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January 17, 2025 Letting

Notice to Bidders, Specifications and Proposal



**Illinois Department
of Transportation**

**Contract No. 78998
JACKSON County
Section D9 TRAFFIC SIGNAL 2024-1
Route FAP 331, FAP 42
District 9 Construction Funds**

Prepared by

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Checked by

(Printed by authority of the State of Illinois)



NOTICE TO BIDDERS

- 1. TIME AND PLACE OF OPENING BIDS.** Electronic bids are to be submitted to the electronic bidding system (iCX-Integrated Contractors Exchange). All bids must be submitted to the iCX system prior to 12:00 p.m. January 17, 2025 prevailing time at which time the bids will be publicly opened from the iCX SecureVault.
- 2. DESCRIPTION OF WORK.** The proposed improvement is identified and advertised for bids in the Invitation for Bids as:

**Contract No. 78998
JACKSON County
Section D9 TRAFFIC SIGNAL 2024-1
Route FAP 331,FAP 42
District 9 Construction Funds**

16.5 miles of fiber optic cable installation and signal modification on IL 13 in Carbondale from Striegel Road west to IL 127/149 and on IL13/127/149 in Murphysboro from IL 13/127/149 north to Industrial Park Road.

- 3. INSTRUCTIONS TO BIDDERS.** (a) This Notice, the invitation for bids, proposal and letter of award shall, together with all other documents in accordance with Article 101.09 of the Standard Specifications for Road and Bridge Construction, become part of the contract. Bidders are cautioned to read and examine carefully all documents, to make all required inspections, and to inquire or seek explanation of the same prior to submission of a bid.

(b) State law, and, if the work is to be paid wholly or in part with Federal-aid funds, Federal law requires the bidder to make various certifications as a part of the proposal and contract. By execution and submission of the proposal, the bidder makes the certification contained therein. A false or fraudulent certification shall, in addition to all other remedies provided by law, be a breach of contract and may result in termination of the contract.
- 4. AWARD CRITERIA AND REJECTION OF BIDS.** This contract will be awarded to the lowest responsive and responsible bidder considering conformity with the terms and conditions established by the Department in the rules, Invitation for Bids and contract documents. The issuance of plans and proposal forms for bidding based upon a prequalification rating shall not be the sole determinant of responsibility. The Department reserves the right to determine responsibility at the time of award, to reject any or all proposals, to readvertise the proposed improvement, and to waive technicalities.

By Order of the
Illinois Department of Transportation

Omer Osman,
Secretary

RECURRING SPECIAL PROVISIONS

The following RECURRING SPECIAL PROVISIONS indicated by an "X" are applicable to this contract and are included by reference:

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STATE OF ILLINOIS

SPECIAL PROVISIONS

The following Special Provisions supplement the “Standard Specifications for Road and Bridge Construction, Adopted January 1, 2022, the latest edition of the “Manual on Uniform Traffic Control Devices for Streets and Highways”, and the “Manual of Test Procedures for Materials” in effect on the date of invitation for bids, and the “Supplemental Specifications and Recurring Special Provisions” indicated on the Check Sheet included herein, which apply to and govern the construction of FAP Route 331/FAP Route 42 (IL 13/IL127), Section D9 Traffic Signal 2024-1, Jackson County, Contract No. 78998, and in case of conflict with any part, or parts, of said Specifications, the said Special Provisions shall take precedence and shall govern.

FAP Route 331/FAP Route 42 (IL 13/IL127)
Section D9 Traffic Signal 2024-1
Jackson County
Contract No. 78998

LOCATION OF PROJECT

This project is located along IL 13 in Carbondale and Murphysboro from the Striegel Road intersection to the IL 127/149 & 5th Street intersection and along IL 13/127/149 from the Walnut St intersection to the IL 13/127 & Industrial Park Road intersection.

DESCRIPTION OF PROJECT

This project consists of installing conduit and fiber optic cable for traffic coordination, remote traffic signal phasing, and timing modification capabilities and to upgrade traffic signal controller equipment to be fiber optic compatible along the IL 13 corridors.

UTILITIES

Add the following after the first paragraph of Article 105.07 of the Standard Specifications:

Existing utility location information is not shown on the plan sheets. The Contractor shall verify the location of all utilities and privately-owned facilities prior to installation of any components. Verification of locations of underground utilities prior to commencing work on the project will be the responsibility of the Contractor. The following utility companies have facilities within the project limits which may require adjustment:

**Status of JULIE Member Utilities
78998 IL 13 Various Locations, Jackson County**

Name and Address of Utility	Type	Location	Estimated Adjustment Status
Ameren Illinois 1800 West Main St Marion, IL 62959 ATTN: Traven Watts Tel: (618) 998-4504 Cell: (618) 351-8440 Email: TWatts2@Ameren.com	Electric	Throughout	No adjustments anticipated
Ameren Illinois Electric 1800 W. Main Marion, IL 62959 ATTN: Rob Estes Tel: (618) 998-4560 Cell: (618) 924-0179 Email: restes@ameren.com	Gas	Throughout	No adjustments anticipated
Carbondale, City of 212 Wet Willow St Carbondale, IL 62902 ATTN: Robert Hardin Tel: (618) 457-3273 Email: rhardin@explorecarbondale.com	Water & sewer	Throughout	No adjustments anticipated
Clearwave ATTN: Marcus Burrell Tel: (470) 857-8159 Cell: (470) 990-1754 Email: Marcus.burrell@clearwavefiber.com	Fiber	Throughout	No adjustments anticipated
Egyptian Electric Cooperative 10169 Old Hwy 13 Murphysboro, IL 62966 ATTN: Chris Stoner Tel: (618) 684-2143 ext No. 1135 Email: Cstoner@eeca.Coop	Electric	Throughout	No adjustments anticipated
ExteNet 3030 Wareville Rd. Lisle, IL 60532 ATTN: Koji Bjerke Tel: (630) 245-2075 Cell: (808) 348-1503 Email: bbjerke@extenetsystems.com	Fiber	Throughout	No adjustments anticipated

FAP ROUTE 331/FAP ROUTE 42 (IL 13/IL127)
SECTION D9 TRAFFIC SIGNAL 2024-1
JACKSON COUNTY
CONTRACT NO. 78998

Frontier Communications 208 West Union St. Marion, IL 62959 ATTN: Rick Shaw Tel: (618) 997-0253 Cell: (618) 967-5540 Email: rick.shaw@ftr.com	Fiber	Throughout	No adjustments anticipated
Kinkaid Area Water System 1763 Water Plant Road Murphysboro, IL 62966 ATTN: J. Jenkins Tel: (618) 687-2951 Cell: (618) 303-1435 Email: jjenk79@gmail.com	Water	Throughout	No adjustments anticipated
Mediacom 1603 E. DeYoung St. Marion, IL. 62959 ATTN: Craig Thompson Tel: (270) 703-9490 Email: cthompson@mediacomcc.com	Fiber	Throughout	No adjustments anticipated
Murphysboro, City of 316 N. 12th Murphysboro, IL 62966 ATTN: Tim Lee Tel: (618) 684-2961 Email: Talee@murphysboro.com	Water & sewer	Throughout	No adjustments anticipated

The above represents the best information the Department has available and is only included for the convenience of the bidder. The applicable provisions of Section 102 and Articles 105.07, 107.20, 107.37-107.40, and 108.02 shall apply.

Additional utility information may be obtained by calling the Joint Utility Location Information for Excavators' phone number, 800-892-0123. This project is located in Carbondale and Murphysboro Townships.

Add the following after the first paragraph of Article 107.39 of the Standard Specifications:

The Contractor is advised that this project includes areas of highway illumination and/or signalized intersections. These areas have underground cable or conduit throughout which is to remain in service. Before driving any posts or beginning any excavation operations, the Contractor shall locate, uncover by hand, and relocate any wiring which conflicts with the proposed work. Any cable or conduit which is damaged as a result of the Contractor's operations shall be replaced by them at their expense. Replacement material and methods shall meet or exceed the original specifications for the wiring. Splicing will not be permitted.

POTHOLING UNDERGROUND UTILITIES

Description. This item shall consist of exposing and determining the location of existing underground utilities to avoid “blind” or obtrusive bores. This process is commonly referred to as potholing. The Contractor shall pothole all underground utilities within project limits to the frequency as directed by the Engineer. Prior to exposing any utilities, the Contractor shall locate all applicable existing utilities as required by JULIE law and obtain any permits or approvals for access required to perform the work. The Contractor shall also establish traffic control if required by the Engineer according to applicable traffic control standards.

Methods and Equipment. The Contractor shall provide minimum 6” diameter potholes by an approved method, either hand dug or machine dug, at the frequency and locations specified by the Engineer. All proposed utility crossings shall be exposed and potholed beyond the depth of the Contractor’s excavation of work at that location for both inspection and verification of vertical utility clearances. The Contractor shall submit any surveyed elevation data to the Engineer to be included in the as-built plans.

Construction Requirements. The Contractor shall make efforts to protect all open potholes during construction activities. The Contractor shall notify the Engineer immediately if any utility is damaged during construction or if any utility conflicts with the proposed work.

Backfilling Requirements. All potholes made from utility exploration shall be pumped dry, and any mud or loose material within the space removed before backfilling. The potholes shall be backfilled as follows.

- For potholes made within 2 ft of pavement, curb, gutter, curb and gutter, or stabilized shoulder, the potholes shall be backfilled with CLSM according to Articles 593.01-593.04.
- For potholes made within 2 ft of sidewalk or aggregate surfaces, the potholes shall be backfilled with porous granular material according to Articles 207.01-207.03.
- All other potholes shall be backfilled with select material. The select material shall be from excavation or borrow and free from large or frozen lumps, clods, or rock meeting the approval of the Engineer. The material shall be placed in lifts not exceeding 8 in. in depth, loose measurement, and compacted to the satisfaction of the Engineer.

Removal and replacement of existing sidewalk, pavement, and islands only for utility locating purposes will not be paid for separately but shall be included in this work.

Method of Measurement. Measurement for payment will be each per pothole measured from the existing ground surface to the top of the exposed utility as indicated or as agreed upon, directed by, or approved by the Engineer. Multiple potholes made to obtain the location of a singular utility facility to be crossed at the same location will be measured as each per pothole per facility.

Basis of Payment. This work will be paid for at the contract unit price per EACH for POTHOLING, which price shall include all labor, equipment and incidentals necessary to complete this work.

TRAFFIC CONTROL PLAN

During the entire construction period, the road shall be kept open to traffic as follows:

- (a) IL 13 shall be kept open to two lanes of traffic in each direction for daytime operations and at least one lane of traffic in each direction for nighttime operations (See Nighttime Lane Closure special provision.) except as noted in the Lane Rental special provision.
- (b) Access to all public roads and private entrances shall be maintained during all stages of the work. If at any time the signs are in place but not applicable, they shall be turned from the view of motorists or covered as directed by the Engineer.

NIGHTTIME LANE CLOSURES

The work day will be divided into a 12 hour night time period and a 12 hour day time period defined as 7:00 PM to 7:00 AM for the nighttime period and from 7:00 AM to 7:00 PM for the daytime period. Lane closures are allowed only during the nighttime period except as noted in the Lane Rental special provision.

LANE RENTAL

Description. The Contractor will be charged a monetary assessment for each day or part of a day that traffic on IL 13 westbound or eastbound is reduced to travel on one through lane in excess of an accumulated total allowed of 10 days to conduct signal modifications. Lane rental in excess of allotted number of days will be deducted from the monthly progress payments. A lane rental day is defined as a period of time from 7:00 AM to 7:00 PM for which any through lane is closed to traffic.

Lane Rental. The Contractor will be assessed a minimum of a one day lane rental charge anytime IL 13 is reduced to one through lane during the 7:00 AM to 7:00 PM time period. Lane rental shall apply to through lanes only. If eastbound and westbound are both closed to one through lane, then two closures will be assessed.

Disincentive Plan (Lane Rental Days Exceeding Allotted Days). The Contractor shall be liable to the Department in the amount of \$5,000 for each lane rental day beyond the number of lane rental days allowed in the contract. There is no limit to the number of lane rental days assessed that exceed the allotted days.

No incentive plan will be offered for lane rental.

SEEDING, MINOR AREAS

Seeding and fertilizing shall be done in accordance with Article 250 of the Standard Specifications, except for the following revisions. All areas disturbed by the work performed shall be seeded, fertilized, and mulched in accordance with Article 251.03(a) and as directed by the Engineer.

The seed mixture shall be applied at 100 pounds/acre. All seeds shall meet the mixture, purity, and noxious weed requirements of Article 1081.04 of the Standard Specifications and be approved by the Engineer. The fertilizer nutrients shall be applied at a rate of 270 pounds/acre. The fertilizer furnished shall be ready mixed material having a ratio of 1-1-1.

The Contractor shall provide the Engineer with the test results from the seed container and the chemical analysis of the fertilizer nutrients.

Basis of Payment: This work will not be measured for payment but will be included in the cost for Underground Conduit, Coilable Nonmetallic Conduit.

UNDERGROUND CONDUIT, COILABLE NONMETALLIC CONDUIT

Revised: March 22, 2018

This work shall consist of furnishing and installing a conduit of the type and size specified in accordance with Sections 810 and 1088.01(b) or 1088.01(c) of the Standard Specifications, except as described herein.

Coilable Nonmetallic Conduit, Augured: The term augured shall cover both the pushed and bored method of installing conduit. Because of differences in equipment and techniques, the Contractor may use either method to install the conduit for the term augured.

If subsurface conditions are encountered which prevent conduit from being augured or pushed through an entire conduit run in three sincere attempts, as determined by the Engineer, compensation for the proposed conduit run will be as follows:

1. The Department will delete the contract specified method of payment for the subject conduit run.
2. The Department will pay for the installation of the conduit run and the three unsuccessful attempts to install the conduit run, under Article 109.04 of the Standard Specification..
3. The Engineer will determine the method to be utilized to install the conduit run.

Basis of Payment: This work will be paid for at the contract unit price per FOOT for CONDUIT, of the size and type specified, which price shall include furnishing and installing the complete conduit run including all fittings.

SIDEWALK REMOVAL AND REPLACEMENT

Required removal and replacement of existing sidewalk due to the placement of conduit and/or communication vaults will not be paid for separately but shall be included in the cost for Underground Conduit, PVC, 4" DIA. and Underground Conduit, Coilable Nonmettalic Conduit, 1 ½" Dia. The work shall be in accordance with applicable portions of Sections 424 and 440 of the Standard Specifications.

OUTDOOR RATED NETWORK CABLE

Description This work shall consist of furnishing and installing a network cable from the proposed communications cabinet to the traffic signal cabinet and its associated field device as shown on the plans. The work shall be performed according to the applicable portions of Section 873 of the Standard Specifications and details as shown on the plans.

Materials. The outdoor rated network cable shall be a black Category 5E cable meeting the TIA/EIA 568-B.2 telecommunication standards. The cable shall be composed of 24 AWG solid bare copper conductors, twisted pairs, polyolefin insulation, inner LLPE jacket, overall shield (100% coverage), 24 AWG stranded TC drain wire, industrial grade sunlight- and oil-resistant LLPE jacket. The cable shall be capable of performing from -40 °F to 160 °F.

Each end of the cable shall be terminated with an RJ-45 connector installed according to the TIA/EIA 568B standard. The drain wire at the cabinet end shall be terminated with a ring lug and attached to a suitable ground point.

Basis of Payment. This work will be paid for at the contract unit price per FOOT for OUTDOOR RATED NETWORK CABLE, which price shall include all equipment, materials and labor required to furnish and install the cable and making all connections necessary for proper operation.

FULL ACTUATED CONTROLLER AND TYPE V CABINET

This work shall be in accordance with applicable portions of Sections 857 and 864 of the Standard Specifications, except as revised by this special provision.

The installation of the cabinets shall include removing the existing service meter and disconnect switch and reinstalling them on the new cabinet. The relocation work shall be included in the cost of Relocate Existing Traffic Signal Equipment.

The installation of the cabinets shall include removing the existing UPS battery cabinet, disconnecting the UPS, and reinstalling them on/in the new cabinet at the following locations:

- IL 13 & Williams Street
- IL 13 & IL 13/128/149 (2nd Street)
- IL 149 & IL 127 (5th Street)

- IL 13/127 & IL 149 (6th Street)

The relocation work shall be included in the cost of Relocate Existing Traffic Signal Equipment.

A traffic actuated solid state digital controller shall comply with the requirements of NEMA Standards for Traffic Control Systems, TS2-2016. This unit shall be capable being used as a master or local controller. One possible start up mode shall be an all red display for a minimum of 15 seconds. The controllers supplied shall be the Siemens M60 Series, or an approved equal, for integration into the existing District 9 Eagle Signal system and shall be fully compatible with the District's Tactics software.

The controller shall be capable of telemetry for controller to controller and controller to computer system or solo operation data transfer. Through telemetry, the system or solo operation shall be capable of being monitored on an IBM AT or compatible personal computer. Typically, the controller shall be completely uploaded or downloaded through telemetry either from a remote location or side by side from the computer. The latest computer software shall be provided so that data, including all timing parameters, can be transferred. The controller will use non-volatile EEPROM memory. All harnesses shall be furnished, if different than provided previously, for the controller to controller and controller to computer data transfer. The controller shall contain all normal connectors and any special connectors required for data transfer. The controller's "D" connector termination panel and all other connectors shall be completely terminated, even if not required in this application. The twisted shielded field cables should remain shielded to within 1" of the cabinet terminals.

A slide out shelf shall be provided below the standard shelf and above the back panel terminal board. The pull out shelf should be mounted as far left as possible. The cabinet shall be equipped with an IP addressable power strip. A standard TS-2 detector card rack shall be provided. The cabinet shall have a thermostat controller heater.

During conflict monitor flash, a means shall be provided to restart the controller at the beginning of startup, just as if the power had been removed, and reset the monitor with a momentary pulse. The signal to restart/reset shall be delivered by telemetry and/or a momentary switch, labeled RESET, located in the police door. The pulse shall only be functional while the signals are in a monitor flash mode. Jumpers shall be installed in the unused load switch sockets to prevent false red fail reports. Hardwiring of this feature on the back panel will not be permitted. The cabinet series/parallel surge protector shall be the plug in type. The controller cabinet shall be a TS-2, type 1 equipped with a 16 load switch, load bay using a conflict monitor capable of operating with 16 or 12 channels.

The conflict monitor shall be a malfunction management unit (MMU) meeting NEMA TS2-2016 standards, capable of supporting Flashing Yellow Arrow (FYA) operation, and be equipped with IP addressable network capability. The conflict monitor shall be capable of providing modes in both TS-2 and TS-1 cabinet configurations. The conflict monitor shall provide error sensing of two +24Vdc cabinet supplies and the controller power supplies via +24V MONITOR I, +24V MONITOR II, and Controller Voltage Monitor (CVM) inputs respectively. The conflict monitor shall use a programmable alpha-numeric LCD to show monitor status and two icon based LCDs to show field signal channel and fault status.

Communication. Controller shall be designed to communicate in two formats. Controller shall communicate in NTCIP format in full compliance with Standard NTCIP 1201. Controller shall communicate in the format of the legacy controllers of the District's Siemens traffic signal

controller models M01, M10, M30, M40, and M50. The communication format may be altered by installation of an alternate firmware version. Both firmware versions shall reside on the controller hardware at the same time, be fully licensed, and available for use. Controller shall have the following communication ports at a minimum:

- USB
- (1)RJ-45
- 25 pin RJ-232 ports for serial communication
- Flat format 37 pin D-Connector with FSK modem

The USB port shall offer the following capabilities to a standard USB storage device that can be purchased at any big box store. The number of files eligible for access to the thumbdrive shall be limited by the storage size of the USB storage device.

- Save data from/ load data to Controller
- Update controller firmware

Controller shall be capable of communicating to the central office software over the following mediums: IP, FSK over copper, phone modem, and serial over fiber. Controller shall be capable of communication in a closed-loop system with an existing master controller.

Interface. Controller display screen shall be in a menu format with a minimum of 16 lines of display. The interface shall be capable of displaying at least two active status screens from the menu of active status screen choices. Controller shall offer at least five favorites keys which store a display for easy access.

