

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	52 U-1785-01	2003	61	143

CONSTRUCTION AND MATERIAL REQUIREMENTS FOR VIDEO IMAGING DETECTION SYSTEM

I. THE SYSTEM

THE VIDEO IMAGING DETECTION SYSTEM (VDS) SHALL USE VIDEO SENSING AS WELL AS IMAGE PROCESSING TECHNIQUES TO MONITOR VEHICLE TRAFFIC ON A ROADWAY. THE DETECTION OF VEHICLES PASSING THROUGH THE FIELD OF VIEW OF AN IMAGE SENSOR SHALL BE MADE AVAILABLE IN REAL TIME AS SIMILAR CONTACT CLOSURE OUTPUTS AS WELL AS SUMMARY TRAFFIC STATISTICS TO A VARIETY OF LOCAL AND REMOTE TRAFFIC APPLICATIONS. THIS IS A TURN-KEY INSTALLATION AND SHALL INCLUDE ALL HARDWARE AND SOFTWARE NECESSARY TO SET-UP AND MAINTAIN THE VDS WHILE DELIVERING THE RESULTS REQUIRED IN "DETECTION PERFORMANCE", ELSEWHERE IN THESE SPECIAL PROVISIONS. THE SYSTEM ONLY ALLOWS THE USE OF GENERIC CCTV CAMERAS WITH SHARED VIDEO IMAGE PROCESSORS (VIP) OR VIDEO DETECTION PROCESSORS (VDP).

II. SYSTEM FIRMWARE OR SOFTWARE

THE VDS SOFTWARE SHALL BE ABLE TO DETECT BICYCLES, MOTORCYCLES, SUBCOMPACT CARS, AND LARGE VEHICLES IN MULTIPLE TRAFFIC LANES. THE NUMBER OF DETECTION ZONES MUST BE SUFFICIENT TO DELIVER THE PERFORMANCE DEFINED IN "DETECTION PERFORMANCE", ELSEWHERE IN THESE SPECIAL PROVISIONS FOR 4 LANES OF TRAFFIC AND 4 TRAFFIC DIRECTIONS.

III. THE VDS SOFTWARE SHALL

- A. INCLUDE PRESENCE AND PASSAGE DETECTION OF MOVING AND/OR STOPPED VEHICLES.
- B. ENABLE DETECTION BASED ON THE DIRECTION OF TRAVEL.

THE SOFTWARE SHALL ALLOW THE USER TO CREATE, DEFINE, AS WELL AS REDEFINE, OVERRIDE OR CHANGE ANY PREVIOUSLY DEFINED DETECTION ZONES. THE SOFTWARE SHALL BE ABLE TO DETECT, BASED ON THE DIRECTION OF TRAVEL, PRESENCE OF MOVING OR STOPPED VEHICLES, AS WELL AS DELAY, EXTENSION, PULSE, COUNT, OCCUPANCY, AND SPEED. THE SOFTWARE SHALL ALLOW BOOLEAN LOGICAL COMBINATIONS OF FUNCTIONS IN REAL-TIME AND PROVIDE LOCAL NON-VOLATILE DATA STORAGE OF TRAFFIC STATISTICS FOR LATER DOWNLOADING AND ANALYSIS.

IV. SYSTEM HARDWARE

THE VDS HARDWARE SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING:

- A. VIDEO DETECTION CAMERAS WITH MOUNTING HARDWARE,
- B. ALL ASSOCIATED DATA CABLES AND ACCESSORIES RECOMMENDED BY THE MANUFACTURER,
- C. VIP AND VDP UNITS TO PROCESS THE VIDEO INPUTS AND PROVIDE OUTPUT DETECTOR DATA TO THE MODEL 170E OR MODEL 2070 TRAFFIC CONTROLLERS,
- D. TRANSFORMERS AND SURGE PROTECTED POWER STRIP, AND
- E. VIDEO MONITOR OR MONITORING COMPUTER.

V. EQUIPMENT

ALL EQUIPMENT SHALL BE OF THE LATEST STANDARD IN PRODUCTION. MANUFACTURING DATE CODES SHALL NOT BE OLDER THAN THREE MONTHS, AND THE EQUIPMENT MODELS SHALL HAVE BEEN IN PRODUCTION FOR A MINIMUM OF SIX MONTHS. THE VDS SHALL INCLUDE THE LATEST FULLY TESTED SOFTWARE THAT DETECTS VEHICLES IN MULTIPLE LANES USING ONLY THE VIDEO IMAGE BETA VERSIONS OF HARDWARE OR SOFTWARE WILL NOT BE ALLOWED.

