SPECIAL PROVISIONS
FOR
LIGHTING AND ITS INFRASTRUCTURE

Johnson County
NHS-080-6(402)239--11-52

Effective Date
July 30, 2019

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150538.01 DESCRIPTION.

A. General Requirements.

1. This specification consists of the special provisions necessary when furnishing and installing the ITS Infrastructure as described in the project plans and these special provisions.

2. This project involves supplying and installing conduit, fiber cable, tracer wire and re-installing existing ITS cabinets. The Iowa DOT plans to initiate separate contracts to relocate and maintain the ITS devices (cameras, sensors, radios) and fiber splicing as shown in the plans as work by others.

B. Disruption to Existing Fiber Networks.

1. Unplanned Disruption.

a. Any unplanned disruptions determined by the Engineer to be caused by the actions of the Contractor shall be corrected by the Contractor at no additional cost to Iowa DOT.

b. In the case of an unplanned disruption and subsequent notification by the Engineer, the Contractor shall immediately stop all other work in progress and shall expend all of its efforts to restore the disrupted system(s) or correct the problem causing the disruption. The Contractor will not be granted an extension of time for delays caused by repairing disrupted systems. Unplanned disruptions shall result in the assessment of liquidated damages.

2. Liquidated Damages.

a. Unplanned disruptions to the existing fiber optic network will result in impacts to the traveling public, increase fuel consumption, vehicle operating costs, pollution, and time needed for Iowa DOT administration, engineering, inspection, and supervision, and other inconveniences and harm far in excess of those resulting from delay of most projects.

b. Accordingly, the Contractor agrees:
   1) To pay $250.00 liquidated damages per 15 minutes for each 15 minute period that the Contractor fails to restore the proper operation of an existing fiber optic network element following an unplanned disruption.
   2) To authorize the Engineer to deduct these liquidated damages from any money due or coming due to the Contractor.

C. As-Built Documentation.

1. General.
a. As-built record drawings will be the responsibility of, and completed by, the Engineer. As such, it will be the responsibility of the Engineer to coordinate directly with the Contractor to ensure that a master record set of the plans is maintained throughout construction to document all installations and any deviations from the design shown in the contract documents.
b. It is the responsibility of the Contractor to maintain written records of daily construction progress, areas worked and quantities installed to aid in the completeness of as-constructed documentation by the Engineer's on-site representative.

2. GPS Data Recording Staking Assistance.
a. The Engineer's on-site representative will be responsible for collecting GPS data of all installations including, but not limited to: conduit routing, handholes, device poles, device cabinets, and power supplies. All efforts will be made by the Engineer's on-site representative to coordinate with the Contractor and collect construction progress daily.
b. The Contractor shall be responsible to coordinate and assist the Engineer's on-site representative in this effort by staking, flagging or otherwise locating all installed features until such time that the GPS data can be collected.

150538.02 MATERIALS.

A. General.
Supply only new materials from reputable suppliers and manufacturers approved by the Engineer. Provide any items, equipment, or materials not specifically addressed in the contract documents but required to provide a complete and functional installation. The level of quality shall be consistent with other specified items. All miscellaneous electrical equipment and materials shall be UL-approved. Securely store and protect all materials delivered to the project site. Provide appropriate material quantities for testing or verification at no additional cost when requested by the Engineer.

B. Device Cabinets.
Contractor to reinstall existing ITS cabinets. Furnish all additional miscellaneous materials for complete cabinet installation of new stock only.

C. High Density Polyethylene Conduit
- High Density Polyethylene (HDPE) conduit shall be smooth wall ORANGE in color.
- Comply with ASTM F 2160 (conduit) and ASTM D 3350 (HDPE material), minimum SDR 13.5, and NEMA TC-7 EPEC-B standards.
- Sequential foot markings printed on HDPE.
- A custom message of stated material specifications that product meets shall be printed a minimum of every 10 feet.
- Continuous reel or straight pieces to minimize splicing.
- For dissimilar conduit connections provide an adhesive compatible with both materials.

