

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	87 N-0684-01	2019	85	109

**5.4.12 CONDUIT IN TRENCH**

Excavate trenches to the width and depth necessary for conduit installation as shown in the Plans. Do not use material which might cause mechanical damage to the conduit for backfilling below an elevation 6 inches above the conduit. Clean the bottom of the trench of such material before the conduit is placed. Obtain approval by the Engineer of the trench prior to conduit placement. Backfill all trenches according to the ITS Special Provision 07-08041, latest revision.

**5.4.13 BORED CONDUIT**

Install bored conduit without disturbing the existing surface. Place bored conduit by boring or other approved means. Locate all bore pits and spoil piles a minimum of 4 feet from the edge of the paved roadway or shoulder surface and barricade, fence, or protect the pits by some other acceptable method from errant vehicles or pedestrians.

**5.4.14 PLOWED CONDUIT**

Conduits may be installed by plowing upon approval of the Engineer. Use a vibratory type plow which will place conduits at the minimum depths indicated above when installation is accomplished by plowing. Compact the soil over the installation to the original in-place density. Do not plow conduits in rocky areas.

**5.4.15 EXTERNAL CONDUIT ON STRUCTURE**

Obtain all permits and approval of all external conduits on structure according to the KDOT Utility Accommodation Policy. All permitting for attachments will go through the KDOT Bridge section for review.

Use RMC for all above ground external conduit. When HDPE conduit is installed inside a RMC raceway, install the HPDE conduit such that there are no splices. Use an approved expansion/contraction joint if a splice is necessary.

Use external conduit on structure for existing structures, or if provisions are not made in the Plans for providing a conduit raceway in new structures. Conduit on structure includes conduit on bridges, retaining walls or other structures. Adhere to the requirements in the KDOT Utility Accommodation Policy (latest edition) for all bridge/structure attachments, except as noted herein. Install conduit based on the bridge type. Do not attach conduit to prestressed concrete girders or prestressed-precast concrete deck panels.

Securely fasten conduit within 3 feet of each transition box or other conduit termination. You may increase fastening to a distance of 5 feet where secured to the concrete with clamps or supported by openings through framing members at intervals no greater than 10 feet.

Install concrete anchors in concrete to a minimum embedment of 1.8 inches.

Do not use drilling, grinding or welding if it is necessary to anchor the conduit to steel bridge members. The Engineer shall approve attachment method to steel members. Install junction boxes as shown on the Plans or as directed by the Engineer. Surface mount junction boxes and install such that covers are easily accessible.

Use a conduit expansion fitting when the conduit crosses a bridge expansion joint. Ensure that minimum movement in either direction is provided in the expansion fitting as shown on the Plans or as specified by the Engineer.

**5.4.16 GROUNDING AND BONDING**

In all conduits for electrical cables, except spare conduit, install a bare, solid copper wire of a gauge equal to the largest current carrying conductor in the conduit. Use a No. 6 AWG ground wire when the largest current carrying conductor is smaller than a No. 6 AWG. Bond the wire to the ground lugs in poles and cabinets and bond the wires to each other to form electrically continuous conductors over the full length of the conduit system.

**5.4.17 SEALING OF CONDUITS**

Seal all spare conduit entering pull boxes, splice vaults, cabinets, and foundations with an approved mechanical duct plug. Seal conduits that contain cables with watertight duct seal.

**6.0 PULL BOXES, SPLICE VAULTS, AND JUNCTION BOXES**

**6.1 DESCRIPTION**

Construct and install all pull boxes and fiber optic splice vaults provided for in this contract as noted below and as detailed in the plans, or as directed by the Engineer.

Install pull boxes and splice vaults according to the locations, lines, grades, and details shown on the Plans. Locations may be adjusted during installation to clear obstructions and to facilitate wiring as approved by the Engineer. The quantity of pull boxes, and splice vaults as shown in the Plans may not be reduced without the Engineer's approval. Install additional pull boxes and splice vaults at Contractor's expense and with Engineer's approval to facilitate the ease of construction and pulling of electrical conductors and fiber optic cables.

