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 814, "ELECTRIC LIGHTING SYSTEMS AND TRAFFIC SIGNALS".

THE CONTRACTOR SHALL PROVIDE, ON THE JOB SITE AT ALL TIMES, AN EMPLOYEE WITH LEVEL II CERTIFICATION IN TRAFFIC SIGNAL INSTALLATION BY THE INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION (IMSA).

THE LOCAL POWER COMPANY SHALL BE NOTIFIED BY THE CONTRACTOR PRIOR TO BEGINNING WORK 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, INCLUDING CONDUIT, LEAD–IN WIRE, SERVICE POLE, METER LANDING, ETC., REGARDLESS OF WHETHER THESE COSTS HAVE BEEN LISTED ON THE BILL OF MATERIALS.

LOCATIONS FOR THE SIGNAL POLES, PEDESTALS, SERVICE BOXES, JUNCTION BOXES, AND LOOP DETECTORS SHALL BE STAKED BY THE CONTRACTOR. STAKED LOCATIONS SHALL BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION OF EACH ITEM.

THE PLAN LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE BEGINNING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ALL DAMAGES WHICH MAY BE OCCASIONED BY FAILURE TO EXACTLY LOCATE AND PRESERVE ALL UNDERGROUND UTILITIES. COMPANIES OR AGENCIES THAT HAVE IDENTIFIED UTILITIES IN THIS VICINITY ARE SHOWN IN THE PLANS.

THE CONTRACTOR IS RESPONSIBLE FOR ALL WIRING – INCLUDING THE CONTROLLER WIRING.

THE CONTRACTOR SHALL CONFORM TO ALL PERTINENT OSHA (OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION) REGULATIONS.

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 STANDARD NO. TS–1.

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

SEE SUBSECTION 1607 "STRUCTURAL STEEL" AND SUBSECTION 1608 "STRUCTURAL STEEL TUBING" OF THE STANDARD SPECIFICATIONS FOR THE BASIS OF ACCEPTANCE FOR MATERIAL FURNISHED UNDER THESE SUBSECTIONS.

SEE SUBSECTION 1615 "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 2601 "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 MATERIALS SPECIFICATION A36 "SPECIFICATION FOR STRUCTURAL STEEL" AND WILL BE VISUALLY ACCEPTED BY THE ENGINEER.

MAJOR ITEMS OF ELECTRONIC EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL BE OF THE SAME TYPE AND CONSIST OF PRODUCTS PROVIDED BY 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 REPLACEMENT AND/OR MODIFICATION OF EXISTING TRAFFIC SIGNAL EQUIPMENT AT A LOCATION WHICH IS PRESENTLY CONTROLLED OR OPERATING TRAFFIC SIGNALS. THE FOLLOWING POLICIES ARE TO BE OBSERVED DURING THE PROPOSED MODIFICATIONS AND IMPROVEMENTS:

1. EXISTING OPERATION: THE CONTRACTOR SHALL PROVIDE CONTINUOUS OPERATION OF THE TRAFFIC SIGNALS DURING 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 IMPROVEMENT; 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 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 COMPLIMENT 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. THE STORED EQUIPMENT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR UNTIL THE OWNER REMOVES IT FROM THE WORK SITE.

3. REMOVAL OF EXISTING BASES: EXISTING BASES FOR TRAFFIC SIGNAL POLES, PEDESTALS, AND CONTROLLERS SHALL BE REMOVED A MINIMUM OF 24" BELOW FINISH GRADE.

4. SERVICE BOXES AND JUNCTION BOXES IN TURF AREAS SHALL BE COMPLETELY REMOVED. HOLES ARE TO BE FILLED AND COMPACTED WITH SELECT SOIL. JUNCTION BOXES IN PAVED AREAS SHALL HAVE LID AND WIRING REMOVED AND FILLED WITH CONCRETE OR ASPHALT.

5. AFTER COMPLETION WIRING TO BE REMOVED IF POSSIBLE AND CONDUIT TO BE ABANDONED IN PLACE.

C. TURN–ON

1. 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.

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

3. A CITY SIGNAL TECHNICIAN WILL BE AT TURN–ON. CALL 785–368–3913 TO ARRANGE. SHOULD TURN–ON TAKE LONGER THAN ONE HOUR DUE TO CONTRACTOR ERROR, THE CONTRACTOR WILL BE BILLED FOR EACH ADDITIONAL HOUR AT A RATE OF $50.00 PER HOUR.

