

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	87 N-0720-01	2023	346	517

14.2.4 LIGHTS

Include 2 fluorescent or LED lighting fixtures mounted inside the front and back portion of the cabinet. Install a door-activated switch to turn on the cabinet lights when the door is open. Install each switch to work each individual light.

14.2.5 ALARM

Install an additional door actuated switch for each main door. Wire this switch such that an alarm can be sent to the TMC when both or either door is opened.

14.2.6 POWER AND LOAD CENTER

The cabinet will be capable of accepting/landing a 120V/240V power circuit. Land all incoming power in a 60 Amp, 120/240 VAC, UL listed Load Center provided with the cabinet, including circuit breakers. Furnish and install a GFCI convenience outlet two position on its own circuit. Provide GFCI outlet that meets the following requirements: 15 Amp - 125 Volt NEMA 5-15R, tamper and weather resistant receptacle, aluminum, steel, or HDPE rectangular box, no cover, mountable to DIN rack adapter for load center. Power will be distributed to the cabinet through the Load Center that will be installed in the cabinet. Ground bars and distribution bars are to be installed adjacent to the Load Center for internal cabinet power distribution. Provide the main power to have its own 2-pole circuit breaker (amperage as defined in the plans) in the load center that will shut off power to the entire cabinet. The load center will be provided with a minimum of three single pole 120V-15A circuit breakers. Distribute cabinet loads across circuits to balance loads. The GFCI outlet and camera should each be on their own individual circuit (three total including one spare). Mount all power terminals and the Load Center a minimum of 12" above the bottom of ground mounted cabinets. If a PDA input file is required for loop detection, one may be installed as approved by the Engineer.

14.2.7 FILTER

Install and house a removable and replaceable furnace type fiberglass or aluminum filter behind door vents. Ensure the filtration area covers the vent openings. Ensure the filter is held firmly in place with a vented back plate shell that fits over the entire filter providing full support. Ensure the shell is louvered to direct the incoming air downward. Where air-conditioning is required, do not use door vents on the main doors and block the top vents of the cabinet with aluminum panels welded in place.

14.2.8 DIN RACK ADAPTER

Provide each ITS cabinet with a 19 inch recessed DIN rail adapter with DIN rail for placement of Cisco equipment and other equipment. Where necessary for space, provide a second adapter for vehicle detector and/or CCTV equipment. The following minimum requirements apply: rail adapter is a 4U or 5U adapter with a minimum depth of 7.5 inches, 19 inch rack mountable with four mounting holes, aluminum or steel, supports a minimum of 20 lbs of equipment.

Provide each ITS cabinet with an additional 19 inch recessed DIN rail adapter for placement of load center and GFCI outlet. The following minimum requirements apply: adapter is 8U or 9U with a minimum depth of 7.5 inches, 19 inch rack mountable with four mounting holes, aluminum or steel.

14.2.9 FAN

Attach a fan and thermostat assembly to the top of the cabinet.

14.2.10 DRAWER

Supply a pull out drawer for all 334 and 336S type cabinets for placement of laptops or tools.

14.2.11 SHELF

Supply a vented equipment shelf for all 334 and 336S type cabinets for placement of laptops or tools.

14.2.13 POWER STRIP

Provide a rack mounted power strip receptacle in cabinets. Include a minimum of 8 receptacles on this unit with a minimum of 2 receptacles on front and 6 receptacles on rear. Use UL 1449 rated for 330V surge suppression. Provide power strip to protect from over voltages up to 40,000 amps per phase. The power strip must be plugged into one of the quadplex outlets. Do not plug the power strip into the GFCI receptacles.

If required to supply a remote controlled IP addressable power strip, use a rack-mounted power strip that meets the following minimum requirements:

1. Web controlled 8 outlet power strip
2. Multi-outlet, multi-user remote reboot
3. Outlet grouping for simultaneous switching
4. AutoPing for automatic failure detect and reboot

14.3 CONSTRUCTION REQUIREMENTS

14.3.1 GENERAL

Stake the proposed location of all Type 334 ground mounted cabinets, indicating the direction that the doors will open for approval by the Engineer prior to excavating and pouring of the cabinet foundation. Place pole mounted cabinets so that the top of cabinet shall not exceed 6 feet above ground and cabinet orientation shall not expose workers to traffic. Receive approval by the Engineer for orientation of all cabinets prior to placement. Install all equipment in all ITS cabinets as shown in the Plans and allowing sufficient space between equipment for ease of maintenance and trouble-shooting. Do not locate any devices in the bottom 10 inches of the cabinet. Submit to the Engineer for approval all ITS cabinet layouts including wiring diagram, dimensional plans and cabinet population drawings. Size and space the ITS equipment racks to accommodate any future communications equipment shown on the Communication Routing Schematics shown on the Project Plans.