VI. FUNCTIONAL CAPABILITIES

THE VIP AND VDP SHALL MOUNT IN A MODEL 332 CABINET WITHOUT THE NEED TO MODIFY, REPLACE, OR REARRANGE CABINET SUBASSEMBLIES. ALL INPUTS AND OUTPUTS SHALL BE TERMINATED ON THE BACKSIDE OF THE DETECTOR INPUT FILE, PANEL, OR CONNECT TO THE FRONT OF THE VIDEO PROCESSOR. THE VIP AND VDP SHALL BE DESIGNED TO OPERATE RELIABLY IN THE ADVERSE ENVIRONMENT FOUND IN THE TYPICAL ROADSIDE TRAFFIC CABINET. IT SHALL MEET THE ENVIRONMENTAL REQUIREMENTS SET FORTH BY THE NEMA (NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION) TS1 AND TS2 SPECIFICATIONS AS WELL AS THE ENVIRONMENTAL REQUIREMENTS FOR THE MODEL 170E OR MODEL 2070 CONTROLLERS. IT SHALL OPERATE IN THE TEMPERATURE RANGE FROM -35° C TO +74° C AND WITHIN THE RELATIVE HUMIDITY RANGE FROM 0 PERCENT TO 95 PERCENT, NON-CONDENSING. THE VIP AND VDC SHALL SUPPORT EIA 232/422 COMMUNICATION STANDARDS AND BE ABLE TO DIRECTLY INTERFACE TO THE DB9M SERIAL PORT CONNECTOR OF COMMERCIALY AVAILABLE PERSONAL COMPUTERS RUNNING UNDER WINDOWS 2000/NT. THIS PORT SHALL BE ABLE TO DOWNLOAD SETUP AND CONFIGURATION DATA STORED IN NONVOLATILE MEMORY AS WELL AS DETECTION DATA NEEDED TO DEFINE DETECTION ZONES AND TO SHOW DETECTOR ACTUATION.

THE VIP AND VDP SHALL HAVE AT LEAST ONE NTSC/RS-170 VIDEO INPUT SIGNAL FOR EACH DIRECTION OF TRAVEL AND ONE COMPOSITE NTSC/RS-170 VIDEO OUTPUT FOR THE SITE. THE VIP AND VDP SHALL IMMEDIATELY OUTPUT A CONSTANT CALL WHEN:

- A. THE LOSS OF ANY VIDEO SIGNAL OR ACTIVE DETECTOR OUTPUT CHANNEL OR
- B. WHEN ENVIRONMENTAL CONDITIONS DEFINED IN "DETECTION PERFORMANCE" ARE DETECTED THAT IMPAIR 95 PERCENT (OR LESS) PERFORMANCE OF THE UNIT. THE VIP AND VDP SHALL OUTPUT AN ALARM SIGNAL THAT CAN BE TRANSFERRED TO THE TRAFFIC CONTROL CENTER VIA A TELEPHONE WHEN CONDITIONS PERSIST FOR MORE THAN ONE HOUR. THE VIP AND VDP SHALL OUTPUT A CONSTANT CALL DURING THE BACKGROUND LEARNING PERIOD NOT TO EXCEED SIX MINUTES. THE VDS SHALL INCLUDE STABILIZATION LOGIC IN THE CAMERA OR THE IMAGE PROCESSING THAT COMPENSATES FOR VIBRATION AND SWAY MOTION RESULTING FROM WINDS GUSTING TO 129 KMH.

VII. VEHICLE DETECTION

A. DETECTION ZONE PLACEMENT

THE VDS SHALL PROVIDE FLEXIBLE DETECTION ZONE PLACEMENT ANYWHERE AND AT ANY ORIENTATION WITHIN THE COMBINED FIELD OF VIEW OF THE IMAGE SENSORS.

