D. FLASHER

1. FLASHER: A SOLID-STATE, TWO-CIRCUIT, JACK-MOUNTED FLASHER WITH A RATED LOAD OF 15 AMPERES PER CIRCUIT SHALL BE SUPPLIED. WHERE ADDITIONAL LOAD IS REQUIRED, MORE THAN ONE FLASHER WILL BE PROVIDED. THE FLASHER SHALL FLASH AT THE RATE OF 50 TO 60 FLASHES PER MINUTE AND BE FILTERED, IF REQUIRED, TO PREVENT RADIO INTERFERENCE. THE TRANSFER FROM THE CONTROLLER TO THE FLASHER SHALL OCCUR AT THE BEGINNING OF THE MAJOR STREET GREEN INDICATION.

2. RELAYS: WHEN FLASHING RELAYS ARE DE-ENERGIZED, THE RELAYS SHALL TRANSFER SIGNAL LIGHT CIRCUITS FROM THE CONTROLLER UNIT TO THE FLASHER, PERMITTING FLASHING YELLOW ON THE MAJOR STREET OR HIGHWAY AND FLASHING RED TO BE DISPLAYED ON THE MINOR STREET AND AT ALL LEFT TURN LANE SIGNALS.

III. TIME BASED COORDINATING UNITS

A. GENERAL

1. TIME BASE: THE UNIT SHALL ALLOW TRAFFIC CONTROL EQUIPMENT TO BE COORDINATED WITHOUT REQUIRING THE USE OF INTERCONNECTING CABLES. THE UNIT SHALL COORDINATE TRAFFIC CONTROL EQUIPMENT BASED ON SIGNALS FROM A PRECISE TIME BASE, UTILIZING POWER LINE FREQUENCY AND A BACK UP SOURCE WHEN POWER IS INTERRUPTED.

2. TIMING PATTERNS: THE UNIT SHALL HAVE A MINIMUM OF THREE OUTPUT PATTERNS IN ORDER TO CHANGE THE SYSTEM SIGNAL PATTERN IN RESPONSE TO PERIODIC, PREDICTABLE CHANGES IN TRAFFIC LEVELS. THE UNIT SHALL ALSO HAVE MEANS TO SWITCH INDEPENDENTLY FROM 1 PATTERN OF OUTPUTS TO ANOTHER AS A PREPROGRAMMED TIME IN ORDER TO ACHIEVE THE DESIRED COORDINATION OF THE SIGNALS IN THE SYSTEM.

3. DISPLAY: THE UNIT SHALL HAVE MEANS OF DISPLAYING ANY OF ITS STORED INFORMATION AND HAVING THAT INFORMATION ALTERED, ERASED, OR REPLACED BY OPERATION OF THE UNIT'S FRONT PANEL CONTROLS. THE UNIT SHALL HAVE MEANS TO PREVENT UNAUTHORIZED OPERATORS FROM ALTERING, ERASING, OR ENTERING DATA.

B. VOLTAGE: THE VOLTAGE RANGE SHALL BE 95 TO 135 VOLTS ALTERNATING CURRENT.

C. FREQUENCY RANGE: THE OPERATING FREQUENCY RANGE SHALL BE 60 HERTZ PLUS OR MINUS 3.0 HERTZ.

D. POWER INTERRUPTION: THE UNIT SHALL UTILIZE MEANS TO RETAIN DATA IN ITS DATA MEMORY AND MAINTAIN THE OPERATION OF ITS INTERNAL TIME REFERENCE WHEN POWER INTERRUPTIONS OCCUR. UPON RESTORATION OF POWER THE UNIT SHALL RESUME OPERATION AS THOUGH THE POWER INTERRUPTION HAD NOT OCCURRED.

E. AMBIENT TEMPERATURE: THE AMBIENT TEMPERATURE RANGE SHALL BE FROM -30 DEGREES FAHRENHEIT (-34 DEGREES CELSIUS) TO +165 DEGREES FAHRENHEIT (+74 DEGREES CELSIUS).

