

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	87 N-0720-01	2023	345	517

12.3.4 AIR TERMINAL

Install the air terminal on the opposite side of the pole from the dome. Position the rod to project a minimum of 5 feet in length above the top of pole (not including the lowering device cap) with an equal length to be mounted to the pole. Provide and install an air terminal mounting bracket. Locate and size the air terminal to adhere to the 150 foot radius rolling sphere model as described in NFPA 780 and as shown on the Plans. Seek approval from Engineer for adjustment of 5 foot height requirement.

Apply a copper-based conductive sealant between the rod and the pole before tightening the bolts. Perform all work related to the installation of the air terminal in accordance with NFPA 780.

12.3.5 POLE GROUNDING

Connect the bottom of the pole to one or more ground rods using a minimum #2 stranded copper grounding conductor from pole to grounding rod. Construct the ground conductor to travel through the foundation in a schedule 40, non-metallic, U.L. listed conduit as shown in the plans. If the steel pole thickness is 3/16 inch or less, use a copper down grounding conductor. Clean galvanized ground lug at bottom connection point prior to exothermic welding. Use exothermic welding for all ground wire connections, except the connection to the pole, which shall use the pole's grounding lug.

12.3.6 CCTV CAMERA LOWERING SYSTEM

Ensure that the lowering device manufacturer furnishes a factory representative to assist with the assembly and testing of the first installation of the lowering system onto the pole assembly. Ensure that this installation is working properly and is approved by the Engineer prior to a second installation. Ensure that the lowering device manufacturer is available to assist in a second installation or possibly a third installation until the manufacturer and KDOT are satisfied with proper installation. Provide from the manufacturer the applicable documentation certifying that the Contractor has been instructed on the installation, operation and safety features of the lowering device. Provide the Engineer with operational instructions.

13.0 VEHICLE DETECTION SYSTEM

13.1 DESCRIPTION

Furnish and install a Vehicle Detection System (VDS) including lightning surge protection, AC/DC power converter and a media converter for Ethernet communications for the purposes of detecting vehicular speed, volume counts, and lane occupancies. Install in the locations shown on the Plans.

13.2 MATERIALS

13.2.1 RADAR VEHICLE DETECTORS (DETECTORS)

Include all the cables, connectors, and mounting hardware recommended by the manufacturer for proper operation of the system. If required, provide a Wavetronix Smartsensor HD (model SS126) unit or approved equal including lightning surge protection, AC/DC power converter and a media converter for Ethernet communications that meets the following minimum requirements. Provide a SS126-001 Retrofitted SmartSensor HD if noted in the plans or if directed by the Engineer.

13.2.1.1 PERFORMANCE

The following requirements apply:

1. Able to measure volume, occupancy (including slow moving or stationary vehicles), classification counts, and speed, when in a sidewire configuration and mounted as shown on the Plans.
2. Suitable for polled operation using multipoint RS-232 communication at 9600 bits per second.
3. Detection range: 6.0 to 250.0 feet.
4. Detection Zone: Up to 22 traffic lanes simultaneously
5. Operating Frequency: 24.0-24.25 GHz
6. Transmit bandwidth: 245 MHz.
7. Transmitter power: up to 10 W.
8. Operating temperature range: -35°C to 50°C
9. Operating humidity range from 5 to 95% RH.
10. Meets FCC rules Part 15 for interference.
11. Occupies no more than 0.6 cubic feet.
12. Weighs no more than 15 lbs.
13. Housing sealed to withstand rain (or snow) up to a rate of 2 inches per hour or wind loads up to 90mph.
14. Includes a mounting assembly for each radar detector with the following requirements: stainless steel or all aluminum construction, capable of supporting a load of 20 lb., capable of being mounted on the side of the pole approved by the manufacturer of the microwave detector.
15. Includes a twisted-pair cable between the cabinet and each microwave detector with the following requirements: provides both power and serial communication, UV-resistant and rated for 300 volts, terminate on a single MS connector.

13.2.2 LAPTOP SOFTWARE

Provide vendor software that enables a technician to test all features and functions of the detector, and perform all set-up procedures with a web based interface. Provide this software to the Engineer so that it can be installed on other computers. Ensure that the Engineer has the right to make and use an unlimited number of copies of this software.