4. WHEN SIGNALS ARE REPLACING STOP SIGNS TRAFFIC SIGNAL WILL NORMALLY FLASH THREE DAYS OR AS DIRECTED BY THE ENGINEER. "TURN–ON" IS CONSIDERED WHEN THE SIGNAL GOES TO NORMAL OPERATIONS.

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 CITY, 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. 2070 TRAFFIC SIGNAL CONTROL SYSTEMS

A. VEHICLE ACTUATED SOLID–STATE TRAFFIC SIGNAL CONTROLLER

1. THE TRAFFIC SIGNAL CONTROLLER SHALL BE A MODEL 2070L ADVANCED TRANSPORTATION CONTROLLER (ATC)

2. THE TRAFFIC SIGNAL CONTROLLER SHALL CONFORM TO THE CALIFORNIA DEPARTMENT OF TRANSPORTATION'S (CALTRANS) TRANSPORTATION ELECTRICAL EQUIPMENT SPECIFICATION (TEES) DATED AUGUST 16, 2002, AND AS AMENDED OCTOBER 27 2003 AND JUNE 8, 2004.

3. TEES CHAPTER 1, SECTION 2–9 SHALL BE FOLLOWED FOR THE DOCUMENTED CONTROLLER TYPE.

4. THE TRAFFIC SIGNAL CONTROLLER SHALL BE A VERSION 2070 LITE UNIT. THE CONTROLLER SHALL BE PHYSICALLY COMPATIBLE WITH 170E CONTROLLERS AND CABINET FACILITIES. (COVERED IN TEES CHAPTER 9, SECTION 1).

5. THE CONTROLLER ASSEMBLY SHALL CONSIST OF THE FOLLOWING MODULES:
a. 2070–1B ONE CIRCUIT BOARD CPU MODULE (TEES CHAPTER 9, SECTION 2).
b. 2070–2A FIELD I/O MODULE FOR 170 CABINETS WITH C1S, C11S, AND C12S CONNECTORS (TEES CHAPTER 9, SECTION 3; CHAPTER 10, SECTION 3).
c. 2070–3B FRONT PANEL MODULE – 8x40 LCD DISPLAY WITH TWO KEYPADS (TEES CHAPTER 9, SECTION 4).
d. 2070–4A 10 AMP POWER SUPPLY MODULE (TEES CHAPTER 9, SECTION 5).
e. 2070–7A SERIAL COMMUNICATIONS MODULE (TEES CHAPTER 10, SECTION 2)– EACH CONTROLLER ASSEMBLY SHALL HAVE 2 OF THESE MODULES INSTALLED.

6. EACH TRAFFIC SIGNAL CONTROLLER SHALL BE DELIVERED WITH LOCAL/MASTER INTERSECTION FIRMWARE INSTALLED. THE FIRMWARE SHALL BE THE LATEST VERSION OF ECONOLITE'S OASIS 2070 MASTER/LOCAL WITH V–LINK CONTROLLER FIRMWARE.

7. POWER

a. CONNECTIONS: ELECTRICAL CONNECTIONS FROM THE CONTROLLER TO THE OUTGOING AND INCOMING CIRCUITS SHALL BE MADE BY INSERTING A MULTI–TERMINAL 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 TO +165 DEGREES FAHRENHEIT.

8. FLASHER

a. 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.

b. 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.

B. DETECTORS

1. GENERAL

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

b. 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 15 OVER A TEMPERATURE RANGE OF –30 DEGREES FAHRENHEIT TO +165 DEGREES FAHRENHEIT AND HUMIDITY RANGE OF ZERO TO 99 PERCENT AND MEET THE FUNCTIONAL, ELECTRICAL, AND PERFORMANCE REQUIREMENTS OF THIS SPECIFICATION.

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

d. SOCKET–MOUNTED: INTEGRATED CIRCUIT DEVICES HAVING 16 OR MORE LEADS SHALL BE SOCKET–MOUNTED TO FACILITATE REPAIR AND MAINTENANCE OF UNITS.