IV. SURGE PROTECTION

A. DETECTORS: INTERNAL SURGE PROTECTION FOR EACH LOOP DETECTOR IS REQUIRED.

B. ALTERNATING CURRENT SERVICE INPUT: THE CONTROLLER CABINET ALTERNATING CURRENT SERVICE SHALL BE PROVIDED WITH THE FOLLOWING SURGE PROTECTION:

1. SURGES: THE UNIT SHALL BE ABLE TO WITHSTAND A MINIMUM OF TWENTY 20,000-AMPERE SURGES.

2. TERMINALS: THE PROTECTOR SHALL BE PROVIDED WITH TERMINALS AS DEFINED BELOW:

A. MAIN LINE: ALTERNATING CURRENT LINE FIRST STAGE TERMINAL.

B. MAIN NEUTRAL: ALTERNATING CURRENT NEUTRAL INPUT TERMINAL.

C. EQUIPMENT LINE IN: ALTERNATING CURRENT LINE SECOND STAGE INPUT TERMINAL, 10 AMPERES.

D. EQUIPMENT LINE OUT: ALTERNATING CURRENT LINE SECOND STAGE OUTPUT TERMINAL, 10 AMPERES.

E. EQUIPMENT NEUTRAL OUT: NEUTRAL TERMINAL TO PROTECTED EQUIPMENT.

F. GROUND: EARTH CONNECTION.

3. INDUCTOR: THE EQUIPMENT LINE IN AND EQUIPMENT LINE OUT TERMINALS SHALL BE SEPARATED BY A 200 MICROHENRY INDUCTOR RATED TO HANDLE 10 AMPERES ALTERNATING CURRENT SERVICE.

4. FIRST STAGE CLAMP: THE FIRST STAGE CLAMP SHALL BE BETWEEN MAIN LINE AND GROUND TERMINALS.

5. SECOND STAGE CLAMP: THE SECOND STAGE CLAMP SHALL BE BETWEEN EQUIPMENT LINE OUT AND EQUIPMENT NEUTRAL.

6. NEUTRAL: MAIN NEUTRAL AND EQUIPMENT NEUTRAL OUT SHALL BE CONNECTED TOGETHER INTERNALLY AND SHALL HAVE CLAMPING DEVICES RATED AT 20 KILOAMPERES BETWEEN MAIN NEUTRAL AND GROUND TERMINALS.

7. LINE TERMINALS: MAIN LINE AND EQUIPMENT LINE TERMINALS SHALL BE ISOLATED INTERNALLY.

8. SOLID-STATE: NO GAS DISCHARGE TUBES WILL BE ALLOWED. THE PROTECTOR SHALL BE OF SOLID STATE DESIGN.

9. PEAK CLAMP VOLTAGE: PEAK CLAMP VOLTAGE SHALL BE 350 VOLTS @ 20 KILOAMPERES, WITH THE VOLTAGE MEASURED BETWEEN EQUIPMENT LINE OUT AND EQUIPMENT NEUTRAL OUT TERMINALS AND THE CURRENT APPLIED BETWEEN MAIN LINE AND GROUND TERMINALS. WITH GROUND AND MAIN NEUTRAL TERMINALS INTERNALLY TIED TOGETHER, THIS VOLTAGE SHALL NEVER EXCEED 350 VOLTS.

THE MATERIAL OF PROTECTOR MUST BE EPOXY-ENCAPSULATED IN A FLAME-RETARDANT MATERIAL.

11. CURRENT: CONTINUOUS SERVICE CURRENT SHALL BE 10 AMPERES AT 120 VOLTS ALTERNATING CURRENT RMS.

V. DETECTORS

A. GENERAL

1. PHYSICAL: DETECTOR UNITS SHALL BE CARD RACK MOUNTED, PLUG-IN VERSIONS WITH A 24 VOLT DIRECT CURRENT EXTERNAL POWER SUPPLY REQUIREMENT.