DETECTOR CONFIGURATIONS MAY BE ACCOMPLISHED BY A VARIETY OF MECHANISMS, INCLUDING BUT NOT LIMITED TO LINES PLACED ACROSS LANES OF TRAFFIC, LINES PLACED IN-LINE WITH LANES OF TRAFFIC, OR DRAWN OR TRACKING ZONES. DETECTION ZONES SHALL BE ABLE TO OVERLAP, HAVE THE CAPABILITY OF REJECTING IMAGES BASED UPON MOVEMENT DIRECTION, AND BE ABLE TO IMPLEMENT BOOLEAN LOGICAL FUNCTIONS. PLACEMENT OF DETECTION ZONES SHALL BE BY MEANS OF A VIDEO MONITOR OR MONITORING COMPUTER OPERATING IN A GRAPHICS ENVIRONMENT WITH THE USE OF A MOUSE OR A KEYPAD. THE MONITOR OR COMPUTER DISPLAY SHALL SHOW IMAGES OF THE DETECTION ZONES SUPERIMPOSED ON THE VIDEO IMAGE OF THE TRAFFIC. WHEN A VEHICLE IS WITHIN A DETECTION ZONE AND APPROACHING FROM THE PROPER DIRECTION, THE DETECTOR SHALL CHANGE CONTRAST, COLOR OR A SYMBOL SHALL APPEAR TO DENOTE TO THE USER THE DETECTION OF A VEHICLE. THE VIDEO DETECTION SYSTEM SHALL AUTOMATICALLY ADAPT TO CHANGING LIGHTING AND ENVIRONMENTAL CONDITIONS. NO MANUAL ADJUSTMENTS SHALL BE NECESSARY. THE VIDEO DETECTION SHALL INCLUDE LEARNING LOGIC THAT COMPENSATES FOR SLOW MOVING SHADOWS, SHADOWS FROM TREES, BUILDINGS AND OTHER OBJECTS SHALL NOT RESULT IN A FALSE COUNT OR INDICATE A VEHICLE PRESENCE.

B. DETECTION ZONE PROGRAMMING

THE DETECTION ZONES SHALL BE CREATED BY USING THE MOUSE OR KEYPAD TO DRAW THE DETECTOR, AND TO RETRIEVE ZONE INFORMATION FROM THE DATABASE. THE DETECTOR SHALL BE CAPABLE OF BEING SIZED, SHAPED, AND OVERLAPPED TO PROVIDE OPTIMAL ROAD COVERAGE AND DETECTION.

THE VDS SHALL BE ABLE TO SAVE THE CONFIGURATIONS TO IBM FORMATTED DISK, ALLOW UPLOAD AND DOWNLOAD OF SETUP AND CONFIGURATION FILES TO AND FROM THE VDS, AND ALLOW RETRIEVAL OF THE DETECTOR CONFIGURATION THAT IS CURRENTLY RUNNING IN THE SOFTWARE. THE VDS PROGRAMMING CONTROL SHALL ALLOW REPOSITIONING OF THE FIELD OF VIEW, INITIALIZATION, RESETTING OF VEHICLE DETECTION ZONE, INITIATION OF DOWN AND UP LOADING DATA, AND RESETTING OF SAMPLING TIME. THE PROGRAMMED PARAMETERS SHALL NOT REQUIRE MANUAL INTERVENTIONS FOR DAY-NIGHT TRANSITION, FOR HANDLING SHADOWS ON ROADWAYS, OR DEALING WITH REFLECTION FROM POLES, VEHICLES OR PAVEMENT DURING RAIN, AND WEATHER CHANGES. IT SHALL BE POSSIBLE TO USE THE MOUSE, KEYPAD OR COMPRESSED DIGITAL VIDEO TRANSMITTED VIA A SERIAL COMMUNICATION LINK TO EDIT, MODIFY, FINE-TUNE, PREVIOUSLY DEFINED DETECTION ZONE PLACEMENT, SIZE, COLOR AND SHAPE ETC. ONCE A DETECTION CONFIGURATION HAS BEEN CREATED, THEN A VIDEO MONITOR OR MONITORING COMPUTER, UTILIZING TRANSMITTED COMPRESSED DIGITAL VIDEO SHALL PROVIDE A GRAPHIC DISPLAY OF THE NEW CONFIGURATION ON ITS OWN VIDEO DISPLAY. WHEN A VEHICLE IS UNDER A DETECTION ZONE THE DETECTOR SHALL CHANGE IN COLOR OR INTENSITY ON THE VIDEO MONITOR OR MONITORING COMPUTER, THEREBY VERIFYING PROPER OPERATION OF THE DETECTION SYSTEM. THE VDS SHALL OPERATE INDEPENDENT OF THE VIDEO MONITOR OR MONITORING COMPUTER. IT SHALL CONTINUE TO BE FULLY FUNCTIONAL WITH THE VIDEO MONITOR OR MONITORING COMPUTER DISCONNECTED FROM THE VDS.

C. OPTIMAL DETECTION

THE DISTANCE FROM THE CAMERA TO THE DESIRED COVERAGE AREA AND DISTANCE TO THE FURTHEST DETECTION ZONE SHALL NOT BE GREATER THAN 10 TIMES THE MOUNTING HEIGHT. THE MINIMUM MOUNTING HEIGHT SHALL BE 6 METERS.