D. Tracer Wire.
Single conductor, solid copper, Type THHN, No. 12 AWG with UL approval and orange colored jacket.

E. Fiber Optic Cable.

1. General.

a. The cable shall meet the latest applicable standard specifications by American National Standards Institute (ANSI), Electronic Industries Association (EIA) and Telecommunications Industries Association (TIA) for the single-mode fiber cable of the size specified per the Plans.

b. All fiber optic cable for installation on this project shall be provided by the Contractor.

2. Single-mode Fiber Optic OSP Cable – Dielectric Loose Tube.

a. Fiber optic, single-mode, graded loose tube dielectric cable constructed with industry standard 3mm buffer tubes stranded around a central strength member.

b. The buffer tubes shall be compatible with standard hardware and shall have 12 fibers per tube, the fibers shall not adhere to the inside of the buffer tube, each fiber shall be distinguishable by means of color coding in accordance with TIA/EIA-598-B and be colored with ultraviolet (UV) curable ink.

c. The cable core shall be water blocked with dry water blocking materials to improve access and handling of individual tubes.

d. The cables shall be designed for point-to-point applications as well as mid-span access, and provide a high-level of protection for fiber installed in the outside plant environment.

e. Single-mode, dispersion-unshifted fiber meeting ITUT G.652D requirements.

f. The fiber shall be fully capable of handling existing and legacy single-mode applications which traditionally operate in the 1310 nm and 1550 nm regions and shall also be designed to operate the full-spectrum from 1260 nm to 1625 nm for optical transmission.

g. The fiber shall be designed to provide optimum performance from 1260 nm to 1625 nm intended for 16-channel Course Wavelength Division Multiplexing applications.

h. Cables shall be sheathed with medium density polyethylene (MDPE). The minimum nominal jacket thickness shall be 1.3 mm. Jacketing material shall be applied directly over cable core and water swellable tape. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

i. The MDPE jacket material shall be as defined by ASTM D1248, Type II, Class C, Category 4 and Grades J4, E7 and E8.

j. The jacket or sheath shall be free of holes, splits, and blisters.

k. The cable jacket shall contain no metal elements and shall be of a consistent thickness.

l. Cable jackets shall be marked with the manufacturer's name, month and year of manufacturer, sequential meter or foot markings, a telecommunication handset symbol as required by Section 350G of the National Electrical Safety Code (NESC), fiber count, and fiber type. The actual length of the cable shall be within -0/+1% of the length markings. The print color shall be white, with the exception that cable jackets containing one or more coextruded white stripes, which shall be printed in light blue. The height of the marking shall be approximately 2.5 mm.

m. The maximum pulling tension shall be 600 pounds during installation (short term) and 200 pounds installed (long term).

n. The shipping, storage, and operating temperature range of the cable shall be -40°C to +70°C. The installation temperature range of the cable shall be –30°C to +70°C.

150538.03 CONSTRUCTION.

A. General.

The Engineer shall authorize any changes in location in writing before performing the installation. No additional compensation shall be provided for additional work associated with or resulting from unauthorized changes to the contract documents.

B. Device Cabinets.

1. General.

a. Install cabinets in accordance with the contract documents and the manufacturer's recommendations.
b. Do not penetrate the top of any cabinets without prior authorization by the Engineer.
c. Do not allow screws used for mounting shelves or other mounting purposes to protrude beyond the outside wall of the cabinet.
d. All connections shall be watertight.
e. Contact the Engineer a minimum of 1 week in advance to arrange a field review prior to placing the cabinets.

2. Mounting.
a. Orient cabinets as shown in the contract documents unless otherwise directed by the Engineer.
b. Ensure sufficient clamps, nuts, hardware, etc., as required for the specified mounting type, are furnished with each cabinet.
c. Seal all conduit openings in the cabinet with a sealing compound that meets the following requirements:
- Readily workable, soft plastic
- Workable at temperatures as low as 30°F, and
- Does not melt or run at temperatures as high as 300°F.