2. NEMA REQUIREMENTS: DETECTOR UNITS SHALL BE IN FULL COMPLIANCE WITH THE ENVIRONMENTAL REQUIREMENTS OF THE LATEST EDITION OF THE "NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION STANDARD TS-1 SECTION 14" OVER A TEMPERATURE RANGE OF -30 DEGREES FAHRENHEIT (-34 DEGREES CELSIUS) TO +165 DEGREES FAHRENHEIT (+74 DEGREES CELSIUS) AND HUMIDITY RANGE OF ZERO TO 95 PERCENT AND MEET THE FUNCTIONAL, ELECTRICAL, AND PERFORMANCE REQUIREMENTS OF THIS SPECIFICATION.

3. IDENTIFICATION: ALL COMPONENT PARTS AND TEST POINTS SHALL BE CLEARLY IDENTIFIED BY PERMANENT MARKING OF CIRCUIT REFERENCES ON THE PRINTED CIRCUIT BOARD.

4. SOCKET-MOUNTED: INTEGRATED CIRCUIT DEVICES HAVING 8 OR MORE LEADS SHALL BE SOCKET MOUNTED TO FACILITATE REPAIR AND MAINTENANCE OF UNITS.

B. FUNCTIONAL REQUIREMENTS

1. GENERAL: EACH DETECTOR UNIT SHALL INCLUDE TWO OR FOUR COMPLETE DETECTOR CHANNELS. EACH CHANNEL SHALL SEQUENTIALLY ENERGIZE ITS LOOP INPUTS TO ELIMINATE CROSSTALK (MUTUAL COUPLING) BETWEEN LOOPS.

2. SELF-TUNING: EACH CHANNEL OF THE SENSOR UNIT SHALL AUTOMATICALLY SELF TUNE TO ANY LOOP AND LEAD-IN INDUCTANCE FROM 20 TO 2000 MICROHENRIES WITHIN 10 SECONDS AFTER APPLICATION OR INTERRUPTION OF SUPPLY VOLTAGE. UNIT SHALL ALSO TRACK CHANGES IN LOOP LEAD-IN ELECTRICAL CHARACTERISTICS AS MIGHT NORMALLY BE EXPECTED TO OCCUR IN UNDAMAGED LOOPS, PROPERLY INSTALLED IN SOUND PAVEMENT, WITHOUT PROVOKING FALSE INDICATIONS OR CHANGES IN SENSITIVITY.

3. OPEN LOOP OUTPUT: EACH DETECTOR CHANNEL SHALL OUTPUT (FAILSAFE) CONTINUOUS, NON-RESETTABLE INDICATION AND OUTPUT IN THE EVENT OF A BROKEN (OPEN) LOOP/LEAD-IN CIRCUIT. THE OPEN LOOP INDICATION SHALL NOT BE RESETTABLE AS LONG AS THE OPEN EXISTS, EXCEPT THAT IT SHALL BE DEFEATED WHEN THE CHANNEL "OFF" POSITION IS SELECTED.

4. OPEN LOOP RETUNING: EACH CHANNEL SHALL RETUNE AND DETECT PROPERLY IMMEDIATELY FOLLOWING RECONNECTION OF THE BROKEN (OPEN) CIRCUIT. PREVIOUS "OPEN" LOOP/LEAD-IN CONNECTIONS SHALL BE HELD IN MEMORY FOR RECALL AND VERIFICATION USING A FRONT PANEL "OPEN LOOP TEST" SWITCH.

5. OPEN LOOP TEST: EACH DETECTOR UNIT SHALL BE PROVIDED WITH A LOOP TEST SWITCH POSITION TO VERIFY LOOP SYSTEM INTEGRITY AND REDUCE MAINTENANCE COSTS. THE "OPEN LOOP TEST" POSITION SHALL INDICATE A PREVIOUS FAULT USING THE FRONT PANEL INDICATOR. THE MEMORY SHALL REMAIN INTACT AND SHALL BE ABLE TO BE QUERIED REPEATEDLY. EXISTING DETECTION SHALL NOT BE RESET AND THE MEMORY SHALL ONLY BE RESET BY POWER INTERRUPTION BY PRESSING THE CIRCUIT BREAKER/RESET BUTTON ON ALTERNATING POWERED UNITS, OR REMOVING AND REINSERTING THE PLUG-IN DETECTOR UNITS.