General Capabilities. Controller shall support the following functions:

- Four rings and 16 phases
- Dynamic Max Timers
- Four Phase Banks - an alternate set of phase data selectable by time of day command
- Eight overlaps in formats standard, FYA, timed, and pedestrian
- Detector Diagnostics – three measurements, two levels activated by time of day
- FYA support for any NEMA cabinet manufacturer format
- 64 vehicle detectors
- Eight special detectors
- Eight pedestrian detectors
- Six pre-empt detectors

The cabinet shall include a new fiber optic distribution enclosure. The distribution enclosure shall be of adequate capacity to accommodate the number of fibers to be terminated in the cabinet as noted in the plans. The enclosure shall be a wall mount with type LC duplex adapters for fusion splicing of individual pigtails. The pigtails shall be mounted on minimum six port panel using type LC optical connectors unless otherwise approved by the Engineer. The new fiber optic distribution enclosure shall be Multilink, Inc. or approved equivalent. All the mounting hardware and cable management (spool for slack storage, adapter plate plugs, documentation labels, etc.) shall be included.

The Contractor shall use type LC duplex adapters only unless otherwise specified in the plans or as directed by the Engineer. The optical connectors shall comply with the following.

- All connectors shall be factory installed LC compatible connectors. Field installed connectors shall not be allowed.
- Maximum attenuation 0.4dB, typical 0.2dB.
- No more than 0.2dB increase in attenuation after 1000 insertions.
- Attenuation of all connectors will be checked and recorded at the time of installation with an insertion test checked five time minimum with an OTDR.
- Terminated fibers as shown on the plans shall be connectorized at each end as directed by the Engineer. Unterminated fibers shall be capped and coiled neatly in the splice tray.
- Applicable fiber strands, as shown on the plans, shall be terminated at a fiber patch panel. The Contractor shall coordinate with the Engineer before any fibers are connected to IDOT network equipment. No additional terminations or splicing shall be done by the Contractor without direction from the IDOT.
- Unused fibers will be protected with a plastic cap to eliminate dust and moisture.
- All connectors shall comply with the TIA/EIA -568-A and TIA/EIA-604 standards, as applicable, and are tested according to the Telcordia/Bellcore GR326-CORE standard.
- When tested according to the TIA and EIA's Fiber Optic Test Procedure (FOTP)- 171 (TIA/EIA-455-171), ensure that the connectors test to an average insertion loss of 0.4 dB maximum.

Pre-terminated Connector Assemblies (Pigtails): Pre-terminated cable assemblies shall consist of 12-strand fiber optic cable with factory-installed and tested connectors on one end of the cable and unterminated optical fiber on the other. Each strand of the pre-terminated cable assembly shall not exceed a maximum attenuation 0.4dB. The pre-terminated cable assembly shall be fusion spliced to the connector panel within the fiber optic distribution enclosure. All buffer tubes and fibers shall be appropriately protected once the attachment of pre-terminated connector assemblies is complete. In addition, the pigtails shall comply with the following:

- The pigtails shall consist of a section of single fiber, jacketed cable equipped with optical connectors at both ends.
- The factory installed connector furnished as part of the pigtail shall meet or exceed the requirements for approved connectors specified herein. The fiber portion of each pigtail shall have optical properties identical to the optical cable furnished under the contract.

Buffer Tube Fan-Out Kits: A buffer tube fan-out kit can be installed when fiber optic cables are terminated if approved by the Engineer. The kit shall be compatible with the fiber optic cable being terminated and shall be color-coded to match the optical fiber color scheme. The buffer tube fanout kit shall support 12 fiber strands, and the output tubing and fiber strands contained therein shall be sufficient length for routing and attaching fiber optic cable to connected electronics or as directed by the Engineer. The kit and the connectors shall be supplied by the same manufacturer.

The controller shall be provided with an RS232 port 3 as well as an RS232 port 2. Connections on the "D" panel, Aux. one output should be connected to red rest. Aux. three should be connected to the special status three inputs. Special status 1 shall be connected to report if the cabinet door is open. A door open switch shall be provided. The controller's "D" connector termination panel shall be provided and fully connected to provide information to the controller, of manual or monitor flash status. A slide out shelf shall be provided below the standard shelf and above the back panel terminal board. The pullout shelf should be mounted as far left as possible.

During conflict monitor flash, a means shall be provided to restart the controller at the beginning of startup, just as if the power had been removed, and reset the monitor with a momentary pulse. The signal to restart/reset shall be delivered by telemetry and/or a momentary switch, labeled RESET, located in the police door. The pulse shall only be functional while the signals are in a monitor flash mode. Jumpers shall be installed in the unused load switch sockets to prevent false red fail reports. Hardwiring of this feature on the back panel will not be permitted. The cabinet series/parallel surge protector shall be the plugin type. The controller cabinet shall be equipped with a 16 load switch bay using a 12 channel conflict monitor. The phasing for the new cabinet shall be as shown in the plans.

The traffic signal controller will not be approved for installation until the requirements of Articles 801.10(b) and 801.07 are satisfied. The Contractor shall prepare traffic signal materials at a suitable location, meeting the approval of the Engineer. The cabinet shall be tested and approved by the Department at the Contractor's shop before moving it to the jobsite.

Basis of Payment. This work will be paid for at the contract unit price per EACH for FULL-ACTUATED CONTROLLER AND TYPE V CABINET, which price shall include furnishing and installing the controller complete with the necessary connections for proper operation.

INSTALL COMMUNICATIONS CABINET

Description. This work shall consist of installing a communications cabinet as shown in the plans. The communications cabinet shall be prepared and provided by IDOT. The cabinet will contain a power panel. Contractor shall contact IDOT's D9 electrical maintenance staff to arrange a pickup.

The Contractor shall install the communications cabinet on the proposed foundation shown in the plans. The cabinet shall be installed in accordance with Article 1074.03 in the Standard Specifications. Any necessary materials to ensure the proper installation of the cabinet shall be included in this pay item.

Basis of Payment This work will be paid for at the contract unit price per EACH for INSTALL COMMUNICATIONS CABINET, which price shall include furnishing all materials, hardware, wiring, and labor required to install the communications cabinet.

UNINTERRUPTABLE POWER SUPPLY EXTENDED

This work shall consist of furnishing and installing an uninterruptable power supply (UPS) in the local controller cabinet. The UPS shall be capable of keeping the signals running green, yellow, and red during periods of utility power failure. The UPS shall meet the following requirements:

1. Maintain power for a minimum of 60 minutes upon power failure.
2. Electrical inputs:
 - a. AC Input Voltage: 85-140 Volts
 - b. AC Input Current: 15 Amps max
 - c. Frequency: 60 +/- 0.5Hz

3. Electrical outputs:
 - a. Output Voltage: 120 VAC +- 3%
 - b. Output Current: 1000W: 8.3A / 1500W: 12.5A
 - c. Output Wave Form: Pure sinewave
4. The batteries shall be kept charged by a balanced charging system.
5. A bypass transfer switch shall be provided.
6. The UPS shall use nickel-zinc battery technology.
7. The UPS shall have network capability.

Basis of Payment. This work will be paid for at the contract unit price per EACH for UNINTERRUPTABLE POWER SUPPLY, EXTENDED, which price shall include furnishing and installing the UPS complete with necessary connections for proper operation at the local controller intersection.

SERVICE INSTALLATION (TRAFFIC SIGNALS)

Revise Section 805 of the Standard Specifications to read.

Description. This work shall consist of all materials and labor required to install, modify, or extend the electric service installation. The electric service installation shall be the electric service disconnecting means and shall be identified as suitable for use as service equipment.

The Contractor must request in writing for service and/or service modification within ten days of contract award and must follow-up with the electric utility to assure all necessary documents and payment are received by the utility. The Contractor shall forward copies of all correspondence between the Contractor and utility company to the Engineer and Owner. The service agreement and sketch shall be submitted for signature to the Owner.

Materials. The completed control panel shall be constructed in accordance with UL Std. 508A, Industrial Control Panel, and carry the UL label. Wire terminations shall be UL listed.

Enclosures. For the ground mounted cabinet, the cabinet shall be UL 50, NEMA type 3R unfinished with a customer and utility section with a lockable hasp design. The cabinet shall be constructed from raw uncoated aluminum. Seams shall be continuous welded and ground smooth. Hinges shall be stainless steel and piano type. The cabinet shall be 16" wide and shall be bolted with stainless steel hardware to the mounting base secured in a concrete pad as indicated on the plans. The foundation is paid for separately.

Electric Utility Meter Housing. The electric meter housing and meter socket shall be supplied and installed by the Contractor. The Contractor is to coordinate the work to be performed and materials required with the utility company to make the final connection at the power source. Electric utility required risers, weather/service head, and any other materials necessary for connection shall also be included in the pay item. Materials shall be in accordance with the electric utility's requirements. For ground-mounted service, the electric utility meter shall be exposed and supplied by the utility company. Metered service shall not be used unless specified in the plans.

Surge Protector. SPD shall be installed on load side of main breaker, Hubbel Part HBLSDSA36 - 36KA single phase with LED indicator or equal.

Circuit Breakers. Circuit breakers shall be standard UL listed molded case, thermal-magnetic, bolt-on type circuit breakers with trip free indicating handles and must include lug to lug connections. Circuit breakers need to be 480V rated Cutler EHD series or equal. Unless otherwise indicated, the main disconnect circuit breaker shall be rated 100 amps, 120V-240V single phase three wire. The auxiliary circuit breakers shall be rated 30 amp-2 pole, 120V-240V for signals and 20 amp-2 pole, 120V-240V for lighting.

GFCI Receptacle. A 20 amp GFCI shall be mounted to dead front.

Lighting Circuit. If lighting circuits are present in power supply, a photocell and a hand off auto (HOA) will be required. Photocell is to be mounted internally with a window and external shield. A contactor 30 A-2 pole electrically held (120V coil) is needed for each lighting circuit. Contactor shall be square D 8903LO20V02 or equal.

Ground and Neutral Bus Bars. A single copper ground and neutral bus bar, mounted on the equipment panel, shall be provided.

Utility Services Connection. The Contractor shall notify the utility company's marketing representative a minimum of 30 working days prior to the anticipated date of hook-up. This 30 day advance notification will begin only after the utility company marketing representative has received service charge payments from the Contractor. Prior to contacting the utility company marketing representative for service connection, the service installation controller cabinet and cable must be installed for inspection by the utility company.

Ground Rod. Ground rods shall be copper-clad steel, a minimum of 10 feet in length, and 3/4 inch in diameter. Ground rod resistance measurements to ground shall be 10 ohms or less. If necessary, additional rods shall be installed to meet resistance requirements at no additional cost to the contract.

Installation. The Contractor shall confirm the orientation of the traffic service installation and its door side with the Engineer prior to installation. All conduit entrances into the service installation shall be sealed with a pliable waterproof material.

Ground Mounted. The service installation shall be mounted plumb and level on the foundation. The space between the bottom of the enclosure and the top of the foundation shall be caulked at the base with silicone.

Basis of Payment. This work will be paid for at the contract unit price per EACH for SERVICE INSTALLATION of the type specified, which price shall include furnishing and installing the service installation complete.

The concrete foundation, which includes the ground rod, shall be paid for separately. Any charges by the utility companies shall be approved by the Engineer and paid for as an addition to the contract according to Article 109.05 of the Standard Specifications.

VIDEO AND RADAR HYBRID DETECTION SYSTEM

Description: This work shall include installing a vehicle detection system that detects vehicles on a roadway using a multi-sensor detection system consisting of video cameras, cables, video processors, a controller interface unit ,and a remote communication module to operate the video vehicle detection system.

The multi-sensor system shall utilize two different sensors of different technologies, video imaging and radar, to detect and track licensed and unlicensed vehicles at distances over 500 feet. The sensor system shall fuse vehicle information from the two sensors to provide highly accurate and precise detection for simultaneous stop bar presence detection, advanced detection, and special or advanced applications.

Detection Performance: The system shall use video imaging for stop bar detection and radar for advanced detection up to 500 ft. Advanced detection will only be required on the mainline approaches, as shown in the plans. The system features shall include vehicle volumes (including turning movements) on all four approaches, advanced detection on IL 13, and speed and dilemma zone detection on IL 13. The system shall have the capability of detecting and differentiating bicycles. The system shall be able to detect and count pedestrians in the crosswalk. All video detection systems shall be equipped with the latest software and firmware revision.

Hardware: The multi-sensor detection system (MSDS) shall consist of two hybrid video camera/radar sensors, two video-only sensors, up to two detection processors (DP) capable of processing from one to two sensors each, one central control unit (CCU) either 19" rack or shelf-mount form factor, input/output extension modules, video surge suppressors, HDMI monitor and a pointing device, or any combination thereof.

The vehicle detection system shall include all necessary camera risers, electric cable, electrical junction boxes, hardware, software, programming, and any camera brackets that are required for installation and configuration.

The CCU shall be supplied in three separate form factors. Users may choose one form factor for use within their controller cabinet system.

1. Standard One Rack Unit (1U) 19" Rack Format. There shall be brackets to allow the CCU to be mounted under shelves where a 19" frame is not available.
2. Shelf-Mount format; TS1 version. The CCU shall be able to stand up on available shelf-space within the cabinet. All connections shall be made from the front of the CCU, including connections to separate DPs located within the cabinet.
3. Shelf-Mount format; TS2 version. The CCU shall be able to stand up on available shelf-space within the cabinet. All connections shall be made from the front of the CCU, and no external DPs will be required.

The CCU shall incorporate surge suppression for each sensor input, and the CCU shall incorporate power surge suppression both on the input power and on the power supplied to the sensors. The CCU shall be appropriately grounded to the cabinet ground rod using 14 AWG minimum.

An Ethernet communications port shall be provided on the front panel. The Ethernet port shall be compliant with IEEE 802.3 and shall use a RJ-45 type connector mounted on the front panel of the CCU. The Ethernet communications interface shall allow the user to remotely configure the system and/or to extract calculated vehicle/roadway information. The interface protocol shall be documented, or the interface software shall be provided. Each MSDS shall have the capability to be IP addressable. The DP shall support data rates of up to 100Mbps.

The CCU shall provide a Wi-Fi connection. The connection shall be over a standard 2.4GHz connection. The Wi-Fi connection shall be enabled and disabled by a switch on the CCU. The CCU shall provide an indicator when the Wi-Fi connection is active.

Software: The system shall include software that discriminately detects the presence of individual vehicles and bicycles in single or multiple lanes using only the video image. Detection zones shall be defined using only an embedded software application. A monitor, a keyboard, and a pointing device are used to place the zones on a video image. A minimum of 32 video detection zones and 16 radar detection zones plus five trip lines per sensor shall be available.

A separate computer shall not be required to program the detection zones. In addition to creating vehicle and bicycle zones, the system shall automatically define a pedestrian crossing area in front of the stop bar zones. The system shall provide a tracking mechanism that counts pedestrian volume moving within this crossing area and determine the average, maximum, and minimum speed of pedestrians moving within this crossing zone. The system shall provide discrete outputs when pedestrians are in the crosswalk during normal crossing phases (one for each direction of travel) and when a red phase input has been detected. The system shall provide a visual indication on the video image that a pedestrian is in the crosswalk.

Installation: The video detection cameras shall be installed in accordance with the manufacturer's recommendations. All holes drilled into signal poles, mast arms, or posts shall require rubber grommets to prevent the chafing of wires.

Warranty and Support: A vendor/manufacture representative shall be present the day of activation to assist in the setup of the detection zones.

The video detection system shall be warranted by the supplier for a minimum of three years from the date of turn-on. This warranty shall cover all material defects and shall provide all parts and labor as well as unlimited technical support.

Ongoing software updates to the system shall be included in the cost of the system.

A training session shall be provided to City/IDOT personnel in the operation, setup, and maintenance of the video detection system if requested.

Basis of Payment: This work will be paid for at the contract unit price per EACH for VIDEO AND RADAR HYBRID DETECTION SYSTEM.

SIGNAL PERFORMANCE MEASURES (SPM) SERVICE

Description: The signal performance measure (SPM) service is a cloud-based data and software service that shall allow the agency easy access to performance measures and visualizations derived from high-resolution data that is extracted from field-located signal controllers. This work shall consist of licensing and programming SPM software at 35 intersections as listed below:

1. IL 13 & Striegel Road
2. IL 13 & Country Club Road
3. IL 13 & Watson Road
4. IL 13 & Williams Street
5. IL 13 & IL 13/127/149 (2nd Street)
6. IL 127/149 & IL 127 (5th Street)
7. IL 13/127/149 & IL 149 (6th Street)
8. IL 13/127 & Industrial Park Road
- 9-35. Additional signals within IDOT's District 9 to be added within the three year service period.

Signal Controller Data: The SPM service shall have the capability of collecting, storing, and analyzing high-resolution (10 Hz) signal controller data from controllers that log this data in the industry-standard format. This list of controllers include:

- Siemens
 - M50 Linux & M60 ATV
 - ECOM v3.52+
 - NTCIP v4.53+
- Econolite
 - Cobalt – Any version
 - ASC3 NEMA – v2.50+ & OS 1.14.03+
 - 2070 with 1C CPU Module – v32.50+
- Intelight Maxtime – v1.7.0+
- McCain ATC Omni eX1.6+
- Peek ATC Greenwave – v03.05.0528+
- Trafficware 980ATC v76.10+

Data Acquisition and Transmission: The SPM Service shall include SPM data collection software that is installed at the customer's site on a server (SPM data collection server) that is supplied by the agency or the vendor. The server and software shall reside within the agency's traffic equipment network. The server shall have internet access. The software shall be configured by the vendor to run at specified intervals, connecting to each traffic signal controller and downloading stored high-resolution controller data off them, and uploading the data to the SPM service's secure https REST API endpoint.

To install and update the SPM data collection software, the vendor shall have access to the server, either remotely or onsite.

The following is required for data acquisition and transmission:

- The vendor shall work with the agency to acquire a list of controller IP addresses and port numbers
- Outbound access from the SPM data collection server to field controllers via port 161 (UDP) or other designated port. This access shall be used to identify the controller firmware version via SNMP.
- Outbound access from the SPM data collection server to the field controllers (typically via port 22 for SFTP data transfer, port 21 for FTP data transfer, or other ports as designated by the controller manufacturer or agency).
- Access from the SPM data collection server to a designated IP address (to be supplied to the agency by the vendor) to the agency via port 443 (TCP) for transfer of high-resolution data logs from the SPM data collection server to the SPM cloud hosted environment.

Service Setup Requirements: To support the SPM service, the vendor shall acquire detector layouts and assignments. These shall be obtained from agency drawings if available or otherwise shall be obtained from the ATMS or by field visits. The vendor shall perform set-up of the detector layouts and assignments within the SPM software tool.

Functional Requirements: This section describes the functional requirements of the software tool (SPM tool) provided as part of the SPM service.

- The SPM tool shall be available to users through a standard web browser.
- The SPM tool shall display a map of all connected traffic signals and shall allow users to navigate to signals of interest via a map, a list, and by search.
- The SPM tool shall provide an interactive visualization that shows, for each phase and cycle during coordinated timing plans, when vehicles arrived at the intersection and whether they arrived during the programmed green split, yellow, red, or early return to green. The visualization shall provide metrics on the percentage of arrivals on green by plan or specified interval (one, two, or four hour) and phase as well as the platoon ratio and whether it is favorable or unfavorable. It shall be user-selectable if the visualization shows the point of 'detector on' or the duration of the 'detector on' for vehicle arrivals. A second date/time field shall be available that, when populated, will show a comparison of the visualization and provide the metrics described above for the same phase side-by-side on two different days.
- The SPM tool shall provide an interactive visualization of a timeline for each timing plan or specified interval (one, two, or four hour) that shows preemption, signal priority, and pedestrian activity requests and when the intersection is in free, preempt, transition, and vs in-step modes. The visualization shall provide metrics on the percentage of each coordinated timing plan spent in transition and the number of preempt events per timing plan.
- The SPM tool shall provide an interactive visualization that shows, for each timing plan or specified interval (one, two, or four hour) and phase, the percentage of terminations by type, the distribution of phase durations by termination type relative to the programmed split, and the percentage of cycles of each termination type that terminate with a vehicle left at the stop bar.
- The SPM tool shall provide an interactive visualization that shows for each phase and cycle over a day the phase duration, how it terminated, and whether a vehicle was left at the stop bar when it terminated. The visualization shall display the programmed splits of each coordinated plan, pedestrian activity, and when each phase was skipped.

