SP-150194
(New)

SPECIAL PROVISIONS
FOR
ITS INFRASTRUCTURE RELOCATION

Polk County
ITS-035-4(239)--25-77

Effective Date
February 21, 2017

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.

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PART I
GENERAL REQUIREMENTS

This part consists of the general provisions necessary when furnishing and installing the infrastructure as described in the project plans and these special provisions.

This project involves supplying and installing conduit, handholes, and tracer wire deemed necessary for uses planned by the Iowa DOT. This project also involves installing fiber optic cable provided by the Iowa DOT. A separate contract will also be initiated to splice the fiber optic cables.

The Contractor shall not take advantage of any apparent error, discrepancy or omission in the plans or specifications. Upon discovery of such an error, discrepancy or omission, the Contractor shall notify the Engineer immediately. The Engineer will then make such corrections or interpretations as necessary to fulfill the intent of the plans and specifications.

Materials or work described in words which, so applied, have known technical or trade meaning shall be held to refer to such recognized standards.

Figured dimensions on the plans shall be taken as correct but shall be checked by the Contractor before starting construction. Any errors, omissions, or discrepancies shall be brought to the attention of the Engineer and the Engineer's decision thereon shall be final. Correction of errors or omissions on the drawings or specifications may be made by the Engineer when such correction is necessary for the proper execution of the work.

The Contractor for this project shall coordinate work with the Iowa DOT. The Iowa DOT will assist in the coordination and scheduling of work. The Contractor for this project shall assign a responsible staff member that will work with the Iowa DOT on decisions regarding order of work and scheduling as needed throughout the duration of this project.

1.01 Related Specifications and Standards

The work as detailed on the plans for the ITS Infrastructure Relocation shall be completed in accordance with the plans, special provisions and all other contract documents including the documents listed below. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete project.

- National Electric Code
- Telecommunications Industry Association/Electronic Industries Alliance
- Manual on Uniform Traffic Control Devices

1.02 Local Requirements

A. General

Comply with any special requirements and limitations identified in the plans.

B. Coordination of Work

Contractor for this project shall coordinate work with the Contractor(s) working on other Iowa DOT projects in the vicinity. The anticipated projects in the area are shown on sheet J.01 of the project plans. The Contractor for this project shall assign a responsible staff member that will work with the Iowa DOT on decisions regarding order of work and scheduling as needed throughout the duration of this project.

C. Building Facilities

All work in or around any building facility shall be coordinated with the Engineer. Provide a minimum of 48 hours' notice to the Engineer before performing any work in the immediate vicinity of a building or surrounding parking area.

1.03 Contractor's Responsibility

A. Coordination with Utilities

1. The Contractor is responsible for determining the exact location and elevation of all public utilities in proximity to any construction work and shall conduct all activities to ensure that public utilities are not disturbed or damaged.

2. The Contractor is fully liable for all expenses incurred as a result of failing to obtain required clearances, location of utilities, and any damage to utilities caused by construction.

3. Utility companies whose facilities are shown on the plans or known to be within the construction limits shall be notified by the Contractor of the starting construction date.

B. One Call Locating

Until final acceptance, the Contractor shall provide all utility locates of the work performed under this contract when requested through One Call services or by the Engineer. The Contractor shall perform any such locations within 48 hours of receiving notice that such locations are needed.

C. Material and Equipment Storage and Construction Site Access

1. Contractor shall secure a designated material storage area for this project. Any request to store material in the right-of-way in order to complete the current work activity shall be approved by the Engineer.

2. Construction equipment may be stored within the right-of-way during non-working hours if it is outside of the roadway clear zone, as far from the traveled way as practical and as approved by the Engineer. No equipment shall be stored at the toe of any roadway slope.

3. No worker vehicles will be allowed to park in, or access a job site directly from an Interstate or Freeway facility. Access to the job site for both workers and materials shall only be via interchanges or intersecting roadways unless otherwise approved by the Engineer. Worker vehicles shall be parked off-site or at a location acceptable to the Engineer

4. No open holes or mounds of dirt shall be left unprotected during non-working hours.

D. Finishing Activities

Upon completion of the work at each project area, thoroughly clean the site and restore it to a condition at least equal to that existing prior to construction. Project area is defined as the approximate area disturbed during a normal week of work. During and after completion, employ appropriate measures for erosion control, where applicable. Seed and fertilize work areas upon completion of work in accordance with the contract documents.