C. Conduit (ITS Communication Conduit Only).

1. General.
a. Follow all general guidelines covering the construction of buried conduit.
b. Install conduit by plowing, jacking, pushing, boring, or other approved methods within the public right of way and in a manner that minimizes atypical damage from construction operations.
c. The minimum bending radius of HDPE conduit shall be the larger of 20 times the outside diameter or the HDPE manufacturer's recommendations for minimum bending radius.
d. Open trench installation is only permitted within 25 feet of any handhole, pole, structure, or other similar improvements, and any other requested locations approved by the Engineer.
e. At the discretion of the Engineer, verify the integrity of the conduit structure in a manner acceptable to the Engineer.
f. Tunneling under the pavement or water jetting shall not be permitted.
g. No excavations are permitted to cross any roadways or any other paved or other similarly improved areas. At these locations, install conduits by boring method unless otherwise directed or approved in writing by the Engineer. Where indicated in the contract document and at all roadway and stream crossings, install conduit sections with external protection as specified herein.
h. No direct-buried cable is allowed.
i. Unless otherwise indicated in the Contract Documents, installation of conduit or approved alternative is allowed only in open trench runs or when approved by the Engineer.
j. Seal all conduit openings using an approved sealing compound (duct seal) at all conduit openings at the junction boxes handholes, poles, cabinets, and building entrances.
k. Thread and cap with standard pipe caps all rigid steel conduit ends until installing wiring. Per Article 2523.03, N of the Standard Specifications replace caps with approved conduit bushing during and after wire installation.

2. Installation Clearances.
a. Depth of all bores shall be a minimum of 48 inches unless otherwise specified in the plans.
b. Maintain the typical offsets from referenced locations as shown in the plans.
c. Maintain the minimum depth throughout the length of all conduit installations.
d. Maintain a minimum of 2 feet of separation when underground conduits parallel an existing facility.

3. Conduit Splicing.

a. Conduit shall be installed in continuous runs between handholes, foundations, and structures unless otherwise directed by the Engineer.
b. Conduit splicing shall only be permitted at locations where conduit of differing materials must be joined.
c. All mechanically joined conduit splices shall use compression couplings designed for underground placement and blown-in fiber installation.
d. Butt fusion welding and solvent welding of conduits will not be allowed.
e. All conduit splices shall be watertight to 200 psi.
f. Conduit splicing is incidental to the connected items of work.

4. Facilities Protection.

a. The contractor is responsible for protecting and maintaining the conduit throughout construction and until final acceptance.
b. To avoid possible damage to buried conduit from exposure to traffic, livestock and other hazards, complete trenching of laterals, trenching around culverts, construction of aerial inserts and similar operations as soon as practicable behind all segment installations.
c. If more than 48 hours lag is expected behind a segment installation, install additional protective measures acceptable to the Engineer.

5. Backfilling.

a. Backfill trenches and other excavations in lifts of 6 inches or less in compacted depth. Compact each layer thoroughly before placing subsequent layers.
b. Remove all cinders, broken concrete, or other hard or abrasive materials in the backfill material before commencing backfilling operations.
c. Remove and dispose of surplus and unsuitable materials upon completion of the backfilling operations in the area.
d. Place and carefully hand tamp backfill under and around the structures in lifts not to exceed 4 inches in loose thickness. Use a suitably sized mechanical tamper for all areas inaccessible to rollers. Operate pneumatic or other mechanical tampers in accordance with the manufacturer's recommendations.
e. Perform operations in a manner that minimizes soil erosion and employs appropriate storm water pollution prevention measures during all construction operations.
f. Maintain work areas in a neat, clean, and orderly condition at all times.
g. Upon completion of conduit/cable placing operations and any other work in an area, remove all debris, materials, tools, and equipment from the area and restore the disturbed area(s) to original or better condition within 24 hours or as soon as practicable as determined by the Engineer. Backfill all excavations and grade all disturbed areas during the restoration process.
h. Remove and dispose of rock and debris excavated and remaining after backfilling as directed by the Iowa DOT.
i. Immediately repair or replace any unauthorized disturbance or damage. Replace improved landscaping, lawns, scrubs, and hedge removed or damaged during construction in a manner acceptable to the Engineer. Re-sod damaged lawns using like grasses.