- The SPM tool shall provide an interactive visualization to show vehicle arrivals into the intersection during the yellow and all-red clearance intervals to help users assess red-light running at intersections.
- The SPM tool shall provide access to traffic volume counts at intersections with appropriate detection. The counts shall include protected left turn movements, permissive left turns, through movements, right turns on green, and right turns on red. The counts shall be shown as hourly counts in 15 minute intervals.
- The SPM tool shall provide an interactive visualization showing the maximum wait time per phase per cycle that a vehicle arriving on red waited for a green signal. The visualization shall also include the amount of time that vehicle waited on red with no detection on phases that were green.
- The SPM tool shall provide an interactive visualization to show the duration of time that pedestrians waited for a pedestrian interval after pushing the pushbutton. The chart shall also show the walk and flashing don't walk durations of that interval. Where appropriate detection is available, the chart shall show when pedestrians are in the crosswalk after the pushbutton actuation.
- The SPM tool shall produce configurable automated alerts of maintenance issues at intersections. Maintenance alerts shall include phases that exceed a configurable number of max-outs, force-offs, or ped calls during a configurable hour range and advanced detectors with counts below a configurable threshold during a configurable hour range. The alerts shall be configurable per intersection per phase.
- The SPM tool shall produce configurable automated alerts of operational issues at intersections. Operational alerts shall include plans that exceed a configurable percentage of time spent in transition, plans that exceed a configurable number of preempt calls, plans and phases with unfavorable progression, and phases with a high number of terminations that leave vehicles at the stop bar. The alerts shall be configurable per intersection per phase.

Support: A vendor/manufacture representative shall provide technical support and onsite training for IDOT staff and other users. The technical support services shall include:

- Hosting the service in a cloud environment
- Monitoring the collection and storage of data into the system and troubleshooting issues
- Responding to user questions and bug reports
- Regularly releasing new and improved versions of the software tool

The initial SPM installation shall provide service for three years from the date when 75% of the intersections listed are fully operating the SPM software.

Basis of Payment: This work will be paid for at the contract unit price per EACH for SIGNAL PERFORMANCE MEASURES SERVICE.

TRAFFIC COUNT DATA COLLECTION SYSTEM

Description: The traffic count data collection system is a cloud-based data service that provides central collection and presentation of vehicle, bicycle, and pedestrian traffic count data, communication status, and integrated Bluetooth/Wi-Fi travel time data. Access to service shall be through a web browser to view and analyze this data. This work shall consist of licensing and programming of the service at the 35 intersections listed below.

1. IL 13 & Striegel Road
2. IL 13 & Country Club Road
3. IL 13 & Watson Road
4. IL 13 & Williams Street
5. IL 13 & IL 13/127/149 (2nd Street)
6. IL 127/149 & IL 127 (5th Street)
7. IL 13/127/149 & IL 149 (6th Street)
8. IL 13/127 & Industrial Park Road
- 9-35. Additional signals within IDOT District 9 to be added within the three year service period.

Data Collection: It shall be possible to register individual intersections to provide data through the service. The service shall have the ability to collect speed and turning movement count data from sensor systems located at intersections. The data to be collected shall include:

- Vehicle count zone data, all movements
- Bicycle count zone data
- Pedestrian count data, bi-directional
- Spot speed data from sensors configured with a radar sensor
- Weather data localized per intersection

Data shall be collected from each intersection and uploaded to a cloud-based storage platform once per day. The service shall accommodate any interruptions in the data upload process by reattempting the upload. During the initial data upload, the service will attempt to collect the data three times. If the data upload is unsuccessful on the initial upload date, the system will flag the process for future retries. The service will attempt to collect data every day for the following 30 days from the date of failure. Data shall be maintained by cloud hosting provider holding ISO 27001:2013 certification or a comparable security certification. Data collected during any day shall be made available for analysis on the following day.

Functional Requirements: The service shall provide a summarized display, or dashboard, which shows the following data items:

- A system-wide map that identifies each location collecting data and what type of data is being collected. The map shall provide for alternate colors of locations based on condition status of communication and data.
- A list of the top intersections, approaches, and movements ranked by total vehicle volume from the previous day.
- A list of the top intersections ranked by total bicycle volume from the previous day.
- A list of the top intersections ranked by total pedestrian volume from the previous day.
- The total vehicle volume for all intersections from the previous day.
- The total bicycle volume for all intersections from the previous day.

- The total pedestrian volume for all intersections from the previous day.
- A chart showing the total vehicle volume, bicycle volume, and pedestrian volume for all intersections from the previous seven days.
- A chart comparing the percentage split of vehicle, bicycle, and pedestrian volume for only those intersections configured to collect bicycle and/or pedestrian data from the previous day.
- A chart that shows real-time status of communication from each intersection.
- A chart that shows the percentage of time that the intersection was detecting from the previous day.

The service shall have the capability of displaying travel time data overlaid on calculated segment volume. When an agency is utilizing a Bluetooth/Wi-Fi travel time system from a third party, the service shall have the capability of merging the travel time data set with the volume data and provide a graphical display of the two data sets. Either travel time or speed data can be selected by the user which will be overlaid on the calculated segment volume between two intersections.

The service shall provide a CSV format export of turning movement count data in standard universal traffic data format (UTDF). This CSV file shall be suitable for import into Synchro Signal Timing and Analysis software. It shall be possible to select either 15 or 60 minutes as the count bin interval for the report. It shall be possible to select the start and end date for the report. It shall be possible to select one or more of the registered intersections for the report. For Synchro compatibility, it shall be possible to associate a unique numerical intersection ID (or node) for each of the selected intersections for the report.

The service shall provide a peak hour summary report, which will report the hour with the highest total vehicle count volume in each of the morning, midday, and evening periods. The user shall be able to define start and end times to define the morning, midday, and evening periods. It shall be possible to select one or more continuous dates for the peak hour summary report. A chart shall show the AM, midday, and PM peak hour turning movement counts in a traditional four-approach intersection formation with actual lane counts and vehicle volume figures. It shall be possible to download and save a graphical image of the peak hour summary chart in PNG, JPEG, or SVG format. The service shall provide a XLS format export of the peak hour summary report.

The service must be scalable to accept and process data from an unlimited number of detection devices. The service must have the ability to accommodate an unlimited number of users on the system simultaneously.

Installation:

The Data Engine (DE) may reside on a physical server with the minimum necessary processor and memory and having the correct OS and applications suitable for running the service. The DE may alternately reside on a virtual server with the minimum necessary processor and memory and having the correct OS and applications suitable for running the service. The DE must be set on a suitable network which provides access to both the detector systems and the Cloud.

The DE will be configured with all details necessary to collect data from the detectors.

Support: A vendor/manufacture representative shall provide technical support and onsite training for IDOT staff and other users. The technical support services shall include:

- Hosting the service in a cloud environment

- Monitoring the collection and storage of data into the system and troubleshooting issues
- Responding to user questions and bug reports
- Regularly releasing new and improved versions of the software tool

The initial installation shall provide service for three years from the date when 75% of the intersections listed are fully operating the traffic count data collection service.

Basis of Payment: This work will be paid for at the contract unit price per EACH for TRAFFIC COUNT DATA COLLECTION SYSTEM.

COMMUNICATIONS VAULT, 24”X36”

This work shall consist of furnishing and installing a communications vault constructed of polymer concrete stackable assembly. This work shall be in accordance with Sections 814 and 1088 of the Standard Specifications, except as modified herein.

The 24” x 36” communications vault and lid shall conform to the following specifications:

Cover:

- Material: Polymer concrete nominal
- Dimensions: 24” x 36” single lid construction
- Gasketed, heavy duty lid with two bolts.
- Design/Test Load: 22,500/33,750 lbs. ANSI Tier: 22

Box:

- Material: Polymer concrete
- Nominal Dimensions: 24” W x 36” L x 36” D
- Open Bottom, Design/Test Load: 22,500/33,750 lbs. ANSI Tier: 22

The handhole lid shall be supplied with pull slots and stainless-steel security bolts and washers. The box shall be equipped with 12” cable racks to secure the fiber optic cable and splice closures off the bottom of handhole. Handhole lid shall have a standard logo design stamped into the lid as directed by the Engineer.

The location of the handhole shall be excavated so the top of the handhole is set flush with the sidewalk, paved surface, or ground line. When installed in earth shoulder away from the pavement edge, the top surface of the handhole shall be 1” in. above the finished grade. The excavation shall be deep enough to accommodate the depth of the box and French drain. The French drain shall be constructed underneath the proposed handhole according to Article 601.06 of the Standard Specifications and in accordance with Standard 814006.

The conduits shall enter through the bottom of the vault. No conduits will be allowed to enter through the side wall of the vault. The Contractor shall install 6 inches of CA 5 or CA 7 in the bottom of the vault.

The Contractor shall submit testing reports to verify that the communications vaults and lids meet the requirements of ANSI tier 22 loading.

A fiber optic marker shall be installed next to each communication vault. The locating cable shall be continuous and accessible on the outside of each communication vault using a locating cap that is installed on top of the fiber optic marker. The Contractor shall utilize appropriate corrosion resistant hardware (stainless-steel) and connections to the locating wire. The Contractor shall submit material and installation methods to the Department for review.

Basis of Payment: This work will be paid for at the contract unit price per EACH for COMMUNICATIONS VAULT, 24"x36" which price shall include all labor, equipment, and materials required to provide and install the equipment described above.

COMMUNICATIONS VAULT, 48"X48"

This work shall consist of furnishing and installing a communications vault constructed of a polymer concrete stackable assembly. The 48" x 48" communications vault is shown in the plans as "large communication vault". This work shall be in accordance with Sections 814 and 1088 of the Standard Specifications, except as modified herein.

The 48" x 48" communications vault and lid shall conform to the following specifications:

Cover:

Material: Polymer concrete nominal
Dimensions: 52 3/8" x 52 3/8" split lid construction
Gasketed, heavy duty lid with two bolts per lid section.
Design/Test Load: 22,500/33,750 lbs. ANSI tier: 22

Box:

Material: Polymer concrete
Nominal Dimensions: 50 1/8" W x 50 1/8" L x 36" D
Open bottom equipped with flange beam to support split lid construction.
Design/Test Load: 22,500/33,750 lbs. ANSI tier: 22

The handhole lid shall be supplied with pull slots and stainless-steel security bolts and washers. The box shall be equipped with 12" cable racks to secure the fiber optic cable and splice closures off the bottom of the handhole. Handhole lid shall have a standard logo design stamped into the lid as directed by the Engineer.

The location of the handhole shall be excavated so the top of the handhole is set flush with the sidewalk, paved surface, or ground line. When installed in earth shoulder away from the pavement edge, the top surface of the handhole shall be 1 in. above the finished grade. The excavation shall be deep enough to accommodate the depth of the box and French drain. The French drain shall be constructed underneath the proposed handhole according to Article 601.06 of the Standard Specifications and in accordance with Standard 814006.

The conduits shall enter through the bottom of the vault. No conduits will be allowed to enter through the side wall of the vault. The Contractor shall install 6 inches of CA 5 or CA 7 in the bottom of the vault.

The Contractor shall submit testing reports to verify that the communications vaults and lids meet the requirements of ANSI tier 22 loading.

A fiber optic marker shall be installed next to each communication vault. The locating cable shall be continuous and accessible on the outside of each communication vault using a locating cap that is installed on top of the fiber optic marker. The Contractor shall utilize appropriate corrosion resistant hardware (stainless steel) and connections to the locating wire. The Contractor shall submit material and installation methods to the Department for review.

Basis of Payment: This work will be paid for at the contract unit price per EACH for COMMUNICATIONS VAULT, 48"x48", which price shall include shall all labor, equipment, and materials required to provide and install the equipment described above.

COMMUNICATIONS VAULT SPACING

The Contractor may submit a revised communication vault spacing plan to the Department for review and approval. Depending upon the fiber installation equipment used and the conduit reel sizes that are available, the communication vault spacing may be altered for optimum fiber installation. Optimum fiber installation essentially means continuous runs with no or minimal splice points unless otherwise shown on plans. However, the Department will still require that the Contractor install communication vaults at or near intersecting roadways. This work will not be paid for separately but shall be included in the cost for Communications Vault.

ROUTING, LAYOUT AND DOCUMENTATION

The Contractor shall layout and stake the proposed conduit route for review and approval by the Engineer a minimum of one week in advance of anticipated construction or at a different timeframe as approved by the Engineer.

After the fiber optic cable plant has been installed, two complete sets of operation and maintenance documentation shall be provided. The documentation shall, as a minimum, include the following:

- Complete and accurate as-built diagrams showing the entire fiber optic cable plant including locations of all splices.
- The Contractor shall locate the fiber optic cable in conduit every 100 feet using a GIS locating device that is accurate to the nearest foot. The Contractor shall provide a GIS based map of the route (including all communication vaults, junction boxes, and splice points) and a complete listing of all map coordinates in an electronic format. The format shall be compatible for viewing and importing into ArcGIS and Google Earth (kml or kmz). Each communication vault and fiber optic cable splice shall be numbered and clearly labeled when displayed in both software programs.
- Final copies of all approved test procedures.
- Complete performance data of the cable plant showing the losses at each terminal connector.

- Complete parts list including names of vendors.

Basis of Payment. This work will be paid for at the contract unit price per LUMP SUM for FIBER LAYOUT, which price shall include all labor, equipment, and materials required to complete the work described above.

FIBER OPTIC CABLE SPLICE

Description. This work shall consist of splicing two fiber optic cables by fusion splicing with the number of fibers at locations as shown on the plans and as directed by the Engineer. No other splicing in the field shall be allowed without written direction from the Engineer. Fiber splicing in the field shall be done using in-ground splice closures as shown on the plans and/or as directed by the Engineer.

Two distinct type of fusion splices that are identified, a fiber optic cable splice and fiber optic cable splice mainline includes all fibers in the cable sheath. In a lateral fiber optic cable splice, the buffer tubes in the mainline fiber optic cable are dressed out so those fibers designated on the plans can be accessed and fusion spliced or joined to the 12-fiber lateral single mode cables.

Materials. All fiber optic connection hardware (splice closures, organizers, cable end preparation tools, etc.) shall be compatible with the fiber optic cable manufacturer's installation practices and procedures and shall be approved by the Engineer.

Fiber Optic Splice - Mainline

- Loose tube dome closure for 48 fiber count
- Four splice tray kit with 12 count splice blocks

Fiber Optic Splice – Lateral:

- Loose tube dome closure
- Splice tray kit with 12 count splice blocks

Splice enclosures and splice trays shall meet the following minimum requirements.

Splice Closures: All optical fiber splices in the field shall be contained within a splice closure. The closures provide storage for splices, fiber, and buffer tubes, restores the mechanical and environmental integrity of the fiber optic cable, encases the sheath opening in the cable, and organizes and stores optical fiber. All hinges and latching devices shall be stainless-steel, and the closure shall be airtight and prevent water intrusion. The splice closure shall be able to accommodate pressurization and the ability to be re-entered without requiring specialized tools or equipment. The closure shall provide fiber and splice organizers including splice trays and strain relief. The splice closure shall be hermetically sealed to protect internal components from environmental hazards such as moisture, insects, and UV light.

The splice closure shall provide space for future expansion equal to 100% of the initial utilization. Fiber optic cable penetration end caps shall be provided to accommodate a minimum installation of two trunk fiber optic cables and two fiber optic drop cables. The closure end caps shall be factory-drilled to the proper diameter to accept and seal the fiber optic cable entries. The cable entry locations shall be able to accommodate an assortment of cables with outside diameters

ranging from 0.45 to 0.55 inches, plus 10%, without jeopardizing the waterproof characteristics of the closure.

In addition, fiber optic splice closures shall meet the following requirements:

Mechanical
Resist compression deformation to a maximum of 400 pounds.
Withstand an impact energy to a maximum of 40 foot-pounds at 0 °F.
Axial Tension: 100 pounds for 30 minutes.
Cable Torsion: ten 90° rotations.
Cable Flexing: ten 90° bends.
Environmental
Hydrostatic Pressure Head: Up to 10 pounds per square inch.
Withstand 40 freeze/thaw temperature cycles.
Ultraviolet resistant during a maximum 30-day exposure in compliance with the requirements detailed in the ASTM B 117 standard.
Chemical
Withstand a 90-day exposure to solutions of 3% sulfuric acid, 0.2 normal of sodium hydroxide, 10% Igepal®, kerosene and be fungus resistant as required in the ASTM G21 standard.

Splice Trays: The splice trays shall be securely attached, accessible, and provide sufficient storage for the fiber cable. The splice trays shall provide access to individual fibers without disrupting other fibers in the tray. The splice trays shall hold the buffer tubes rigidly in place and provide protection for fusion splices. The Contractor shall ensure that the raceway accommodates the minimum bend radius of the fiber. The splice trays shall allow visible inspection of the fiber and include a cover with a locking mechanism to hold it in place.

Construction Requirements. All optical fiber splicing shall be performed using the fusion splicing technique and according to the latest version of the manufacturer's cable installation procedures; industry accepted installation standards, codes, and practices; or as directed by the Engineer. A fusion splice machine shall be used to splice all optical fiber. All splicing equipment shall be cleaned and calibrated according to the manufacturer's recommendations prior to each splicing session at each location.

Where a fiber cable is to be accessed for lateral or drop signal insertion, only the buffer tube containing the fiber to be accessed shall be opened, and only the actual fiber to be accessed shall be cut. If a fiber end is not intended for use, the fiber shall be cut to a length equal to that of the fiber to be used and neatly laid into the splice tray. Any fibers exposed during splicing shall be treated with a protective coating and placed in a protective sleeve or housing to protect the fiber from damage or contaminants.

All splicing shall be performed as shown on the plans. All splice locations must be identified in the record drawings.

Splicing Requirements All fiber optic cable splices shall be performed using a fusion splicer. Mechanical splicing of fiber optics strands shall not be permitted. After completing a fusion splice, the Contractor shall protect all the fused fibers with the appropriate transparent single mode, fiber optic, heat shrink tube with stainless-steel support rod. Once the splice has been completed and shrink been allowed to cool, all spliced fibers shall be neatly trained in splice trays housed in splice closures, splice enclosures, or termination panels.

Splicing shall be performed only at locations shown in the approved cable-pulling plan. Any other splices shall be permitted only with the approval of the Engineer. Fiber optic splices at location shown on the plans will be paid for under separate pay items. Fiber optic splices and underground splice closures required for end-of-reel splices will not be paid for separately but shall be included in the cost of Fiber Optic Cable. All splice locations shall be identified in the record drawings. **Cable runs which dead-end at a handhole or communications vault shall be dead ended in an underground splice closure.**

Slack Storage of Fiber Optic Cables Included as a part of this item, slack fiber shall be supplied as necessary to allow splicing the fiber optic cables in a controlled environment, such as a splicing van or tent. After splicing has been completed, the slack fiber shall be stored underground in handholes or in the raised base adapters of ground mounted cabinets in accordance with the fiber optic cable manufacturer's guidelines. Fiber optic cable slack shall be 100 feet for each cable at each splice location or communication vault, above or below ground. Fiber optic cable slack shall be 50 feet for each cable heavy duty handholes and access points, above or below ground, where splicing is not involved. If the innerduct is cut, the ends of the innerduct should extend beyond the first vertical rack so that they can be secured at that point. This slack shall be measured for payment.

Fiber optic cable shall be tagged inside handholes with yellow self-laminating fiber optic cable marker tag containing the text "CAUTION - FIBER OPTIC CABLE."

The splice loss for a single mode fiber fusion splice shall not exceed a maximum bi-directional average of 0.1 dB per splice. Any splices that exceed allowable attenuation shall be repaired or replaced at no cost to the Department.

Testing Requirements: The Contractor shall submit detailed test procedures for approval by the Engineer. All fibers (terminated and un-terminated) shall be tested bi-directionally at both 1310 nm and 1550 nm with both an OTDR and a power meter with an optical source. For testing, intermediate breakout fibers may be concatenated and tested end-to-end. Any discrepancies between the measured results and these specifications will be resolved to the satisfaction of the Engineer.

