STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	1	57

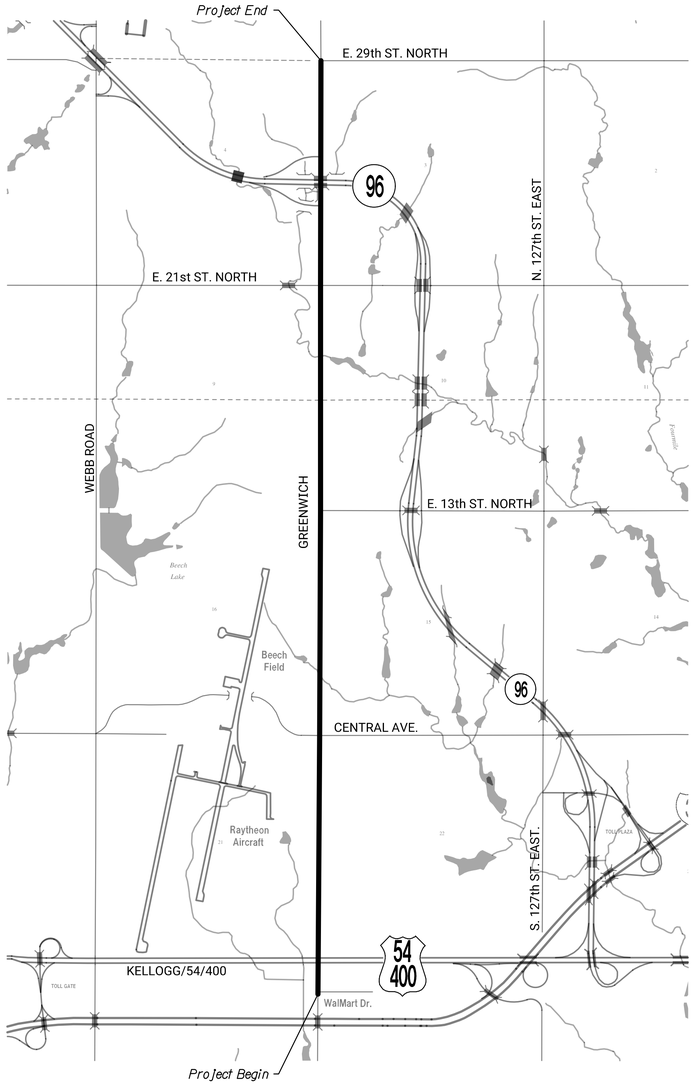
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GREENWICH V2I AND ITS IMPROVEMENTS FROM WALMART DRIVE TO 29TH ST. N. CITY OF WICHITA, KANSAS

INTELLIGENT TRANSPORTATION SYSTEM
TRAFFIC SIGNALIZATION

PAUL GUNZELMAN, P.E. – CITY ENGINEER
C.O.W. PROJ. NO. 472–085898
E–3071 40100523



NOT TO SCALE

TWO-WAY TRAFFIC SHALL BE CARRIED THROUGH CONSTRUCTION ON EXISTING ALIGNMENTS WITH PARTIAL LANE CLOSURES DURING CONSTRUCTION. SEE GENERAL NOTES AND TRAFFIC CONTROL DETAILS FOR MORE INFORMATION.



SHIVRAJ S. PATIL
LICENSED
27012
1/24/2025
KANSAS
PROFESSIONAL ENGINEER

TRANSYSTEMS
100 N. BROADWAY, SUITE 500
WICHITA, KANSAS 67202
MAIN: 316-303-3000
FAX: 316-462-5629

IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

sheet1
2025-02-12 - 4:17:01 PM - c:\transystems\pw_local\transyscorp.pw:\\squalllist1356703\Dc-CO\Ai001-101.dgn

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	2	57

LEGEND

EXISTING DEVICES ARE SHOWN IN PLANS USING HALFTONE/GRAYSCALE

- Dynamic Message Sign, Ground Mounted (Butterfly)
- Dynamic Message Sign, Ground Mounted (Dual Post)
- Dynamic Message Sign, Ground Mounted (Butterfly, Dual Face)
- Dynamic Message Sign, Truss Mounted
- Dynamic Message Sign, Trailer Mounted
- CCTV Camera
- Radar Vehicle Detector
- Radar Vehicle Detection Area
- ITS Cabinet with Foundation
- Pole Mounted ITS Cabinet
- Fiber Optic Cable Splice Vault without Splice
- Fiber Optic Cable Splice Vault with Splice
- Fiber Optic Cable Splice Vault without Splice, by Others (CL, KTA, Etc)
- Fiber Optic Cable Splice Vault with Splice, by Others (CL, KTA, Etc)
- Pull Box
- Wireless Communication Tower/Pole
- XXX-XXX — New ITS Field Component
- Ramp Meter
- Flashing Beacon
- 6'x6' Loop Detector
- 6'x10' Loop Detector
- 6'x30' Loop Detector

- L.P. — Light Pole
- Mile Marker
- Power Pole
- Power Supply Assembly
- T — Power Transformer
- OP — Power Overhead Source
- UP — Power Underground Source
- (R) — Removal
- Sign, Existing
- Guy Wire
- Telephone Pole
- Trees, Existing
- Truss Sign
- City Limits
- Conduit, Existing
- Conduit, Bored, Proposed
- Conduit, On Structure, Proposed
- Conduit, Trenched, Proposed
- Construction Limits

- Fiber Optic Cable — Fiber Optic Cable, Existing
- Gas Line — Gas, Existing
- Telephone Cable — Telephone, Existing
- Guard Rail, Existing
- Guard Rail, Proposed
- Hedge, Existing
- Marsh
- Power, Existing
- Property Line
- Railroad, Existing
- Exist R/W — R/W, Existing
- R/W, Existing Access Control
- R/W, Access Control
- Township, Section or Grant Line
- State/County Line
- Culverts, Existing
- Drop Inlet & Storm Sewer, Existing
- Perm Esmt. — Easement, Permanent
- Temp Esmt. — Easement, Temporary
- Fence, Existing

ABBREVIATIONS

AG	Above Ground
Approx.	Approximate
Ave.	Avenue
Blvd.	Boulevard
BOC	Back of Curb
BPU	Board of Public Utilities
BWM	Bandwidth Manager
C	Conductor
CA	ITS Cabinet Assembly
CAT 6	Category 6 Twisted Pair Ethernet Cable
CCR	Camera Control Receiver
CCTV	Closed Circuit Television Camera
CL	CenturyLink/Lumen
Coax.	Coaxial
Comm.	Communications
Conc.	Concrete
Ctr.	Center
DET	Detector
DIO	Digital Input/Output
Dist.	Distribution
DMS	Dynamic Message Sign
Dr.	Drive
Ea.	Each
EB	Eastbound
EOP	Edge of Pavement
EOS	Edge of Shoulder
EOTW	Edge of Travel Way
Exist.	Existing
FDU	Fiber Distribution Unit
F&I	Furnish And Install
Flex.	Flexible
FO	Fiber Optic
FT	Feet
FTC	Field Traffic Controller
HAR	Highway Advisory Radio
HDPE	High Density Polyethylene
HH	Handhole (Splice Vault)
Hwy.	Highway
IN	Inch
I/O	Input/Output
ITS	Intelligent Transportation System
KDOT	Kansas Department of Transportation
KTA	Kansas Turnpike Authority
Ln.	Lane
LS	Lump Sum
LT	Left
Min.	Minimum
MMFO	Multimode Fiber Optic
MM	Mile Marker
MP	Milepost
MPH	Miles per Hour
NB	Northbound
No.	Number
Nom.	Nominal
PB	Pull Box
Pkwy.	Parkway
POP	Point of Presence
PP	Power Pole
PS	Power Supply/Assembly
PVC	Polyvinyl Chloride
Rd.	Road
Req'd.	Required
RMC	Rigid Metal Conduit
RT	Right
Rte.	Route
R/W	Right-of-Way
SB	Southbound
SIG	Traffic Signal
SMFO	Single-mode Fiber Optic
St.	Street
Sta.	Station
SV	Splice Vault
SW	Sidewalk
TB	Transition Box
TMC	Traffic Management Center
Trfwy.	Trafficway
Typ.	Typical
Truck	Truckline
UIP	Use In Place
UP	Underground Power
SOP	Source Of Power
VDS	Vehicle Detection Station
WB	Westbound
XFMR	Transformer

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

LEGEND AND ABBREVIATIONS

ITS-D01 10-27-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

Sh. No. 2

Plotted : 12-FEB-2025 16:17

Drawn By : sspatil
File : ITS-D01.dgn

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	3	57

GENERAL NOTES

1. REFERENCE IS MADE TO KDOT AND CITY OF WICHITA AND MAY BE USED INTERCHANGEABLY IN SOME CIRCUMSTANCES. IF THERE IS A DISCREPANCY BETWEEN OR AMONG THE FOLLOWING CONTRACT DOCUMENTS, THE GOVERNING RANKING OR ORDER OF PRECEDENCE IS:
   A. INFORMATION RECEIVED AT PREBID / ADDENDUM
   B. PLANS
   C. PROJECT SPECIAL PROVISIONS
   D. SPECIAL PROVISIONS
   E. STANDARD SPECIFICATIONS

   IF THERE IS A DISCREPANCY BETWEEN THE ITS SPECIFICATIONS AND TRAFFIC SIGNAL SPECIFICATIONS, THE GOVERNING SPECIFICATION WILL FOLLOW THE SPECIFIC WORK/DEVICE BEING PERFORMED (ITS VERSUS TRAFFIC SIGNAL OPERATION). THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCY RELATED TO THE WORK BEING PERFORMED.

2. ALL WORK WILL BE CONFINED WITHIN THE EXISTING ROADWAY RIGHT-OF-WAY. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY AND KEEP INSTALLATION OF ALL EQUIPMENT AND DEVICES WITHIN THE EXISTING ROADWAY RIGHT-OF-WAY.

3. CONTRACTOR SHALL MAINTAIN 2 FT CONDUIT CLEARANCE FROM ALL LANDSCAPED FEATURES AND IRRIGATION SYSTEMS EXISTING WITHIN THE RIGHT-OF-WAY. ANY LANDSCAPING OR IRRIGATION SYSTEMS DISTURBED DURING CONSTRUCTION ACTIVITIES SHALL BE RESTORED TO ORIGINAL CONDITION. NO ADDITIONAL PAYMENT WILL BE MADE.

4. CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ALL DISTURBED WORK AREAS. RESTORATION INCLUDES SEEDING, FERTILIZING, MULCHING, AND THE REMOVAL OF ALL UNUSED MATERIAL AND DEBRIS FROM THE WORK AREA ACCORDING TO THE KDOT STANDARD SPECIFICATIONS AND AS REQUIRED BY THE ENGINEER. ALL GRADING WORK SHALL SLOPE AWAY FROM FOUNDATIONS TO PREVENT PONDING. ADEQUATE TEMPORARY PROTECTION AGAINST EROSION SHALL BE PROVIDED ACCORDING TO THE KDOT UTILITY ACCOMMODATION POLICY. THIS ITEM OF WORK IS INCIDENTAL TO THE SITE BID ITEM.

5. SEEDING MIX SHALL BE TALL FESCUE (ENDOPHYTE FREE) PURE LIVE SEED (PLS), 220 LBS/ACRE. SEEDING SHALL BE COMPLETED IN ACCORDANCE WITH KDOT STANDARD SPECIFICATIONS FOR COOL GRASS MIX DESIGN. SEEDING SHALL BE CONSIDERED SUBSIDIARY TO THE CONSTRUCTION PER LUMP SUM SITE. IT IS ANTICIPATED THAT THE TOTAL DISTURBED AREA WILL BE LESS THAN 1 ACRE BUT IS BASED ON THE CONSTRUCTION METHODS OF THE CONTRACTOR AND MAY CHANGE AT NO ADDITIONAL COST TO KDOT.

6. THE CONTRACTOR SHALL DETERMINE ANY CONFLICTS WITH EXISTING UTILITIES INCLUDING KDOT LIGHTING AND FIBER IN THE FIELD PRIOR TO INITIATION OF CONSTRUCTION PER SITE. THE CONTRACTOR SHALL CONTACT THE ENGINEER UPON DETERMINATION OF ANY UTILITY CONFLICTS. THE CONTRACTOR SHALL ADHERE TO KDOT'S UTILITY ACCOMMODATION POLICY UNLESS OTHERWISE NOTED.

7. PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL CALL DIG SAFE AT 811 OR 1-800-344-7233 (1-800-DIG SAFE) TO REQUEST THE UTILITIES BE MARKED IN THAT AREA. THE CONTRACTOR SHALL CALL THE KDOT FIELD ENGINEER TO REQUEST THAT KDOT LIGHTING AND ITS (FIBER, OTHER) BE MARKED IN THAT AREA. THE CONTRACTOR SHALL ALSO CONTACT ANY AND ALL UTILITIES AND LOCAL GOVERNMENT AGENCIES NOT PARTICIPATING IN LOCATION SERVICES.

8. SURVEY AND STAKE LOCATIONS WHERE POLES, FOUNDATIONS, CABINETS, POWER SERVICES, PULL BOXES, AND SPLICE VAULTS ARE TO BE INSTALLED. APPROVED STAKED LOCATIONS SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ANY EXCAVATION.

9. PLACEMENT OF ALL EQUIPMENT, CABINETS, TRANSFORMERS, SPLICE BOXES AND PULL BOXES MUST BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION AND BEFORE SURVEYORS LEAVE EACH SITE. ORIENTATION OF ALL CABINETS SHALL BE APPROVED BY THE ENGINEER PRIOR TO PLACEMENT. ANY RESTAKING NECESSITATED BY ADJUSTMENT IS CONSIDERED INCIDENTAL TO THE PROJECT AND NO ADDITIONAL PAYMENT WILL BE MADE.

10. CONDUIT SHALL BE INSTALLED IN STRAIGHT LINES EITHER PARALLEL OR PERPENDICULAR TO THE RIGHT-OF-WAY TO THE EXTENT POSSIBLE. THE CONTRACTOR SHALL DETERMINE FINAL ROUTING BASED ON ACTUAL FIELD CONDITIONS PRIOR TO CONSTRUCTION AT EACH SITE, INCLUDING UTILITY LOCATOR SERVICE MARKINGS, TO PREVENT CONFLICTS WITH EXISTING UTILITIES. CONTRACTOR TO ROUTE TRUNKLINE CONDUIT ADJACENT TO RIGHT-OF-WAY LINE AND BRANCH LINE PERPENDICULAR TO RIGHT-OF-WAY LINE.

11. THE CONTRACTOR SHALL FIELD REVIEW CONDUIT ON STRUCTURE FOR NECESSARY ROUTING, MOUNTING HARDWARE (INCLUDING BRIDGE HANGERS, FITTINGS, EXPANSION JOINTS AND JUNCTION BOXES) FOR ALL EXTERNALLY MOUNTED CONDUITS PRIOR TO SUBMITTAL OF BID TO DETERMINE THE TYPES AND EXTENT OF INCIDENTAL ITEMS TO BE INCLUDED IN THE UNIT PRICE OF CONDUIT.

12. BRIDGE ATTACHMENTS ON KDOT STRUCTURES REQUIRE A SEPARATE PERMIT FROM KDOT THAT SHALL BE OBTAINED BY THE CONTRACTOR PER KDOT'S UTILITY ACCOMMODATION POLICY.

13. ALL TRAFFIC CONTROL PLANS AND LANE CLOSURES SHALL BE PRE-APPROVED BY THE ENGINEER.

14. PROPOSED ITS EQUIPMENT LOCATIONS ARE APPROXIMATE AND MAY BE MODIFIED TO AVOID CONFLICTS WITH UNDERGROUND UTILITIES OR OTHER OBSTRUCTIONS. DMS, CCTV CAMERA, DETECTOR AND WIRELESS EQUIPMENT LOCATIONS ARE LOCATION SENSITIVE. THE CONTRACTOR AND ENGINEER SHALL RECEIVE APPROVAL FROM THE KDOT ITS ENGINEER PRIOR TO REVISING THE PLAN LOCATION OR ORIENTATION OF ANY ITS EQUIPMENT.

15. KDOT OR CITY OF WICHITA WILL FURNISH HARDWARE AS DESCRIBED IN THE PLANS, SPECIFICATIONS, AND ON THE SUMMARY OF QUANTITIES. CONTRACTOR SHALL CAREFULLY REVIEW PLANS AND SPECIFICATIONS FOR DETAILS ON KDOT/CITY OF WICHITA FURNISHED ITEMS.

16. CONTRACTOR SHALL COORDINATE WITH THE ENGINEER A LOCATION TO STORE KDOT/WICHITA FURNISHED EQUIPMENT AND INCIDENTAL ITEMS. CONTRACTOR SHALL PROVIDE THE MEANS TO UNLOAD AND LOAD KDOT/WICHITA FURNISHED EQUIPMENT, SIGNS, CABINETS, AND INCIDENTAL ITEMS AT THE ARRANGED STORAGE LOCATION. THIS ITEM OF WORK IS INCIDENTAL TO THE SITE BID ITEM.

17. ALL ITS EQUIPMENT CALLED OUT BY PLANS AND SPECIFICATIONS AS "INSTALL" OR KDOT FURNISHED, INCLUDING DMS, CCTV ASSEMBLIES, DETECTORS, AND COMMUNICATIONS EQUIPMENT, SHALL INCLUDE ALL LOADING AND TRANSPORTATION FROM A DESIGNATED KDOT FACILITY, INSTALLATION, AND TESTING IN ACCORDANCE WITH THE SPECIFICATIONS. CONTRACTOR SHALL COORDINATE WITH ENGINEER AND MANUFACTURER FOR A STORAGE LOCATION AT A DESIGNATED FACILITY.

18. INSTALLATION, TESTING, AND INTEGRATION OF ALL ITS DEVICES, INCLUDING KDOT FURNISHED ITEMS, SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.

19. CONTRACTOR SHALL NOTIFY ANY/ALL APPLICABLE UTILITY COMPANIES LOCATED WITHIN EXISTING DUCT BANKS AT LEAST TWO WEEKS AND AGAIN AT 72 HOURS PRIOR TO PERFORMING ANY WORK IN DUCT BANKS WITH SHARED UTILITIES. THE UTILITY COMPANY MAY REQUIRE A REPRESENTATIVE TO BE ON SITE.

20. WESTAR SHALL BE NOTIFIED AT LEAST TWO (2) WEEKS AND AGAIN AT 72 HOURS PRIOR TO PERFORMING ANY WORK IN OR AROUND THE EXISTING WESTAR DUCT BANK ALONG MAIN STREET BETWEEN CITY HALL AND DOUGLAS. A WESTAR REPRESENTATIVE MUST BE PRESENT FOR ALL WORK WITHIN THIS SPECIFIC EXISTING WESTAR DUCT BANK. ANY ASSOCIATED COSTS SHALL BE PAID FOR BY THE CONTRACTOR AND SUBSIDIARY TO OTHER ITEMS OF THE CONTRACT.

21. CONTRACTOR SHALL NOTIFY CENTURYLINK AND/OR KTA WHEN APPLICABLE TWO WEEKS AND AGAIN AT 72 HOURS PRIOR TO PERFORMING ANY WORK WITHIN 5 FT OF A CENTURYLINK OR KTA BACKBONE FIBER. A CENTURYLINK, KTA WHEN APPLICABLE, AND KDOT INSPECTOR MUST BE PRESENT FOR WORK WITHIN 5 FT OF FIBER OPTIC FACILITIES.

22. AT NO TIME SHALL THE CONTRACTOR ACCESS A CENTURYLINK AND/OR KTA PULLBOX OR SPLICE VAULT FOR ANY REASON WITHOUT A CENTURYLINK AND/OR KTA INSPECTOR PRESENT.

23. ALL WORK WITHIN 10 FT OF CENTURYLINK AND/OR KTA FIBER BACKBONE SHALL BE CARRIED OUT WITH HAND TOOLS ONLY. NO MECHANIZED EQUIPMENT SHALL BE ALLOWED IN THE ACCESS OF THE KDOT CONDUIT FROM THE CENTURYLINK AND / OR KTA CONDUIT ARRAY. HYDRO EXCAVATION IS ALLOWED.

24. CONTRACTOR TO MAINTAIN AT LEAST 20 FT OF CLEARANCE FROM ALL EXISTING GAS FACILITIES AND 5 FT OF CLEARANCE FROM LUMEN AND / OR KTA FIBER. EXCEPTION ALLOWED WHEN PERFORMING WORK WITH LUMEN WHILE KDOT AND LUMEN INSPECTOR PRESENT.

25. WHEN WITHIN 5 FT OF KDOT OR CITY LIGHTING FACILITIES, CONDUIT SHALL BE HAND DUG.

26. HIGH VOLTAGE POWER LINES MAY BE WITHIN THE PROJECT LIMITS. ALL WORK IS TO BE PERFORMED IN CONFORMANCE WITH ALL STATE, LOCAL, FEDERAL, UTILITY, AND CONTRACT REQUIREMENTS. KDOT OR CITY OF WICHITA HAS NO CONTROL OVER THE MEANS, METHODS, CHOICE OF EQUIPMENT, SEQUENCING OF WORK, AND SAFETY PRACTICES USED WHEN WORKING IN, ON, OR AROUND HIGH VOLTAGE LINES OR OTHER UTILITY STRUCTURES AS THESE ITEMS ARE THE RESPONSIBILITY OF THE PARTIES CONTROLLING THE PHYSICAL PERFORMANCE OF THE WORK.

27. ALL GROUNDING SYSTEMS SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND MANUFACTURER SPECIFICATIONS. FOLLOW APPLICABLE NEC REQUIREMENTS FOR INSTALLATION OF ALL PROJECT MATERIALS. THE CONTRACTOR SHALL PROPERLY GROUND ALL EQUIPMENT, CABINET, AND GROUND RODS PER APPLICABLE STANDARDS OR AS DIRECTED BY ENGINEER.

28. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ORDERING AND PAYING FOR THE ELECTRICAL SERVICE IN CITY'S NAME WHEN IN CITY'S AREA AT THE LOCATIONS SHOWN ON THE PLANS. CONTRACTOR SHALL MAKE PAYMENT OF ALL POWER COMPANY FEES UNTIL KDOT OR CITY OF WICHITA ASSUMES OWNERSHIP. UTILITY COMPANY, CONTACT NAME, AND PHONE NUMBER FOR EACH SITE ARE LISTED ON THE ELECTRICAL SERVICE LOCATION SUMMARY SHEET.

29. WARNING TAPE IS REQUIRED IN ALL TRENCHES CONTAINING CONDUIT. MULTIPLE CONDUITS IN PARALLEL SHALL SHARE THE SAME TRENCH.

30. CONTRACTOR TO INSPECT AND REPAIR EXISTING CONDUIT. SEE CONDUIT SPECIFICATIONS FOR ADDITIONAL DETAILS. REPAIRS WILL BE PAID FOR UNDER ITS UNIT COST ITEM "CONDUIT REPAIR".

31. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR ANY EXISTING CONDUIT AND REPLACE ANY EXISTING CONDUCTORS OR OTHER FACILITIES DAMAGED DURING CONSTRUCTION. CONTRACTOR SHALL DOCUMENT (VIDEO, IMAGES) EXISTING INFRASTRUCTURE PRIOR TO COMMENCING WORK. ALL EXISTING IMPROVEMENTS REMOVED OR DAMAGED BY THE CONTRACTOR SHALL BE REPLACED IN KIND BY THE CONTRACTOR, WITH NO ADDITIONAL PAYMENT.

32. THE CONTRACTOR SHALL PROVIDE CITY OF WICHITA AN ELECTRONIC LIST OF GPS READINGS (EXCEL FORMAT), GPS-CODED PHOTOGRAPH COPIES, AND AS-BUILT KMZ FILE FOR ALL INSTALLED DEVICES, PULL BOXES, SPLICE VAULTS, CABINETS, POWER METERS, TRANSFORMERS, AND WIRELESS TOWERS. THE ACCURACY OF THE GPS READINGS SHALL BE WITHIN 3 FT. OBTAIN GPS AND THREE TIE-POINT MEASUREMENTS FOR EACH BURIED ELECTRICAL PULL BOX PRIOR TO PLACING BACKFILL MATERIAL.

33. CONTRACTOR SHALL EQUIP THE TRENCHING/PLOWING EQUIPMENT WITH GPS TRACKING TECHNOLOGY OR PROPOSE ALTERNATE METHOD OF HARD LOCATING GPS POINTS. GPS READINGS SHALL BE TAKEN AT EVERY SPLICE VAULT AND AT A MINIMUM AT EVERY 100 FEET ALONG THE TRENCH LINE. WHEN BORING, VENDOR SHALL TAKE MANUAL GPS POINTS EVERY 20 FEET AND IMPORT THESE POINTS INTO THE GIS TOOL. VERTICAL BORE HEIGHT FROM EXISTING GROUND SHALL ALSO BE INCLUDED. CONTRACTOR SHALL FORM A LINE FROM BORING POINTS TO TRENCHING POINTS TO PROVIDE AN AS-BUILT LOCATION MAP AND PROFILE CHART. THE ACCURACY OF THE GPS READINGS SHALL BE WITHIN 3 FEET (1 METER). CONTRACTOR SHALL PROVIDE TO THE OWNER THE AS-BUILT KMZ FILE, AS-BUILT ELECTRONIC LIST OF ALL GPS READINGS, AND AS-BUILT PROFILE CHART.

34. ALL MATERIALS SHALL MEET THE BUY AMERICA ACT REQUIREMENTS OUTLINED IN SECTION 106 OF KDOT'S STANDARD SPECIFICATIONS.

35. THE CONTRACTOR WILL BE REQUIRED TO WORK IN CONJUNCTION AND COORDINATE WITH OTHER WORKING CONTRACTORS IN CERTAIN AREAS OF THE CONSTRUCTION LIMITS. THIS WORK IS CONSIDERED INCIDENTAL TO THE PROJECT AND NO ADDITIONAL PAYMENT WILL BE MADE.

36. LOCATING, TRACING, AND POTHOLING FOR EXISTING UTILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR. POTHOLING SHALL BE COMPLETED BY HYDRO EXCAVATION AND BE RESTORED WITH SIMILAR MATERIAL AND CONSTRUCTION METHODS. NO ADDITIONAL PAYMENT WILL BE MADE FOR LOCATING OR POTHOLING EXISTING UTILITIES, INCLUDING PAVEMENT RESTORATION. ALL LABOR, MATERIAL AND EQUIPMENT NECESSARY FOR LOCATING EXISTING UTILITIES SHALL NOT BE PAID FOR DIRECTLY BUT IS SUBSIDIARY TO OTHER ITEMS OF THE CONTRACT.

37. THE CONTRACTOR SHALL PROOF EXISTING CONDUITS AND VERIFY CONDUIT WILL ACCOMMODATE NEW FIBER PRIOR TO INSTALLATION. THIS WORK IS INCIDENTAL TO OTHER ITEMS OF THE CONTRACT. SEE ITS EQUIPMENT SPECIFICATION 5.0 FOR ADDITIONAL INFORMATION.

38. MOST EXISTING CONDUIT ROUTES CONTAIN A CITY OF WICHITA 6-PAIR TRAFFIC SIGNAL CABLE THAT SHALL BE REMOVED. THIS EXISTING CABLE MAY BE USED TO LOCATE EXISTING CONDUIT PATHS AND FOR INSTALLATION OF NEW FIBER. REMOVAL OF EXISTING CABLE IS INCIDENTAL TO NEW FIBER. CONTRACTOR SHALL VERIFY WITH CITY STAFF PRIOR TO REMOVAL OF CABLE.

39. IP SCHEMA WILL BE PROVIDED BY THE CITY OF WICHITA AND KDOT DURING CONSTRUCTION.

40. THE INFORMATION SHOW IN THESE PLANS IS BASED ON THE BEST INFORMATION AVAILABLE BUT MAY DIFFER FROM FIELD CONDITIONS. EXISTING COMMUNICATION DUCT PLANS, INTERSECTION WIRING DIAGRAMS AND BUILDING CONNECTIONS IS AVAILABLE FOR REVIEW FROM THE CITY OF WICHITA.

41. IT IS THE PRIME CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL SHOP DRAWINGS, TESTING RESULTS, AND ALL OTHER REQUIRED SUBMITTALS PRIOR TO SUBMITTING FOR ENGINEER'S APPROVAL. THE ENGINEER WILL NOT REVIEW ANY SUBMITTED DOCUMENTATION OR BEGIN ANY TESTING PERIODS UNTIL THIS WORK IS COMPLETE.

42. ALL TRAFFIC SIGNAL CONTROLLERS, RADIOS, CABINETS, AND OTHER APPURTENANT EQUIPMENT SHOWN TO BE REMOVED, SHALL BE REMOVED IN SALVAGEABLE CONDITION AND TRANSPORTED TO THE APPROPRIATE LOCATION AS SHOWN BELOW. CONTACT ENTITY RESPONSIBLE FOR SIGNALS PRIOR TO BEGINNING WORK ON SITE. CONTACT INFORMATION FOR REMOVAL AND COORDINATION IS SHOWN BELOW:

CITY OF WICHITA EQUIPMENT:
CITY OF WICHITA CENTRAL MAINTENANCE
ATTN: KEVIN SHORE
PHONE: 316-268-4033
1801 S MCLEAN BLVD
WICHITA KS, 67213

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS GENERAL NOTES

~~ITS-D02~~ 11-27-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

Sh. No. 3

Plotted : 12-FEB-2025 16:17
Drawn By : sspatil
File : ITS-D02.dgn

SUMMARY OF ITS QUANTITIES (FOR INFORMATION ONLY)

	ITEM DESCRIPTION	UNITS	FIBER ROUTE	TRAFFIC SIGNAL SITE - GREENWICH										TOTAL QTY.
			GREENWICH	WALMART	US-54	CENTRAL	PLAZZIO	13TH ST	21ST ST	22ND ST	K-96 S	K-96 N	29TH ST	
	2" HDPE Conduit - Trenched (Orange, Communications)	L.F.	11,742											11,742
	2" HDPE Conduit - Trenched (Black, Spare)	L.F.												
	2" HDPE Conduit - Bored (Orange, Communications)	L.F.	5,228											5,228
	2" HDPE Conduit - Bored (Black, Spare)	L.F.												
	2" HDPE Conduit - Trenched (Red, Power)	L.F.	10											10
	2" HDPE Conduit - Bored (Red, Power)	L.F.	401											401
†	Conduit Repair per Section	Section	15											15
	3-1/C #4 AWG Power Conductor	L.F.	1,231											1,231
	Pull Box	Each	5											5
	Surge Protection Device	Each	2											2
	FO Splice	Each			4	4	4	4	4	4	4	4	4	36
	FO Splice Closure, Large	Each			1	1	1	1	1	1	1	3	1	11
	FO Splice Vault	Each	22											22
	FO Splice Tray	Each	6		1	1	1	1	1	1	1	1	1	15
	12 Ct. SMFO Branch Fiber Cable	L.F.	1,486											1,486
	96 Ct. SMFO Trunk Fiber Cable	L.F.	23,870											23,870
	Category 6 Ethernet Cable (for Signal Controller Communication)	Each			1	1	1	1	1	1	1	1	1	9
	Small Form Pluggable (SFP) Fiber Modules (LX)	Each			1	2	2	2	2	2	2	1	2	16
	Small Form Pluggable (SFP) Fiber Modules (EX)	Each												
	Small Form Pluggable (SFP) Fiber Modules (ZX)	Each			1							1		2
	Pad Mounted 342 LX Cabinet and Foundation (Double Cabinet)	Each			1				1					2
	Steel Bollard (6")	Each	8											8
	Category 6 Ethernet Cable (for RSU Communication)	Each	30											30
*	Fiber Optic Patch Cords LC-LC Connector (Duplex), 2 meter	Each	20	2	2	2	2	2	2	2	2	2	2	40
	Fiber Optic Patch Panel 12 Position LC Connector	Each		1	1	1	1	1	1	1	1	1	1	10
	Fiber Optic Patch Panel 96 Position LC Connector	Each	6											6
	Concrete Sidewalk Removed & Replaced	S.F.	175											175
	Concrete Sidewalk (4")	S.F.	400											400
	Traffic Signal Cabinet Remove	Each							1					1
	Iteris BlueToad Spectra - RSU w/ POE Injector/power supply	Each		1	2	1	1	1	1	1	1	1	1	11
	Dymec Newtork Switches	Each		1	1	1	1	1	1	1	1	1	1	10
	Traffic Signal Service Box Lid and/or Cap - Adjust/Replace	Each	18											18

† CONDUIT REPAIR PER SECTION. SEE GENERAL NOTE 30 AND ITS EQUIPMENT SPECIFICATION 5.3.2.

* ASSUMED DUPLEX COUNT (SIMPLEX IS DOUBLED)

BLUETOAD SPECTRA RSU (COMBINATION BLUETOAD SPECTRA AND CV2X) WITH POE INJECTOR/POWER SUPPLY, IN-CABINET PROCESSOR FOR CV APPLICATIONS AND OTHER ACCESSORIES REQUIRED FOR THE SATISFACTORY OPERATION OF THE RSU.

SUMMARY OF TRAFFIC SIGNAL QUANTITIES (FOR INFORMATION ONLY)

ITEM DESCRIPTION	QTY.	UNITS	SPEC NO.	NOTES
CONTROLLER UNIT	1	EACH	703.2.1	PROVIDED BY CITY
CONFLICT MONITOR	1	EACH	703.2.2	
LOAD SWITCH	16	EACH	703.2.3	
FLASHER	2	EACH	703.2.4	
FLASH TRANSFER RELAY	6	EACH	703.2.5	
SURGE PROTECTOR	1	EACH	703.2.6	
DC ISOLATOR	3	EACH	703.2.7	
AC ISOLATOR		EACH	703.2.8	
GPS CLOCK	1	EACH	703.2.9	
POWER STRIP	1	EACH	703.2.11	NOTE 7
AUXILIARY OUTPUT FILE	1	EACH	-	NOTE 6
POLE MOUNTED CABINET (336L)		EACH	703.2.11	
PAD MOUNTED CABINET (332L)	1	EACH	703.2.11	
PAD MOUNTED CABINET (342) (DOUBLE)		EACH	703.2.11	
BATTERY BACKUP (BBS/UPS)	1	EACH	703.2.14	
VIDEO DETECTION DEVICE & HARDWARE		EACH	703.3.1	
RADAR DETECTION DEVICE & HARDWARE	TABLE	EACH	703.3.2	ADD. ALT. #2
ENTRANCE HEAD		EACH	703.9.2	
SERVICE ENCLOSURE, 200 AMP.	1	EACH	703.9.3	
CIRCUIT BREAKER, TRAFFIC SIGNAL, 50 AMP.	1	EACH	703.9.4	ADD 15 AMP. BREAKER FOR HUB #2
CIRCUIT BREAKER, LUMINAIRE, 15 AMP.	1	EACH	703.9.4	
SURGE ARRESTER CA 302R	1	EACH	703.9.5	
POWER SERVICE CONTROLLER CABINET	1	EACH	703.9.6	
GROUND ROD & CLAMP	2	EACH	703.10	
SERVICE WIRE NO. 4 AWG 1/C	700	LIN FT	703.11.1	
LIGHTING DISTRIBUTION WIRE NO. __ AWG 1/C		LIN FT	703.11.2	
POLE & BRACKET WIRE NO. 10 AWG 1/C		LIN FT	703.11.3	
GROUND WIRE NO. 6 AWG 1/C BARE SOLID	755	LIN FT	703.11.4	
TRACER WIRE NO. 12 AWG (BLUE)	755	LIN FT	703.11.5	
TRACER WIRE CONNECTOR	1	EACH	703.11.6	
MULTI-CONDUCTOR CABLE NO. 14 AWG 7/C	2,625	LIN FT	703.11.7	
MULTI-CONDUCTOR CABLE NO. 14 AWG /C		LIN FT	703.11.7	
DETECTION CABLE		LIN FT	703.11.9	
PRE-FORMED LOOP		EACH	703.11.10	
ETHERNET CABLE (CAT6)		LIN FT	703.11.11	
CONDUIT, 2" & FITTINGS		LIN FT	703.12	
CONDUIT, 3" & FITTINGS	85	LIN FT	703.12	
CONDUIT, __" & FITTINGS		LIN FT	703.12	

RECAPITULATION OF QUANTITIES

BASE BID

ITEM DESCRIPTION	QTY.	UNITS
INTELLIGENT TRANSPORTATION SYSTEM	1	L.S.
TRAFFIC SIGNAL	1	EA.
CONCRETE SIDEWALK REMOVE & REPLACE	175	S.F.
CONCRETE SIDEWALK (4")	400	S.F.
TRAFFIC CONTROL	1	L.S.
MOBILIZATION	1	L.S.

ADD. ALT. BID #1

ITEM DESCRIPTION	QTY.	UNITS
INTELLIGENT TRANSPORTATION SYSTEM FIBER ROUTE GREENWICH (SPARE COND.)	1	L.S.

SUMMARY OF QUANTITIES FOR ADD ALT BID #1 (FOR INFORMATION ONLY)

2 — 2" HDPE Conduit - Trenched (Black, Communications) = 11,545 FEET

6 — 2" HDPE Conduit - Bored (Black, Communications) = 5,169 FEET

ADD. ALT. BID #2

ITEM DESCRIPTION	QTY.	UNITS
WAVETRONIX DETECTION SYSTEM (21ST STREET)	1	L.S.

ADD. ALT. #2
WAVETRONIX RADAR DETECTION DEVICE & HARDWARE
-QUANTITIES FOR INFORMATION ONLY-

ITEM DESCRIPTION	MODEL	QTY.	UNITS
STOP BAR DETECTION UNIT	WX-SS-225	4	EA.
ADVANCE DETECTION UNIT	WX-SS-200V	-	EA.
DETECTION UNIT HARNESS	WX-SS-704-080	4	EA.
DETECTION UNIT BRACKET	WX-SS-611	4	EA.
CABINET INTERFACE DEVICE	CLICK 600	1	EA.
CONTACT CLOSURE	CLICK 114	4	EA.
DETECTION UNIT CABLING	STOP BAR UNIT(S)	As Needed	L.F.
	ADVANCE UNIT(S)	-	-

NOTES:

1. TRAFFIC SIGNAL QUANTITIES SHOWN ARE FOR 21ST STREET N AND GREENWICH ROAD SIGNAL.

2. REFER TO CITY OF WICHITA PART 700 TRAFFIC SIGNALIZATION SPECIFICATIONS.

3. ALL TRAFFIC SIGNAL POLES SHALL BE PAINTED BLACK PER LATEST EDITION OF PART 700 SPECIFICATIONS. SIGNAL CABINET SHALL BE NATURAL ALUMINUM.

4. CONFLICT MONITOR SHALL BE A 2010 ECL-IP UNIT WITH ETHERNET PORT.

5. A SEPARATE DETECTION CARD SHALL BE USED FOR EACH INTERSECTION LEG. THE DETECTION SYSTEM INCLUDES DETECTOR UNIT, PROCESSOR, CARD, AND INCIDENTAL ITEMS NECESSARY FOR THE SUCCESSFUL OPERATION OF THE DETECTION SYSTEM. (ADD. ALT. #2)

6. AUXILLARY OUTPUT FILE SHALL BE FULLY WIRED AND FUNCTIONAL AT THE TIME OF SIGNAL TURN-ON.

7. POWER STRIP TO BE TRIPP LITE POWER STRIP RACKMOUNT METAL 120V 5-15R 12 OUTLET 15' CORD, 19"RACKMOUNT 1U, NEMA 5-15P - 12 NEMA 5-15R - 15FT, OR APPROVED EQUAL. POWER STRIP IS TO BE MOUNTED IN REAR OF CABINET AT THE TOP OF THE RACK, AND PLUGGED INTO THE 2ND CONTROLLER PLUG IN PDA2.

8. TRAFFIC SIGNAL CONTROLLER ITEM INCLUDES THE UNIT COST FOR PERMANENT CONTROLLER ONLY. COST FOR INSTALLATION, PROGRAMMING, ETC. SHALL BE INCLUDED IN THE "TRAFFIC SIGNAL" QUANTITY.

9. THE TRAFFIC SIGNAL SYSTEM SHALL BE COMPLETE AND THE CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT AND MATERIALS NECESSARY FOR THE SATISFACTORY OPERATION OF ELECTRICAL APPARATUS AND FOR COMPLETE OPERATION OF THE TRAFFIC SIGNAL SYSTEM WHETHER SPECIFICALLY MENTIONED OR NOT.

BIDDING INFORMATION

Contractor shall submit bids on base bid and all additive bids. It is the City's intention to review the bids and choose additive bids based on available funding.

Mobilization and Traffic Control for Add. Alt. Bids #1 & #2 shall not be paid for directly but shall be SUBSIDIARY to other items of the contract.

TRANSYSTEMS
100 N BROADWAY
SUITE 500
WICHITA, KANSAS 67202
PHONE: 316-303-3000
FAX: 316-462-5629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

MARK	DATE	DESCRIPTION

PROJ NO: 472-085898
SCALE: NOT TO SCALE
DATE: 2025-02-12
DESIGNED BY: SSP
DRAWN BY: SSP
CHECKED BY: SGE

SHEET TITLE:
GREENWICH SUMMARY OF QUANTITIES SHEET 1 OF 2

SHEET NO. 4
SHEET 4 OF 57

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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

TRAFFIC SIGNAL EQUIPMENT REQUIREMENTS

These specifications are intended to describe specific equipment requirements for the traffic signal equipment to be installed. Additional construction and material requirements are located in the traffic signal specifications.

1. CONTROLLER

1.1. Traffic Signal Controller Hardware Requirements
The Contractor shall supply fully assembled TRAFFICWARE Model 2070C/LX ATC controllers that are in full compliance with ATC5201 v6.24 and TEES 2009 by CalTrans. The Contractor shall provide evidence that controller units, with a make and model identical to those being provided, have been tested and approved in accordance with TEES, by Caltrans, or an approved agent of City of Wichita. A Quality Control Plan shall be submitted within fifteen (15) days from the Notice to Proceed as required by the TEES.

1.1.1. Front Panel Harness Interface
The front panel harness cable shall have a minimum length of 254 mm (10 inches) to allow for interchangeability among equipment manufacturers.

1.2. Required Components for the Model 2070C/LX
The Contractor shall supply Model 2070C/LX controllers with the following configuration:

Unit Chassis	
Model 2070 1C	CPU Module
Model 2070 2E	Field I/O Module w/C1, C11, C12 (Installed in H3 Slot)
Model 2070 3B	Front Panel Assembly (8 x 40 Display)
Model 2070 4A	Power Supply Module (Minimum 4.0 AMP)
Model 2070 5B	MCB Mounting Assembly
Model 2070-7T or 7G	GPS Module
Model 2070 7B	Serial Comm Module

1.3. Watchdog
Startup time for an active watchdog signal shall be no longer than 9 seconds.

1.4. GPS Timeclocks
1.4.1. General. The GPS timeclocks must be compatible with the above specified 2070C/LX controllers as well as the City's existing Siemens Eagle 2070L hardware and software.
1.4.2. Requirements. The GPS shall be configured such that the controller's time is updated automatically on a user-programmable schedule.
1.4.3. Mounting. The preferred GPS timeclock will be able to be plugged into any standard 170 detection rack or internal 2070 module.

2.0 SMALL FORM PLUGGABLE (SFP) MODULES
The SFP module shall be compatible with the intended switch in which the device is being used. The switch may include a Cisco IE-3000, Kyland SICOM 3170, or other DYMEC-3170TX. For the Cisco equipment all SFP's shall be Cisco equipment; specifically GLC-LX-SM SFP's shall be provided.

3.0 FABRIC INNERDUCT
The innerduct shall be made of a flexible outdoor rated polyester/nylon textile fabric with a maximum coefficient of friction of 0.08. The fabric innerduct shall contain a 1250lb (min.) polyester flat woven pull tape. The fabric innerduct shall be contain multiple cells and be sized appropriately for the intended conduit in which it will be used. Innerduct shall be installed per manufacture's recommendations. A manufacture representative is required to assist with the first installation or until installation method has been approved.

4.0 DOUBLE CABINET ASSEMBLY
The double cabinet assembly shall be a 342LX cabinet and meet the applicable standards and specifications set forth by the National Electric Code (NEC) and TEES, by Caltrans. The cabinet shall include all necessary incidental items necessary for a complete and fully functioning cabinet installation including, but not limited to, DIN rails, wiring, and all equipment mounting hardware.

Provide all HUB cabinet main cabinet doors with a BEST 3L Series Deadbolt Cabinet Lock with construction core that will allow KDOT/City of Wichita to install their own lock core. The construction core will be replaced by the Owner upon cabinet acceptance.

Provide all signal cabinet main cabinet doors with a Corbin # 2 Cabinet Lock.

The cabinet shall meet all applicable specifications as outlined in ITS Equipment Specification 14.0 and Traffic Signal Specifications.

TRAFFIC CONTROL
These specifications supplement KDOT and City of Wichita traffic control specifications. All traffic control shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), latest edition. All traffic control plans and lane closures shall be pre-approved by the Engineer.

1.0 MAINTENANCE AND PROTECTION OF TRAFFIC
Maintenance and Protection of Traffic (MPT) plans must follow the criteria outlined below:

Lane closures may not occur during the morning and afternoon rush hours. For purposes of this policy, rush hours are defined as the hours of 7:00AM - 9:00AM and 3:00PM - 6:00PM. Additional work hour restrictions may be required dependent upon the specific street, surrounding area, or previously scheduled public events.

The Contractor must coordinate with adjacent activities and with City permitted special events, including sporting events. As needed, the Contractor may be required to shift or suspend work activities or temporarily restore public right-of-way for public use.

1.0 MAINTENANCE AND PROTECTION OF TRAFFIC (CONT'D.)
In the event of a lane closure, the Contractor must notify adjacent property owners, business owners, and residents at least 48 hours in advance. In the event of a street closure, a minimum 2 week notice is required. For emergency work, the Contractor should provide notification as soon as possible to impacted property owners, business, owners, and residents.

Face-to-face notification is preferred, but at a minimum impacted parties must be notified using a door hang-tag that outlines important information related to the closure, including the area impacted, the expected start and end dates for the closure, and a contact number for the responsible contractor.

Any posted detours and emergency closures within business districts require a press release. The Contractor is responsible to issue their press release.

The Contractor must, at all times, keep the site accessible for emergency vehicles.

The MPT plan must conform to Manual on Uniform Traffic Control (MUTCD) requirements. In high volume areas, for long term closures, or in areas of complicated traffic patterns, as determined by the City of Wichita Traffic Engineer, a standard MUTCD Typical Application will not be accepted and a site specific MPT plan must be prepared by a Registered Engineer and submitted for approval prior to receiving a permit. The site specific MPT plan must be to scale, properly dimensioned, show site specific detail, and provide accommodations for vehicles, pedestrians, and bicyclists.

Additional requirements for MPT plans that impact pedestrian and bicycle infrastructure are detailed in Sections 2 and 3, respectively.

The City contact for site specific MPT plans is:

City of Wichita
Traffic Engineering
455 N. Main, 7' Floor
Wichita, KS 67202
Attn: Mike Armour
316-268-4598

All work associated with this work shall be subsidiary to the bid item "Traffic Control".

2.0 PEDESTRIAN WORK ZONES AND TRAFFIC CONTROL
The public passage on the existing sidewalk or pedestrian pathway should be safe, protected, and ADA accessible. An unobstructed pathway with a minimum horizontal clearance of 5 FT must be maintained through the construction site. The pathway should be separated from construction activities by using construction fencing or barrier depending on the construction activity.

Scaffolding may be required to maintain safe sidewalk passage, specifically if overhead hazards are anticipated. Scaffolding must have a minimum horizontal clearance of 5 FT. Lighting must be provided.

If public passage on the existing sidewalk or pedestrian pathway is not possible, a pedestrian reroute into an adjacent cart way around the work area is required. This pedestrian reroute must be a clearly delineated and ADA accessible.

