLLOWING ITEMS SHALL BE A PART OF THE CABINET WIRING AND ALL TERMINALS PROPERLY IDENTIFIED BY FUNCTION OR NUMBER WITH A FUNCTION CODE:

I. POWER INPUT FUSE: A TERMINAL WITH MAIN CIRCUIT BREAKER FOR POWER SUPPLY LINE INPUT.

II. POWER INPUT NEUTRAL: A TERMINAL UNFUSED FOR THE NEUTRAL SIDE OF POWER SUPPLY LINE INPUT.

III. SIGNAL CABLE: TERMINALS FOR CONDUCTORS OF SIGNAL LIGHT CABLE, ONE FOR EACH SIGNAL OUTPUT CIRCUIT SPECIFIED.

IV. GROUNDING: A GROUNDING BUS WITH NO LESS THAN EIGHT CONNECTING POINTS OR TERMINALS.

V. DETECTOR CABLE: TERMINALS FOR ALL DETECTOR CABLES AS REQUIRED FOR PROPER OPERATION FOR THE NUMBER AND SIZE OF DETECTOR LOOPS SHOWN ON THE PLAN.

VI. PEDESTRIAN PUSH BUTTON CABLE: TERMINALS FOR ALL PEDESTRIAN PUSH BUTTON CABLES AS REQUIRED FOR THE TYPE AND NUMBER OF PUSH BUTTONS SPECIFIED ON THE PLAN.

C. ARRANGEMENT: THE CONTROLLER ASSEMBLY SHALL BE FUNCTIONALLY ARRANGED WITHIN THE CABINET IN A MANNER THAT WILL NOT HINDER THE ENTRANCE, TRAINING AND CONNECTION OF THE INCOMING CABLES AND CONDUCTORS, OR WILL UNNECESSARILY OVERLAP THE CONDUCTORS.

D. POLARITY: THE OUTGOING TRAFFIC CONTROL SIGNAL CIRCUITS SHALL BE OF THE SAME POLARITY AS THE LINE SIDE OF THE POWER SUPPLY. THE COMMON RETURN OF THE SIGNAL CIRCUITS SHALL BE OF THE SAME POLARITY AS THE GROUND OR NEUTRAL SIDE OF THE LINE POWER SUPPLY.

E. GROUNDING: THE GROUNDED SIDE OF THE LINE POWER SUPPLY SHALL BE GROUNDED TO THE CONTROLLER CABINET IN AN APPROVED MANNER.

F. ACCESSORIES: WHEN OTHER ACCESSORIES ARE A PART OF THESE SPECIFICATIONS, THERE SHALL BE A SUFFICIENT NUMBER OF TERMINALS ON THE PANEL TO TERMINATE AND INTERCONNECT ALL EQUIPMENT.

G. RADIO INTERFERENCE: THE COMBINATION OF CHOKE COILS AND/OR CAPACITORS SHALL BE APPLIED TO THE INCOMING POWER LINE CIRCUIT IN ORDER TO SUPPRESS OR MINIMIZE INTERFERENCE WITH RADIO RECEPTION.

H. LOAD SWITCHES: LOAD SWITCHES SHALL HAVE A MINIMUM RATING OF 10 AMPERES INCANDESCENT LOAD, CONTINUOUS DUTY AT 120 VOLT ALTERNATING CURRENT. LOAD SWITCHING SHALL BE PERFORMED WITH SOLID-STATE DEVICES DESIGNED TO PROVIDE FULL LINE VOLTAGE AND LOAD CURRENT TO THE SIGNAL LAMPS. ALL LOAD SWITCHES SHALL BE RACK-MOUNTED FOR EASE IN REPLACEMENT AND CHECKING.

5. SOLID-STATE PREFERRED TRAFFIC SIGNAL CONTROLLER:

A. DIMENSIONS: THE CONTROLLER UNIT SHALL BE SHELF-MOUNTED. THE HEIGHT OF THE CONTROLLER UNIT SHALL NOT EXCEED 24 INCHES. THE DEPTH OF THE UNIT, INCLUDING CONNECTORS, HARNESSES, AND PROTRUSIONS, SHALL NOT EXCEED 15 INCHES.

B. DESIGN: THE CONTROLLER UNIT SHALL BE A MICROPROCESSOR DESIGN. CIRCUIT BOARDS SHALL BE EASILY ACCESSIBLE FOR TROUBLESHOOTING AND SHALL BE INTERCHANGEABLE WITHOUT ADJUSTMENT. THE CONTROLLER UNIT SHALL BE CAPABLE OF OPERATING ACROSS THE FULL TEMPERATURE RANGE AS SPECIFIED IN THE CONTROLLER UNIT ENVIRONMENTAL STANDARDS AND TEST PROCEDURES. THE CONTROLLER UNIT SHALL CONSIST OF SOLID-STATE ELECTRONIC COMPONENTS.