1.04 Disruption to Existing Fiber Networks

A. Planned Disruption

Ensure continuous operation of the existing fiber networks and systems during construction of the project. The Contractor shall be responsible for repairing, to the Engineer's satisfaction and at no cost to Iowa DOT, any damage the Contractor causes to the existing fiber networks and systems during the life of the project.

The Contractor shall not work on splicing, disconnecting and/or in any way disrupting normal operation of the existing fiber networks or systems without approval from all affected parties. Parties include the Iowa DOT and the Iowa Communications Network (ICN). The Contractor shall provide a written request to the Iowa DOT and the respective parties for approval at least 10 calendar days before the existing fiber network or equipment is disrupted. A copy of the written request shall be submitted to the Engineer

in all cases. In addition to the written request, submit the work plan and schedule for approval by the Engineer. The work plan shall include all fiber strands and the parties being affected.

Restore the disrupted system upon completion of the work within the allowable working hours. Remain on site until Iowa DOT and/or ICN notifies that the disrupted systems are fully operational. Failure to restore disrupted systems and equipment within the allowable working hours will constitute an unplanned disruption.

B. Unplanned Disruption

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

In the case of an unplanned disruption and subsequent notification by the Engineer, 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.

C. Liquidated Damages

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, supervision, and other inconveniences and harm far in excess of those resulting from delay of most projects.

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.

1.05 Contractor Submissions

A. Materials List

Complete and submit one electronic pdf file of the materials list within 7 calendar days after award of the project contract. Include the name of the materials supplier and catalog number of each item listed.

B. Construction Schedule

1. Within 30 days after award of contract, submit to the Engineer one electronic pdf file of the detailed construction schedule including dates of commencement for each major work item, duration of each major work item and completion of each major work item on each segment of the proposed construction.

2. Major items of work to be included on the schedule shall include, but is not limited to the following:
- **a.** Duration of material procurement
- **b.** Installation of conduit and handholes
- **c.** Installation of foundations, poles, and cabinets

3. Upon acceptance of the schedule, the Contractor will be expected to adhere to these dates as proposed unless modified with the approval of the Engineer.

4. Submittal and approval of the proposed construction schedule by the Engineer is required before construction activities can commence.

C. Shop Drawings/Catalog Cuts

1. Prior to construction and after approval of the Materials List, submit one electronic pdf file of the shop drawings or catalog cuts for the materials to the Iowa DOT for approval.

2. The Engineer shall review the shop drawings/catalog cuts for the purpose of assuring general conformance with the project design concept and contract documents. The Engineer will provide approval or rejection of shop drawings within 14 calendar days of submission. Re-submit the shop drawings for approval within 7 days of the Engineer's rejection.

3. **P**rovide written notice of any deviations from the requirements of the plans or contract documents.

4. Engineer's approval of shop drawings/catalog cuts does not relieve the responsibility for providing satisfactory materials complying with the contract documents. Errors not detected during review do not authorize the Contractor to proceed in error.

D. Materials Procurement

1. Shop drawings, specification data, and samples for acceptance testing (when requested) shall be submitted to the Iowa DOT for approval and/or selection prior to the placing of orders for any equipment and materials.

2. The Contractor shall order all materials requiring production lead time greater than 4 weeks within 7 calendar days of receiving the approved shop drawing(s).

3. The Contractor shall submit to the Engineer proof of material purchase order in electronic pdf format.

E. Final Acceptance

1. The Contractor shall perform all the obligations under the contract before the final acceptance of the project by Iowa DOT. Completion of the work will be the date of approval and work acceptance on "Statement of Completion and Final Acceptance of Work" (Form 830435) by the Engineer.

2. Final acceptance shall not constitute acceptance of any unauthorized or non-compliant work or material. Iowa DOT shall not be barred from requiring the Contractor to remove, replace, repair, or dispose of any work or material that is defective, unauthorized or that otherwise fails to comply with the contract documents or from recovering damages for any such work or material.

3. Final acceptance shall not relieve the Contractor of any obligations and/or responsibilities relating to warranty requirements designated in the contract documents.

4. Contractor shall perform a walkthrough of the project with the Iowa DOT and ICN prior to transferring locating responsibility to ICN.