Fibers which are not to be terminated shall be tested with a temporary fusion spliced pigtail fiber. **Mechanical splice or bare fiber adapters are not acceptable.**

The Contractor shall provide the date, time, and location of any tests required by this specification to the Engineer at least five working (seven calendar) days before performing the test. Included with the notification shall be a record drawing of the installed fiber optic cable system. The drawings shall indicate actual routing of the installed cable and the locations of splices and cable slack with slack quantities identified.

Upon completion of the cable installation, splicing, and termination, the Contractor shall test all fibers for continuity, events above 0.1 dB, and total attenuation of the cable. The test procedure shall be as follows. A certified technician using an OTDR and optical source/power meter shall conduct the installation test. The test equipment used shall have been calibrated within the year in accordance with manufacturer's specifications, and documentation in the form of calibration certificate shall be provided. The technician is directed to conduct the test using the standard operating procedures defined by the manufacturer of the test equipment. All fibers installed shall be tested in both directions. A fiber ring or fiber box, commonly known as a launch kit, shall be used to connect the OTDR to the fiber optic cable under test at both the launch and receive ends.

The tests shall be conducted at 1310 and 1550 nm for all fibers, bi-directionally.

All test results shall be provided on or the day following the test date. A copy of the test results on a CD ROM shall be submitted. At the completion of the test, the Contractor shall provide copies of the documentation of the test results to the Engineer. The test documentation shall be submitted as three CD ROM copies and shall include the following:

Cable & Fiber Identification:

• Cable ID	• Operator name
• Fiber ID, incl. tube and fiber color	• Date & time
• Pulse width (OTDR)	• Setup parameters
• Cable location -beginning and end point	• Range (OTDR)
• Wavelength	• Scale (OTDR)
• Refractory index (OTDR)	• Setup option chosen to pass OTDR "dead zone"

Test results shall include:

- OTDR test results including the raw test results file and the results in a .pdf format.
- Total fiber trace
- Measured length (cable marking)
- Total length (OTDR)
- Optical source/power meter total attenuation (dB/km)
- Splice loss/gain
- Events > 0.10 dB
- OTDR fiber trace viewer software details

Sample Power Meter Tabulation:

Power Meter Measurements (dB)									
Location		Fiber No.	Cable Length (km)	A to B		B to A		Bidirectional Average	
A	B			1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm
		1							
		2							
Maximum Loss									
Minimum Loss									

A copy of the test equipment manufacturer's software to read the test files, OTDR, and power, shall be provided to IDOT. These results shall also be provided in tabular form, as shown below.

Sample OTDR Summary					
Cable Designation	<i>TCF-IK-03</i>	OTDR Location:	<i>Pump Sta. 67</i>	Date:	<i>1/1/00</i>
Fiber Number	Event Type	Event Location	Event Loss (dB)		
			1310 nm	1550 nm	
<i>1</i>	<i>Splice</i>	<i>23500 Ft.</i>	<i>.082</i>	<i>.078</i>	
<i>1</i>	<i>Splice</i>	<i>29000 Ft.</i>	<i>.075</i>	<i>.063</i>	
<i>2</i>	<i>Splice</i>	<i>29000 Ft.</i>	<i>.091</i>	<i>.082</i>	
<i>3</i>	<i>Splice</i>	<i>26000 Ft.</i>	<i>.072</i>	<i>.061</i>	
<i>3</i>	<i>Bend</i>	<i>27000 Ft.</i>	<i>.010</i>	<i>.009</i>	

The following shall be the criteria for the acceptance of the cable:

- The test results shall show that the dB/km loss does not exceed +3% of the factory test or 1% of the cable's published production loss. However, no event shall exceed 0.10 dB. If any event is detected above 0.10 dB, the Contractor shall replace or repair the fiber including that event point.
- The total loss of the cable (dB), less events, shall not exceed the manufacturer's production specifications as follows: 0.4 dB/km at 1310 nm and 0.5 dB/km at 1550 nm.

If the total loss exceeds these specifications, the Contractor shall replace or repair the cable run at the no additional cost to the Department for both labor and materials.

Basis of Payment: This work shall be paid for at the contract unit price per EACH as follows:

- FIBER OPTIC CABLE SPLICE–MAINLINE, which shall consist of 48 fibers spliced, tested, and accepted by the Engineer on splices between two fiber optic cable in conduit, single mode and/or one fiber optic cable in conduit, single mode and one hq fiber optic connectivity where required as detailed in the plans.
- FIBER OPTIC CABLE SPLICE–LATERAL, which shall consist of 12 fibers spliced, tested, and accepted by the Engineer on splices between the fiber optic cable, single mode, armored, 12 fibers and single mode, armored, 48 fibers as detailed in the plans.

All materials, labor, equipment, testing, and documentation required for fiber optic cable splicing shall be included and will not be paid separately. Payment shall not be made until the cable is installed, spliced, tested, and accepted by the Engineer in compliance with these special provisions.

FIBER OPTIC PATCH PANEL, RACK MOUNT

Description. This work shall consist of furnishing and installing a 19" fiber optic patch panel, splice housing, associated connection hardware, and all other hardware and accessories required for use (e.g., bulkheads, cassettes, splice trays, splice sleeves, blank panels, bonding/grounding, etc.) in the communications cabinets as shown on the plans and as directed by the Engineer.

Materials. The Contractor shall provide a 19" fiber optic connector patch panel housing which shall be able to accept cassettes or termination panels. The Contractor shall also provide a 19" splice and storage module with splice trays to store excess fiber and splicing of individual pigtailed. The pigtailed shall be mounted on 12 port bulkhead sleeves using type LC optical connectors unless otherwise approved by the Engineer. The housing and storage enclosure along with ancillary and accessory materials shall be equal to or exceed Corning Cable Systems Closet Connector Housing.

Closet housings which shall accommodate up to 12 connector panels or approved equivalents for termination of 144 SM FO cable assembly shall be Part No. CCH-04U. Closet housings which shall accommodate up to four connector panels or approved equivalents for termination of up to 48 SM FO cable assembly shall be CCH-02U. All mounting hardware and cable management (strain relief brackets, routing clips/guides, documentation labels, etc.) shall be included.

Contractor shall provide for each patch panel a 4U or 2U vertical wall mount bracket to mount the fiber optic patch panel to the existing shelf in the existing traffic signal cabinet. Each vertical wall mount bracket shall come with all the necessary mounting hardware to attach the bracket to the shelf. The vertical wall mount bracket shall be equal to or exceed Tripp Lite Smart Rack in either a 2U or 4U version depending on the application.

The Contractor shall use type LC duplex adapters only unless otherwise specified in the plans or as directed by the Engineer. The optical connectors shall comply with the following:

- All connectors shall be factory installed LC compatible connectors. Field installed connectors shall not be allowed.
- Maximum attenuation 0.4dB, typical 0.2dB.
- No more than 0.2dB increase in attenuation after 1000 insertions.
- Attenuation of all connectors will be checked and recorded at the time of installation with an insertion test checked minimum of five times with an OTDR.
- Terminated fibers shown on the plans shall be connectorized at each end as directed by the Engineer. Unterminated fibers shall be capped and coiled neatly in the splice tray.
- Applicable fiber strands, as shown on the plans, shall be terminated at a fiber patch panel. The Contractor shall coordinate with the Engineer before any fibers are connected to IDOT's network equipment. No additional terminations or splicing shall be done by the Contractor without direction from IDOT.
- Unused fibers will be protected with a plastic cap to eliminate dust and moisture.
- Termination shall be facilitated by splicing factory OEM pigtailed on the end of the bare fiber utilizing the fusion splicing method. The maximum splice loss shall not be greater than 0.1 dB per event. The splice loss shall be tested at the time of splicing.
- Pigtailed shall be a minimum of 20 feet in length, unless approved by the Engineer.

All connectors shall comply with the TIA/EIA -568-A and TIA/EIA-604 standards, as applicable, and tested according to the Telcordia/Bellcore GR326-CORE standard. When tested according

to the TIA and EIA's Fiber Optic Test Procedure (FOTP)-171 (TIA/EIA-455-171), the Contractor shall ensure the connectors test to an average insertion loss of less than or equal to 0.4 dB.

Pre-terminated Connector Assemblies (Pigtails): Pre-terminated cable assemblies shall consist of 12-strand fiber optic cable with factory-installed and tested connectors on both ends of the cable. Each strand of pre-terminated cable assembly shall not exceed a maximum attenuation 0.4dB. The pre-terminated cable assembly shall be cut in half and fusion spliced to the bulkhead sleeves within the rack mounted connector panel housing. All buffer tubes and fibers shall be appropriately protected once attachment of pre-terminated connector assemblies is complete. In addition, pigtails shall comply with the following.

- The pigtails shall consist of a section of single fiber, jacketed cable equipped with optical connectors at both ends.
- The factory installed connector furnished as part of the pigtail shall meet or exceed the requirements for approved connectors specified herein. The fiber portion of each pigtail shall have optical properties identical to the optical cable furnished under the contract.

Construction Requirements. The Contractor shall install the fiber optic patch panel along with associated hardware including any ancillary material items required for properly installing the fiber optic patch panel and splice housing within the 19" equipment rack at communication cabinets as shown on the plans and as directed by the Engineer. All cables shall be neatly dressed, labeled, and fastened to the corresponding equipment with the appropriate hardware. Tie wraps are not permitted. Hook and loop bundling straps shall be used for cable management. The Contractor shall also supply and install the necessary material to properly ground and bond the equipment in accordance with the NEC, telecommunications industry standards (ANSI/TIA/BICSI/IEEE), and manufacturers' requirements.

Prior to inspection, testing, and connecting fiber optic jumpers or patch cables to the bulkheads within the fiber optic patch panel, all LC connectors require proper cleaning using lens grade and lint free tissues and a 98% isopropyl alcohol cleaning solution unless another method and material is approved by the Engineer. Rubbing alcohol and medical wipes shall not be used and are not appropriate as both may contain oil or water which leave residue. The Contractor shall wipe each connector twice with a moistened and dry tissue area, and failure to wipe the connector immediately with the dry tissue area will result in needing to redo the entire process.

Testing. The Contractor shall submit detailed test procedures for approval by the Engineer. All fibers (terminated and un-terminated) shall be tested bi-directionally at both 1310 nm and 1550 nm with both an OTDR and a power meter with an optical source. For testing, intermediate breakout fibers may be concatenated and tested end-to-end. Any discrepancies between the measured results and these specifications will be resolved to the satisfaction of the Engineer.

Fibers which are not to be terminated shall be tested with a temporary fusion spliced pigtail fiber. **Mechanical splice or bare fiber adapters are not acceptable.**

The Contractor shall provide the date, time, and location of any tests required by this specification to the Engineer at least five working (seven calendar) days before performing the test. Included with the notification shall be a record drawing of the installed fiber optic cable system. The drawings shall indicate actual installed routing of the cable, the locations of splices, and locations of cable slack with slack quantities identified.

Upon completion of the cable installation, splicing, and termination, the Contractor shall test all fibers for continuity, events above 0.1 dB, and total attenuation of the cable. The test procedure shall be as follows. A certified technician utilizing an OTDR and optical source/power meter shall conduct the installation test. The test equipment used shall have been calibrated within the year. Documentation shall be provided. The technician is directed to conduct the test using the standard operating procedures defined by the manufacturer of the test equipment. All fibers installed shall be tested in both directions. A fiber ring or fiber box, commonly known as a launch kit, shall be used to connect the OTDR to the fiber optic cable under test at both the launch and receive ends. The tests shall be conducted at 1310 and 1550 nm for all fibers, bi-directionally.

All test results shall be provided on or the day following the test date. A copy of the test results on a CD ROM shall be submitted.

At the completion of the test, the Contractor shall provide copies of the documentation of the test results to the Engineer. The test documentation shall be submitted as three CD ROM copies and shall include the following:

Cable & Fiber Identification:

• Cable ID	• Operator name
• Fiber ID, including tube and fiber color	• Date & time
• Pulse width (OTDR)	• Setup parameters
• Cable Location -beginning and end point	• Range (OTDR)
• Wavelength	• Scale (OTDR)
• Refractory index (OTDR)	• Setup option chosen to pass OTDR "dead zone"

Test Results shall include:

- OTDR test results including the raw test results file and the results in a .pdf format.
- Total fiber trace
- Measured length (cable marking)
- Total length (OTDR)
- Optical source/power meter total attenuation (dB/km)
- Splice loss/gain
- Events > 0.10 dB
- OTDR fiber trace viewer software details

Sample Power Meter Tabulation:

Power Meter Measurements (dB)									
Location		Fiber No.	Cable Length	A to B		B to A		Bi-directional Average	
A	B			1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm
		1							
		2							
Maximum Loss									
Minimum Loss									

A copy of the test equipment manufacturer's software to read the test files, OTDR, and power shall be provided to IDOT. These results shall also be provided in tabular form shown below:

Sample OTDR Summary					
Cable Designation	<i>TCF-IK-03</i>	OTDR Location:	<i>Pump Sta. 67</i>	Date:	<i>1/1/00</i>
Fiber Number	Event Type	Event Location	Event Loss (dB)		
			1310 nm	1550 nm	
<i>1</i>	<i>Termination</i>	<i>23500 Ft.</i>	<i>.082</i>	<i>.078</i>	
<i>1</i>	<i>Termination</i>	<i>29000 Ft.</i>	<i>.075</i>	<i>.063</i>	
<i>2</i>	<i>Termination</i>	<i>29000 Ft.</i>	<i>.091</i>	<i>.082</i>	
<i>3</i>	<i>Termination</i>	<i>26000 Ft.</i>	<i>.072</i>	<i>.061</i>	
<i>3</i>	<i>Bend</i>	<i>27000 Ft.</i>	<i>.010</i>	<i>.009</i>	

The following shall be the criteria for the acceptance of the cable:

- The test results shall show that the dB/km loss does not exceed +3% of the factory test or 1% of the cable's published production loss. However, no event shall exceed 0.10 dB. If any event is detected above 0.10 dB, the Contractor shall replace or repair the fiber including that event point.
- The total loss of the cable (dB), less events, shall not exceed the manufacturer's production specifications as follows: 0.4 dB/km at 1310 nm and 0.5 dB/km at 1550 nm.

If the total loss exceeds these specifications, the Contractor shall replace or repair the cable run at the no additional cost to IDOT for both labor and materials.

Basis of Payment: This work will be paid for at the contract unit price per EACH for FIBER OPTIC INTERCONNECT CENTER, 48 PORT, which price includes all labor, equipment, materials, and documentation required to provide and install the equipment as described. Payment shall not be made until panel is installed, terminated, tested by the Contractor and accepted by the Engineer.

FIBER OPTIC CABLE IN CONDUIT, SINGLE MODE

This work shall be in accordance with Sections 801, 864, 871, 873, and 1076 of the Standard Specifications, except as modified herein.

All fibers shall be fusion spliced and terminated as shown in plans details. All terminated fibers shall be clearly labeled. Fibers not being used shall be labeled "spare".

All ancillary components, required to complete the fiber optic cable plant, including but not limited to moisture and water sealants, cable caps, fan-out kits, boots, cable trays, etc., are included in the cost of this work. These items shall be submitted to the Department for approval.

The fiber optic cable shall be clearly marked in each vault and cabinet with a brightly colored (orange or yellow) weather resistant label securely attached to the cable. The weather resistant self-laminating fiber optic cable marker tag shall contain the text: "CAUTION-FIBER OPTIC CABLE."

Materials. The single-mode, fiber optic cable shall incorporate a loose, buffer-tube design. The cable shall be an accepted product of the USDA Rural Utilities Service (RUS) 7 CFR 1755.900 and meet the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-1999 for a single sheathed, armored cable and shall be new, unused, and of current design and manufacture. Single mode optical fibers shall comply with EIA/TIA 492-CAAA, except otherwise note herein. Fiber optic cable buffer tubes and strands shall be color coded per EIA/TIA-598-B and shall be a single jacket cable assembly with a corrugated steel armor system.

Fiber optic cable shall have identification and date marking every 2 feet indented, embossed, and surface printed the entire length of the cable. The identification shall indicate it is an optical cable, manufacturer's trade name, hand set symbol if the cable is suitable for direct burial, sequential length numbered, and cable ends sealed to prevent moisture entry. The cable shall utilize either a water blocking gel or a dry block tape.

Experience Requirements. Personnel involved in the installation, splicing, and testing of the fiber optic cables shall meet the following requirements:

- A minimum of three years experience in the installation of fiber optic cables, including splicing, terminating, and testing single mode fibers.
- Install two systems where fiber optic cables are outdoors in conduit and where the systems have been in continuous satisfactory operation for at least two years. The Contractor shall submit as proof, photographs or other supporting documents and the names, addresses, and telephone numbers of the operating personnel who can be contacted regarding the installed fiber optic systems.
- One fiber optic cable system (which may be one of the two in the preceding paragraph), which the Contractor can arrange for demonstration to Department representatives and the Engineer.

Installers shall be familiar with the cable manufacturer's recommended procedures for installing the cable including knowledge of splicing procedures for equipment being used on this project and knowledge of all hardware such as breakout (furcation) kits and splice closures. The Contractor shall submit documented procedures for approval and use by the Engineer.

Personnel involved in testing shall have been trained by the manufacturer of the fiber optic cable test equipment to be used. Proof of this training shall be submitted to the Engineer for approval. In addition, the Contractor shall submit documentation of the testing procedures for approval by the Engineer.

Installation in Raceways

Preinstall Integrity Test: To check and confirm the integrity of the existing conduit and ensure it is airtight and free of obstruction, the Contractor shall pressurize the duct prior to actual cable installation by installing a small amount of lubricant into the duct and blowing a foam carrier of sufficient size through the conduit run using the required material and equipment (e.g., hydraulic

power system, air compressor, conduit couplers, foam carrier, etc.). All unused ducts shall be capped with blow string left in place.

Installation Plan: Prior to installation, the Contractor shall provide a cable-installation plan. The plan shall include the following information:

- Identify where each cable will enter the underground system and the direction of each install.
- Identify locations where the cable is pulled out of a communications vault, coiled in a figure eight, and installed back into the communications vault.
- The plan shall address the physical protection of the cable during installation and during periods of downtime.
- Identify the location of slack storage locations and the locations of the splices.
- Identify distances between fiber access points and crossings.

The cable-installation plan shall be provided to the Engineer and shall be approved prior to the start of installation. The Engineer's approval shall be for the operation of the cable after installation and does not include an endorsement of the proposed construction methods or procedures. The Contractor is responsible for the technical adequacy of the proposed construction methods and installation procedure.

Blowing: Fiber optic cable blowing is the most efficient and safe means of installing fiber optic cable. To minimize the exposure of the backbone cable and to facilitate the longer lengths of the fiber optic cable, the Contractor shall use a "blown cable" (pneumatically assisted) technique to place the fiber optic cable. Either the high airspeed blowing (HASS) method or the piston method shall be used. When using the HASS method, the volume of air passing through the conduit shall not exceed 600 cubic feet per minute or the conduit manufacturer's recommended air volume, whichever is more restrictive. When using the piston method, the volume of air passing through the conduit shall not exceed 300 cubic feet per minute or the conduit manufacturer's recommended air volume, whichever is more restrictive. A compressed air cooler shall be used when ambient air temperatures reach 90 °F or higher.

During cable installation operations, the Contractor shall ensure that the minimum bending of the cable is maintained during the unreeling and install operations. Unless specified otherwise by the fiber optic cable manufacturer, the outside bend radius of the cable during installation shall be no less than 20 times the outside diameter of the fiber optic cable. Entry guide chutes shall be used to guide the cable into the communications vault conduit ports where applicable. Lubricating compound shall be used to minimize friction. Corner rollers (wheels), if used, shall not have radii less than the minimum installation bending radius of the cable. A series array of smaller wheels can be used for accomplishing the bend if the cable manufacturers specifically approve the array.

Where figure-eight techniques are used during cable installation, the cable shall be handled manually and stored on the ground. The cable shall be placed on tarps to prevent damage from gravel, rocks, or other abrasive surfaces. Tarps should also be used in muddy conditions to keep the cable clean. Enough area to accommodate the cable length to be stored and sufficient personnel to maintain the required minimum bending diameter as well as avoid kinking or otherwise damaging the cable shall be provided. If the cable has been figure-eighted in preparation for a forward feed, the figure-eight must be flipped over to access the outside cable

end. Sufficient personnel shall be provided to avoid kinking the cable as the figure-eight is flipped over. When removing the cable from the figure-eight, use care to avoid kinking the cable and violating the minimum bending diameter. Power assisted or figure-eight eliminator equipment, which is used to eliminate manual figure-eight procedures, shall not be used unless specifically allowed by the cable manufacturer in writing and approved by the Engineer.