D. DETECTION PERFORMANCE

OVERALL PERFORMANCE OF THE VDS (COUNT, SPEED, VOLUME, OCCUPANCY) SHALL BE COMPARABLE TO INDUCTIVE LOOPS WITH VEHICULAR TRAFFIC RANGING IN SPEEDS FROM 0 KMH TO 129 KMH. USING STANDARD VIDEO IMAGING DETECTION CAMERAS OPTICS AND IN THE ABSENCE OF OCCLUSION UNDER NORMAL DAY AND NIGHT CONDITIONS, THE VDS SHALL BE ABLE TO DETECT VEHICLE PRESENCE WITH 98 PERCENT MINIMUM ACCURACY. WHEN COMPARED TO VIDEO TAPE RECORDINGS, MEASURED OVER ONE HOUR PERIODS THAT INCLUDE SUNRISE, NOON, SUNSET, PEAK AND OFF-PEAK, THE VEHICLE COUNT SHALL BE ± 2 PERCENT OF ACTUAL. THE VIDEO DETECTION SHALL BE ABLE TO DETECT THE PRESENCE OF VEHICLES, WITH AN AVERAGE OF 95 PERCENT ACCURACY (WITH ALL COUNTS BETWEEN 90 PERCENT AND 100 PERCENT), UNDER ALL TYPES OF ADVERSE WEATHER AND ENVIRONMENTAL CONDITIONS, INCLUDING SNOW, HAIL, DENSE FOG, DIRT, DUST OR CONTAMINANT BUILDUP ON THE LENS OR FACEPLATE, OR VIBRATION. THE VDS SHALL HAVE A METHOD TO ELIMINATE THE FALSE DETECTION OF VEHICLES IN AN ADJACENT LANE WITH OPPOSING TRAFFIC. FALSE DETECTION CAUSED BY SHADOWS OR FALSE DETECTION RESULTING FROM THE MOTION OF THE CAMERA DUE TO WINDS UP TO 129 KMH. THE MINIMUM VDS DETECTION RESOLUTION AT 60 METERS SHALL BE 1.5 METERS.

VIII. IMAGE SENSOR SYSTEM

A. VIDEO DETECTION CAMERA

1. THE VDS SHALL USE EITHER COLOR OR MONOCHROME CAMERAS AS THE VIDEO SOURCE FOR REAL-TIME VEHICLE DETECTION AND MEET THE FOLLOWING REQUIREMENTS:

- \* OPTICAL FORMAT SIZE 8.5 MM OR 12.7 MM
- \* LENS 12X MINIMUM, CONTINUOUS FOCUS OPTICAL ZOOM
- \* RESOLUTION 460 HORIZONTAL/350 VERTICAL LINES
- \* SCANNING SYSTEM 625 LINES 2:1 INTERLACED
- \* MIN. VIDEO SENSITIVITY 0.1 LUX
- \* GAMMA ADJUSTMENT OVER RANGE FROM 0.45 TO 1.0
- \* ABSOLUTE BLACK REFERENCE REQUIRED
- \* AUTOMATIC GAIN CONTROL REQUIRED

2. THE FOLLOWING ARE MINIMUM ELECTRICAL SPECIFICATIONS FOR THE CAMERA:

- \* OPERATING VOLTAGE 120 V(AC) ±15% (ADAPTER ALLOWED)
- \* POWER CONSUMPTION-HEATER OFF LESS THAN 10 W
- \* POWER CONSUMPTION-HEATER ON LESS THAN 20 W
- \* VIDEO OUTPUT SIGNAL STANDARDS NTSC (RS-170 OR RS 170A)
- \* VIDEO OUTPUT LEVEL 1.0 V P-P (75 W COMPOSITE)
- \* SIGNAL TO NOISE RATIO BETTER THAN 48 DB AT 1.0 V P-P (WITH AGC OFF AND 15 LUX)
- \* VIDEO OUTPUT CONNECTOR STANDARD BNC
- \* AUTOMATIC GAIN CONTROL REQUIRED
- \* SYNCHRONIZATION INTERNAL CRYSTAL SYNC OR LINE LOCK

THE VIDEO DETECTION CAMERA SHALL BE EQUIPPED WITH AUTOMATIC IRIS, ELECTRONIC SHUTTER CONTROL AND CONTINUOUS FOCUS ZOOM LENS FOR ADJUSTMENT TO MEET THE SITE GEOMETRY, WITHOUT OPENING UP THE CAMERA HOUSING. THE LENS FORMAT MUST BE EQUAL TO OR GREATER THAN THE CAMERA OPTICAL FORMAT. THE APERTURE OF THE LENS SHALL HAVE A MINIMUM RANGE FROM F/8 TO F/560 AND BE PRE-FOCUSED AT INFINITY AT THE FACTORY. THE CAMERA SHALL PRODUCE A USEABLE VIDEO IMAGE UNDER ALL ROADWAYS LIGHTING CONDITIONS, REGARDLESS OF TIME OF DAY. THE RANGE OF SCENE LUMINANCE OVER WHICH THE CAMERA SHALL PRODUCE A USEABLE VIDEO IMAGE SHALL BE GREATER THAN 0.1 LUX TO 10,000 LUX.