F. Warranty

1. Transfer all required standard materials warranties on the date of final acceptance to the Iowa DOT.

2. Warranty periods shall not commence prior to final acceptance of the work and shall remain in effect until at least 1 year after the final acceptance for all cables and equipment furnished and installed for this project.

1.06 As-Built Documentation

A. General

1. As-built record drawings will be the responsibility of, and completed by, an on-site representative of the Engineer. As such, it will be the responsibility of the Engineer's representative 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.

2. 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.

B. GPS Data Recording Staking Assistance

1. The Engineer's on-site representative will be responsible for collecting GPS data of all installations including, but not limited to: conduit routing, handholes, power locations, and poles. All efforts will be made by the Engineer's on-site representative to coordinate with the Contractor and collect construction progress daily.

2. 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.

PART II
TECHNICAL PROVISIONS

This part consists of the material requirements, construction details, and methods of measurement and basis of payment necessary to complete construction of the ITS infrastructure relocation project, in place, as described in the contract documents.

2.01 General

A. 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. 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. The Contractor shall expect some reasonable variation in location of the facilities shown due to unforeseen conflicts, changes in proposed work, installation difficulties, or other circumstances. 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.

C. 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.

2.02 Traffic Control

The Engineer shall provide any required detour routes and detour route signage at no cost to the Contractor. All lane, ramp, and roadway closures are subject to the limitations stated in the contract documents and the approval of the Engineer. Request any such closures a minimum of 10 days prior to the desired closure date in accordance with Article 1108.02, M of the Standard Specifications. The decision of the Engineer regarding a request shall be final. Closures of convenience will not be permitted.

2.03 Handholes

A. Materials

1. General

a. Supply handholes constructed of epoxy or polyester resin mortar with woven glass fiber reinforcement and an appropriate aggregate dimensioned as indicated in the contract documents.

b. Handhole materials shall not support combustion when tested in accordance with “Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position” ASTM D-635.

c. Water absorption shall not exceed 2% of the original weight of material under test conditions per “Standard Test Method for Water Absorption of Plastics” ASTM D-570.

d. The handhole shall be functional without failure throughout a temperature range of -50°F to +170°F.

e. The handhole walls shall not deflect more than 0.24 inches per foot of length of box when installed and subject to an ASTM C-857 TIER 22 load.

f. Handholes shall meet ANSI/SCTE 77 standards and be verified by a registered third party and stamped by a registered Professional Engineer.

g. Handhole lid strength shall be tested to 33,750 pounds (Tier 22).

h. Handhole lids shall be labeled as indicated in the plans or as directed by the Engineer.

i. The Engineer shall provide approval prior to use of any handholes satisfying the contract documents requirements for structural, physical, and chemical properties.

2. Test Stations

a. Install Test Stations at all Type Fiber Vault handholes.

b. Test Stations will be supplied by the Iowa DOT.

3. Fiber Marker

a. Install Fiber Markers at all FOR27 handhole locations.

b. Fiber Markers will be supplied by the Iowa DOT.

B. Construction

1. General

a. Install the type and size of handholes at the locations indicated in the contract documents.

b. Construct all Type Fiber Vault handholes as located by the Engineer

c. Set handholes flush with the surface when constructing in a sidewalk or driveway. Set FOR27 and Fiber Vault handholes approximately 12 inches below the finished surface of the surrounding ground when constructing in an earth embankment or non-paved surface.

d. Install course aggregate bedding to a depth of one foot below the handhole.

e. Conduit shall enter the handhole from the bottom and extend conduit ends between 4 and 6 inches above the aggregate bedding.

f. Side penetrations of the handholes are not permitted.

g. Rodent proof all handholes to the satisfaction of the Engineer.

C. Method of Measurement & Basis of Payment

1. Measurement and payment for all handholes shall be paid for at the contract unit price per each for the pay items Handhole, Type FOR27 and Handhole, Type Fiber Vault.

2. Payment is full compensation for:

- The furnishing and installation of all handholes,
- Including all surface excavations, repair or restoration of any nearby areas, concrete, proper water/moisture drainage materials, all necessary electric grounding materials and installation,
- Furnishing all materials, labor, equipment, and other incidental items necessary to meet the requirements of the contract documents.
- Installing all test stations at Handhole, Type Fiber Vault locations, and
- Installing all Fiber Markers at Handhole, Type FOR27 locations.