Standard electronic controls shall be used during installation to monitor the cable blowing system and display the cable and tractor drive speeds, so installation can be immediately stopped for problematic situations, such as cable slippage or stoppage, over-speed, a duct blockage detected, etc., to potentially prevent cable damage during installation.

Factory and Cable Reel Testing: Factory test results shall be performed prior to shipping the fiber optic cable, and results submitted by the Contractor. In addition and prior to installation, the fiber optic cable shall be OTDR tested on the reel by the Contractor to verify that no strands were damaged during shipment, that the cable has the proper length, and that the measured attenuation matches the cable datasheet.

Testing Requirements: Testing shall be in accordance with Article 801.13.

The Contractor shall submit detailed test procedures for approval by the Engineer. All continuous fiber runs shall be tested bi-directionally at both 1310 nm and 1550 nm with a power meter and optical source. For testing, intermediate breakout fibers may be concatenated and tested end-to-end. Any discrepancies between the measured results and these specifications will be resolved to the satisfaction of the Engineer.

The Contractor shall provide the date, time, and location of any tests required to the Engineer at least five days before performing the test. Upon completion of the cable installation, splicing, and termination, the Contractor shall test all fibers in each link for continuity and attenuation. The test procedure shall be as follows. A certified technician using an OTDR and optical source/power meter shall conduct the installation test. The test equipment used shall have been calibrated within the year in accordance with manufacturer specifications and documentation in form of a calibration certificate shall be provided. The technician is directed to conduct the test using the standard operating procedures defined by the test equipment's manufacturer. All fibers installed shall be tested in both directions. A fiber ring or fiber box, commonly known as a launch kit, shall be used to connect the OTDR to the fiber optic cable under test at the launch end. The tests shall be conducted at 1310 and 1550 nm for all fibers, bi-directionally.

All test results shall be provided on or the day following the test date. A copy of the test results on a CD ROM shall be submitted.

At the completion of the test, the Contractor shall provide copies of the test results to the Engineer. The test documentation shall be submitted as three CD ROM copies and shall include the following.

Cable & Fiber Identification:

• Cable ID	• Operator Name
• Fiber ID, including tube and fiber color	• Date & Time
• Pulse width (OTDR)	• Setup Parameters
• Cable Location -beginning and end point	• Range (OTDR)
• Wavelength	• Scale (OTDR)
• Refractory index (OTDR)	• Setup Option chosen to pass OTDR "dead zone"

Test results shall include:

- OTDR test results including the raw test results file and the results in a .pdf format.
- Total fiber trace
- Measured length (cable marking)
- Total length (OTDR)
- Optical source/power meter total attenuation (dB/km)
- Splice loss/gain
- Events > 0.10 dB
- OTDR fiber trace viewer software details

Sample Power Meter Tabulation:

Power Meter Measurements (dB)									
Location		Fiber No.	Cable Length (km)	A to B		B to A		Bi-directional Average	
A	B			1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm
		1							
		2							
Maximum Loss									
Minimum Loss									

A copy of the test equipment manufacturer's software to read the test files, OTDR, and power shall be provided to IDOT. These results shall also be provided in tabular form as shown below:

Sample OTDR Summary					
Cable Designation	<i>TCF-IK-03</i>	OTDR Location:	<i>Pump Sta. 67</i>	Date:	<i>1/1/00</i>
Fiber Number	Event Type	Event Location	Event Loss (dB)	1310 nm	1550 nm
<i>1</i>	<i>Splice</i>	<i>23500 Ft.</i>	<i>.082</i>	<i>.078</i>	
<i>1</i>	<i>Splice</i>	<i>29000 Ft.</i>	<i>.075</i>	<i>.063</i>	
<i>2</i>	<i>Splice</i>	<i>29000 Ft.</i>	<i>.091</i>	<i>.082</i>	
<i>3</i>	<i>Splice</i>	<i>26000 Ft.</i>	<i>.072</i>	<i>.061</i>	
<i>3</i>	<i>Bend</i>	<i>27000 Ft.</i>	<i>.010</i>	<i>.009</i>	

The following shall be the criteria for the acceptance of the cable:

- The test results shall show that the dB/km loss does not exceed +3% of the factory test or 1% of the cable's published production loss. However, no event shall exceed 0.10 dB. If any event is detected above 0.10 dB, the Contractor shall replace or repair the fiber including that event point.
- The total loss of the cable (dB), less events, shall not exceed the manufacturer's production specifications as follows: 0.4 dB/km at 1310 nm and 0.5 dB/km at 1550 nm.

If the total loss exceeds these specifications, the Contractor shall replace or repair the cable run at the no additional cost to IDOT for both labor and materials.

At the completion of the test, the Contractor shall provide two copies of the test results to the Engineer. The test documentation shall be bound and shall include the following.

- Cable & fiber identification: Cable ID
- Cable location - beginning and end point
- Fiber ID, including tube and fiber color operator name
- Date & time setup parameters
- Wavelength
- Pulse width (OTDR)
- Refractory index (OTDR)
- Range (OTDR)
- Scale (OTDR)
- Setup option chosen to pass OTDR "dead zone"

Test Results: Results for optical source/power meter and total attenuation (dB/km) shall be provided in tabular form. Elevated attenuation due to exceeding the pulling tension during installation shall require the replacement of the cable run at the Contractor's expense, including labor and materials.

The Contractor shall label the destination of each trunk cable onto the cable tag in each handhole and termination panel.

Slack Storage of Fiber Optic Cables. Included as a part of this item, slack fiber shall be supplied as necessary to allow splicing the fiber optic cables in a controlled environment, such as a splicing van or tent. After splicing has been completed, the slack fiber shall be stored underground in handholes or in the raised base adapters of ground mounted cabinets in accordance with the fiber optic cable manufacturer's guidelines. Fiber optic cable slack shall be 100 feet for each cable at each splice location or communication vault, above or below ground. Fiber optic cable slack shall be 50 feet for each cable communication vaults, heavy duty handholes, and access points, above or below ground, where splicing is not involved. If the innerduct is cut, the ends of the innerduct should extend beyond the first vertical rack so that they can be secured at that point. This slack shall be measured for payment.

A waterproof, simplex, fiber optic split plug with bushing assembly of appropriate size or approved equivalent shall be installed around the fiber optic cable to seal around the ducts for the conduits entering all communication vaults. This is included in the cost of the fiber optic cable pay item and will not be paid for separately

Basis of Payment: This work will be paid for at the contract unit price per FOOT for FIBER OPTIC CABLE 12 FIBERS, SINGLE MODE and for FIBER OPTIC CABLE 48 FIBERS, SINGLE MODE, which price includes all labor, equipment, and materials required to provide, install, terminate, splice, and test the fiber optic cable.

FIBER OPTIC UTILITY MARKER

This work shall be in accordance with the applicable Sections 810 and 1088 of the Standard Specifications with the following modifications.

Fiber optic utility marker shall be furnished in an orange color and incorporate a premium UV inhibitor package to resist harmful effects to the sun. The post shall be capable of withstanding multiple directional impacts and provide a long lasting and extremely durable product requiring little field maintenance. The post shall have a minimum 0.20" wall thickness, stand straight in all weather conditions, and self-right to straight upon impact. The top of post hat shall be removable, partially flattened, and transition to round to afford 360° visibility. The post materials shall include an anchor, test plate, a non-mechanical flexible joint, fiber optic innerduct split plugs, and a round delineator post.

The Contractor shall furnish and install fiber optic cable markers at each communication vault and every 500' along roadways and interchanges. Sign panels shall be non-reflective, 18" (L) x 18" (W), and shall be in accordance with Sections 1090-1092 of the Standard Specifications.

The marker shall have a 6' tall, 3-1/2" diameter post (white), and orange slide over poly-dome marker (3-1/2" OOD, 16" length) containing the following text: "Warning – Fiber Optic Cable", "IDOT District 9 (618) 549-2171". The marker shall be designed to self erect after vehicle impact. Marker installation should be so that marker cannot be pulled out or removed manually.

The Contractor shall submit catalog cut sheets for signs and markers for review by the Department prior to ordering materials.

Contractor shall furnish the Department with 50 additional complete markers to be used for maintenance and repair.

Markers shall be installed so that all lengths of installed fiber optic cables in new conduit have a minimum of one marker. A minimum of two markers shall be installed along each fiber optic cable path in new conduit so that one forward and one behind are always visible. A marker shall be installed at each point along the fiber optic cable path where a 45° or greater change in direction occurs. Markers shall be installed at a maximum of 24" lateral displacement from the actual placement of the conduit and fiber optic cabling and shall be installed no later than three days following the installation of conduit that contains fiber optic cables or of direct buried fiber optic cables. The Contractor shall safeguard the conduit and cables during the installation of the markers and remove and replace any conduit or cables that are damaged during marker installation at no additional cost to the Department.

Test plate (terminal board) shall be preconfigured 11-hole terminal board easily accessible by removing the cap from the fiber optic marker. The ground wire and fiber cable shields shall be

extended from the communications vault and terminated on the test plate. The fiber cable shields shall be labeled as shown in the plans. The label material shall be weather resistant, and the markings shall be non-fading.

The Contractor shall furnish and install all materials required for marker installation. The Contractor shall restore the ground to its original condition including topsoil, sand, concrete, or other required materials and dispose of surplus materials.

Basis of Payment. This work will be paid for at the contract unit price per EACH for FIBER OPTIC UTILITY MARKER, which price includes all labor, materials, and equipment required and as detailed in this special provision.

HQ FIBER OPTIC CONNECTIVITY

Description This work shall consist of furnishing and installing fiber optic patch cables and SFP transceivers at the District 9 office for the purpose of establishing layer 3 connectivity between the existing layer 3 network switch at the IDOT District 9 office and the proposed layer 3 network switch being installed in the traffic signal cabinet at the IL 13/127/149 traffic signal cabinet.

The transceivers shall be plugged into the ports shown below, and the fiber optic jumpers shall be installed between the ports on the fiber optic patch panel and the network switch as shown below and as directed by the Engineer.

Material. The Contractor shall furnish and install the following.

SFP Transceiver (Primary Backbone Communications). The SFP transceiver shall be Cisco SFP-10G-LR or approved equivalent. The SFP shall be capable of 10 Gbps communications speed and able to communicate up to 10 kilometers (6.21 miles). If the distance of the fiber backbone cable is longer than 10 kilometers, then a Cisco SFP-10G-ER or approved equivalent shall be used. The Contractor shall verify the distance between the two end points using a OTDR to confirm that the correct SFP is purchased and installed.

The SFP transceiver shall be installed on port 30 (TE/G port 6) of the switch and as directed by the Engineer.

Single Mode Fiber Optic Patch Cable. The single mode fiber optic patch cable, duplex, LC to LC connectors shall be Corning part number 040402R5120003M or approved equivalent. The cable shall be factory terminated, and factory test results shall be included as part of the submittal. The Contractor shall perform a continuity test prior to the installation of the cables to ensure that the cables were not damaged during transport.

The single mode fiber optic patch cable shall be installed between FPP ports 109-110 (K1-K2) and port 30 (TE/G port 6) of the switch and as directed by the Engineer.

Construction Requirements. A pre-installation site visit to the District 9 building shall be conducted by the Contractor and the Engineer for the purpose of planning and inspecting the work to be

completed at this site a minimum of two weeks in advance of the Contractor ordering the material and scheduling the associated work.

The installation of the single mode fiber optic patch cable shall be in accordance with and installed per manufacturer's installation guidelines and recommendations, which shall not exceed the cable bending radius both during installation and once completed. The fiber optic patch cables shall be neatly dressed, labeled, and fastened to the equipment rack with the appropriate hardware. Tie wraps are not permitted, and all equipment and cables shall be labeled.

The Contractor shall confirm with the Engineer and the District 9 Office that a 10 Gbps network link has been established between the two end switches once all installation is complete.

Basis of Payment. This work will be paid for at the contract unit price per LUMP SUM for HQ FIBER OPTIC CONNECTIVITY, which price includes all hardware, labor, equipment, and materials required to meet all the requirements described.

ETHERNET MANAGE SWITCH

Description. This work shall consist of furnishing, configuring, installing, and testing network communications equipment and associated infrastructure (e.g., power supplies, SFP modules, etc.) in the existing or proposed traffic signal cabinets as shown in the plans and as designated by the Engineer, complete with all of the hardware and accessories required for the intended use of the equipment.

Material. The layer 3 Ethernet network switch communications equipment or approved equal and ancillary materials shall be provided as stated below and as shown on the plans. The Ethernet switch with power supplies shall be installed within the equipment rack and connected to other equipment using the SFP transceiver modules noted and the copper ports within the switch as shown on the plans and as directed by the Engineer. The Contractor shall also provide all equipment and items listed including any ancillary material (fiber optic cable jumpers, Ethernet patch cables, connectors, mounting hardware, labels, cable ties, equipment grounding connection, etc.) required for successfully connection between the Ethernet network communications equipment, switches, and fiber optic termination panels without using adapters or gender changer ("gender benders") at each identified location and as shown on the plans. In addition, the Contractor shall supply one spare fiber optic cable jumper and Ethernet patch cable with the required connector type and of appropriate length per each Ethernet switch shown below.

Network Switch: The network switch shall be Antaira LMX-2828G-10G-SFP or approved equivalent. The network switch shall be a 28-port industrial gigabit managed Ethernet switch, with at least sixteen 100/1000 SFP slots, eight gigabit combo ports (10/100/1000Tx RJ45 and 8*100/1000 SFP Slots), and four 10G SFP slots. The network switch shall come with the appropriate power supply and mounting hardware.

The switch shall be capable of the following requirements.

- Network Redundancy: RSTP
- Layer 3 Routing Protocols: RIP, OSPF, and Static Routing Table

- Supports VRRP Protocol
- Configuration: Web Console, telnet, CLI Command
- IGMP for Multicast Traffic Filtering
- QoS (IEEE 802.1p)
- IEEE802.1Q VLAN for Easy Network Planning
- IEEE802.1X, SNMP v1/v2/v3
- Capable of Providing Local Syslog Information
- Link Aggregation for More Throughput
- Support Port Mirroring for Online Diagnostic
- Minimum of Three-Year Warranty

Small Form-Factor Plug (SFP) transceiver: The Contractor shall install two different types of SFPs as stated below. One type shall be 10 Gbps capable and shall be used for primary layer 3 communications between the layer 3 switches. The other type shall be 1 Gbps capable and shall be used to communicate with the intersection switches. The number of SFPs of each type shall be installed in the ports in each switch per the description below.

Primary Backbone Communications. The SFP transceiver shall be Cisco SFP-10G-LR or approved equivalent. The SFP shall be capable of 10 Gbps communications speed and able to communicate up to 10 km (6.21 miles). If the distance of the fiber backbone cable is longer than 10 km, then a Cisco SFP-10G-ER or approved equivalent shall be used. The Contractor shall verify the distance between the two end points using a OTDR to confirm that the correct SFP is purchased and installed.

Intersection Communications. The SFP transceiver shall be Cisco GLC-LH-SMD= or approved equivalent. The SFP shall be capable of 1 Gbps communications speed and able to communicate up to 10 km. If the distance of the cable is longer than 10 km, then a Cisco GLC-EX-SMD= or approved equivalent shall be used. The Contractor shall verify the distance between the two end points using a OTDR to confirm that the correct SFP is purchased and installed.

Single Mode Fiber Optic Patch Cable. The single mode fiber optic patch cable, duplex, LC to LC connectors shall be Corning part number 040402R5120003M or approved equivalent. The cable shall be at least 3 meters long and factory terminated, and the factory test results shall be included as part of the submittal. The Contractor shall perform a continuity test prior to the installation of the cables to ensure that the cables were not damaged during transport.

Construction Requirements. The Contractor shall procure the switches and power supplies as described. Once all units are ready for programming, the Contractor shall provide notification to the Engineer and IDOT's D9 to schedule the programming and/or configuration of the equipment by IDOT's network integrator. At least 30 days prior to the scheduled field installation, the Contractor shall label the switches for the appropriate sites and drop them off at the location as directed by the Engineer and IDOT for programming.

Once programming has been completed, the Contractor shall pick up the equipment and shall locate shelf space, another suitable mounting location in the traffic signal cabinets, or as identified on the plans. The Contractor shall secure the switch and power supply as appropriate and approved by the Engineer in accordance with the manufacturer's installation requirements. The equipment shall be permanently and securely mounted, and all corresponding power and communications cables shall be neatly dressed, labeled, and fastened to the equipment rack with

the appropriate hardware. Tie wraps are not permitted. The Contractor shall perform all network switch and corresponding communications equipment connections in the presence of the Engineer.

When all equipment is installed and connected, the Contractor shall test and demonstrate the performance of the installed network communications equipment to ensure that data is being transmitted to the IDOT building.

All equipment shall be warranted and guaranteed against defects and failure in design and materials for a minimum of three years from the date of delivery as recorded by the Engineer. The warranty period shall not begin until the date the Engineer issues and records final acceptance of all materials listed above. The Contractor shall transfer all manufacturer warranty information to the Engineer prior to final acceptance notification by the Engineer. If a manufacturer's standard warranty does not cover the entire period of the warranty required by IDOT, the Contractor shall procure and furnish to IDOT an extended manufacturer's warranty or provide their own warranty covering the additional time.

The Contractor shall submit the warranty terms as part of the submittals for each material item. The warranty shall provide that, in the event of malfunction during the warranty period, the defective system component shall be replaced with a new component by the Contractor within five working days. Any component that, in the opinion of the Engineer, fails three times prior to the expiration of the warranty will be judged as unsuitable and shall be replaced by the Contractor with a new component of the same type at no additional cost to the Department. The unsuitable component shall be permanently removed from the project by the Contractor.

Basis of Payment. This work will be paid for at the contract unit price of EACH for ETHERNET MANAGE SWITCH, which price includes all labor, equipment, and materials required to provide and install the equipment described.

ETHERNET SWITCH

Description. This work shall include supplying, installing, configuring, and powering Ethernet switches at locations designated in the plans and as directed by the Engineer for the purpose of interfacing with fiber optic networks.

The Contractor shall procure all the switches and power supplies. Once all units are ready for programming, the Contractor shall provide notification to the Engineer to schedule the programming and/or configuration of the equipment by IDOT's network integrator. At least 30 days prior to the scheduled field installation, the Contractor shall label the switches for the appropriate sites and drop off at the location directed by the Engineer and IDOT for programming.

Once programming has been completed, the Contractor shall pick up the equipment and shall locate shelf space, another suitable mounting location in the traffic signal cabinets, or as identified on the plans. The Contractor shall secure the switch and power supply as appropriate and approved by the Engineer in accordance with the manufacturer's installation requirements. The equipment shall be permanently and securely mounted, and all corresponding power and communications cables shall be neatly dressed, labeled, and fastened to the equipment rack with

the appropriate hardware. Tie wraps are not permitted. The Contractor shall perform all network switch and corresponding communications equipment connections in the presence of the Engineer.

The Contractor shall install all necessary patch cords, optical transceivers, connectors, power supplies, communication transformers, or auxiliary equipment necessary to complete the communication circuits at full functional potential. The Contractor shall connect the switch to the field devices as indicated on the plans.

When all equipment is installed and connected, the Contractor shall test and demonstrate the performance of the installed network communications equipment to ensure that data is being transmitted to the IDOT building.

The Ethernet switch shall meet the following material specifications.

Overall Switch Station Capacity and Flexibility: Managed gigabit Ethernet switch with seven 10/100BaseT(X) ports and three 10/100/1000BaseT(X) or 100/1000BaseSFP combo ports with -40 to 75 °C operating temperature. In addition, the switch shall include a SFP module with two 1000BaseLX port with LC connector for 10 km transmission with -40 to 85 °C operating temperature. The SFP module shall be fully compatible with the SFPs furnished and installed as part of Ethernet manage switch provided at IDOT's District 9 building to ensure communications to equipment in field cabinets.