When rerouting pedestrians into the cart way, traffic barriers must be used to separate the pedestrian pathway from the travel lanes. Barriers should be concrete or water-filled plastic jersey barrier. Fencing or barriers should be used to separate pedestrians from the work zone.

Pedestrian pathways rerouted due to obstructions and construction activities, will require pedestrian traffic controls to clearly direct pedestrians through and around the work zone. Pedestrian traffic controls include items such as signs, channelization devices, barrier, fencing, flagmen, etc.

The City may authorize closure of the existing sidewalk or pedestrian pathway with a detour across the street from the work zone if other options are not viable.

Pedestrian detour signage will be required that is mounted in a manner that is clearly visible to the pedestrians being affected. Pedestrians should be detoured with advance signing that encourages them to cross to the opposite side of the roadway at intersections. Signs should be placed at intersections so that pedestrians are not confronted with mid-block crossings and detours.

When existing pedestrian pathways are rerouted or detoured, the reroute or detour should include ADA accessibility features consistent with the existing pedestrian facility such as detectable warning surfaces. In addition, temporary ramps should be the full width of the passage way, made of suitable non-slip material, and firmly anchored into the ground. Railings are required when the rise is greater than 6 IN and the length of the temporary ramp is greater than 72 IN. Details of the temporary ramps should be included with the MPT plan for review and approval by the City.

A pedestrian passage should not be severed and/or moved for non-construction activities such as parking.

Pedestrian passages must be maintained to/from all adjacent buildings and coordinated with the adjacent property owners.

Contractor shall inspect barriers and other protective devices every 24 hours.

All work associated with this work shall be subsidiary to the bid item "Traffic Control".

3.0 CYCLIST WORK ZONES AND TRAFFIC CONTROL

When cycling infrastructure is impacted by construction activities, it must be rerouted, detoured, or accommodated in a manner consistent with the facility being impacted.

For construction activities that are long term or mobile operations, protected bike lanes may require a rerouting or detour that is not mixed with traffic. For short term or mobile operations, advance signage and flaggers can be used to maintain the protected bike lane traffic through the project site.

During construction, temporary protected bike lanes may be delineated by cones but at no time shall the clear width of a bike lane be less than 4 FT. Any protected bike lane that is effectively narrowed below 4 FT is considered a bike lane closure and requires a reroute, detour, or other accommodation.

Specific signage for merging of the bike lane to shared road condition is required.

Contractor shall inspect barriers and other protective devices every 24 hours.

Trail closures will require an off-street reroute or detour. Legal agreements (easements) may also be required for trail closures. Trail closures will only be granted when no other options exist. All trail closures require a press release.

All work associated with this work shall be subsidiary to the bid item "Traffic Control".

BIDDING INFORMATION

Contractor shall submit bids on base bid and all additive bids. It is the City's intention to review the bids and choose additive bids based on available funding.

Mobilization and Traffic Control for Add. Alt. Bids #1 & #2 shall not be paid for directly but shall be SUBSIDIARY to other items of the contract.

AGENCY / UTILITY CONTACTS

AGENCY / UTILITY	CONTACT	PHONE	EMAIL
City of Wichita	Mike Armour	316-268-4598	marmour@wichita.gov
Traffic Signals	Kevin Shore	316-268-4033	kshore@wichita.gov
City Hall Conn.	Robert Walters	316-303-8159	rwalters@wichita.gov
	Dean Carson	316-303-8159	dcarson@wichita.gov
TMC & Courthouse	Jason Kelley	316-990-3027	jason.kelley@sedgwick.gov
KDOT	Shari Hilliard	785-296-6356	Shari.Hilliard@ks.gov
	J.B. Wilson	316-217-0356	JB.Wilson@ks.gov
	Duane Flug	316-217-0360	Duane.Flug@ks.gov
TranSystems	Slade Engstrom	316-303-3014	sgengstrom@transystems.com
	Shivraj Patil	785-979-7732	sspatil@transystems.com
AT&T	Jason Edwards	316-268-2008	je1682@att.com
Blackhills	Suzette Wilson	316-941-1631	Suzette.Wilson@blackhillscorp.com
Lumen	Xan Rypkema	720-888-1089	xan.rypkema@lumen.com
	Justin Spore	316-210-2547	justin.spore@lumen.com
Cox	James Walburn	316-260-7491	James.Walburn@cox.com
KGS	Adam Knolla	316-832-3123	Adam.Knolla@onegas.com
KsFiberNet	Steve Linder	316-712-6016	Slinder@ksfiber.net
Evergy	Shane Price	316-261-6315	shane.price@evergy.com
Wichita Water	Greg Lolley	316-268-4334	glolley@wichita.gov
Zayo	Jeff Capps	316-833-9032	jeff.capps@zayo.com
NuStar Energy	Blase Grasso	609-504-2959	blase.grasso@nustarenergy.com

**CONTRACTOR SHALL COORDINATE WITH EVERGY FOR NEW CONNECTIONS OR POWER HOOK-UP. ANY ASSOCIATED COSTS SHALL BE PAID FOR BY THE CONTRACTOR AND SUBSIDIARY TO OTHER ITEMS OF THE CONTRACT UNTIL TRANSFERRED TO THE CITY OF WICHITA.

REPRESENTATIVES FROM UTILITY COMPANIES MAY WANT TO BE ON-SITE WHEN EXACAVATION OR DIGGING OCCURS IN AREAS WITH CLOSE PROXIMITY TO THEIR UTILITIES. CONTRACTOR SHALL COORDINATE WITH EACH UTILITY COMPANY IN THE AREA OF WORK PRIOR TO ACTUAL DIGGING/EXCAVATION WORK DURING THE PROJECT.

TRANSYSTEMS
100 N BROADWAY
SUITE 500
WICHITA, KANSAS 67202
PHONE: 316-303-3000
FAX: 316-462-5629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

WICHITA, KANSAS

CITY OF WICHITA

REVISIONS:

MARK	DATE	DESCRIPTION

PROJ NO: 472-085898
SCALE: NOT TO SCALE
DATE: 2025-02-12
DESIGNED BY: SSP
DRAWN BY: SSP
CHECKED BY: SGE

SHEET TITLE:
GREENWICH
SUMMARY
OF
QUANTITIES
SHEET 2 OF 2

SHEET NO.
5
SHEET 5 OF 57

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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	6	57

From Device No. — To Device No. — Device Center to Center Distance — Size, Color, and Number of Conduits in Trench — Size, Color and Number of Conduits in Bore — Size and Number of Conduits on Structure — Power Cable Size — Fiber Optic Cable Fiber Count — Total Length of Category 6 Cable — CCTV/DMS/VDS Device-Specific Cables

CONDUIT AND CABLE ROUTING TABLE

CONDUIT (FT)																	CABLE (FT)															
			TRENCHED									BORED					ON STRUCTURE	POWER					COMM.		DETECTOR		DEVICE					
			1T		2T		3T		XT		ST	2B		3B		SB	2S	1	2	3	4	5	FIBER OPTIC		#		1	2	3	4		
			1 IN		2 IN		3 IN		X IN		SPARE 2 IN	2 IN		3 IN		SPARE 2 IN	2 IN RMC						12	XX								
FROM	TO	CTR TO CTR DISTANCE (FT)	RED	GREEN	RED	GREEN	RED	GREEN	RED	GREEN	BLACK	RED	GREEN	RED	GREEN	BLACK		3-#X/0	3-#6	3-#X	2-#X	2-#X	12 SMFO	XX SMFO	CAT 6 CABLE		CCTV	DMS	VDS**			
TOTAL																																

* CONDUIT AND / OR CABLE RUN CARRIES OVER TO ADJACENT SHEETS

** MAX. HEIGHT OF DETECTOR ON POLE ASSUMED AT 25 FT FOR CABLE QUANTITIES

NOTES:

1. Table may be modified to fit project needs. Tables shall be consistent across sites within the same project.
2. All lengths in tables are measured in feet.
3. Trenched conduit shall be HDPE, and conduit on structures shall be rigid metal (RMC), unless otherwise noted.
4. Center to center horizontal distances are rounded up to the nearest whole foot. Grade elevation changes are not accommodated in cable quantities and are incidental.
5. Total lengths of conduit and cable include additional quantities as given on this sheet, and are rounded up to the nearest whole foot.
6. After pulling fiber optic cable through the boxes, the Contractor shall cut off and discard the first 10 ft of the cable. This 10 ft is considered incidental to the project and no additional payment will be made.
7. All conduit sizes are industry standard English size conduit designated by their rounded nominal inch (in) diameter equivalent.
8. Ground wire is required to be installed for conduits wih electrical cables. The number of conductors listed in the table does not include the required ground wire. Ground wire is considered incidental to the project and no additional payment will be made.
9. For all power and communications conduit, install tracer wire. See ITS specifications for details.

ADDITIONAL CONDUIT QUANTITIES INCLUDED IN TABLE

5 FT AT EACH POWER SUPPLY ASSEMBLY (LOAD AND SERVICE SIDE)
5 FT AT EACH ITS CABINET ASSEMBLY
5 FT AT EACH CCTV
5 FT AT EACH DMS
5 FT AT EACH POWER POLE OR POWER PEDESTAL FOR POWER CO. SERVICE

* ADDITIONAL QUANTITIES ADDED TO THE TABLE ARE FOR THE DESIGN ENGINEER'S ESTIMATE ONLY. CONTRACTOR TO FOLLOW SLACK REQUIREMENTS IN SPECIFICATIONS.

CONDUIT SYMBOL LEGEND

- TRENCHED
  - 1T — 1 IN (HDPE)
  - 2T — 2 IN (HDPE)
  - 3T — 3 IN (HDPE)
  - XT — X IN (HDPE)
  - ST — 2 IN SPARE (HDPE)
- BORED
  - 2B — 2 IN (HDPE)
  - 3B — 3 IN (HDPE)
  - SB — 2 IN SPARE (HDPE)
- ON STRUCTURE
  - 2S — 2 IN RMC

ADDITIONAL CABLE QUANTITIES INCLUDED IN TABLE

POWER CABLES

50 FT AT EACH POWER SUPPLY ASSEMBLY
36 FT COIL AT TYPE 1 SERVICE POLE
8 FT COIL AT TYPE 2 LOAD SIDE
8 FT COIL AT TYPE 2 SERVICE SIDE
36 FT COIL AT SERVICE POLE (TYPE 2)
8 FT COIL AT SERVICE PEDESTAL (TYPE 2)
10 FT COIL AT EACH TRANSFORMER
10 FT COIL AT EACH ITS CABINET ASSEMBLY
5 FT COIL AT EACH PULL BOX
25 FT COIL AT EACH ROADSIDE DMS
50 FT COIL AT EACH OVERHEAD DMS

FIBER OPTIC TRUNKLINE CABLES (XX SMFO)

50 FT FROM EACH DIRECTION AT EACH SPLICE VAULT WHEN SPLICING
100 FT AT EACH SPLICE VAULT FOR FUTURE USE
25 FT AT EACH PULL BOX (WHEN NOT SPLICING)

FIBER OPTIC BRANCH CABLES (XX SMFO)

50 FT AT EACH ITS CABINET LOCATION
100 FT FROM EACH DIRECTION AT EACH KDOT SPLICE VAULT WHEN SPLICING
25 FT AT EACH PULL BOX OR SPLICE VAULT FOR FUTURE USE

CATEGORY 6 CABLE

10 FT COIL AT EACH ITS CABINET
5 FT COIL EACH AT PULL BOX WHERE SPLICED TO LOOP WIRE
10 FT COIL AT EACH MID-RUN PULL BOX
THESE QUANTITIES MAY BE ADJUSTED AT THE STATE ITS ENGINEER'S DISCRETION TO ENSURE RUNS DO NOT EXCEED 328 FEET IN LENGTH.

CCTV/DMS/VDS CABLES

10 FT COIL AT EACH ITS CABINET
5 FT COIL AT EACH DEVICE
10 FT COIL AT EACH PULL BOX
POLE HEIGHT (VARIES) AT EACH POLE

* ADDITIONAL QUANTITIES ADDED TO THE TABLE ARE FOR THE DESIGN ENGINEER'S ESTIMATE ONLY. CONTRACTOR TO FOLLOW SLACK REQUIREMENTS IN SPECIFICATIONS.

DEVICE ID CODE LEGEND

K075NBC-151.41 — CL/L-AP1001

K 075 NB C XXX.XX - X

- Sequential Number or Letter*
- Mile Post or Reference Marker
- Device:
  - AG - Automated Gate
  - BT - Bluetooth
  - C - Camera (CCTV)
  - CA - ITS Cabinet
  - CT - Trailer Camera
  - PB - Pull Box
  - PP - Power Pole
  - PS - Power Supply / Assembly
  - RS - RWIS Sensor
  - S - Sign (DMS)
  - ST - Trailer DMS
  - SV - Splice Vault**
  - T - Transformer
  - V - Vehicle Detection Station
- Direction: NB - Northbound, SB - Southbound, EB - Eastbound, WB - Westbound
- Route: US 75
- Agency:
  - K - Kansas DOT
  - KTA - Kansas Turnpike Authority
  - L - CenturyLink/Lumen
  - IDEA - Ideatek
  - Z - Zayo

* ONLY USE SEQUENTIAL NUMBERS OR LETTERS IF THERE ARE MULTIPLE DEVICES AT THE SAME MILE POST. USE SEQUENTIAL NUMBERS FOR SPLICE VAULTS AND PULL BOXES. USE SEQUENTIAL LETTERS FOR CAMERAS AND DETECTORS.

** WHEN SPLICE VAULT IS LOCATED ADJACENT TO A THIRD PARTY PROVIDER'S SPLICE POINT, LABEL THE PROVIDER'S SPLICE POINT USING THEIR ID CODE.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

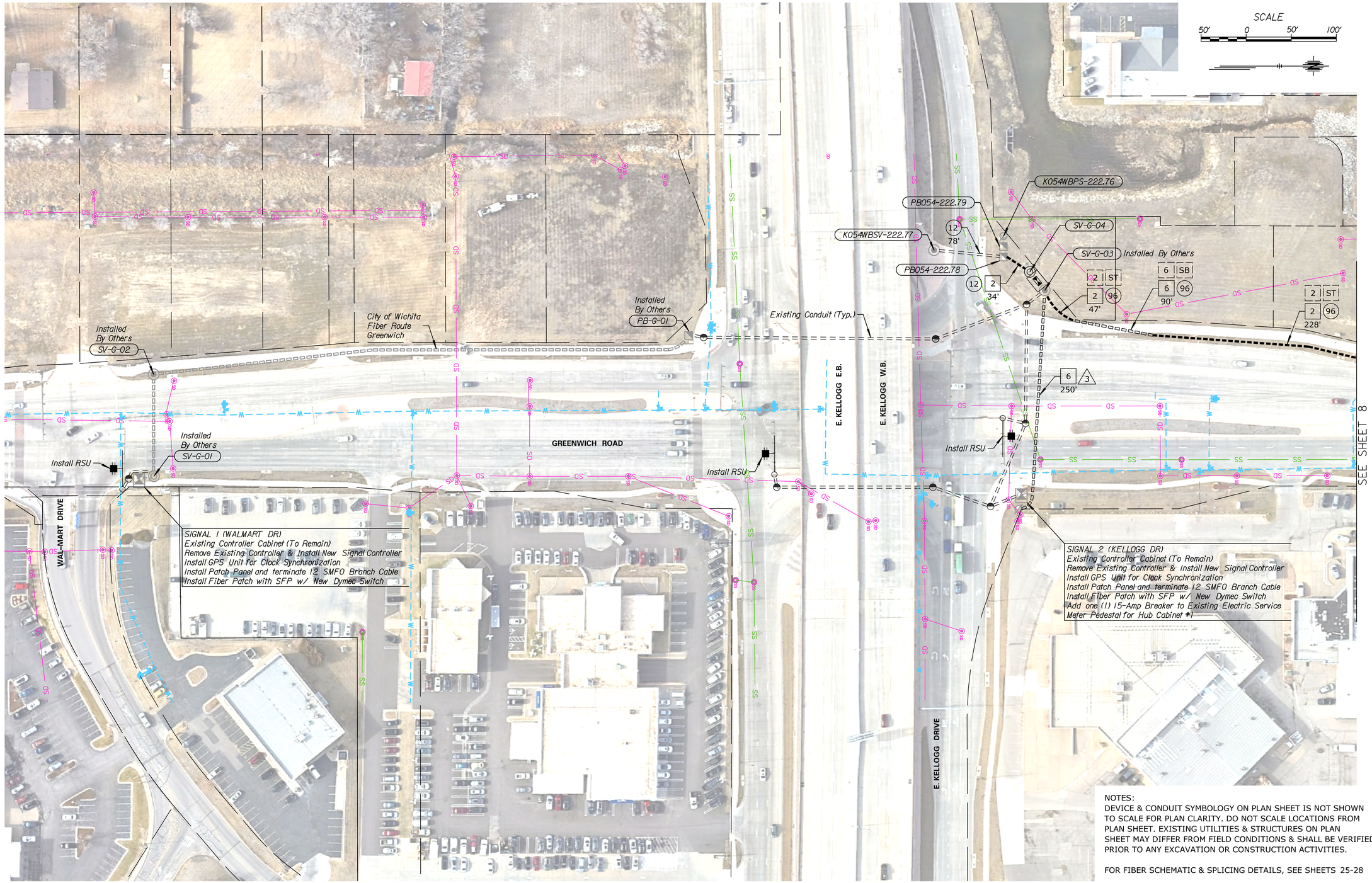
CABLE, CONDUIT, AND DEVICE LEGEND FOR KDOT INSTALLATIONS

ITS-D03A — 11-15-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

Sh. No. 6

Plotted : 12-FEB-2025 16:17
Drawn By : sspatil
File : ITS-D03A.dgn



NOTES:
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FOR FIBER SCHEMATIC & splicing DETAILS, SEE SHEETS 25-28

TRANSYSTEMS
100 N BROADWAY
SUITE 500
WICHITA, KANSAS 67202
PHONE: 316-303-3000
FAX: 316-462-5629

CONSULTANTS:

REVISIONS:

MARK	DATE	DESCRIPTION

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH
WICHITA, KANSAS

CITY OF WICHITA

PROJ NO: 472-085898
SCALE: 1"=50'
DATE: 2025-02-12
DESIGNED BY: AEW
DRAWN BY: AEW
CHECKED BY: SSP

SHEET TITLE:
GREENWICH ROAD FIBER OPTIC TRAFFIC SIGNAL IMPROVEMENTS

SHEET NO.
7
SHEET 7 OF 57

ssgaff
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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

SCALE
50' 0 50' 100'

SEE SHEET 7

SEE SHEET 9

GREENWICH ROAD

E. LEWIS STREET

E. WATERMAN STREET

2 ST
2 96
223'

Exist. R/W

6 SB
6 96
80'

2 ST
2 96
131'

6 SB
6 96
105'

2 ST
2 96
170'

SV-G-05

6 SB
6 96
244'

Fiber Esmt.

Exist. R/W

2 ST
2 96
445'

6 SB
6 96
68'

Exist. R/W

NOTES:
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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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SUITE 500
WICHITA, KANSAS 67202
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FAX: 316-462-5629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE

CITY OF WICHITA

REVISIONS:

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SHEET TITLE:
GREENWICH ROAD FIBER OPTIC TRAFFIC SIGNAL IMPROVEMENTS

SHEET NO.
8

SHEET 8 OF 57

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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

SCALE
50' 0 50' 100'

SEE SHEET 8

SEE SHEET 10

2 ST
2 96
474'
Exist. R/W
Fiber Esmt.
SV-G-06
2 ST
2 96
848'
Fiber Esmt.
Exist. R/W
6 SB
6 96
67'
2 ST
2 96
155'

GREENWICH ROAD

Exist. R/W
Exist. R/W
Exist. R/W

E. DOUGLAS AVENUE

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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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WICHITA, KANSAS 67202
PHONE: 316-303-3000
FAX: 316-462-5629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

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SHEET TITLE:

GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
9
SHEET 9 OF 57

IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

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SCALE
50' 0 50' 100'

SEE SHEET 9

SEE SHEET 11

GREENWICH ROAD

SV-G-07

2 ST 2 96 419'

2 ST 2 96 213'

6 SB 6 96 56'

2 ST 2 96 484'

6 SB 6 96 60'

2 ST 2 96 269'

Exist. R/W

Exist. R/W

Exist. R/W

Exist. R/W

Exist. R/W

NOTES:
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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

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SHEET TITLE:
GREENWICH ROAD FIBER OPTIC TRAFFIC SIGNAL IMPROVEMENTS

SHEET NO.
10
SHEET 10 OF 57

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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

SCALE
50' 0 50' 100'

SEE SHEET 10

SEE SHEET 12

PB-G-02

Exist. R/W

GREENWICH ROAD

CENTRAL AVENUE

SV-G-09

SV-G-08

See Detail A

SIGNAL 3 (CENTRAL AVE)
Existing Controller Cabinet (To Remain)
Remove Existing Controller & Install New Signal Controller
Install GPS Unit for Clock Synchronization
Install Patch Panel and terminate 12 SMFO Branch Cable
Install Fiber Patch with SFP w/ New Dymec Switch

DETAIL A

Traffic Signal Conduit (Exist.)
RSU Install (Typ.)
Traffic Signal Cabinet (Exist.)

NOTES:
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ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

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SHEET TITLE:
GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
11
SHEET 11 OF 57

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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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SUITE 500
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PHONE: 316-303-3000
FAX: 316-462-5629

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GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

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SHEET TITLE:
GREENWICH ROAD FIBER OPTIC TRAFFIC SIGNAL IMPROVEMENTS

SHEET NO.
12
SHEET 12 OF 57

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SCALE
50' 0 50' 100'

SEE SHEET 12

SEE SHEET 14

GREENWICH ROAD

E. PINE MEADOW STREET

Exist. R/W

SV-G-11

2 ST 2 96 245'

2 ST 2 96 310'

6 SB 6 96 202'

2 ST 2 96 404'

6 SB 6 96 67'

2 ST 2 96 252'

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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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FAX: 316-462-5629

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GREENWICH ROAD
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WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

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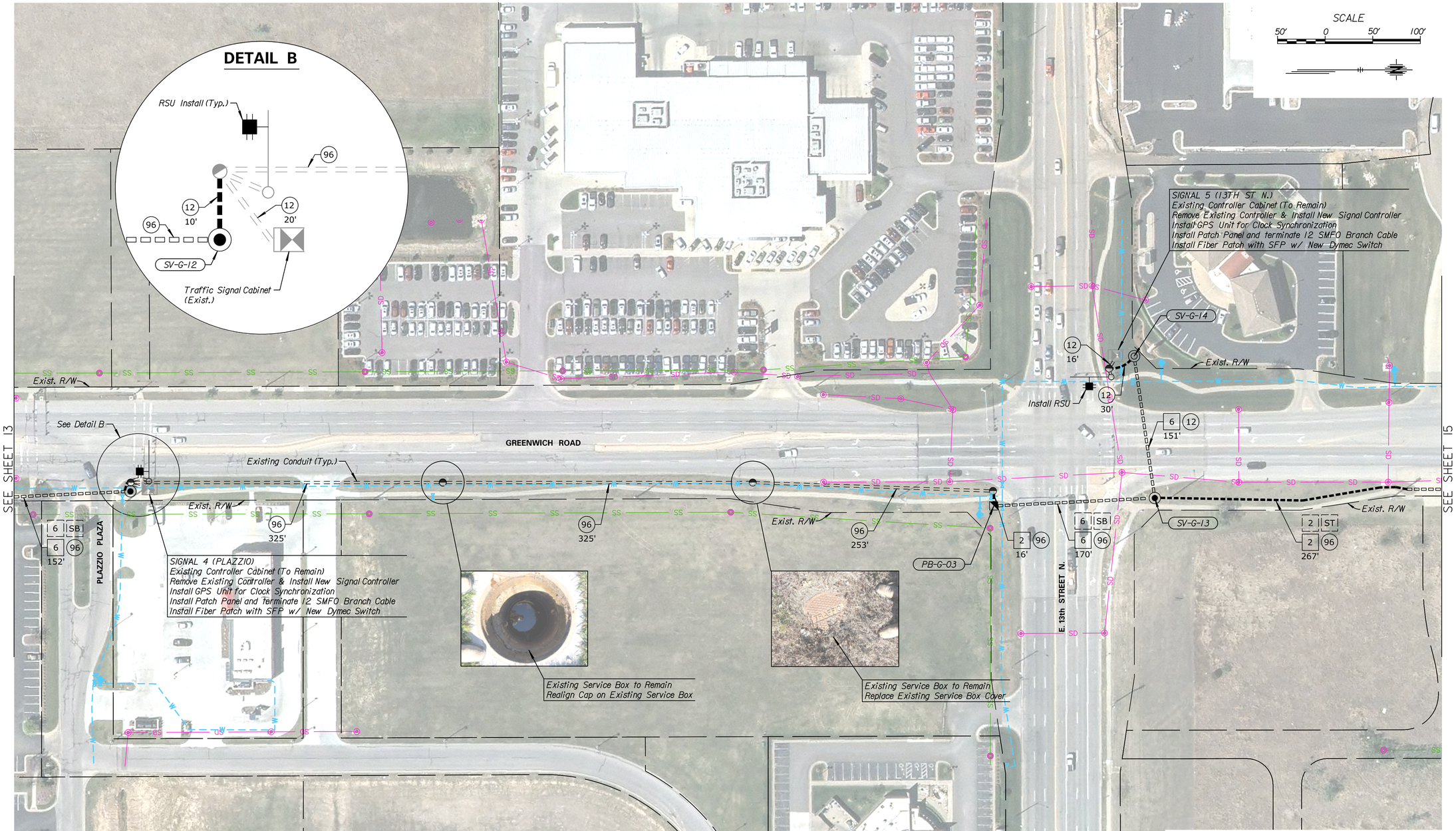
SHEET TITLE:

GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
13
SHEET 13 OF 57

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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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PHONE: 316-303-3000
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GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

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SHEET TITLE:

GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
14

SHEET 14 OF 57

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SCALE
50' 0 50' 100'

SEE SHEET 14

SEE SHEET 16

GREENWICH ROAD

Exist. R/W

Exist. R/W

Exist. R/W

Exist. R/W

SV-G-15

6 SB 6 96 90'

2 ST 2 96 267'

6 SB 6 96 40'

2 ST 2 96 496'

6 SB 6 96 76'

2 ST 2 96 568'

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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

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SHEET TITLE:
GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
15
SHEET 15 OF 57

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SCALE
50' 0 50' 100'

SEE SHEET I5

SEE SHEET I7

GREENWICH ROAD

OAK CREEK PARKWAY

Exist. R/W

Exist. R/W

Exist. R/W

Exist. R/W

Exist. R/W

Exist. R/W

Existing Service Box to Remain
Replace Existing Service Box Cover

Existing Conduit (Typ.)

SV-G-16

2 ST
2 96
114'

6 SB
6 96
73'

2 ST
2 96
470'

6 SB
6 96
627'

96
110'

96
107'

Existing Service Box to Remain
Realign Cap on Existing Service Box

Existing Service Box to Remain
Realign Cap on Existing Service Box

NOTES:
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ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

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SHEET TITLE:
GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
16
SHEET 16 OF 57

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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

SCALE
50' 0 50' 100'

SEE SHEET 16

SEE SHEET 18

GREENWICH ROAD

Exist. R/W

Exist. R/W

Exist. R/W

Exist. R/W

Existing Conduit (Typ.)

96 166'

96 252'

96 194'

96 257'

96 214'

96 224'

96 188'

Existing Service Box to Remain
Realign Cap on Existing Service Box

Existing Service Box to Remain
Realign Cap on Existing Service Box

Existing Service Box to Remain
Realign Cap on Existing Service Box

Existing Service Box to Remain
Realign Cap on Existing Service Box

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FOR FIBER SCHEMATIC & splicing DETAILS, SEE SHEETS 25-28

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SUITE 500
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GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

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DATE: 2025-02-12
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DRAWN BY: AEW
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SHEET TITLE:

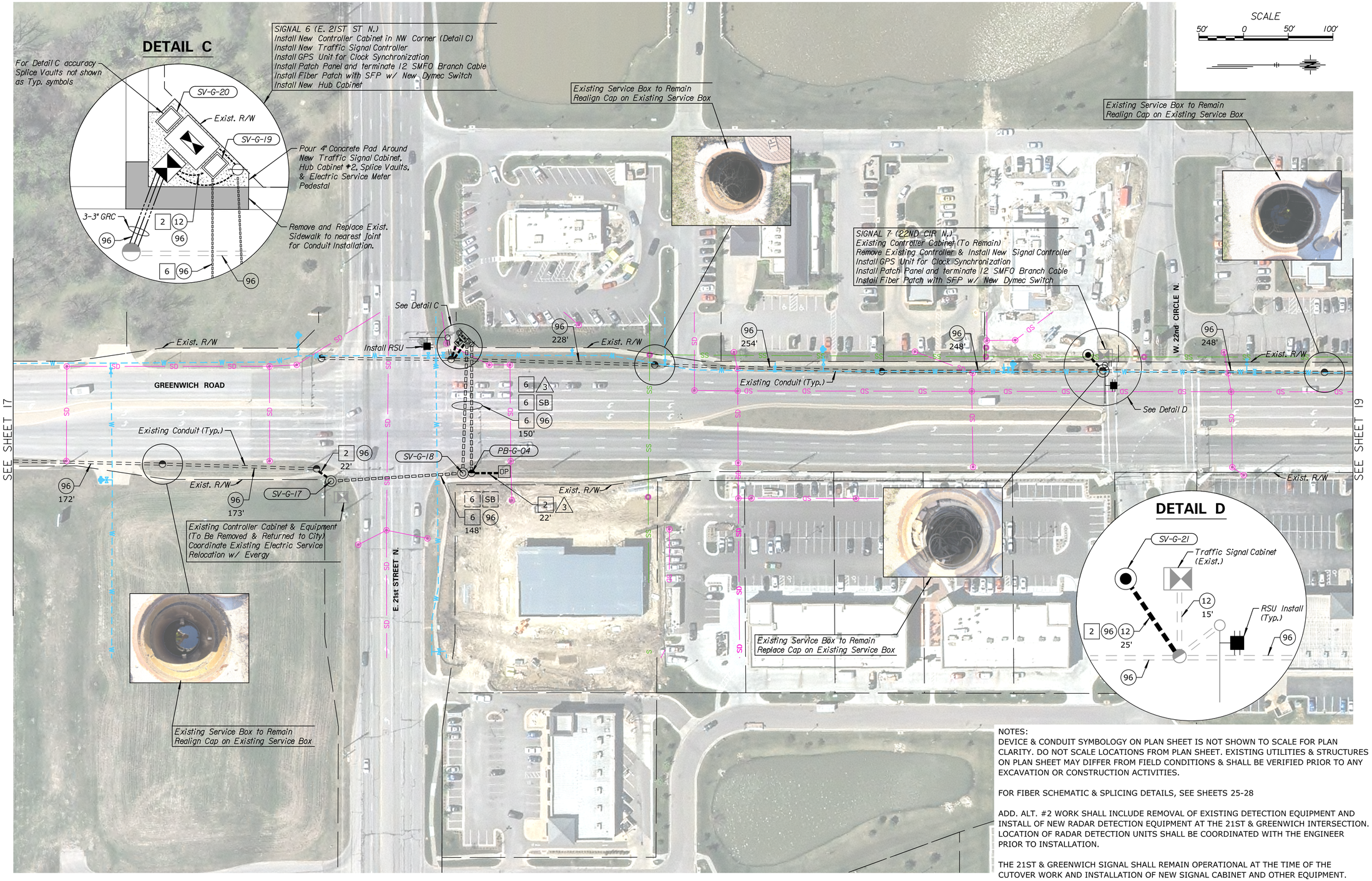
GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
17

SHEET 17 OF 57

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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

ADD. ALT. #2 WORK SHALL INCLUDE REMOVAL OF EXISTING DETECTION EQUIPMENT AND INSTALL OF NEW RADAR DETECTION EQUIPMENT AT THE 21ST & GREENWICH INTERSECTION. LOCATION OF RADAR DETECTION UNITS SHALL BE COORDINATED WITH THE ENGINEER PRIOR TO INSTALLATION.

THE 21ST & GREENWICH SIGNAL SHALL REMAIN OPERATIONAL AT THE TIME OF THE CUTOVER WORK AND INSTALLATION OF NEW SIGNAL CABINET AND OTHER EQUIPMENT.

FOR WIRING DIAGRAM AND DETAILS, SEE SHEET 54

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SUITE 500
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PHONE: 316-303-3000
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CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

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GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
18
SHEET 18 OF 57

IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

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SCALE
50' 0 50' 100'

Existing Service Box to Remain
Replace Existing Service Box Cover

Existing Service Box to Remain
Replace Existing Service Box Cover

Existing Service Box to Remain
Replace Existing Service Box Cover

Existing Service Box to Remain
Replace Existing Service Box Cover

SIGNAL 8 (K-96 S)
Existing Controller Cabinet (To Remain)
Remove Existing Controller & Install New Signal Controller
Install GPS Unit for Clock Synchronization
Install Patch Panel and terminate 12 SMFO Branch Cable
Install Fiber Patch with SFP w/ New Dymec Switch

96 250'
96 247'
96 247'
96 183'
96 332'
96 274'

Exist. R/W
Existing Conduit (Typ.)
See Detail E
GREENWICH ROAD
K-96 HWY E.B.
K-96 HWY W.B.

SEE SHEET 18
SEE SHEET 20

Existing Service Box to Remain
Realign Cap on Existing Service Box

DETAIL E

SV-G-22
Traffic Signal Cabinet (Exist.)
12 16'
2 96 12 26'
96
96
96
RSU Install (Typ.)

NOTES:
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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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GREENWICH ROAD
FIBER OPTIC
TRAFFIC SIGNAL
IMPROVEMENTS

SHEET NO.
19
SHEET 19 OF 57

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SCALE
50' 0 50' 100'

Existing Service Box to Remain
Realign Cap on Existing Service Box

SIGNAL 9 (K-96 N)
Existing Controller Cabinet (To Remain)
Remove Existing Controller & Install New Signal Controller
Install GPS Unit for Clock Synchronization
Install Patch Panel and terminate 12 SMFO Branch Cable
Install Fiber Patch with SFP w/ New Dymec Switch

KDOT096-07
PB-G-05
See Detail F
Existing Conduit (Typ.)
Exist. R/W
E. 26th STREET N.
GREENWICH ROAD
N. GREENWICH COURT
E. 27th STREET N.
K096WBSV-296.98

SEE SHEET 19
SEE SHEET 21

12 2	310'	
SB 6 / 12 6	122'	
96	241'	
96	113'	
96	145'	
6 SB / 6 12	493'	
2 ST / 2 12	575'	
6 12	168'	

DETAIL F

SV-G-23
To PB-G-05
Traffic Signal Cabinet (Exist.)
6 12
2 96 12 — 25'
12 — 15'
12 6
RSU Install (Typ.)
96 — 145'

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FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

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CONSULTANTS:

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WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

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PROJ NO: 472-085898
SCALE: 1"=50'
DATE: 2025-02-12
DESIGNED BY: AEW
DRAWN BY: AEW
CHECKED BY: SSP

SHEET TITLE:
GREENWICH ROAD FIBER OPTIC TRAFFIC SIGNAL IMPROVEMENTS

SHEET NO.
20
SHEET 21 OF 57

IF THIS DRAWING IS LESS THAN 22" X 36" IT IS a REDUCED SIZE DRAWING

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SCALE
50' 0 50' 100'

SIGNAL 10 (29TH ST N.)
Existing Controller Cabinet (To Remain)
Remove Existing Controller & Install New Signal Controller
Install GPS Unit for Clock Synchronization
Install Patch Panel and terminate 12 SMFO Branch Cable
Install Fiber Patch with SFP w/ New Dymec Switch

PB-G-06
6 SB
6 12
172'
Exist. R/W
2 ST
2 12
325'
6 SB
6 12
163'
E. 28th STREET N.
2 ST
2 12
430'
SB 6
12 6
68'
6 SB
170'
SV-G-25
See Detail G
GREENWICH ROAD
SEE SHEET 20
E. 29th STREET N.

DETAIL G
Traffic Signal Cabinet (Exist.)
SV-G-24
Future Spare Cond.
12
24'
6 12
12
18'
RSU Install (Typ.)

NOTES:
DEVICE & CONDUIT SYMBOLOGY ON PLAN SHEET IS NOT SHOWN TO SCALE FOR PLAN CLARITY. DO NOT SCALE LOCATIONS FROM PLAN SHEET. EXISTING UTILITIES & STRUCTURES ON PLAN SHEET MAY DIFFER FROM FIELD CONDITIONS & SHALL BE VERIFIED PRIOR TO ANY EXCAVATION OR CONSTRUCTION ACTIVITIES.

FOR FIBER SCHEMATIC & SPLICING DETAILS, SEE SHEETS 25-28

TRANSYSTEMS
100 N BROADWAY
SUITE 500
WICHITA, KANSAS 67202
PHONE: 316-303-3000
FAX: 316-462-5629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

MARK	DATE	DESCRIPTION

PROJ NO: 472-085898
SCALE: 1"=50'
DATE: 2025-02-12
DESIGNED BY: AEW
DRAWN BY: AEW
CHECKED BY: SSP

SHEET TITLE:
GREENWICH ROAD FIBER OPTIC TRAFFIC SIGNAL IMPROVEMENTS

SHEET NO.
21
SHEET 21 OF 57

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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

CONDUIT AND CABLE ROUTING TABLE

FROM	TO	CTR TO CTR DISTANCE (FT)	CONDUIT (FT)																	CABLE (FT)								
			TRENCHED									BORED								ON STRUCTURE	COMM.						COMM.	POWER
			1						2	ST		5						6	SB	8	FIBER OPTIC							
			1.25 IN						2 IN	SPARE 2 IN		1.25 IN						2 IN	SPARE 2 IN	2 IN RMC	12	48	96	144	144 A	288	**PT	#	3
			GREEN	ORANGE	YELLOW	WHITE	BLACK	GRAY	GREEN	ORANGE	GRAY	GREEN	ORANGE	YELLOW	WHITE	BLACK	GRAY	GREEN	ORANGE	GRAY		12 SMFO	48 SMFO	96 SMFO	144 SMFO	144 SMFO (ARMORED)	288 SMFO	**12 SMFO PRETERM.	CAT 6 CABLE (RSU)	3-#4 AWG
CONTROLLER 1 (WALMART DR)	EX-WALMART-01	10.32																										10.32	161.22
EX-WALMART-01	POLE 1 (WALMART DR)	13.67																										53.67	34.29
US-54 HUB Cabinet #1	PB054-222.78	33.65							53.74												58.65								
PB054-222.78	K054WBSV-222.77	77.44							77.44												177.44								
US-54 HUB Cabinet #1	EX-US54-PS (GRNWCH)	250.0																250.0											750.0
EX-US54-04	US-54 POLE 1	26																										66	
EX-US54-04	EX-US54-05	100																										100	
EX-US54-05	EX-US54-06	67.34																										67.34	
EX-US54-06	EX-US54-07	173.21																										173.21	
EX-US54-07	US-54 POLE 2	14.42																										44.42	
EX-US54-05	CONTROLLER 2 (US-54)	36.94																			86.94							36.94	
SV-G-03	SV-G-05	1074.07							798.68	798.68								275.4	275.4				1374.07						
SV-G-05	SV-G-06	1229.8							918.35	918.35								311.5	311.5				1329.8						
SV-G-06	SV-G-07	1488.98							1421.98	1421.98								67	67				1588.98						
SV-G-07	PB-G-02	1249.49							1133.9	1133.9								115.6	115.6				1349.49						
PB-G-02	SV-G-08	156.48																156.5	156.5				256.48						
SV-G-08	EX-CENTRAL-01	29.37							29.37	29.37											79.37								
CONTROLLER 3 (CENTRAL)	EX-CENTRAL-01	24.09							24.09	24.09											24.09							24.09	
EX-CENTRAL-01	CENTRAL POLE 1	19.75																										59.75	
SV-G-08	SV-G-09	146.54																146.5	146.5				246.54						
SV-G-09	SV-G-10	1281.07							1014.85	1014.85								869.33	869.33				1984.18						
SV-G-10	SV-G-11	1575.47							1282.45	1282.45													1382.45						
SV-G-11	SV-G-12	1387.95							966.31	966.31								421.6	421.6				1487.95						
SV-G-12	EX-PLAZZIO-01	9.29							9.29	9.29											59.29								
CONTROLLER 4 (PLAZZIO)	EX-PLAZZIO-01	19.28							19.28	19.28																		19.28	
EX-PLAZZIO-01	PLAZZIO POLE 1	19.33																										59.33	
EX-PLAZZIO-01	EX-GRNWCH-01	324.26																					324.26						
EX-GRNWCH-01	EX-GRNWCH-02	325.62																					325.62						
EX-GRNWCH-02	EX-13TH-01	252.52																					252.52						
EX-13TH-01	PB-G-03	15.65							15.65	15.65													40.65						
PB-G-03	SV-G-13	169.33																169.3	169.3				469.33						
SV-G-13	SV-G-14	150.61																150.6	150.6		175.61								
SV-G-14	EX-13TH-02	29.36							29.36	29.36											79.36								
CONTROLLER 5 (13TH)	EX-13TH-02	16																										16	
EX-13TH-02	13TH POLE 1	9.22																										49.22	
SV-G-13	SV-G-15	1234.47							1028.9	1028.9								205.6	205.6				1534.47						
SV-G-15	SV-G-16	1223.94							1151.4	1151.4								72.55	72.55				1523.94						
SV-G-16	EX-GRNWCH-03	627.05																627.1	627.1				627.05						
EX-GRNWCH-03	EX-GRNWCH-04	110.43																					110.43						
EX-GRNWCH-04	EX-GRNWCH-05	273.55																					273.55						
EX-GRNWCH-05	EX-GRNWCH-06	252.53																					252.53						
EX-GRNWCH-06	EX-GRNWCH-07	194																					194						
EX-GRNWCH-07	EX-GRNWCH-08	257.01																					257.01						
EX-GRNWCH-08	EX-GRNWCH-09	214																					214						
EX-GRNWCH-09	EX-GRNWCH-10	223.96																					223.96						
EX-GRNWCH-10	EX-GRNWCH-11	187.95																					187.95						
EX-GRNWCH-11	EX-GRNWCH-12	171.71																					171.71						
EX-GRNWCH-12	EX-21ST-01	172.58																					172.58						
EX-21ST-01	SV-G-17	21.24							21.24	21.24													321.24						
SV-G-17	SV-G-18	147.97																148	148				247.97						451.71
SV-G-18	SV-G-19	150.57																301.1	301.1				450.57						30
PB-G-04	21ST-PS-01	150.57																											
21ST-PS-01	CONTROLLER 6 (21ST)	10																											
SV-G-19	CONTROLLER 6 (21ST)	10							10	10											60								
CONTROLLER 6 (21ST)	EX-21ST-02	28.02																										28.02	
EX-21ST-02	21ST POLE 1	24.82																										64.82	

NOTES:

1. CONDUIT AND / OR CABLE RUN CARRIES OVER TO ADJACENT SHEETS.
2. LENGTHS IN TABLE INCLUDE ADDITIONAL QUANTITIES FOR SLACK, SPLICE VAULTS, EXISTING STRUCTURES, ETC. FOR MORE INFORMATION, SEE SHEET 6

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FAX: 316-462-5629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

MARK	DATE	DESCRIPTION

PROJ NO: 472-085898
SCALE: NOT TO SCALE
DATE: 2025-02-12
DESIGNED BY: SSP
DRAWN BY: SSP
CHECKED BY: SGE

SHEET TITLE:

CABLE, CONDUIT & DEVICE TABLE WALMART DR TO HUB CABINET #2

SHEET NO.
22
SHEET 22 OF 57

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CONDUIT AND CABLE ROUTING TABLE

CONDUIT (FT)

FROM	TO	CTR TO CTR DISTANCE (FT)	TRENCHED									BORED									ON STRUCTURE
			1						2		ST	5						6		SB	8
			1.25 IN						2 IN		SPARE 2 IN	1.25 IN						2 IN		SPARE 2 IN	2 IN RMC
			GREEN	ORANGE	YELLOW	WHITE	BLACK	GRAY	GREEN	ORANGE	GRAY	GREEN	ORANGE	YELLOW	WHITE	BLACK	GRAY	GREEN	ORANGE	GRAY	
SV-G-19	EX-21ST-02	27.91								27.91	27.91										
EX-21ST-02	EX-GRNWCH-13	228.04																			
EX-GRNWCH-13	EX-GRNWCH-14	254.02																			
EX-GRNWCH-14	EX-22ND-01	247.89																			
EX-22ND-01	SV-G-21	24.46								24.46	24.46										
SV-G-21	EX-22ND-01	24.46								24.46	24.46										
CONTROLLER 7 (22ND)	EX-22ND-01	17.98																			
EX-22ND-01	22ND POLE 1	7.04																			
EX-22ND-01	EX-GRNWCH-15	248.07																			
EX-GRNWCH-15	EX-GRNWCH-16	250.09																			
EX-GRNWCH-16	EX-GRNWCH-17	246.79																			
EX-GRNWCH-17	EX-K96S-01	246.38																			
EX-K96S-01	SV-G-22	25.65								25.65	25.65										
EX-K96S-01	CONTROLLER 8 (K-96S)	15.77								15.77	15.77										
EX-K96S-01	K-96S POLE 1	11.03																			
EX-K96S-01	EX-GRNWCH-18	182.64																			
EX-GRNWCH-18	EX-GRNWCH-19	331.82																			
EX-GRNWCH-19	EX-GRNWCH-20	273.71																			
EX-GRNWCH-20	EX-GRNWCH-21	241.11																			
EX-GRNWCH-21	EX-K96N-01	112.42																			
EX-K96N-01	EX-K96N-02	145.3																			
EX-K96N-01	PB-G-05	22.51								22.51	22.51										
PB-G-05	KDOT096-07	309.68								309.68	309.68										
KDOT096-07	K096WBSV-296.98	168.05																			
PB-G-05	SV-G-23	121.53																121.5	121.5		
SV-G-23	EX-K96N-02	30.49								30.49	30.49										
CONTROLLER 9 (K-96N)	EX-K96N-02	35.25																			
EX-K96N-02	K-96N POLE 1	15.72																			
SV-G-23	PB-G-06	1067.55								574.55	574.55							493	493		
PB-G-06	SV-G-24	1156.48								753.74	753.74							402.7	402.7		
SV-G-24	EX-29TH-01	24.1								24.1	24.1										
CONTROLLER 10 (29TH)	EX-29TH-01	31.43																			
EX-29TH-01	29TH POLE 1	32.66																			
SV-G-24	SV-G-25	173.13																173.1	173.1		
		TOTAL								11742	◔11742							5228	5228		

CABLE (FT)

COMM.							COMM.	POWER
FIBER OPTIC							(#)	(3)
(12)	(48)	(96)	(144)	(144 A)	(288)	(**PT)		
12 SMFO	48 SMFO	96 SMFO	144 SMFO	144 SMFO (ARMORED)	288 SMFO	**12 SMFO PRETERM.	CAT 6 CABLE (RSU)	3-#4 AWG
		228.04						
		254.02						
		247.89						
		124.46						
74.46								
							17.98	
							47.04	
		248.07						
		250.09						
		246.79						
		246.38						
		125.65						
65.77								
							51.03	
		182.64						
		331.82						
		273.71						
		241.11						
		112.42						
		145.3						
		47.51						
309.68								
168.05								
		221.53						
80.49								
							35.25	
							55.72	
		1167.55						
74.1								
							31.43	
							72.66	
1486		23870					1083	1231

NOTES:

1. LENGTHS IN TABLE INCLUDE ADDITIONAL QUANTITIES FOR SLACK, SPLICE VAULTS, EXISTING STRUCTURES, ETC. FOR MORE INFORMATION, SEE SHEET 6

◔ QUANTITY INCLUDES LENGTH FOR ADD ALT BID #1. BELOW ARE THE QUANTIES FOR ADD ALT BID#1 ONLY:

[ST] 2" HDPE Conduit - Trenched (Gray, Communications) = 11,709 FEET

[SB] 2" HDPE Conduit - Bored (Gray, Communications) = 5,228 FEET

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PHONE: 316-303-3000
FAX: 316-462-5629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

MARK	DATE	DESCRIPTION

PROJ NO: 472-085898
SCALE: NOT TO SCALE
DATE: 2025-02-12
DESIGNED BY: SSP
DRAWN BY: SSP
CHECKED BY: SGE

SHEET TITLE:

CABLE, CONDUIT & DEVICE TABLE HUB CABINET #2 TO 29TH ST

SHEET NO.
23
SHEET 23 OF 57

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HUB CABINET #1

COW 96 - ROUTE GREENWICH
(TO NORTH)

A		B		C		D	
1	13	25	37	49	61	73	85
2	14	26	38	50	62	74	86
3	15	27	39	51	63	75	87
4	16	28	40	52	64	76	88
5	17	29	41	53	65	77	89
6	18	30	42	54	66	78	90
7	19	31	43	55	67	79	91
8	20	32	44	56	68	80	92
9	21	33	45	57	69	81	93
10	22	34	46	58	70	82	94
11	23	35	47	59	71	83	95
12	24	36	48	60	72	84	96

COW 96 - ROUTE GREENWICH
(TO SOUTH)

A		B		C		D	
1	13	25	37	49	61	73	85
2	14	26	38	50	62	74	86
3	15	27	39	51	63	75	87
4	16	28	40	52	64	76	88
5	17	29	41	53	65	77	89
6	18	30	42	54	66	78	90
7	19	31	43	55	67	79	91
8	20	32	44	56	68	80	92
9	21	33	45	57	69	81	93
10	22	34	46	58	70	82	94
11	23	35	47	59	71	83	95
12	24	36	48	60	72	84	96

HUB CABINET #2

COW 96 - ROUTE GREENWICH
(TO NORTH)

A		B		C		D	
1	13	25	37	49	61	73	85
2	14	26	38	50	62	74	86
3	15	27	39	51	63	75	87
4	16	28	40	52	64	76	88
5	17	29	41	53	65	77	89
6	18	30	42	54	66	78	90
7	19	31	43	55	67	79	91
8	20	32	44	56	68	80	92
9	21	33	45	57	69	81	93
10	22	34	46	58	70	82	94
11	23	35	47	59	71	83	95
12	24	36	48	60	72	84	96

COW 96 - ROUTE GREENWICH
(TO SOUTH)

A		B		C		D	
1	13	25	37	49	61	73	85
2	14	26	38	50	62	74	86
3	15	27	39	51	63	75	87
4	16	28	40	52	64	76	88
5	17	29	41	53	65	77	89
6	18	30	42	54	66	78	90
7	19	31	43	55	67	79	91
8	20	32	44	56	68	80	92
9	21	33	45	57	69	81	93
10	22	34	46	58	70	82	94
11	23	35	47	59	71	83	95
12	24	36	48	60	72	84	96

GENERAL NOTES:

ACTUAL FIBER CONNECTIONS, SWITCH CONFIGURATION, AND PORT ASSIGNMENT SUBJECT TO CHANGE. KDOT AND CITY OF WICHITA NETWORK ENGINEER TO APPROVE FINAL FIBER CONNECTION PLANS. CONTRACTOR SHALL WORK WITH ENGINEER TO PROVIDE COMMUNICATION PATH FROM COW CITY HALL TO FIELD DEVICES. ADDITIONAL PATCHING AND TESTING MAY BE REQUIRED FROM THE TMC AND OTHER POP BUILDINGS OR HUB CABINETS TO COMPLETE THE CONNECTIONS.