6. SENSITIVITIES: EACH CHANNEL SHALL INCLUDE A 16 POSITION THUMBWHEEL SWITCH TO ALLOW SELECTION OF EIGHT PULSE SENSITIVITIES, SEVEN PRESENCE LEVELS AND AN "OFF" POSITION. THE SENSITIVITY SETTING SHALL OFFER 2:1 STEPS OVER A RANGE OF 128:1 TO ENABLE SELECTION OF THE PROPER SENSITIVITY (THRESHOLD) TO INSURE DETECTION OF ALL LICENSED MOTOR VEHICLES (INCLUDING 70CC MOTORCYCLES) WITHOUT DETECTING AUTOMOBILES IN THE ADJACENT LANE, MOVING OR STOPPED, WITHIN 10 INCHES OF THE LOOP(S) DESCRIBED IN THE FOLLOWING CONFIGURATIONS, EACH WITH 50 FEET, 500 FEET, AND 1000 FEET OF LEAD-IN CABLE:

A. THREE-TURN LOOPS: ONE TO EIGHT 6 FOOT BY 6 FOOT LOOP(S)

B. TWO-TURN LOOPS: ONE OR TWO 6 FOOT BY 50 FOOT LOOP(S) INSTALLED BY THE QUADRAPOLE METHOD

7. MODE SWITCH: EACH CHANNEL SHALL INCLUDE A MODE SWITCH TO SELECT PRESENCE, PULSE, OR "OFF". THE "OFF" POSITION SHALL DISABLE THE OUTPUT AND INDICATION WHEN SELECTED. IT MAY ALSO BE USED TO ASSIST IN DETERMINING THE OFFENDING CHANNEL WHEN CROSSTALK IS PRESENT.

A. PULSE: PULSE MODE SHALL PROVIDE A SINGLE 100 MILLISECOND, PLUS OR MINUS 20 MILLISECONDS, OUTPUT PULSE IN RESPONSE TO VEHICLES TRAVELING OVER A 6 FOOT BY 6 FOOT LOOP AT ALL SPEEDS FROM ZERO TO 100 MILES PER HOUR WITH A MINIMUM 1 SECOND HEADWAY. PULSE MODE SHALL INCLUDE A 2 SECOND REPHASE TO ALLOW DETECTION OF A LICENSED VEHICLE OVER UNOCCUPIED PORTIONS OF THE LOOP(S) WITHIN 3 SECONDS AFTER INITIATION OF THE OUTPUT WITH A VEHICLE STOPPED ON THE LOOP(S).

8. RESET: PULSE MODE SELECTION SHALL RESET (CLEAR) PRESENCE INDICATIONS ON INDIVIDUAL CHANNELS.

9. PRESENCE

1. HOLD TIME: PRESENCE HOLD TIME SHALL BE AT LEAST FOUR MINUTES FOR SMALL 70CC MOTORCYCLES OVER A 6 FOOT BY 6 FOOT LOOP WITH 1000 FEET OF LEAD-IN. HOLD TIME FOR A STANDARD AUTOMOBILE OVER A 6 FOOT BY 6 FOOT LOOP WITH 1000 FEET OF LEAD-IN SHALL BE AT LEAST 15 MINUTES.

11. STRETCH/DELAY: CHANNEL PRESENCE TIME SHALL BE MODIFIED BY DELAY OR STRETCH TIME IS SELECTED. THE TIMING SWITCH SHALL SELECT DELAY OR STRETCH, OR "OFF" IF NO TIMING IS DESIRED. INTERNAL DIP SWITCHES SHALL PROVIDE FOR SELECTION OF "DELAY" TIME OF ZERO TO 31 SECONDS IN 1 SECOND INCREMENTS AND "STRETCH" TIME OF ZERO TO 7.75 SECONDS IN 0.25 SECOND INCREMENTS.