Cabling Options: The switch shall be able to utilize a variety of connecting interfaces including 10/100Base(T)X, 10/100/1000Base(T)X, and 1000BaseSX/LX/LHX/ZX (LC connector).

Port Configuration Options: Port configurations shall be accessible via a standard web browser without requiring special vendor software. Port configuration changes shall be possible by personnel without special IT training. The configuration can be done via a console UI, telnet connection, or command line interface. All T(X) ports shall provide cable autocross capability.

The Ethernet switch shall be compatible with following network and software requirements:

Networking and Software: The Ethernet switches shall be IEEE802.3/802.3u/802.3ab/802.3z/802.3x/802.1D-2004/802.1w/802.1s/802.1Q/802.1p/802.1X/802.3ad compliant. The switch shall support the following standards and software interfaces:

- a. Redundant fast/gigabit Ethernet ring capability
- b. IGMP snooping and GMRP for filtering multicast traffic from industrial Ethernet protocols
- c. Supports IEEE 802.1Q VLAN and GVRP protocol to ease network planning
- d. Supports QoS-IEEE 802.1p/1Q and TOS/DiffServ to increase determinism
- e. Supports 802.3ad, LACP for optimum bandwidth utilization
- f. Supports TACACS+, SNMPv3, IEEE 802.1X, HTTPS, and SSH to enhance network security
- g. Support Ethernet/IP, PROFINET, and Modbus/TCP protocols for device management and monitoring
- h. SNMPv1/v2c/v3 for different levels of network management security
- i. Bandwidth management to prevent unpredictable network status
- j. Lock port for authorized MAC address access only

- k. Port mirroring for online debugging
- l. Automatic warning by exception through e-mail, relay output
- m. Digital inputs to integrate a sensor and alarm with an IP network
- n. Automatic recovery of connected device IP addresses
- o. Line-swap fast recovery

Port Trunking for Flexible Network Connection: Maximum of four trunk groups for all Gigabit ports with maximum of eight trunk ports for each trunk group shall be available. The user shall be able to either choose the type of the trunk group to be “Static” or “LACP.”

IP Addressing Approach Options: IP addresses shall be set over the network using BootP/DHCP. The user shall have the capability to disable BootP or DHCP network-based IP address changes. In addition, the switch shall support both a serial port and web page based manual (static) addressing approach.

Ethernet Packet Transfer Accuracy and Capacity: The switch shall be capable of forwarding valid Ethernet frames using the store and forward method or equivalent method, and the address table shall have a maximum capacity of 8192 addresses.

Quality of Service Functions Enhance Determinism: The switches shall be able to read IEEE 802.1Q VLAN priority tags and support a minimum of a low, normal, medium, and high priority buffer. High priority messages shall be able to process before low priority messages. It shall support QoS-IEEE 802.1p/1Q and TOS/DiffServ.

SNMP Traps: The switches shall support sending SNMP messages to maximum of two SNMP “Trap” servers, and the SNMP traps IP addresses shall be settable through a web browser interface.

Multicast Message Control for Filtering Multicast Traffic: The switches shall be able to support IEEE 802.1D-1998 GMRP (GARP Multicast Registration Protocol), and IGMP (Internet Group Management Protocol).

Port Access Control Enhances User Authentication: The switches shall support IEEE 802.1X and static port lock for port-base access control.

Accessible IP Settings: It shall allow the user to add or remove “Legal” remote host IP addresses to prevent unauthorized access. Access to switch shall be controlled by IP address. That is, if a host’s IP address is in the accessible IP table, then the host shall be allowed access to the switch.

Additional network and software requirements shall be met:

- IEEE 802.1X, HTTPS, and SSH to enhance network security
- Bandwidth management prevents unpredictable network status
- Port mirroring for online debugging
- Automatic warning by exception through email and relay output
- Digital inputs to integrate sensors and alarms with IP networks
- Automatic recovery of connected device’s IP addresses
- Line-swap fast recovery
- Support EDS-SNMP OPC Server Pro
- Software based IEEE 1588 PTP for precise time synchronization of networks

- DHCP Option 82 for IP address assignment with different policies
- Modbus/TCP / EtherNet/IP / PROFINET industrial Ethernet protocols supported
- Supports LLDP (link layer discovery protocol)
- Turbo Ring™ and Turbo Chain™ (< 20ms recovery time for fast Ethernet ports and < 50 ms recovery time for Gigabit Ethernet ports at full load) and STP/RSTP (IEEE 802.1w/D)

The Ethernet switch shall meet the following general installation requirements.

Mounting: The switch shall be DIN-Rail or wall mountable

Power Supply: Low voltage ranges: 12/24/48 VDC (9.6-60 VDC). In addition, a provision shall be made such that the loss of a power supply may be user configurable to trigger a hardware (i.e. relay contact), SNMP, e-mail, and web page alarms.

Environmental Specifications:

Temperature and Humidity-The switch shall have operating temperature ranges of -10 to 60 °C or -40 to 75 °C. In addition, the switch shall be rated to withstand a maximum continuous operating humidity of 95% without condensation.

Electronical Noise Immunity: The switch will conform to the IEC61000-4-2 to 4-8 series of noise specifications as specified below:

- IEC 61000-4-2 Electrostatic Discharge: Criterion A
- IEC 61000-4-3 Radiated Noise Immunity: Criterion A
- IEC 61000-4-4 Fast Transient (Burst) Withstand: Criterion A
- IEC 61000-4-5 Surge Voltage: Criterion A
- IEC 61000-4-6 Conducted Noise Interference: Criterion A
- IEC 61000-4-8 Electromagnetic Field withstand: Criterion A
- IEC 61000-4-12
- IEC 61000-4-29

Shock & Vibration: The operating shock rating shall conform to IEC60068-2-27 and withstand a 15 g, 11 ms duration, and 18 shocks. In addition, the operating vibration spec shall conform to IEC60068-2-6 (Criterion 3) at 1 mm, 2 Hz - 13.2 Hz, 90 min.; 0.7g, 13.2 Hz - 100 Hz, 90 min.; 3.5 mm, 3 Hz - 9 Hz, 10 cycles, 1 octave/min.; 1g, 9 Hz - 150 Hz, 10 cycles, 1 octave/min.

Switch shall be compliant with IEC 62443-4-2.

The Ethernet switch shall meet the following hardware-based diagnostics and user interfaces requirements:

- Alarm Contact: The switch shall contain an alarm contact that can be configured via standard web browser to annunciate the drop out of either or both power supply inputs and/or to annunciate the active link status of any combination of ports. A fault LED will be provided to indicate the status of the alarm contact.
- LED indications
- Diagnostic display for internal switch status

- Serial Port: The switch shall include a USB serial port that can be accessed by computers with hyper terminal or equivalent capability. The serial console connection manner shall require a short USB cable applied to connect the switch to a PC's USB port.

The Ethernet switch shall meet the following security requirements.

- Port Disable: Unused ports shall be able to be disabled to prevent unauthorized access.
- It shall support IEEE 802.1X and SSL to enhance network security.
- Switch configuration password protection
- https/SSL

The Ethernet switch shall have following communication redundancy:

- The switch shall be able to detect and compensate for the failure of another switch, cable disruption, or hardware failure of one or more ports.
- IEEE standards-based redundancy, including IEEE 802.1D/W spanning treeTurbo ring: gigabit Ethernet redundant ring capability (Turbo Ring V2: recovery time <20ms for fast Ethernet ports; < 50 ms for gigabit Ethernet ports). Ring coupling function to integrate different turbo ring for distributed application.
- Turbo chain function for a multiple-ring architecture (recovery time <20ms for fast Ethernet ports; <50 ms for gigabit Ethernet ports)

The Ethernet switch shall be compatible with following software suite that assists with installation, operation, maintenance, and diagnostics of the existing network.

- The switch must be compliant with a mass configuration tool that must contain a security wizard for convenient setup of security-related parameters. The tool must allow for topology analysis to eliminate manual setting errors and must contain a configuration overview for efficient management.
- The switch shall be compliant with network management software (NMS). The NMS must allow for auto-discovery of network devices and physical connections, for event playback for quick troubleshooting, for color-coded VLAN/IGMP groups and other visualized network data, and for a security view for the security status of network devices. The NMS must support a mobile app for remote monitoring and notification.
- The switch must be compliant with a stand-alone data collection tool to take network snapshots for quick troubleshooting. The collection tool must allow for the ability to compare network and device data and then highlight the differences.

Basis of Payment. This work will be paid for at the contract unit price per EACH for ETHERNET SWITCH, which price includes all labor, materials, and equipment required and as detailed in this special provision.

DRILL EXISTING FOUNDATION

This work shall consist of drilling all the proper sized holes at a specified foundation to complete conduit installation in accordance with Section 879. Each hole drilled will be considered as a unit. The method for drilling shall be approved by the Engineer to prevent the signal cabinet components from being covered/damaged from concrete debris/dust.

This work will be paid for at the contract unit price per EACH for DRILL EXISTING FOUNDATION, and no additional compensation will be allowed.

CONDUIT SPLICE

Description. This work shall consist of locating and intercepting the existing conduit as shown on the plans, or as directed by the Engineer, and splicing proposed PVC conduit to existing rigid galvanized steel (RGS), HDPE, or PVC conduit. This pay item shall include all necessary work to splice conduit as shown on the plans. This work shall conform to Section 810 of the Standard Specifications.

The conduit splice shall be waterproof and made with a pressure tight or clamp on type coupler manufactured for joining PVC to PVC or HDPE conduits. The coupler shall be UL listed for underground conduit connections in wet locations. Prior to splicing conduit ends shall be cut square with burrs and rough edges removed per the manufacturer's installation requirements.

Basis of Payment. This work will be paid for at the contract unit price per EACH for CONDUIT SPLICE, which price includes all connections, materials, and labor necessary to locate the existing conduit and prepare the existing conduit for connection to the new conduit.

The new conduit shall be paid for separately.

CONTRACT GUARANTEE

The Contractor shall guarantee all electrical equipment, apparatuses, materials, and workmanship provided under the contract for a period of six months after the date of final inspection according to Article 801.14. All instruction sheets required to be furnished by the manufacturer for materials and supplies and for operations shall be delivered to the Engineer prior to the acceptance of the project with the following warranties and guarantees:

- The manufacturer's standard written warranty for each piece of electrical equipment or apparatus furnished under the contract.
- The Contractor's written guarantee that for a period of six months after the date of final inspection of the project, all necessary repairs to or replacement of said warranted equipment or apparatus shall be made by the Contractor at no cost to the Department.

- The Contractor's written guarantee for satisfactory operation of all electrical systems furnished and constructed under the contract for a period of six months after final inspection of the project.
- Subject to the requirements of Article 107.30, the Contractor will be required to locate the fiber optic cable as needed throughout the project limits until the date of final acceptance. No additional compensation will be provided for this work.

AS-BUILT DOCUMENTATION

The Contractor shall locate all new conduit and communication vaults every 100 feet using a GIS locating device that is accurate to the nearest foot. The Contractor shall provide a GIS based map of the conduit route and a complete listing of all of map coordinates in an electronic format (Google Earth KML or KMZ shape file).

Basis of Payment. This work will not be paid for separately but shall be included in the cost for Underground Conduit, Coilable Nonmettalic Conduit.

TRAFFIC SIGNAL SYSTEM SHUTDOWN

Before the any traffic signal shutdown, both District 9's Bureau of Operations and the local police department shall be notified 48 hours in advance. The police department shall also be given the anticipated duration of the shutdown.

The existing system may be shut down for one working day to switch over to the new traffic signal cabinet. During the shutdown, the Contractor shall maintain flashing red lights at each intersection. The Contractor shall also provide and erect stop signs while signals are in the red flashing mode.

At all intersections where the signal cabinets are to be modified and the controller replaced, the Contractor shall install as much of the fiber optic equipment as possible with the signals in operation before switching over to red flash to keep the shutdown to a minimum.

CEMENT, FINELY DIVIDED MINERALS, ADMIXTURES; CONCRETE, AND MORTAR (BDE)

Effective: January 1, 2025

Revise the first paragraph of Article 285.05 of the Standard Specifications to read:

“285.05 Fabric Formed Concrete Revetment Mat. The grout shall consist of a mixture of cement, fine aggregate, and water so proportioned and mixed as to provide a pumpable slurry. Fly ash or ground granulated blast furnace (GGBF) slag, and concrete admixtures may be used at the option of the Contractor. The grout shall have an air content of not less than 6.0 percent nor more than 9.0 percent of the volume of the grout. The mix shall obtain a compressive strength of 2500 psi (17,000 kPa) at 28 days according to Article 1020.09.”

Revise Article 302.02 of the Standard Specifications to read:

“302.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Hydrated Lime	1012.01
(d) By-Product, Hydrated Lime	1012.02
(e) By-Product, Non-Hydrated Lime	1012.03
(f) Lime Slurry	1012.04
(g) Fly Ash	1010
(h) Soil for Soil Modification (Note 1)	1009.01
(i) Bituminous Materials (Note 2)	1032

Note 1. This soil requirement only applies when modifying with lime (slurry or dry).

Note 2. The bituminous materials used for curing shall be emulsified asphalt RS-2, CRS-2, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250.”

Revise Article 312.07(c) of the Standard Specifications to read:

“(c) Cement1001”

Add Article 312.07(i) of the Standard Specifications to read:

“(i) Ground Granulated Blast Furnace (GGBF) Slag1010”

Revise the first paragraph of Article 312.09 of the Standard Specifications to read:

“312.09 Proportioning and Mix Design. At least 60 days prior to start of placing CAM II, the Contractor shall submit samples of materials to be used in the work for proportioning and testing. The mixture shall contain a minimum of 200 lb (120 kg) of cement per cubic yard (cubic meter). Cement may be replaced with fly ash or ground granulated blast furnace (GGBF) slag according to Article 1020.05(c)(1) or 1020.05(c)(2), respectively, however the minimum cement content in

the mixture shall be 170 lbs/cu yd (101 kg/cu m). Blends of coarse and fine aggregates will be permitted, provided the volume of fine aggregate does not exceed the volume of coarse aggregate. The Engineer will determine the proportions of materials for the mixture according to the “Portland Cement Concrete Level III Technician Course” manual. However, the Contractor may substitute their own mix design. Article 1020.05(a) shall apply, and a Level III PCC Technician shall develop the mix design.”

Revise Article 352.02 of the Standard Specifications to read:

“**352.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Cement (Note 1)	1001
(b) Soil for Soil-Cement Base Course	1009.03
(c) Water	1002
(d) Bituminous Materials (Note 2)	1032

Note 1. Bulk cement may be used for the traveling mixing plant method if the equipment for handling, weighing, and spreading the cement is approved by the Engineer.

Note 2. The bituminous materials used for curing shall be emulsified asphalt RS-2, CRS-2, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250.”

Revise Article 404.02 of the Standard Specifications to read:

“**404.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Fine Aggregate	1003.08
(d) Bituminous Material (Tack Coat)	1032.06
(e) Emulsified Asphalts (Note 1) (Note 2)	1032.06
(f) Fiber Modified Joint Sealer	1050.05
(g) Additives (Note 3)	

Note 1. When used for slurry seal, the emulsified asphalt shall be CQS-1h according to Article 1032.06(b).

Note 2. When used for micro-surfacing, the emulsified asphalt shall be CQS-1hP according to Article 1032.06(e).

Note 3. Additives may be added to the emulsion mix or any of the component materials to provide the control of the quick-traffic properties. They shall be included as part of the mix design and be compatible with the other components of the mix.

Revise the last sentence of the fourth paragraph of Article 404.08 of the Standard Specifications to read:

“When approved by the Engineer, the sealant may be dusted with fine sand, cement, or mineral filler to prevent tracking.”

Revise Note 2 of Article 516.02 of the Standard Specifications to read:

“Note 2. The sand-cement grout mix shall be according to Section 1020 and shall be a 1:1 blend of sand and cement comprised of a Type I, IL, or II cement at 185 lb/cu yd (110 kg/cu m). The maximum water cement ratio shall be sufficient to provide a flowable mixture with a typical slump of 10 in. (250 mm).”

Revise Note 2 of Article 543.02 of the Standard Specifications to read:

“Note 2. The grout mixture shall be 6.50 hundredweight/cu yd (385 kg/cu m) of cement plus fine aggregate and water. Fly ash or ground granulated blast furnace (GGBF) slag may replace a maximum of 5.25 hundredweight/cu yd (310 kg/cu m) of the cement. The water/cement ratio, according to Article 1020.06, shall not exceed 0.60. An air-entraining admixture shall be used to produce an air content, according to Article 1020.08, of not less than 6.0 percent nor more than 9.0 percent of the volume of the grout. The Contractor shall have the option to use a water-reducing or high range water-reducing admixture.”

Revise Article 583.01 of the Standard Specifications to read:

“**583.01 Description.** This work shall consist of placing cement mortar along precast, prestressed concrete bridge deck beams as required for fairing out any unevenness between adjacent deck beams prior to placing of waterproofing membrane and surfacing.”

Revise Article 583.02(a) of the Standard Specifications to read:

“(a) Cement1001”

Revise the first paragraph of Article 583.03 of the Standard Specifications to read:

“ **583.03 General.** This work shall only be performed when the air temperature is 45 °F (7 °C) and rising. The mixture for cement mortar shall consist of three parts sand to one part cement by volume. The amount of water shall be no more than that necessary to produce a workable, plastic mortar.”

Revise Note 2/ in Article 1003.01(b) of the Standard Specifications to read:

“2/ Applies only to sand. Sand exceeding the colorimetric test standard of 11 (Illinois Modified AASHTO T 21) will be checked for mortar making properties according to Illinois Modified ASTM C 87 and shall develop a compressive strength at the age of 14 days when using Type I, IL, or II cement of not less than 95 percent of the comparable standard.

Revise the second sentence of Article 1003.02(e)(1) of the Standard Specifications to read:

“The test will be performed with Type I, IL, or II portland cement having a total equivalent alkali content (Na₂O + 0.658K₂O) of 0.90 percent or greater.”

Revise the first sentence of the second paragraph of Article 1003.02(e)(3) of the Standard Specifications to read:

“The ASTM C 1293 test shall be performed with Type I, IL, or II portland cement having a total equivalent alkali content ($\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$) of 0.80 percent or greater.”

Revise the second sentence of Article 1004.02(g)(1) of the Standard Specifications to read:

“The test will be performed with Type I, IL, or II portland cement having a total equivalent alkali content ($\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$) of 0.90 percent or greater.”

Revise Article 1017.01 of the Standard Specifications to read:

“**1017.01 Requirements.** The mortar shall be high-strength according to ASTM C 387 and shall have a minimum 80.0 percent relative dynamic modulus of elasticity when tested by the Department according to Illinois Modified AASHTO T 161 or AASHTO T 161 when tested by an independent lab. The high-strength mortar shall have a water-soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the high-strength mortar shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every five years, and the test results shall be provided to the Department. Mixing of the high-strength mortar shall be according to the manufacturer’s specifications. The Department will maintain a qualified product list.”

Revise the fourth sentence of Article 1018.01 of the Standard Specifications to read:

“The ASTM C 1218 test shall be performed by an independent lab a minimum of once every five years, and the test results shall be provided to the Department.”

Revise Article 1019.02 of the Standard Specifications to read:

“**1019.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Fine Aggregate for Controlled Low-Strength Material (CLSM)	1003.06
(d) Fly Ash	1010
(e) Ground Granulated Blast Furnace (GGBF) Slag.....	1010
(f) Admixtures (Note 1)	

Note 1. The air-entraining admixture may be in powder or liquid form. Prior to approval, a CLSM air-entraining admixture will be evaluated by the Department. The admixture shall be able to meet the air content requirements of Mix 2. The Department will maintain a qualified product list.”

Revise Article 1019.05 of the Standard Specifications to read:

“**1019.05 Department Mix Design.** The Department mix design shall be Mix 1, 2, or 3 and shall be proportioned to yield approximately one cubic yard (cubic meter).

