

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	87 N-0720-01	2023	339	517

#### 4.5 APPROVALS

Any work done prior to the Engineer's review and approval will be at the Contractor's risk and expense. Following review of the submittal data, the Engineer will mark the items in one of five ways:

1. "No Exceptions Taken";
2. "Exceptions As Noted";
3. "No Exceptions Taken, Resubmit With Complete Group Submittal";
4. "Corrections Required - Resubmit"; Or
5. "Rejected - Resubmit".

Proceed with any items marked "no exceptions taken" since the Engineer has taken no exception to the submittal. Proceed with any items marked "exceptions as noted", provided that the Contractor concurs with the notations. Items that are marked "corrections required - resubmit" are judged to be basically acceptable, they will have notations made on them about additional information required or corrections which are necessary before the items are acceptable. In such case, proceed immediately to correct said items and resubmit them for review. Items that are marked "rejected - resubmit" are judged to be unacceptable. Proceed immediately to identify new items or redesign said items and resubmit them for review.

Substitutions for any of the materials on the list are not acceptable without prior written approval by the Engineer. Submit in writing to the Engineer any changes to the approved materials list.

#### 4.6 ORDER OF WORK

Provide a construction schedule (in MS Project or similar format) outlining the proposed order of work that shows a timely progression of ITS related construction. The Contractor will be allowed to construct footings and place concrete, install conduit and cables, and return at a later date to install the poles, controller assembly, or closed circuit television systems. The construction schedule shall provide a detailed plan for connection to the existing KDOT traffic management system.

#### 5.0 CONDUITS

##### 5.1 DESCRIPTION

Construct and install conduits per the KDOT Utility Accommodation Policy as detailed on the Plans, as noted below, or as directed by the Engineer. Provide conduits of the type and size as shown on the Plans. Provide all incidental items necessary to provide a complete and fully functional conduit system. If approved by the Engineer, conduit may be installed by trenching, plowing, or directional bore; however, payment will be made based on the installation method indicated in the plans for that conduit. No additional payment will be made for installation methods not indicated in the plans unless approved by the Engineer.

##### 5.2 MATERIALS

###### 5.2.1 RIGID METALLIC CONDUIT

Rigid metallic conduit (RMC) is a threaded metal raceway of circular cross section with a coupling, which can be either a standard straight tapped conduit coupling or the integral type. Cover threads on the uncoupled end by thread protectors prior to installation. Adhere to UL 6 standards and outdoor ratings for all RMC and fittings. All RMC must be galvanized steel in accordance with KDOT Standard Construction Specification 1703.2. Where RMC is installed underground, wrap with an approved PVC tape. For RMC conduits that transition from above ground to underground, the PVC tape shall be extended 6 inches above ground level. Provide a bushing to all metallic conduit ends to protect the electrical conductors or fiber optic cable from abrasion.

###### 5.2.2 NON METALLIC CONDUIT/HDPE CONDUIT

Provide HDPE conduit that is Schedule 80 and UL listed. Provide color-coded conduit as required for installation location. KDOT installation area: Provide red conduit for electrical cables, green conduit for communication and fiber optic cables, and black conduit for spare. KC Scout installation area: Provide yellow conduit for electrical cables, blue conduit for communication and fiber optic cables, and black conduit for spare. Install HDPE conduit according to manufacturer's instruction.

###### 5.2.3 CONDUIT REPAIR SPLICES

When conduit is used to repair a section of existing conduit to provide the required conduit pathway, provide the same grade and size HDPE conduit as the existing conduit. Approval by the Engineer is required for mechanical conduit splices.

###### 5.2.4 TRACER WIRE

Provide orange No. 12 AWG THHN stranded copper wire.

#### 5.2.5 WARNING TAPE

Provide color durable and chemically resistant red reinforced 3 inch minimum wide, 4-mil thickness warning tape imprinted with "CAUTION BURIED CONDUIT BELOW" for conduits. Provide color durable and chemically resistant orange reinforced 3 inch wide warning tape imprinted with "CAUTION - FIBER OPTIC CABLE BURIED BELOW" for fiber optics.

##### 5.2.6 PULL ROPES

Provide polypropylene pull ropes with a minimum tensile strength of 1,125 lbs.