THIS SHEET TO BE COMPLETED BY THE CONTRACTOR, INSPECTOR AND ENGINEER DURING CONSTRUCTION FOR FIELD DOCUMENTATION PURPOSES.

ASSUMED 24 PATCH CABLES NEEDED (DUPLEX).

TRANSYSTEMS
100 N BROADWAY
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WICHITA, KANSAS 67202
PHONE: 316-303-3000
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CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

MARK	DATE	DESCRIPTION

PROJ NO: 472-085898
SCALE: NOT TO SCALE
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DRAWN BY: SSP
CHECKED BY: SSP

SHEET TITLE:

HUB CABINETS #1 & #2
CITY OF WICHITA
PATCH PANEL
DETAILS

SHEET NO.
24
SHEET 24 OF 57

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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

LEGEND:

X	=	FIBER OPTIC SPLICE
RX	=	RECEIVE
TX	=	TRANSMIT
F/O	=	FIBER OPTIC
—■	=	UNTERMINATED FIBER
SMFO	=	SINGLE MODE FIBER OPTIC
COW	=	CITY OF WICHITA
KDOT	=	KANSAS DEPARTMENT OF TRANSPORTATION

NOTES:

ACTUAL FIBER CONNECTIONS, SWITCH CONFIGURATION, AND PORT ASSIGNMENT SUBJECT TO CHANGE. CITY OF WICHITA TRAFFIC ENGINEER TO APPROVE FINAL FIBER CONNECTION PLANS.

INTERMEDIATE SPLICE AND PULL BOX LOCATIONS NOT SHOWN IN SCHEMATICS FOR CLARITY. KEY BOXES WHERE SPLICING OR ROUTE CHANGES ARE SHOWN.

FIBERS 3 & 4 WILL GET LOOPED BACK BETWEEN THE FDU'S.

<u>UTILITY CONTACTS:</u>

KDOT WICHITA UTILITY COORDINATOR
NATE STAHLY
W - 316-337-6973
NATE.STAHLY@KS.GOV

EVERGY
SHANE PRICE
W - 316-261-6315
C - 316-706-6702
SHANE.PRICE@EVERGY.COM

KDOT WICHITA TMC ACCESS
SHIVRAJ PATIL
W - 316-303-3019
SSPATIL@TRANSYSTEMS.COM

S < ROUTE GREENWICH > N

SIGNAL 2
GREENWICH & US-54 RAMPS

F&I SIGNAL CONTROLLER

F&I CAT 6 UTP

DYMEC SWITCH
TX RX TX RX

F&I SWITCH W/ SFPs

F&I LC F/O PATCH CORD, DUPLEX (TYP.)

F&I 12 POSITION LC PRETERMINATED PATCH PANEL & PIGTAIL

F&I 12 SMFO

F&I HUB CABINET #1
GREENWICH & US-54

F&I 96 POS. COW LC PATCH PANEL & PIGTAIL "GREENWICH" FROM US-54 TO 21ST

F&I 96 POS. COW LC PATCH PANEL & PIGTAIL "GREENWICH" FROM WALMART TO US-54

1 2 3 4 5-96

F&I SPLICE CLOSURE: SPLICE FIBERS IN LARGE SPLICE CLOSURE (TYP.)

12 COW SMFO BRANCHLINE

1-96

1 2 3 4 5 6 7 8 9 10 11 12

FIBER OPTIC CABLE TO THE WALMART DRIVE SIGNAL AND SPLICE VAULT

1-96 COW
INSTALLED BY OTHERS

FROM SOUTH

TO NORTH

1-96 COW
INSTALLED BY OTHERS

ROUTE A MATCHLINE SEE SHEET 26

NEW SPLICE VAULT
SV-G-03

IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

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SUITE 500
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PHONE: 316-303-3000
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CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

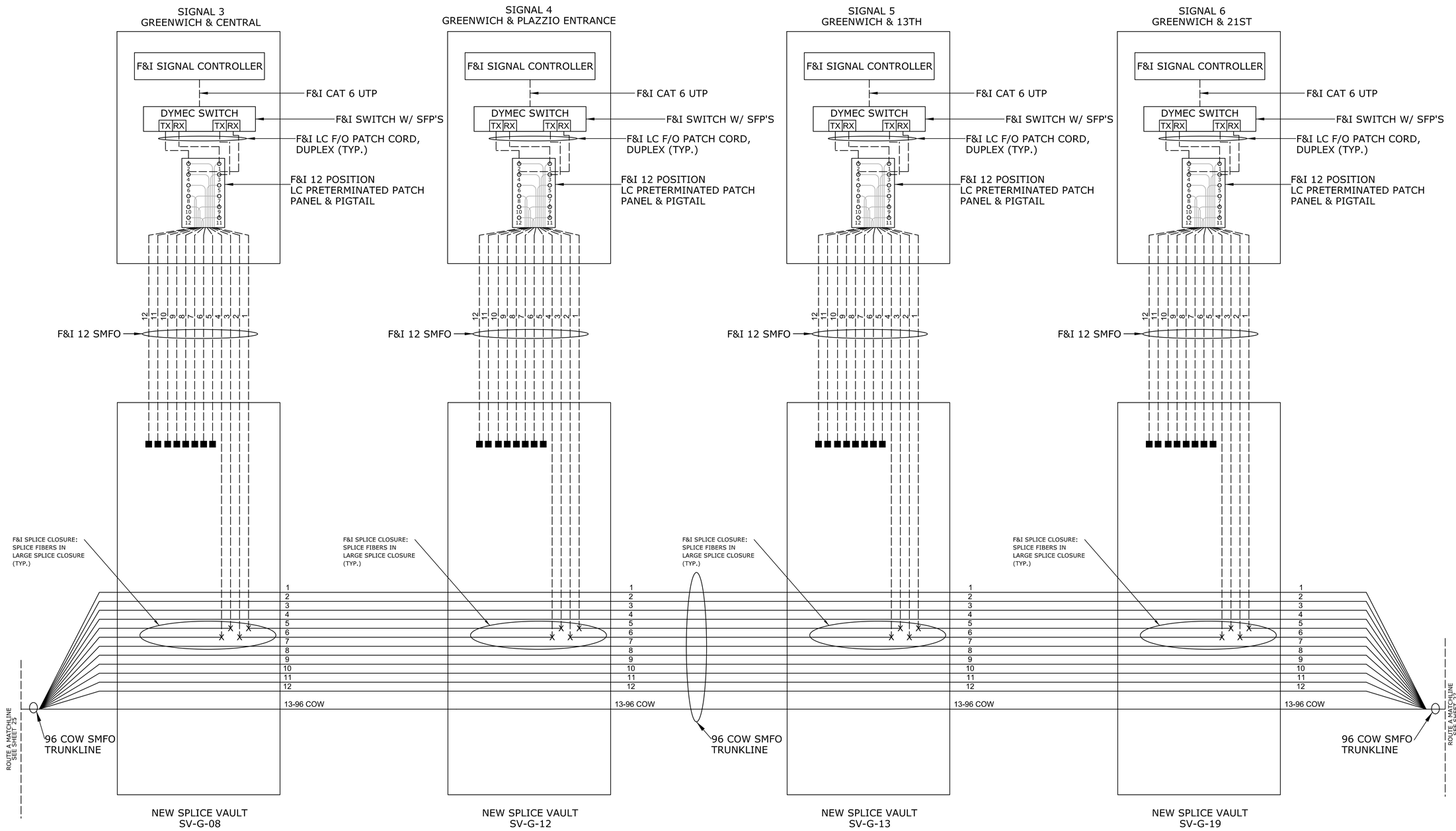
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SHEET TITLE:
ROUTE - GREENWICH FIBER OPTIC SCHEMATIC

SHEET NO.
25
SHEET 25 OF 57

S < ROUTE GREENWICH > N



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SUITE 500
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CHECKED BY:	SGE

SHEET TITLE:

ROUTE - GREEWICH FIBER OPTIC SCHEMATIC

SHEET NO.

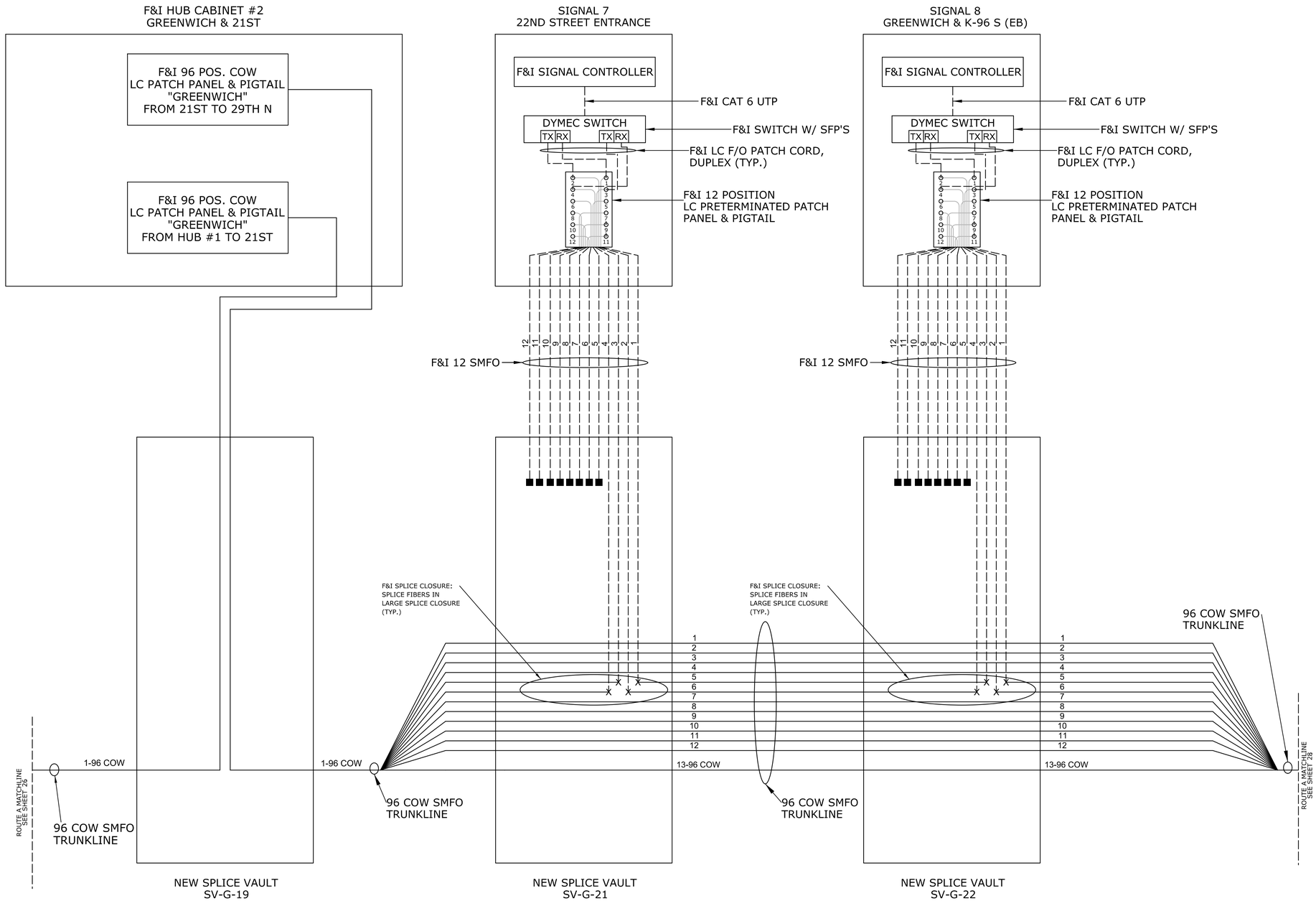
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SHEET 26 OF 57

sgetifl
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IF THIS DRAWING IS LESS THAN 22" X 36" IT IS A REDUCED SIZE DRAWING

S < ROUTE GREENWICH > N



TRANSYSTEMS
100 N BROADWAY
SUITE 500
WICHITA, KANSAS 67202
PHONE: 316-303-3000
FAX: 316-462-5629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

MARK	DATE	DESCRIPTION

PROJ NO: 472-085898
SCALE: NOT TO SCALE
DATE: 2025-02-12
DESIGNED BY: SGE
DRAWN BY: SSP
CHECKED BY: SGE

SHEET TITLE:

ROUTE - GREENWICH
FIBER OPTIC
SCHEMATIC

SHEET NO.

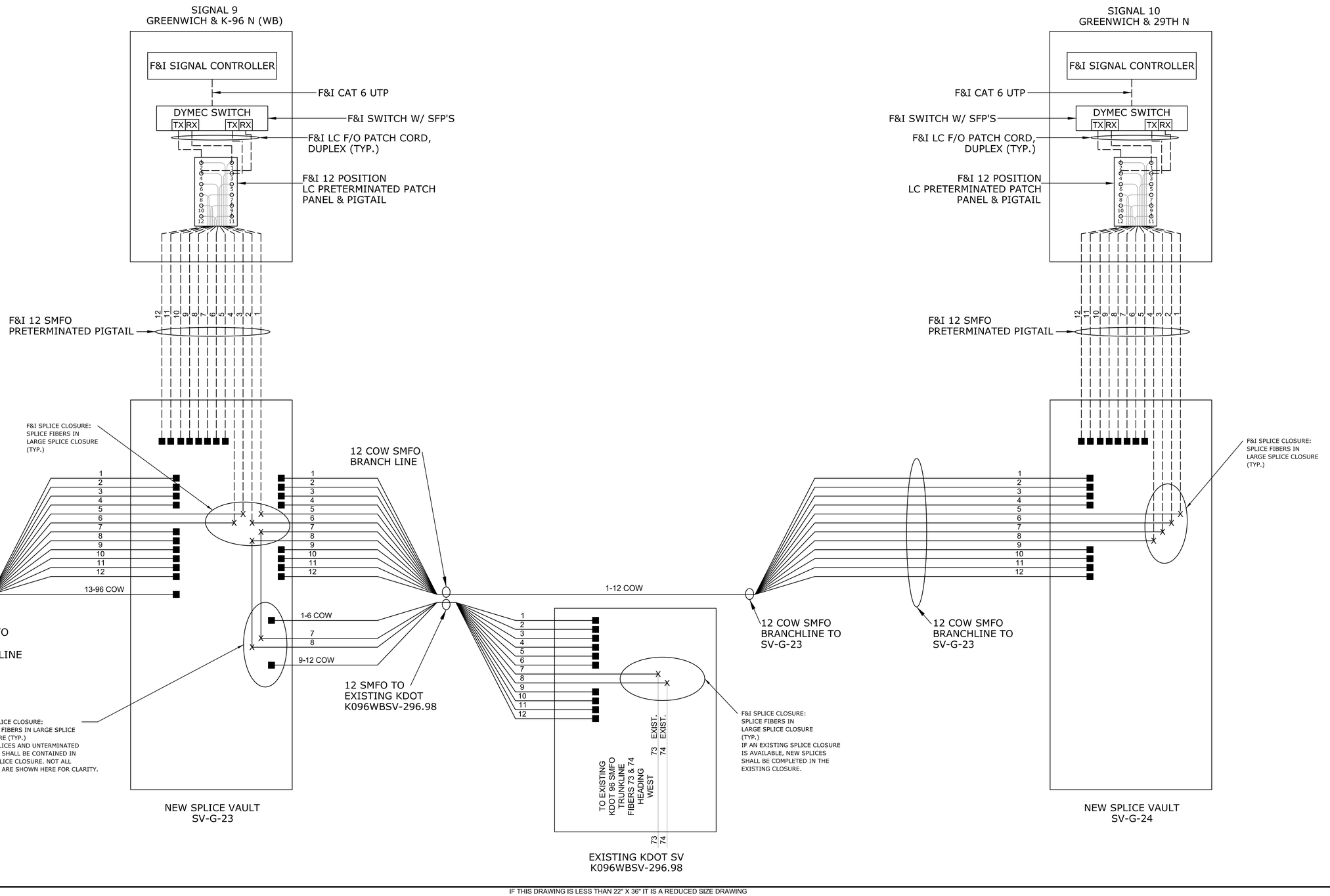
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SHEET 27 OF 57

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S < ROUTE GREENWICH > N



TRANSYSTEMS
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SUITE 500
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CITY OF WICHITA

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CHECKED BY:	SGE

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ROUTE - GREEWICH FIBER OPTIC SCHEMATIC

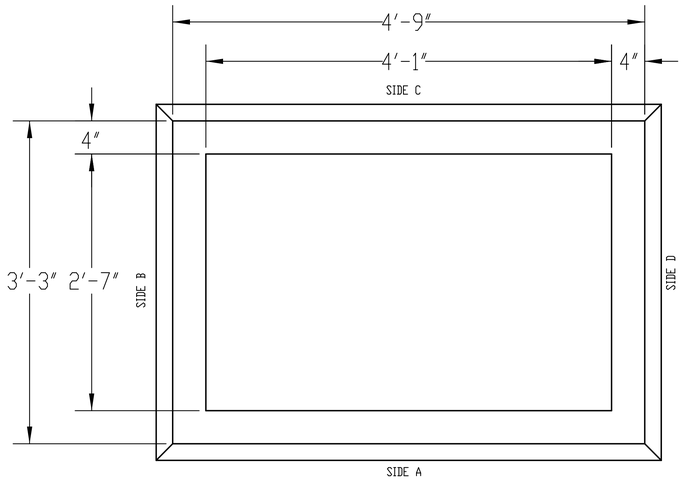
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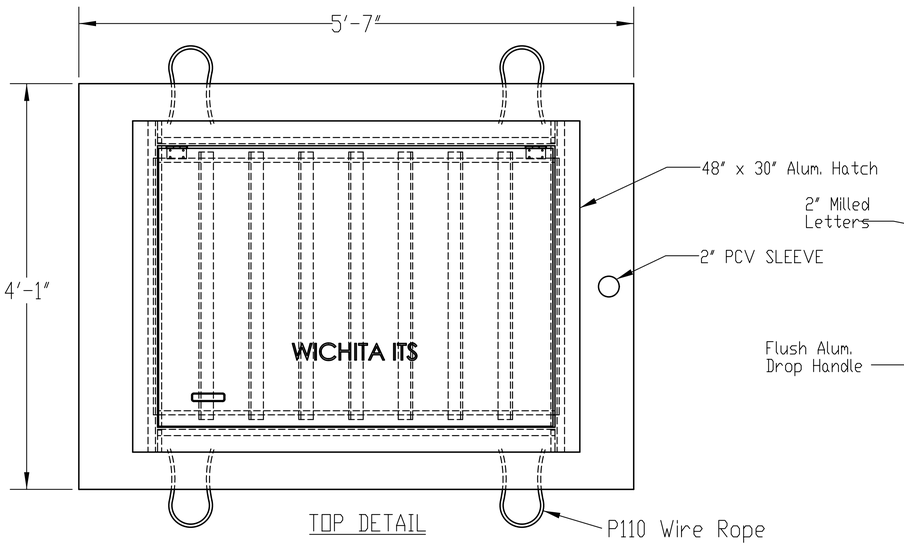
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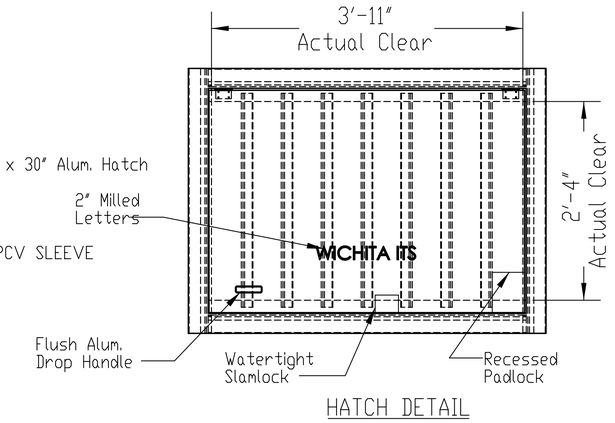
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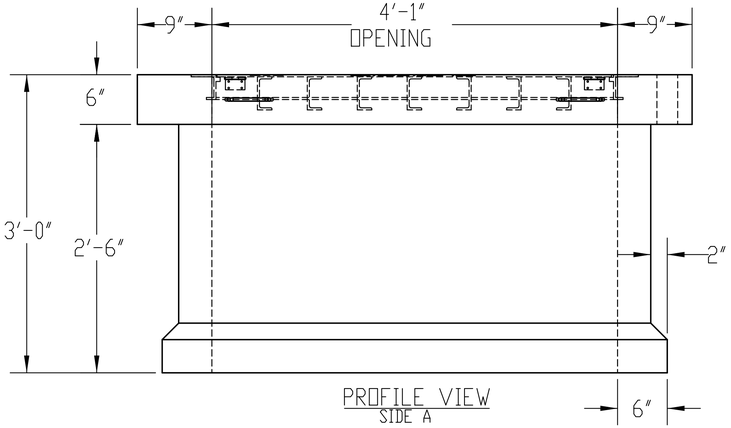
PLAN VIEW
TOP REMOVED FOR CLARITY



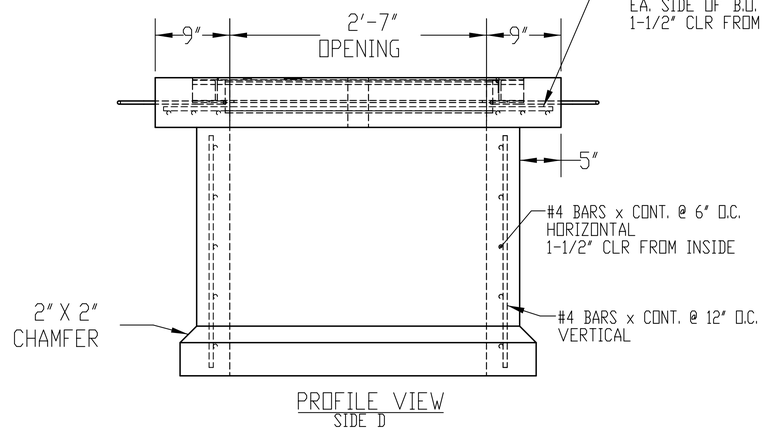
TOP DETAIL



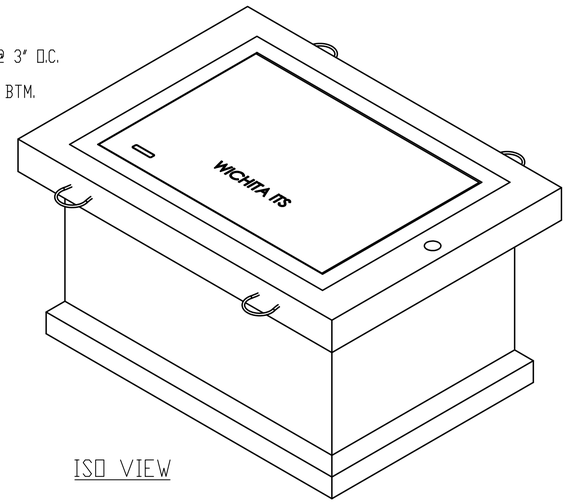
HATCH DETAIL



PROFILE VIEW
SIDE A



PROFILE VIEW
SIDE D



ISO VIEW

PART NUMBER	Weight	QTY.
WICHITA SV Walls	1983	1
WICHITA SV Top	1006	1

Desgin Information: ACI318

Live Load = 32 Kips Axle
(HS 20) 16 Kips Wheel

Impact Factor = 1.0 To 1.3
Load Factors: DL = 1.2
LL = 1.6

Tire Footprint = 10″ x 20″
Ka = 0.36
Lateral Soil Pressure = 90pcf
ϒSoil = 120 pcf
ϒc = 150 pfc

DESIGN INFORMATION: -F'c = 5,000 PSI
-Fy = 60,000 PSI

SIZE: B

WEIGHT: 2989

TRANSYSTEMS
100 N BROADWAY
SUITE 500
WICHITA, KANSAS 67202
PHONE: 316-303-3000
FAX: 316-462-5629

CONSULTANTS:

REVISIONS:

MARK	DATE	DESCRIPTION

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

PROJ NO: 472-085898	
SCALE: NOT TO SCALE	
DATE: 2025-02-12	
DESIGNED BY: SSP	
DRAWN BY: SSP	
CHECKED BY: SGE	

SHEET TITLE:
CITY OF WICHITA
48" SPLICE VAULT
DETAIL

SHEET NO.
29
SHEET 29 OF 57

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BlueTOAD® CV

(DSRC/C-V2X Roadside Unit)

Iteris BlueTOAD Connected Vehicle Roadside Unit - Optional 2.4 GHz BlueTOAD Bluetooth Detector Installation and Deployment Guide

Iteris Roadside Unit Layout Guidelines

After selecting the target road segment for Connected Vehicle application, determine how many Iteris Roadside Units (RSUs) are necessary for the project by using the following guidelines:

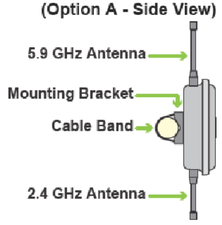
The Iteris RSU has an effective detection range of up to approximately 3,000 feet radius from the antennas (with direct line-of-sight). Therefore, an RSU can be placed at each signalized intersection, or within 0.25 miles between devices. *
* Power Control allows to reduce the detection zone to minimize overlap.

Iteris RSU Mounting Guide

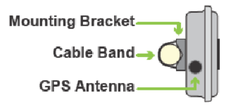
Mount Iteris RSU Enclosure to Structure

The BlueTOAD standard unit package includes one (1) "dual direction" mounting bracket and two (2) metal cable bands designed for mounting on, mast arms, poles, I-Beams or support structures up to a 14" diameter.

Mast Arm (Horizontal) Mount (Option A - Side View)

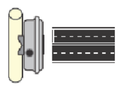


Pole (Vertical) Mount (Option B - Top View)

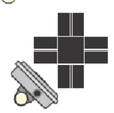


NOTE: Mounting Guide

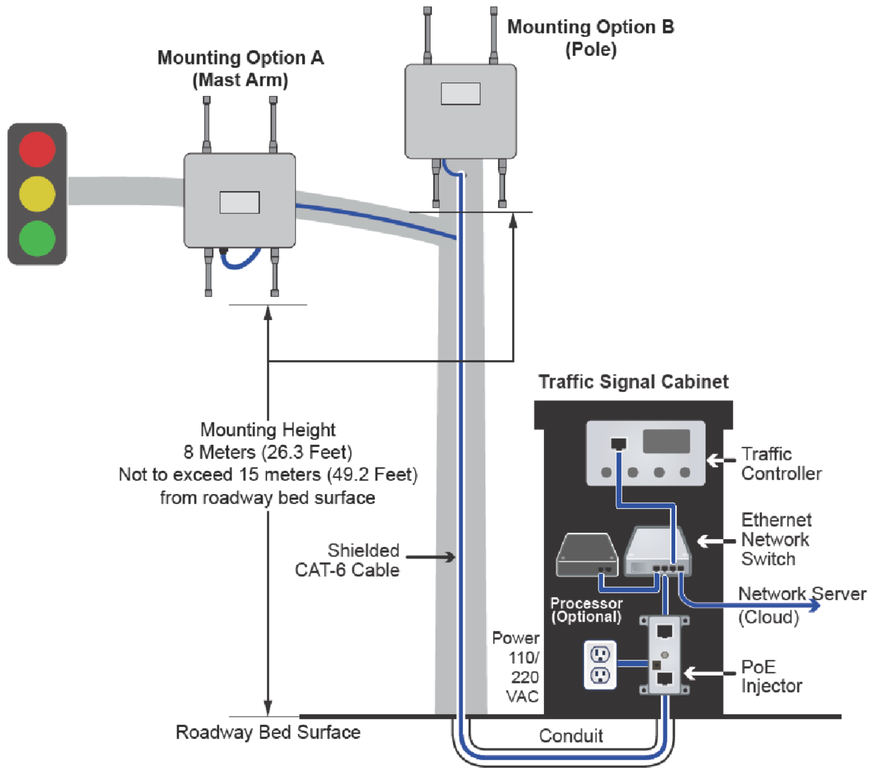
Mast Arm Installation - To achieve optimal line-of-sight, RSU should be mounted near as possible to center of intersection.



Pole Mount Installation - To achieve optimal line-of-sight, RSU should be mounted at 45 Degree angle, pointed at center of intersection.



NOTE: Iteris RSU ships with wrapped antenna and lightening suppression connectors.
ALL Iteris RSU installations will utilize plastic waterproof heat-sealed sheathing for antenna connectors.



Ethernet-based Communications
Power over Ethernet (PoE)

BlueTOAD CV Roadside Unit (RSU)

Mounting Detail

Ethernet-based Communications (Power over Ethernet - PoE)

ROADSIDE UNIT MOUNTING DETAIL

Iteris RSU Installation Quick Start Guide

STEP 1 - Confirm site survey checklist has been completed for all locations.
Important to confirm all required inbound/outbound network ports have been setup.

STEP 2 – Notify Iteris support team to schedule remote support for installation date.

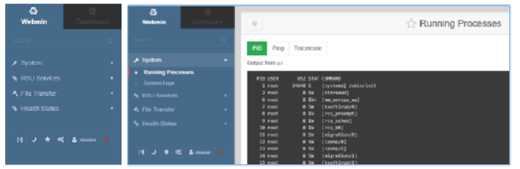
STEP 3 - Power up unit and confirm all LEDs are normal after the unit initializes

Iteris RSU (Bottom View)



LED Indicators
Green – Device operational
Amber – Device ON
Red - Fault

STEP 4 - Configure network settings using Iteris Setup Utility (Browser-based Application)
Upload unique MAP file to Iteris RSU for each designated intersection.



STEP 5 - Call Iteris*, communicate the Iteris RSU device number, indicate that the unit has been powered up, LEDs are normal, and await Iteris to confirm the network is seeing SPaT and MAP data from this unit.

*** Customer Support Number: 608-713-9299 (Iteris will schedule installation appointment)**

STEP 6 - After confirmation from Iteris, Power OFF the unit before installation.

Roadside Unit Installation Guide

STEP 1 - Mount Iteris RSU as required (See Iteris Mounting Guide left of page).

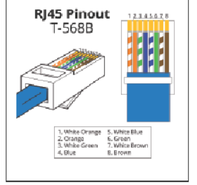
STEP 2 - After the Iteris RSU enclosure has been mounted, thread Ethernet Cable Coupler and terminate Ethernet Cable, follow RJ45 Pinout T-568B wire layout. Connect Ethernet cable to RSU.

STEP 3 - Plug the main CAT-6 cable from the PoE injector into the PoE splitter. See PoE Injector installation instructions below.

Install PoE Injector in Roadside Cabinet

1. Secure PoE injector onto cabinet rack rail or flat surface inside roadside cabinet
2. Attach Ground Wire
   - Data – connects to network Ethernet switch, router, or hub
   - Data & Power – connects to the RSU
   - Connect AC power supply to PoE Injector and "plug" the 110V cord to AC power outlet





STEP 4 - Power ON RSU, confirm all LEDs are normal (See LED Guide above).

STEP 5 - Before leaving the location, call Iteris* after the unit is Powered ON, communicate the device ID number and that the LEDs are normal, and confirm from Iteris that the network is transmitting the SPaT and MAP data from this unit. Also access Iteris RSU status using BlueARGUS software (see instructions below).

STEP 6 - Add each installed Iteris RSU unit to a compiled list of unit location data (keep a list of device ID, location, and installation date for each unit).

Each Iteris RSU can be monitored using the web-based BlueARGUS software. Login credentials (Username and Password) are provided to each User, based on their predetermined Role (Admin or User) when the Account was initially setup.

BlueARGUS Website: https://bluetoad.trafficcast.com/

Iteris Support Website: https://trafficcast.zendesk.com

TRANSYSTEMS
100 N BROADWAY
SUITE 500
WICHITA, KANSAS 67202
PHONE: 316-303-3000
FAX: 316-462-8629

CONSULTANTS:

GREENWICH ROAD
ITS & SIGNAL IMPROVEMENTS
WALMART DRIVE TO 29TH ST. NORTH

CITY OF WICHITA

REVISIONS:

MARK	DATE	DESCRIPTION

PROJ NO:	472-085898
SCALE:	NOT TO SCALE
DATE:	2025-02-12
DESIGNED BY:	SSP
DRAWN BY:	SSP
CHECKED BY:	SGE

SHEET TITLE:

BLUETOAD CV ROADSIDE UNIT (RSU) DETAILS

SHEET NO.

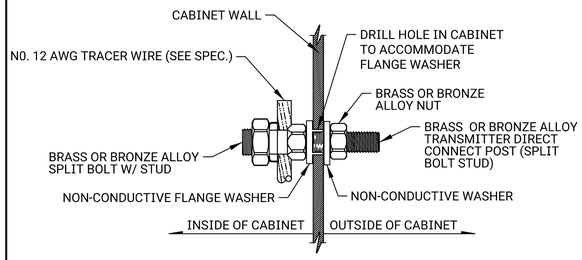
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SHEET 30 OF 57

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STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	31	57



NOTES

1. TRACER WIRE TERMINAL SHALL BE SOLID BRASS OR BRONZE ALLOY & ACCESSIBLE FROM THE OUTSIDE OF THE CABINET.
2. TERMINAL SHALL BE COMPLETELY ISOLATED FROM CABINET & GROUNDING.
3. HOLE IN CABINET SHALL BE MADE WATER TIGHT.
4. MAINTAIN 1.5" MINIMUM CLEARANCE FOR TERMINAL.
5. APPLY THREAD LOCK SEALANT TO REDUCE TAMPERING.
6. TERMINAL LOCATION - TERMINALS SHALL BE MOUNTED IN ORDER TO PREVENT ACCIDENTAL "SNAGGING" . LOCATIONS SHOULD BE A MINIMUM OF 1.5" FROM CABINET EDGES AND SIDE IN WHICH IT IS NOT DIRCTLY MOUNTED TO.
   A. PAD MOUNTED TYPE 334 CABINET - TERMINAL SHALL BE LOCATED NEAR THE BOTTOM OF THE CABINET UNDER THE BACK CABINET DOOR, HINGE SIDE.
   B. POLE MOUNTED TYPE 336 CABINET - TERMINAL SHALL BE MOUNTED ON THE BOTTOM SIDE OF THE CABINET NEAREST THE POLE.

CABINET TRACER WIRE CONNECTION DETAIL

ITS EQUIPMENT/CABINET LABELING EXAMPLE

IN ADDITION TO LABELING EACH DEVICE WITH LABELS AS WRITTEN IN THE ITS SPECIFICATIONS, INCLUDE A CABLE TAG WITH SITE AND DEVICE INFORMATION, SEE ITS EQUIPMENT SPECIFICATIONS FOR ADDITIONAL DETAILS.

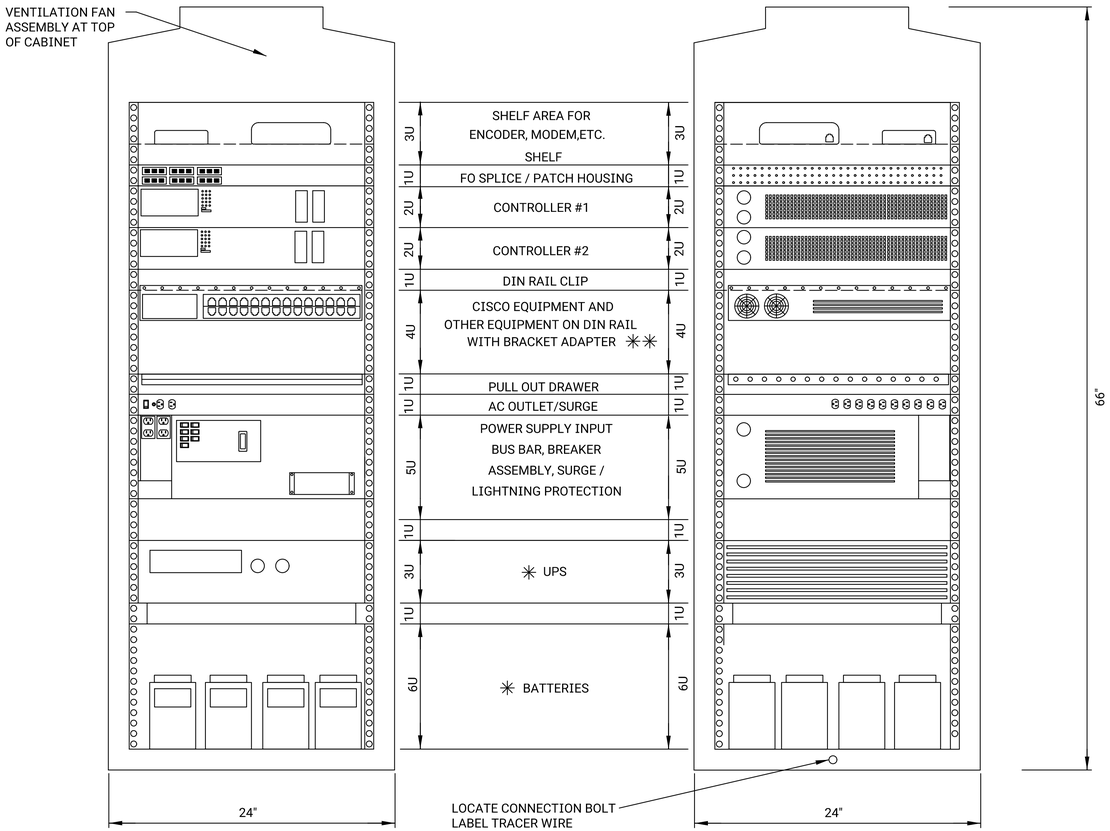
SITE NAME
MILE MARKER
SWITCH IP ADDRESS & VLAN
SWITCH PORT ASSIGNMENTS/CONFIGURATIONS/VLAN

DEVICE IP ADDRESS(ES)
DEVICE IP ADDRESS(ES)
DEVICE IP ADDRESS(ES)

NOTES

GENERAL NOTES:

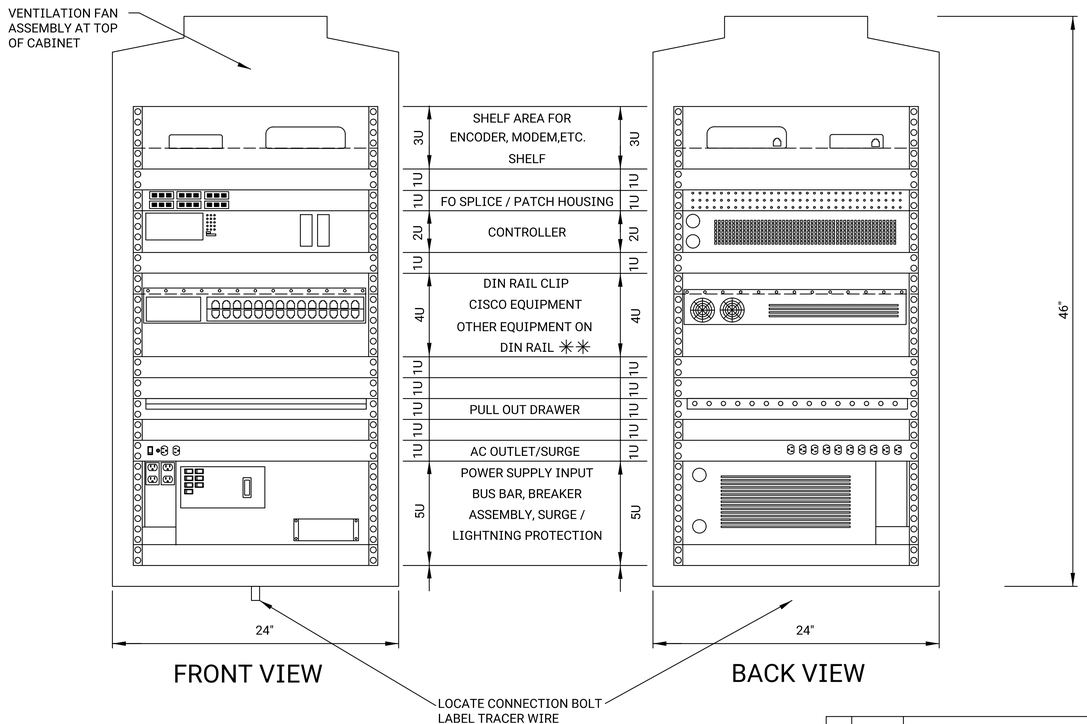
1. Power supply assemblies and connections shall be mounted a minimum of 12 in above the bottom of ground mounted cabinets.
2. Contractor shall submit actual cabinet elevations to the Engineer for approval prior to installation.
3. See ITS plans and specifications for equipment to be included in cabinets.
4. Door filters shall have full back plates enclosing filter and holding filter in place.
5. Provide a rack elevation drawing for each ITS cabinet within the project showing the front, rear, and side views for proposed equipment placements. Clearly indicate equipment dimensions on elevation drawings.
6. ✳✳ Provide a second DIN rail with bracket adapter for ITS equipment if additional space is required, or as requested by the Engineer. Second DIN rail with bracket adapter shall be incidental to the site bid item.
7. Include louvered back plate on all cabinets.



TYPICAL TYPE 334 CABINET PAD MOUNT

NOTE: 1U = 1.75 INCHES

✳ UPS + BATTERIES INCLUDED ONLY WHERE NOTED



TYPICAL TYPE 336S CABINET POLE MOUNT

NOTE: 1U = 1.75 INCHES

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

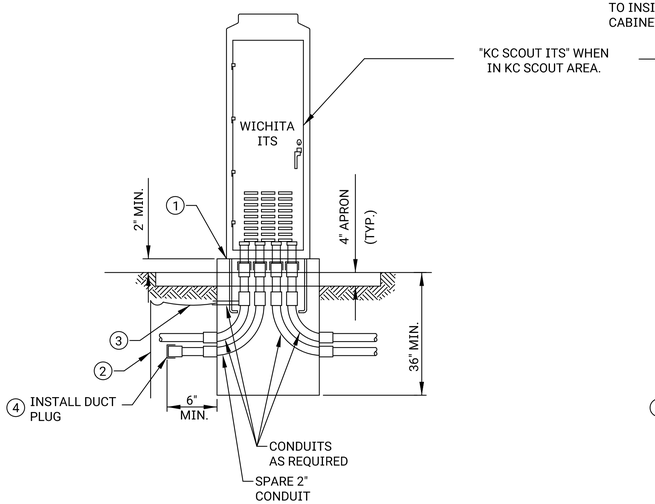
TYPICAL 334 AND 336S CABINET LAYOUT

ITS-D04 08-23-21

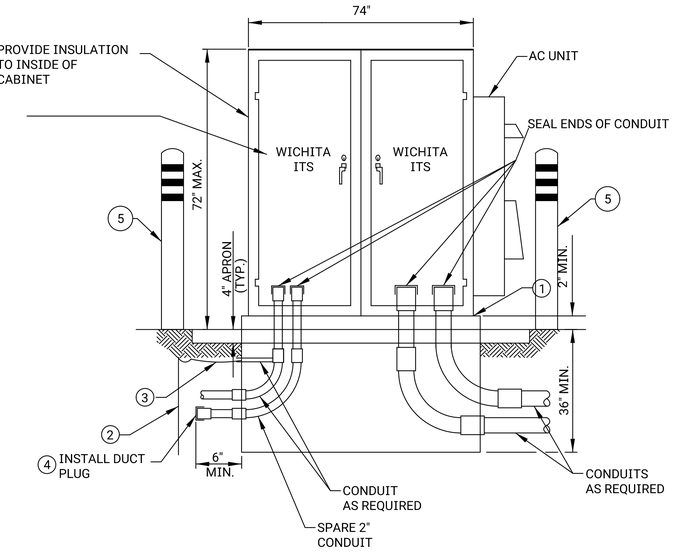
FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

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File : ITS-D04.dgn

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	32	57



SINGLE CABINET (NEW FOUNDATION)



DOUBLE CABINET (NEW FOUNDATION)

NOTES:

1. 50 year silicone caulk between cabinet and base.
2. Grounding rod, 3/4 in x 20 ft min. If subsurface conditions exist which prohibit the placement of the ground rod in a vertical position, the rod may be driven at an oblique angle not to exceed 45 degrees from vertical or buried in a trench at least 2.5 ft deep. Connection to ground rod shall be exothermically welded.
3. Minimum No. 4 copper grounding conductor from cabinet equipment ground bus to ground rod.
4. F&I in spare conduit, stub out 6 in from face of foundation. F&I duct plug.
5. 6" schedule 40 round steel pipe filled with concrete. Prime & paint all exposed surfaces yellow. Dome top of bollard. Bollards shall be placed on all four corners of double cabinet foundation. Bollards shall be placed so they do not interfere with cabinet doors.