13.2.3 COMMUNICATION PROTOCOL

Demonstrate that the radar vehicle detector can communicate with KDOT ATMS software and is compliant with the National Transportation Communications for ITS Protocol (NTCIP). To be NTCIP compliant, ensure that the detector adheres to the version of the following standards that is current at the time of bidding:

1. Information level: NTCIP Standard 1209, including implementation of the TSS Data Collection conformance group.
2. Application level: NTCIP Standard 1101, Compliance Level 2.
3. Transport level: Null protocol
4. Subnetwork level: NTCIP Standard 2101

13.2.4 DEVICE SERVER

Provide a Wavetronix Click 301 device server or approved equal (if specified in the plans) which will allow the detector to communicate over the Ethernet IP network when the detector is connected to an Ethernet network device. Provide a device server that meets the following minimum requirements:

1. Able to convert half-duplex serial communication to Ethernet and vice versa
2. Include multiple communication ports: Ethernet, RS-485, RS-232 DTE
3. Use either Ethernet or serial interfaces to configure baud rates
4. Operating temperature range: -20°F (-28°C) to 165°F (74°C)
5. Operating humidity range from 5 to 95% RH
6. Input voltage range between 10 to 30 VDC

If multiple vehicle detectors are present at one location, ensure physical separation between the click components for each vehicle detector. Ensure no T-bus connections occur between different detector components.

Provide a Wavetronix Click 201 AC/DC power converter or approved equal that meets the following minimum requirements:

1. Provide 24 VDC at currents of 1-Amp
2. Provide a mains buffering greater than 20ms under full load

13.2.6 DETECTOR POLE

For standalone detector locations, conform and construct in accordance with details shown on the Plans. For locations where detectors are mounted to another ITS device pole or structure, mount as shown in the plans. Design the poles for the standalone detectors to comply with the latest edition of the AASHTO publication "Standard Specifications for Structural Supports for Highway Signs, Luminaires, Traffic Signals and Interims". Also, see the KDOT Standard Specifications.

All mounting hardware not specifically detailed in drawings shall be aluminum or stainless steel. Aluminum hardware shall be natural aluminum color.

Conform to the standard KDOT specifications, latest edition, Division 1600 for miscellaneous hardware that requires galvanizing or electroplating.

Use ground wire that is a #4 AWG bare copper wire, unless otherwise shown on the Plans. Use ground rods that are solid copper or copper-bonded steel.

Conform to the KDOT Standard Specifications, latest edition, Division 1600 for anchor rods.

Provide break-away cable connectors that provide a fused waterproof wiring connection that when subjected to strain consistent with a knockdown, will separate without damage to the wiring. When separation occurs, ensure the connectors shall have no contacts exposed to present a shock hazard. Meet requirements as listed in the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (Latest Edition), Article 12.5.3 (C). Install the connectors as directed by the manufacturer.

If wedge-type stud rod anchors are used, install 3/8 inch by 3 inch wedge-type anchors for conduit clamps. Use wedge-type anchors made from carbon steel meeting AISI 12L14 Steel. Provide a minimum embedded depth of 1-3/4 inches.

If conduit clamps with clamp backs are used, install 2 inch conduit clamps with a compatible clamp back. Use heavy duty steel clamps to secure the rigid conduit to the structure. Space conduit clamps at 6 foot intervals.

Install one cable support grip in each detector pole. Provide a cable support grip made of high grade, non-magnetic tin coated bronze strand. Provide a cable support grip that is capable of securing two #10 AWG type USE-2 cables in a vertical position holding the weight of the cables and cable connectors off the detector assembly.

Comply with the requirements of the ASTM 607 with the exceptions and/or additions as listed in the KDOT standards.

Submit weld details with pole shop drawings, referencing approved weld procedures. Weld procedures will be approved by KDOT prior to use. All welding shall be in accordance with AWS D1.1 (latest revision), and AASHTO standard specifications for structural supports for highway signs, luminaires, and traffic signals and current interims. All handholes and weld backing rings shall have CJP at splices unless made from a solid.