6. Plowing.

a. Use equipment and construction methods subject to the approval of the Engineer that cause minimal displacement of the soil.
b. Furnish competent supervision at all times at the site of plowing operations to assure compliance with the contract documents.
c. The equipment shall be capable of extending the plow in order to maintain the required minimum depths under all terrain conditions.
d. The reel carrier shall be of adequate size and be configured so that the reel sizes being used can be safely handled.
e. Avoid damaging any paved surfaces, ditches, or other similar surface features. Immediately repair any damage to such features to the satisfaction of the Engineer.

f. Perform plowing in accordance with standard industry practices using a prime mover with hydrostatic type steering and a vibratory plow. The design of the plowshare shall be such that the buried conduit passing through the plow shall not bind and shall not be bent in a radius less than 20 times the outside diameter of the conduit and maintains the structural integrity of the conduit. The feed chute shall have a removable gate for the purpose of inspection and to allow the conduit to be removed from or inserted into the feed chute at any intermediate point between splice locations. The conduit path inside the feed chute shall have low friction surfaces and be free of burrs and sharp edges to prevent damage to the conduit as it passes through. Smooth any welds before use. Internal guide rollers shall not be used. Exercise care during the plowing operation to avoid conduit damage. Feed the conduit into the ground through the plow loose and at no tension.

g. Excavate as needed start and finish pits and pits at points of intersection in advance of plowing. Expose ends of casings and crossings of foreign utilities before the start of plowing operations for a conduit segment. Exercise care in the use of trenching and excavating tools and equipment to avoid damaging installed and intersecting conduits or other facilities.

h. Restore plow furrowed areas to conform to the surrounding terrain using a rubber tired tractor or heavy truck or a vibratory roller having a weight of three tons and a drum width between 4 and 6 feet or by other suitable means approved by the Iowa DOT.

7. Bored Crossings.

a. Use equipment and construction methods subject to the approval of the Engineer that cause minimal displacement of the soil.

b. Bore all crossings beneath roadways, streets, other paved surfaces, railroads, or other structure in accordance with requirements and regulations of the authority having jurisdiction and as directed in the contract documents

c. Limit bore hole sizes to the outside diameter of the conduit being placed.

d. Locate bore pits a minimum of 2 feet from the edge of pavement or shoulder unless otherwise directed by the Engineer.

D. Tracer Wire.

1. General.

All installations and connections shall comply with the contract documents and all generally accepted codes and standards.

2. Tracer Wire.

a. Install and test for tracer wire continuity in all conduit installations as indicated on the contract documents. The Engineer shall witness continuity testing. The Contractor shall submit continuity test reports to the Engineer for final acceptance.

b. Splicing tracer wires will not be allowed unless approved by the Engineer. Maintain solid, uncut wire continuity of the tracer wire through Type FOR27 pulling handholes. If Engineer approved, splice tracer wires only in handholes to form a continuous network using UL tested for wet location splice kits.

c. Terminate each tracer wire run at Type Fiber Vault handholes in test stations.

d. Place tags on all tracer wire identifying the owner and direction of the wire at each termination point and in every handhole, fiber vault and test station.

e. Tags shall clearly identify where each individual tracer run originated and where it ends (handhole to handhole, handhole to cabinet, handhole to building, etc.)