GENERAL NOTES:

1. Slack for fiber optic cable shall be placed in pull boxes and splice vaults adjacent to cabinet. 10 ft of slack shall be placed within controller cabinet.
2. Conduit must enter cabinet foundation onthe same side as its approach run.
3. Install 6" PVC between each splice vault and the base of the Hub Cabinet. All material and labor for this work shall be included in the cost for the install of the Hub (Double) Cabinet.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS CABINET DETAILS

~~ITS-D05~~ 07-14-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

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Drawn By : sspatil
File : ITS-D05.dgn

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	33	57

CABINET FOUNDATION NOTES:

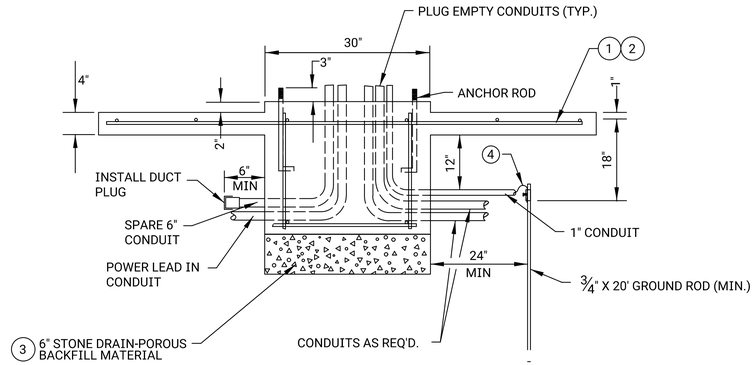
1. ALL REINFORCING BAR USED IN THE CONSTRUCTION OF THE CABINET FOUNDATION SHALL BE NO. 4 BARS, EVENLY SPACED AT 12 IN SPACING, +/- 1.5 IN. SEE ITS-D06 FOR DETAILS.
2. REBAR SHALL BE ADJUSTED TO ACCOMMODATE CONDUIT AND BOLLARDS.
3. STONE DRAIN MATERIAL SHALL CONFORM TO THE STANDARD SPECIFICATION.
4. MINIMUM NO. 4 COPPER GROUNDING CONDUCTOR FROM CABINET EQUIPMENT GROUND BUS TO GROUND ROD.
5. F&I 2 IN SPARE CONDUIT, STUB OUT 6 IN FROM FACE OF FOUNDATION. F&I DUCT PLUG.

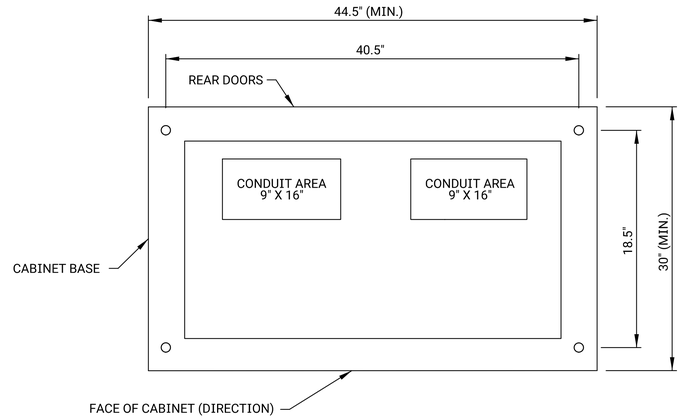
GENERAL NOTES:

1. BASE DIMENSIONS MAY VARY DEPENDING ON CABINET. CONTRACTOR SHALL VERIFY DIMENSIONS FROM CABINET MANUFACTURE PRIOR TO CONSTRUCTING BASE.

2. BOLLARDS SHALL SPACED SO THEY DO NOT INTERFERE WITH CABINET DOORS. THIS SHALL BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

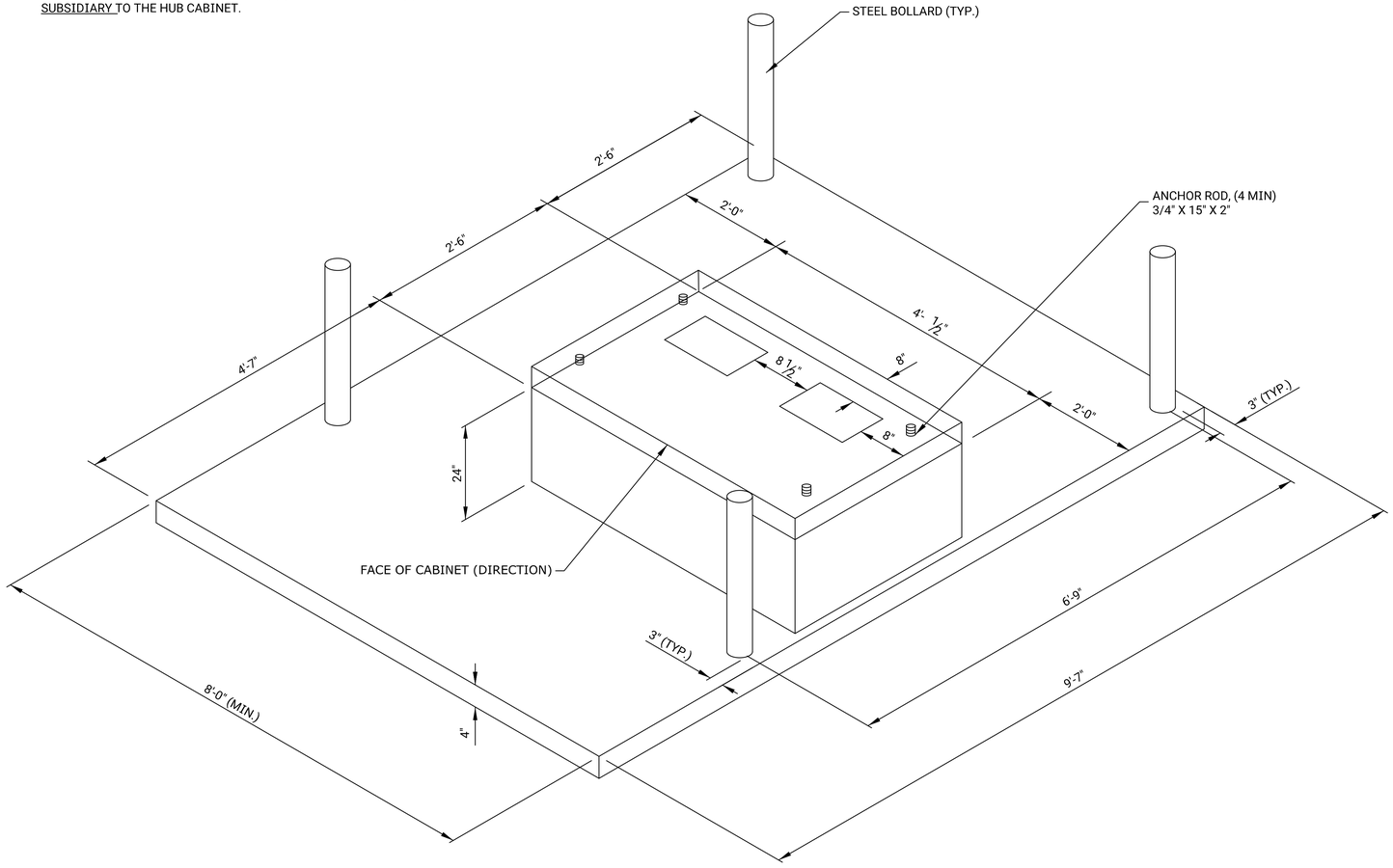
3. ON HUB CABINETS (NOT SIGNAL CABINETS), AN EMPTY 6" CONDUIT SHALL BE PLACED BETWEEN HUB CABINET AND ADJACENT SPLICE VAULTS. CONDUIT MAY BE EITHER PVC OR HDPE, BUT SHALL BE PLUGGED AT EITHER END. CONDUIT IS SUBSIDIARY TO THE HUB CABINET.



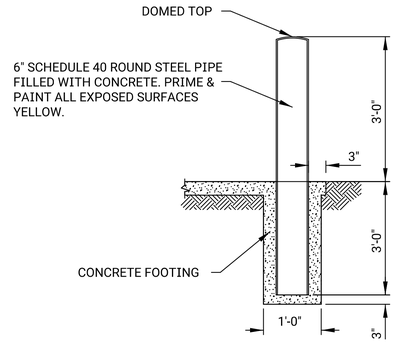


BASE PLAN

BASE DIMENSIONS MAY VARY DEPENDING ON CABINET. CONTRACTOR SHALL VERIFY DIMENSIONS FROM CABINET MANUFACTURE PRIOR TO CONSTRUCTING BASE.



FOUNDATION & PAD DETAILS



BOLLARD DETAIL

1. 6" SCHEDULE 40 ROUND STEEL PIPE FILLED WITH CONCRETE. PRIME & PAINT ALL EXPOSED SURFACES YELLOW. DOME TOP OF BOLLARD.

2. BOLLARDS SHALL SPACED SO THEY DO NOT INTERFERE WITH CABINET DOORS. THIS SHALL BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

3. ALL WORK ASSOCIATED WITH INSTALLATION, CONSTRUCTION, & FABRICATION OF 6" STEEL BOLLARDS SHALL BE SUBSIDIARY TO THE BID ITEM "BOLLARD (PERMANENT)". THIS SHALL INCLUDE ALL THE TIME, MATERIALS, & EQUIPMENT NECESSARY FOR INSTALLATION & FABRICATION WHETHER SPECIFICALLY MENTIONED OR NOT. CONCRETE FOOTING SHALL BE SUBSIDIARY TO "BOLLARD (PERMANENT)".

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS DOUBLE CABINET FOUNDATION DETAILS

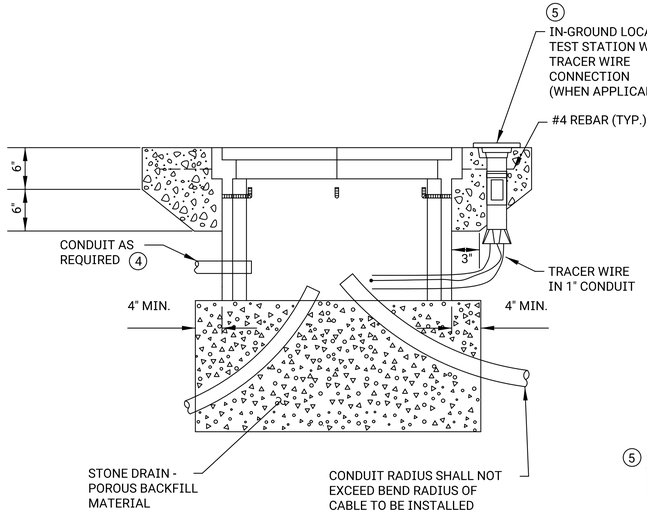
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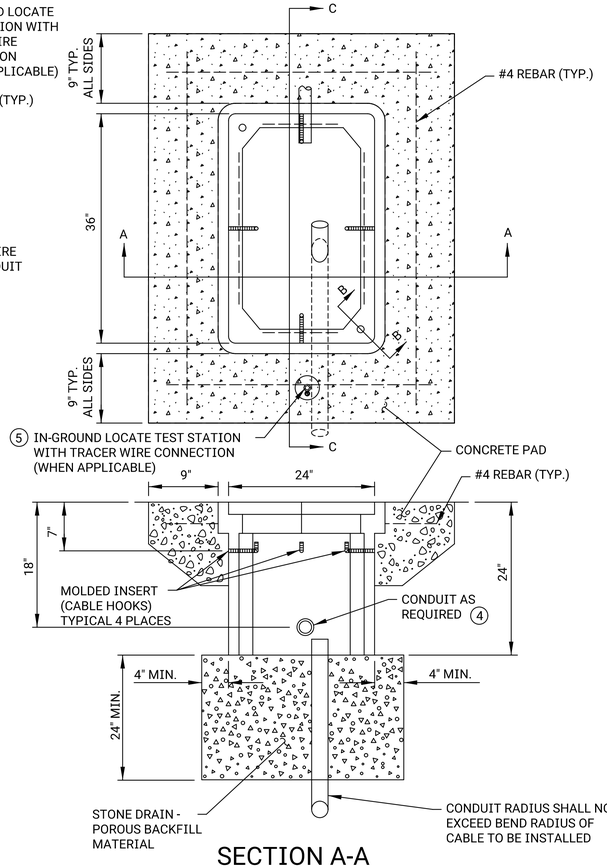
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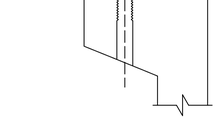
STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	34	57



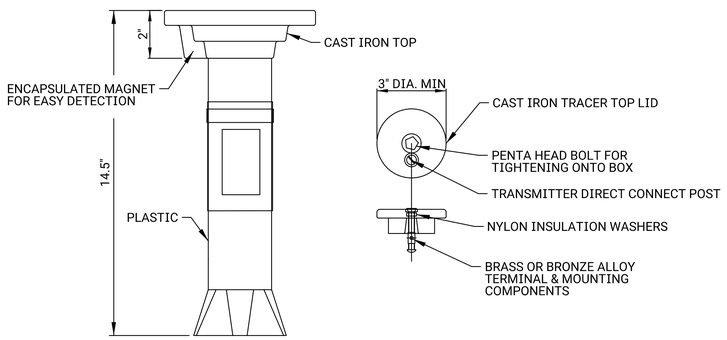
SECTION C-C



SECTION A-A

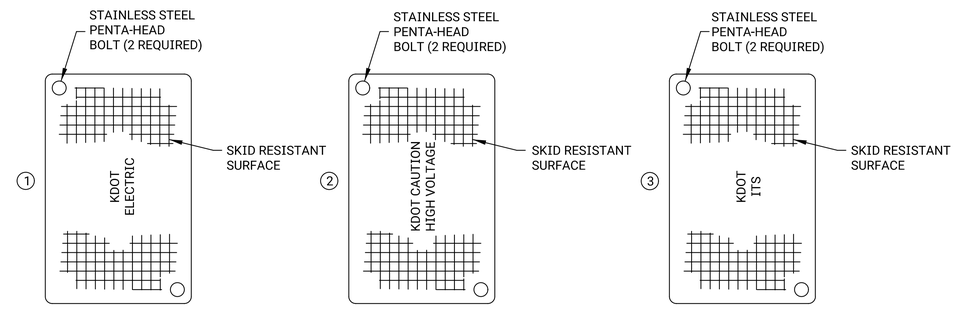


SECTION B-B
TYPICAL BOLT CLEANOUT



IN-GROUND LOCATE TEST STATION DETAIL FOR COMMUNICATION PULL BOXES ONLY

1. TRACER WIRE SINGLE TERMINAL SHALL BE SOLID BRASS OR BRONZE ALLOY & ACCESSIBLE FROM THE TOP OF LID WITHOUT REQUIRING LID REMOVAL.
2. TRACER LID SHALL BE ORANGE FOR COMMUNICATIONS AND RED FOR POWER AND INCLUDE A CAST-IRON FLANGE FOR LOW TRAFFIC.



PREFORMED PULL BOX COVER

GENERAL NOTES:

1. All dimensions shown are in inches unless otherwise noted.
2. Preformed box walls may be either flared or vertical.
3. At the Engineer's discretion, bury electrical pull boxes six inches below grade. Concrete pad is not required when electrical pull box is buried.
4. If an extension is used with a preformed box, the lip of the extension may be interior or exterior. The extension shall be compatible and from the same manufacturer.
5. Conduit shall enter the pull box from the side of the box or from the bottom. If using side entry conduit, ensure bend radius of cable is not exceeded when pulling cable.
6. Side entry conduit shall only be used for RMC, bridge conduit transition, or short splice vault / pull box connections.
7. Pull box and cover shall be rated for a minimum loading of tier 22 per ANSI/SCTE 77, current edition.
8. Stone drain material shall conform to the standard specifications and shall be clean aggregate.
9. Provide KDOT with one stainless steel penta-head socket and pull box lifting hook for every 20 pull boxes installed. A minimum of one stainless steel penta-head socket and one pull box lifting hook must be provided for each project.
10. Substitute "KC SCOUT" for "KDOT" when installations are in KC Scout area.
11. Conduit must enter pull box on the same side as its approach run.
12. All communications and power pull boxes and splice vaults shall be equipped with locate testing stations. Separate stations shall be provided for power and communications conduit. Separate stations will be required for each power or communications run (E.G. entry and exit straight through would require one test station). Multiple runs will require multiple test stations. Selectable ground (and grounding per manufacturer recommendation) is required at each location where there is a splice vault, both sides of a bored conduit deeper than 4', when a run changes direction greater than forty-five degrees or at the end of a fiber run (or start of a branch run). If an existing mow strip or splice vault that the contractor is connecting to is not equipped with a test station, new test stations will be required to be installed on the existing and new lines.

NOTES:

1. Pull boxes with 120/240V conductors shall have 5" x 11" cast-in, stamped concrete labels with "KDOT/ELECTRIC". Text shall be 2 in high and centered. Maintain adequate letter width and spacing.
2. Pull boxes with 480V conductors shall have 5" x 11" cast-in, stamped concrete labels with "KDOT CAUTION/HIGH VOLTAGE". Text shall be 2 in high and centered. Maintain adequate letter width and spacing.
3. Pull boxes with loop lead-in cables, detector cables, communication cables, or DMS cables shall have 5" x 11" cast-in, stamped concrete labels with "KDOT/ITS". Text shall be 2 in high and centered. Maintain adequate letter width and spacing.
4. All metal conduits shall be electrically bonded by a ground bushing and No. 4 bare copper wire.
5. All KDOT ITS Communication Pull Boxes must include an in-ground locate test station(s). Locate stations are required for each direction of conduit leaving the pull box. Test stations must be located on the same side as conduits is exiting pull box. Match test station color to the color of the related conduit. Test stations are incidental to pull boxes.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

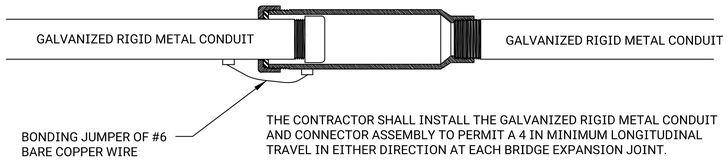
ITS PULL BOX DETAILS

ITS-D07 11-27-23

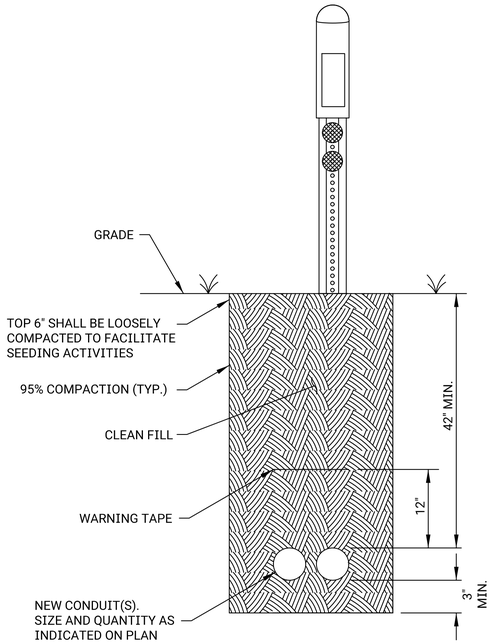
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KANSAS	472-085898	2025	35	57



EXPANSION FITTING



FIBER OPTIC TRENCH DETAIL

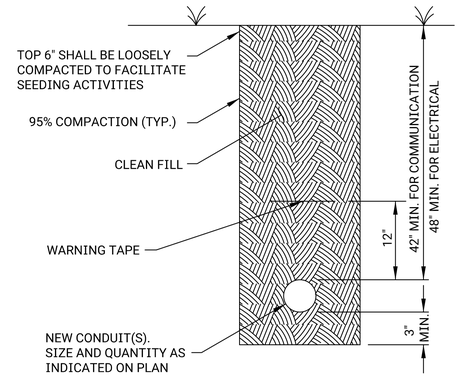
FIBER OPTIC CONDUIT MARKERS TO BE PLACED AT:

1. BEGINNING AND END OF BACKBONE/BRANCH CONDUIT RUNS OVER 100 FT

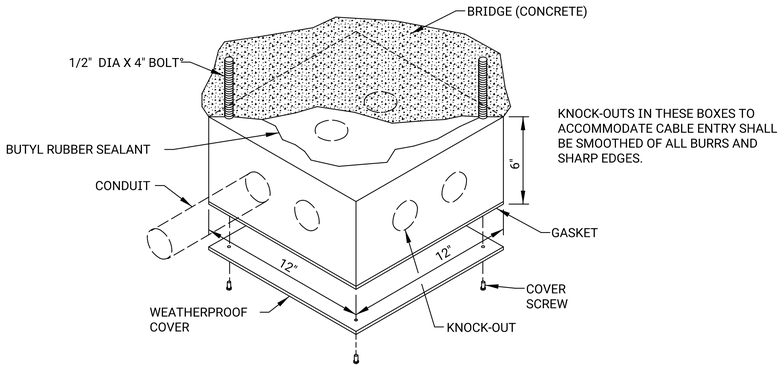
2. EVERY 500 FT FOR BACKBONE/BRANCH CONDUIT RUNS ADJACENT TO R/W

3. BEGINNING AND END OF CONDUIT RUNS ON STRUCTURE

4. AT SPLICE VAULTS (IF NOT A TERMINATION POINT ALREADY)
   a. ADD 1 REFLECTIVE DISK TO MARKER IF A SPLICE VAULT WITH SLACK COIL
   b. ADD 2 REFLECTIVE DISKS TO MARKER IF A SPICE VAULT WITH SLACK COIL AND A SPLICE ENCLOSURE
   c. REFLECTIVE DISK SHALL BE A ROUND, AMBER, 3" DIAMETER REFLECTOR WITH CENTER MOUNT.

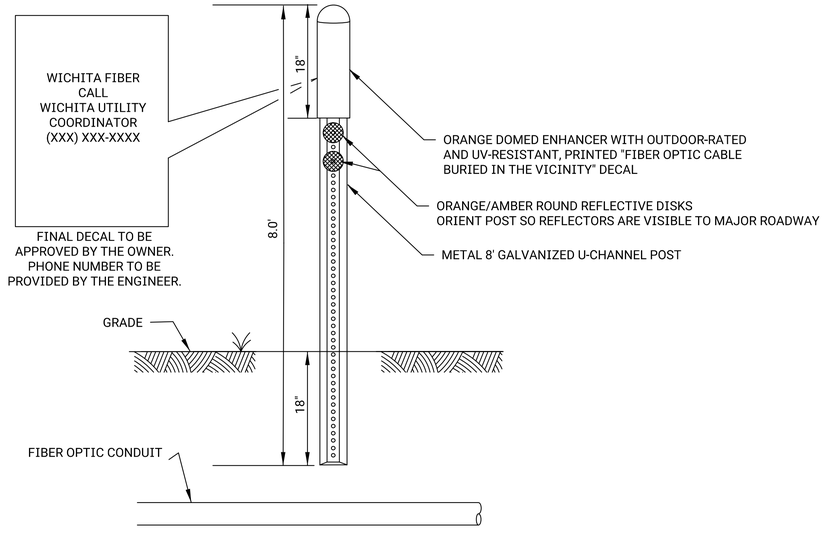


TRENCH DETAIL (NON FIBER)



THE JUNCTION BOX IS TO BE ATTACHED TO THE BRIDGE. THE CONTRACTOR SHALL DRILL TWO HOLES IN THE BOTTOM OF THE BOX AND BOLT THE JUNCTION BOX TO THE BRIDGE AT THE INSERTS PROVIDED. BOLTS SHALL BE 12 IN DIA. BY 4 IN LONG AND SHALL CONFORM TO ASTM F3125. A WASHER SHALL BE INSTALLED BETWEEN THE BOLT HEAD AND BOTTOM OF THE BOX.

ABOVE GROUND JUNCTION BOX



FIBER OPTIC CONDUIT ABOVE GROUND DELINEATOR DETAIL

GENERAL NOTES:

All utility crossings under roadway should have a minimum of 5 ft of cover below crown grade or 3 ft cover below ditch grade.

Refer to the KDOT Utility Accommodation Policy for bridge attachment details.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

CONDUIT STRUCTURAL ATTACHMENT AND TRENCH DETAILS

ITS-D10 07-10-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
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STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	36	57

CONSTRUCTION AND MATERIAL REQUIREMENTS FOR INTELLIGENT TRANSPORTATION SYSTEM (ITS) INSTALLATIONS

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6.0	PULL BOXES, SPLICE VAULTS, AND JUNCTION BOXES	SHEET S03
7.0	WIRING	SHEET S03
8.0	GROUNDING, POWER SUPPLY ASSEMBLY, AND POWER	SHEET S04
9.0	CONCRETE FOUNDATIONS	SHEET S05
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~~17.0~~	~~POINT-TO-POINT (P2P) ETHERNET RADIO (LICENSED BAND)~~	~~SHEET S12~~
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21.0	TRAINING	SHEET S14
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23.0	MAINTENANCE AND WARRANTY	SHEET S14
24.0	TRM CHECKLIST	SHEET S15

1.0 DESCRIPTION

These specifications describe the equipment, material, and construction requirements to complete the lump sum Intelligent Transportation System (ITS) bid item. Compliance by the Contractor with the Specifications and Plans does not relieve the Contractor of the responsibilities of furnishing equipment and materials of proper design and installation to meet operating warranties for all ITS related components.

2.0 BID PREPARATION

Confirm the existing conditions before preparing the bid. Topography as shown on the plans is derived from existing roadway plans. Visit the site of the work and make a determination of the amount of rock, unclassified, or other materials that might be encountered. No additional pay will be made for differences in material encountered. Review the locations of devices and conduits throughout the project area prior to submittal of bid to determine the types and extent of incidental installation, removal, relocation, and replacement items to include in the price.

3.0 MATERIALS

All materials shall conform to the requirements for individual components of the ITS identified in these Specifications. All materials shall be as specified in the Summary of Quantities on the Plans and shall meet the Buy America Act requirements outlined in Section 106 of KDOT's Standard Specifications.

3.1 BASIS OF ACCPTANCE

Acceptance of material furnished under these specifications will be based on satisfactory submittals that meet the requirements of section 4.0 and on the Engineer's approval of submittals where "no exceptions taken" or "exceptions as noted" is indicated.

3.2 KDOT SUPPLIED MATERIALS

KDOT may provide equipment such as Cisco equipment, VDS, DMS, DMS cabinet, DMS multimode communication cable, and analog CCTV cameras for installation by the Contractor, as noted in the plans. Refer to the Summary of Quantities in the plans for specific KDOT supplied items. When using KDOT furnished equipment, the KDOT furnished equipment shall become the Contractor's responsibility upon delivery of this equipment to the Contractor.

4.0 SUBMITTALS

Submit one electronic copy of each submittal group to the Engineer for review and approval. At the same time, submit an electronic version to the KDOT ITS unit and others as directed by the KDOT ITS unit. Include in each submittal sufficient information and details to permit full evaluation of each item. Submittals, which in the judgment of the Engineer are insufficient to permit proper evaluation, will not be reviewed. Take care to address all the requirements of the Contract Documents in the submittal data. Leave nothing to assumption. Address the functional and technical interrelationships among the various items in detail.

In each submittal group, state all relevant information regarding materials and equipment in order to procure exact replacements of any or all items on the project. To be acceptable, provide a material list for each submittal group containing all items supplied by the Contractor for the group. The Engineer reserves the right to reject an incomplete or unclear submittal. Identify the materials on the list by the contract project number, item description, catalog part numbers, catalog cuts, shop drawings, trade names, and schedules or other pertinent information. Clearly indicate the materials from any catalog cuts. Note any material designation used in the Contract Documents on the materials list. Submit all manufacturer product sheets for review and approval.

For each item, include in the documents all information necessary to determine product specification compliance. Clearly indicate, on the documentation, the exact model number, accessories, and options that are being proposed for use. If standard manufacturer documentation does not specifically address all the product requirements, then obtain a letter from the manufacturer certifying compliance with each referenced requirement that is not indicated on the standard documentation. If reprinted literature, such as catalog cut sheets, is used to satisfy some or all of the submittal data requirements, do not include any statements on the literature which conflict with the requirements of the Contract Documents. Cross off and initial any such statements. Give an explanation of how specifications shall be met pertaining to items changed from the literature.

4.1 SUBMITTAL SCHEDULE AND REVIEW PERIODS

Submit product data submittals and shop drawings in a timely manner to allow for job completion within the contract working days. All submittals and shop drawings to be approved prior to installion on site.

For each submittal, plan for any given package of submittal information to be in the hands of the Engineer for up to 15 business days. Obtain final approval, in writing from the Engineer, on all items within the submitted documentation. No time extensions will be granted as a result of having to resubmit items for review or having to make any modifications necessary to any submitted documentation. Review of the submittal data by the Engineer will not relieve the Contractor from obligation to furnish and install the work in accordance with Contract Documents.

4.2 SUBMITTAL REQUIREMENTS

Certify, by stamp or letter, that the material has been reviewed and approved and that it conforms to the requirements of the Contract Documents. If this certification is not included, the submittal will be returned without action.

Submit electronic shop drawing submittals for structural items in Group 5 such as CCTV poles and DMS structures as full size created documents or larger. The intent of this requirement is to provide a legible set of shop drawing submittals to allow for a thorough shop drawing review.

At the time of each submittal, define and delineate in writing, separate from the certification, any deviations from the Contract Documents. If the Engineer accepts this deviation, the deviation will be authorized by issuing a change order or if the deviation is minor, by endorsement to the letter.

To aid in control of the submittal data process, transmit each group of submittal data to the Engineer using a transmittal sheet. The Engineer will date-stamp these transmittal sheets with the date received and will return a copy of the stamped transmittal sheet when returning the submittal data. List on the transmittal sheet specifically each item or element included in the transmittal. An element is one part of several parts of information related to the same item. Each drawing shall be listed separately. Furthermore, each drawing shall have a unique drawing number that can be referenced. The same drawing number shall not be used on more than one sheet.

The Engineer review will be only for conformance with the design concept of the work and for compliance with the information contained in the Contract Documents. The review of a specified item, as such, will not indicate review of the assembly in which the item functions. Review by the Engineer will not relieve the Contractor from responsibility for any errors or omissions in the submittals nor from his responsibility for complying with the Contract Documents.

4.3 SUBMITTAL GROUPS

Submit the data for the items in each group together. In general, no items in any group will be accepted until all items in the group are accepted; however, the Engineer may accept some items in a group, at his or her discretion, prior to all items being approved. Submit all additional devices that are not specifically listed below with the appropriate group. Clearly label on each submittal the intended location and purpose for each submitted product. KDOT may provide a list of required submittals to include. For submittal purposes, submit the data for the following items in groups defined as follows:

Group 1 - Conduit, Pull Boxes, Wiring, and Electrical
- HDPE conduit
- Rigid metallic conduit
- Conduit couplings and/or reducers
- Pull boxes
- Splice vaults
- Electrical conductors
- Power service equipment
- PVC Tape
- Grounding equipment
- Air terminal equipment
- Warning tape
- Tracer wire
- Pull rope
- Duct plugs
- Surge Protection Device

Group 2 - Cabinet Assembly
- Cabinet
- Field traffic controller
- Fluorescent or LED cabinet lights and fixture
- Fan and thermostat assembly
- Power supply
- Power strip
- Detector card
- Cabinet rack elevation drawings (See ITS-D04)
- All other cabinet equipment except CCTV and communications equipment
- Load center
- Locking system
- Filter
- Door plate label
- Alarm
- Cabinet wiring diagram
- Surge Protection Device
- Label Maker, Label Tape and Materials

Group 3 - ITS Device Equipment
- Encoder
- Cat 6 cable
- Communication Switch
- Ethernet/Data transceiver
- PoE Injector
- Pavement sensor
- Vehicle detector
- Sensor mount
- Co-Ax cable
- Cellular equipment
- Communication Surge Protection Device
- Media converter
- CCTV camera and power supply
- CCTV cables
- CCTV mounting equipment
- Detector cable

Automated Gate System
RWIS
Trailer Mounted Devices
Bluetooth detection system
Shop drawings for CCTV camera lowering device, including composite cable for CCTV
Shop drawings and specification for IP CCTV cameras including EPA and weight
Wireless point to multi-point IDU radio, ODU antenna, power supply, mounting equipment, and radio cabling
Wireless point to point IDU radio, ODU antenna, power supply, mounting equipment, and radio cabling
Other communications equipment or accessories

Group 4 - Fiber Optics
- Fiber optic cable
- Fiber optic patch cable
- Fiber optic splice enclosure and trays
- Fiber distribution assembly
- Fiber optic patch panels
- Fiber connectors
- Cable labels
- Closet connector housing assembly
- Any other fiber optic equipment

Group 5 - CCTV, Detector, and DMS Support Structures (send electronic submittal). Structural shop drawings to be reviewed by design Engineer (or consultant of record) with final approval by KDOT.
- Shop drawings for DMS structures, foundations, and DMS mounting details
- Shop drawings for CCTV pole (including handhole locations) and foundation
- Shop drawings for detector pole and foundation
- All other structural submittals

Group 6 - Testing
- Ground resistance testing procedure and equipment
- Example fiber optic test results sheet
- Test procedures not provided by KDOT
- KDOT may provide DMS and CCTV test procedures
- Fiber optic testing equipment and testing procedures
- Fiber optic test equipment calibration certifications (recalibrated within the last year)

Group 7 - Other
- Cisco network and fiber optic splicing certifications
- Fiber optic cable installation procedure and splicing resume
- Miscellaneous items that did not fall in any of the previous groups

4.4 STRUCTURAL AND FOUNDATION SHOP DRAWINGS

For all non-catalog or custom made items including the support structures and foundations for VDS, CCTV and DMS, submit shop drawings for approval along with other data necessary to permit full evaluation of the proposed product and/or material. Obtain approved submittals prior to purchase or fabrication of any support structures for use on this project. Roadside DMS leg lengths may be determined in field. Note in shop drawings included in the submittal.

Structural and foundation shop drawings and calculations shall be sealed and signed by a Professional Engineer licensed in the State of Kansas.

No additional payment will be made for Contractor geotechnical work. Historical boring log data may be provided by the Engineer.

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KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S01 07-21-23

FHWA APPROVAL		APP'D.	
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STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	37	57

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 Noted - Resubmittal Not Required";
3. "Rejected - Resubmittal Required";
4. "Review Not Required".

Proceed with any items marked "no exceptions taken" since the Engineer has taken no exception to the submittal. Proceed with any items marked "exceptions noted - resubmittal not required", provided that the Contractor concurs with the notations. In such case, proceed immediately to correct said items and resubmit them for review. Items that are marked "rejected - resubmittal required" 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 CCTV. 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.

If Micro-Duct is identified in the plan, reference ITS-SMD for all Micro-Duct Pathway details and specifications.

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 in all underground conduit.
See ITS-D07, D08, and D09 for additional information regarding test stations and tracer 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.

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

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 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.

5.4.9 TRACER WIRE
Tracer wire shall either run continuous through splice vault, or be grounded per D07, D08 and D09 as appropriate or as required per this specification. Tracer wire shall be installed on all conduit runs (including power and communications). 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.

After final project completion and prior to project acceptance Contractor shall coordinate with KDOT ITS to perform an initial one-call locate to ensure new and existing tracer wire and test station is working properly.

Contractor is responsible for one-call locates of the newly constructed facilities during construction and until final acceptance.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S02 11-27-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

Plotted : 12-FEB-2025 16:50
Drawn By : sspatil
File : ITS-S02.dgn

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	38	57

5.4.10 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 and compact all trenches.

5.4.11 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.

5.4.12 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.

5.4.13 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 Galvanized RMC for all above ground external conduit as noted in Section 5.2.1. 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.

5.4.14 GROUNDING AND BONDING
In all conduits for electrical cables, except spare conduit, install a 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.

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

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 modified 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 Tier 22 per ANSI/SCTE 77, current edition. Equip each pull box and splice vault with a bolt down cover of the same material and rating per ANSI/SCTE 77, current edition. 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 labeled with 5" x 11" cast-in, stamped concrete with "KDOT CAUTION-HIGH VOLTAGE". Covers on pull boxes that contain electric cable (120V/240V) shall be labeled with 5" x 11" cast-in, stamped concrete with "KDOT ELECTRIC". Covers on pull boxes that contain communication cable shall be labeled with 5" x 11" cast-in, stamped concrete with "KDOT ITS". Covers on all other pull boxes or splice vaults shall be labeled with 5" x 11" cast-in, stamped concrete with "KDOT ITS" unless otherwise directed by the Engineer. Maintain 2 inch tall block letter widths and spacing. Substitute "KC SCOUT" for "KDOT" on KDOT ITS vaults in the KC Scout area and use 4 inch tall block letter widths and spacing.

Covers on pull boxes and splice vaults shall be rated for a minimum loading of Tier 22 per ANSI/SCTE 77, current edition.

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) of the KDOT Standard Construction Specifications, use crushed stone.

6.2.4 IN-GROUND LOCATE TEST STATION
Furnish an in-ground locate test station for each ITS Splice Vault and ITS Communication Pull Box. The tracer wire terminal shall be solid brass or bronze alloy and be accessible from the top of the test station without requiring removal of the lid. The locate test station lid shall be orange and include a cast-iron flange for low traffic. Submit the proposed test station for approval by the Engineer prior to installation.

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.

The distance between Pull Boxes and/or Splice Vaults shall not exceed 0.5 miles along a route.

When installing ITS communication pull boxes and splice vaults, construct a concrete pad around the perimeter 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 leased fiber conduit by at least 36 inches. Excavate a new trench adjacent to the leased fiber conduits to allow the KDOT conduits to be re-aligned to intercept the new splice vault offset from the leased fiber conduits. Maintain minimum bending radius for the conduit. Contact the owner of the leased fiber two weeks in advance of excavation adjacent to leased fiber conduits. Do not enter (open, cut into) leased fiber conduit at any time. Only designated representatives from the company which owns the vault has access to the 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.

6.3.4 IN-GROUND LOCATE TEST STATION
Install an in-ground locate test station for each ITS Splice Vault and ITS Communication Pull Box. The in-ground locate test station shall be embedded in the concrete apron surrounding the splice vault or pull box as shown in the splice vault and pull box details. Provide a flexible metallic conduit from the test station to the inside of the vault as shown in the details. Ensure all tracer wires are securely connected to the test station as recommended by the test station manufacturer. The tracer wire shall be connected to the terminal so as to provide a continuous locating system throughout the limits of each device site.

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 6 or higher Ethernet cable with RJ-45 connectors, gold plated, shielded, and allow for power over Ethernet.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S03 11-15-23

FHWA APPROVAL		APP'D.	
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Drawn By : sspatil
File : ITS-S03.dgn

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	39	57

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.

7.3 CONSTRUCTION REQUIREMENTS

7.3.1 PULLING
Use insulating types of pulling compounds containing no mineral oil. Follow the pulling tension limits recommended by the wire and cable manufacturer. Use a dynamometer where mechanical means are used. Cut off section subject to mechanical means.

7.3.2 BENDING RADIUS
Use a minimum bending radius for all cable, except fiber optic cable, that is greater than the manufacturer's minimum bending radius and greater than six times the overall cable diameter.

7.3.3 SPLICES
Use continuous low voltage power conductors from the power supply to the control cabinet and not spliced in pull boxes or junction boxes unless indicated on plan. Install all other cables continuous, without splices, from termination to termination. Where required, splice where shown on the Plans or as approved by the Engineer where required for cable installation. Receive pre-approval by the Engineer for all splices and locations.

If splicing in power supply circuits where the voltage does not exceed 600 Volts AC, utilize splices made with approved spring-type wire connectors. Soldered connections will not be permitted. The insulation for the splice shall consist of two layers of electrical rubber tape, four layers of plastic electrical tape, and two layers of friction tape. Securely apply the tapes over the bare wire splice area and back onto the original insulation a minimum of one inch. Apply a minimum of three coats of approved liquid waterproof compound to the splice. The finished splice's electrical and mechanical characteristics and insulation quality are required to be equal to those of the original cable.

Splice conductors only in pull boxes, terminal compartments, pedestals, or cabinets. Splices are not allowed in conduits. Where possible, install cable continuous, without splices, from termination to termination.

7.3.4 INSTALLATION
Install low voltage control and communications cables in conduit separate from power cables, unless otherwise noted on the Plans. Ground the shield of shielded cables at one end only and as recommended by equipment manufacturer. Install and terminate vendor furnished cable in accordance with vendor equipment requirements.

8.0 GROUNDING, POWER SUPPLY ASSEMBLY, AND POWER

8.1 GROUNDING
Ensure that all equipment, devices, wiring, power supplies, and service antennas are protected from external and internal sources, including power surges, lightning, induced voltages, and static discharges. A minimum of 20' equivalent ground rod is required at any location. An alternative grounding array may be submitted by the Contractor for approval by the Engineer to meet site specific field conditions. Ensure that ground rods are listed according to UL requirements as detailed in the standard UL 467, Grounding and Bonding Equipment, and meet the requirements of NEC 250. Use electrodes that are solid copper or copper-bonded steel. Use grounding rod attachments that are minimum No. 4 tin-plated bare copper wires. All components of the lightning protection system shall conform to the current edition requirements of UL 96A and NFPA 780.

Exothermically weld all underground ground rod attachments at all connection points. When ground rods are above ground and inside cabinets, mechanical connections or exothermic welds are both permitted. Bond all metal components of the ITS device subsystem, such as the cabinets, racks, and steel poles, to the grounding system with a grounding cable that uses a mechanical connection on the equipment side and an exothermically welded connection at the down cable.

8.2 GROUND RESISTANCE TESTING AND CERTIFICATION
Per NEC Article 250, achieve a resistance to ground measurement of 25 ohms or less in dry conditions between the grounding electrode and the soil (using multiple electrodes or extending links, if necessary). Isolate the ground rod from the connected system during testing. Make all connections to the grounding electrode using exothermic welds.

Connect all grounding electrodes related to the ITS device and its subsystems, and any grounded electrical system within a 100 foot radius (but not beyond the right of way) of the ITS cabinet base, to a single point main grounding electrode, sometimes referred to as the ground window, which shall be driven a maximum of 3 feet from the base of the ITS cabinet. Provide for each grounding electrode an interfacing hemisphere, which is an imaginary cylinder with a radius and depth equal to the length of the electrode, so each additional electrode must be spaced two times the electrode length away from other electrodes. Bury the bonding wires a minimum of 2 feet below the grade.

Measure the ground resistance with an instrument designed specifically to measure and document earth/ground resistance, soil resistance, and current flow. Perform testing in the presence of the Engineer or their approved representative. Do not bury the exothermic connections to the ground rod until grounding has been approved by the Engineer. Record the approximate ground rod distance from the foundation for future location identification. Conduct the test by using the fall-of-potential method as described in the IEEE Standard 142-2007. Provide the Engineer with written test results for each testing location prior to backfilling the grounding electrode. Include in the test results the instrument model and date of calibration for the device used in the testing and the local environmental conditions at the time of testing. Certify and sign the test results. The 60-day acceptance test for any device at each site will not start until ground resistance testing reports are submitted to the Engineer for that particular site.

8.3 DESCRIPTION
Provide a complete interface between the project electrical distribution system and the utility company providing power service. New service points will be established as indicated on the Plans. As necessary, provide a service pole or pedestal, meter socket, circuit breakers, weatherproof enclosure for the breakers, risers, grounding materials, fittings, and adapters. Circuit breakers and disconnect switches required as indicated on the Plans. Any work to bring the power from outside of the right-of-way to the right-of-way will be completed by utility company providing power service. Comply with the National Electrical Code (NEC) for all work. Pay particular attention to grounding specifications regarding netural and ground connections at ITS power supply assemblies and cabinets.

Perform the following: Process an application for electrical service for each location, coordinate with the Utility to ensure the proper location of electrical services provided by the utility, provide the Utility with the construction schedule so that power is available when needed. Coordinate with the Utility for installation of the power meter. Contractor is required to install conduit and conductors as required and as directed by Utility between power source and the ITS power service. Contractor shall work with Utility to meet conduit and conductor requirements. Contractor shall be responsible for ordering and paying for any electrical service in KDOT's name when in KDOT area or KC Scout's name when in KC Scout area at the locations shown on the plans. Contractor shall make payment of all power company fees until KDOT or KC Scout assumes ownership. KDOT will take possession of electrical bills 60 days after KDOT inspector has signed off on site completion. Utility company, contact name, and phone number for each site are listed on the electrical service location summary sheet.

Power coordination will be reviewed at the pre-construction meeting. All utility hookups are incidental.

For additional detail, see sheet ITS-D12.

8.4 MATERIALS
Comply with the details shown in the Plans. Consult the utility company providing power service regarding their service installation requirements and furnish the service equipment in compliance with codes and regulations, and their requirements.

8.4.1 POWER SUPPLY ASSEMBLY, TYPE 1.
Supply and install new Type 1 power supply assemblies in accordance with the details shown on the Plans. Include meter socket and disconnect on a new Type 1 overhead service pole. Use conductor and disconnect size as indicated on the Plans.

8.4.2 POWER SUPPLY ASSEMBLY, TYPE 2.
Supply and install new Type 2 power supply assemblies in accordance with the details shown on the Plans. Provide power supply assemblies that contain a main circuit breaker frame and trip rating as indicated on the Plans. When breaker lugs are not large enough for the conductor size, provide and install a power distribution block in a NEMA 4 enclosure on the secondary side of the disconnect.

The customer door shall have a latching handle with provision for padlocking in the closed position. Provide a temporary padlock. KDOT will replace the padlock with a KDOT-supplied padlock at final acceptance.

8.4.3 SERVICE POLE
Where service poles are required; either new, modification to existing, or replacement of existing, use a service pole that is 35 feet minimum height made of Class 4 or 5 wood. Ground the pole with a ground rod per the utility company's requirements. Where conduit is attached to the pole include a service entrance cap on the top of the conduit run. Design this cap to prevent ingress of water into conduit. Include guy wires where requested by the utility company.

8.4.4 TRANSFORMERS
Provide and install step-down transformers (480 VAC to 120/240 VAC) and step-up transformers (120/240 VAC to 480 VAC) where indicated on the Plans. Use a transformer assembly in all instances where the control cabinet location requires a transformer to ensure that proper voltage is provided to the control cabinet being serviced by the transformer assembly. Use Jefferson Electric phase encapsulated transformers or approved equal that meet these following minimum requirements.

Step-down transformer: The transformer assembly shall consist of a NEMA 3R rated cabinet/enclosure and an appropriate 480 VAC to 120/240 VAC transformer, service disconnect (480 Volt side), and distribution panel (120/240 volt side). The transformer primary voltage shall be 480 VAC and the secondary voltage shall be 120/240 VAC single phase 0.5Hz, grounded neutral. The volt-ampere rating shall be as shown in the Plans.

Step-up transformer: The transformer assembly shall consist of a NEMA 3R rated cabinet/enclosure and an appropriate 120/240 VAC to 480 VAC transformer, service disconnect (120/240 volt side), and secondary over-current protection, via circuit breaker or fuse (480 volt side). The transformer primary voltage shall be 120/240 VAC and the secondary voltage shall be 480 VAC single phase 0.5Hz, grounded neutral. The volt-ampere rating shall be as shown in the Plans.