##### 5.2.7 CONCRETE ANCHORS

The following requirements apply: federal specification FF-S-325, Group II, Type 4, Class I and galvanized in accordance with ASTM A 153, B 695-91 Class 50 or constructed of stainless steel. Furnish a manufacturer's certification that the concrete anchors meet the required material and galvanizing specifications.

##### 5.3 PROOF AND REPAIR OF EXISTING CONDUIT

Proof, and repair as needed, existing conduits to allow fiber optic backbone cable to be pulled or blown through existing conduit as shown on the Plans. In some instances, the existing conduits are collocated with leased fiber conduits. When accessing the KDOT conduits to repair or install a splice vault, care must be taken not to impact the leased fiber conduits.

##### 5.3.1 CONDUIT PROOFING

Provide a continuous conduit path for pulling or blowing of fiber backbone and fiber branch cables as shown in the Plans. The continuous path must be demonstrated through the conduit between existing pullboxes or newly installed splice vaults by passing a mandrel through the conduit.

##### 5.3.2 CONDUIT REPAIR

Repair conduit where needed and as approved by the Engineer by installing a new conduit section connected to the existing conduits using a mechanical conduit splice. Request and receive approval from the Engineer prior to any repair work. Conduit repair is defined based on a section. A section is considered a continuous length of conduit that is removed and replaced in order to provide a continuous conduit path. For purposes of bidding, each section shall be a maximum length of 50 feet. If a section is greater than 50 feet but less than 100 feet it shall be considered as two (2) sections.

The Contractor shall include five (5) sections of conduit repair in their ITS lump sum bid and shall provide a unit price per section in the Unit Cost List shown in the Required Contract Provision Furnishing Individual Components Necessary for the ITS System. KDOT makes no guarantee that this quantity will be utilized in the contract. The unit price quoted in this contract provision will be used to decrease the ITS lump sum bid through a change order for any sections of conduit repair that are not needed or to increase it if more than five sections are needed.

Seek approval from the Engineer prior to use of discretionary splice vaults or pullboxes for conduit repair. Maintain detailed conduit repair records (including, but not limited to the date, time, exact location, quantity in feet, approval/authorization), then submit these records to the Engineer. Conduit damaged by the Contractor during work performed under this contract shall be repaired at the Contractor's expense.

#### 5.4 CONSTRUCTION REQUIREMENTS

##### 5.4.1 LOCATION OF CONDUIT

Prior to construction, contact Kansas One-Call and any private utilities for locates. Field check the existing conditions at each site, including utility locator service markings, to assure no conflicts with existing utilities, including state-owned underground lighting, traffic signals, cathodic protection facilities, and drainage features. Upon written approval by the Engineer, alter the route of the conduit to avoid conflicts. Conduit shall be installed in straight lines either parallel or perpendicular to the right of way line to the best extent possible. Install trunk line conduit adjacent to the edge of the right of way or in the backslope of the ditch. Install conduit branch lines perpendicular to trunk line conduits. Slope conduit to a pull box at a minimum rate of 0.5 percent.

Unless otherwise shown on the Plans, accomplish a change in direction of conduit by bending the conduit uniformly to a radius that will fit the location or by the use of standard bends. The minimum bending radius of all conduits is the greater of the following: twenty (20) times the diameter of the fiber optic cable; six (6) times the internal diameter of a 2-inch conduit or smaller; ten (10) times the internal diameter of a 3-inch conduit or larger.

##### 5.4.2 NOTIFICATION

After utility locates have been completed, and prior to any construction, notify the owner of any leased fiber (when applicable) a minimum of two weeks in advance and again at 72 hours in advance to have an inspector on site prior to any planned work adjacent to their conduits. A leased fiber representative along with a KDOT representative must be present for work that is within five feet of leased fiber conduit. Any adjacent work located within ten feet of any leased fiber conduits, fiber optic pullboxes or vaults will all be done by hand trenching and digging. No mechanical equipment will be allowed.

##### 5.4.3 THREADING

Use nipples to eliminate cutting and threading where short lengths of conduit are required. If it is necessary to cut and thread steel conduit, no exposed threads will be permitted.

#### 5.4.4 CLEANING

Blow air through each conduit to remove debris and water. Clean and swab all conduits before cables are installed. Install expandable type dust plugs after cleaning on each end of individual conduits.