3. THE CAMERA SHALL BE FACTORY PRESET PRIOR TO SHIPMENT FOR THE FOLLOWING:

- \* BLACK REFERENCE ADJUSTED TO 0 IRE UNITS.
- \* VIDEO LEVEL SET SO THAT A NO-CONTRAST IMAGE HAS 40 OR 50 IRE UNITS.
- \* LENS ALC ADJUSTED TO AVERAGE.

THE CAMERA SHALL BE EQUIPPED WITH A NEUTRAL DENSITY SPOT FILTER DESIGNED TO PREVENT BRIGHT LIGHT "FLARE" FROM AFFECTING THE SCENE WHEN CAUSED BY INDIRECT SUNLIGHT OUTSIDE THE ANGLE OF VIEW OF THE LENS. THE CAMERA SHALL HAVE APPROPRIATE ELECTRONIC CIRCUITRY OR SOFTWARE TO SUPPRESS "BLOOMING" EFFECTS FROM CAR HEADLIGHTS AND BRIGHT OBJECTS AT NIGHT. WHEN THE CAMERA IS POINTED AT A VERY BRIGHT OBJECT OR WHEN THE CAMERA AND LENS ARE FIRST TURNED ON, THE IMAGE PRODUCED BY THE LENS AND CAMERA COMBINATION SHALL NOT OPTICALLY OSCILLATE, I.E., PRODUCE AN IMAGE THAT ALTERNATES FROM TOTAL LIGHT TO BLACK OR OTHERWISE BE UNSTABLE. THE LENS AND CAMERA COMBINATION SHALL REACT TO TEMPORARY OVERLOAD SITUATIONS IN A SMOOTH AND RAPID FASHION WITH MINIMUM OVERSHOOT.

B. ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS

1. THE CAMERA SHALL WITHSTAND THE FOLLOWING CONDITIONS:

- \* OPERATING TEMPERATURE -10° C TO +74° C
- \* STORAGE TEMPERATURE -35° C TO +80° C
- \* OPERATING HUMIDITY 0 TO 80% (NON-CONDENSING)
- \* STORAGE HUMIDITY 0 TO 90% (NON-CONDENSING)
- \* SHOCK TEST: 5 G
- \* VIBRATION TEST: 5-60 HZ WITH 21 CM EXCURSION, AND 5 G RMS
- \* VIBRATION FROM 60 TO 1000 HZ

\*THE CAMERA SHALL NOT INCUR ANY PHYSICAL DAMAGE AFTER A SHOCK, RETURN TO NORMAL OPERATING IMMEDIATELY AND OPERATE WITHIN THE SPECIFIED VIBRATION.

IX. IMAGE SENSOR (CAMERA) ENVIRONMENTAL ENCLOSURE

THE VIDEO DETECTION CAMERA AND LENS ASSEMBLY SHALL BE HOUSED IN AN OUTDOOR TYPE SEALED ENVIRONMENTAL ENCLOSURE THAT PROVIDES THE FOLLOWING CAPABILITIES:

- A. THE ENCLOSURE SHALL BE SEALED, WATERPROOF AND DUST-TIGHT TO NEMA-4 SPECIFICATIONS.
- B. THE ENCLOSURE SHALL ALLOW THE VIDEO DETECTION CAMERA TO OPERATE SATISFACTORILY OVER AN AMBIENT TEMPERATURE RANGE FROM -34° C TO +74° C WHILE EXPOSED TO PRECIPITATION AS WELL AS DIRECT SUNLIGHT.
- C. THE ENCLOSURE SHALL ALLOW THE IMAGE SENSOR HORIZON TO BE ROTATED IN THE FIELD DURING INSTALLATION.
- D. A SINGLE SEALED AND WEATHERPROOF MULTI-PIN CONNECTOR SHALL BE PROVIDED FOR THE CONNECTION OF ALL VIDEO, POWER AND CONTROL CABLING. THE CONTRACTOR SHALL APPLY AN APPROVED WEATHER RESISTANT SPRAY TO THE INSIDE OF THE CONNECTOR BEFORE ENGAGING THE CONNECTOR.
- E. THE ENCLOSURE SHALL INCLUDE AN INTERNAL THERMOSTATICALLY CONTROLLED HEATER ASSEMBLY TO PREVENT THE FORMATION OF ICE AND CONDENSATION IN COLD WEATHER AS WELL AS TO ASSURE PROPER OPERATION OF THE LENS MECHANISM. THE HEATER SHALL NOT INTERFERE WITH THE VIDEO SIGNAL NOR OPERATION OF THE VIDEO DETECTION CAMERA ELECTRONICS.
- F. THE ENCLOSURE SHALL BE LIGHT-COLORED AND MATCH MOUNTING STANDARD AND SHALL INCLUDE A SUN SHIELD TO MINIMIZE SOLAR HEATING. THE FRONT EDGE OF THE SUN SHIELD SHALL PROJECT BEYOND THE FRONT EDGE OF THE ENVIRONMENTAL ENCLOSURE A MINIMUM OF 50 MM AND SHALL INCLUDE PROVISION TO DIVERT WATER FLOW TO THE SIDES OF THE SUN SHIELD. THE AMOUNT OF OVERHANG OF THE SUN SHIELD SHALL BE ADJUSTABLE TO PREVENT DIRECT SUNLIGHT FROM ENTERING THE LENS.
- G. THE TOTAL WEIGHT OF THE VIDEO DETECTION CAMERA IN THE ENVIRONMENTAL ENCLOSURE WITH SUN SHIELD SHALL BE LESS THAN 3.0 KG. WHEN OPERATING IN THE ENVIRONMENTAL ENCLOSURE WITH POWER AND VIDEO SIGNAL CABLES CONNECTED, THE IMAGE SENSOR SHALL MEET FCC CLASS A REQUIREMENTS FOR ELECTROMAGNETIC INTERFERENCE EMISSIONS.