2.04 Conduit

A. Materials

1. High Density Polyethylene (HDPE) conduit

a. (HDPE conduit shall be smooth wall ORANGE in color.

b. Comply with ASTM F 2160 (conduit) and ASTM D 3350 (HDPE material), minimum SDR13.5, and NEMA TC-7 EPEC-B standards.

c. Sequential foot markings printed on HDPE.

d. Continuous reel or straight pieces to minimize splicing.

e. For dissimilar conduit connections provide an adhesive compatible with both materials.

B. Construction

1. General

a. Follow all general guidelines covering the construction of buried conduit.

b. Install conduit by plowing, jacking, pushing, boring, structure attachment 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 Schedule 40 PVC conduit or approved alternative is allowed only in open trench runs or when approved by the Engineer.
j. Seal all conduit openings using ETCO duct plugs provided by the Iowa DOT at all conduit openings at the junction boxes, handholes, poles, cabinets, and building entrances.
k. Transverse bore pits and receiving pits shall be within 15 feet of right-of-way.

2. Installation Clearances
a. Maintain the minimum depth throughout the length of all conduit installations.
b. Maintain a minimum of two feet of separation when underground conduits parallel an existing facility.

3. Conduit Splicing
a. All mechanically joined conduit splices shall use compression couplings designed for underground placement and blown-in fiber installation.
b. Electrofusion joining of HDPE conduit will be allowed provided that method used does not create a ridge on the inside of the conduit that may impact future fiber installation.
c. Butt fusion welding and solvent welding of conduits will not be allowed.
d. All conduit splices shall be watertight to 200 psi.
e. 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 six 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. Conduit in Trench

a. Use equipment and construction methods subject to the approval of the Engineer that cause minimal displacement of the soil.
b. Excavate open trench straight as practicable. Shape the trench to be smooth, free from any sharp edges, and clear of debris and loose rock. Excavate only gradual grade changes.
c. Do not leave trenches unattended at any time or open during non-working hours unless approved in writing by the Engineer. Install barriers or other protective measures to prevent livestock or persons from falling into an open trench when appropriate.
d. Notify the Engineer immediately if solid rock is encountered at any location. Excavate rock trenches using a rock saw or other suitable equipment. The excavation, backfill, and road crossings in solid rock areas shall conform to the requirements stated above unless specifically exempted in this section.
e. Rock excavation shall be considered extra work and shall be paid as a separate cost item. Obtain approval from the Engineer before commencing any rock excavation.

C. Method of Measurement & Basis of Payment

1. Measurement and payment for all conduit shall be paid for at the contract unit price per linear foot for the pay items 2 Inch Conduit, Plowed, and 2 Inch Conduit, Bored.

2. 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,
- 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.

2.05 Wire and Cable

A. Materials

1. Tracer Wire

Single conductor, solid copper or copper clad steel, Type XHHW, No. 12 AWG with orange colored jacket.

2. Grounding/Bonding

Ground all installations using a No. 6 AWG copper, non-insulated wire bonded to copper-clad metal, driven electrodes using an exothermic weld.

B. Construction

1. General

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

b. The Engineer shall resolve all conflicts.

2. Tracer Wire

a. Install, splice, and test for continuity tracer wire in all conduit installations as indicated on the contract documents.

b. Where new tracer wires are installed, the Contractor shall:

- Splice tracer wires only in fiber vaults and handholes to form a continuous network using splice kits tested for wet locations.
- Terminate each tracer wire run at Type Fiber Vault handholes in test stations per detail in plans.
- Test all tracer wire for continuity.

3. Grounding/Bonding

a. Ground all installations as indicated in the contract documents.

b. Installation of grounds is incidental to the cost of the connected items of work.

c. Ground all installations in accordance with the requirements of NEC. Supply and install additional grounding rods and equipment as necessary to satisfy such requirements at no additional cost to the Iowa DOT.

C. Method of Measurement & Basis of Payment

1. Measurement and payment for all wire and cable shall be paid for at the contract unit price per linear foot for the pay item Tracer Wire.

2. Payment is full compensation for:

- The furnishing and installation of all wire and cable,
- Including the proper installation of the wire and cable into existing conduit and new conduit systems, supply and installation of splices and connectors, and slack, coiled, or stored wires or cables, and
- Furnishing all materials, labor, equipment, and other incidental items necessary to meet the requirements of the contract documents.