Construct the cabinet and door from 5052-H32 sheet aluminum alloy with a thickness of 0.125 inches. Form all welds neatly and free of cracks, blow holes, and other irregularities. Ensure that there are no burrs on all inside and outside edges of the cabinets/enclosures. Provide a sloped top on the cabinets/enclosures to prevent the accumulation of water on its top surface. Construct signs that are riveted to the access doors to the transformer and service disconnect stating "DANGER HIGH VOLTAGE". The latching handle is to have a provision for padlocking in the closed position. Provide temporary padlock. KDOT will replace the padlock with a KDOT supplied padlock at final acceptance.

Where required by the plans, mount the step-down transformer to the side of the ITS cabinet facing away from traffic. Ensure all cabling runs from the transformer to the cabinet panel board are tied tightly to the rack to prevent excess slack in the cable.

Provide all transformer assembly equipment and accessories furnished on the project that is new, of prime quality, and has not been used previously on other projects or in other locations. All items of the same type shall be identical and totally interchangeable.

Use transformers that include a fused service disconnect appropriately sized for the intended load and to safely clear a fault. Submit the size of the service disconnect for approval.

Use transformers that are single phase, dry type units with two 5% augmentation taps.

The weight of the transformer shall not exceed 250 pounds. Label the transformer (i.e. step-down or step-up) and identify on the exterior all incoming and outgoing voltages. Use transformers that are the quiet type. Do not use sound levels in excess of 45dB.

8.4.5 FITTINGS AND ADAPTERS
Where large conductor sizes of 1/0 or greater are shown on the plans, provide shop drawings that show the type of fitting/adapter being proposed and the locations in which these fittings/adapters are being proposed to accommodate proper termination (lugs/splices) within panels, pull boxes, and cabinets for a complete system assembly that can be installed in a tidy, professional manner. Utilize fitting/adapter with a set screw to secure the conductors. Do not use a crimp style fitting/adapter.

8.5 SURGE PROTECTION - LOAD SIDE
Surge protection for all power supply assemblies and cabinets should meet the following minimum specifications:
1. Voltage Protection Rating (VPR) of 700V, L-N, L-G, N-G
2. Surge current 40kA per phase
3. Failure indicator
4. Operating temperature range: -20°F (-28°C) to 165°F (74°C)
5. Operating humidity: 95% RH non-condensing
6. 5 year minimum manufacturer warranty
7. Nominal discharge current (In) rating of 10kA

Terminate all cables on surge protectors. Ensure all surge protection devices are grounded properly to the ground bus via a dedicated ground cable to the cabinet grounding bus bar. 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.

8.5.1 POWER SUPPLY ASSEMBLY SURGE PROTECTION
Provide a Citel M50-120T or approved equivalent. Power supply assembly surge protection must meet UL 1449 Type 1 Listed, current edition. Supply each power supply assembly with a 120/240 or 240 /480 Volt AC heavy-duty parallel surge protector on the load side of the main breaker.

8.5.2 CABINET POWER SUPPLY SURGE PROTECTION
Provide a Citel M50-120T or approved equal. Devices must be listed to UL 1449 Type 2, current edition, to protect the control equipment from power surges and over voltages. This includes incoming power lines, the power supply, and outgoing lines when applicable. Supply all cabinets with 120/240 Volt AC heavy-duty parallel surge portector on the AC service input. Provide all cabinets except DMS-only cabinets with surge protection that meets SCCR of 100k AIC or available short circuit current, whichever is greater. Provide DMS-only cabinets with surge protection that meets SCCR of 200k AIC or available short circuit current, whichever is greater.

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KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

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8.6 SURGE PROTECTION - DEVICE SIDE
Surge protection for all ITS devices should meet the following minimum specifications:
1. Failure indicator
2. Operating temperature range: -20°F (-28°C) to 165°F (74°C)
3. Operating humidity: 95% RH non-condensing
4. 3 year minimum manufacturer warranty

Terminate all cables on surge protectors. Ensure all surge protection devices are grounded properly with a direct connection to the ground bus.

8.6.1 CAMERA SURGE PROTECTION
Furnish and install a surge protection system that ensures all cables between the cabinet and the camera are protected by the surge protectors in the cabinet. Camera surge protection must meet the additional following minimum requirements:
1. UL listed and labeled to curent editions of UL 497B and UL 497C
2. Wall, DIN rail, or 19" rack mountable
3. Three stage protection
4. The minimum requirements listed on the following table:

Circuit	Maximum Continuous Operating Voltage	Frequency/ Bandwidth/ Data Rate	Surge Capacity	Max. Let-Through Voltage	Pre-Approved Model
12 VDC	15-20V	N/A	5kA per mode (8x20 µs)	< 150 Vpk	Citel DS220S-12DC
24 VAC	30-55V	N/A	5kA per mode (8x20 µs)	<175 Vpk	Citel DS220S-24DC
Ethernet Data	7-12V	Up to 1 Gbps	5kA per mode (8x20 µs)	< 30 Vpk (100kHz 0.5µs; 6kV, 500A)	Citel MJ8-Cat6
Power over Ethernet	60-70V	Up to 1 Gbps	5kA per mode (8x20 µs)	< 30 Vpk (100kHz 0.5µs; 6kV, 500A)	Citel MJ8-PoE

8.6.2 VDS SURGE PROTECTION
Provide a Wavetronix Click 200 surge protector or approved equal that meets the following minimum requirements:
1. Three-stage surge protection over DC, RS-232, and RS-485 lines
2. Meets NEMA TS2-1998 environmental testiing and IEC 61000-4-5 electrical surge test
Use these inside the cabinet to in order to protect both the power and the communications lines.

8.6.3 COAX/ANTENNA SURGE PROTECTION
Provide surge protection (Citel P8AX09 or approved equal) on all coax/antenna cables entering a cabinet or data closet. Provide and install bi-direction replaceable gas tube lightning arrestors that are UL 497E listed devices.

8.6.4 POWER STRIP - SURGE PROTECTION
Refer to 14.2.13 for details.

8.7 CONSTRUCTION REQUIREMENTS

8.7.1 POWER SUPPLY
The power service locations, as indicated on the drawings, are initial service points coordinated between KDOT and the utility company providing power service. Coordinate with the utility to verify the final point of service. Consult the utility company providing power service regarding their service installation requirements and furnish the service equipment in compliance with codes and regulations and their requirements.

Notify the utility company providing power service for the need for service and coordinate the schedule for that service from the utility. Any power supply requiring modifications from what is shown on the Plans will require an additional service request form to be submitted by the Contractor.

Measure the resistance between the ground electrode and earth using the testing procedures as outlined in these Specifications.

Verify the power service voltage at the power service locations prior to installation of circuits at all locations indicated on the drawings. Provide lightning arrestors of the rated voltage as shown on the Plans. Provide each constructed service drop with a phenolic nameplate indicating the following:
Project "KDOT ITS" When in KC Scout area use "KC Scout"
Service address: "_____"
Service voltage: "_____"
Coordinate with local City government to determine the appropriate service address for power supply if not otherwise shown on plans.

8.7.2 IN-CABINET GROUNDING REQUIREMENTS AND TESTING
All equipment within the cabinet must be grounded to the master ground bus in the cabinet via a direct-route ground cable as specified. Do not ground equipment to the rack or frame of the cabinet. The ground resistance between each device and the ground bus must not exceed 3 ohms.

8.7.3 GROUNDING SYSTEM CHECKLIST
KDOT will provide a grounding system checklist for each site. Complete the grounding system checklist in the presence of the Engineer or their approved representative for submittal as part of the Technical Reference Manual (TRM). The Contractor shall provide a minimum of 72 hours' notice in request of the grounding system checklist from KDOT and another 72 hours' notice to schedule the grounding system inspection.

8.7.4 POWER CABLE SLACK
For slack requirements see ITS-DO3A and/or ITS-D03B.

9.0 CONCRETE FOUNDATIONS

9.1 DESCRIPTION
Construct and install all foundations for ITS Field Equipment provided for in this contract per Division 400 and 700 of the KDOT Standard Specifications, as modified below, and as detailed in the plans.

9.2 MATERIALS

9.2.1 REINFORCING STEEL
Use reinforcing steel that meets the requirements of the KDOT Standard Specifications. Use reinforcing steel that is free of rust and dirt. Provide reinforcing steel of the size, number, shape and dimensions as shown in the Plans.

9.2.2 ANCHOR RODS
Provide anchor rods of the size, number and materials as shown in the Plans and meet the requirements of Division 1600 of the KDOT Standard Specifications, as described below, and as detailed in the plans.

9.3 CONSTRUCTION REQUIREMENTS

9.3.1 CONCRETE FOUNDATIONS
Before placement of the concrete for the foundation, ensure that the appropriate anchor rods are placed in the proper orientation, in both the horizontal and vertical direction. This will be accomplished by using preformed rod templates as detailed in the plans. Protect all anchor rod threads from concrete fouling when the foundation is poured.

9.3.2 CONDUIT ENTRY
Extend Conduit 5" into base of pole. Cables shall not be exposed between the foundation and the pole.

9.3.3 ANCHOR ROD INSTALLATION
Install anchor rods per the Plans and according to KDOT standard specification 738.3.e.

10.0 ITS FIELD ELEMENTS

10.1 DESCRIPTION
This work consists of furnishing equipment and material for, and installing ITS field elements in conformity with the locations and details shown on the Plans or established by the Engineer. ITS field elements include the controller assemblies, cabinets, communication equipment, closed circuit television (CCTV) systems, vehicle detection systems (VDS), and dynamic message sign (DMS) systems.

10.2 MATERIALS
Furnish all tools, labor, equipment, materials, supplies, and manufactured articles and perform all operations necessary to construct the ITS field element installations as shown on the Plans and as specified herein. The hardware, construction services, and support services specified are intended to describe the minimum configuration that would be acceptable for these installations.

10.2.1 LABELING EQUIPMENT
Apply permanent external labeling on all communication equipment; including any required cross connects to communications equipment, according to these contract documents. Use self-laminating vinyl or polyester labels at least 3/4-inch wide and long enough that the translucent portion of the label completely covers the white area bearing the legend. Use vinyl or polyester with a layer of pressure sensitive acrylic adhesive. Use labels that resist oil, water, and solvents and are self-extinguishing. Use a machine to print the legend in letters at least 1/8 inch high.

10.2.2 INCIDENTALS
Furnish and install all incidental accessories necessary to make the system complete in all respects and ready for operation, even if not particularly specified; furnish, deliver, and install all incidentals without additional expense. Include in the work and in the bid all minor details not usually shown or specified, but necessary for the proper installation and operation.

10.2.3 CABLES AND CONDUCTORS
Incidental items include all cables and conductors including but not limited to, serial cables, alarm ribbon cables, Cisco equipment power cables, DC power cables, AC power cables, power service conductors, fiber optic jumpers, signal cables, interface cables, and other cables and connectors located at the field element sites. All cables and conductors shall be labeled with the standards identified in these specifications. No separate payment shall be made for incidental items.

10.2.4 MEDIA CONVERTER
Furnish and install a GE Security IFS Ethernet Optical Transceiver DE7200 or approved equal if specified in the plans with the following minimum requirements:
1. 10/100 Mbps Ethernet, auto-negotiating, full duplex or half duplex data. IEEE 802.3 compliant.
2. Auto network detection.
3. NTCIP Compatible
4. Optical: 1310/1550 nm, Single-mode fiber optic cabling support. LC optical connectors.
5. Minimum optical range of 10 miles.
6. Data: RJ-45 connector
7. Power: 12VDC @ 200mA
8. Power, Transmit, and Received LED indicators.
9. Physical Properties: 4.0 in x 3.0 in x 1.0 in, 2.0 lbs maximum
10. Operating temperature range from -20ºF (-28ºC) to 165ºF (74ºC)

10.3 CONSTRUCTION REQUIREMENTS

10.3.1 LABELING EQUIPMENT AND CABLES
Label all communication equipment and every cable immediately upon installation. Label all communication equipment and all cables at every point of access, including pull boxes, and termination points. Consult with the Engineer concerning the desired method of identifying each cable.

10.3.1.1 FIBER OPTIC CABLES OUTER JACKETS
1. Label each cable with permanent, weatherproof, and UV-resistant cable tags, with two integrated holes on each end for connecting tag to cable with cable ties. Use self-laminating vinyl or polyester labels at least 3/4-inch wide. Use a machine to print the legend in letters at least 1/8" high.
2. Label each cable where it enters a cabinet, pull box, splice vault, splice closure, and termination points. Tape labels are acceptable at splice closures as approved by the Engineer.
3. All cables shall be labeled within 12 inches of the conduit or other entry point. Label both ends as it comes in and out of a pull box or vault.
4. Label FO trunk cables with the following information:
    a. The number of fiber strands in the cable by mode
    b. Cable type (single mode "SM", Multi-mode "MM" or hybrid "SM/MM")
    c. Owner
    d. The item to which the cable travels (e.g. "TO PB 18-2", "To P.O.P.", etc.)
    e. Example: "96 SM FIBER KDOT" "TO PB 18-2"
5. Label branch cables with same plus what device it is connecting to. Example: "12 SM FIBER KDOT" "TO CCTV10/DET 12"

10.3.1.2 SPLICE ENCLOSURE
1. Label splice closures indicating what fibers inside are spliced.
2. Label splice trays within closures with cable and fiber strand numbers.
3. Example: "KDOT 96 SMFO FIBERS 23-24 TO KDOT 12 SMFO BRANCH FIBERS 3-4" or "CENTURYLINK/LUMEN-KDOT 12 SMFO FIBERS 11-12 TO KDOT 12 SMFO BRANCH FIBERS 3-4".

10.3.1.3 POWER CABLES AND LOAD CENTER
1. Label each cable within 12 inches of where it enters a cabinet, pull box, meter pedestal, transformer or other termination point with a round aluminum identification tag with a minimum thickness of 2.5 micrometers attached to the cables with a copper wire.
2. Label it "POWER XXX VOLTS" with a RED label.
3. Label where it is coming from/going to (e.g. "POWER 120 VOLTS" "TO CA CCTV I-135/Central").
4. Label taps inside meter pedestals or transformers with "ITS POWER" tag.
5. Label each circuit.

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KANSAS DEPARTMENT OF TRANSPORTATION

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10.3.1.4 ITS CABINETS
1. Inside cabinets, place a patch panel key/diagram of patch panel with port numbers.
2. On each diagram/key include the following:
   a. Cable number for mainline fiber.
   b. What cabinet/shelter and device to which the fiber connects.
   c. The port on the Cisco switch to which a jumper/patch cable connects.
3. Label each port on the fiber optic patch panel with the designated port number.
4. Jumper cables need not be labeled in ITS cabinets as long as they are less than three meters in length.
5. Label each network device (CCTV encoders, DMS controllers, and site numbers, Vehicle Detectors, Media Converters, Power Distribution Devices and Uninterruptable Power Supplies) with IP addresses, ports, and site numbers.
6. Label Cellular Modems with IP addresses and assigned phone numbers.
7. Label Cisco switches with IP address and site number. Label switch ports with Tx1, Rx1, Tx2, Rx2 and what port they connect to on the fiber optic patch panel. Label each port with its corresponding VLAN address.
8. Wireless network devices shall be labeled with the following items:
   a. IP address and ports
   b. Programmed radio frequency/channel
   c. Other wireless devices that link to the unit
   d. e.g.: "AU, 10.8.32.25, 4.97 GHz, TO SU@CCTV 03, TO SU@DET 01, TO SU@DET 02" or "SU, 10.8.34.24, 4.95 GHz, TO AU@SG CO COURTHOUSE"

10.3.1.5 POP BUILDINGS
1. Label patch panels ports to indicate the origin of the fiber optic cable terminated.
2. Label jumper cables at each end with a tag that includes the destination patch panel and port number(s) (e.g. "TO Panel 1 Ports 11-12" and "TO Panel 2 Ports 3-4").
3. Label outer jackets of fiber cables entering patch panels/distribution frames as in Section 10.3.1.1.
4. Label individual fibers entering back of patch panel with the corresponding strand number and origin.

10.3.1.6 TMC COMMUNICATION ROOM (IF UTILIZED)
1. Label patch panels to indicate the origin of the fiber optic cable terminated.
2. Label individual fibers entering back of patch panel with the corresponding strand number and origin.
3. Label jumper cables at each end with a tag that includes the destination patch panel and port number(s) (e.g. "TO: Panel 1 Ports 11-12" and "TO Panel 2 Ports 3-4").
4. Label jumpers from patch panel to Cisco SFPs with the fiber strand numbers, and origin to which they connect (e.g. Fiber #3, P.O.P. Building).
5. Provide Cisco switch port diagram denoting what fiber and ring they are connected to.

10.3.1.7 CONDUITS
1. Label empty conduits noting to where they connect (e.g. "TO PB2-2 TO PB2-3").
2. If a conduit color is not per plans (Red for Power, Green for Communications), label it so it is clear what it is being used for, even if there are cables inside conduit.

11.0 DYNAMIC MESSAGE SIGN SYSTEM

11.1 DESCRIPTION
The purpose of this section is to provide general information for the installation of KDOT furnished dynamic message sign (DMS) systems as shown on the Plans and specified herein.

11.2 MATERIALS

11.2.1 GENERAL
KDOT will supply the dynamic message sign systems. The equipment supplied by KDOT consists of a DMS case including contents, sign controller unit (SCU) and communication unit; communications cables between the DMS case and the sign controller unit, display modules, equipment cabinet; and DMS software and power supplies. Do not attach the DMS to the support posts until the supporting systems of conduits, pull boxes, controller assemblies, power supply assemblies and all other items necessary are in place to provide a fully functioning DMS system. Contractor is responsible for providing and installing power cables as well as installation of any provided communication cables and terminations (including fiber splicing if applicable) between the DMS cabinet and the DMS.

11.2.2 DELIVERY
Contractor is responsible for all loading, unloading, and relocation of DMS prior to installation, including unloading from manufacturer delivery.

Contractor is responsible for any damage to the DMS system upon delivery from the manufacturer. Prior to unloading from the manufacturer, document, in writing and detailed photographs, any visible damage or non-functioning portion of the KDOT-provided DMS system prior to accepting the DMS and leaving the KDOT storage facility. Schedule 72 hours in advanced with KDOT for date and time to pick-up the DMS from the KDOT facility. Do not store the DMS at the field site for more than 24 hours prior to installation.

11.2.3 LIGHTNING PROTECTION
Use system materials that are copper and high copper-content bronze castings. For all fittings, except cable holders, use heavy-duty type made from bronze castings. For all terminal rods, bolts, screws, and related type hardware use copper clad steel, bronze, or brass to prevent galvanic corrosion. The system consists of all necessary equipment as required to provide a complete and coordinated system. Ensure that all cables and all air terminals bear the UL label. Do not mix materials unless using a UL approved transition. All components of the lightning protection system shall conform to the current edition requirements of UL 96A and NFPA 780. Submit 150 foot radius rolling sphere zone of protection drawing with air terminal equipment.

11.3 CONSTRUCTION REQUIREMENTS

11.3.1 GENERAL
Furnish any and all additional tools, equipment, mounting hardware, beam clips, cabling, materials, supplies, manufactured articles and perform all operations necessary to install the DMS as shown on the Plans and as specified herein. The hardware, construction services, and support services specified are intended to describe the minimum configuration that would be acceptable for this DMS system. Furnish and install the DMS support structure as detailed on the Plans.

11.3.2 ERECTION
For category A structures, the Contractor shall submit detailed erection plans to the field engineer per KDOT specifications and per KDOT Field Erection special provisions. The seal of a licensed professional engineer is not required. Field erection and field erection plans are incidental to the site bid and no additional payment will be made.

11.3.3 DMS CONTROLLER CABINET
Install the DMS controller cabinet; this includes providing anchor rods for pad mounted cabinets as shown on the Plans. Coordinate with the Engineer to ensure proper anchor bolt spacing for DMS cabinets provided by KDOT or the manufacturer. Connect the DMS controller to the appropriate communication equipment specified in the plans to access the network as shown on the Plans and as directed by the Engineer. Contractor shall provide and install a raised nameplate with label "KDOT ITS" for all DMS controller cabinet doors. Nameplates shall be of similar material as the controller cabinet.

11.3.4 MOUNTING
Mount the DMS to the support posts or structure as herein specified, shown on the Plans, or as directed by the Engineer.

11.3.5 DMS ORIENTATION
Orient the DMS such that the face of the sign is towards the roadway. Follow the DMS orientation detail located in the construction drawings for the orientation and exact position of the DMS. Receive approval by the Engineer prior to placement of the foundations.

11.3.6 SECURITY
Change manufacturer default password to a unique temporary password upon taking possession of and commissioning the controller. Provide temporary password to KDOT.

11.3.7 LIGHTNING PROTECTION
Furnish and install lightning protection at every DMS to reduce electrical differential potential. Install all equipment in accordance with the requirements of current editions of UL 96A, NFPA 780, and LPI 175.

11.3.8 DMS CABLE
For slack requirements, see ITS-D03A and/or ITS-D03B.

12.0 CLOSED CIRCUIT TELEVISION SYSTEM (CCTV)

12.1 DESCRIPTION
Furnish and install the closed circuit television (CCTV) camera and equipment cabinet as specified in the plans. Orient all equipment as shown on the construction drawings. Pay attention to the specific orientation of the pole and the specific mounting orientation of all equipment on the pole.

Provide and install a pole, pole foundation, anchor rods, equipment cabinet, connection hardware, camera lowering device, composite cable, camera lowering tool, surge protection and grounding, air terminal, CCTV communication equipment and cables as specified in the plans.

Install the new CCTV cameras adjacent to and have their operating and communication equipment located in the pole mounted controller cabinets or in ground mounted cabinet assemblies as indicated on the Plans, or as directed by the Engineer.
12.2 MATERIALS

12.2.1 CCTV CAMERA ASSEMBLY
The CCTV camera assembly consists of a high performance color CCTV camera, zoom lens, pan and tilt drive unit, domed enclosure, mounting brackets, connectors and cabling all assembled together into one operational unit. Ensure that the CCTV camera assembly weighs less than or equal to 130 lbs, has an effective projected area less than or equal to 3.00 SF, and a distance to centroid from center of the pole less than or equal to 2'-6"

Unless shown otherwise on the plans, provide an Axis Q-60 series PTZ POE dome camera such as the Q6135-LE or approved equal. Ensure the encoded video is H.264 compliant using the baseline profile. Provide a 100Base-TX network interface that facilitates the transmission of camera control commands and video over an Ethernet-Based IP network.

The following electrical and environmental requirements are applicable for all CCTV equipment:
1. Power: 120VAC @ 60Hz;
2. Environmental: Operating Temperature: -35° to 50°C; and
3. Operating Humidity: Up to 95% RH non-condensing.
4. Minimum Power Output: 60W

A combination POE and DC power supply may be utilized to power the camera if both the POE injector and DC power supply meet the environmental requirements listed above. Use a Meanwell SDR 120-48 AC to DC Power Supply or approved equal and Axis T8144 60W Industrial Midspan POE or approved equal.

Ensure that the camera operates with a motorized-iris lens and is designed for day and night functionality. Ensure that the shutter speeds are remotely adjustable from 1/60 to 1/10,000 seconds. Ensure that the camera incorporates Digital Signal Processing (DSP) circuitry to provide advanced features such as automatic electronic shutter control, backlight compensation, digital zoom, and image stabilization. Ensure that the camera supports closing of the iris when pointed directly at the sun. Ensure the camera has a minimum horizontal resolution of 470 lines. Ensure the system to noise ratio is no less than 48 dB. Ensure that the camera is equipped with Automatic Gain Control (AGC) so that the camera will be capable of remotely controlling the white balance in response to changes in environmental lighting conditions. If the AGC is switchable, set the AGC to the "on" position. Ensure that the camera supports on-screen title generation that will allow the user to define the camera with character specific information.

Ensure the camera is supplied with optical and digital zoom capabilities. Ensure the optical zoom lens is remotely controlled through the camera unit and has a magnification factor of at least 30x. Ensure the zoom lens has an automatic and manual iris and focus controls. In addition, ensure the camera has at least a 12x digital zoom capability. Ensure the lens aperture range is F1.6 to F2.8 minimum.

Provide a camera housing that contains the CCTV camera, lens, and pan/tilt drive unit. Securely mount and wire the domed enclosure to the camera-lowering device. Supply all hardware required to mount the domed camera enclosure to the camera lowering device. Provide the domed camera enclosure that is water tight and constructed so that the enclosed equipment will not be affected by rainfall, blowing dust, salt, fungus, and other debris. Supply the unit with a heater to keep the camera and lens within the acceptable operating temperature range.

Ensure that the pan and tilt drive unit allows the remote position of the CCTV camera to view freeway traffic conditions. Fit the units to mount to the CCTV camera and domed enclosure and supply with all of the necessary mounting plates, connectors, brackets and wiring for operation. Ensure the unit allows 360° of continuous panning which is variable from 1 to 40°/second. Ensure the unit allows a minimum of 10 preset positions accurate to within 0.5° accuracy.
Demonstrate that the camera assembly functions with the applicable ATMS and video distribution software for KDOT or KC Scout.

Minimum functionality to be demonstrated shall include the ability to decode and display a video stream using the codes, resolution and frame rate specified and all pan-tilt-zoom, iris, focus and present functions.

Video Stream Settings for an Axis IP CCTV

Communication	Resolution	Frame Rate (frames per sec)	Compression	Zipstream	Bitrate (kbit/s)
Fiber	4CIF (704x480)	*30	30	Off	**Variable
Radio	4CIF (704x480)	25 or lower	50	Off	**Variable
Cell	CIF (352x240)	10 or lower	50	Off	**Variable

*may be set to higher rates if no issues are observed
**may be set to a constant 100kbit/s if needed

Camera functionality must also include the ability to add a text overlay with the camera name and image stabilization.

Change manufacturer default passwords of the cameras to a unique temporary password prior to their connection to the network. Provide temporary password to KDOT.

12.2.2 CCTV CAMERA LOWERING SYSTEM
Ensure that the camera lowering system is designed to support and lower the CCTV camera assembly without damage or causing degradation of camera operations. The camera lowering system device and the pole are interdependent and thus, must be considered a single unit or system. Provide a lowering system that consists of a suspension contact unit, divided channel support arm, pole top adjustable tenon, pole top junction box, conduit mount adapter, and camera connection box. Provide a cable strain relief device/wire mesh grip if not provided by the lowering device supplier. Provide a MG Squared system or approved equal.

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Ensure that the divided support arm and receiver brackets are designed to self-align the contact unit with the pole center line during installation and ensure the contact unit cannot twist under high wind conditions. Provide a camera-lowering device that withstands sustained 100 mile per hour winds with a 30 percent gust factor using a 1.65 safety factor. Deliver to the Engineer the lowering device manufacturer independent laboratory testing documents certifying adherence to the stated wind force criteria utilizing, as a minimum effective projected area (EPA), the actual EPA or an EPA greater than that of the camera system to be attached.

Provide a camera-lowering device product from a manufacturer with a minimum of 2 years of experience in the successful manufacturing of such systems. Provide documentation by the lowering device provider identifying a minimum of 3 previous projects where the proposed system has been installed successfully.

As part of this contract, the lowering device manufacturer is required to furnish a factory representative to assist with the assembly and testing of the first installation of the lowering system onto the pole assembly. Receive approval by the Engineer for this installation to lowering device manufacturer is required to be available to assist in a second installation or possibly a third installation until the manufacturer and KDOT are satisfied with proper installation. Furnish from the manufacturer the applicable documentation certifying instruction on the installation, operation, and safety features of the lowering device. Provide operational instructions to the Engineer.

Provide the suspension contact unit with a load capacity of 600 pounds with a 4 to 1 safety factor. Use a locking mechanism between the fixed and moveable components of the lowering device. Use a movable assembly with a minimum of 2 latches. Use a latching mechanism that securely holds the device and its mounted equipment. Use a latching mechanism that operates by alternately raising and lowering the assembly using the winch and lowering cable. When latched, ensure that all weight is removed from the lowering cable. Use a fixed unit that has a heavy duty cast tracking guide and means to allow latching in the same position each time. Use a contact unit housing that is weatherproof with a replaceable neoprene gasket provided to seal the interior from dust and moisture. Ensure that the entire unit has a minimum temperature rating of -35 degrees Celsius to 50 degrees Celsius.

Ensure that the prefabricated components of the lift unit support system are designed to preclude the lifting cable from contacting the power or video cabling. Supply an internal 1.25 inch PVC conduit in the pole for the lifting/lowering cable. Ensure that a conduit mount adapter for housing the lowering cable with an interface to allow the connection of a 1.25 inch PVC conduit is located just below the cable stop block at the back of the lowering device. Ensure that the only cable permitted to move within the pole or lowering device during lowering or raising is the stainless steel lowering cable. Ensure that all other cables remain stable and secure during lowering and raising operations.

Provide one hand-operated lowering tool for up to 10 lowering devices, and one additional tool for each 10 additional devices. Lowering tools must be submitted to the Engineer prior to the start of the 60-day test period for any device or system. Ensure that the camera lowering device is operated by use of a portable lowering tool. Ensure that the tool consists of a lightweight metal frame and winch assembly with a quick release cable connector and an adjustable safety clutch (socket). Ensure that this tool is compatible with accessing the support cable through the handhole of the pole. When attached to the handhole, the tool will support itself and the load assuring lowering operations and provide a means to prevent freewheeling when loaded. Ensure that the lowering tool has a reduction gear to reduce the manual effort required to operate the lifting handle to raise and lower a capacity load. Provide the lowering tool with an adapter (socket) for operating the lowering device by a portable drill using a clutch mechanism.

Ensure that the lowering tool is equipped with a positive locking mechanism to secure the cable reel during raising and lowering operations and prevent freewheeling. Ensure that the lowering tool is made of durable and corrosion-resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry accepted coatings to withstand exposure to a corrosive environment. The lowering tools are incidental to other items of work.

Provide a camera junction box that is of two piece clamshell design with one hinge side and one latch side to facilitate easy opening. Ensure that the general shape of the box is cylindrical to minimize the EPA. Ensure that the Camera Junction Box is cast aluminum with stabilizing weights on the outside of the box to increase room on the interior. Ensure that the box is capable of having up to 40 pounds of stabilizing weights. Ensure that the bottom of the Camera Junction Box is drilled and tapped with a 1-1/2" NPT thread to accept industry standard dome housings and be able to be modified to accept a wide variety of other camera mountings. Install gaskets with the junction box to prevent water intrusion. Ensure that the bottom of the box has a screened and vented hole to allow airflow and reduce internal condensation.

Ensure that all pulleys for the camera lowering device and portable lowering tool have sealed, self lubricated bearings, oil tight bronze bearings, or sintered-oil impregnated bronze bushings. Ensure that the lowering cable is a minimum 1/8 inch diameter stainless steel aircraft cable with a minimum breaking strength of 1740 pounds with (7) strands of 19 AWG wire each.

Ensure that all electrical and communications connections between the fixed and movable lowering device components are protected from exposure to the weather by a waterproof seal to prevent degradation of the electrical contacts. Ensure that the electrical connections between the fixed and movable lowering device components are designed and tested to conduct video signals as well as the power for operation of dome environmental controls.

Provide a camera lowering system for IP cameras that is equipped with a contact block specifically designed for use with IP cameras in an outdoor environment and includes an outdoor rated Cat 6 cable for the operations of video, power, data, and control molded directly to the contact block.

Ensure that the current carrying male contacts are gold plated, beryllium, and 0.09 inch in diameter at the contact area. Ensure that all current carrying female barrel contacts are also gold-plated, beryllium copper, and at least 0.09 inches I.D. at the contact area. Ensure that each individual female barrel contact has a stainless steel sleeve which prevents foreign matter from entering the contact area as well as preclude the possibility of the leaves of the female contact from opening beyond allowable limits and ensure a snug fit around the respective male pins. Ensure that there is at least one female contact that is positioned closer to the face of the female connector body than all the others, which will allow it to make first contact and break last contact to provide optimum grounding performance.

Ensure that each IP male/female connector includes (8) contacts mechanically crimped to Cat 6 wire and (5) contacts mechanically crimped to #18/1 UL lead wire, which may be used for additional camera requirements including, but not limited to: power, alarms, or grounds. Connect these wire ends to the contractor-provided power/signal cable in the pole and CCTV accordingly in a manner acceptable to Engineer. Ensure that each male pin is self wiping. During production, the contacts must be successfully tested and verified for Ethernet data speeds up to a minimum of 1000 Base T requirements.

Ensure that each male contact and female barrel contact is individually encased in their respective male and female molded rubber blocks to provide protection from moisture.

Ensure that the contacts are self-wiping with a shoulder at the base of each male contact so that it will recess into the female block, thereby giving a rain-tight seal when mated. Ensure that the facility manufacturing the electrical contact connector complies with Mil Spec Q-9858 and Mil Spec I-45208.

Ensure that the interface and locking components are made of stainless steel or aluminum. Ensure that all external components of the lowering device are made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry accepted coatings to withstand exposure to a corrosive environment.

The lowering unit shall have sufficient weight to disengage the camera and its control components in order that it can be lowered properly. Provide counterweights as necessary to assure that the alignment of pins and connectors are proper for camera support to be raised into position without binding. Ensure that the pole top and/or camera junction boxes have the connectors for attachment to the bare leads in the pole top and/or junction boxes.

Install a drip shield above the lowering device connection to prevent moisture from infiltrating the camera assembly.

12.2.3 CCTV POLE
Provide poles in accordance with the latest edition of AASHTO **LRFD** Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals**, First Edition** including all interims. Other design requirements, such as MRI, wind speed, fatigue, and foundation are listed on the pole detail or foundation detail sheets. Furnish and install camera poles as shown on the Plans and details.

Submit camera pole shop drawings and detailed calculations, signed and sealed by a Professional Engineer, to the Engineer for approval prior to pole and lowering device fabrication.
The Contractor is responsible for the design and construction of all poles. All steel poles must meet the requirements outlined in these specifications.

Provide steel poles that are designed with the following considerations:
1. Pole dimensions shall be determined by the manufacturer's design.
2. Only round or hexadecagonal (16 sided) shapes will be allowed.

Ensure that the pole is designed such that the deflection does not exceed one inch (1") at the top of the pole in a sustained 30 mile per hour wind condition. Use a service limit load factor of 1.0 for deflection. Provide a pole shaft that is one-piece construction up to 50 feet in length and poles with a maximum of one splice for greater lengths and conforms to ASTM A595 Grade A with minimum yield strength of 55 ksi or ASTM A572 with minimum yield strength of 55 ksi. Provide a pole with a constant linear taper of greater than or equal to 0.14 in/ft and contain only one longitudinal seam weld. Ensure that hexadecagonal poles have a 4 in. corner radius. Circumferential welded tube butt splices and laminated tubes are not permitted.

Ensure that longitudinal seam welds within 6 in. of complete penetration pole to base plate welds are complete penetration welds. Ensure that tube longitudinal seam welds are free of cracks and excessive undercut, performed with automatic processes, and be visually inspected. Ensure that longitudinal welds suspected to contain defects are magnetic particle inspected. Ensure that all circumferential butt-welded pole and arm splices are ultrasonically or radiographically inspected.

Provide a single, large, bottom handhole opening that is reinforced with a minimum 2-inch-wide hot rolled steel rim. Ensure that the nominal outside dimension is approximately 6 inches x 27 inches. Ensure that the handhole has a tapped hole for mounting the portable winch thereto. Ensure that a tenon is welded or bolted to the pole top with mounting holes and slot as required for the mounting of the camera-lowering system. Ensure that the tenon is of dimensions necessary to facilitate camera lowering device component installation. Ensure that each slot is parallel to the pole centerline for mounting the lowering device.

Provide a pole with a custom plate-mounted tenon that allows the field modification of the arm/camera orientation up to 360 degrees. Ensure that the tenon has mounting holes and slot as required for the mounting of the camera-lowering system. Ensure that the tenon is of dimensions necessary to facilitate camera lowering device component installation. Ensure that each slot shall be parallel to the pole centerline for mounting the lowering device.

Ensure that top and bottom electrical cable guides are located within the pole aligned with each other. Position one cable guide 2 inches below the handhole and position the other 1 inch directly below the top of tenon. Position a parking stand 1.5 inches below the top of the handhole on the inner portion of the handhole frame and located at 90, 180, and 270 degrees.

Construct CCTV pole foundations as indicated on the Plans.

Direct Tension Indicators:
DTIs are to comply with the requirements of the latest edition of ASTM F959 for the ASTM F3125 bolts. The DTIs on the anchor rods are to comply with the requirements of the latest edition of ASTM F2437. Installation will adhere to the Plans and the KDOT Standard Specifications.

Demonstrate compliance with the requirements shown on the Plans and herein. Submit calculations for poles that include analysis of the pole, base plate, and anchor rods. Submit pole calculations that are analyzed at six-inch (6") intervals from the base plate to the pole top. At each of these locations, give the following information:
1. The pole diameter, thickness, section modulus, moment of inertia, and cross-sectional area.
2. The centroid, weight, projected area, drag coefficient, velocity pressure, and wind force of each trapezoidal pole segment.
3. The factored axial force, shear force, primary moment, total moment, axial stress, bending stress, axial resistance, bending resistance, and demand over capacity ratio at each elevation.
4. The pole angular and linear deflection at each elevation.
5. The factored axial force, shear force, primary moment, and total moment at the top of the foundation for foundation design.

Submit weld details with pole shop drawings, referencing approved weld procedures in KDOT Specification 744. Weld procedures will be approved by KDOT prior to use. All welding shall be in accordance with AWS D1.1 (latest revision). All handholes and weld backing rings shall have CJP at splices unless made from a solid.

12.2.5 ASSOCIATED CONTROL EQUIPMENT
Furnish and install equipment in the cabinet as specified in the construction Plans including associated patch cables and incidental items.

12.2.8 AIR TERMINAL
Furnish and install a solid or tubular aluminum, copper, or stainless steel at least 5/8 inch in diameter air terminal. Use air terminals that are UL listed.

12.2.9 POLE GROUNDING
Provide pole grounding that meets the requirements of the Power Supply Assembly, Power, and Grounding sections of these specifications.

12.2.10 TRANSPORTATION
Obtain the correct transportation guidelines from the manufacturer and implement these guidelines. Take precautions to ensure no damage to the lowering system.

12.3 CONSTRUCTION REQUIREMENTS

12.3.1 CAMERA ASSEMBLIES
Install the dome so that the pole does not block the camera's view of traffic. Refer to the Plans for guidance on where the allowable blind spot is located.

12.3.2 POLE AND FOUNDATION
Contact the Engineer a minimum of two weeks prior to final placement of the CCTV foundation to schedule the final location review.

12.3.3 NETWORK SWITCH CONNECTIONS
Request port assignments from the Engineer/owner at least 4 weeks prior to making the physical connections to the network switch. Supply technicians with at least one year of experience installing and configuring Cisco network switches. Submit experience resume to the Engineer for approval prior to performing any work.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S07 07-21-23

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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 sidefire 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: -35ºC to 50ºC
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: -20ºF (-28ºC) to 165ºF (74ºC)
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.

Provide all hardware (bolts, nuts, and washers, but not including anchor rod assemblies) not otherwise specifically designed in the specifications that is aluminum or stainless steel. Furnish all materials in natural aluminum color. Finish pole shafts with a polished surface.

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

Use ground wire that is a #6 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.

13.4.2 VDS CABLE
For slack requirements see ITS-D03A and/or ITS-D03B.

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 336 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 336 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 336 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.

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KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S08 10-27-23

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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. If shown in the plans, 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 336 type cabinets for placement of laptops or tools.

14.2.11 SHELF
Supply a vented equipment shelf for all 334 and 336 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.

Unless otherwise specified in plans, provide 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 XXU 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 1300mm 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/(nm2✳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.

Type	Canister Style
Min. # of Cable Ports	4
Min. # of Express Ports	2
Cable Seal	Reusable Gel

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S09 11-08-23

FHWA APPROVAL		APP'D.	
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STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	45	57

15.7 FIBER OPTIC SPLICE CLOSURE (CONT. FROM PREVIOUS PAGE)

Other Requirements:

1. Provide fiber optic splice closures with splice trays from the same manufacturer as the splice closure. Provide a splice closure with enough trays to account for all proposed splices required on the plans plus at least two additional trays for future capacity.
2. No pressurized splice closures allowed.
3. Sealing tape shall be used outside canister at all used ports..Port plugs shall be in place and prevent water intrusion on unused ports (as appropriate)>
4. All installations shall be completed to manufacturer instructions.
5. Any entry into a closure shall include a pressure check of the enclosure on resealing using a hand pump to a minimum of 5 psi (or as shown in the manufacturer instructions), and soapy water on any ports or ring to ensure proper seal. If properly sealed, release pressure after testing; if not, find subsequent issues reseal and retest until leaks have been fixed. Any entry shall also require resealing rings with fresh lubricant per manufacturer recommendations. Ensure no debris (grass, leaves, dirt, etc.) are on or in sealing gasket or sealing mechanism.
6. All armored cables shall be grounded per manufacturer instructions.
7. Suspend all splice closures off the floor of the vault.
8. For end of reel splicing, use an appropriate splice enclosure to accommodate full cable splice in one enclosure.

15.8 FIBER OPTIC CABLE ASSEMBLIES

Provide cable assemblies (jumpers and pigtails) that are Corning Lanscape Solution cable assemblies or approved equal that meets the following minimum requirements. Provide the cable used for cable assemblies that is made of fiber meeting the performance requirements of these Specifications for the fiber optic cable being connected. Provide Manufacturer's attenuation test results for all cable assemblies. Provide breakout cables that comply with the specifications for pigtails.

15.8.1 PIGTAILS

Provide pigtails that are of simplex or duplex construction, in 900 micrometer tight buffer form, surrounded by aramid yarn for strength, with a connector on one end. Provide an outer jacket that is yellow PVC with a nominal diameter of 3 mm, marked with the Manufacturer's identification information. Provide all pigtails a minimum of one meter in length. Provide pigtail connectors that are factory terminated. Field terminations are not permitted. Follow the installation procedures outlined for fiber optic cables for pigtails installed in conduit, except that the pulling tension shall not exceed 200 pounds.

15.8.2 JUMPERS

Jumpers should be duplex unless specified by Engineer. Provide all jumpers to be at least six feet in length, sufficient to avoid stress and allow orderly routing. Provide jumpers that have connectors on both ends. Ensure that the outer jacket of duplex jumpers is yellow for all single mode; orange for 62.5µm multimode; aqua for 50µm multimode jumpers. Ensure that the two inner simplex jackets have contrasting colors to provide easy visual identification for polarity. Ensure that all jumper connectors are factory terminated. Do not use field terminations.

15.8.3 CONNECTORS

Use LC connectors for all new connectors. Many existing connectors are SC. Use SC to LC jumpers to mate with equipment when required to assure all new connectors are type LC. Do not apply index-matching fluids, gels, or anti-reflection coating to the end of the fiber. Ensure that the connector operating temperature range is -20ºF (-28ºC) to 165ºF (74ºC). Ensure that typical insertion loss is 0.2 dB (or better) and the return reflection loss is 50 dB (or better). Ensure that connection durability is less than a 0.2 dB change per 500 mating cycles per EIA-455-21A (FOTP-21). Provide connectors with a blue color body or boot.

15.8.4 FACTORY TESTING

Provide all pigtail and jumper connectors that are factory-installed and tested. Do not install connectors in the field.

15.9 FIBER DISTRIBUTION UNIT (FDU)

Use the fiber distribution unit (FDU), also referred to as patch panels, to terminate fibers in all cabinets containing fiber terminations. Provide units that are capable of terminating the required number of fibers, as is indicated on the Plans. Use terminations that are SC or LC (as indicated on the plans), bulkhead connectors which match the fiber optic jumper cables used for connection to the optical termination equipment in the controller assembly. Do not allow fiber optic splicing to occur outside of splice trays housed within the fiber distribution units. Provide all units located in POP buildings to be rack mountable in an EIA 23-inch rack. Provide all units located in roadside devices to be rack mountable in an EIA 19-inch rack. Use units that are of the minimum necessary dimensions to terminate the quantity of fibers indicated on the Plans as to maximize the total amount of available rack space. Provide units which terminate 6 or 12 fibers that occupy no more than one rack unit of space within the cabinet. Comply with the requirements of ANSI/TIA/EIA-568-A and ANSI/TIA/EIA-606.

15.10 FIBER OPTIC CABLE MARKERS

Provide fiber optic cable markers as shown in the standard details. Fiber optic cable markers shall have information machine printed on the marker. No stickers will be accepted. All fiber optic marker materials shall be outdoor rated and UV resistant. Decals shall be factory printed with a minimum letter height of 1-inch.

15.11 CONSTRUCTION REQUIREMENTS

Install all equipment per the manufacturer's instructions and industry standards. Do not exceed equipment and material ratings. When cable is delivered to the site, conduct optical time domain reflectometer (OTDR) tests on-the-spool. See testing section 20.8 Fiber Optic Tests of these specifications.

15.11.1 INSTALLATION AND SPLICING QUALIFICATIONS

Submit resumes and references detailing fiber splicing and installation experience for on-site personnel to the Engineer for approval. The subcontractors used on this project are considered part of the contractor's team and are also required to submit resumes and references. Submit to the Engineer references including client project manager, phone number and project experience. Failure to comply may result in a declaration of noncompliance. Provide necessary documentation of subcontractor qualifications to the Engineer upon request.

In addition, ensure that a member of the contractor's team, that has two years experience in the installation, testing, use and maintenance of fiber optic cable and fiber optic splicing equipment and has been approved by the Engineer, is on site at all times during the fiber optic cable installation and fiber optic splicing work until successful completion of the work. Receive approval from the Engineer for any substitution of this individual. The Engineer may stop activity on this project as a result of the absence of this on-site personnel from the project and may continue to charge time to the contractor and will not grant a time extension. Demonstrate successful completion of fiber optic installation and splice training courses. Provide any certificates.

Ensure that installations provide ease of maintenance, with all component parts being readily accessible for inspection and maintenance.

15.11.2 CABLE INSTALLATION

Submit the manufacturer's recommended procedures for pulling and for blowing of the fiber optic cable to the Engineer for review and approval at least 2 weeks prior to installing cables. Contractor is required to have the equipment and experience to install cable by either method: pulling or blowing. KDOT reserves the right to choose the method of installation. Use mechanical aids to assist cable installation. Use a breakaway swivel to ensure that the tension does not exceed 80 percent of the manufacturer's recommended tension. Ensure that the cable grips for installing fiber optic cable have a ball bearing swivel to prevent the cable from twisting during installation. Ensure pulling of cable is with even tension. Properly seal cable ends during installation.

Use cable pulling lubricant recommended by the cable manufacturer and a non-abrasive pull tape conforming to the provisions described under "Conduit" elsewhere in these Specifications. When blowing cable, use cable blowing lubricant specifically designed for installation of cable by blowing. Ensure that the lubricant will cover the fiber optic cable for the entire pull. Provide cable slack as indicated on the Plans. Record sequential markings (the number of feet printed on the cable) at all splice vaults; organize and submit this information to the Engineer.

During cable installation, keep the bend radius at a minimum of twenty times the outside diameter of the cable. Install cable with no splices except those indicated on the Plans. After installation, cut off and discard the first 10 feet of the cable. These 10 feet have not been included in the conduit and cable table and are considered incidental to other items of work. Ensure that no residual tension remains on the cable after installation, except the weight of the cable.

Do not perform any "end of day" or "end of shift" cable cuts on any fiber optic cables. For all cable used as a trunkline cable, use full, uncut, virgin reels or spools.

15.11.2.1 TRUNKLINE FIBER OPTIC CABLE SLACK

For slack requirements see ITS-D03A and/or ITS-D03B.

15.11.2.2 BRANCH FIBER OPTIC CABLE SLACK

For slack requirements see ITS-D03A and/or ITS-D03B.

15.11.3 CABLE DAMAGE DURING INSTALLATION

If the cable becomes damaged during installation, stop operations and notify the Engineer immediately. There will be no extra payment or revisions to contract completion time for the replacement of the damaged cable.