X. ELECTRICAL REQUIREMENTS

THE VIP/VDP, ASSOCIATED CAMERAS AND ENCLOSURE HEATERS SHALL PRIMARILY BE POWERED BY 120 V(AC) ±15 PERCENT, 60 HZ SINGLE PHASE SOURCE. THE VIP AND VDP SHALL DRAW LESS THAN 0.25 A FROM THE 120 V(AC) SOURCE AND DRAW LESS THAN 100 MA FROM THE 24 V(DC) CABINET POWER SUPPLY. THE CONTRACTOR SHALL FURNISH A SURGE PROTECTED POWER STRIP FOR POWERING ALL CAMERAS AND NECESSARY TRANSFORMERS FROM A SINGLE CONTROLLER CABINET 120 V(AC) RECEPTACLE. THE VIDEO OUTPUT FROM THE VIDEO DETECTION AND ALL VIDEO CONNECTIONS FROM TO THE INTERFACE PANEL SHALL BE ISOLATED FROM EARTH GROUND. SURGE RATINGS OF ALL COMPONENTS OF THE SYSTEM SHALL MEET THE REQUIREMENT SET FORTH IN THE NEMA TS-1 AND TS-2 SPECIFICATIONS. THE VIDEO OUTPUT, COMMUNICATION, AND POWER STAGES OF THE SENSOR SHALL INCLUDE TRANSIENT PROTECTION TO PREVENT DAMAGE TO THE SENSOR DUE TO VOLTAGE TRANSIENTS INDUCED ON VDS CABLES AND FIELD TERMINATIONS. THE VIDEO DETECTION CAMERA SHALL BE CONNECTED TO THE VIP AND VDP SUCH THAT THE VIDEO SIGNAL ORIGINATING FROM THE CAMERA IS AT ATTENUATED MORE THAN 3 DB WHEN MEASURED AT THE VIP AND VDP INPUT. WHEN THE CONNECTION BETWEEN THE VIDEO DETECTION CAMERA AND THE VIP AND VDP IS COAXIAL CABLE, THE COAXIAL CABLE USED SHALL BE A LOW LOSS 75W PRECISION VIDEO CABLE SUITED FOR OUTDOOR INSTALLATION SUCH AS BELDEN 8281, WEST PENN #806, OR AS RECOMMENDED BY THE MANUFACTURER OF THE VDS. THE CONTRACTOR SHALL FURNISH AND INSTALL NEMA 3R JUNCTION BOXES ON THE CAMERA POLES AS SHOWN ON THE PLANS. IT SHALL BE OF SUFFICIENT SIZE TO HOUSE CABLE STRAIN RELIEF'S, TERMINAL BLOCKS, AND CONNECTORS. THE JUNCTION BOX SHALL BE SECURELY MOUNTED ON THE CAMERA POLE USING TWO 60 MM CHASE NIPPLES AND STAINLESS STEEL STRAPS. THE BOX SHALL BE MOUNTED ON THE SIDE OF THE POLE AND NOT IMPEDE THE OPERATION OF THE DOOR.