C. MATERIAL AND CONSTRUCTION OF RIGID PRINTED CIRCUIT ASSEMBLIES: MATERIALS, CONSTRUCTION, AND COMPONENT IDENTIFICATION FOR ALL PRINTED CIRCUIT BOARDS SHALL CONFORM TO THE REQUIREMENTS IN SECTION 10.2.3 'MATERIALS AND CONSTRUCTION OF PRINTED CIRCUIT BOARD ASSEMBLIES' OF THE LATEST EDITION OF THE NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION STANDARD 15-1.

D. ENVIRONMENTAL STANDARDS AND TEST PROCEDURES: THE CONTROLLER UNIT SHALL CONFORM TO THE REQUIREMENTS IN SECTION 2 'ENVIRONMENTAL STANDARDS AND TEST PROCEDURES' OF THE LATEST EDITION OF THE NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION STANDARD 15-1.

E. FRONT PANEL DISPLAYS: THE CONTROLLER UNIT SHALL DISPLAY THE FOLLOWING INFORMATION ON THE FRONT PANEL OF THE UNIT: CYCLE LENGTH OR DATA IN EFFECT; OFFSET IN EFFECT AND ITS VALUE; SPLIT IN EFFECT; INTERVAL TIMING; AND DATA ENTRY ACCEPTANCE.

F. PROGRAMMING: THE FRONT PANEL OF THE CONTROLLER UNIT SHALL HAVE A KEYBOARD FOR ENTERING TIMING AND DATA BY THE OPERATOR.

G. FUNCTIONAL REQUIREMENTS: THE FOLLOWING FUNCTIONS, WITH ASSOCIATED MINIMUM TIMING RANGES AND MAXIMUM INCREMENTS, SHALL BE PROVIDED:

A. CYCLES: A MINIMUM OF THREE CYCLES SHALL BE PROVIDED. TOTAL CYCLE LENGTH IS THE SUM OF ALL INTERVAL TIMES. EACH CYCLE SHALL BE ADJUSTABLE OVER A RANGE OF 30 TO 250 SECONDS IN 1 SECOND INTERVALS.

B. SPLITS: A MINIMUM OF TWO SPLITS PER CYCLE SHALL BE PROVIDED. EACH SPLIT SHALL PROVIDE AN ADJUSTABLE INTERVAL TIME FOR EACH INTERVAL IN THE SEQUENCE IN ACCORDANCE WITH SECTION 11.8.7.0 'INTERVALS'. EACH SPLIT SHALL BE ADJUSTABLE IN 1 SECOND INCREMENTS OR IN 1 PERCENT INCREMENTS OF THE CYCLE LENGTH.

C. OFFSETS: A MINIMUM OF THREE OFFSETS PER CYCLE SHALL BE PROVIDED. EACH OFFSET SHALL BE ADJUSTABLE OVER A RANGE OF ZERO TO 249 SECONDS IN 1 SECOND INCREMENTS.

D. INTERVALS: THE CONTROLLER UNIT SHALL PROVIDE A MINIMUM OF 24 INTERVALS PER SEQUENCE. THE TIMING RANGE OF EACH INTERVAL SHALL BE ZERO TO 9.9 SECONDS IN 0.1 SECOND INCREMENTS AND ZERO TO 99 SECONDS IN 1 SECOND INCREMENTS.

E. OUTPUT CIRCUITS: THE CONTROLLER UNIT SHALL PROVIDE A MINIMUM OF 48 OUTPUT CIRCUITS FOR CONTROLLING SIGNAL INDICATIONS.

F. FLASHING OPERATION: THE CONTROLLER UNIT SHALL BE PROGRAMMABLE SO THAT A MINIMUM OF FOUR OUTPUT CIRCUITS MAY BE PROGRAMMED TO FLASH DURING PEDESTRIAN PROTECTION INTERVALS AND ANOTHER FOUR OUTPUT CIRCUITS SHALL BE PROGRAMMED TO FLASH DURING FLASHING OPERATION. A PROGRAMMABLE FLASH INTERVAL SHALL BE PROVIDED FOLLOWING A POWER ON. THE LENGTH OF THE FLASHING INTERVAL SHALL BE PROGRAMMABLE FROM ZERO TO 99 SECONDS IN 1 SECOND INCREMENTS.

G. PREEMPTION: THE CONTROLLER UNIT SHALL PROVIDE OR AT LEAST TWO PREEMPTION SEQUENCES.

H. OFFSET CORRECTION: THE CONTROLLER UNIT SHALL PROVIDE FOR OFFSET CORRECTION WHENEVER THE UNIT IS OUT-OF-STEP WITH THE SYSTEM MASTER.