2.06 Fiber Optic Cable

A. Materials

1. Fiber optic cable to be installed with this project will be provided by the Iowa DOT.

2. The Contractor shall perform pre-installation testing of the fiber optic cable. The Contractor shall identify and notify the Engineer of any defects in the fiber optic cable prior to installing the cable.

B. Construction

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 conduit or 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. Iowa 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 of 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 Iowa DOT provided ETCO duct plug at all conduit openings at the junction boxes, handholes, poles, and cabinets after cable installation.

3. Facilities Protection

a. In the event it is suspected that cable damage has occurred 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

- Handhole, type Fiber Vaults – 150 feet

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.

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.

C. Method of Measurement & Basis of Payment

1. Measurement and payment for all fiber optic cable shall be paid for at the contract unit price per linear foot for the pay items Install 96 SM Dielectric Fiber and Install 96 SM Armored Fiber.

2. Payment is full compensation for:

a. The furnishing and installation of all cables and wires per the contract documents,

b. Furnishing all materials, labor, tools, consumable items and other incidental items necessary to meet the requirements of the contract documents.

PART III
ACCEPTANCE CRITERIA

3.01 Fiber Optic Cable Acceptance Testing

A. Materials
None

B. Construction

1. Fiber Optic Cable Acceptance Testing Methods

a. Visually inspect fiber optic cable prior to installation. Report any defects to Engineer.

b. Post installation, 100% of the cable's fiber count shall be tested with an Optical Time Domain Reflectometer (OTDR) at 1310 nm and 1550 nm to verify attenuation and continuity of strands for the entire length of cable. The contractor shall perform all tests in the presence of the Engineer and provide the Engineer with up to two copies of any software required for viewing electronic files of the OTDR traces.

c. The fiber optic cable is to have a maximum attenuation of 0.4 dB/km at 1310 nm and 0.3 dB/km at 1550 nm when measured with an OTDR. Fiber test results submitted to the Engineer that exceed the max attenuation loss specification will be identified as Out Of Specification.

d. Contractor shall replace, as directed by the Engineer, any defect discovered during final acceptance at no additional cost to the Iowa DOT. Consider a defect to be any cable with an OTDR measured length that differs from the actual cable footage, excluding manufacturer's helicity.

e. All test equipment shall be factory certified within the last year. The Contractor shall provide copies of the certification 10 days prior to testing.

f. Test results will be recorded on a form supplied by the Contractor, with data compiled in .PDF format through the meter manufacturer's software. No additional alteration using software from the Contractor beyond the meter manufacturer's software will be allowed. The Contractor shall submit test results in a format approved by the Engineer. Completed test forms on each fiber shall be handed over to the Engineer. Contractor shall also provide native test (electronic version) with no alterations and meter software for viewing of fiber traces. At a minimum, test results shall show the following:

- Cable and fiber identification (as approved by Iowa DOT)
- Operator name
- Date and Time
- Setup and test parameters including wavelength, pulse width, range, scale and ambient temperature.

g. OTDR testing shall use a launch and receiving cables minimum 1000 meters or greater than the dead zone for the OTDR used for this test.

C. Method of Measurement & Basis of Payment

1. Measurement and payment for fiber optic acceptance testing shall be paid for at the lump sum contract unit price bid for the pay items Pre-Installation Fiber Optic Acceptance Testing and Post-Installation Fiber Optic Acceptance Testing.

2. Payment is full compensation for:

a. The furnishing of all test equipment

b. Furnishing labor, tools, testing equipment, consumable items, and incidentals necessary to complete all acceptance testing satisfying the requirements of the contract documents.

PART IV
ADDITIONAL BIDDING ATTACHMENTS

4.01. Equipment and Materials List

IOWA DOT PROJECT NO. ITS-035-4(239)--25-77 IN ANKENY, IOWA

DESCRIPTION	MANUFACTURER	CATALOG NUMBER
HANDHOLE, TYPE FOR27		
HANDHOLE, TYPE FIBER VAULT		
2 INCH HDPE CONDUIT		
1C No. 12 TRACER WIRE		
OTDR METER		
No. 6 AWG COPPER GROUND		