Mix 1	
Cement	50 lb (30 kg)
Fly Ash – Class C or F, and/or GGBF Slag	125 lb (74 kg)
Fine Aggregate – Saturated Surface Dry	2900 lb (1720 kg)
Water	50-65 gal (248-322 L)
Air Content	No air is entrained

Mix 2	
Cement	125 lb (74 kg)
Fine Aggregate – Saturated Surface Dry	2500 lb (1483 kg)
Water	35-50 gal (173-248 L)
Air Content	15-25 %

Mix 3	
Cement	40 lb (24 kg)
Fly Ash – Class C or F, and/or GGBF Slag	125 lb (74 kg)
Fine Aggregate – Saturated Surface Dry	2500 lb (1483 kg)
Water	35-50 gal (179-248 L)
Air Content	15-25 %”

Revise Article 1020.04, Table 1, Note (8) of the Standard Specifications to read:

“(8) In addition to the Type III portland cement, 100 lb/cu yd of ground granulated blast-furnace slag and 50 lb/cu yd of microsilica (silica fume) shall be used. For an air temperature greater than 85 °F, the Type III portland cement may be replaced with Type I, IL, or II portland cement.”

Revise Article 1020.04, Table 1 (Metric), Note (8) of the Standard Specifications to read:

“(8) In addition to the Type III portland cement, 60 kg/cu m of ground granulated blast-furnace slag and 30 kg/cu m of microsilica (silica fume) shall be used. For an air temperature greater than 30 °C, the Type III portland cement may be replaced with Type I, IL, or II portland cement.”

Revise the second paragraph of Article 1020.05(a) of the Standard Specifications to read:

“For a mix design using a portland-pozzolan cement, portland blast-furnace slag cement, portland-limestone cement, or replacing portland cement with finely divided minerals per Articles 1020.05(c) and 1020.05(d), the Contractor may submit a mix design with a minimum portland cement content less than 400 lbs/cu yd (237 kg/cu m), but not less than 375 lbs/cu yd (222 kg/cu m), if the mix design is shown to have a minimum relative dynamic modulus of elasticity of 80 percent determined according to AASHTO T 161. Testing shall be performed by an independent laboratory accredited by AASHTO re:source for Portland Cement Concrete.”

Revise the first sentence of the first paragraph of Article 1020.05(b) of the Standard Specifications to read:

“Corrosion inhibitors and concrete admixtures shall be according to the qualified product lists.”

Delete the fourth and fifth sentences of the second paragraph of Article 1020.05(b) of the Standard Specifications.

Revise the third sentence of the second paragraph of Article 1020.05(b)(5) of the Standard Specifications to read:

“The qualified product lists of concrete admixtures shall not apply.”

Revise second paragraph of Article 1020.05(b)(10) of the Standard Specifications to read:

“When calcium nitrite is used, it shall be added at the rate of 4 gal/cu yd (20 L/cu m) and shall be added to the mix immediately after all compatible admixtures have been introduced to the batch. Other corrosion inhibitors shall be added per the manufacturer’s specifications.”

Delete the third paragraph of Article 1020.05(b)(10) of the Standard Specifications.

Revise Article 1020.15(b)(1)c. of the Standard Specifications to read:

“c. The minimum portland cement content in the mixture shall be 375 lbs/cu yd (222 kg/cu m). When the total of organic processing additions, inorganic processing additions, and limestone addition exceed 5.0 percent in the cement, the minimum portland cement content in the mixture shall be 400 lbs/cu yd (237 kg/cu m). For a drilled shaft, foundation, footing, or substructure, the minimum portland cement may be reduced to as low as 330 lbs/cu yd (196 kg/cu m) if the concrete has adequate freeze/thaw durability. The Contractor shall provide freeze/thaw test results according to AASHTO T 161, and the relative dynamic modulus of elasticity of the mix design shall be a minimum of 80 percent. Testing shall be performed by an independent laboratory accredited by AASHTO re:source for Portland Cement Concrete. Freeze/thaw testing will not be required for concrete that will not be exposed to freezing and thawing conditions as determined by the Engineer.”

Revise Article 1021.01 of the Standard Specifications to read:

“**1021.01 General.** Admixtures shall be furnished in liquid or powder form ready for use. The admixtures shall be delivered in the manufacturer’s original containers, bulk tank trucks or such containers or tanks as are acceptable to the Engineer. Delivery shall be accompanied by a ticket which clearly identifies the manufacturer, the date of manufacture, and trade name of the material. Containers shall be readily identifiable as to manufacturer, the date of manufacture, and trade name of the material they contain.

Concrete admixtures shall be on one of the Department’s qualified product lists. Unless otherwise noted, admixtures shall have successfully completed and remain current with the AASHTO Product Eval and Audit Concrete Admixture (CADD) testing program. For admixture submittals to the Department; the product brand name, manufacturer name, admixture type or types, an electronic link to the product’s technical data sheet, and the NTPEP testing number which contains an electronic link to all test data shall be provided. In addition, a letter shall be

submitted certifying that no changes have been made in the formulation of the material since the most current round of tests conducted by AASHTO Product Eval and Audit. After 28 days of testing by AASHTO Product Eval and Audit, air-entraining admixtures may be provisionally approved and used on Departmental projects. For all other admixtures, unless otherwise noted, the time period after which provisionally approved status may be earned is 6 months.

The manufacturer shall include the following in the submittal to the AASHTO Product Eval and Audit CADD testing program: the manufacturing range for specific gravity, the midpoint and manufacturing range for residue by oven drying, and manufacturing range of pH. The submittal shall also include an infrared spectrophotometer trace no more than five years old.

For air-entraining admixtures according to Article 1021.02, the specific gravity allowable manufacturing range established by the manufacturer shall be according to AASHTO M 194. For residue by oven drying and pH, the allowable manufacturing range and test methods shall be according to AASHTO M 194.

For admixtures according to Articles 1021.03, 1021.04, 1021.05, 1021.06, 1021.07, and 1021.08, the pH allowable manufacturing range established by the manufacturer shall be according to ASTM E 70. For specific gravity and residue by oven drying, the allowable manufacturing range and test methods shall be according to AASHTO M 194.

All admixtures, except chloride-based accelerators, shall contain a maximum of 0.3 percent chloride by weight (mass) as determined by an appropriate test method. To verify the test result, the Department will use Illinois Modified AASHTO T 260, Procedure A, Method 1.

Prior to final approval of an admixture, the Engineer reserves the right to request a sample for testing. The test and reference concrete mixtures tested by the Engineer will contain a cement content of 5.65 cwt/cu yd (335 kg/cu m). For freeze-thaw testing, the Department will perform the test according to Illinois Modified AASHTO T 161. The flexural strength test will be performed according to AASHTO T 177. If the Engineer decides to test the admixture, the manufacturer shall submit AASHTO T 197 water content and set time test results on the standard cement used by the Department. The manufacturer may select their lab or an independent lab to perform this testing. The laboratory is not required to be accredited by AASHTO.

Random field samples may be taken by the Department to verify an admixture meets specification. A split sample will be provided to the manufacturer if requested. Admixtures that do not meet specification requirements or an allowable manufacturing range established by the manufacturer shall be replaced with new material.”

Revise Article 1021.03 of the Standard Specifications to read:

“**1021.03 Retarding and Water-Reducing Admixtures.** The admixture shall be according to the following.

- (a) Retarding admixtures shall be according to AASHTO M 194, Type B (retarding) or Type D (water-reducing and retarding).
- (b) Water-reducing admixtures shall be according to AASHTO M 194, Type A.
- (c) High range water-reducing admixtures shall be according to AASHTO M 194, Type F (high range water-reducing) or Type G (high range water-reducing and retarding).”

Revise Article 1021.05 of the Standard Specifications to read:

“1021.05 Self-Consolidating Admixtures. Self-consolidating admixture systems shall consist of either a high range water-reducing admixture only or a high range water-reducing admixture combined with a separate viscosity modifying admixture. The one or two component admixture system shall be capable of producing a concrete that can flow around reinforcement and consolidate under its own weight without additional effort and without segregation.

High range water-reducing admixtures shall be according to AASHTO M 194, Type F.

Viscosity modifying admixtures shall be according to AASHTO M 194, Type S (specific performance).”

Revise Article 1021.06 of the Standard Specifications to read:

“1021.06 Rheology-Controlling Admixture. Rheology-controlling admixtures shall be capable of producing a concrete mixture with a lower yield stress that will consolidate easier for slipform applications used by the Contractor. Rheology-controlling admixtures shall be according to AASHTO M 194, Type S (specific performance).”

Revise Article 1021.07 of the Standard Specifications to read:

“1021.07 Corrosion Inhibitor. The corrosion inhibitor shall be according to one of the following.

(a) Calcium Nitrite. Corrosion inhibitors shall contain a minimum 30 percent calcium nitrite by weight (mass) of solution and shall comply with either the requirements of AASHTO M 194, Type C (accelerating) or the requirements of ASTM C 1582. The corrosion inhibiting performance requirements of ASTM C 1582 shall not apply.

(b) Other Materials. The corrosion inhibitor shall be according to ASTM C 1582.

For submittals requiring testing according to ASTM M 194, Type C (accelerating), the admixture shall meet the requirements of the AASHTO Product Eval and Audit CADD testing program according to Article 1021.01.

For submittals requiring testing according to ASTM C 1582, a report prepared by an independent laboratory accredited by AASHTO re:source for portland cement concrete shall be provided. The report shall show the results of physical tests conducted no more than five years prior to the time of submittal, according to applicable specifications. However, ASTM G 109 test information specified in ASTM C 1582 is not required to be from an independent accredited lab. All other information in ASTM C 1582 shall be from an independent accredited lab. Test data and other information required to be submitted to AASHTO Product Eval and Audit according to Article 1021.01, shall instead be submitted directly to the Department.”

Add Article 1021.08 of the Standard Specifications as follows:

“1021.08 Other Specific Performance Admixtures. Other specific performance admixtures shall, at a minimum, be according to AASHTO M 194, Type S (specific performance). The

Department also reserves the right to require other testing, as determined by the Engineer, to show evidence of specific performance characteristics.

Initial testing according to AASHTO M 194 may be conducted under the AASHTO Product Eval and Audit CADD testing program according to Article 1021.01, or by an independent laboratory accredited by AASHTO re:source for Portland Cement Concrete. In either case, test data and other information required to be submitted to AASHTO Product Eval and Audit according to Article 1021.01, shall also be submitted directly to the Department. The independent accredited lab report shall show the results of physical tests conducted no more than five years prior to the time of submittal, according to applicable specifications.”

Revise Article 1024.01 of the Standard Specifications to read:

“**1024.01 Requirements for Grout.** The grout shall be proportioned by dry volume, thoroughly mixed, and shall have a minimum temperature of 50 °F (10 °C). Water shall not exceed the minimum needed for placement and finishing.

Materials for the grout shall be according to the following.

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Fine Aggregate	1003.02
(d) Fly Ash	1010
(e) Ground Granulated Blast Furnace (GGBF) Slag.....	1010
(f) Concrete Admixtures	1021”

Revise Note 1 of Article 1024.02 of the Standard Specifications to read:

“Note 1. Nonshrink grout shall be according to Illinois Modified ASTM C 1107.

The nonshrink grout shall have a water-soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the grout shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every five years, and the test results shall be provided to the Department. Mixing of the nonshrink grout shall be according to the manufacturer’s specifications. The Department will maintain a qualified product list.”

Revise Article 1029.02 of the Standard Specifications to read:

“ **1029.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Cement.....	1001
(b) Fly Ash	1010
(c) Ground Granulated Blast Furnace (GGBF) Slag	1010
(d) Water.....	1002
(e) Fine Aggregate.....	1003
(f) Concrete Admixtures	1021
(g) Foaming Agent (Note 1)	

Note 1. The manufacturer shall submit infrared spectrophotometer trace and test results indicating the foaming agent meets the requirements of ASTM C 869 in order to be on the Department's qualified product list. Submitted data/results shall not be more than five years old."

Revise the second paragraph of Article 1103.03(a)(4) the Standard Specifications to read:

"The dispenser system shall provide a visual indication that the liquid admixture is actually entering the batch, such as via a transparent or translucent section of tubing or by independent check with an integrated secondary metering device. If approved by the Engineer, an alternate indicator may be used for admixtures dosed at rates of 25 oz/cwt (1630 mL/100 kg) or greater, such as accelerating admixtures, corrosion inhibitors, and viscosity modifying admixtures."

Revise the first two sections of Check Sheet #11 of the Supplemental Specifications and Recurring Special Provisions to read:

Description. This work shall consist of filling voids beneath rigid and composite pavements with cement grout.

Materials. Materials shall be according to the following Articles of Division 1000 - Materials of the Standard Specifications:

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Fly Ash	1010
(d) Ground Granulated Blast Furnace (GGBF) Slag.....	1010
(e) Admixtures	1021
(f) Packaged Rapid Hardening Mortar or Concrete	1018"

Revise the third paragraph of Materials Note 2 of Check Sheet #28 of the Supplemental Specifications and Recurring Special Provisions to read:

"The Department will maintain a qualified product list of synthetic fibers, which will include the minimum required dosage rate. For the minimum required fiber dosage rate based on the Illinois Modified ASTM C 1609 test, a report prepared by an independent laboratory accredited by AASHTO re:source for Portland Cement Concrete shall be provided. The report shall show results of tests conducted no more than five years prior to the time of submittal."

COMPENSABLE DELAY COSTS (BDE)

Effective: June 2, 2017

Revised: April 1, 2019

Revise Article 107.40(b) of the Standard Specifications to read:

“(b) Compensation. Compensation will not be allowed for delays, inconveniences, or damages sustained by the Contractor from conflicts with facilities not meeting the above definition; or if a conflict with a utility in an unanticipated location does not cause a shutdown of the work or a documentable reduction in the rate of progress exceeding the limits set herein. The provisions of Article 104.03 notwithstanding, compensation for delays caused by a utility in an unanticipated location will be paid according to the provisions of this Article governing minor and major delays or reduced rate of production which are defined as follows.

- (1) Minor Delay. A minor delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two hours, but not to exceed two weeks.
- (2) Major Delay. A major delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two weeks.
- (3) Reduced Rate of Production Delay. A reduced rate of production delay occurs when the rate of production on the work in conflict with the utility in an unanticipated location decreases by more than 25 percent and lasts longer than seven calendar days.”

Revise Article 107.40(c) of the Standard Specifications to read:

“(c) Payment. Payment for Minor, Major, and Reduced Rate of Production Delays will be made as follows.

- (1) Minor Delay. Labor idled which cannot be used on other work will be paid for according to Article 109.04(b)(1) and (2) for the time between start of the delay and the minimum remaining hours in the work shift required by the prevailing practice in the area.

Equipment idled which cannot be used on other work, and which is authorized to standby on the project site by the Engineer, will be paid for according to Article 109.04(b)(4).

- (2) Major Delay. Labor will be the same as for a minor delay.

Equipment will be the same as for a minor delay, except Contractor-owned equipment will be limited to two weeks plus the cost of move-out to either the Contractor’s yard or another job and the cost to re-mobilize, whichever is less. Rental equipment may be paid for longer than two weeks provided the Contractor presents adequate support to the Department (including lease agreement) to show retaining equipment on the job is the most economical course to follow and in the public interest.

- (3) Reduced Rate of Production Delay. The Contractor will be compensated for the reduced productivity for labor and equipment time in excess of the 25 percent threshold for that portion of the delay in excess of seven calendar days. Determination of compensation will be in accordance with Article 104.02, except labor and material additives will not be permitted.

Payment for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be determined according to Article 109.13.”

Revise Article 108.04(b) of the Standard Specifications to read:

“(b) No working day will be charged under the following conditions.

- (1) When adverse weather prevents work on the controlling item.
- (2) When job conditions due to recent weather prevent work on the controlling item.
- (3) When conduct or lack of conduct by the Department or its consultants, representatives, officers, agents, or employees; delay by the Department in making the site available; or delay in furnishing any items required to be furnished to the Contractor by the Department prevents work on the controlling item.
- (4) When delays caused by utility or railroad adjustments prevent work on the controlling item.
- (5) When strikes, lock-outs, extraordinary delays in transportation, or inability to procure critical materials prevent work on the controlling item, as long as these delays are not due to any fault of the Contractor.
- (6) When any condition over which the Contractor has no control prevents work on the controlling item.”

Revise Article 109.09(f) of the Standard Specifications to read:

“(f) Basis of Payment. After resolution of a claim in favor of the Contractor, any adjustment in time required for the work will be made according to Section 108. Any adjustment in the costs to be paid will be made for direct labor, direct materials, direct equipment, direct jobsite overhead, direct offsite overhead, and other direct costs allowed by the resolution. Adjustments in costs will not be made for interest charges, loss of anticipated profit, undocumented loss of efficiency, home office overhead and unabsorbed overhead other than as allowed by Article 109.13, lost opportunity, preparation of claim expenses and other consequential indirect costs regardless of method of calculation.

The above Basis of Payment is an essential element of the contract and the claim cost recovery of the Contractor shall be so limited.”

Add the following to Section 109 of the Standard Specifications.

“**109.13 Payment for Contract Delay.** Compensation for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be allowed when such costs result from a delay meeting the criteria in the following table.

Contract Type	Cause of Delay	Length of Delay
Working Days	Article 108.04(b)(3) or Article 108.04(b)(4)	No working days have been charged for two consecutive weeks.
Completion Date	Article 108.08(b)(1) or Article 108.08(b)(7)	The Contractor has been granted a minimum two week extension of contract time, according to Article 108.08.

Payment for each of the various costs will be according to the following.

- (a) Escalated Material and/or Labor Costs. When the delay causes work, which would have otherwise been completed, to be done after material and/or labor costs have increased, such increases will be paid. Payment for escalated material costs will be limited to the increased costs substantiated by documentation furnished by the Contractor. Payment for escalated labor costs will be limited to those items in Article 109.04(b)(1) and (2), except the 35 percent and 10 percent additives will not be permitted.
- (b) Extended Project Overhead. For the duration of the delay, payment for extended project overhead will be paid as follows.
 - (1) Direct Jobsite and Offsite Overhead. Payment for documented direct jobsite overhead and documented direct offsite overhead, including onsite supervisory and administrative personnel, will be allowed according to the following table.

Original Contract Amount	Supervisory and Administrative Personnel
Up to \$5,000,000	One Project Superintendent
Over \$ 5,000,000 - up to \$25,000,000	One Project Manager, One Project Superintendent or Engineer, and One Clerk
Over \$25,000,000 - up to \$50,000,000	One Project Manager, One Project Superintendent, One Engineer, and One Clerk
Over \$50,000,000	One Project Manager, Two Project Superintendents, One Engineer, and One Clerk

- (2) Home Office and Unabsorbed Overhead. Payment for home office and unabsorbed overhead will be calculated as 8 percent of the total delay cost.
- (c) Extended Traffic Control. Traffic control required for an extended period of time due to the delay will be paid for according to Article 109.04.

When an extended traffic control adjustment is paid under this provision, an adjusted unit price as provided for in Article 701.20(a) for increase or decrease in the value of work by more than ten percent will not be paid.

Upon payment for a contract delay under this provision, the Contractor shall assign subrogation rights to the Department for the Department's efforts of recovery from any other party for monies paid by the Department as a result of any claim under this provision. The Contractor shall fully cooperate with the Department in its efforts to recover from another party any money paid to the Contractor for delay damages under this provision."

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (BDE)

Effective: September 1, 2000

Revised: January 2, 2025

1. OVERVIEW AND GENERAL OBLIGATION. The Department of Transportation, as a recipient of federal financial assistance, is required to take all necessary and reasonable steps to ensure nondiscrimination in the award and administration of contracts. Consequently, the federal regulatory provisions of 49 CFR Part 26 apply to this contract concerning the utilization of disadvantaged business enterprises. For the purposes of this Special Provision, a disadvantaged business enterprise (DBE) means a business certified in accordance with the requirements of 49 CFR Part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory. Award of the contract is conditioned on meeting the requirements of 49 CFR Part 26, and failure by the Contractor to carry out the requirements of Part 26 is a material breach of the contract and may result in the termination of the contract or such other remedies as the Department deems appropriate.
2. CONTRACTOR ASSURANCE. All assurances set forth in FHWA 1273 are hereby incorporated by reference and will be physically attached to the final contract and all subcontracts.
3. CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. The Department has determined the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies and that, in the absence of unlawful discrimination and in an arena of fair and open competition, DBE companies can be expected to perform 0.00% of the work. This percentage is set as the DBE participation goal for this contract. Consequently, in addition to the other award criteria established for this contract, the Department will only award this contract to a bidder who makes a good faith effort to meet this goal of DBE participation in the performance of the work in accordance with the requirements of 49 CFR 26.53 and SBE Memorandum No. 24-02.
4. IDENTIFICATION OF CERTIFIED DBE. Information about certified DBE Contractors can be found in the Illinois UCP Directory. Bidders can obtain additional information and assistance with identifying DBE-certified companies at the Department's website or by contacting the Department's Bureau of Small Business Enterprises at (217) 785-4611.
5. BIDDING PROCEDURES. Compliance with this Special Provision and SBE Policy Memorandum 24-02 is a material bidding requirement. The following shall be included with the bid.