14.3.2 WIRING

Use insulated, stranded copper wire. Neatly bundle and secure wiring with plastic cable ties. Route incoming field circuits horizontally from the conduit to the back of the cabinet, then vertically to the terminal block. Label all terminals and ensure they are not visibly obstructed. Identify all field leads by means of round aluminum identification tags with a minimum thickness of 0.1 mils attached to the cables with a copper wire to correspond with the Plans. Use outgoing circuits of the same polarity as the line side of the power supply, and the common return of the circuits of the same polarity as the ground side of the power supply. Provide the power supply through three single conductor cables. Carry the ground side of the power supply throughout the cabinet in a continuous circuit, and secured to a ground bus bar in an approved manner. Terminate all field conductors in the ITS cabinet. Ensure ground wires from all equipment have the shortest lead length possible with direct connection to the cabinet ground bus bar. Avoid cable loops and bends for all ground bonds and wires.

14.3.3 CABINET PANEL WIRING

Neatly bundle and secure all wiring on the cabinet panel with plastic cable ties. Use an expandable braided sleeve for any multi-conductor cable between the controller or auxiliary equipment and the back panel. Use discrete insulated wires and solder directly to lugs on the back of terminal blocks and sockets. Do not use printed circuit boards.

14.3.4 CABLES

Locate and secure all cables such that they do not interfere with the removal of the rack mounted equipment or opening access panels on the equipment.

14.3.5 CABINET LOCATE TEST STATION

For each cabinet installed (all ITS and KDOT-furnished DMS cabinets), furnish and install a cabinet locate test station as shown in the plan details. The tracer wire terminal for the cabinet locate test station shall be solid brass or bronze alloy and must be accessible from the outside of the cabinet. Puncture a hole no larger than necessary in the cabinet at the locations shown in the details to install the locate test station terminal, then be sure to seal and make the hole water tight. For Type 334 cabinets, the terminal shall be located near the bottom of the cabinet under the hinge side of the back cabinet door. For Type 336 cabinets, the terminal shall be located on the bottom side of the cabinet near the pole. Apply thread lock sealant to reduce tampering and maintain a 1.5-inch minimum clearance in all directions of the terminal. The terminal shall be completely isolated from the cabinet and the grounding system. The tracer wire shall be mechanically bonded to the tracer terminal so as to provide a continuous locating system throughout the limits of the project. Contractor shall submit construction details for the cabinet locate test station wire connection for approval.

14.3.5 CONDUIT ARRANGEMENT

Install the conduits placed in the controller base such that the appropriate conduit is placed at the location where wire running through it will be attached in the cabinet. Each cabinet may require different conduit placement. Carefully design conduit placement to prevent crossing of cables within the cabinet.

14.3.6 DOCUMENT POCKET

Install a document pocket on the inside of the front door of the cabinet for storage of wiring diagrams, maintenance logs, cabinet elevation drawings, communication schematic drawings, and test results.

14.3.7 CABINET RACK ELEVATIONS

Submit rack elevation drawings for each ITS cabinet and all racks modified in the KDOT designated facility. Provide rack elevation drawings that are drawn to scale; include front, back, and side elevations. Label each rack elevation with a summary title stating the location, type of cabinet, cabinet outside dimensions, and rack dimensions (19" rack with XU slots). Indicate the placement of each rack-mounted or shelf-mounted piece of equipment, including vehicle detector equipment, CISCO switches, DIN Rail Adapters, blank panels, and blank spaces. Show vertical dimensions in both inches and rack units (multiples of 1.75 inches). Conform to Documentation section of these specifications.

15.0 FIBER OPTIC CABLE, INSTALLATION, AND HARDWARE

15.1 DESCRIPTION

Provide, install, terminate, and test fiber optic cable.

15.2 MATERIALS

Provide fiber optic components that are compatible, designed for the purpose intended, and manufactured by a company regularly engaged in the production of material for the fiber optic industry. Provide all cable, components, or assemblies that are best quality, non-corroding, with a design life of at least 20 years. Provide all components or assemblies of the same from the same manufacturer. Provide all components that are the size and type required for the specified fiber.