13.3 FOUNDATION

Construct as indicated on the Plans and Specifications.

13.4 CONSTRUCTION REQUIREMENTS

13.4.1 RADAR VEHICLE DETECTORS

Install in accordance with the manufacturer's recommended procedure for side-fired installation. Determine proper mounting height of the detector being supplied based on offset, height, and lanes to be detected. Note that the recommended mounting height is relative to the road surface, not the base of the pole. Install mounting hardware to prevent conflict with CCTV camera when lowered. Aim the detector to detect vehicles in the lanes indicated at the particular location.

Specify the length of control cable/harness required to the detector supplier. Include the vehicle detector control cable/harness in the detector ITS unit cost.

Provide a separate entry point for each VDS.

Installation may be done by the Contractor's forces, but each installation must be checked by the manufacturer or manufacturer's representative, and adjusted as recommended by the manufacturer. Installation includes connecting the detector to the device server and power supply in the associated ITS cabinet, as shown on the Plans. Coordinate with the manufacturer to resolve any calibration or environmental concerns.

The set up includes speed calibration using measured (not estimated) reference speeds with a LIDAR gun. When the setup is complete and the detector is ready for operation, deliver the values of all parameters that were set during the process to the Engineer in printed or computer-readable form. Provide all equipment, such as a LIDAR gun, software, laptop computer, tools and cables, needed for the set up work.

14.0 ITS CABINET ASSEMBLY

14.1 DESCRIPTION

ITS cabinet assemblies are defined as the complete assembly of all required equipment and components for the control of ITS field elements at each location as detailed in the Plans and the collection and communication to the Traffic Management Center of data gathered from the ITS Field Elements. Install Type 334 and Type 336S in the quantities and numbers at the locations as detailed in the Plans or as directed by the Engineer. Provide all necessary incidental items for a complete fully functioning cabinet installation including DIN rails, wiring, and all equipment mounting hardware.

14.2 MATERIALS

14.2.1 GENERAL

Include necessary back panels, interface for CCTV, VDS, or DMS as shown on the Plans, all required communication equipment, all required wiring, switches and connectors, and all other equipment as required by these specifications and as shown on the Plans, or as directed by the Engineer, to provide a fully functioning and operational ITS system.

14.2.2 ITS CABINETS

Use either model 334 for pad mounted cabinets or 336S for pole mounted cabinets as shown and indicated in the Plans and exhibit a bare aluminum finish. Provide cabinets with two full size doors for front and rear entry. Ensure that all cabinets are designed to NEMA 3R specification. Provide handles for each main door that open outwards. Supply all cabinets with a removable self-standing rack assembly, an AC bus, and a ground bus. Do not provide any power distribution assemblies unless specified.

Provide all KDOT main cabinet doors with a BEST 3L Series Deadbolt Cabinet Lock with construction core that will allow KDOT to install their own lock core. KDOT will replace the construction core with a KDOT keyed core upon cabinet acceptance. Dispose of the construction core after cabinets are accepted. Provide all KDOT main cabinet doors with a raised designation 'KDOT ITS' as indicated in the Plans. Name plates shall match cabinet material type.

Provide all KC Scout main cabinet doors with a Corbin Number 2 Lock. Provide all KC Scout main cabinet doors with a raised designation 'KC SCOUT ITS' as indicated in the Plans.

14.2.3 CABINET SIZE

Standard 336S cabinet dimensions are approximately 46" x 24" x 22". Standard 334 cabinet dimensions are approximately 66" x 24" x 30". Size each controller cabinet based on the equipment as identified on the Plans and described herein.

1	6/22	13.2.6 Paragraph 2. Removed polished shaft surface.	CCB	
NO.	DATE	REVISIONS	BY	APPD
KANSAS DEPARTMENT OF TRANSPORTATION				
ITS EQUIPMENT SPECIFICATIONS				
ITS-S08		VERSION DATE: 08-23-21		
APPD				
DESIGNED	DETAILED	QUANTITIES	TRACED	
DESIGN CK.	DETAIL CK.	QUAN. CK.	TRACE CK.	