B. VEHICLE ACTUATED SOLID-STATE TRAFFIC SIGNAL CONTROLLER

1. CONTROLLER

A. GENERAL: THE CONTROLLER SHALL PROVIDE TWO THROUGH EIGHT PHASE FULLY ACTUATED OPERATION AND MEET OR EXCEED THE REQUIREMENTS OF THE LATEST EDITION OF THE NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION STANDARD 15-1. THE DESIGN LIFE OF ALL COMPONENTS SHALL BE NOT LESS THAN 5 YEARS, BASED ON 24 HOURS A DAY OPERATING CONDITIONS IN THEIR RESPECTIVE CIRCUIT APPLICATIONS.

B. TIMING: THE TIMING RANGE OF THE FOLLOWING INTERVALS SHALL BE ZERO TO 9.9 SECONDS IN 0.1 SECOND INCREMENTS: PASSAGE, YELLOW, RED CLEAR, SECONDS PER ACTUATION, MINIMUM GAP, AND DETECTOR STRETCH. THE TIMING RANGE OF THE FOLLOWING INTERVALS SHALL BE ZERO TO 99 SECONDS IN 1 SECOND INCREMENTS: MAXIMUM GREEN, TWO MAXIMUM GREENS, WALK, PEDESTRIAN CLEARANCE (FLASHING DON'T WALK), MAXIMUM INITIAL, TIME BEFORE REDUCTION, TIME TO REDUCE, AND DETECTOR DELAY. THE TIMING OF ANY INTERVAL OR PORTION OF ANY INTERVAL SHALL NOT CHANGE BY MORE THAN 0.9 PERCENT OF ITS SET OPERATING VALUE DUE TO CHANGES IN THE AMBIENT TEMPERATURE WITHIN THE LIMITS OF -30 DEGREES FAHRENHEIT (-34 DEGREES CELSIUS) TO +165 DEGREES FAHRENHEIT (+74 DEGREES CELSIUS).

C. KEYBOARD ENTRY

A. MENU-DRIVEN: THE UNIT SHALL BE MODULAR IN CONSTRUCTION AND UTILIZE FRONT PANEL MENU-DRIVEN KEYBOARDS TO PROGRAM OR READ INFORMATION STORED IN MEMORY. THE UNIT SHALL HAVE A LIQUID CRYSTAL DISPLAY WITH A MINIMUM SIZE OF FOUR LINES WITH 40 CHARACTERS PER LINE AND A BACKLIGHT.

D. FEATURES: THE CONTROLLER SHALL BE PROGRAMMED BY EITHER SEQUENTIAL OR CONCURRENT TIMING FROM TWO THROUGH EIGHT PHASE OPERATION. THE CONTROLLER SHALL HAVE THE FOLLOWING FEATURES: CONCURRENT PEDESTRIAN TIMING, STEADY WALK INDICATIONS, LAST CAR PASSAGE OPTION, MINIMUM YELLOW, VOLUME DENSITY, AND REMOTE FLASH. THE CONTROLLER SHALL BE CAPABLE OF A MINIMUM OF FOUR INTERNALLY PROGRAMMED OVERLAPS.

E. EXPANSION: THE CONTROLLER SHALL BE CAPABLE OF EXPANSION USING INTERNAL FEATURES TO INCLUDE A COORDINATED SYSTEM, PREEMPTION, AND/OR AN INTERNAL TIME CLOCK.

2. POWER

A. CONNECTIONS: ELECTRICAL CONNECTIONS FROM THE CONTROLLER TO THE OUTGOING AND INCOMING CIRCUITS SHALL BE MADE BY INSERTING A MULTITERMINAL PLUG OR PLUGS (MS TYPE) INTO THE ASSOCIATED PLUG RECEPTACLE, INCORPORATED IN THE MOUNTING FRAME OR POWER SUPPLY PANEL. THE CONTROLLER SHALL BE REPLACEABLE WITH A SIMILAR UNIT WITHOUT THE NECESSITY OF DISCONNECTING AND RECONNECTING INDIVIDUAL WIRES.

B. VOLTAGE: THE CONTROLLER SYSTEM SHALL BE DESIGNED TO OPERATE WITHIN THE POWER RANGE OF 95 TO 135 VOLTS SINGLE-PHASE ALTERNATING CURRENT AT 60 HERTZ AND IN THE TEMPERATURE RANGE OF -30 DEGREES FAHRENHEIT (-34 DEGREES CELSIUS) TO +165 DEGREES FAHRENHEIT (+74 DEGREES CELSIUS).

NO.	DATE	REVISIONS	BY	APP'D
3				
2				
1	02/16/93	RETYPED WITH SPEC MODIFICATIONS	JFF	LGV

KANSAS DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL SPECIFICATIONS

TE120A 8/1/90

FHWA APPROVAL	08/01/93		APP'D		
DESIGNED JFF	DETAILED JFF		QUANTITIES	TRACED	
DESIGN CH. M.K.S	DETAIL CH. M.K.S		QUAN. CH.	TRACE CH.	