15.3 FIBER OPTIC CABLE

Provide fiber optic cables in compliance with Corning ALTOS All-Dielectric gel free cables for fiber counts of 2-288 fibers or approved equal and that comply with the following minimum requirements. Provide all fiber optic cable required for this project that are all dielectric, duct type, with loose buffer tubes and conform to these Specifications. Ensure that the Single Mode Fiber Optic (SMFO) cables contain single mode (SM) dual-window (1310 nm and 1550 nm) fibers. Ensure the multi-mode fiber optic (MMFO) cables contain graded index fiber at 850 nm and 1300nm with 62.5 micron core diameters.

Ensure the optical fibers are contained within loose buffer tubes. Ensure the loose buffer tubes are stranded around an all dielectric central member. Ensure that Aramid yarn and/or fiberglass is used as a primary strength member, and a polyethylene outside jacket is provided for overall protection. Provide and install fiber optic cables as shown in the Plans and specifications. Provide single mode fibers within the finished cable that comply with the requirements in the following table:

Parameters	Value
Mode	Single
Type	Step Index
Core diameter	8.3µm (nominal)
Cladding diameter	125µm±1.0µm
Core to Cladding Offset	= 0.6 µm
Coating Diameter	245 µ m±10µm
Cladding Non-circularity defined as: [1-(min. cladding dia ÷max. cladding dia.)]x100	≤ 1.0%
Proof/Tensile Test	690 Mpa, min.
Attenuation @ 1,310nm	≤ 0.40 dB/km
Attenuation @ 1,550 nm	≤ 0.35 dB/km
Attenuation at the Water Peak	≤ 2.1 dB/km @ 1383±3nm
Chromatic Dispersion:	
Zero Dispersion Wavelength	1301.5 to 1321.5 nm
Zero Dispersion Slope at zero dispersion wavelength	=0.092 ps/(nm ² *km)
Maximum Dispersion:	3.3 ps/(nm*km) for 1285 - 1330nm
	<18 ps/(nm*km) for 1550 nm
Cut-Off Wavelength	<1260 nm
Mode Field Diameter (Petermann II)	9.3±0.5µm at 1310 nm 10.5±1.0µm at 1550 nm

15.4 COLOR CODING

Comply with EIA/TIA-598a "color coding of fiber optic cables."

15.5 GENERAL CABLE PERFORMANCE SPECIFICATIONS

As part of the material submittal for the cable, include evidence that the cable meets the ANSI/ICEA S-87-640 design and test criteria.

15.6 PACKAGING AND SHIPPING REQUIREMENTS

Provide documentation of compliance to the required specifications to the Engineer prior to ordering the material. Attention is directed to "fiber optic testing" elsewhere in these Specifications. Ensure the completed cable is packaged for shipment on reels. Ensure the cable is wrapped in weather and temperature resistant covering. Ensure both ends of the cable are sealed to prevent the ingress of moisture.

Securely fasten each end of the cable to the reel to prevent the cable from coming loose during transit. Provide six feet of accessible cable length on each end of the cable for testing. Ensure that the complete outer jacket marking is visible on these six feet of cable length.

Provide each cable reel with a durable weatherproof label or tag showing the Manufacturer's name, the cable type, the actual length of cable on the reel, the Contractor's name, the contract number, and the reel number. Include a shipping record in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, bandwidth, etc.), factory test results, cable identification number and any other pertinent information. Ensure that the minimum hub diameter of the reel is at least 30 times the diameter of the cable. Provide the cable in one continuous length per reel with no factory splices in the fiber. Ensure that each reel is marked to indicate the direction the reel should be rolled to prevent loosening of the cable. Include all installation procedures and technical support information in the Technical Reference Manual.

15.7 FIBER OPTIC SPLICE CLOSURE

Provide all fiber optic splice closures that are CommScope FOSC or Corning SCF Splice Closures, or approved equal that meets the following minimum requirements. Provide the end cap of the canister splice closure with two express ports for uncut backbone cables and a minimum of four gel-sealed, liquidtight cable ports for branch cables or additional backbone cables. Provide fiber optic splice closures with splice trays from the same manufacturer as the splice closure and with sufficient quantity of trays to account for all proposed splices required on the Plans at each splice point plus an additional two trays for future splicing capacity. Suspend all splice closures off floor of vault.

Do not use pressurized splice closures.

For end of reel splicing, use an approved fiber optic splice enclosure sized to accommodate full cable splice in one enclosure.

NO.	DATE	REVISIONS	BY	APPD
KANSAS DEPARTMENT OF TRANSPORTATION				
ITS EQUIPMENT SPECIFICATIONS				
ITS-S09		VERSION DATE: 08-23-21		
APPD	DESIGNED	DETAILED	QUANTITIES	TRACED
	DESIGN CK.	DETAIL CK.	QUAN. CK.	TRACE CK.