E. Fiber Optic Cable.

1. General.

a. Remove fiber optic cable from the reel in a manner acceptable to the Manufacturer and Engineer.

b. Install fiber optic cable in existing conduit as indicated in the contract documents.

c. Direct bury of fiber optic cable is not allowed.
d. Do not twist or bend the fiber optic cable in excess of the limits recommended by the manufacturer.
e. As the cable is fed into the duct and conduit system the Contractor shall use a manufacturer approved water-based cable lubricant for all fiber optic cable installations.
f. Protect at all times all proposed cables, cable ends, and any exposed portions of fiber optic cable from damage including water intrusion.
g. Any existing pull tape or tracer wire that is used as a pull rope for fiber optic cable installation shall be replaced in kind. The cost of any tracer wire or pull tape replacement shall be subsidiary to the fiber optic cable installation.

2. Cable Installation.
a. All fiber optic cable shall be installed in conduits.
b. A suitable cable feeding method shall be used between the cable reel and the face of the duct and conduit to protect the cable and guide it into the duct.
c. Dynamometers and breakaway pulling swings shall be used to ensure that the pulling line tension does not exceed 600 pounds.
d. The mechanical stress placed on a cable during installation shall not be such that the cable is twisted or stretched. A pulling eye and swivel shall be attached to the cable and used to install the cable through the duct conduit system to prevent the cable from twisting.
e. Cables shall not be forced around sharp corners and precautions shall be taken during installation to prevent the cable from being kinked or crushed.
f. Minimum bending radius during installation shall not be less than 20 times the outside diameter of the cable or as recommended by the manufacturer, whichever is greater.
g. Pulling of the cable shall be hand assisted.
h. DOT approved installation methods include Pulling, High Air Speed Blowing, Air- Assist, Push/Pull Installation, and Air Blown Cable. Installation shall comply with all manufacturers' recommendations for cable installation including pulling tensions and bending radii.
i. The cable shall be carefully inspected for jacket defects. If defects are noticed, the pulling operation shall be stopped immediately and the Engineer notified. The Engineer shall make a determination of acceptability or shall reject the cable.
j. The fiber cable shall be installed in continuous runs as marked on the plans. End of reel splices or butt splices not shown in the plans shall be pre-approved by the Engineer and are incidental to the cost of the installation of the cable. If approved, the end of reel or butt splices shall be performed in existing splice vaults as shown on the plans. The cost associated with the end of reel or butt splices including splice closures, storage baskets, splice trays, protective sleeves, and all accessories shall be included in their respective items and shall not result in additional cost to Iowa DOT.
k. No splices shall be allowed unless indicated by the plans or approved by the Iowa DOT.
l. Seal all conduit openings using an approved sealing compound (duct seal) at all conduit openings at the junction boxes handholes, poles, cabinets, and building entrances after cable installation.

3. Facilities Protection.
a. In the event it is suspected that cable damage has occurred by the Engineer prior to final acceptance, Contractor shall test the cable with an OTDR within 72 hours after notification and submit a copy of the OTDR test to the Engineer upon completion.
b. Contractor shall replace or repair, as directed by the Engineer, any damage occurring before final acceptance at no additional cost to the Iowa DOT. Perform any repairs or replacements as soon as reasonably possible unless otherwise approved by the Engineer.
c. Contractor shall repair or replace any defect in the installed cable at no additional cost to the Iowa DOT. Consider a defect to be any condition resulting in a negative or adverse effect on current or future operations of the completed fiber optic

communication system as determined by the Engineer.

d. Any existing wiring that is damaged during fiber optic cable installation shall be replaced or repaired, as directed by the Engineer, at no additional cost to the Iowa DOT.

4. Slack Coils.

a. Sufficient slack shall be left at each end of the cable to allow proper cable splicing and termination. The minimum slack amount shall be as follows or as indicated in the plans:

- Handhole, type FOR27 – 60 feet per cable without splicing
- Handhole, type Fiber Vaults – 150 feet (75 feet per each end of the cable)

b. Storage of slack cable in cabinets and handholes shall be neatly coiled. The slack coils shall be bound at a minimum of three points around the coil perimeter. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames and terminals.

c. For storage purposes, the minimum bending radius shall not be less than ten times the outside diameter of the cable or as recommended by the manufacturer, whichever is greater.