15.11.4 SPLICING

When a buffer tube is required to be opened in order to perform fusion splicing, cut only the fibers to be terminated/spliced at a location according to the Plans. Unused fibers or fibers that are continuous through a splice location (expressed fibers) are to be coiled, and neatly routed around the inside edges of the splice tray. Splice optical fibers using the fusion splice method. Ensure alignment is via fiber cores and splicing equipment has fully automated X, Y, and Z axis (3-axis) alignment using a light injection/detection system. Use splicing equipment that has an auto fusion time control to monitor the power level through the splice to complete the fusing process when splice loss is a minimum. Complete all cabinet terminations and branch splicing prior to mainline or trunkline splices to ensure network connectivity for testing and communications. All splices and terminations must meet the requirements outlined in section 20.7: Fiber Optic Tests.

At splice locations where branch cables intersect with trunkline cables, do not open the buffer tubes of the trunkline cable unless a splice is required within that particular buffer tube. Ensure that these "straight through" buffer tubes remain unopened and simply be "expressed" through the splice enclosure; stowed in the bottom of the splice closure beneath the splice tray/s.

Protect all splices with a thermal shrink sleeve, 60 millimeters long. Place the completed splices in a splice tray. Place the splice tray in the splice closure or housing. Refer to the "Fiber Optic Cable Segment Diagram" in the Plan Set concerning the required labeling text for each cable segment.

An "end of reel/spool" trunkline splice is allowed every 10,000 cable feet minimum. Contain full cable splice in a single splice enclosure of adequate size. Redline the location of the trunkline splice enclosure/s onto the plan set and formally submit along with the fiber optic cable system test report. End-of-reel/spool splicing is considered incidental to the lump sum ITS site bid item for which no additional payment will be made.

15.11.5 SPLICE ENCLOSURES

Use a fiber optic splice enclosure contained inside a splice vault for underground splicing. Contain all fibers that require splicing within one enclosure. Upon completion of the splices, secure the splice trays to the inner enclosure. Seal the enclosure using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices. Ensure a tight salt-resistant and waterproof seal is made which will not leak upon aging.

Fasten the enclosure securely to the wall of the pull box in a manner that allows the cables to enter at the end of the closure without violating the minimum bending radius for the cables, while maximizing the clearance from the bottom of the pull box.

A splice closure is required at the end of all fiber runs for both terminated and un-terminated fibers. No fibers shall be left exposed.

15.11.6 FIBER DISTRIBUTION UNIT (FDU)

Secure the main cable into the FDU in a workman like manner. No bends to exceed a 2.0 inch minimum bend radius. Sparingly and carefully use wire pulls as to not pinch the fiber. Organize and secure fiber optic cables within the cabinet using hook and loop wire ties. Zip ties are not permitted.

15.11.6.1 SLACK CABLE

Leave sufficient amount of fiber optic cable in the FDU to facilitate removal of splice casettes to allow splicing to occur on a splice table.

15.11.6.2 LAST LINE

All terminations and splices within the cabinet are incidental to the site bid item and will not be paid on an individual splice price basis - this includes any splicing from a pre-terminated pigtail or FDU to a branch fiber when the splicing occurs within the cabinet.

15.11.6.3 TERMINATION SPLICES

Termination splices are splices in an equipment cabinet that join fibers in a cable to pigtails or connector modules. Place the termination splices in a splice casette and place the splice casettes in the fiber distribution unit (FDU). Loop the individual fibers at least one full turn within the splice casette to avoid micro bending. Maintain a 2.0 inch minimum bend radius during installation and after placing fibers in the casette. Individually restrain each fiber in a splice casette. Place the optical fibers in the splice casette to provide no discernible tensile force on the optical fiber. Label every Closet Connector Housing Module by placing appropriate labels with pin/port numbers 1 through 12 on the Module; Label the fiber optic SFP Ports on every Ethernet Switch with the text (TX1, RX1, TX2, RX2). Terminate all fibers required for system operation as shown in the Plans. All termination splices are incidental to the site bid item and will not be paid on an individual splice price basis. This includes any splicing from a pre-terminated pigtail or FDU to a branch fiber when the splicing occurs within the cabinet. See section 20.8 Fiber Optic Tests for testing unterminated fibers. See section 15.7 Fiber Optic Splice Closure for unterminated fibers.

15.11.6.4 INSPECTION AND CLEANING

All FDUs and patch panels must be cleaned to meet IEC 61300-3-35 standards, and equipment paperwork (including yearly calibration) shall be made available to the engineer upon request.

Before mating two optical surfaces together, both surfaces must be visually inspected with an approved fiber inspection camera. If debris is detected by the camera, the surfaces shall be cleaned using an approved cleaning pen or lint-free wipes. Use at least 98% isopropyl alcohol. After cleaning, inspect the surfaces again before mating to verify they are clean. Only clean surfaces if debris is detected to prevent smearing on the surface. While surfaces are not being inspected, they should be protected with dust caps or patch cords.

Immediately after installation and testing, all optic panels shall be wraped in protective wrap such as cellophane to prevent ingress of debris. The protective wrapping will be removed upon handover to KDOT.

15.11.7 CONNECTIONS

Clean all connections to meet IEC61300-3-35 standards. Cleaning shall only be completed if camera detects debris, and connectors shall be cleaned in a similar process to 15.11.6.4.

15.11.8 FIBER OPTIC CABLE TESTING

Perform Fiber Optic Cable Testing in accordance with the requirements set forth in the testing section of these Specifications.

~~T6.0 CELLULAR MODEMS~~

16.1 GENERAL

Furnish all tools, equipment, materials, supplies and manufactured articles and perform all operations necessary to install cellular modems as shown on the Plans and as specified herein.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S10 11-08-23

FHWA APPROVAL		APP'D.	
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Drawn By : sspatil
File : ITS-S10.dgn

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	46	57

16.2 MATERIALS

16.2.1 CELLULAR MODEM
Provide a modem that is a Sierra Wireless MP70 (ethernet model with four ports) or approved equal, as indicated on the Plans. The following minimum requirements apply: Support automatic scheduled over the air Preferred Roaming List (PRL) updates and be supported on Verizon network, ALEOS embedded intelligence or equivalent functionality, high speed processor, embedded machine protocols, class 1 division 2 certified, serial and Ethernet interface. Provide associated antennas, antenna cables, and power supplies with the modem at no additional charge. KDOT will activate all cellular modems.

16.2.2 DIRECTIONAL ANTENNA
Provide an antenna that is a Wilson 314411 or approved equal to meet the following minimum requirements. Use antenna assemblies with cellular modems that are of the dual-band (698~960/1710~2700 MHz) Yagi style and have a working temperature of -35°C to 50°C. Provide a vandal-resistant type antenna base. Mount antenna to the top of the ITS device pole or structure as shown in the details with mounting hardware that is approved by the Engineer.

16.2.3 ANTENNA CABLE - DIRECTIONAL ANTENNA
Provide riser cables that are of a low-loss co-axial design. Ensure loss per 100 feet does not exceed 5 dB at 1800 MHz. Jumper cables may be used inside cabinets between cellular modems and lightning protection devices. Jumper cables may not exceed three feet in length and may not have losses greater than 18 dB per 100 feet. Provide outdoor rated RF cables with UV resistant outer jacket. Provide plenum rated cable for installations inside of buildings or shelters.

16.2.4 OMNIDIRECTIONAL ANTENNA - LOW PROFILE
Provide an antenna that is a PCTEL BMLPVMBLTENGP, BMLPVMBLTENGP-VP or approved equal to meet the following minimum requirements. Where specified, use antenna assemblies with cellular modems that are of low-profile, omnidirectional design. Antenna shall not exceed 4 1/2" in height (excluding mounting base, if used) and 1 1/2" in diameter. Provide antenna assemblies that are dual band (700-960/1710-2700 MHz), have a temperature rating of -35°C to +50°C. If mounting directly through a cabinet shelf or other surface, provide an antenna with an integrated Type-N female connector and appropriate Type-N to SMA adapter cable. If mounting to an exterior bracket, provide bracket and suitable antenna base with an integrated lead that includes an SMA connector.

16.2.5 SURGE PROTECTION
Provide lightning protection Wilson 859902 or approved equal.

16.3 CONSTRUCTION REQUIREMENTS

16.3.1 GENERAL
Incidental items include all connectors, adaptors, and cables; including but not limited to RF co-axial cables, DC power cables, AC power cables, Ethernet cables, or any other interface cables. There will be no separate payment for incidental items. KDOT will provide IP addressing. Construct and make all necessary network configurations. Coordinate with KDOT and receive approval for any downtime necessary to connect the cellular modems.

16.3.2 ANTENNA INSTALLATION
Install antennas as per manufacturer's instruction and in accordance with any applicable electrical or construction codes. Align antennas to optimize signal quality (received signal strength indication (RSSI) and signal to noise ratio (S/N)). Determine the appropriate antenna azimuth and align the antenna toward the appropriate cellular communication tower. Supply the necessary test equipment for antenna alignment to achieve the maximum signal transfer.

17.0 POINT-TO-POINT (P2P) ETHERNET RADIO (LICENSED BAND)

17.1 DESCRIPTION
Furnish, install, configure, and test an Ethernet radio. If required to supply a radio, provide an Ethernet radio that meets these specifications. Ensure that the radio provides an acceptable wireless Ethernet communication link when combined with another radio.

17.2 SPECIFICATIONS AND REQUIREMENTS
Provide wireless equipment that meets the following specifications and requirements:
1. Point-to-Point (P2P).
2. Operate in 11 GHz FCC licensed frequency band.
3. Use Time Division Multiplexing (TDM) wireless modulation.
4. Allow Quality of Service (QoS) management.
5. Support 802.1Q headers to carry VLAN tags and priority markings shall support VLAN tagging per port.
6. Use a native Ethernet technology for Payload Interface. Mapping of Ethernet over TDM will not be accepted. Equipment will support FE and GE autosensing interfaces.
7. Frame Length Support: Support for "Baby Jumbo" frames up to 1632 Bytes.
8. Buffer Size: overall buffer size (used to manage traffic queues) of at least 1 Mb. Usable by a single service, if required by traffic profile.
9. RF Bandwidth: 10 MHz, 30 MHz capable.
10. Receive sensitivity (BER 10-6): With 10MHz channel spacing, range between -90.5 dBm at QPSK to -73.0 dBm at 256 QAM.
11. Support forward error correction.
12. Fade and Intermodulation Countermeasures: Support for adaptive equalization, adaptive modulation and space diversity.
13. Minimum supplied bandwidth 100Mbps. Software expandable to 200Mbps without hardware changes. During testing, actual bandwidth to be verified with RFC2544 throughput and latency tests.
14. FCC Part 15 compliant and certified for EMC.
15. Type of emission: Licensed only (compliant with FCC Part 101).
16. Provide 10/100 BaseT RJ-45 Ethernet port.
17. Minimum operating temperature range for P2P radio Outdoor Unit (ODU): -35°C to 50°C. Minimum operating temperature range for P2P radio Indoor Unit (IDU): -20°F (-28°C) to 165°F (74°C).
18. Security: Provide user-controlled levels and privileges and user access control.
19. Management: Ethernet SNMP remotely, ASCII RS-232 locally or equivalent. Fully managed remotely, allowing downloading of system configuration, equipment software or system operation firmware changes.
20. Rack mounted
21. Warranty: In-warranty product repairs are covered up to 5 years.
22. Advance replacement: Replacement product is shipped express overnight (in most cases) in case of a verified product issue.

17.3 CONSTRUCTION
Provide all radio channel planning, communication path analysis, power level settings, antenna positioning (X, Y and Z axis including tilt), and Radio Frequency Interference (RFI) and Electro-Magnetic Interference (EMI) resolution so that fully functional, operational, and secure communication links are provided. A preliminary design plan has been provided in the plan set, but it is understood that the design may need to change based on field conditions encountered. Take into consideration existing licensed radio networks operated by others. Install, orient, and align the P2P radios in order to optimize performance. Reference and follow installation guidelines provided by the radio manufacturer. Provide all antennas, pipes, mounts, cabling, lightning protection, grounding, configuration, testing, and other subsidiary items and include in this individual bid item.

Furnish all tools, equipment, materials, supplies, and manufactured articles and all operations necessary to install wireless equipment and construct, configure, and test the wireless communications facilities as shown on the plans and as specified herein. Use stainless steel for all hardware and fasteners.

Lightning Protection: For protection of the P2P radio equipment, provide and install bi-directional replaceable gas tube lightning arrestors (Polyphaser Model RGT or equivalent).

Mount the ground level network interface, power supply, and grounding block in the cabinet or data closet at the site. Contact the Engineer to coordinate FCC required prior coordination notice and FCC License Application. Contact the Engineer to obtain network configuration information including: IP addresses, VLAN tags and security key info for equipment installed.

Connect the P2P Ethernet radio to the Ethernet switch or other Ethernet-enabled device at the site.

17.4 TESTING/SUBMITTALS
Develop a test plan to demonstrate that each P2P Ethernet Radio is providing a wireless link capable of a continuous data rate of 100 Mbps. Complete a minimum 15-day test period before final acceptance. Submit test plan to the Engineer for approval. Incorporate any changes requested by the Engineer into the test plan and test each link. Document all test results and submit these to the Engineer for approval. Provide an Excel spreadsheet (electronically) that details all equipment received and installed as well as all configuration settings, including VLAN's.

18.0 POINT TO MULTIPOINT (P2M) ETHERNET RADIO

18.1 DESCRIPTION
Furnish, install, configure, and test a P2M Ethernet Radio. Ensure that the P2M radio provides an acceptable wireless Ethernet communication link when combined with another P2M radio.

18.2 SPECIFICATIONS AND REQUIREMENTS
Provide wireless equipment that meets the following specifications and requirements:

1. Operates in unlicensed frequency band, 5.15-5.35 GHz, 5.47-5.725 GHz, 5.725-5.850 GHz or in the 4.94-4.99 GHz band
2. Radio Access Method: Time Division Duplex (TDD)
3. Channel: 10 MHz, 20 MHz
4. Central Frequency Resolution: 5 MHz, 10 MHz
5. Typical Sensitivity (dBm at antenna port):

Modulation	1	2	3	4	5	6	7	8
Level* 20 MHz	-89	-88	-86	-84	-81	-77	-73	-71
Level* 10 MHz	-92	-91	-89	-87	-84	-80	-76	-74

*Modulation Level combines modulation scheme and coding gain.

6. Modulation Scheme (Adaptive): OFDM: BPSK, QPSK, QAM16, QAM64
7. VLAN Support: Based on IEEE 802.1q, QinQ 802.3ad
8. Layer-2 Traffic Prioritization: Based on IEEE 802.1p
9. Layer-3 Traffic Prioritization: IP ToS according to RFC791 and DSCP according to RFC2474
10. Layer-4 Traffic Prioritization: UDP/TCP port range
11. Security: WEP 128-bit authentication, AES128, WEP 128, and certified FIPS-197 mode built-in encryption
12. Remote Management Access: From wired LAN or wireless link
13. Management Access Protection: Multilevel password; configuration of remote direction (from Ethernet only, wireless only, or both sides); configuration of IP addresses of authorized stations
14. Software Upgrade: via TFTP and FTP
15. SNMP Agents: SNMP v1 client, MIB II, Bridge MIB
16. Allows Quality of Service (QoS) management
17. Ethernet Interface: 10/100 BaseT RJ-45 port
18. Operating Temperature, SU/AU Outdoor Units: -35° C to 50° C
19. Power over Ethernet (POE)
20. Point-to-Multipoint (P2M)
21. Minimum rated/actual bandwidth of 54/24 Mbps
22. EMC and Radio: FCC Part 15 compliant

18.3 CONSTRUCTION
Install P2M Ethernet Radios at locations as shown on the plans.

Provide for all radio channel planning, communication path work, power level settings, antenna positioning (X, Y and Z axis including tilt), Radio Frequency Interference (RFI) and Electro-Magnetic Interference (EMI) resolution so that fully functional, operational, and secure communication links are provided. A design plan has been provided in the plan set but it is understood that that design may need to change based on field conditions encountered. Take into consideration existing unlicensed radio networks operated by others. Install the radios and orient to maximize the Signal-to-Noise Ratio (SNR) levels. Reference and follow installation guidelines provided by the radio manufacturer. Provide all antennas, pipes, mounts, cabling, lightning protection, grounding, configuration, and testing to provide a fully functional system.

Furnish all tools, equipment, materials, supplies, and manufactured articles and all operations necessary to install wireless equipment and construct, configure, and test the wireless communications facilities as shown on the plans and as specified herein. Use stainless steel for all hardware and fasteners.

Mount the P2M Radio Outdoor Unit/Antenna as high on the supporting structure as practical, while remaining within the 30 degree protected radius beneath the air terminal (if installed). Do not allow the mounting of the radio to interfere with the camera lowering device or with the lightning air terminal.

Use outdoor-plant rated industrial Cat 6 cable (Commscope 2003 Black or approved equivalent) with shielded RJ-45 end connectors (Digi-Key A9115-ND or approved equivalent) between the radio outdoor unit and the cabinet or data closet surge protector.

Mount the network interface, power supply, surge suppression, and grounding block neatly in the cabinet or data closet at the site.

Contact the Engineer to obtain network configuration information including; IP addresses, VLAN tags, and security key info for equipment installed.

Connect the P2M Ethernet radio to the Ethernet switch or other Ethernet-enabled device at the site.

Apply permanent external labeling on radio equipment in the cabinet according to information to be provided by the Engineer.

19.0 ITS COMMUNICATIONS INTEGRATION

19.1 DESCRIPTION
This work consists of the installation of communication equipment and configuration of hardware settings and software parameters (both wireless and fiber optic), such as IP addressing and serial port definitions, VLAN definitions and network management parameters of KDOT furnished and Contractor furnished communications equipment as defined herein, in KDOT designated facilities, or ITS cabinets as shown on the Plans, or as directed by the Engineer.

Configure all communication equipment based on a template provided by the Engineer for each type of ITS component such as Ethernet switches, modems, CCTV cameras, and DMS.

Provide a complete, functional, wireless, fiber optic, and electronic communications system, including all necessary cables, connections, surge suppressors, antenna alignments and configurations in accordance with the KDOT and equipment manufacturers' specifications and as specified on the Plans and Specifications. Provide equipment as specified on the Plans and Specifications, integrate, test, demonstrate, and receive KDOT's approval of the complete system.

Provide troubleshooting, reinstallation, and reconfiguration of all KDOT furnished and Contractor furnished communication equipment in the event of communication equipment failure. Receive approval by the Engineer for any reconfiguration.

There will be no separate payment for troubleshooting, reinstallation, or reconfiguration of devices. If an issue outside of contractor control causes delay of more than 8 hours in completing integration, additional payment may be requested from KDOT.

19.1.1 CERTICIATION OF CONTRACTOR PERSONNEL
Use a CISCO certified technician, or in the presence of and under the responsible charge of an employee or subcontractor who is a CISCO certified technician, for all configuration of Cisco switches. Before starting work, provide the Engineer with the names of the personnel assigned to perform switch configuration and a copy of their certification card.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S11 07-21-23

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KANSAS	472-085898	2025	47	57

19.2 MATERIALS

19.2.1 GENERAL
Supply all tools, equipment, materials, supplies, and manufactured articles and perform all operations necessary to install KDOT furnished equipment and construct the communications facilities as shown on the Plans and as specified herein, or as directed by the Engineer.

19.2.2 CONNECTORS, CABLES AND ADAPTERS
Incidental items include all connectors, adaptors, and cables, including but not limited to serial cables, alarm cables, all power cables for Cisco equipment, DC power cables, AC power cables, fiber optic jumpers, DS-1 cables, Ethernet cables, interface cables, located within and between all ITS cabinets and KDOT designated facilities. There will be no separate payment for incidental items. Use outdoor-rated for cables exposed to weather conditions or installed in field cabinets.

19.3 CONSTRUCTION REQUIREMENTS

19.3.1 GENERAL
Furnish all tools, equipment, materials, supplies, and manufactured articles and perform all operations necessary to install KDOT-furnished equipment and Contractor-furnished equipment and construct the communications facilities as shown on the Plans and as specified herein.

19.3.2 KDOT FURNISHED EQUIPMENT
Receive and review the installation wiring diagrams from the KDOT-furnished communication equipment suppliers. Use these drawings to make necessary terminations to all KDOT-furnished and Contractor-furnished communication equipment.

19.3.3 COMMUNICATION SCHEMATIC DRAWINGS
Submit as-built communication schematic drawings to the Engineer based on the actual connections made in the field and in the KDOT designated facility. Include in the as-built communication schematic drawings all equipment, both KDOT furnished and Contractor furnished. Leave a copy of these approved drawings in each respective ITS cabinet or KDOT designated facility. Use documentation format as specified in these specifications.

19.3.4 NETWORK CONFIGURATIONS
KDOT will provide IP addressing and configuration files for each KDOT furnished communication equipment type. Make all necessary network configurations. Coordinate with KDOT and receive approval for any downtime necessary to connect the new network components.

19.3.5 COORDINATION
Provide a skilled staff member to attend a coordination meeting prior to installation of communication equipment.

19.4 INTEGRATION WITH CENTRAL SOFTWARE
Ensure proper integration and functionality with systems as identified by KDOT or KC Scout. Ensure continuity of functions currently in place, and prevent disruption of service for any sites not included in the plans. Coordinate with KDOT or KC Scout to identify affected systems and devise methods to prevent service interruptions.

Perform software integration testing in coordination with KDOT or KC Scout on ATMS and video distribution systems. Configure both KDOT furnished and Contractor furnished equipment as needed in order to achieve functionality prescribed by KDOT. Travel to site locations as many times as required to test and configure equipment to provide a working communication system with KDOT or KC Scout central software. Complete integration prior to final acceptance.

20.0 ITS COMPONENT TESTING

20.1 DESCRIPTION
Test all ITS devices and communication links installed in this project. Demonstrate functionality of each device using a test plan provided by KDOT. Test plans will include a list of items to be tested, a test method (observation, calculation, or demonstration), an expected result, and an obtained result. Seek KDOT approval for input or specific procedures or for modifications to the test plan.

First, test each unit with its vendor software, then coordinate with KDOT to test with KDOT ATMS software, finally check transmission at site and at the KDOT designated facility. Demonstrate through testing that the equipment associated with each cabinet works as required. The tests described below are in addition to any other tests required herein.

20.2 MATERIALS
Provide all testing equipment, labor, materials and incidentals required to carry out the KDOT-provided test plan and all tests described in this section.

20.3 CABINET LEVEL FUNCTIONAL TESTS
Perform testing on each of the field components installed. Ensure that this testing verifies the proper functioning of the field components after installation. Perform the tests identified under this type of testing on each installed component and ensure the results are signed off by the Engineer or designated KDOT representative.

Provide copies of the test results for each component to KDOT and if requested, the test hardware and software.

20.3.1 CCTV PAN-TILT-ZOOM (PTZ) CAMERA CONTROL TEST
Ensure that the PTZ camera control test verifies the functionality of the installed camera controller as well as the serial communication to the camera controller. This test will use vendor test software to the CCTV camera to be commanded to turn on; turn off; send a message to the controller to pan right and left; send a message to the controller to tilt up and down; and send a message to the camera controller to zoom-in and zoom-out.

20.3.2 CCTV STAND-ALONE TEST
Following the installation, conduct an approved stand-alone test for each CCTV to verify that the units operate as specified. Ensure that this test demonstrates that video data from the CCTV camera can be manually selected on the IP network switch and be displayed on a workstation monitor at a KDOT-designated facility. Use vendor's software to test the CCTV camera for the follow commands: to turn on, turn off, pan right and left, tilt up and down, and zoom-in and zoom-out. If a unit fails to pass the stand-alone test, correct or replace the unit, and repeat the test until proven successful.

For each unit of equipment, conduct approved stand-alone tests that exercise all stand-alone functional operations of the equipment including the following: control of focus, iris, and power on/off; range of pan, tilt, zoom and digital zoom; presence and quality of video signal; camera ID and preset text generation; and pan and tilt limit stops are set to the Engineer's specification.

Stand-alone test the CCTV camera assembly for no-less-than 24 hours as a complete unit to include the CCTV camera, all cabling, all surge suppression, video encoder and/or IP network switch (if applicable) as required per project plans and specifications. This testing will require that each CCTV location be connected to a laptop to exercise the CCTV camera functionality.

Verify the video transmission quality; response to all central software commands identified under functional requirements; horizontal and vertical resolution; and verify the video transmission quality to the designated KDOT or KC Scout facility. Conduct the test in the following order: test with vendor software at site, test with the ATMS software, verify video transmission at site, and verify video transmission at the designated KDOT or KC Scout facility. Test video for smooth frame transmission, good color, and overall image quality. Ensure no video locking.

Prior to testing, the contractor shall program CCTV cameras according to the documented requirements. Coordinate with the Engineer to obtain written programming procedures. After programming is complete, the Engineer will verify that cameras are correctly programmed, and network communication is functional. Once programming and communication is verified, the CCTV subsystem test may begin.

20.4 DYNAMIC MESSAGE SIGN TEST
Perform the DMS test to evaluate the functionality of the installed DMS signs as well as the communication links between the controller and the KDOT central software. Use vendor software and KDOT's current NTCIP-compliant central software for this test. This testing will require that each DMS location be connected to a laptop to exercise DMS functionality. Contact and coordinate with the DMS manufacturer to power up the unit and perform sign commissioning. Provide all equipment required to complete testing.

20.4.1 DMS STAND-ALONE TEST
Following the installation, including power connectivity, conduct an approved stand-alone test for each DMS assembly to verify that the unit operates as specified. Complete the stand-alone test for each DMS within two weeks following the installation of the DMS case, cabinet, power, and communication links. If a unit fails to pass the stand-alone test, correct or replace, and repeat the test until proven successful.

If DMS parts are defective, coordinate with the DMS vendor to obtain warranty replacement of defective parts for DMS or other KDOT-provided equipment and reinstall at no charge to KDOT.

Perform the stand-alone test for the DMS system using both the controller front display panel and a laptop. Provide the laptop. The DMS manufacturer shall provide the vendor software for the test.

20.4.2 DMS COMMISSIONING
Manufacturer shall perform on-site DMS commissioning including communication testing with KDOT central software. DMS commissioning includes the following items: DMS system is installed correctly, DMS system is functioning correctly, DMS is ready for normal operations without the need for an additional site visit, record of all tests and setup tests performed. Manufacturer shall provide procedures. DMS commissioning shall include the following tests in this order: test with vendor software at site, test with KDOT central software, verify transmission at site, verify transmission at KDOT facility.

20.5 VEHICLE DETECTOR TEST
Test each radar vehicle detector to confirm the accuracy of the data reported to the KDOT designated facility staff.

20.5.1 VOLUME
Use human observers to count the vehicles in each lane during a 15 minute interval. The total for each lane shall be compared with the lane total for the same period reported by the central computer. The totals from the computer and from the observers must not differ by more than 10 percent for every lane.

20.5.2 SPEED
Conduct this test one lane at a time. Use a trained, experienced operator with a speed measuring device such as a a LIDAR or Radar to measure the speeds of individual vehicles, excluding large trucks, in the lane. Measure as many vehicles as possible in a 10 minute period and the results averaged. Calculate a weighted average speed for the same period based on data from the central computer. Weight the speed for each reporting period by the number of vehicles in that reporting period. The speeds from the computer must be within fifteen percent of the observed speed for every lane. If vehicles in the closest lane interfere with speed measurements in other lanes, provide a means of elevating the observer enough to provide a clear line of sight to the vehicles being observed.

20.6 60 DAY ACCEPTANCE TESTING
The test period for each device (including all CCTV, DMS, and VDS) will be 60 days, to commence when all work has been completed, materials have been furnished and completely installed, and copies of the test results have been received and accepted by the Engineer. Final system acceptance for each device will be defined as when the device has operated continuously and successfully for 60 calendar days with no more than 2 calendar days downtime due to mechanical, electrical, and/or other malfunctions.

20.7 WIRELESS DATA COMMUNICATIONS LINK TEST
Prior to testing an installed link, calculate expected signal strengths for each link and expected throughput. Include the following in the test plans installation documentation for each site: Transmit power setting, antenna type and gain, antenna azimuth, transmit frequencies (or channel/band for broadband equipment), antenna height, and minimum receive power for the applicable modulation scheme/throughput as provided by the manufacturer. Include in the test reports: signal quality, modulation scheme selected (or selected by device if automatic), link throughput for TCP and UDP protocols using a tool such as Iperf over a period of no less than 60 seconds and packet loss over a period of no less than 60 seconds. Include in the test report comparisons of observed and expected throughput for each link. Provide test results to the Engineer.

20.8 FIBER OPTIC TESTS
Provide sample test results and test procedures to the Engineer for approval before testing begins.

After all splices and terminations have been completed, test each fiber, including spares and unterminated fibers, with a power meter/stable laser source and OTDR between termination points (for unterminated fiber a temporary pigtail termination to a temporary FDU is required; there is no extra payment for temporary terminations, this work is subsidiary to other iterms of the contract). Test fiber optic cables bi-directionally. Both ends of the tested fiber require a launch cable to accurately measure connector losses. Test with a launch cable that is at least ten times the pulse width used for the test and a receive cable of similar length.

Conduct power meter tests for each fiber to demonstrate connectivity and attenuation from origin to destination. Model this test after FOTP-171 insertion loss. Demonstrate that the attenuation for each fiber path including connectors, and splices as a whole, comply with the loss budgets required by these documents. Submit a test result summary sheet showing calculated attenuation, splice and connector losses, and tested loss for each fiber to the Engineer for review and approval. The Contractor may request a sample test result summary sheet. Test between termination and ITS Cabinets as designated by the Engineer.

Conduct bi-directional OTDR and power meter tests end to end for each fiber. End to end is defined as KDOT designated facility to field device or temporary termination point for testing purposes on unterminated fiber. This includes tests for each fiber from the designated KDOT facility to the field device. If using two OTDR or power meter testers, verify that they are providing similar results using the same pulse width on a single fiber prior to testing. Provide these results to the Engineer upon request.

Conduct the tests at test wavelengths of 1310 nm and 1550 nm. Prior to testing, provide the Engineer with an example test sheet for approval that includes OTDR and power meter test data as well as physical characteristics of the fiber optic cable and the cable run. Provide OTDR trace results in a graphical form acceptable to the Engineer. Identify direction using an A/B identifier for each fiber tested. Identify the pulse width used on all trace results.

The actual link loss must be less than the calculated maximum for each fiber and no unexplained events shall exist. If any fiber fails to satisfy the specified performance requirements in the 1310 nm or 1550 nm wavelength tests, determine the cause and correct the failure to the satisfaction of the Engineer. Provide electronic copies of all test results to the Engineer. Provide test results with a summary table indicating fiber data, calculated losses, 1310 nm results, 1550 nm results, and fiber identification. Additionally power meter tests and OTDR tests should provide similar end to end results.

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KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

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Testing results must meet the loss budget as shown below:

	Test Wavelength:	
Allowed Loss Per:	1310 nm	1550 nm
Kilometer	0.40 dB	0.35 dB
Splice (Average)*	0.05 dB	0.05 dB
Connector (Average)**	0.20 dB	0.20 dB

*A maximum loss of 0.30 dB is allowed for any single splice. If fewer than four splices exist in the fiber being tested, an average loss of 0.05 dB is allowed for each splice.
**A maximum loss of 0.40 dB is allowed for any single connector. If the distance between a field splice and FDU is less than 50 feet, a maximum combined loss of 0.50 dB is allowed.

The OTDR measured back reflection (reflectance) loss shall be less than -40dB. Averaging time for OTDR traces shall be at least 30 seconds. OTDR pulse width shall be appropriate for the length of trace that is being tested; auto-test values by OTDR should be reviewed by contractor and a series of pulse widths used to determine best trace for each run. Acquire approval from the Engineer for any exceptions and document them at the time of testing.

If the maximum loss is exceeded for any splice, cut and re-splice the fiber. A minimum of two attempts at cutting and re-splicing fiber should be made to correct the loss. If the loss still exceeds the maximum listed, verify with the Engineer that the loss will be acceptable. Provide documentation of each attempted test.

Provide documentation that all testing equipment has been calibrated within the last year. KDOT reserves the right to require a new calibration certificate for OTDRs, Power Meters, or Fusion Splicers if it is felt that equipment has been mishandled or damaged.

Coordinate with the owner of leased fiber (e.g., KTA, CenturyLink/Lumen, etc.) as necessary for access to test locations to verify testing and confirm results. If problems are identified on leased fiber, the Contractor shall document issues and work with KDOT to notify providers and remedy the identified issues. Additional expenses from extra site visits to establish and test connectivity as a result of coordination with the owner of leased fiber or backbone splicing shall be approved by KDOT in advance. Losses within leased fiber are not the responsibility of the Contractor. If leased fiber power meter results fail, results may still be accepted. Instances will be evaluated on a case-by-case basis.

20.9 TECHNICAL REFERENCE MANUAL (TRM)
Coordinate with the Engineer to locate and compile all project, device, and component information required by these specifications into a Technical Reference Manual (TRM). Organize and submit all information electronically via a USB flash drive or online drop box system in the formats noted on Table S.15.2 on sheet ITS-S15.

A complete draft of the TRM, including all fiber test results, must be submitted prior to commencement of the 60-day test period for any device or system. KDOT's ITS Unit will provide written approval and confirmation that all materials were received and that equipment is ready for testing prior to commencing any test periods.

The Engineer will review the draft TRM during the 60-day test period and will provide comments to the Contractor for any corrections to be made prior to the termination of the 60-day test period. Final acceptance of any system or project will not be granted until a final, updated version of the TRM has been submitted to and accepted by KDOT's ITS Unit.

The following sections must be included in the TRM:
1. Table of Contents
2. Project Information, Documents, and As-Built Plans
3. Device Documentation & Warranties
4. Test Results
5. Splice Vault / Pull Box Documentation
6. GPS Documentation
7. Cabinet Documentation Records

See Table S.15.1 and S.15.2 on ITS-S15 for a checklist of all items to be submitted as part of the project.

20.9.1 TABLE OF CONTENTS
Following the cover page of the TRM, include a linked or bookmarked table of contents for the entire TRM. Each section and subsection as noted in Table S.15.2 must be included and linked.

20.9.2 PROJECT INFORMATION, DOCUMENTS, AND AS-BUILT PLANS
In this section, include any relevant information or documents obtained or developed for the project.

Provide all approved permits obtained for the project, including railroad, waterway, bridge, city, or county permits.

Additionally, include a table listing all new power service locations with corresponding addresses, service types, and utility contact information.

After all cable and conduit has been installed, contact Kansas OneCall to perform locates for all cable included in project. Include email(s) from Kansas OneCall showning status of all locates as complete. The project will not be accepted if utilities cannot be located correctly. The Contractor will be responsible for correcting utilities so they can be located.

Include an As-Built version of the plans in this section with any field alterations or changes noted in red. Legibly mark plans in a contrasting, reproducible color to depict any changes or deviations made during construction, including buried or concealed construction or utility features. Record locations of all buried utilities that differ from the location indicated or that were not included on the contract plans. As-Builts must include marked-up communication schematic drawings. Supplement as-built documents with detailed sketches as necessary.

20.9.3 DEVICE DOCUMENTATION & WARRANTIES
Provide a list of all components and parts used in the project. Include a brief description, part or model number, and listing of recommended suppliers including e-mail addresses, phone numbers, or website links. For each item, include the warranty start date and effective warranty period. Also include component serial numbers for cameras, detectors, and DMS.

Include electronic copies of any warranty submittals.

Include all final and approved submittals and shop drawings as an electronic PDF file with bookmarks of each component or cable. Be sure to include any structural weld drawings and general wiring/block schematics.

Additionally, provide a copy of each user manual for all vendor-supplied software and equipment. Tab or highlight any fault diagnostic or repair procedures and any preventative maintenance procedures to facilitate field maintenance or repairs.

Include all lowering device installation certifications from the manufacturer indicating that the lowering devices were installed correctly. Include the installation and operation specifications and manuals for the lowering device in this section if they were not already included in the approved submittals.

20.9.4 TEST RESULTS
Include copies of all results for each test conducted for the contract. Test results should be labeled clearly with locations on the header of each page. This includes, but is not limited to:
1. Ground Resistance Test Results
2. ITS Component Test Results
   a. CCTV Camera
      i. Standalone
      ii. 60-day/Final Acceptance
   b. CCTV Lowering Device Test Results
   c. DMS Test Results
      i. Standalone
      ii. Commissioning
      iii. 60-day/Final Acceptance
   d. VDS Test Results
      i. Standalone Test
      ii. 60-day/Final Acceptance
   e. Ethernet Radio Systems
      i. Wireless data communications link
      ii. Throughput
3. Fiber Optic Test Results
   a. Power Meter
   b. OTDR
   c. Total Fiber Loss Budget

20.9.5 SPLICE VAULT / PULL BOX DOCUMENTATION
For each fiber optic splice vault and communications pull box, include the following documentation: a photo of the inside of each vault or box, a brief location description, the vault or box identifier as labeled on the plans, a description of the cables within the vault or box, sequential fiber markings taken within three feet of conduit entry, and any other pertinent information that would be useful for future maintenance activities. Upon completion of splicing, take a picture of each splice tray, labeling each fiber and each tray with clear identifiers.

For at least one electrical pull box per project, include a photo of the outside of the box after installation.

The data for each vault may be presented in a PDF format or included as attached data in a shape or KMZ file. All data must be embedded in the GPS points provided and should not reference external storage locations.

20.9.6 GPS DOCUMENTATION
Provide electronic GPS documentation of all items installed or used in the project. Include plan identifiers/labels for each item. GPS documentation shall be submitted as an electronic spreadsheet using the template provided by the Engineer, a shapefile, or a KMZ file. If Providing an electronic spreadsheet, provide the spreadsheet as a PDF within the TRM and as an electronic Excel file.

GPS points shall be included for all the following installed devices: DMS foundations, CCTV camera poles, detector poles, cabinets (pad- and pole-mounted), pull boxes, splice vaults, wireless towers, power supply assemblies (Type 1 and Type 2), service poles, transformers, junction boxes, and all conduit and cable runs. GPS coordnates shall be collected for existing devices or features utilized or modified during the project. GPS coordinates for conduit runs shall be taken every 100 feet for trenched or plowed conduit and every 20 feet for bored conduit. Collect both depth (distance from ground level) and elevation (distance from datum) data for bored conduit.

GPS points shall be collected with high accuracy GPS receivers capable of submeter accuracy. GPS points shall be in decimal degree format reported to a minimum of six decimal places for both latitude and longitude.

Include a photo of both the front and back of the inside (doors open) of each cabinet in the GPS documentation section of the TRM. Include pictures of all fiber distribution units in POP Buildings, Hub Cabinets, or Communications Shelters that were modified with the project.

20.9.7 CABINET DOCUMENTATION RECORDS
For each cabinet in the project (installed, modified, or existing), provide an electronic copy of the cabinet documentation to be included in the document pouch/folder. The following documents must be included for each cabinet: Patch Panel Diagrams, Cabinet and Device Wiring Diagrams, Cabinet Elevation Drawings with detailed labels, Site Communication Schematics, and a copy of any maintenance logs.

Print an 8 ½" by 11" hard copy of all documentation for each cabinet and place within the cabinet's document pouch/folder. Final acceptance will not be granted until both the hard copies are placed in each cabinet and electronic copies are included in the TRM.

21.0 TRAINING

21.1 DESCRIPTION
Conduct training courses for KDOT operations and maintenance staff on operating components of the ITS system if requested by KDOT. Design training courses to ensure that KDOT staff achieves a full knowledge and appreciation of the design, operation and maintenance of equipment. Training may consist of field device operations and maintenance training, field communications operations and maintenance training, and system (outside plant) operations and maintenance training.

21.2 MATERIALS
Provide all training documentation, and coordination with vendors to provide teaching staff. Provide the training to consist of lectures and demonstrations that shall provide practical (hands-on) training and experience.

Provide 5 hard copies of the training manuals and 1 electronic copy of the training manuals.

Provide a detailed training plan and a syllabus for each course for the approval of the Engineer. Include in the information: tentative dates for courses, locations, and an outline of topics and names of instructors. Provide this information to the Engineer at least 30 days in advance of the training course.

21.3 CONSTRUCTION REQUIREMENTS
Provide up to a 2-day training class to train operations and field maintenance personnel at KDOT's request. Include in-field demonstrations.

22.0 BASIS OF ACCEPTANCE FOR ITS SYSTEM

The ITS system will be accepted when all test results, documentation including but not limited to the TRM and as-built plans are received and approved by the Engineer, all test periods are successfully completed, and all training is completed.

Prior to acceptance, KDOT will contact Kansas One-Call to confirm new utilities can be located and are in the correct position. The project will not be accepted if utilities cannot be located correctly. The Contractor will be responsible for correcting utilities so they can be located.

23.0 MAINTENANCE AND WARRANTY

23.1 MAINTENANCE
Maintain all equipment and cables installed in this project until the ITS system has passed all testing requirements specified herein and has been accepted by KDOT. Once the operational test period has successfully been completed, turn over the maintenance of the ITS system to KDOT.

23.2 WARRANTY
Equipment Warranty: Obtain, assign, and furnish to the Engineer written manufacturer's warranties for all Contractor-provided products and electronic equipment consistent with those provided as customary trade practice.

Contractor Warranty: Provide a Contractor's warranty providing for satisfactory in-service operation of the ITS during the 60 day test period for each ITS component. Comply with the following for Contractor provided equipment: if defects develop during this period, replace or repair the provided equipment, at the expense of the Contractor, including all labor, material and associated costs, as necessary to restore required performance. Comply with the following for KDOT provided equipment: if defects develop in KDOT provided equipment, KDOT will provide a replacement and Contractor shall replace equipment, at the expense of the Contractor, including all labor, material and associated costs, as necessary to restore required performance. KDOT labor costs resulting from equipment replacement will not be charged to the manufacturer or the Contractor.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS

ITS-S13 07-21-23

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STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	49	57

MICRO-FIBER SPECIFICATIONS

1.0 GENERAL

These specifications are intended to be supplemental to the KDOT ITS Fiber Specifications. Micro-fiber used shall adhere to the KDOT ITS Fiber Specifications unless otherwise noted on this page. Cable shall be 8.1-8.3\125 um single-mode, bend insensitive optical fiber cable containing glass of type Corning SMF-28 Ultra, AFL SR-15e, or approved equal, and that meets the following specifications:

ITU- T G652.D/G657.A1
IEC Specification 60793-2-50
TIA/EIA 492-CAAB
Telecordia GR-20

The micro-fiber shall be fully backwards compatible with legacy G.652 compliant fiber types. Micro-fiber shall be single-mode and consist of fibers arranged in binderless loose color-coded buffer tubes of 12 individually color-coded fibers. The micro-fiber shall be optimized for air-assisted installation in micro-duct and installation distances greater than 6,560 ft.

2.0 MECHANICAL AND PERFORMANCE REQUIREMENTS

The cable shall be a rugged all dielectric outdoor cable containing color coded buffer tubes / binders with 12 single mode color-coded fibers per binder, dual window (1310 nm and 1550 nm) fibers with UV acrylate coating in color coded, buffer tubes or binders with the maximum outer diameter between 7 mm - 10.5 mm.

The buffer tubes / binders shall be stranded around an all-dielectric center strength element using a reverse oscillation lay, wrapped by water blocking core separator or functional equivalent. The maximum allowable attenuation of the fiber is 0.35dB/km for 1310nm and 0.25dB/km for 1550nm. No water blocking yarns are permitted to avoid accidentally cutting fibers. The water blocking elements shall be non-nutritive to fungus, electrically non-conductive, and homogeneous; it shall also be free from dirt or foreign matter. This water blocking element will preclude the need for other water-blocking material. The cables shall include GR-20 compliant water-blocked cable core and buffer tubes / binders. The cable components shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter. The cable manufacturer shall be TL 9000 registered. The optical fiber cable shall withstand water penetration when tested with a one-meter static head or equivalent continuous pressure applied at one end of a one-meter length of filled cable for one hour. No water shall leak through the open cable end. Perform testing in accordance with EIA-455-82B.

2.1 OUTER JACKET

Cables shall be all dielectric cable (with no armoring) and shall be jacketed (sheathed) with Polybutylene Terephthalate or High-Density Polyethylene. Jacketing material shall be applied directly over the tensile strength members to provide mechanical protection, and to serve as the primary moisture barrier. This cable sheath shall be designed to meet or exceed the tensile criteria defined in EIA-455- 89a. Each jacketed fiber shall have a tensile strength in excess of 50 lbs. The jacketing shall contain carbon black to provide ultra-violet light protection, and it shall not promote the growth of fungus. The jacket or sheath shall be free of any holes, splits, or blisters. The cable jacket shall contain no metal elements and shall be of a consistent thickness. The cable shall contain at least one ripcord under the sheath for easy sheath removal.

2.2 CRUSH RESISTANCE

The non-armored optical fiber cables shall withstand a compressive load of 220 N/cm applied uniformly over the length of the cable. The average increase in attenuation for the fibers shall be </= 0.10 db at 1550 nm for a cable subjected to this load. The cable shall not exhibit any measurable increase in attenuation after load removal. Perform testing in accordance with EIA-455-41, "compressive loading resistance of fiber optic cable," except that the load shall be applied at the rate of 3 mm to 20 mm per minute and maintained for 10 minutes. Submit the manufacturer's certification for approval.

2.3 CYCLIC FLEXING

The cable shall be capable of withstanding 25 cycles of mechanical flexing at a rate of 30 +/- 1 cycles/minute. The average increase in attenuation for the fibers shall be less than or equal to 0.10dB at 1550 nm at the completion of the test. Outer cable jacket cracking or splitting observed under 10x magnification shall constitute failure. Conduct the test in accordance with EIA-455-104, except that the sheave diameter shall be a maximum diameter of 20 times the cable outer diameter (O.D.). Test the cable in accordance with test conditions I and III of EIA-455-104. The cable shall withstand 25 impact cycles. The average increase in attenuation for the fibers shall be 0.20dB at 1550 nm (single-mode). The cable jacket shall not exhibit evidence of cracking or splitting. The test shall be conducted in accordance with EIA/TIA-455-25A. Submit the manufacturer's certification for approval.

2.4 TENSILE STRENGTH

Tensile strength shall be provided by high tensile strength aramid yarns and fiberglass, which shall be helically stranded evenly around the cable core. The cable shall withstand a tensile load of 1334 Newtons (N) [300 lbs.] without exhibiting an average increase in attenuation of greater than 0.10dB. Apply the load for one hour in test condition II of EIA-455-33A. The optical fiber cable shall withstand a maximum pulling tension of 1334N (300 lbs.) during installation (short term) with no damage and 400N (90 lbs.) installed (long term). Submit the manufacturer's certification for approval.

2.5 TEMPERATURE

The shipping, storage, installation, and operating temperature range of the cable shall meet or exceed 14 °F to +140 °F (-10°C to +60°C).

2.6 BEND-INSENSITIVE

Single-mode fibers shall be contained in color-coded binders. The configuration shall be dimensionally sized to minimize local stresses and microbend losses. The optical fiber cable shall be an approved product of the U.S. Department of Agriculture, Rural Electrification Administration in accordance with the requirements of REA-PE-90, or as otherwise indicated, and shall conform to EIA/TIA-598. Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding. The central anti-buckling member shall consist of a glass reinforced plastic rod; the purpose of the central member is to prevent buckling of the cable.