111. INDICATORS: PRESENCE INDICATORS SHALL BE WIDE ANGLE, HIGH BRIGHTNESS TYPE LIGHT-EMITTING DEVICES SUITABLE FOR SUNLIGHT VISIBILITY. IF TIMING IS SELECTED, THE INDICATORS SHALL FLASH SLOW (4 PULSES PER SECOND) DURING DELAY AND FAST (16 PULSES PER SECOND) DURING STRETCH TO INDICATE TIMING IN PROCESS. EACH TIMER (DELAY OR STRETCH) SHALL BE PROVIDED WITH BUFFER CIRCUITRY TO ENABLE OR DISABLE THE TIMER BASED ON AN EXTERNAL SIGNAL INPUT.

C. ELECTRICAL REQUIREMENTS: ALL DETECTORS SHALL BE PLUG-IN CARD RACK MOUNTED. EACH UNIT SHALL OPERATE OVER A RANGE OF 22 TO 28 VOLTS DIRECT CURRENT. IT SHALL HAVE INTERNAL CURRENT-LIMITING AND THERMAL SHUTDOWN PROVISIONS. EACH DETECTOR SHALL CONSUME LESS THAN 200 MILLIAMPERES.

D. INSTALLATION DETAILS: INSTALLATION AND TESTS SHALL CONFORM TO THE DETAILS SHOWN ON THE PLAN.

1. SLOTS: SLOTS CUT IN THE PAVEMENT SHALL BE BLOWN OUT AND DRIED BEFORE INSTALLING INDUCTIVE LOOP DETECTORS.

2. SENSOR UNITS: CONDUCTORS OF ALL LOOPS TO BE OPERATED BY EACH SENSOR UNIT SHALL BE RUN CONTINUOUS TO THE NEAREST PULL BOX. THE LOOPS SHALL BE JOINED IN THE PULL BOX IN COMBINATION OF SERIES AND PARALLEL SO THAT OPTIMUM SENSITIVITY AS RECOMMENDED BY THE MANUFACTURER IS OBTAINED AT THE SENSOR UNIT.

3. SPLICES: THE LOOP CONDUCTORS FOR EACH LOOP SHALL BE SPLICED IN THE JUNCTION OR SERVICE BOX TO A DETECTOR LEAD-IN CABLE RUNNING CONTINUOUS FROM THE BOX TO A SENSOR UNIT IN THE CONTROLLER CABINET. FINAL SPLICES BETWEEN LOOPS AND LEAD-IN CABLES SHOULD BE TWISTED, SOLDERED AND CAREFULLY WATERPROOFED (INCLUDING END OF LOOP WIRE TUBING) AN APPROVED SPLICE KIT MAY BE USED. ALL LEAD-IN AND CABLE WIRES SHALL BE TWISTED. LEAD-IN SHIELDING SHOULD BE ELECTRICALLY FLOATING. SHIELD SHALL BE GROUNDED AT THE CABINET END.

4. SEALANTS: AFTER CONDUCTORS ARE INSTALLED IN THE SLOTS CUT IN THE PAVEMENT, THE SLOTS SHALL BE FILLED WITH AN APPROVED SEALANT TO WITHIN 1/8 INCH OF THE PAVEMENT SURFACE. THE SEALANT SHALL BE AT LEAST 1 INCH BUT NOT ABOVE THE TOP CONDUCTOR IN THE SAW CUT. BEFORE SETTING, EXCESS SEALANT SHALL BE REMOVED FROM THE ADJACENT ROAD SURFACES WITHOUT USE OF SOLVENTS.

VI. CIRCUIT BREAKER, WIRE, AND CABLE

A. SERVICE CIRCUIT BREAKERS: THE CONTRACTOR SHALL PROVIDE CIRCUIT BREAKERS AS SHOWN ON THE PLAN FOR SECONDARY POWER DROP. THE CIRCUIT BREAKERS SHALL BE SINGLE POLE, MOLDED CASE, OF THE SIZE AND TRIP RATING AS SHOWN ON THE PLAN. THE CIRCUIT BREAKERS SHALL BE PROVIDED IN A SUITABLE WATERTIGHT ENCLOSURE PROVIDED WITH A HASP FOR A PADLOCK. PADLOCKS TO BE PROVIDED BY OTHERS.