5. Cable Identification.

a. Place tags on all fiber optic cable identifying the owner and direction of the cable at each termination point and in every handhole, Fiber Vault, and cabinet.

b. Tags shall clearly identify where each individual cable run originated and where it ends (handhole to handhole, handhole to cabinet, handhole to building, etc.)

c. For fiber installations with joint Department of Transportation/other agency (or entity) use where the fiber will be owned by the other agency (or entity), install typical identifiers and/or markings for that fiber.

150538.04 METHOD OF MEASUREMENT.

A. Device Cabinets.

Measurement for device cabinets shall be per each for the bid item Reinstall Existing ITS Cabinet.

B. Conduit (ITS Communication Conduit Only).

Measurement for all conduit shall be per linear foot for the bid item 2 Inch ITS Communication Conduit.

C. Fiber Optic Cable.

Measurement For all fiber optic cable shall be per linear foot for the pay item 12 SM Fiber.

150538.0f BASIS OF PAYMENT.

A. Device Cabinets.

Payment is full compensation for:

- The installation of all mounted cabinets,
- Including all internal and external components and accessories required to provide a complete cabinet installation per the contract documents,
- Providing and installing all mounting materials and
- Furnishing all materials, labor, equipment, and other incidental items necessary to meet the requirements of the contract documents.

B. Conduit (ITS Communication Conduit Only).

Payment is full compensation for:

- The furnishing and installation of all conduits per the contract documents,
- Including all surface excavations or surface preparation work, repair or restoration of any disturbed areas to pre-construction conditions, proper water/moisture drainage materials,
- Tracer wire,

- Conduit mounting on new or existing infrastructure, and
- Furnishing all materials, labor, equipment, and other incidental items necessary to meet the requirements of the contract documents.

C. Fiber Optic Cable.

Payment is full compensation for:

- The furnishing and installation of all cables and wires per the contract documents,
- Furnishing all materials, labor, tools, consumable items and other incidental items necessary to meet the requirements of the contract documents.

ADDITIONAL BIDDING ATTACHMENTS

Appendix A Submittal Requirements for this Special Provisions

DESCRIPTION	MANUFACTURER	CATALOG NUMBER
2” ITS COMMUNICATION CONDUIT		
TRACER WIRE		
12 SM FIBER		

Appendix B Bill of Materials Submittal Table

The selected Contractor is required to submit the completed table post-award of the contract for Engineer review.

Bill of Materials

Item No.	*Item Description*	*Unit*	*Quantity*	*Unit Price*	*Extended*
BILL OF MATERIALS FOR: ELECTRICAL CIRCUITS					
1	#10 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	1950		
2	#8 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	3940		
3	#6 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	5648		
4	#4 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	7815		
5	#3 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	1410		
6	#2 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	8706		
7	#1 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	3326		
8	#3/0 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	2388		
9	#4/0 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	6326		
10	#4/0 AWG USE-2/RHW-2 CONDUCTOR (ALUMINUM)	LF	5414		
11	#250 AWG USE-2/RHW-2 CONDUCTOR (COPPER)	LF	2520		
12	#350 AWG USE-2/RHW-2 CONDUCTOR (ALUMINUM)	LF	10828		
13	2" SCH 40 PVC CONDUIT, TRENCHED	LF	8566		
14	3" SCH 40 PVC CONDUIT, TRENCHED	LF	3909		
15	3.5" SCH 40 PVC CONDUIT, TRENCHED	LF	740		
16	TWO 3" SCH 40 PVC CONDUITS, TRENCHED	LF	3852		
17	2" SCH 80 PCV CONDUIT, TRENCHED	LF	240		
18	3" SCH 80 PVC CONDUIT, TRENCHED	LF	360		
19	3.5" SCH 80 PVC CONDUITS, TRENCHED	LF	70		
20	2" SCH 80 PCV CONDUIT, BORED	LF	755		
21	3" SCH 80 PVC CONDUIT, BORED	LF	2057		