##### 5.4.5 MANDREL TEST

Test conduit path by pulling a mandrel through the conduit. The mandrel shall have a diameter no less than 70% of the inside diameter of the conduit and a length of 2 inches. If the conduit does not allow the mandrel to be pulled through, clean and/or repair conduit to permit passage of the mandrel. When conduit run is an extended distance the Contractor may seek alternative methods as approved by the Engineer for this test.

##### 5.4.6 END TREATMENT

Cut HDPE conduit inside pull boxes and splice vaults at a 90 degree angle with 10 inches to 14 inches exposed inside of the box. Pull from one box to the adjacent box (minimize stretching), not pulling through several boxes at the same time (minimize stretching), and anticipate some conduit pullback by installing a small amount of extra conduit. Conduit installation may be rejected if conduit pullback occurs resulting in less than 8 inches of exposed conduit.

Sand all conduit ends smooth in order to eliminate any burrs on the inside or outside diameter of the HDPE conduit.

##### 5.4.7 SPLICING

Use mechanical splices made in accordance with conduit and splice manufacturer's recommendations. Fusion conduit splices are not allowed. Submit materials to be used for conduit splices to the Engineer for review and approval along with the manufacturer's recommendations and installation procedures.

##### 5.4.8 EMPTY CONDUITS

Cap or plug open ends of conduits placed for future use with water tight mechanical plugs. Expandable foam seal is not permitted. Do not cap or plug with tape. After cleaning and testing have been completed, place a pull rope in all empty conduits.

##### 5.4.9 DEPTH

The following requirements apply: a minimum of 42 inches of cover for all underground conduit containing communication service; a minimum of 48 inches of cover for all underground conduit containing electrical service; a minimum of 5 feet of cover below crown grade or 3 feet below ditch grade for all utilities crossing under roadways. Encase conduit in concrete or other appropriate means as approved by the Engineer if this minimum conduit depth cannot be achieved at site-specific locations. The Engineer will determine if exceptions to meeting the depth requirements are necessary.

##### 5.4.10 TRACER WIRE

Install tracer wire for locating purposes in all KDOT conduit containing fiber optic cable and spare conduits intended for future fiber optic cables installed as part of this project. When multiple conduits share the same trench or bore, only one conduit will be required to contain a tracer wire. Pull tracer wire into all cabinets and device bases. Terminate and ground tracer wire inside cabinets or device bases. Continuously connect tracer wire along the fiber backbone. Do not continuously connect the tracer wire in conduit containing fiber spurs that branch out to the individual controller cabinets. For all conduit carrying fiber spurs, the central point in which all tracer wires are electrically bonded to each other at an isolated terminal is the controller cabinet. Use waterproof lug connectors in splice vaults and pull boxes to electrically bond the tracer wires when continuous runs of tracer wire cannot be installed. Label all tracer wires at all access points with "TRACER".

Terminate tracer wires on the installed cabinet test station lugs or in the in-ground locator test station terminals, as applicable. Ensure a continuous tracer wire run so that locates can be performed by connection at any single point.

Upon TRM Submittal and prior to final acceptance, the Contractor shall coordinate with the Engineer to call an initial locate for the entirety of installed conduit through KDOT's locate contractor. This work shall ensure that KDOT's utility locator is able to mark the new conduits appropriately. Any areas where locates cannot be completed will be identified for remedial action. This process shall be repeated until the entire installed conduit sections can be located appropriately. Any marking locates necessary prior to final acceptance (i.e. during construction) shall be the responsibility of the contractor and follow general located practices. This work shall be subsidiary to the installation of the locate wire and equipment.

##### 5.4.11 WARNING TAPE

Install warning tape 12" above the top of electrical, fiber optic, and communications conduits, or as directed by the Engineer.

NO.	DATE	REVISIONS	BY	APPD
<b>KANSAS DEPARTMENT OF TRANSPORTATION</b>				
<b>ITS EQUIPMENT SPECIFICATIONS</b>				
ITS-S02		VERSION DATE: 02-12-21		
APPD				
DESIGNED	DETAILED	QUANTITIES	TRACED	
DESIGN CK.	DETAIL CK.	QUAN. CK.	TRACE CK.	