**6.2 MATERIALS**

**6.2.1 PREFORMED PULL BOX AND SPLICE VAULT**

Pull box and splice vault dimensions are shown on the Plans. Preformed pull boxes and splice vaults are composed of mortar consisting of sand, gravel and polyester resin reinforced by a woven glass fiber mat or of resin mortar and fiberglass. Pull box and splice vault shall be rated for a minimum loading of 20,000 pounds or Tier 22. Equip each pull box and splice vault with a bolt down cover of the same material and rating. Electrically bond metal conduits to one another when used in preformed pull boxes.

Rectangular fiber optic splice vault with split lid is for KDOT installations. Round fiber optic splice vault is for KC Scout installations.

**6.2.2 PREFORMED PULL BOX AND SPLICE VAULT COVER**

Covers on pull boxes shown on the Plans that contain 480 volt or greater circuits shall be cast-in, stamped concrete with "KDOT CAUTION-HIGH VOLTAGE". Covers on pull boxes that contain electric cable (120V/240V) shall be cast-in, stamped concrete with "KDOT ELECTRIC". Covers on pull boxes that contain communication cable shall be cast-in, stamped concrete with "KDOT ITS". Covers on all other pull boxes or splice vaults shall be cast-in, stamped concrete with "KDOT ITS" unless otherwise directed by the Engineer. Substitute "KC SCOUT" for "KDOT" for installations in the KC Scout area.

Covers on pull boxes and splice vaults shall be rated for a minimum loading of 20,000 pounds or Tier 22.

Each pull box and splice vault shall be equipped with a bolt down cover. The threaded hole which receives the cover hold-down bolt shall be open at the bottom to allow cleanout of sand, dirt, and other debris. Lock down bolts shall be stainless steel or brass with a penta-head. For each project, provide KDOT with one penta-head socket and pull box lifting hook. Provide one additional penta-head socket and lifting hook for every twenty pull boxes installed within a project. Sockets and lifting hooks must be submitted to the Engineer prior to the start of the 60-day test period for any device or system.

**6.2.3 STONE DRAIN**

Comply with Section 1107.2 (e), use crushed stone.

**6.3 CONSTRUCTION REQUIREMENTS**

**6.3.1 PREFORMED PULL BOXES AND SPLICE VAULTS**

Install conduit to enter the pull box or splice vault in the side or from the bottom of the box and to extend a minimum of 8 inches and a maximum of 12 inches into the box as shown on the Plans. If it is necessary to increase the excavation depth and extend the pull box, no direct payment will be made. Excavate the opening outside the pull box wide enough to allow compaction of the backfill material. Do not use cinders, broken concrete, broken rock or other hard or undesirable material for backfilling. Backfill ITS pull boxes and splice vaults.

Drill the holes for the conduit as recommended by the manufacturer. Drill round holes that are no more than 1/2 inch larger than the conduit. Seal all conduit entrances into pull boxes or splice vaults with an expandable foam sealer around the conduits to prevent the entering of foreign material into the pull boxes. Clean all pull boxes and splice vaults so they are free of trash, conduit and wire scraps, etc.

Do not construct pull boxes and splice vaults in or near sidewalk handicap ramps or approaches.

When installing ITS communication pull boxes, construct a concrete pad around the perimeter of the pull box placed in a sod area or shoulder as shown on the Plans. Use KDOT Grade 4.0 on-grade concrete for the pad, or a commercial mixture approved by KDOT and in accordance with Section 401 of the KDOT Standard Specifications. Construct ITS communication pull boxes so the top surface is flush with surfaced areas and approximately 1 inch above earth or sod areas.

Construct all pull boxes and splice vaults with a stone drain that is 2 feet deeper than the bottom of the pull box. Pull boxes or splice vaults located in rock will require a 6 inch concrete floor with a 2 inch rigid conduit drain.

Install separate pull boxes for all power service cables and communications cables. No sharing of the pull boxes will be allowed.

**6.3.2 JUNCTION BOXES**

Mount junction boxes to bridges with wedge anchor rods of sufficient size and strength to safely secure the box to the structure. Cover the surface of the junction box which comes in contact with concrete with aluminum colored butyl rubber sealant (caulking compound).