B. GROUNDING: ALL TRAFFIC SIGNAL POLES, PEDESTALS, CONTROLLER CABINETS, AND SERVICE CIRCUIT BREAKERS SHALL BE GROUNDED BY MEANS OF A NO. 6 AMERICAN WIRE GAUGE SOLID BARE COPPER WIRE BOLTED TO THE INSIDE OF THESE DEVICES WITH A 1/2 INCH INTERNAL GROUND LUG. ALL GROUND WIRES SHALL BE ATTACHED BY MEANS OF A GROUND CLAMP TO A COPPER-CLAD STEEL ROD. THE GROUND ROD SHALL BE 3/4 INCH IN DIAMETER AND 10 FEET LONG. GROUND RODS SHALL BE DRIVEN TO A MINIMUM OF 3 FEET FROM DISTURBED SOIL AND A MINIMUM OF 8 FEET BELOW FINISHED GROUND SURFACE.

C. COLOR CODING: ALL DETECTOR WIRE AND CABLE SHALL BE COLOR CODED ACCORDING TO ONE OF THE FOLLOWING METHODS: THE METHOD APPROVED BY THE INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION, INC. OR METHOD ONE FOR 2010 AS APPROVED BY THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION.

D. MULTICONDUCTOR CABLE

1. GENERAL: ALL CONDUCTOR CABLE FOR INTERSECTION SIGNALIZATION AND INTERCONNECTION SHALL BE NO. 14 AMERICAN WIRE GAUGE, MULTICONDUCTOR CABLE FOR OPERATION ON A 600 VOLT 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 LATEST EDITION OF THE INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION, INC. SPECIFICATION 19-1 FOR POLYETHYLENE INSULATED, POLYVINYL CHLORIDE JACKETED SIGNAL CABLE.

2. ALTERNATE: AS AN ACCEPTABLE ALTERNATE THE CONTRACTOR MAY USE MULTICONDUCTOR, STRANDED CABLE MEETING THE REQUIREMENTS OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S 61-402 "THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY" AND AS FOLLOWS:

A. STRANDING: 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 THE AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) B33 "SPECIFICATION FOR TINNED SOFT OR ANNEALED COPPER WIRE FOR ELECTRICAL PURPOSES" (FOR COATED WIRE) OR ASTM B3 "SPECIFICATION FOR SOFT OR ANNEALED COPPER WIRE" (FOR UNCOATED WIRE). STRANDING SHALL BE CLASS B, IN ACCORDANCE WITH THE LATEST EDITION OF ASTM B8 "SPECIFICATION FOR CONCENTRIC-LAY-STRANDED COPPER CONDUCTORS, HARD, MEDIUM-HARD, OR SOFT".

B. INSULATION: 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.

1. POLYETHYLENE: THE POLYETHYLENE INSULATION SHALL MEET THE REQUIREMENTS OF PARAGRAPH 3.3 OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S 61-402 "THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY" BEFORE APPLICATION TO THE CONDUCTOR, AND PARAGRAPH 3.31 AFTER APPLICATION TO THE CONDUCTOR.

11. POLYVINYL CHLORIDE: THE POLYVINYL CHLORIDE INSULATION COVERING SHALL MEET THE REQUIREMENTS OF PARAGRAPH 4.3.1 OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S 61-402 "THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY".

C. JACKET: 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 THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S 61-402 "THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY".

D. JACKET THICKNESS: THE OVERALL JACKET THICKNESS SHALL BE IN ACCORDANCE WITH TABLE 18, PART 4 OF THE LATEST EDITION OF THE INSULATED POWER CABLE ENGINEERS' ASSOCIATION STANDARD S 61-402 "THERMOPLASTIC INSULATED WIRE AND CABLE FOR THE TRANSMISSION AND DISTRIBUTION OF ELECTRICAL ENERGY".