3.0 INSTALLATION, CONSTRUCTION, AND TESTING REQUIREMENTS

The micro-fiber shall be optimized for air-assisted installation in micro-duct by using an approved micro cable blowing machine. The fiber shall be capable of installation distances greater than 6,560 ft at speeds up to 490 ft/min. Micro-fibers shall be blown in following the manufacture's recommended procedures and equipment to minimize fiber tension during installation. At no time shall the manufacturer's recommended maximum pulling tension, push force, air pressure, and installation distance and speed be exceeded. All fiber optic installation shall be performed by a Contractor certified by the manufacturer for installation of micro-fiber in micro-duct. Splicing shall be completed using a core alignment splicer. Fiber optic cable shall meet or exceed the requirements measured in accordance with the methods of the individual requirements or the following methods as defined in EIA-455-A:

1. Fiber dimensions
2. Attenuation
3. Numerical aperture
4. Fiber proof test
5. Crush resistance
6. Cable bending
7. Tensile load
8. Impact resistance
9. Attenuation vs. Temperature

3.1 MICRO-FIBER SLACK

Contractor shall reference the plans for coiling requirements at each micro-fiber splice vault. Continuous micro-fiber shall not exceed the maximum allowable continuous fiber length specifications between regeneration hubs.

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

MICRO-FIBER SPECIFICATIONS

ITS-S14 09-20-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

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STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	50	57

TABLE S.15.1

THE FOLLOWING ITEMS MUST BE GIVEN TO THE ENGINEER PRIOR TO THE SUBMITTAL OF THE TRM

Spec	Item Description	Format	Deadline	Complete
4.0	Submittals Including Shop Drawings, Product Data, Resumes and Certifications of Fiber Splicing Subcontractors, Recommended Procedure for Fiber Optic Installation, and Certifications for CISCO Technician	PDF	Prior to Construction	
4.6	Construction Schedule	MS Project or Similar	Prior to Construction	
14.3.1	Device Placement Approval/Staking	Stake in Field	Prior to Device Placement	
5.4.1	Conduit Trench Alteration Approval, If Applicable	Flag in Field	Prior to Conduit Placement	
5.3.2	Conduit Repair Approval, If Applicable	PDF	Prior to Repair	
11.3.2	DMS Erection and Corresponding Traffic Control Plans	PDF	Prior to DMS Installation	
8.2	Ground Resistance Test Results and Grounding Checklist	Table	Prior to Backfilling Electrodes	
20.8	Sample Fiber Optic Test Results	PDF	30 Days Prior to Testing	
6.2.2	Pull Box Hooks & Pentahead Sockets	Physical Tools	Prior to 60-Day Testing	
12.2.2	CCTV Lowering Device Equipment	Physical Tools	Prior to 60-Day Testing	
11.3.6	Passwords for DMS Controllers and CCTV Cameras	Word Document	Prior to 60-Day Testing	

TABLE S.15.3

THE FOLLOWING ITEMS MAY BE PROVIDED BY KDOT, IF APPLICABLE

Spec	Item Description	Received
4.3	List of Required Submittals	
4.4	Historical Boring Log Data, If Applicable	
11.1	DMS and System Components	
19.3.4	Cisco Switches and Configuration	
20.2	CCTV and VDS Test Reports	
20.8	Fiber Test Summary Sheet	
16.3.1	IP Address Schedules	

TABLE S.15.4

THE FOLLOWING ITEMS SHALL BE EXAMINED BY THE DEVICE MANUFACTURER

Spec	Item Description	Examined
11.1	DMS and System Components	
12.2.2	CCTV Lowering Device	
13.4.1	Vehicle Detection System (If Applicable)	

TABLE S.15.2

ITEMS TO INCLUDE IN THE TRM

TRM Subsection	Spec	Item Description	Format	Complete
1) Table of Contents for TRM			Linked PDF w/ Bookmarks	
2) Project Information, Documents, and As-Built Plans - Any Documents Pertinent to the Project				
	20.9.2	As-Built Plan Set	PDF	
	20.9.2	As-Built Communication Schematic Drawings	PDF	
	20.9.2	Approved Permits - RR, Waterway, Bridge, City, County	PDF	
	20.9.2	List of New Power Services - Addresses, Service Type, Utility Contact Info	Table	
	20.9.2	Kansas OneCall Utility Locate Documentation	Email	
3) Device Documentation & Warranties- Related Documents & Warranties of All ITS Components and Equipment				
	20.9.3	List of All Equipment/Parts	Table	
		Description		
		Part/Model Number		
		Serial Number (If Applicable)		
		Warranty Start Date		
		Effective Warranty Period (Start and End Date)		
	20.9.3	Warranty Document(s) for Each Device	PDF	
	20.9.3	Final, Approved Submittals/Drawings	PDF w/ Bookmarks	
		Structural Weld Drawings		
		System Wiring/Block Diagrams		
		Rack Elevation Drawings		
	20.9.3	User Manuals - Tab Repair & Maintenance Procedures	PDF	
		DMS		
		CCTV Cameras		
		VDS		
		Controllers (e.g., Signal Controllers, Loop Cards, etc.)		
		FO Patch Panels		
		Surge Protection Devices		
		Network Switches		
	20.9.3	Lowering Device Certification from Manufacturer	PDF	
	20.9.3	Lowering Device Installation Instructions & Operational Specs	PDF	
4) Test Results - Results for All Tests Conducted for the Contract				
	8.2	Ground Resistance Test Results & Checklist	Table	
	20.1	ITS Component Test Results	Table	
	20.3	CCTV Test Report	Table	
	20.1	CCTV Lowering Device Test Documents from Vendor	Table	
	20.4	DMS	Table	
	20.5	VDS Test Report	Table	
	17.4	Ethernet Radio Systems (P2P & P2MP)	Table	
	20.7	Wireless Data Communications Link Test	Table	
	20.7	Throughput Test	Table	
	20.1	Test Results for ITS Components Specific to the Project	Table	
	20.8	Fiber Optic Test Results	Table	
	20.8	Total Fiber Loss Test Summary	Table	
	20.8	OTDR Test Results	PDF / OLTS Files	
	20.8	Power Meter Test Results	PDF / Trace Files	

TRM Subsection	Spec	Item Description	Format	Complete
5) Splice Vault/Pull Box Documentation - Splice Vault/Pull Box Documents				
	20.9.5	For Each Vault/Box, Include on a Single Page:	PDF	
		Vault or Box Identifier as Labeled in Plans	PDF	
		Geo-Tagged Photo of Splice Vault / Pull Box	PDF	
		Photo of Splice Trays / Enclosures	PDF	
		Brief Location Description	PDF	
		Identification of Each Cable in Box/Vault	PDF	
	20.9.5	Sequential Fiber Markings taken from within 3' of Conduit Entry	Spreadsheet	
6) GPS Documentation - Coordinates and Plan Identifiers for All Installed Equipment				
	20.9.6	DMS Structures	Spreadsheet	
	20.9.6	CCTV Poles	Spreadsheet	
	20.9.6	VDS Poles	Spreadsheet	
	20.9.6	Cabinets - Pole & Pad Mounted Include Pictures of Front and Back of Cabinet	Spreadsheet	
	20.9.6	Pull boxes	Spreadsheet	
	20.9.6	Splice Vaults	Spreadsheet	
	20.9.6	Wireless Towers	Spreadsheet	
	20.9.6	Power Supplies	Spreadsheet	
	20.9.6	Service Poles	Spreadsheet	
	20.9.6	Transformers	Spreadsheet	
	20.9.6	Junction Boxes	Spreadsheet	
	20.9.6	Conduit Runs - Points Every 100' for Trenched Conduit and 20' for Bored Conduit	Spreadsheet	
7) Cabinet Documentation Records - Include a Copy of Each Cabinet's Documentation, Labeled by Cabinet ID				
	10.3.1.4	Patch Panel Diagram	Paper in Cabinet PDF in TRM	
	20.9.6	Photo of FDUs / Patch Panels (Including those in POP Buildings, Hub Cabinets, and Communication Shelters)	Paper in Cabinet PDF in TRM	
	14.3.6	Wiring Diagrams	Paper in Cabinet PDF in TRM	
	14.3.6	Maintenance Logs	Paper in Cabinet PDF in TRM	
	14.3.6	Communication Schematics	Paper in Cabinet PDF in TRM	

GENERAL NOTES

1. Items included in the TRM differ for each project. The Contractor is responsible for including all necessary items in the correct format in the TRM.
2. TRM should be submitted to the KDOT Construction Office and ITS unit on a Flashdrive or be made available online.
3. A complete draft of the TRM must be submitted prior to the start of the 60-day testing period for any device.
4. Include a copy of this completed checklist with the final TRM submittal.
5. The Contractor shall provide a minimum of 7 working days notice for commissioning, requested site visits, etc.
6. The Contractor shall provide a minimum of 3 working days notice for access to KDOT facilities (e.g. POP buildings, TMC, etc.).

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KANSAS DEPARTMENT OF TRANSPORTATION

ITS EQUIPMENT SPECIFICATIONS CONSTRUCTION/TRM CHECKLIST

ITS-S15 07-21-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	51	57

GENERAL NOTES:

The following checklist is provided as a guide to the ITS/Project Inspector for critical points of inspection during the ITS construction process. This checklist does not include all requirements outlined in the plans and specifications and should not be used as a standalone reference to the requirements of this contract. Review all specifications and plan documents thoroughly and use this inspection checklist to verify correct and accurate construction and installation of critical ITS infrastructure. Work with the project Engineer to resolve any potential conflicts prior to final approval of any items on this checklist.

GENERAL: PRE-CONSTRUCTION				
Spec. No.	Item	Pass	Fail	N/A
4.0	Shop drawings have been submitted and approved.			
4.6	A construction schedule (in MS Project or similar format) outlining the proposed order of work has been submitted and approved by the engineer.			
GN 7, GN 8	All field locations for devices have been staked and approved by the engineer. Any proposed plan modifications have been approved by the engineer.			
KDOT Spec	All construction permits including KDOT Access Permit have been obtained.			

GENERAL: DURING CONSTRUCTION				
Spec. No.	Item	Pass	Fail	N/A
GN 2	Disturbed areas at sites are restored and reseeded.			
GN 2	Disturbed landscaping is restored and irrigation lines repaired.			
Best Practices	Extra concrete at site is cleaned up and removed.			
Best Practices	Materials and trash at sites are cleaned up and removed			
Best Practices	Brush has been trimmed around power sources and devices as needed			
Per Plans	Temporary detectors and their associated equipment noted as salvaged have been delivered to KDOT.			
Per Plans	All temporary cameras, poles, cabinets, and associated equipment have been salvaged and delievered to KDOT.			
Best Practices	A minimum clear zone for devices of 38' is maintained for slopes 4:1 or 5:1. For rural DMS, this is a 32' to edge of DMS face.			
Best Practices	A minimum clear zone for devices of 32' is maintained for slopes 6:1 or flatter. For rural DMS, this is 32' to edge of DMS face.			
Best Practices	Ground rods shall not be buried until connections are visually verified by the Engineer and test results are accepted.			

GENERAL: POST CONSTRUCTION				
Spec. No.	Item	Pass	Fail	N/A
14.2.2	All cabinets have been accepted and construction cores are replaced with KDOT lock cores.			
GN 38, 20.9.6	Contractor has taken a GPS reading accurate to within 3 feet at all splice vaults and pull boxes and recorded them electronic spreadsheet and provided to KDOT. Contractor has recorded three tie-point measurements for buried electrical pull boxes.			
20.9	Technical Reference Manuals have been delivered to KDOT at the end of job. TRM includes items as referenced in specifications.			
20.9.2	As-built plans have been provided to KDOT.			
GN 43, 5.4.9, 20.9.2	Kansas OneCall utility locates have been confirmed by KDOT ITS by performing initial one-call locate to ensure new and existing tracer wire and test station is working properly.			
20.9.3, 20.9.4	Equipment warranties have been assigned to KDOT and documentation provided to KDOT. Contractor warranty of products and installation for 60 days test period, including on-site repair and/or replacement at no cost to KDOT provided.			
20.9.4	Equipment testing at each site has been performed, recorded in forms, signed by the Contractor, and a copy provided to KDOT.			
Best Practices	Inspector has provided contractor with final punch list.			
22.0	Engineer has accepted all work.			
22.0	All utilities have been located by Kansas One-Call and verified by KDOT.			

CONDUITS & PULL BOXES				
Spec. No.	Item	Pass	Fail	N/A
5.3	Existing conduits have been proofed and cleaned before installation of cables.			
5.2.2	Non-metallic conduits are Schedule 80.			
GN 10	If site allows, conduit is routed parallel to ROW line and/or KDOT's fiber backbone and then perpendicular to ROW to device.			
GN 21, GN 23, GN 24	When within 5 feet of KDOT lighting conduit or 10 feet of KDOT fiber or CenturyLink/Lumen fiber, conduit was hand dug or hydro-excavated			
Best Practices	Conduits and pull boxes are located at least 25' from edge of roadway and ramps where possible.			
5.2.2	Colors of conduit used are correct: KDOT area: green for communication, red for power, and black for spare. COW area: orange for communication, red for power, and gray for spare.			
5.4.16	Minimum bend radius of conduit is the greater of the following: 20 times the OD of fiber optic cable, 6 times the ID of the conduit for 2 inch or smaller, or 10 times the ID of the conduit for 3 inch or larger.			
5.4.8	Empty conduits have mechanical duct plugs installed, no duct tape or expandable foam seal			
5.4.16, 15.11.2	Conduits with cable have watertight duct seal at each end, no duct tape or expandable foam seal.			
5.4.6, 6.3.1	Conduit edges are square and smooth, free of burrs. 10 to 12 inches of conduit is exposed inside the box.			
5.4.4, 5.4.5	Conduits are cleaned, swabbed, and mandrel tested			
5.4.8, ITS-D10	Communication conduit has a minimum of 42 inches of cover. Electrical conduit has a minimum of 48 inches of cover. Utilities crossing under roadways have a minimum of 5 feet of over below crown grade or 3 feet below ditch grade.			
ITS-D10, 5.2.5, 5.4.11, GN 25	Trenches for conduit have 3 inch minimum reincorced warning tape installed 12 inches above the top of conduit. Tape is orange for conduit carrying communication and red for other conduits.			
ITS-D10, 5.4.11	Trenches for conduit are free of rock or items that may damage conduit when compacted.			
ITS-D10, 5.4.11	Trenches for conduit are filled and compacted.			
5.4.14	HDPE conduit on bridges has expansion devices installed.			
5.4.14	Rigid metal conduit attached to structures is anchored within 3 feet of each termination and every 5 feet with galvanized or stainless steel hardware.			
5.4.14	Rigid metal conduit attached to steel bridge members is clamped. No drilling, grinding, or welding is allowed.			
ITS-D10, 5.4.14	Rigid metal conduit that passes across an expansion joint has a conduit expansion device installed.			
ITS-D10	Metal conduits have bushings on ends to protect cable from sharp edges.			
ITS-D10	Metal conduits are grounded and bonded to one another.			
5.4.15	Conduit carrying electrical wire is grounded. Ground wire is the size of the largest current-carrying conductor, #6 minimum.			
5.2.4, 5.4.9	Tracer wire is orange, No. 12 strand THHN copper wire and is installed in or over conduits with fiber optics and spare conduits intended for future fiber optics (one tracer wire per conduit group).			
5.4.9	Tracer wire is isolated at terminals and labeled "Tracer" and not grounded.			
Best Practices	Do not allow truck traffic over pull boxes.			
Best Practices	Use a double pull box configuration when power and communications are present in same location.			
ITS-D06A	Pull boxes are installed downhill of cabinets on slope so they do not rain into cabinet.			
6.2.2	Lids on pull boxes are labeled correctly for power, communications, and high voltage.			
6.3.1	Pull boxes and splice vaults have 24" of gravel underneath.			
6.3.1, ITS-D07, ITS-D08	Concrete around pull boxes and splice vaults is formed square with clean and neat edges.			
5.4.9, 6.2.4 ITS-D07, ITS-D08	Tracer wire test station is installed for communication pull boxes with tracer wire hooked up and proper grounding.			
6.2.2, ITS-D07, ITS-D08	Stainless steel bolts with pentaheads are installed in pull box lids after final punch list is approved.			
6.2.2	Lid bolt holes and lift anchors are free of concrete and debris.			
Best Practices	Extra concrete at pull boxes cleaned up.			
6.3.1	Pull boxes should be cleaned out of mud/debris before final acceptance.			

POWER/WIRING				
Spec. No.	Item	Pass	Fail	N/A
6.3.1	Power and communication cables are in separate conduits and pull boxes per plan requirements.			
8.7.1	Power meter assemblies have phenolic nameplate with "KDOT ITS", service address, and service voltage			
GN 19, GN 20	Transformers are mounted adjacent to cabinet or near ROW line, always outside clear zone, on lightweight structure in weather-tight enclosure			
8.4.4	Transformers and service disconnect doors have metal plates with "DANGER HIGH VOLTAGE".			
8.4.4	Transformer are labeled as step-up or step-down and with all incoming and outgoing voltages.			
8.4.4	Transformers have padlocks and key is provided to KDOT.			
8.5.2	Surge protectors installed in cabinets.			
10.3.1.3	Power cables labeled correctly entering cabinets, pull boxes, transformers, or power meter assemblies.			
8.7.1	All circuits are labeled in power supply.			
8.3	Power at sites has been ordered in KDOT's or KC Scout's name. Contractor assumes all fees until KDOT or KC Scout assumes ownership.			
7.3.2	The minimum bend radius of power cable is 6 times the OD of the cable.			
ITS-D03A, ITSD03B	36 feet of power cable stored at Type 1 power supply assembly			
ITS-D03A, ITSD03B	8 feet of power cable stored at each Type 2 power supply assembly, load side			
ITS-D03A, ITSD03B	8 feet of power cable stored at each Type 2 power supply assembly, service side			
ITS-D03A, ITSD03B	36 feet of power cable stored at service pole and 8 feet at service pedestal			
ITS-D03A, ITSD03B	8 feet of power cable stored at transformers			
ITS-D03A, ITSD03B	8 feet of power cable stored at ITS cabinets			
ITS-D03A, ITSD03B	6 feet of power cable stored at pull boxes			
ITS-D03A, ITSD03B	50 feet of power cable at each overhead DMS			
ITS-D03A, ITSD03B	25 feet of power cable at each roadside DMS			
7.3.3	Power cable splice is in pull box or enclosure only and only if indicated on the plans. No splices allowed in conduit.			
7.3.3	Splices have connectors, 2 layers of electrical rubber tape, 4 layers of plastic electrical tape, 2 layers of friction tape, and 3 coats of waterproof compound. No soldered connections allowed.			
8.1	Ground rod attachments are exothermically welded. No clamps. Mechanical connections are permitted if ground rods are above ground and inside cabinet.			
8.2	Ground resistance testing is performed in the presence of the engineer or their approved representative and results provided to the Engineer.			
Best Practices	Ground rods shall not be buried until connections are visually verified by the Engineer and test results are accepted.			

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KANSAS DEPARTMENT OF TRANSPORTATION

ITS INSPECTION CHECKLIST PAGE 1 OF 2

ITS-S16 10-27-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	472-085898	2025	52	57

GENERAL NOTES:

The following checklist is provided as a guide to the ITS/Project Inspector for critical points of inspection during the ITS construction process. This checklist does not include all requirements outlined in the plans and specifications and should not be used as a standalone reference to the requirements of this contract. Review all specifications and plan documents thoroughly and use this inspection checklist to verify correct and accurate construction and installation of critical ITS infrastructure. Work with the project Engineer to resolve any potential conflicts prior to final approval of any items on this checklist.

CCTV SITES				
Spec. No.	Item	Pass	Fail	N/A
12.3.5	CCTV pole grounded using a minimum #2 stranded copper grounding conductor.			
12.3.5	Galvanization at grounding lug cleaned away.			
12.3.5	Grounding wire welded to grounding rod.			
ITS-D13D	Grounding rod is 20' x ¾ copper clad.			
Best Practices	Grounding rod drive below ground surface min. 6".			
12.3.4, ITS-D13	Air terminal is minimum 5 ft length above top of pole and 5ft length attached to pole (total length of 10ft).			
Per Plans	Extra conduit stubbed from CCTV pole to adjacent pull box.			
Per Plans	Pull boxes for power and communications located within 25' of CCTV, where site allows			
10.3.1	Wiring is labeled and labeled correctly.			
ITS-D13D	A maintenance pad is installed beneath pole mounted cabinet.			
GN 19	CCTV pole face is minimum 7' from back of guardrail			
Per Plans	Radios and detectors mounted on CCTV pole oriented correctly.			
ITS-D13	Wire mesh installed at base of poles to prevent rodent intrusion			
Per Plans	CCTV orientation correct as per plans			
ITS-D13	CCTV not directly over cabinet or lowering device access point			
ITS-D13, ITS-D14	CCTV lowering will not interfere with radio or detectors			
Best Practices	Camera cable connected and tight to CCTV dome			
8.5.2	Surge protection devices installed in cabinet			
ITS-D20	Folding poles have two winch operation placards in place as per standards			
ITS-D21	Cables installed through folding pole hinge properly			
ITS-D22	For folding poles, 2" Schedule 80 conduit used for FO pigtail in exposed portion. Conduit does not block access door.			
20.3.1, 20.3.2	CCTV acceptance testing has been conducted and acceptance checklist is completed. CCTV has been operated successfully for 60 days.			

CCTV LOWERING DEVICE				
Spec. No.	Item	Pass	Fail	N/A
12.2.2	Verify lowering device is attached properly to pole using supplied hardware.			
12.2.2	Verify lowering device cable and wiring harness are routed through pole on separate paths so as not to interfere with each other.			
Best Practices	Verify that wiring harness is securely fastened to tie down loops inside pole.			
12.2.2	Very that lowering tool attaches properly to pole handhole using the provided tapped hole and bolt through lowering device.			
12.2.2	Verify operation of lowering drill forward and reverse.			
12.2.2	Verify clutch operation on clutch/socket assembly.			
12.2.2	Attach lowering tool to pole, connect lowering tool cable to lowering device cable using supplied screw links.			
12.2.2	Unlock camera using hand crank attached to lowering tool.			
12.2.2	Attach lowering drill to lowering tool and lower camera to full extent			
12.2.2	Verify camera stops lowering before contact with ground or other objects.			
12.2.2	Raise camera using drill to within 12" of camera mount. Use hand crank to raise camera final 12" and to lock in position. Verify camera is locked in place by releasing tension on lowering cable.			
GN 35	Lowering device handhole is not on downhill side of pole nor underneath CCTV.			
12.2.2	Lowering device engages and disengages easily.			
Best Practices	Lowering device safety loop properly installed.			
12.2.2	Lowering device tools delivered to KDOT.			

DETECTOR SITES				
Spec. No.	Item	Pass	Fail	N/A
ITS-D19	Detector pole bases are complete with covers.			
13.2.6	Detector pole base wires have breakaway cable connectors.			
13.2.6	Ground wire is a #4 bare copper wire or as shown on plans.			
ITS-D19	Drip loop in detector cable before it enters pole.			
13.2.6	Cable grips installed inside pole to support cable weight.			
13.4.1	Detector is mounted at height specified by manufacturer for offset.			
ITS-D13, ITS-D19	Detector is mounted securely to bracket and bracket securely strapped to pole.			
ITS-D19	Attachment hardware is stainless steel or aluminum.			
8.6.2	Click! 200 surge protection device or equivalent is installed in cabinet.			
13.2.4	Click! 301 media converter device installed in cabinet.			
8.6.2	Click! 201 power converter installed in cabinet.			
13.4.1	Detector has been tested and verified in the field to provide coverage for all lanes and accuracy tested.			
20.5	Test report on detector provided to KDOT.			

CABINETS				
Spec. No.	Item	Pass	Fail	N/A
14.3.1	Cabinet heights are such that the top of the cabinet does not exceed 6 feet above ground.			
Best Practices	Cabinet attachement does not interfere with pole pull boxes.			
VARIOUS	Cabinet conduit to pole connections are watertight.			
14.3.5	Cabinet locate test station is installed. Tracer wire is connected, accessible from the exterior of the cabinet, and is isolated from cabinet and ground.			
5.4.6	Conduits edges are square and smooth and free of burrs.			
ITS-D05	Cabinets are sealed between pad and cabinet bottom.			
14.2.2	Cabinet locks are Best 3L (KDOT) or Corbin Number 2 (KC Scout), keys given to KDOT or KC Scout.			
14.2.2	Cabinet has metal or phenolic name plate labeled KDOT ITS or KC SCOUT ITS and a phenolic name plate with device number.			
ITS-D16	Ground mounted cabinets are installed minimum of 5 feet from ROW line (5'-10' preferred) or behind device pole (if in median or site dictates).			
ITS-D25	DMS cabinets attached to pole with 4 stainless steel straps.			
14.2.4	Lights are installed in cabinet.			
8.5.2	Surge proection installed in cabinet.			
ITS-D04	Power terminals and breakers are installed a minimum of 12" from bottom of cabinet for ground mounted cabinets.			
5.4.9	Tracer wire entering cabinet is labeled and NOT grounded.			
5.4.16	Conduits with wire are sealed with watertight duct seal. Conduits without wire are sealed with a mechanical duct plug. Expandable foam seal is not permitted.			
14.2.13	Rack mounted power strip is installed in cabinet.			
14.3.2, 14.3.3	Wires in cabinet are routed and bundled in a neat manner and wire tired so no loose cables are dangling in cabinet.			
14.3.7	Rack elevation drawing of finished cabinet provided to KDOT.			
Per Supplier	If UPS equipment is present, test the individual battery voltage to ensure they are fully charged/charging. Voltage should be at or near 12 volts.			
14.2.7	Filters installed in cabinet and fit tightly to door.			
14.2.11	Verify a single slide-out shelf is installed.			
14.2.13	Verify the presence of surge suppression devices.			
7.3.2	Fiber optic jumpers and cable do not exceed recommended bending radius.			
Best Practices	Cabinet is vacuumed and free of any dust or loose debris.			
10.3.1.4	Cabinet devices have IP addresses and subnet labeled, including sign controller, IE 3000 with switch, modem, encoder, and boot bar.			
14.3.6	Cabinet documentation is in cabinet.			
14.3.2	Cabinet wiring is labeled.			
14.3.7	Verify cabinet documentation, including maintenance log, wiring schematic, rack elevation drawing, splice diagrams and test results.			
14.2.2	All cabinets have been accepted and construction cores are replaced with KDOT lock cores.			

DYNAMIC MESSAGE SIGNS				
Spec. No.	Item	Pass	Fail	N/A
11.2.3	All lighting protection fittings except cable holders are heavy-duty and made from bronze castings.			
11.2.3	All terminal rods, bolts, screws, and hardward use coper clad steel, bronze, or brass.			
11.2.3	All cables and terminals bear UL Label.			
11.2.3	150-foot radius rolling sphere zone of protection drawing with air terminal has been submitted to the engineer.			
11.3.2	Detailed erection plans have been sent to the field engineer.			
11.3.5	DMS face is oriented towards roadway and according to plans.			
11.3.6	DMS temporary password is unique and provided to KDOT.			
ITS-D24, ITS-D26	Exposed anchor rods are cleaned of debris and lubricated with an approved wax.			
ITS-D25	All connections are liquid-tight.			
ITS-D25	All exposed conduits are HDPE.			

FOUNDATIONS				
Spec. No.	Item	Pass	Fail	N/A
Best Practices	Depth of foundation excavation meets minimum depth on all sides, even on slope side.			
KDOT Spec	Welding of reinforcement and anchor bolt threads is prohibited in concrete foundations.			
9.3.1	Anchor bolts are protected from concrete fouling during foundation pour.			
9.3.2	Anchor bolts are placed in proper alignment with bolt pattern of pole.			
9.3.2	Steel pole leveling nuts are torqued as specified.			
9.3.2	Steel pole top nuts are torqued as specified.			
9.3.2	Rodent screens are installed between steel pole base and foundation and in a manner such that wiring and fiber are not exposed.			
ITS-D21, ITS-D22	Folding pole foundations are 6" to 8" above existing ground grade.			
ITS-D24	Foundation has cured for at least 14 days.			
Best Practices	Concrete foundations and concrete pads are formed and neat in appearance.			
Best Practices	Excavation sites are protected with fencing or caution tape and covered.			
ITS-D24	DMS foundation does not extend more than 6" above existing ground line.			
ITS-D13D, ITS-D21	Wire mesh installed at base of poles to prevent rodent intrusion.			

COMMUNICATIONS				
Spec. No.	Item	Pass	Fail	N/A
5.4.9	Tracer wire is installed in or over conduits with fiber optics and spare conduits intended for future fiber optics (one tracer wire per conduit group).			
ITS-D10	Fiber optic marker posts are installed at pull box, splice vaults, at sharp turns, and every 500' over conduit with fiber.			
ITS-D10	Marker posts at pull box or splice vault with coiled fiber only shall have one orange band mark.			
ITS-D10	Marker posts at pull box or splice vault with splice enclosure shall have two orange band marks.			
15.3	Fiber optic cable is single mode XX strand per plans and meets requirement of specifications.			
15.11.2	No end-of-day cable cuts done. Full reel, contiguous installations of cable utilized as situation permitted.			
15.6	New fiber cable on reel has ends that are sealed to prevent moisture instrusion.			
15.6	Each fiber reel has tag with specification information as required.			
15.11.1	At least one member of on-site fiber personnel have two years of experience in industry as required.			
15.8.1 15.8.2	Pigtails and jumpers are all factory terminated. No field terminations allowed.			
14.3.2 14.3.3	Fiber optic cables are not folded and are not wire tied tightly in any enclosure or cabinet.			
15.11.2	Bend radius of fiber optic cable is no less than 20 times the OD of the fiber optic cable in cabinets, pull boxes, and splice vaults.			
15.11.2	Lubricant is used when placing cabling in conduit.			
15.11.2	When fiber optic cable is pulled, a break-away swivel is used to prevent cable tension from exceeding 80% of recommended tension and swivel has ball bearings to prevent cable twisting.			
15.11.2	When fiber optic cable is pulled, cable ends are sealed to prevent ingress of dirt and moisture.			
15.11.2	No tension remains on fiber optic cable after installation.			
15.11.2	The first 10 feet of fiber optic cable pulled is discarded.			
ITS-D03A, ITS-D03B	50' of slack trunkline fiber optic cable from each direction stored in splice vault with splices.			
ITS-D03A, ITS-D03B	100' of slack trunkline fiber optic cable stored in splice vault without splices.			
ITS-D03A, ITS-D03B	25' of slack trunkline fiber optic cable stored in pull boxes.			
ITS-D03A, ITS-D03B	100' of slack branch fiber optic cable from each direction stored in pull boxes or splice vaults with splices.			
ITS-D03A, ITS-D03B	25' of slack branch fiber optic cable stored in pull box or splice vaults without splices			
ITS-D03A, ITS-D03B	50' of slack branch fiber optic cable stored at each ITS cabinet location. 40' stored at nearest pull box or splice vault. 10' store at ITS cabinet.			
15.7	Splice closures are mounted to side of splice enclosure box, not laying on bottom.			
15.11.5	Splice closure is waterproof and has been sealed.			
15.11.4	Fiber splicing is by fusion method only. No mechanical splices allowed.			
15.11.4	All splices have thermal shrink sleeve protection.			
15.11.6.4 15.11.7	Clean all connections to meet IEC61300-3-35			
10.3.1.1	All fibers at splice locations and pull box locations are labeled.			
15.11.6.3	Individual fibers in a splice tray are looped at least one full turn.			
10.3.1.4 15.11.6.3	Each closet connector housing with pin/port numbers is labeled and each patch panel with pin/port numbers is labeled.			
Best Practices	Patch panels are protected with plastic wrapping during construction. Post-construction, all unpatched terminals shall have dust covers intact.			
10.3.1.4.7	Each SFP port on Cisco switches is labeled with proper TX and RX port numbers.			
15.11.7	Unmated connectors have protective caps installed.			
20.8	Power meter tests and OTDR test have been performed per specs. Test results are provided to the Engineer.			
ITS-D13	Cable connections on back of radio antennas are sealed and waterproofed.			
Best Practices	Radio antenna is mounted securely to brakcet and bracket securely strapped to pole.			
17.3, 18.3	Radio antenna attachment hardware is stainless steel or aluminum.			
ITS-D13, 17.3, 18.3	Radios are oriented correctly to provide maximum signal strength.			

NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

ITS INSPECTION CHECKLIST PAGE 2 OF 2

ITS-S17 09-07-23

FHWA APPROVAL		APP'D.	
DESIGNED	DETAILED	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK.

Plotted : 12-FEB-2025 16:21

Drawn By : sspatil
File : ITS-S17.dgn

NOTE TO DESIGNER: Designer shall identify any project specific changes to the standard sheets or specifications. All changes shall be approved by City of Wichita and identified on "MODIFICATIONS TO SIGNAL STANDARDS OR SPECS". Design shall update peak hour volumes for the design intersection(s).

GENERAL NOTES

1. TRAFFIC SIGNAL SPECIFICATIONS (PART 700), STANDARD DRAWINGS, CHECKLISTS, AND OTHER INFORMATION MAY BE FOUND ONLINE AT: HTTPS://WICHITA.GOV/PWU/PAGES/REGULATIONS.ASPX
   IF THERE IS A DISCREPANCY BETWEEN OR AMONG THE FOLLOWING CONTRACT DOCUMENTS, THE GOVERNING RANKING OR ORDER OF PRECEDENCE IS:
   A. INFORMATION RECEIVED AT PREBID / ADDENDUM(S)
   B. PLANS
   C. PROJECT SPECIAL PROVISIONS
   D. SPECIAL PROVISIONS
   E. STANDARD SPECIFICATIONS

   THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCY RELATED TO THE WORK BEING PERFORMED.

2. ALL WORK WILL BE CONFINED WITHIN THE EXISTING ROADWAY RIGHT-OF-WAY OR RIGHT-OF-WAY SHOWN PER PLAN. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY AND KEEP INSTALLATION OF ALL EQUIPMENT AND DEVICES WITHIN THE APPROVED RIGHT-OF-WAY.

3. CONTRACTOR SHALL MAINTAIN 2 FT CONDUIT CLEARANCE FROM ALL LANDSCAPED FEATURES AND IRRIGATION SYSTEMS EXISTING WITHIN THE RIGHT-OF-WAY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED TO ANY EXISTING UNDERGROUND SPRINKLER SYSTEM DURING CONSTRUCTION. ANY LANDSCAPING OR IRRIGATION SYSTEMS DISTURBED DURING CONSTRUCTION ACTIVITIES SHALL BE RESTORED TO ORIGINAL CONDITION OR AS ACCEPTABLE BY THE ENGINEER AND OWNER THEREOF. NO ADDITIONAL PAYMENT WILL BE MADE.

4. CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ALL DISTURBED WORK AREAS. RESTORATION INCLUDES SEEDING, FERTILIZING, MULCHING, AND THE REMOVAL OF ALL UNUSED MATERIAL AND DEBRIS FROM THE WORK AREA ACCORDING TO THE STANDARD SPECIFICATIONS AND AS REQUIRED BY THE ENGINEER. ALL GRADING WORK SHALL SLOPE AWAY FROM FOUNDATIONS TO PREVENT PONDING. ADEQUATE TEMPORARY PROTECTION AGAINST EROSION SHALL BE PROVIDED ACCORDING TO CITY OF WICHITA SPECIFICATIONS.

5. THE CONTRACTOR SHALL DETERMINE ANY CONFLICTS WITH EXISTING UTILITIES PRIOR TO INITIATION OF CONSTRUCTION. THE CONTRACTOR SHALL CONTACT THE ENGINEER UPON DETERMINATION OF ANY UTILITY CONFLICTS.

6. LOCATING, TRACING, AND POTHOLING FOR EXISTING UTILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR. DISTURBED AREAS SHALL BE RESTORED WITH SIMILAR MATERIAL AND CONSTRUCTION METHODS. NO ADDITIONAL PAYMENT WILL BE MADE FOR LOCATING OR POTHOLING EXISTING UTILITIES, INCLUDING PAVEMENT RESTORATION. ALL LABOR, MATERIAL AND EQUIPMENT NECESSARY FOR LOCATING EXISTING UTILITIES SHALL NOT BE PAID FOR DIRECTLY BUT IS SUBSIDIARY TO OTHER ITEMS OF THE CONTRACT.

7. PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL CALL DIG SAFE AT 811 OR 1-800-344-7233 (1-800-DIG SAFE) TO REQUEST THE UTILITIES BE MARKED IN THAT AREA. THE CONTRACTOR SHALL ALSO CONTACT ANY AND ALL UTILITIES AND LOCAL GOVERNMENT AGENCIES NOT PARTICIPATING IN LOCATION SERVICES.

8. THE CITY WILL SURVEY AND STAKE LOCATIONS WHERE POLES, FOUNDATIONS, CABINETS, POWER SERVICES, AND SERVICE BOXES ARE TO BE INSTALLED. THE CONTRACTOR SHALL COORDINATE AND SCHEDULE STAKING WITH THE CITY WITH ADVANCED NOTICE. STAKED LOCATIONS SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ANY EXCAVATION.

9. ALL TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), LATEST EDITION. ALL TRAFFIC CONTROL PLANS AND LANE CLOSURES SHALL BE PRE-APPROVED BY THE ENGINEER IF NOT SPECIFICALLY PROVIDED IN THE CONTRACT DOCUMENTS.

10. THE PUBLIC PASSAGE ON THE EXISTING SIDEWALK OR PEDESTRIAN PATHWAY SHOULD BE SAFE, PROTECTED, AND ADA ACCESSIBLE. IF PUBLIC PASSAGE IS NOT POSSIBLE, A REROUTE AROUND THE WORK AREA IS REQUIRED. REROUTE MUST BE CLEARLY IDENTIFIED, ADA ACCESSIBLE, AND MEET ALL APPLICABLE REGULATIONS.

11. POWER COMPANY SHALL BE NOTIFIED AT LEAST TWO (2) WEEKS AND AGAIN AT 72 HOURS PRIOR TO THE ANTICIPATED SIGNAL TURN ON. THE CONTRACTOR SHALL NOTIFY THEM TO COORDINATE POWER HOOK-UP, INSTALLATION OF LUMINAIRES (IF APPLICABLE), AND ANY OTHER ITEMS REQUIRED FOR COMPLETION OF THE TRAFFIC SIGNAL. IF AVAILABLE, PROVIDE ENGINEER WITH ANY WORK ORDER/CASE NUMBERS.

12. HIGH VOLTAGE POWER LINES MAY BE WITHIN THE PROJECT LIMITS. ALL WORK IS TO BE PERFORMED IN CONFORMANCE WITH ALL STATE, LOCAL, FEDERAL, UTILITY, AND CONTRACT REQUIREMENTS. THE CITY HAS NO CONTROL OVER THE MEANS, METHODS, CHOICE OF EQUIPMENT, SEQUENCING OF WORK, AND SAFETY PRACTICES USED WHEN WORKING IN, ON, OR AROUND HIGH VOLTAGE LINES OR OTHER UTILITY STRUCTURES AS THESE ITEMS ARE THE RESPONSIBILITY OF THE PARTIES CONTROLLING THE PHYSICAL PERFORMANCE OF THE WORK.

13. ALL GROUNDING SYSTEMS SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND MANUFACTURER SPECIFICATIONS. FOLLOW APPLICABLE NEC REQUIREMENTS FOR INSTALLATION OF ALL PROJECT MATERIALS. THE CONTRACTOR SHALL PROPERLY GROUND ALL EQUIPMENT, CABINET, AND GROUND RODS PER APPLICABLE STANDARDS OR AS DIRECTED BY ENGINEER.

14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE ELECTRICAL SERVICE CONNECTION IN THE CITY'S NAME AT THE LOCATIONS SHOWN ON THE PLANS. DIRECT COSTS FOR PERMANENT ELECTRICAL SERVICES TO BE PAID BY CITY. THE CONTRACTOR IS RESPONSIBLE FOR TEMPORARY SERVICE (IF REQUIRED).

15. THE CONTRACTOR SHALL BE REQUIRED TO SUBMIT CATALOG CUTS OR SHOP DRAWINGS FOR ALL EQUIPMENT TO BE INSTALLED. IT IS THE PRIME CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL SHOP DRAWINGS, TESTING RESULTS, AND ALL OTHER REQUIRED SUBMITTALS PRIOR TO SUBMITTING FOR ENGINEER'S APPROVAL. THE ENGINEER WILL NOT REVIEW ANY SUBMITTED DOCUMENTATION OR BEGIN ANY TESTING PERIODS UNTIL THIS WORK IS COMPLETE.

16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND SALVAGING EXISTING EQUIPMENT AS NOTED. DAMAGE TO ANY EXISTING TRAFFIC SIGNAL EQUIPMENT DUE TO THE CONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND THE CONTRACTOR SHALL REPORT ANY OPERATIONAL PROBLEMS TO THE TRAFFIC MAINTENANCE DEPARTMENT (316) 268-4013. THE EQUIPMENT SHALL BE REPLACED OR REPAIRED (AS DIRECTED BY THE CITY) WITH APPROVED MATERIALS IN CONFORMANCE WITH THE CURRENT STANDARD DETAILS, SPECIFICATIONS, PRACTICES AND POLICIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY STORED EXISTING MATERIALS (REMOVED FOR CONSTRUCTION) TO BE RE-INSTALLED.

17. WHEN SALVAGED EQUIPMENT IS NOT TO BE REINSTALLED, IT SHALL BE DELIVERED UNDAMAGED TO THE CITY OF WICHITA OR RESPECTIVE OWNER. IF NOT OTHERWISE IDENTIFIED ON THE PLANS, EQUIPMENT SHOULD BE DELIVERED TO CENTRAL MAINTENANCE FACILITY (CMF) AT 1801 S MCLEAN BLVD, WICHITA, KS 67213. THE CONTRACTOR SHALL SCHEDULE THE DELIVERY WITH TRAFFIC SIGNAL MAINTENANCE A MINIMUM OF 24 HOURS IN ADVANCE. THE STORED EQUIPMENT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR UNTIL REMOVED BY OWNER FROM THE WORK SITE OR DELIVERED TO THE OWNER.

18. THE TRAFFIC SIGNAL CONTRACTOR SHALL NOTIFY THE ENGINEER OF THE EXACT CONSTRUCTION SCHEDULE SO THAT INSPECTION OF THE TRAFFIC SIGNAL INSTALLATION CAN BE MADE OF ALL PHASES, INCLUDING CONDUIT INSTALLATIONS.

19. THE CONTRACTOR SHALL PROVIDE THE CITY AN ELECTRONIC LIST OF GPS READINGS (EXCEL FORMAT) FOR ALL INSTALLED DEVICES, PULL BOXES, SERVICE BOXES, CABINETS, POWER METERS, AND TRANSFORMERS. THE GPS READINGS SHALL MATCH THE CITY OF WICHITA'S CURRENT GEOGRAPHIC INFORMATION SYSTEM (GIS) WITH 'SUB-METER' ACCURACY. THE PROJECT SURVEY SHALL BE BASED ON NAD83, KANSAS STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, U.S. SURVEY FEET DEFINITION. THE VERTICAL DATUM SHALL BE NAVD88. GPS AND THREE TIE-POINT MEASUREMENTS SHALL BE OBTAINED FOR EACH BURIED ELECTRICAL PULL BOX PRIOR TO PLACING BACKFILL MATERIAL. CONDUITS WHICH ARE NOT PLACED IN A STRAIGHT LINE, SHALL BE LOCATED AS NEEDED IN ORDER TO ESTABLISH ITS EXACT LOCATION AND DEPTH.

TRAFFIC SIGNAL TURN-ON AND ACCEPTANCE PROCEDURE

1. AT LEAST TWO (2) WORKING DAYS PRIOR TO SCHEDULED SIGNAL ACTIVATION, ALL TESTING SHOULD BE COMPLETED AND SUCCESSFUL, ALL DEFECTS AND DEFICIENCIES CORRECTED, ALL INDICATIONS OPERATIONAL AND PROPERLY AIMED, CABLES TAGGED, CABINETS AND SURROUNDING AREAS CLEANED OF DEBRIS, CONTROLLER FULLY OPERATIONAL PERFORMING ALL TIMING FUNCTIONS REQUIRED, ALL OTHER ITEMS OF WORK ASSOCIATED WITH THE SIGNAL COMPLETED, AND ALL SIGNS AND PAVEMENT MARKINGS PROPERLY INSTALLED UNLESS OTHERWISE APPROVED BY THE ENGINEER.

2. THE CONTRACTOR SHALL REVIEW AND SUBMIT TO THE ENGINEER A COMPLETED "CITY OF WICHITA TRAFFIC SIGNAL INSPECTION CHECKLIST" AVAILABLE ONLINE AT WWW.WICHITA.GOV. THE CHECKLIST MUST BE COMPLETED PRIOR TO CITY, TRAFFIC SIGNAL MAINTENANCE, OR ENGINEERING FULL INSPECTION.

3. THE ENGINEER AND CITY WILL CONDUCT A FULL INSPECTION OF THE SIGNAL SYSTEM. UPON SATISFACTORY CONDITIONS OF THE SIGNAL SYSTEM, THE TURN-ON SCHEDULE WILL BE CONFIRMED. THE CITY SHALL BE NOTIFIED AT LEAST ONE (1) WEEK IN ADVANCE OF THE ANTICIPATED SIGNAL TURN-ON DATE. ANY DEFICIENCIES FOUND DURING THE FINAL INSPECTION SHALL RESULT IN THE RESCHEDULING OF THE ACTIVATION.

4. ACTUAL ACTIVATION SHALL CONSIST OF THE FOLLOWING STEPS:
   A. INSTALLATION OF ALL REQUIRED EQUIPMENT IN THE CONTROLLER CABINET
   B. TESTING OF INSTALLED EQUIPMENT
   C. UNBAGGING OF ALL SIGNAL HEADS AND SIGNS (IF APPLICABLE)
   D. ACTIVATION OF THE SIGNAL WITH THE CONTRACTOR'S FLAGGER STOPPING ALL TRAFFIC MOMENTARILY AS THE SIGNAL IS TURNED ON.
   E. MINOR RE-AIMING OF SIGNAL HEADS, IF NECESSARY

5. ACTIVATION OF THE TRAFFIC SIGNAL SHALL NOT BE SCHEDULED FOR WEEKENDS, FRIDAYS OR DAYS RIGHT BEFORE PUBLIC HOLIDAYS. ENERGIZING OF SIGNAL (TURN-ON) TO OCCUR MONDAY - THURSDAY, 9:00 AM - 3:00 PM UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE ENGINEER.

6. TEST PERIOD - FOLLOWING COMPLETION OF ALL ELECTRICAL APPARATUS HOOKUPS AND THE SYSTEM TURN-ON, THE SIGNALS SHALL OPERATE SATISFACTORILY FOR 30 DAYS UNDER NORMAL OPERATION PRIOR TO ACCEPTANCE BY THE CITY. DURING THE TEST PERIOD, THE SIGNALS SHALL OPERATE TROUBLE-FREE WITH NO MAJOR OR MINOR FAILURES OF THE CONTROLLER OR ITS COMPONENTS AS DETERMINED BY THE TRAFFIC ENGINEER. SHOULD ANY DEFECT DEVELOP UNDER NORMAL AND PROPER OPERATING CONDITIONS DURING THE TESTING PERIOD AND PRIOR TO ACCEPTANCE BY THE CITY, THIS MALFUNCTION SHALL BE CORRECTED BY AND AT THE EXPENSE OF THE CONTRACTOR, INCLUDING ALL LABOR, MATERIALS AND ASSOCIATED COSTS. MINOR FAILURES SUCH AS LAMP FAILURES OR LOOP DETECTOR RE-TUNING WILL NOT BE THE BASIS FOR STARTING A NEW TEST PERIOD, PROVIDED THE FAILURES ARE REPAIRED IMMEDIATELY AND THE SAME FAILURES DO NOT RECUR DURING THE REMAINDER OF THE TEST PERIOD. A MAJOR MALFUNCTION OR FAILURE OF THE CONTROLLER AND ITS COMPONENTS WILL RESULT IN A NEW 30 DAY TEST PERIOD BEING IMPLEMENTED AFTER THE REPAIRS HAVE BEEN MADE. COMPLETION OF THE TEST PERIOD DOES NOT ABSOLVE THE CONTRACTOR OF ANY WARRANTY.