- (a) DBE Utilization Plan (form SBE 2026) documenting enough DBE participation has been obtained to meet the goal, or a good faith effort has been made to meet the goal even though the efforts did not succeed in obtaining enough DBE participation to meet the goal.
- (b) Applicable DBE Participation Statement (form SBE 2023, 2024, and/or 2025) for each DBE firm the bidder has committed to perform the work to achieve the contract goal.

The required forms and documentation shall be submitted as a single .pdf file using the "Integrated Contractor Exchange (iCX)" application within the Department's "EBids System".

The Department will not accept a bid if it does not meet the bidding procedures set forth herein and the bid will be declared non-responsive. A bidder declared non-responsive for failure to meet the bidding procedures will not give rise to an administrative reconsideration. In the event the bid is declared non-responsive, the Department may elect to cause the forfeiture of the penal sum of the bidder's proposal guaranty and may deny authorization to bid the project if re-advertised for bids.

- 6. UTILIZATION PLAN EVALUATION. The contract will not be awarded until the Utilization Plan is approved. All information submitted by the bidder must be complete, accurate, and adequately document the bidder has committed to DBE participation sufficient to meet the goal, or that the bidder has made good faith efforts to do so, in the event the bidder cannot meet the goal, in order for the Department to commit to the performance of the contract by the bidder.

The Utilization Plan will be approved by the Department if the Utilization Plan documents sufficient commercially useful DBE work to meet the contract goal or the Department determines, based upon the documentation submitted, that the bidder has made a good faith effort to meet the contract goal pursuant to 49 CFR Part 26, Appendix A and the requirements of SBE 2026.

If the Department determines that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan of that determination in accordance with SBE Policy Memorandum 24-02.

- 7. CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work the bidder commits to have performed by the specified DBEs and paid for upon satisfactory completion. The Department is only able to count toward the achievement of the overall goal and the contract goal the value of payments made for the work actually performed by DBE firms. In addition, a DBE must perform a commercially useful function on the contract to be counted. A commercially useful function is generally performed when the DBE is responsible for the work and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The Department and Contractor are governed by the provisions of 49 CFR Part 26.55(c) on questions of commercially useful functions as it affects the work. Specific guidelines for counting goal credit are provided in 49 CFR Part 26.55. In evaluating Utilization Plans for award the Department will count goal credit as set forth in Part 26 and in accordance with SBE Policy Memorandum 24-02.
- 8. CONTRACT COMPLIANCE. The Contractor must utilize the specific DBEs listed to perform the work and supply the materials for which each DBE is listed in the Contractor's approved Utilization Plan, unless the Contractor obtains the Department's written consent to terminate the DBE or any portion of its work. The DBE Utilization Plan approved by SBE is a

condition-of-award, and any deviation to that Utilization Plan, the work set forth therein to be performed by DBE firms, or the DBE firms specified to perform that work, must be approved, in writing, by the Department in accordance with federal regulatory requirements. Deviation from the DBE Utilization Plan condition-of-award without such written approval is a violation of the contract and may result in termination of the contract or such other remedy the Department deems appropriate. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan.

- (a) **NOTICE OF DBE PERFORMANCE.** The Contractor shall provide the Engineer with at least three days advance notice of when all DBE firms are expected to perform the work committed under the Contractor's Utilization Plan.
- (b) **SUBCONTRACT.** If awarded the contract, the Contractor is required to enter into written subcontracts with all DBE firms indicated in the approved Utilization Plan and must provide copies of fully executed DBE subcontracts to the Department upon request. Subcontractors shall ensure that all lower tier subcontracts or agreements with DBEs to supply labor or materials be performed in accordance with this Special Provision.
- (c) **PAYMENT TO DBE FIRMS.** The Department is prohibited by federal regulations from crediting the participation of a DBE included in the Utilization Plan toward either the contract goal or the Department's overall goal until the amount to be applied toward the goal has been paid to the DBE. The Contractor shall document and report all payments for work performed by DBE certified firms in accordance with Article 109.11 of the Standard Specifications. All records of payment for work performed by DBE certified firms shall be made available to the Department upon request.
- (d) **FINAL PAYMENT.** After the performance of the final item of work or trucking, or delivery of material by a DBE and final payment to the DBE by the Contractor, but not later than 30 calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Agreement (form SBE 2115) to the Engineer. If the Contractor does not have the full amount of work indicated in the Utilization Plan performed by the DBE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages.
- (g) **ENFORCEMENT.** The Department reserves the right to withhold payment to the Contractor to enforce the provisions of this Special Provision. Final payment shall not be made on the contract until such time as the Contractor submits sufficient documentation demonstrating achievement of the goal in accordance with this Special Provision or after liquidated damages have been determined and collected.

ILLINOIS WORKS APPRENTICESHIP INITIATIVE – STATE FUNDED CONTRACTS (BDE)

Effective: June 2, 2021

Revised: April 2, 2024

Illinois Works Jobs Program Act (30 ILCS 559/20-1 et seq.). For contracts having an awarded contract value of \$500,000 or more, the Contractor shall comply with the Illinois Works Apprenticeship Initiative (30 ILCS 559/20-20 to 20-25) and all applicable administrative rules. The goal of the Illinois Apprenticeship Works Initiative is that apprentices will perform either 10% of the total labor hours actually worked in each prevailing wage classification or 10% of the estimated labor hours in each prevailing wage classification, whichever is less. Of this goal, at least 50% of the labor hours of each prevailing wage classification performed by apprentices shall be performed by graduates of the Illinois Works Pre-Apprenticeship Program, the Illinois Climate Works Pre-Apprenticeship Program, or the Highway Construction Careers Training Program.

The Contractor may seek from the Department of Commerce and Economic Opportunity (DCEO) a waiver or reduction of this goal in certain circumstances pursuant to 30 ILCS 559/20-20(b). The Contractor shall ensure compliance during the term of the contract and will be required to report on and certify its compliance. An apprentice use plan, apprentice hours, and a compliance certification shall be submitted to the Engineer on forms provided by the Department and/or DCEO.

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES (BDE)

Effective: January 1, 2024

Revised: April 1, 2024

Revise the first paragraph of Article 669.04 of the Standard Specifications to read:

“669.04 Regulated Substances Monitoring. Regulated substances monitoring includes environmental observation and field screening during regulated substances management activities. The excavated soil and groundwater within the work areas shall be managed as either uncontaminated soil, hazardous waste, special waste, or non-special waste.

As part of the regulated substances monitoring, the monitoring personnel shall perform and document the applicable duties listed on form BDE 2732 “Regulated Substances Monitoring Daily Record (RSMDR)”.

Revise the first two sentences of the nineteenth paragraph of Article 669.05 of the Standard Specifications to read:

“The Contractor shall coordinate waste disposal approvals with the disposal facility and provide the specific analytical testing requirements of that facility. The Contractor shall make all arrangements for collection, transportation, and analysis of landfill acceptance testing.”

Revise the last paragraph of Article 669.05 of the Standard Specifications to read:

“The Contractor shall select a permitted landfill facility or CCDD/USFO facility meeting the requirements of 35 Ill. Admin. Code Parts 810-814 or Part 1100, respectively. The Department will review and approve or reject the facility proposed by the Contractor based upon information

provided in BDE 2730. The Contractor shall verify whether the selected facility is compliant with those applicable standards as mandated by their permit and whether the facility is presently, has previously been, or has never been, on the United States Environmental Protection Agency (U.S. EPA) National Priorities List or the Resource Conservation and Recovery Act (RCRA) List of Violating Facilities. The use of a Contractor selected facility shall in no manner delay the construction schedule or alter the Contractor's responsibilities as set forth.”

Revise the first paragraph of Article 669.07 of the Standard Specifications to read:

“**669.07 Temporary Staging.** Soil classified according to Articles 669.05(a)(2), (b)(1), or (c) may be temporarily staged at the Contractor’s option. All other soil classified according to Articles 669.05(a)(1), (a)(3), (a)(4), (a)(5), (a)(6), or (b)(2) shall be managed and disposed of without temporary staging to the greatest extent practicable. If circumstances beyond the Contractor’s control require temporary staging of these latter materials, the Contractor shall request approval from the Engineer in writing.

Topsoil for re-use as final cover which has been field screened and found not to exhibit PID readings over daily background readings as documented on the BDE 2732, visual staining or odors, and is classified according to Articles 669.05(a)(2), (a)(3), (a)(4), (b)(1), or (c) may be temporarily staged at the Contractor’s option.”

Add the following paragraph after the sixth paragraph of Article 669.11 of the Standard Specifications.

“The sampling and testing of effluent water derived from dewatering discharges for priority pollutants volatile organic compounds (VOCs), priority pollutants semi-volatile organic compounds (SVOCs), or priority pollutants metals, will be paid for at the contract unit price per each for VOCS GROUNDWATER ANALYSIS using EPA Method 8260B, SVOCs GROUNDWATER ANALYSIS using EPA Method 8270C, or RCRA METALS GROUNDWATER ANALYSIS using EPA Methods 6010B and 7471A. This price shall include transporting the sample from the job site to the laboratory.”

Revise the first sentence of the eight paragraph of Article 669.11 of the Standard Specifications to read:

“Payment for temporary staging of soil classified according to Articles 669.05(a)(1), (a)(3), (a)(4), (a)(5), (a)(6), or (b)(2) to be managed and disposed of, if required and approved by the Engineer, will be paid according to Article 109.04.”

SUBCONTRACTOR AND DBE PAYMENT REPORTING (BDE)

Effective: April 2, 2018

Add the following to Section 109 of the Standard Specifications.

“109.14 Subcontractor and Disadvantaged Business Enterprise Payment Reporting.
The Contractor shall report all payments made to the following parties:

- (a) first tier subcontractors;
- (b) lower tier subcontractors affecting disadvantaged business enterprise (DBE) goal credit;
- (c) material suppliers or trucking firms that are part of the Contractor’s submitted DBE utilization plan.

The report shall be made through the Department’s on-line subcontractor payment reporting system within 21 days of making the payment.”

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)

Effective: November 2, 2017

Revised: April 1, 2019

Replace the second paragraph of Article 109.12 of the Standard Specifications with the following:

“This mobilization payment shall be made at least seven days prior to the subcontractor starting work. The amount paid shall be at the following percentage of the amount of the subcontract reported on form BC 260A submitted for the approval of the subcontractor’s work.

Value of Subcontract Reported on Form BC 260A	Mobilization Percentage
Less than \$10,000	25%
\$10,000 to less than \$20,000	20%
\$20,000 to less than \$40,000	18%
\$40,000 to less than \$60,000	16%
\$60,000 to less than \$80,000	14%
\$80,000 to less than \$100,000	12%
\$100,000 to less than \$250,000	10%
\$250,000 to less than \$500,000	9%
\$500,000 to \$750,000	8%
Over \$750,000	7%”

SUBMISSION OF BIDDERS LIST INFORMATION (BDE)

Effective: January 2, 2025

In accordance with 49 CFR 26.11(c) all bidders for federally assisted contracts shall submit bidders list information with their bid or initial response to a procurement solicitation. Submission of the bidders list information is a material bidding requirement, and failure to comply with this requirement may render the bid non-responsive.

The bidders list information shall be provided for each firm from whom the bidder receives any bid as a subcontractor. This requirement is not limited to DBE subcontractor bids but applies to all DBE and non-DBE firms from whom the bidder has received a quote or bid to work as a subcontractor, whether or not the bidder has relied upon that bid in placing its bid as the prime contractor. The bidders list information shall contain the following.

- (a) Firm name;
- (b) Firm address including ZIP code;
- (c) Firm's status as a DBE or non-DBE;
- (d) Race and gender information for the firm's majority owner;
- (e) NAICS code applicable to each scope of work the firm sought to perform in its bid;
- (f) Age of the firm; and
- (g) The annual gross receipts of the firm (this may be provided by indicating whether the firm's annual gross receipts are less than \$1 million; \$1-3 million; \$3-6 million; \$6-10 million; etc.).

The bidders list information shall be submitted with the bid using the link provided within the "Integrated Contractor Exchange (iCX)" application of the Department's "EBids System".

SUBMISSION OF PAYROLL RECORDS (BDE)

Effective: April 1, 2021

Revised: November 2, 2023

FEDERAL AID CONTRACTS. Revise the following section of Check Sheet #1 of the Recurring Special Provisions to read:

"STATEMENTS AND PAYROLLS

The payroll records shall include the worker's name, social security number, last known address, telephone number, email address, classification(s) of work actually performed, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof), daily and weekly number of hours actually worked in total, deductions made, and actual wages paid.

The Contractor and each subcontractor shall submit certified payroll records to the Department each week from the start to the completion of their respective work, except that full social security numbers, last known addresses, telephone numbers, and email addresses shall not be included on weekly submittals. Instead, the payrolls need only include an identification

number for each employee (e.g., the last four digits of the employee's social security number). The submittals shall be made using LCPtracker Pro software. The software is web-based and can be accessed at <https://lcptracker.com/>. When there has been no activity during a work week, a payroll record shall still be submitted with the appropriate option ("No Work", "Suspended", or "Complete") selected."

STATE CONTRACTS. Revise Item 3 of Section IV of Check Sheet #5 of the Recurring Special Provisions to read:

- "3. Submission of Payroll Records. The Contractor and each subcontractor shall, no later than the 15th day of each calendar month, file a certified payroll for the immediately preceding month to the Illinois Department of Labor (IDOL) through the Illinois Prevailing Wage Portal in compliance with the State Prevailing Wage Act (820 ILCS 130). The portal can be found on the IDOL website at <https://www2.illinois.gov/idol/Laws-Rules/CONMED/Pages/Prevailing-Wage-Portal.aspx>. Payrolls shall be submitted in the format prescribed by the IDOL.

In addition to filing certified payroll(s) with the IDOL, the Contractor and each subcontractor shall certify and submit payroll records to the Department each week from the start to the completion of their respective work, except that full social security numbers shall not be included on weekly submittals. Instead, the payrolls shall include an identification number for each employee (e.g., the last four digits of the employee's social security number). In addition, starting and ending times of work each day may be omitted from the payroll records submitted. The submittals shall be made using LCPtracker Pro software. The software is web-based and can be accessed at <https://lcptracker.com/>. When there has been no activity during a work week, a payroll record shall still be submitted with the appropriate option ("No Work", "Suspended", or "Complete") selected."

VEHICLE AND EQUIPMENT WARNING LIGHTS (BDE)

Effective: November 1, 2021

Revised: November 1, 2022

Add the following paragraph after the first paragraph of Article 701.08 of the Standard Specifications:

"The Contractor shall equip all vehicles and equipment with high-intensity oscillating, rotating, or flashing, amber or amber-and-white, warning lights which are visible from all directions. In accordance with 625 ILCS 5/12-215, the lights may only be in operation while the vehicle or equipment is engaged in construction operations."

WEEKLY DBE TRUCKING REPORTS (BDE)

Effective: June 2, 2012

Revised: January 2, 2025

The following applies to all Disadvantaged Business Enterprise (DBE) trucks on the project, whether they are utilized for DBE goal credit or not.

The Contractor shall notify the Engineer at least three days prior to DBE trucking activity.

The Contractor shall submit a weekly report of DBE trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) to the Engineer on Department form "SBE 723" within ten business days following the reporting period. The reporting period shall be Sunday through Saturday for each week reportable trucking activities occur.

Any costs associated with providing weekly DBE trucking reports shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

Effective: March 2, 2020

Revised: January 1, 2025

Add the following to Article 701.03 of the Standard Specifications:

"(q) Temporary Sign Supports1106.02"

Revise the third paragraph of Article 701.14 of the Standard Specifications to read:

"For temporary sign supports, the Contractor shall provide a FHWA eligibility letter for each device used on the contract. The letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device. The signs shall be supported within 20 degrees of vertical. Weights used to stabilize signs shall be attached to the sign support per the manufacturer's specifications."

Revise the first paragraph of Article 701.15 of the Standard Specifications to read:

" **701.15 Traffic Control Devices.** For devices that must meet crashworthiness standards, the Contractor shall provide a manufacturer's self-certification or a FHWA eligibility letter for each Category 1 device and a FHWA eligibility letter for each Category 2 and Category 3 device used on the contract. The self-certification or letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device."

Revise the first six paragraphs of Article 1106.02 of the Standard Specifications to read:

" **1106.02 Devices.** Work zone traffic control devices and combinations of devices shall meet crashworthiness standards for their respective categories. The categories are as follows.

Category 1 includes small, lightweight, channelizing and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, plastic drums, and delineators, with no attachments (e.g. lights). Category 1 devices shall be MASH compliant.

Category 2 includes devices that are not expected to produce significant vehicular velocity change but may otherwise be hazardous. These include vertical panels with lights, barricades, temporary sign supports, and Category 1 devices with attachments (e.g. drums with lights). Category 2 devices shall be MASH compliant.

Category 3 includes devices that are expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. These include crash cushions (impact attenuators), truck mounted attenuators, and other devices not meeting the definitions of Category 1 or 2. Category 3 devices manufactured after December 31, 2019 shall be MASH compliant. Category 3 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350, may be used on contracts let before December 31, 2029. Category 3 devices shall be crash tested for Test Level 3 or the test level specified.

Category 4 includes portable or trailer-mounted devices such as sign supports, speed feedback displays, arrow boards, changeable message signs, temporary traffic signals, and area lighting supports. It is preferable for Category 4 devices manufactured after December 31, 2019 to be MASH-16 compliant; however, there are currently no crash tested devices in this category, so it remains exempt from the NCHRP 350 or MASH compliance requirement.

For each type of device, when no more than one MASH compliant is available, an NCHRP 350 compliant device may be used, even if manufactured after December 31, 2019.”

Revise Articles 1106.02(g), 1106.02(k), and 1106.02(l) to read:

“(g) Truck Mounted/Trailer Mounted Attenuators. The attenuator shall be approved for use at Test Level 3. Test Level 2 may be used for normal posted speeds less than or equal to 45 mph.

(k) Temporary Water Filled Barrier. The water filled barrier shall be a lightweight plastic shell designed to accept water ballast and be on the Department’s qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings.

(l) Movable Traffic Barrier. The movable traffic barrier shall be on the Department’s qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings. The barrier shall be capable of being moved on and off the roadway on a daily basis.”

WORKING DAYS (BDE)

Effective: January 1, 2002

The Contractor shall complete the work within **60** working days.

REVISIONS TO THE ILLINOIS PREVAILING WAGE RATES

The Prevailing rates of wages are included in the Contract proposals which are subject to Check Sheet #5 of the Supplemental Specifications and Recurring Special Provisions. The rates have been ascertained and certified by the Illinois Department of Labor for the locality in which the work is to be performed and for each craft or type of work or mechanic needed to execute the work of the Contract. As required by Prevailing Wage Act (820 ILCS 130/0.01, et seq.) and Check Sheet #5 of the Contract, not less than the rates of wages ascertained by the Illinois Department of Labor and as revised during the performance of a Contract shall be paid to all laborers, workers and mechanics performing work under the Contract. Post the scale of wages in a prominent and easily accessible place at the site of work.

If the Illinois Department of Labor revises the prevailing rates of wages to be paid as listed in the specification of rates, the contractor shall post the revised rates of wages and shall pay not less than the revised rates of wages. Current wage rate information shall be obtained by visiting the Illinois Department of Labor web site at <http://www.state.il.us/agency/idol/> or by calling 312-793-2814. It is the responsibility of the contractor to review the rates applicable to the work of the contract at regular intervals in order to insure the timely payment of current rates. Provision of this information to the contractor by means of the Illinois Department of Labor web site satisfies the notification of revisions by the Department to the contractor pursuant to the Act, and the contractor agrees that no additional notice is required. The contractor shall notify each of its subcontractors of the revised rates of wages.