**6.3.3 SPLICE VAULT**

Install discretionary splice vaults, at Contractor's expense, with approval by the Engineer, along the existing conduit to provide a conduit pathway along the existing conduit or to facilitate pulling or blowing of fiber optic cable. When installing a splice vault, both as shown on the Plans and discretionary, to intercept the KDOT conduits, offset the splice vault from the CenturyLink conduit by at least 36 inches. Excavate a new trench adjacent to the CenturyLink conduits to allow the KDOT conduits to be re-aligned to intercept the new splice vault offset from the CenturyLink conduits. Maintain minimum bending radius for the conduit. Contact CenturyLink two weeks in advance of excavation adjacent to CenturyLink conduits. Do not enter (open, cut into) CenturyLink's conduit at any time. Only a designated CenturyLink representative has access to a CenturyLink vault.

When rerouting an existing empty KDOT conduit into a new splice vault, propose a method to positively identify the empty KDOT conduit and seek approval by the Engineer. Demonstrate this method of positively identifying the empty KDOT conduit to the Engineer. Perform this demonstration prior to performing field work on the existing conduit.

**7.0 WIRING**

**7.1 DESCRIPTION**

Comply with the requirements as detailed in the Plans and as described below. Provide wiring of the type and size as shown on the Plans. This section specifically does not include fiber optic cable.

**7.2 MATERIALS**

**7.2.1 ELECTRICAL CONDUCTORS**

Use electrical conductors and associated equipment that meet the requirements of ICEA, IMSA, NEMA, RETMA, NEC and the regulations of the national board of fire underwriters, as applicable, and meet the approval of the Engineer. Use soft drawn copper for all conductors except as noted. Solid conductors may be used only for grounding where connected to a ground rod.

Use copper cablings that conform to ASTM B 3 and B 8 with flame-retardant, moisture, and heat resistant cross-linked polyethylene or thermoplastic insulation rated for 90°C in wet locations and listed by UL as Type XHHW-2 or USE-2. Use solid wire for No. 10 AWG and smaller and stranded wire for sizes No. 8 AWG and larger.

For all current carrying electrical conductor runs, use ground wire in run that matches AWG size of the largest conductor in a specified run.

Furnish all low voltage, control, and communications cables on reels. Use reels with continuous cable of sufficient length to permit the associated cable runs to be made without splices in between specified locations shown on the Plans. Utilize the appropriate sheath for the particular application. Comply with the requirements of ANSI/EIA/TIA-568 B or latest approved version of that standard.

**7.2.2 CAT 6 CABLE**

Use outdoor rated Cat 6 or higher cable with UV resistant outer jacket. Use a gel-free, paper based waterstop cable for cabinet and outdoor installations. Furnish plenum rated cable for installations inside of buildings or shelters including POP buildings.

**7.2.3 COMMUNICATION (CCTV) CABLE**

Comply with manufacturers requirements for Communication CCTV cable. Use communication (CCTV) cable for analog cameras that are 75 ohm co-axial construction with copper center conductors and polyethylene dielectric material. Use co-axial shields that are braided with a 95% minimum coverage. Use outer jackets for cables that are UV resistant and flame retardant. Install CCTV cable connectors that are of the type appropriate for devices specified in the Plans (BNC, F, etc.). For IP based cameras, use communications CCTV cable that is a Cat 5E or higher Ethernet cable with RJ-45 connectors, gold plated and allow for power over Ethernet.

**7.2.4 COMMUNICATION (RF) CABLE**

Use communication (RF) cables that are 75 ohm co-axial construction with polyethylene dielectric material. Use co-axial shields that have 100% coverage. Use outer jackets for RF cables that are UV resistant and flame retardant. Use RF cables (excluding jumpers with lengths less than three feet) that have an attenuation of less than 6 dB per 100 feet at 1800 MHz. When using RF cables for jumpers of less than three feet, an attenuation of less than 18 dB per 100 feet is required. Install RF cable connectors or provide manufacturer pre-installed RF cable connectors that are appropriate for the type of device as specified in the Plans.

KANSAS DEPARTMENT OF TRANSPORTATION			
ITS EQUIPMENT SPECIFICATIONS			
<del>ITS-S03</del> VERSION DATE: 05-29-17			
APP'D	DESIGNED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN. CK.	TRACE CK.

Plotted : 23-JUL-2019 13:06

Drawn By : Road  
File : ITS-S03.dgn