E. DETECTOR LOOP WIRE

1. GENERAL: THE CONDUCTOR SHALL BE SOFT DRAWN COPPER WIRE WITH CLASS C STRANDING PER THE LATEST EDITION OF THE AMERICAN SOCIETY FOR TESTING AND MATERIALS SPECIFICATION B8 "SPECIFICATION FOR SOFT ANNEALED COPPER WIRE". THE WIRES SHALL HAVE POLYVINYL CHLORIDE INSULATION PER UNDERWRITERS' LABORATORY SUBJECT 83 FOR THHN AT 90 DEGREES CELSIUS, THWN AT 75 DEGREES CELSIUS AND A POLYAMIDE NYLON ARMOR JACKET.

2. CABLE REQUIREMENTS: IN ADDITION, THE CABLE SHALL MEET THE FOLLOWING REQUIREMENTS:

WIRE SIZE:	NO. 14 AMERICAN WIRE GAUGE (STRANDED)
INSULATION THICKNESS:	0.015 INCH
JACKET THICKNESS:	0.004 INCH
NOMINAL OUTSIDE DIAMETER:	0.12 INCH
CONDUCTOR COLOR CODE:	BLACK
SUGGESTED WORKING VOLTAGE:	600 VOLTS

3. FUSING: THE THHN LOOP WIRE SHALL BE INSERTED INTO POLYVINYL CHLORIDE OR POLYETHYLENE TUBING PRIOR TO INSTALLATION (ONE THHN WIRE PER SECTION OF TUBING). THE TUBING SHALL HAVE A NOMINAL 3/16 INCH INSIDE DIAMETER, A NOMINAL WALL THICKNESS OF 1/32 INCH AND SHALL BE CONTINUOUS.

F. SHIELDED DETECTOR LEAD-IN ELECTRICAL CABLE

1. GENERAL: THE CONDUCTOR AND DRAIN WIRES SHALL BE TINNED COPPER WIRES. THE CONDUCTORS SHALL BE SHIELDED BY A LAYER OF ALUMINUM BONDED TO POLYESTER FILM. ALL WIRES SHALL HAVE POLYETHYLENE INSULATION AND A JACKET OF VINYL. IN ADDITION, THE CABLE SHALL MEET THE FOLLOWING REQUIREMENTS:

WIRE SIZE:	NO. 14 (19 X 29) AMERICAN WIRE GAUGE (STRANDED)
DRAIN WIRE:	NO. 18 AMERICAN WIRE GAUGE (STRANDED)
INSULATION THICKNESS:	0.025 INCH
JACKET THICKNESS:	0.030 INCH
NOMINAL OUTSIDE DIAMETER:	0.274 INCH
CONDUCTOR COLOR CODE:	BLACK & CLEAR
SHIELD COVERAGE:	100 PERCENT
NOMINAL CAPACITANCE BETWEEN CONDUCTORS:	24 PICOFARADS PER FOOT
NOMINAL CAPACITANCE BETWEEN ONE CONDUCTOR AND THE OTHER CONDUCTOR CONNECTED TO SHIELD:	47 PICOFARADS PER FOOT
SUGGESTED WORKING VOLTAGE:	600 VOLTS

2. ALTERNATE: AS AN ACCEPTABLE ALTERNATIVE, THE SHIELDED DETECTOR LEAD-IN ELECTRICAL CABLE SHALL MEET THE LATEST EDITION OF THE INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION, INC. SPECIFICATION 50-2 FOR LEAD-IN CABLE.

NO.	DATE	REVISIONS	BY	APP'D
4	02/16/93	RETYPED WITH SPEC REVISIONS	J.F.	L.O.V.
3	7/18/91	SECTION VI.B.	J.F.	J.E.T.
2	11/7/90	SECTION IV.B.1. - CHANGED TWENTY-FIVE TO TWENTY	J.F.	J.E.T.
1	5/4/90	TOTAL REVISION	N.J.J.	R.J.E.T.

KANSAS DEPARTMENT OF TRANSPORTATION

TRAFFIC SIGNAL SPECIFICATIONS

TE1208 8/1/90

FHWA APPROVAL	06/04/93		APP'D		
DESIGNED	J.F.	DETAILED	J.F.	QUANTITIES	TRACED
DESIGN CK.	N.A.	DETAIL CK.	N.A.J.	QUAN. CK.	TRACE CK.