2. FUNCTIONAL REQUIREMENTS

a. 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.

b. 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 OR INTERRUPTION OF SUPPLY VOLTAGE. UNITS SHALL ALSO TRACK CHANGES IN LOOP/LEAD–IN ELECTRICAL CHARACTERISTICS, AS MIGHT REASONABLY BE EXPECTED TO OCCUR IN UNDAMAGED LOOPS, PROPERLY INSTALLED IN SOUND PAVEMENT, WITHOUT PRODUCING FALSE INDICATIONS OR CHANGES IN SENSITIVITY.

c. OPEN LOOP OUTPUT: EACH DETECTOR CHANNEL SHALL OUTPUT (FAIL–SAFE) CONTINUOUS, NON–RESTTABLE INDICATION AND OUTPUT IN THE EVENT OF A BROKEN (OPEN) LOOP/LEAD–IN SYSTEM. THE OPEN LOOP INDICATION SHALL BE RESETTABLE AS LONG AS THE OPEN EXISTS, EXCEPT THAT IT SHALL BE DEFEATED WHEN THE CHANNEL "OFF" POSITION IS SELECTED.

d. 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.

e. 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 POWER UNITS, OR REMOVING AND REINSERTING THE PLUG–IN DETECTOR UNITS.

f. SENSITIVITIES: EACH CHANNEL SHALL INCLUDE A THUMBWHEEL SWITCH TO ALLOW SELECTION OF A MINIMUM OF EIGHT PULSE SENSITIVITIES, SEVEN PRESENCE LEVELS AND AN "OFF" MODE. 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 36 INCHES OF THE LOOP(S) DESCRIBED IN THE FOLLOWING CONFIGURATIONS, EACH WITH 50 FEET, 500 FEET, AND 1000 FEET OF LEAD–IN CABLE:

i. THREE–TURN LOOPS: ONE TO EIGHT 6 FOOT BY 6 FOOT LOOP(S)

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

g. MODE SWITCH: THE DETECTOR SHALL BE CAPABLE OF OPERATING EACH CHANNEL IN THE PRESENCE, PULSE, OR "OFF" MODE. THE "OFF" MODE SHALL DISABLE THE OUTPUT AND INDICATION OF THE CHANNEL WHEN SELECTED. IT MAY ALSO BE USED TO ASSIST IN DETERMINING THE OFFENDING CHANNEL WHEN CROSSTALK IS PRESENT.

i. PULSE: PULSE MODE SHALL PROVIDE A SINGLE 100 MILLISECOND, PLUS OR MINUS 25 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).

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

iii. PRESENCE

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.

STRETCH/DELAY: CHANNEL PRESENCE TIME SHALL BE MODIFIED IF 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.

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 TIME (DELAY OR STRETCH) SHALL BE PROVIDED WITH BUFFER CIRCUITRY TO ENABLE OR DISABLE THE TIMER BASED ON AN EXTERNAL SIGNAL INPUT.

3. 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.

4. POWER

a. CONNECTIONS: ELECTRICAL CONNECTIONS FROM THE CONTROLLER TO THE OUTGOING AND INCOMING CIRCUITS SHALL BE MADE BY INSERTING A MULTI–TERMINAL 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.

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

d. SOCKET–MOUNTED: INTEGRATED CIRCUIT DEVICES HAVING 16 OR MORE LEADS SHALL BE SOCKET–MOUNTED TO FACILITATE REPAIR AND MAINTENANCE OF UNITS.

7. 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 WILL BE PROVIDED BY OTHERS.

8. 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 5/8 INCH DIAMETER AND 8 FEET LONG. GROUND RODS AT POLE BASES SHOULD BE A MINIMUM OF 2 FEET FROM THE POLE BASE AND A MINIMUM OF 1 FOOT BELOW THE GROUND SURFACE.

9. 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.

10. EXCESS CABLE: A MINIMUM OF 6 FEET OF EXCESS SIGNAL AND DETECTOR LEAD–IN CABLE SHALL BE COILED IN EACH SERVICE BOX.

11. POLE WIRING: EACH SIGNAL HEAD SHALL HAVE A SEPARATE RUN OF SIGNAL CABLE FROM THE TERMINAL BLOCK IN THE POLE TO THE SIGNAL HEAD.

NO.	DATE:	REVISION	BY:	APP'D
3	3/25/09	ADDED OSHA NOTE UNDER "CONSTRUCTION"	CDR	LGV
2	2/22/08	UPDATE TRAFFIC SPECIFICATIONS	KAP	LGV
1	9/4/07	ADDED NOTE C–3 (TURN–ON)	CDR	LGV

DRAWN BY: K.PELTON
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STANDARD DETAILS

TRAFFIC SIGNAL SPECIFICATIONS

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PAGE: ___ OF ___
DRAWING: DT–108
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