XII. INSTALLATION AND TRAINING

THE SUPPLIER OF THE VDS SHALL SUPERVISE THE INSTALLATION AND TESTING OF THE VDS. A FACTORY CERTIFIED REPRESENTATIVE FROM THE SUPPLIER SHALL BE ON-SITE DURING INSTALLATION. THE SUPPLIER OF THE VDS SHALL PROVIDE A PC BASED BASIC TRAINING COURSE, AVAILABLE ON A CD THAT INCLUDES THEORY OF OPERATION, AN INTRODUCTION TO ALL SYSTEM ELEMENTS, OFFERS AN OVERVIEW OF INSTALLATION STEPS AND CONFIGURATION AS WELL AS SET-UP. THE SUPPLIER SHALL PROVIDE A ONE DAY HANDS-ON IN-DEPTH TRAINING COURSE COVERING THE SET-UP, OPERATION, MAINTENANCE AS WELL AS TROUBLESHOOTING OF THE VDS AND ITS COMPONENTS. ALL EQUIPMENT FOR TRAINING SHALL BE PROVIDED BY THE CONTRACTOR FOR A UP TO 10 PERSONS AND THE TRAINING SHALL BE CONDUCTED AT A TIME AND IN THE PLACE SPECIFIED BY THE ENGINEER. THE INSTRUCTORS FOR THE TRAINING COURSE SHALL BE TECHNICALLY KNOWLEDGEABLE, COMPETENT, AND PROFICIENT IN THE ENGLISH LANGUAGE. A MEMBER OF THE CONTRACTOR'S STAFF WITH INTIMATE EXPERIENCE WITH THIS CONTRACT SHALL ATTEND THE COURSE AND ANSWER INQUIRES FOR THE CONTRACTOR'S WORK. THE CONTRACTOR SHALL PROVIDE MATERIAL FOR REVIEW AND APPROVAL BEFORE THE TRAINING. THE TRAINING CLASS IS SCHEDULED. THE ENGINEER, WITHIN THREE WEEKS, WILL APPROVE OR REJECT THE COURSE MATERIAL, OR THE CONTENT, OR ANY PART OF THE SUBMITTAL. THE CONTRACTOR SHALL REVISE ALL REJECTED MATERIAL, AND RE-SUBMIT FOR FINAL REVIEW AND APPROVAL.

XIII. ACCEPTANCE TESTING

THE ACCEPTANCE TEST SHALL BE CONDUCTED IN ACCORDANCE WITH THE APPROVED TEST PLAN. THE CONTRACTOR SHALL SUBMIT FIVE COPIES OF THE ACCEPTANCE TEST PLAN TO THE ENGINEER FOR REVIEW, AND APPROVAL PRIOR TO COMMENCEMENT OF ANY TESTING. THE TEST PLAN SHALL BE SUBMITTED AT LEAST TWO WEEKS IN ADVANCE OF TESTING TO ALLOW TIME FOR REVIEW. THE ACCEPTANCE TESTING SHALL INCLUDE ACCEPTANCE TESTS AND SUBSEQUENT RE-TESTS, IF NEEDED, AND DOCUMENTATION OF THE TEST RESULTS. ALL EQUIPMENT INSTALLED SHALL BE ADJUSTED, ALIGNED, CALIBRATED FOR THE OPTIMUM PERFORMANCE. THE CONTRACTOR SHALL NOTIFY THE ENGINEER, AFTER APPROVAL OF THE ACCEPTANCE TEST PLAN, AT LEAST TWO DAYS PRIOR TO THE COMMENCEMENT OF THE TESTING.