7. IF A TRAFFIC SIGNAL MALFUNCTION OCCURS BETWEEN SUCCESSFUL TURN-ON AND FINAL ACCEPTANCE AND THE SIGNAL MALFUNCTION IS DUE TO FAULTY WORK BY THE CONTRACTOR, THE CITY MAINTENANCE DIVISION MAY TAKE CORRECTIVE ACTION AND HAS THE DISCRETION TO BILL THE CONTRACTOR FOR ALL RELATED EXPENSE, INCLUDING OVERHEAD.

8. FINAL ACCEPTANCE BY THE CITY IS CONDITIONAL UNTIL THE CONTRACTOR HAS CORRECTED ALL DEFECTS AND PUNCH LIST ITEMS. FINAL ACCEPTANCE WILL BE BY WRITTEN NOTICE OF ENGINEER.

9. WARRANTY - THE WARRANTY PERIOD BEGINS ONCE THE FINAL ACCEPTANCE BY THE CITY HAS OCCURRED. CONFIRMATION OF THE ACCEPTANCE SHOULD BE PROVIDED IN WRITTEN DOCUMENTATION.

MODIFICATIONS TO SIGNAL STANDARDS OR SPECS

NO.	DESCRIPTION OF ITEM	SPEC. NO.	SHEET NO.
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

LEGEND

- LUMINAIRE
- TRAFFIC SIGNAL POLE
- TRAFFIC SIGNAL PEDESTAL
- APS PUSHBUTTON STATION
- TRAFFIC SIGNAL HEAD W/TYPE DESIGNATION
- TRAFFIC SIGNAL HEAD W/TYPE DESIGNATION & BACKPLATE
- PEDESTRIAN SIGNAL & PUSHBUTTON
- PAD MOUNTED CONTROLLER
- SERVICE BOX
- SECONDARY SERVICE POINT
- P.B. PEDESTRIAN PUSH BUTTON
- DETECTION ZONE
- 3" CONDUIT
- 2" CONDUIT
- 1 1/2" CONDUIT
- SIGN ON 1 BRACKET
- SIGN ON 2 BRACKETS
- SB / ADV RADAR DETECTION (ADVANCE OR STOP BAR)
- VIDEO DETECTOR
- PTZ CCTV
- 23 DETECTOR NUMBER
- 6 POLE/PEDESTAL NUMBER
- 2 SERVICE BOX NUMBER

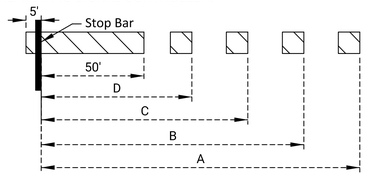
EXISTING EQUIPMENT REMOVAL SUMMARY

LOCATION	DESCRIPTION OF ITEM	QUANTITY
21ST & GREENWICH	SIGNAL CONTROLLER CABINET	1
21ST & GREENWICH	SERVICE METER W/ DISCONNECT	1

ADVANCE DETECTION DISTANCE & TIMING CALCULATION

SPEED (MPH)	MIN. ADVANCE DETECTION ZONE DISTANCES (FEET)				*TOTAL EXT. (SEC.)
	A	B	C	D	
60	610	420	260	92	2.0
55	490	320	210	92	2.0
50	420	260	92	-	2.0
45	320	210	92	-	2.0
40	260	92	-	-	2.0
35	210	92	-	-	2.0
<35 MPH NO ADVANCE DETECTION. STOP BAR ZONE ONLY (55' TYP.)					

* DETECTOR EXTENSION TIMINGS SHALL BE PROGRAMMED INTO THE TRAFFIC SIGNAL CONTROLLER.



NO.	DATE	REVISIONS	BY	APP'D
3				
2				
1				

CITY OF WICHITA
PUBLIC WORKS & UTILITIES ENGINEERING DIVISION

TRAFFIC SIGNAL GENERAL NOTES

TRAFFIC ENGINEER: MIKE ARMOUR, P.E. APP'D 01/27/22

PROJECT NUMBER	ORG NUMBER	DATE
472-085898		2025

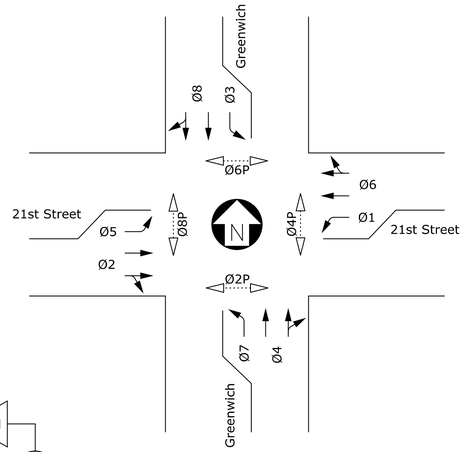
CITY ENGINEER'S OFFICE
CITY HALL - SEVENTH FLOOR
455 NORTH MAIN STREET
WICHITA, KANSAS 67202-1620
(316) 268-4501

SHEET 53

TR-101

NOTE TO DESIGNER: Calculate signal clearance times per recommendations from NCHRP Report 731. Yellow and All-Red times shall be rounded up to the nearest 0.5 second. Designer shall provide pole wiring diagrams. Pole wiring uses a separate 7C for each 3,4,or 5 section head per specification 702.21.6. Cable call-out shall be in consistant order on diagram.

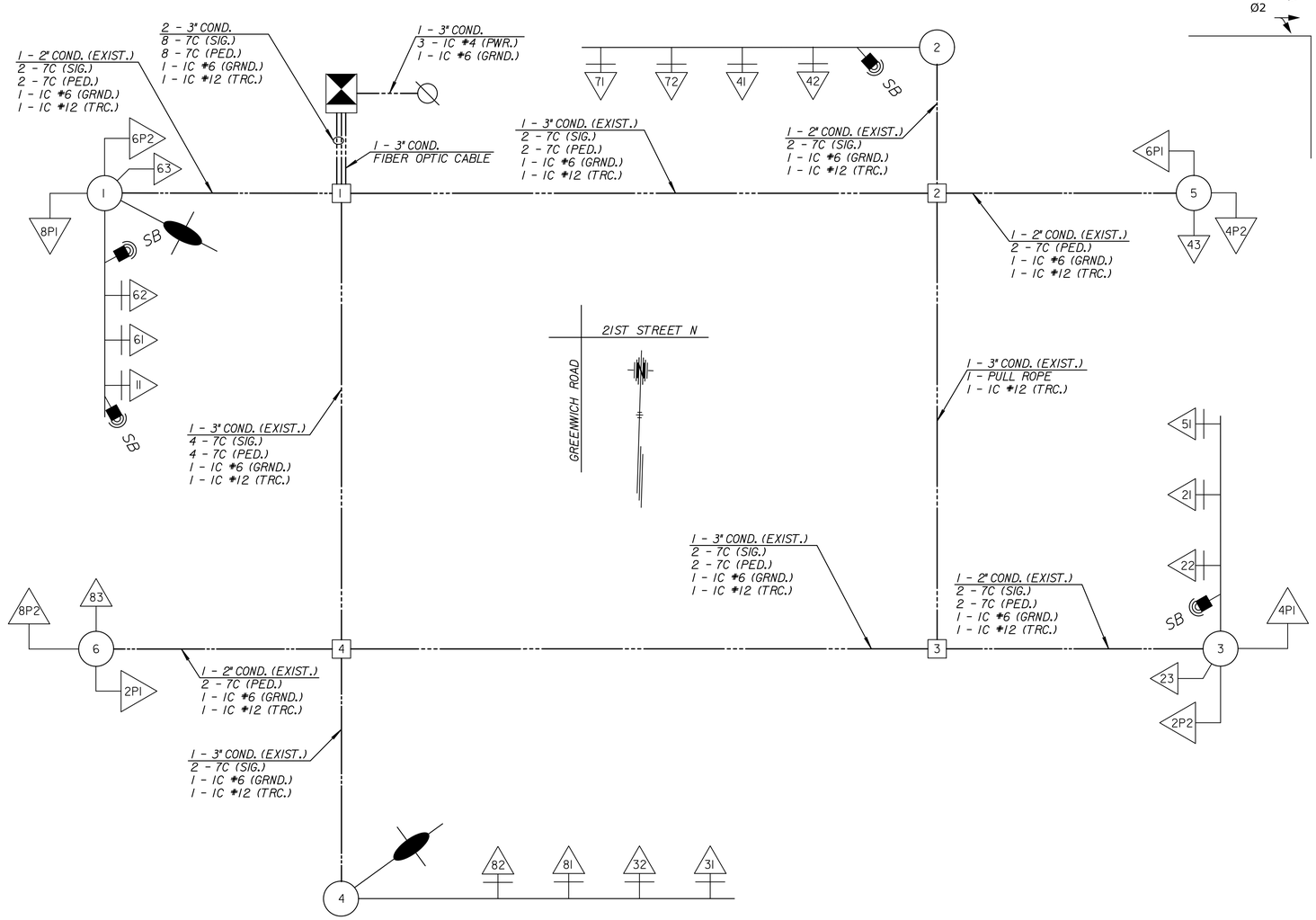
SIGNAL PHASES



LEGEND

COND.	CONDUIT
SIG.	SIGNAL CABLE
PED.	PEDESTRIAN SIGNAL CABLE
DET.	DETECTOR LEAD-IN CABLE
ST. LT.	STREET LIGHTING CABLE
GRND.	WIRE FOR POLE GROUND
COAX.	COAXIAL CABLE
FUT.	FUTURE CABLE
B.O.	BLANK OUT SIGN CABLE
PREEMPT	PREEMPTION CABLE
RADAR	RADAR DETECTION CABLE

*4-C FROM PEDESTRIAN SIGNAL HEAD (K) TO ADA PUSHBUTTON PROVIDED BY SUPPLIER



NOTES:

1. ALL MULTI-CONDUCTOR WIRE SHALL BE AWG #14 SOLID UNLESS SPECIFIED OTHERWISE. LABEL EACH WIRE AS SHOWN IN PART 700 SPECIFICATIONS.
2. ALL GROUND WIRE SHALL BE #6 AWG COPPER WIRE IN ACCORDANCE WITH ATM B-3. SOLID BARE COPPER WIRE SHALL BE USED FOR ALL EXTERIOR INSTALLATIONS INCLUDING SERVICE AND GROUND ROD BONDING. OTHERWISE, GREEN INSULATED STRANDED WIRE TYPE "THHN/THWN" SHALL BE USED.
3. GROUND WIRE SHALL BE BONDED TO EACH GROUND ROD AT EVERY POLE, PEDESTAL, SERVICE BOX, AND CONTROLLER TO FORM ONE CONTINUOUS GROUND CIRCUIT.
4. DETECTOR CABLES SHOULD RUN CONTINUOUS. SPLICES, IF REQUIRED, SHALL ONLY OCCUR IN THE POLE BASE AND MUST BE APPROVED BY THE CITY OF WICHITA TRAFFIC ENGINEER.
5. IN NO CASE SHALL MORE THAN 60% OF ANY CONDUIT BE FILLED BY AREA.
6. STREET LIGHTING CABLE SHALL BE SPLICED IN SERVICE BOXES. THE SPLICE SHALL BE MADE WATERPROOF.
7. SPLICES AT POLE BASE SHALL BE LINEMAN SPLICES PER SECTION 702.21.11. TERMINAL BLOCKS WILL NOT BE USED.
8. ALL CONDUIT SHALL BE HOT DIPPED GALVANIZED RIGID STEEL CONDUIT (GRC) AS SHOWN IN THE PROJECT SPECIFICATIONS.
9. DURING EMERGENCY FLASH OPERATIONS, ALL SIGNAL PHASES SHALL BE RED INDICATIONS. PEDESTRIAN PHASE SHALL BE DARK.
10. CONTRACTOR SHALL MAINTAIN TRAFFIC ON ALL APPROACHES DURING THE SIGNAL RE-WIRING WORK. APPROPRIATE TRAFFIC CONTROL PLANS AND MEASURES SHALL BE IN-PLACE WHILE THIS WORK IS BEING COMPLETED.
11. SIGNAL CABLE SHALL BE ADDED FROM THE NEW SIGNAL CONTROLLER CABINET TO THE BASE OF EACH SIGNAL POLE AND PEDESTAL. ALL CABLE SHALL BE NEW UNLESS OTHERWISE NOTED. THIS NEW CABLE SHALL BE SPLICED TO THE EXISTING CABLE UP THE POLE AT THE POLE BASE.
12. EXISTING DETECTOR CABLE SHALL REMAIN IN-PLACE AND WILL NEED TO BE ADJUSTED TO COMPLETE CONNECTIONS AT THE NEW SIGNAL CONTROLLER CABINET. IF NEW RADAR DETECTION UNITS AND CABLING ARE BEING INSTALLED, ALL EXISTING DETECTION CABLE & UNITS SHALL BE REMOVED AND RETURNED TO THE CITY.
13. STOP BAR RADAR DETECTION UNITS ARE APPROXIMATE ONLY AND FINAL INSTALL LOCATIONS SHALL BE COORDINATED WITH THE ENGINEER.
14. EXISTING STREET LIGTHING CABLE SHALL BE RE-USED, IF NEEDED. CONTRACTOR SHALL COORDINATE WITH APPROPRIATE STREET LIGHT MAINTAINING AGENCY TO ENSURE THE INTERSECTION LIGHTING REMAINS ACTIVE.

NO.	DATE	REVISIONS	BY	APP'D
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LEGEND: SIGNAL HEAD (X) · VIDEO DETECTOR · RADAR DETECTOR · PTZ CCTV · LUMINAIRE · PED. HEAD (K) · PUSHBUTTON · GROUND · ST.LT. CONNECTOR KIT · SPLICE CONNECTION

CITY OF WICHITA
PUBLIC WORKS & UTILITIES ENGINEERING DIVISION

TRAFFIC SIGNAL WIRING & TIMING DETAILS

TRAFFIC ENGINEER: MIKE ARMOUR, P.E.
APP'D 01/27/22

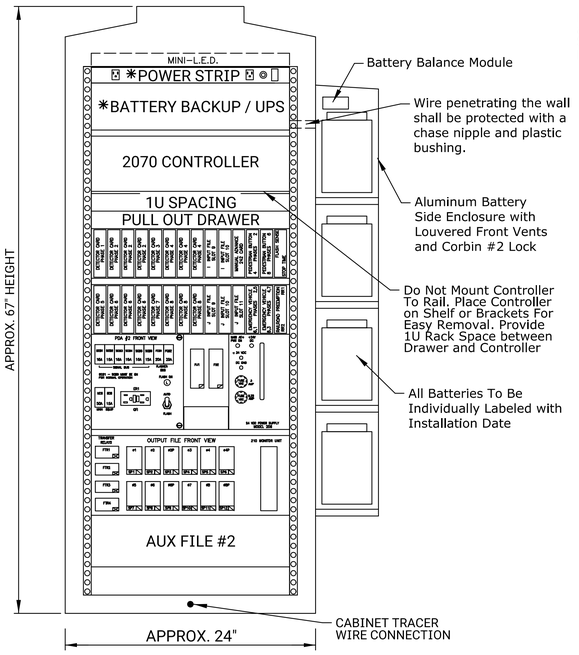
PROJECT NUMBER	ORG NUMBER	DATE
472-085898		2025

CITY ENGINEER'S OFFICE
CITY HALL - SEVENTH FLOOR
455 NORTH MAIN STREET
WICHITA, KANSAS 67202-1620
(316) 268-4501

SHEET: 54

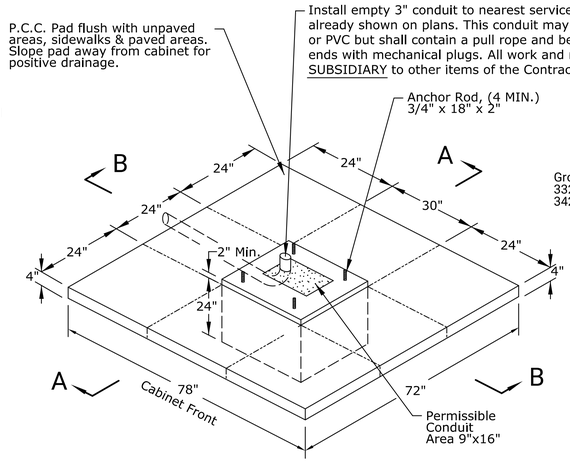
TR-104

NOTE TO DESIGNER: Design shall identify cabinet type on Traffic Signal Quantity Sheet. Typically, the Type 332L Cabinet shall be used unless intersection includes (or future) fiber connections or integration with transportation system.

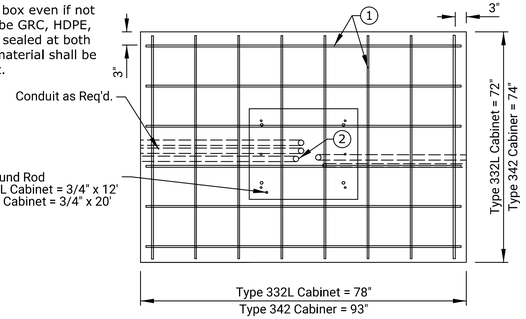


TYPICAL TYPE 332L CABINET (PAD MOUNT)

Approximate 67" H x 24" W x 30" D
*Locate Power Strip & BBS on Backside of Cabinet



TYPE 332L PAD



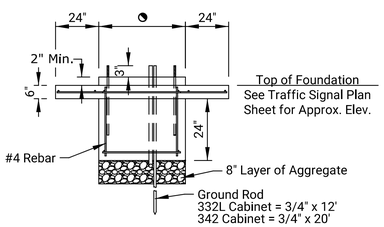
CABINET FOUNDATION NOTES:

1. ALL REINFORCING BAR USED IN THE CONSTRUCTION OF THE CABINET FOUNDATION SHALL BE NO. 4 BARS, EVENLY SPACED AT 12 IN SPACING, +/- 1.5 IN.

   6"x6"-W4xW4 WELDED WIRE FABRIC (WWF) MAY BE USED IN LIEU OF REINFORCING BAR.

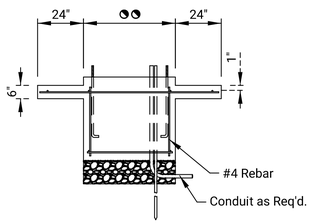
2. REINFORCEMENT SHALL BE ADJUSTED TO ACCOMMODATE CONDUIT.

3. MINIMUM NO. 4 COPPER GROUNDING CONDUCTOR FROM CABINET EQUIPMENT GROUND BUS TO GROUND ROD.



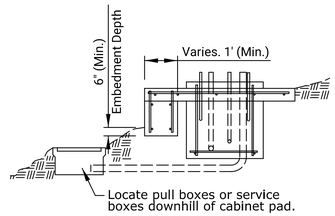
SECTION "A-A"

◔ Type 332L Cabinet = 24"
Type 342 Cabinet = 26"



SECTION "B-B"

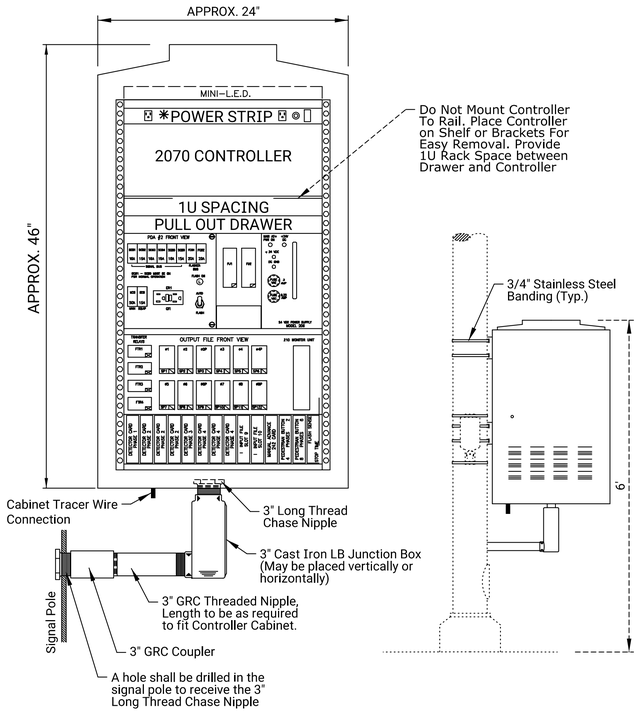
◔◔ Type 332L Cabinet = 30"
Type 342 Cabinet = 45"



FOUNDATION ON SLOPE DETAIL

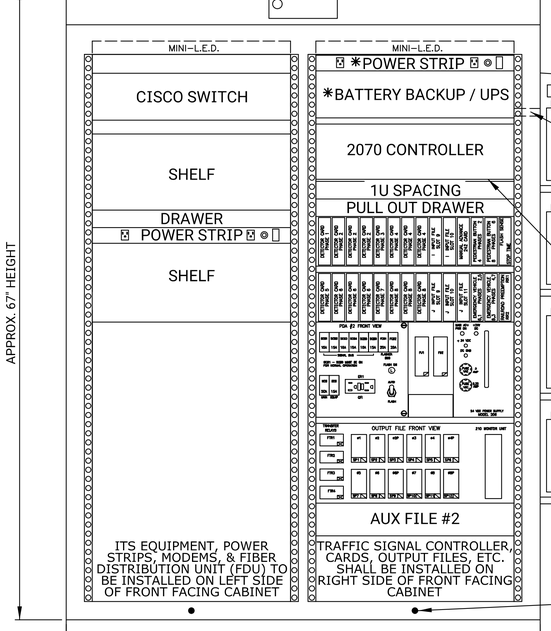
1. All reinforcing bar shall be No. 4 bars, evenly spaced at 12" spacing, +/- 1.5".

2. Additional concrete, material, and labor required for cabinet foundation on slope shall be SUBSIDIARY to other items of the contract.



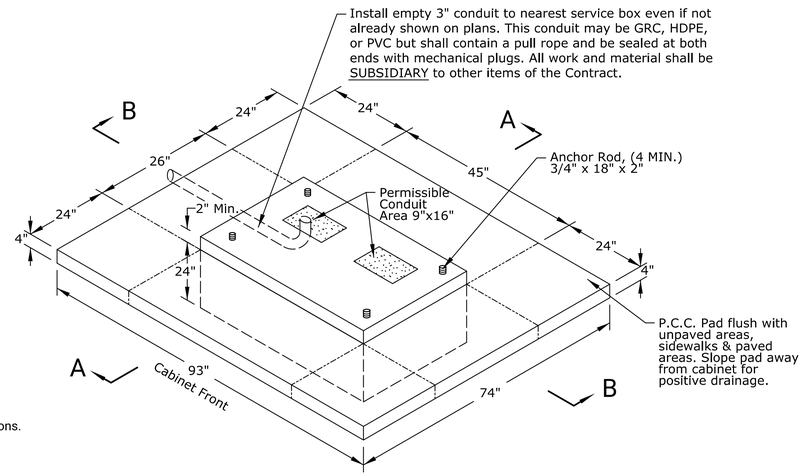
TYPICAL TYPE 336L CABINET (POLE MOUNT)

Approximate 46" H x 24" W x 22" D
*Locate Power Strip on Backside of Cabinet



TYPICAL TYPE 342 CABINET (PAD MOUNT)

Approximate 67" H x 45" W x 26" D
*Locate Power Strip & BBS on Backside of Cabinet



TYPE 342 PAD

NOTE:

1. CABINET BASE DIMENSIONS MAY VARY DEPENDING ON MANUFACTURER. CONTRACTOR SHALL VERIFY DIMENSIONS AND ANCHOR BOLT LOCATIONS FROM MANUFACTURER PRIOR TO CONSTRUCTING BASE.
2. All CABINETS SHALL BE A MINIMUM OF 0.125" NATURAL ALUMINUM AND INCLUDE A 19" EIA RACK.
3. ALL CABINETS SHALL INCLUDE A TRACER WIRE CONNECTION AND ANODES. SEE SIGNAL STANDARDS FOR DETAILS.
4. SIGNAL CONTROLLER SHALL NOT BE MOUNTED DIRECTLY TO 19" EIA RACK BUT SHALL SIT ON SHELF/BRACKETS TO ALLOW EASY REMOVAL.
5. ALL CONDUITS SHALL BE SEALED WITH APPROVED MATERIAL. EMPTY CONDUITS SHALL CONTAIN PULL ROPE AND SEALED WITH MECHANICAL PLUG.
6. ANTENNA(S) IF USED, SHALL BE PLACED WITHIN THE CABINET IF SIGNAL QUALITY IS ADEQUATE AS DETERMINED BY THE ENGINEER THROUGH SIGNAL STRENGTH TESTING BY THE CONTRACTOR.
7. GROUND RODS TO BE POSITIONED AND SHOWN TO INSPECTOR BEFORE POURING BASE.
8. GROUND RODS FOR 342 CABINETS SHOULD BE 3/4" X 20'. TWO (2) 3/4" X 12' GROUND RODS MAY BE USED IN LIEU OF A SINGLE 20' GROUND ROD. ALL OTHER CABINET GROUND RODS SHALL BE 3/4" X 12'.

NO	DATE	REVISIONS	BY	APP'D
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CITY OF WICHITA
PUBLIC WORKS & UTILITIES ENGINEERING DIVISION

2070 SIGNAL CABINET & PAD DETAILS

TRAFFIC ENGINEER: MIKE ARMOUR, P.E.
APP'D 01/27/22

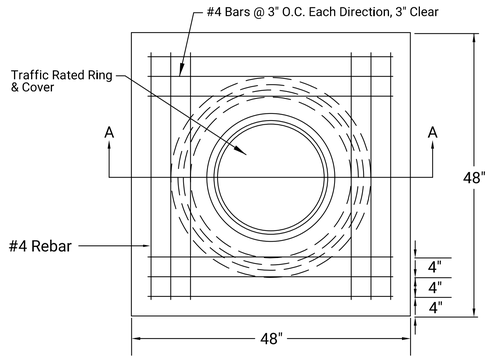
PROJECT NUMBER	ORG NUMBER	DATE
472-085898		2025

CITY ENGINEER'S OFFICE
CITY HALL - SEVENTH FLOOR
455 NORTH MAIN STREET
WICHITA, KANSAS 67202-1620
(316) 268-4501

SHEET: 55

TR-106

SERVICE BOX CONSTRUCTION/INSTALLATION DETAILS

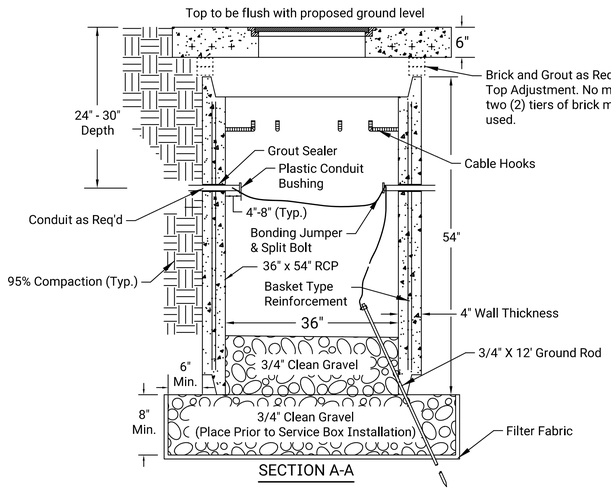


PRECAST CONCRETE SERVICE BOX
(36" I.D. X 54" RCP) with 6" cap

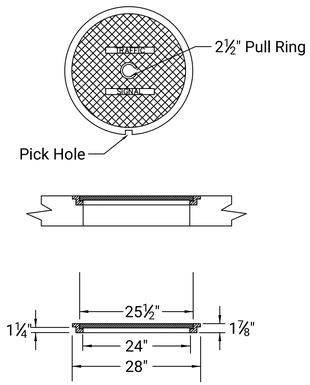
SERVICE BOX:
1. CONDUIT CONNECTION TO BE 4"-8" INSIDE FACE OF SIDE WALL, CONDUIT TO DRAIN INTO SERVICE BOX.
2. CONDUIT CONNECTIONS TO SERVICE BOX SHALL BE TERMINATED WITH PLASTIC CONDUIT BUSHING.
3. CONDUIT SHALL BE SEALED WITH APPROVED SEALER AT INSIDE WALL FACE.
4. ALL SERVICE BOXES TO HAVE 8" OF 3/4" CLEAN GRAVEL WITH FILTER FABRIC PLACED PRIOR TO SERVICE BOX INSTALLATION.
5. NO MORE THAN TWO (2) TEIRS OF BRICKS SHALL BE USED FOR TOP ADJUSTMENTS. BRICKS SHALL BE GROUTED.
6. SERVICE BOX AND LID SHALL BE TRAFFIC RATED.

CONDUIT:
1. SLOPE CONDUIT TO DRAIN AS DIRECTED BY THE ENGINEER.
2. ALL CONDUIT SHALL BE GALVANIZED RIGID STEEL CONDUIT (GRC) UNLESS APPROVED OTHERWISE BY ENGINEER.

NO 90 DEGREE ELBOWS UNLESS APPROVED BY TRAFFIC MAINTENANCE



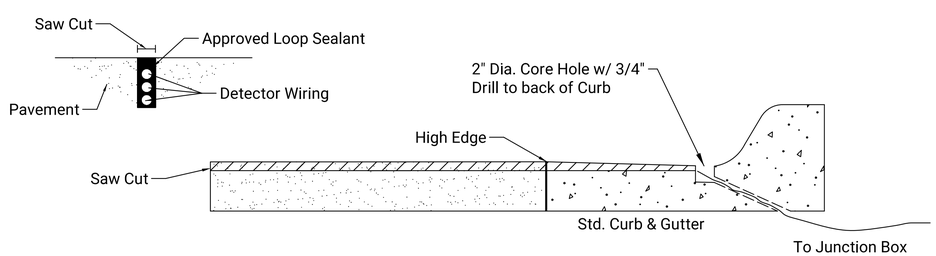
SECTION A-A



RING & COVER DETAIL

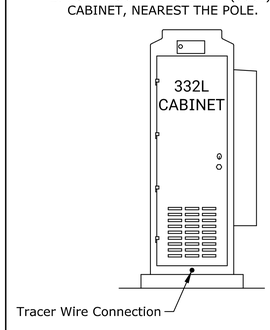
COVER SHALL INCLUDE "TRAFFIC SIGNAL"

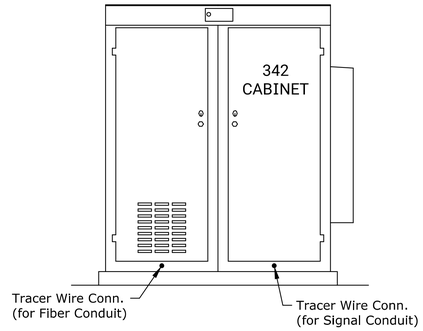
CONDUIT/DETECTOR WIRE INSTALLATION DETAILS

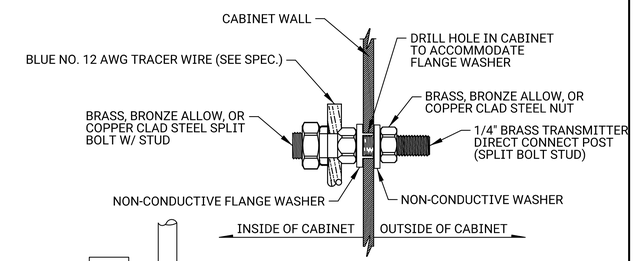


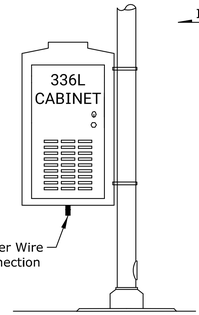
CABINET TRACER WIRE CONNECTION DETAIL

1. TRACER WIRE TERMINAL SHALL BE SOLID BRASS, BRONZE ALLOY, OR COPPER CLAD STEEL & ACCESSIBLE FROM THE OUTSIDE OF THE CABINET.
2. TERMINAL SHALL BE COMPLETELY ISOLATED FROM CABINET & GROUNDING. RUBBER ISOLATORS ARE NOT ALLOWED.
3. HOLE IN CABINET SHALL BE MADE WATER TIGHT.
4. MAINTAIN 1.5" MINIMUM CLEARANCE FOR TERMINAL.
5. APPLY THREAD LOCK SEALANT TO REDUCE TAMPERING.
6. CRIMP STYLE WIRE TERMINALS CONNECTING TRACER WIRE TO TRANSMITTER DIRECT CONNECT POST ARE NOT PERMITTED.
7. TERMINAL LOCATION - TERMINALS SHALL BE MOUNTED IN ORDER TO PREVENT ACCIDENTAL "SNAGGING". LOCATIONS SHOULD BE A MINIMUM OF 1.5" FROM CABINET EDGES.
   A. PAD MOUNTED CABINET (332L) - TERMINAL SHALL BE LOCATED IN THE BOTTOM LIP OF THE CABINET UNDER THE BACK CABINET DOOR, CENTERED.
   B. POLE MOUNTED CABINET (336L) - TERMINAL SHALL BE MOUNTED ON THE BOTTOM SIDE OF THE CABINET, NEAREST THE POLE.

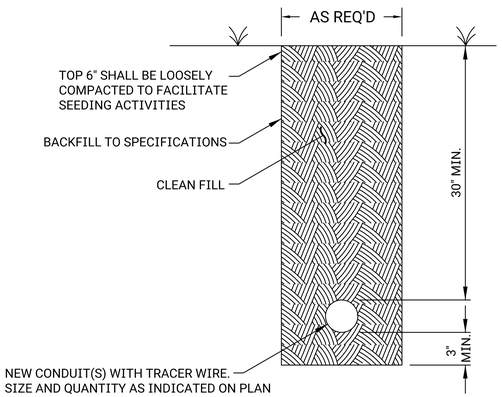








CONDUIT BORING & TRENCH DETAILS



GENERAL:
1. ALL CROSSINGS UNDER ROADWAY SHOULD HAVE A MINIMUM OF 5 FT OF COVER BELOW CROWN GRADE OR 3 FT COVER BELOW DITCH GRADE.

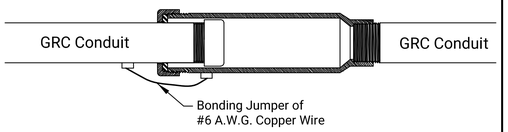
2. NO 90° ELBOWS UNLESS APPROVED BY TRAFFIC MAINTENANCE

3. INSTALL TRACER WIRE FOR LOCATING PURPOSES IN ALL CONDUIT RUNS. WHEN MULTIPLE CONDUITS SHARE THE SAME TRENCH OR BORE, TRACER WIRE TO BE LOCATED IN TOP CONDUIT ONLY.

4. BORING:
   A. 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. TRENCHING:
   A. DEPTH TO BE 30" MINIMUM WITH ROCK & RUBBLE FREE BACKFILL TO SERVE AS BEDDING MATERIAL. MAINTAIN MINIMUM CONDUIT DEPTH IN TRENCH.
   B. BACKFILL TO BE COMPACTED IN 6" LOOSE LIFTS BY HAND OR MECHANICAL TAMPING TO PREVENT SETTLEMENT.
   C. 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 AND COMPACT ALL TRENCHES.

EXPANSION FITTING



THE CONTRACTOR SHALL INSTALL THE CONDUIT AND CONNECTOR ASSEMBLY TO PERMIT A 1" MINIMUM LONGITUDINAL TRAVEL IN EITHER DIRECTION.

NO	DATE	REVISIONS	BY	APP'D
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CITY OF WICHITA
PUBLIC WORKS & UTILITIES
ENGINEERING DIVISION

SERVICE BOX, CONDUIT, & TRACER WIRE CONNECTION CONSTRUCTION/INSTALLATION

TRAFFIC ENGINEER APP'D 01/27/22
MIKE ARMOUR, P.E.

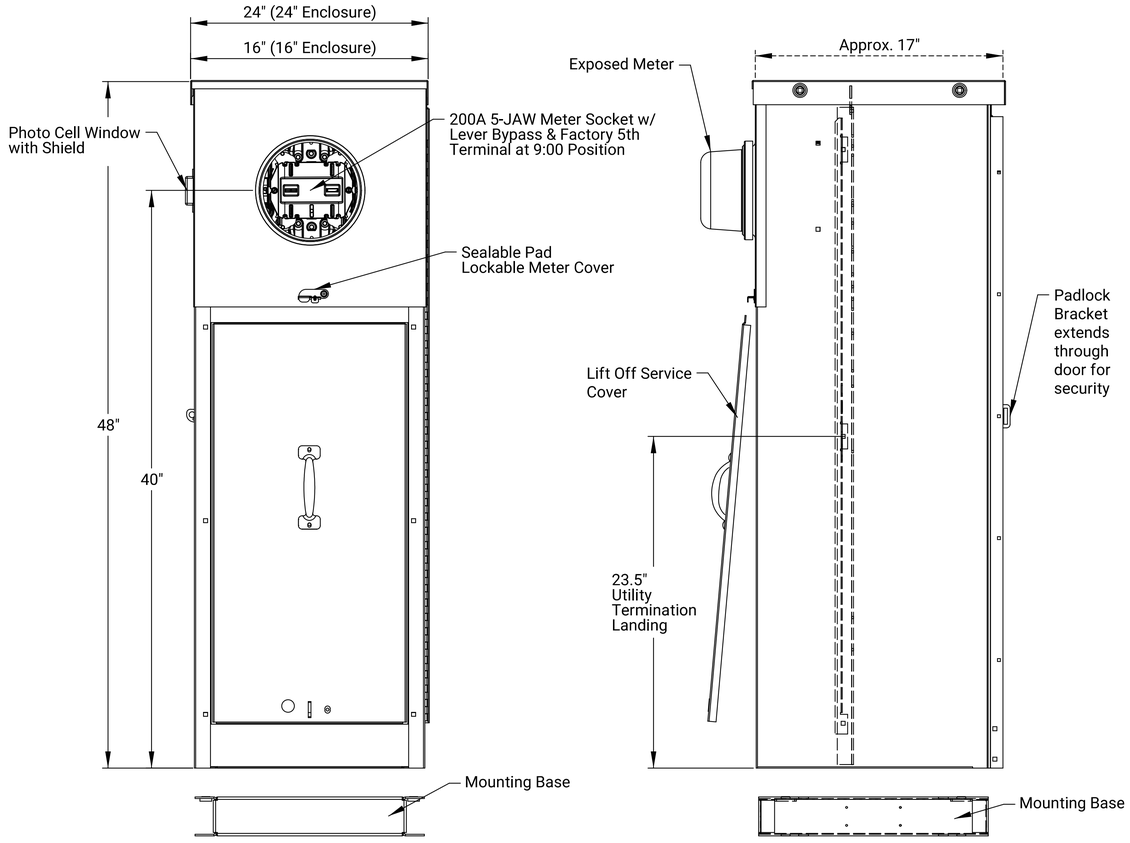
PROJECT NUMBER	ORG NUMBER	DATE
472-085898		2025

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CITY HALL - SEVENTH FLOOR
455 NORTH MAIN STREET
WICHITA, KANSAS 67202-1620
(316) 268-4501

SHEET 56

TR-108

NOTE TO DESIGNER: Designer shall specifiy the 16" (single meter) or 24" (double meter) size in quantities.

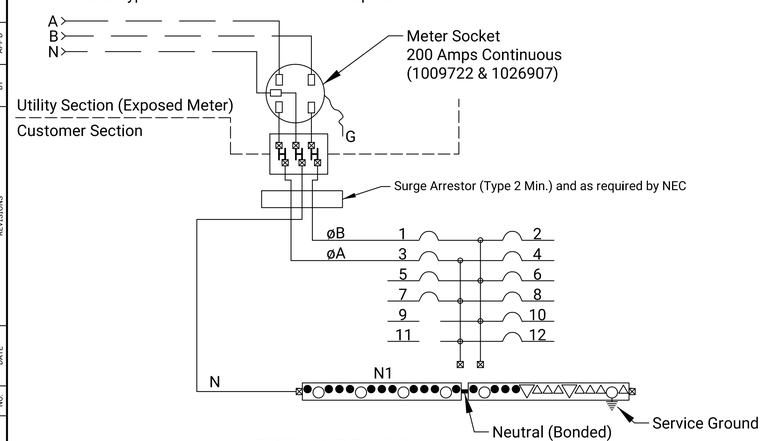


FRONT VIEW

SIDE VIEW

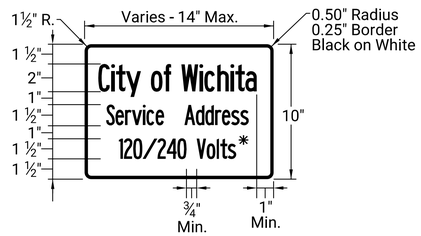
POWER SERVICE ENCLOSURE

CAUTION:
Lever By-pass. Circuit may be live with meter removed.
Meter is bypassed when handle is rotated upward.



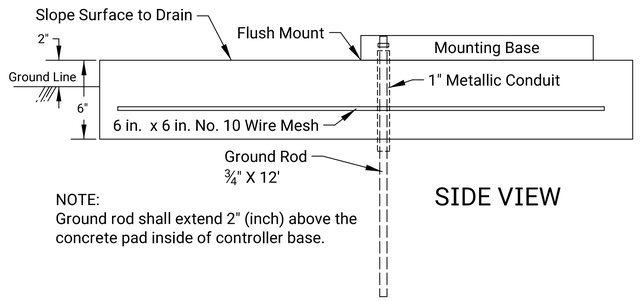
WIRING DIAGRAM

Lighting circuit not shown. See Manufacturer's Drawing for Additional Details.



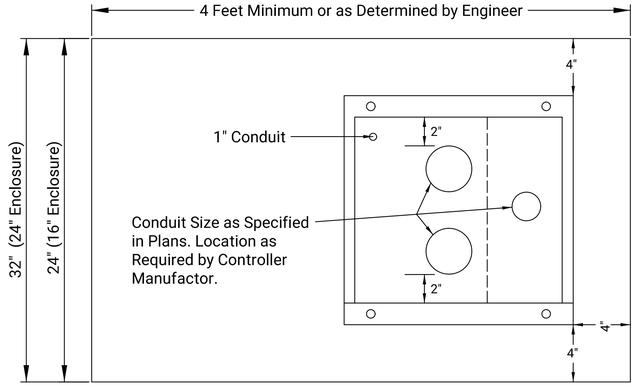
NAMEPLATE DETAIL

1. Apply on "street side" of enclosure facing the street referenced in the address
2. * Voltage as Provided by Electric Service
3. Nameplate shall match enclosure material type & be mechanically fastened (rivets) to enclosure



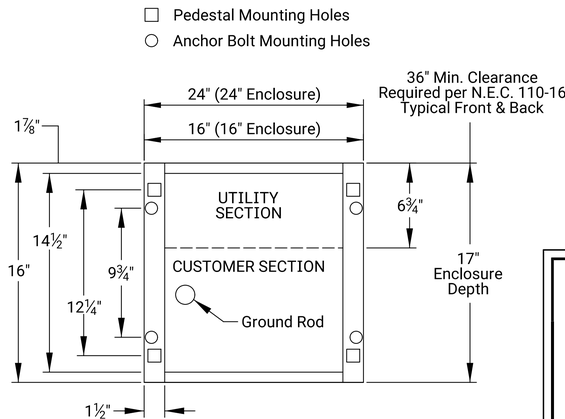
NOTE:
Ground rod shall extend 2" (inch) above the concrete pad inside of controller base.

SIDE VIEW

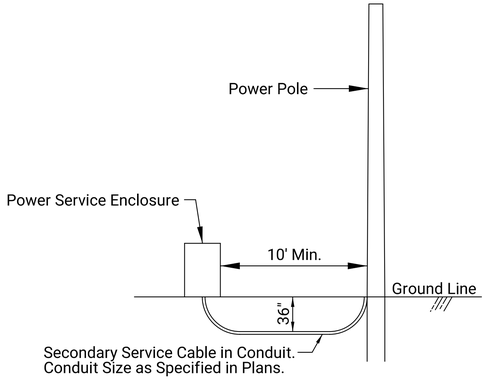


TOP VIEW

CONCRETE FOUNDATION PAD DETAIL



MOUNTING BASE DETAIL



POWER ARRANGEMENT

NOTES:

1. THE POWER ENCLOSURE SHALL BE CONSTRUCTED OF BARE 5052 ALLOY ALUMINUM 0.125" (INCH) THICK. THE ENCLOSURE SHALL BE OF CLEAN CUT DESIGN HAVING NO SHARP EDGES, CORNERS OR PROJECTIONS AND NEMA TYPE 3R CONSTRUCTION
2. THE ENCLOSURE SHALL INCREASE IN SIZE WITH THE NUMBER OF CIRCUITS.
3. ENCLOSURE SHALL BE MEET THE CURRENT ENERGY COMPANY REQUIREMENTS. THIS INCLUDES A EXPOSED METER ENCLOSURE, 200A, JAW-CLAMPING LEVER-BYPASS METER SOCKET WITH FACTORY INSTALLED FIFTH TERMINAL AT 9:00 POSITION.
4. SPLIT BUS LOAD CENTER. THE BUS LOAD CENTER SHOULD INCLUDE THE FOLLOWING UNLESS SHOWN OTHERWISE IN THE PLAN DOCUMENTS.
   A. UNSWITCHED (CONSTANT) LOAD CENTER WITH 50A 2P; 30A 1P AND 30A 2P BREAKERS
   B. SWITCHED LOAD CENTER WITH ELECTRICALLY-HELD CONTACTOR CONTROLLED BY PHOTO CELL RECEPTACLE AND HAND-OFF-AUTO SWITCH, 30A 1P AND 30A 2P BREAKERS.
5. THE SECONDARY BREAKER FOR THE PHOTO-CELL CIRCUIT SHALL BE 277 VOLT, 15 AMP SINGLE POLE.
6. THE WIRING FROM PB1 AND PB2 TO T1 THROUGH T4 SHALL BE NO. 6 AWG THW.
7 THE WIRING FOR THE LOAD AND LINE SIDE OF THE MAIN BREAKER SHALL BE THE SAME SIZE WITH THE WIRE.
8. THE WIRING FOR THE PHOTO ELECTRIC CONTROL CIRCUIT SHALL BE NO. 12 AWG THW.
9. ALL WIRING AND WIRING METHODS SHALL COMPLY WITH THE MOST CURRENT NATIONAL ELECTRIC CODE (NEC) STANDARDS. ANY CHANGES TO THESE STANDARDS SHALL BE APPROVED BY THE AUTHORITY HAVING JURISDICTION.
10. NO STEP DOWN TRANSFORMER SHALL BE LOCATED ON METER
11. USE MILBANK POWER SERVICE ENCLOSURES BELOW (OR APPROVED EQUAL):
    16" ENCLOSURE CATALOG #CP3B51C14PAOSL1
    24" ENCLOSURE CATALOG #CP3B51C14RAOSL1
12. PROVIDE AN ADDITIONAL 15A 1P CIRCUIT FOR HUB CABINET #2 AT THE NEW METER PEDESTAL FOR 21ST & GREENWICH.
13. ADD AN ADDITIONAL 15A 1P CIRCUIT FOR HUB CABINET #1 AT THE EXISTING METER PEDESTAL FOR US-54 & GREENWICH.

NO.	DATE	REVISIONS	BY	APP'D
3				
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CITY OF WICHITA
PUBLIC WORKS & UTILITIES ENGINEERING DIVISION

POWER SERVICE ENCLOSURE (SINGLE METER)

TRAFFIC ENGINEER: MIKE ARMOUR, P.E.
APP'D 01/27/22

PROJECT NUMBER	ORG NUMBER	DATE
472-085898		2025

CITY ENGINEER'S OFFICE
CITY HALL - SEVENTH FLOOR
455 NORTH MAIN STREET
WICHITA, KANSAS 67202-1620
(316) 268-4501

SHEET: 57

TR-110