A. THE TEST PLAN SHALL INCLUDE THE FOLLOWING MAJOR TEST AND ACCEPTANCE CATEGORIES:

- 1. PHYSICAL INSPECTION. THE CONTRACTOR SHALL PROVIDE THE DOCUMENT TO PROVE DELIVERY OF ALL MATERIAL, EQUIPMENT, CABLING AND DOCUMENTATION IF ANY MATERIAL OR DOCUMENTATION IS OUTSTANDING OR HAD BEEN REPLACED UNDER PRE-ACCEPTANCE WARRANTY. A PHYSICAL INSPECTION AND DOCUMENTATION SHALL BE PROVIDED FOR THIS MATERIAL. THE PHYSICAL INSPECTION SHALL CONSIST OF INSPECTING OF INSTALLED MATERIAL TO ENSURE QUALITY WORKMANSHIP THAT SATISFIES THE SPECIFIED REQUIREMENTS.
- 2. FUNCTIONAL DEMONSTRATION. THE CONTRACTOR SHALL DEMONSTRATE THAT THE FUNCTION OF ALL CIRCUITS, CAMERAS, AND ALL EQUIPMENT SATISFY THE REQUIREMENTS OF THESE SPECIFICATIONS.
- 3. TEST RESULTS. THE CONTRACTOR SHALL DOCUMENT ALL FUNCTIONAL TEST RESULTS. IN THE EVENT THAT ANY ASPECT OF THE FUNCTIONAL TESTS ARE DETERMINED BY THE ENGINEER TO HAVE FAILED, THE CONTRACTOR SHALL CEASE ALL ACCEPTANCE TESTING, DETERMINE THE CAUSE OF THE FAILURE AND MAKE REPAIRS TO THE SATISFACTION OF THE ENGINEER. FAILED EQUIPMENT WILL AUTOMATICALLY RESET THE PERIOD OF TESTING. THREE FAILURES SHALL RESULT IN REJECTION OF THE CONTRACTOR-FURNISHED EQUIPMENT.
- 4. PERFORMANCE TEST. THE CONTRACTOR SHALL CONDUCT OPERATIONAL PERFORMANCE TEST FOR VEHICLE PRESENCE, VEHICLE VOLUME, COUNT, SPEED, AND OCCUPANCY UNDER DIFFERENT DAY AND NIGHT LIGHTING CONDITIONS. THE CONTRACTOR SHALL PROVIDE A CONTINUOUS VIDEOTAPE OF TRAFFIC CONDITIONS, WITH THE SUPERIMPOSED DETECTION ZONES FROM EACH CAMERA FOR THIRTY MINUTES BEFORE AND AFTER SUNRISE, SUNSET, NOON, PEAK AND OFF-PEAK TIMES ON A NORMAL WORK DAY. NO ADJUSTMENTS (REMOTELY OR MANUALLY) WILL BE ALLOWED.

THE CONTRACTOR SHALL FURNISH THE ORIGINAL UNEDITED VIDEOTAPE(S), IN VHS FORMAT, IMMEDIATELY AT THE COMPLETION OF THE TEST, TO THE ENGINEER TO VERIFY THE RESULT. THE CONTRACTOR SHALL PROVIDE ALL TEST EQUIPMENT INCLUDING VCR, LABOR, SOFTWARE AND ANCILLARY ITEMS REQUIRED TO PERFORM THE TESTING. ALL ACCEPTANCE TEST RESULTS SHALL BE FULLY DOCUMENTED AND SUCH DOCUMENTATION PROVIDED AS A CONDITION OF ACCEPTANCE OF THE EQUIPMENT INSTALLED.

XIV. WARRANTY

THE VDS SHALL BE WARRANTED AGAINST ANY DEFECTS IN MATERIAL OR WORKMANSHIP FOR A PERIOD OF TWO YEAR FROM THE DATE OF INSTALLATION AND TURN-ON. DURING THE WARRANTY PERIOD THE MANUFACTURER OR SUPPLIER SHALL REPAIR OR REPLACE THE DEFECTIVE UNITS, WITHIN 10 DAYS, AFTER NOTIFIED BY THE OWNER, AT NO CHARGE AND SHALL BEAR ALL COST INCLUDING SHIPPING AND HANDLING. THE DEFECTIVE UNITS SHALL BE PICKED UP AND DELIVERED TO THE ADDRESS PROVIDED FOR IN THE NOTICE. ONCE NOTIFIED IN THE EVENT THAT THE MANUFACTURER OR SUPPLIER CANNOT REPAIR THE DEFECTED UNIT(S) WITHIN 10 DAYS, A TEMPORARY OR REPLACEMENT UNIT SHALL BE PROVIDED FREE OF CHARGE TO THE OWNER. THE MANUFACTURER OR SUPPLIER SHALL PROVIDE SOFTWARE UPDATES FOR THE DETECTION SYSTEMS AND MONITORING COMPUTER DURING THE WARRANTY PERIOD. FREE OF CHARGE. THE MANUFACTURER OR SUPPLIER SHALL MAINTAIN A TECHNICAL SUPPORT PROGRAM AND OFFER SOFTWARE UPDATES FOR TEN YEARS FOLLOWING EXPIRATION OF THE WARRANTY PERIOD. SIX MONTHS PRIOR TO THE END OF THE WARRANTY PERIOD THE MANUFACTURER OR SUPPLIER SHALL SUPPLY THE OWNER A SEPARATE AGREEMENT FOR REVIEW TO EXTEND THE WARRANTY PERIOD, IF SO AGREED.

DATE	BY	REFERENCES NOTED	REFERENCES CHECKED
9-01	M Adams		
11-01	R Stigman		

Plotted : 4/16/2004  
 Drawn By : rrsfegman  
 File : p:\0154\01541 Trsp01.dgn  
 Section : \$\$\$KDOT GRP-\$\$\$



KANSAS DEPARTMENT OF TRANSPORTATION  
 TRAFFIC SIGNAL SPECIFICATIONS  
 VIDEO IMAGING SYSTEM