

**NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING**

**ALBANY, NY
AUGUST 9, 2024**

**AMENDMENT NO. 2
TO**

**CONTRACT TAS 24-1
D214944
PAVEMENT REHABILITATION AND MISCELLANEOUS
WORK FROM MILEPOST 347.1 TO 351.4 EB/WB
IN THE SYRACUSE AND BUFFALO DIVISIONS
OF THE NEW YORK STATE THRUWAY
IN ONTARIO COUNTY**

**IN THE LETTING OF
AUGUST 14, 2024**

NOTE: This amendment shall be attached to and become a part of the Proposal for Contract **TAS24-1**.

NOTICE

For Electronic Bidders, the Project's amended EBSX file will automatically account for any necessary item changes (deletions, changes in quantities, or additions) that this Amendment may describe as being required regarding the project's estimated cost. Instructions to make physical changes to the Project Proposal's bid sheets are intended for "paper" Bidders who choose to submit bids via paper.

Questions and Answers for this project are available from the Authority's website, specifically at: http://www.thruway.ny.gov/netdata/contractors/documents/d214944_tas24-1_questions-and-answers-08-07-2024.pdf. This document may be updated periodically without formal issuance of an Amendment. Prospective bidders are advised to revisit this link weekly and before proposals are due, for any possible additional questions and answers information.

Additional Supplemental Information for this project is now available from the Authority's website, specifically at: http://www.thruway.ny.gov/netdata/contractors/documents/d214944_tas24-1_supplemental-information-08-08-2024.zip

Sub surface and soil boring information is now available.

PROPOSAL

1. **CHANGE** the estimated quantity for the following Items:

<u>Contract Proposal Page</u>	<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Initial Estimated Quantity</u>	<u>Revised Estimated Quantity</u>
205	404.1959	19 F9 Binder Course Asphalt, 50 Series Compaction	TON	68,923	76,837
205	404.3769	37.5 F9 Base Course Asphalt, 60 Series Compaction	TON	59,465	59,625
219	670.7003	Single Conductor Cable, Number 4 Gage	LF	315	345
219	670.75040025	Ground Wire 1/C No. 4 AWG THWN 600 Volts	LF	105	120

The “paper” Bidder shall **CROSS OUT** the estimated quantity shown for these items in the Contract Proposal, **WRITE IN** the revised estimated quantity, and submit its bid based on the noted changes. If the Bidder fails to make these changes, the Authority will do so and adjust the BID AMOUNT for the items and TOTAL BID, accordingly.

2. **ADD** the following Items:

<u>Contract Proposal Page</u>	<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Estimated Quantity</u>
219B-A2	206.03	Conduit Excavation and Backfill Including Surface Restoration	LF	30
219B-A2	210.481201	Removal and Disposal of Misc. ACM (BV14)	SF	1,100
219B-A2	210.481202	Removal and Disposal of Misc. ACM (BV14)	SF	4,500
219B-A2	651.99083125	Fiber Optic Distribution Cable	LF	15
219B-A2	651.99083225	Fiber Optic Splice Enclosure (Butt-End)	EA	1
219B-A2	662.74125325	HDPE Innerduct 1.25 Inch ID	LF	15
219B-A2	670.2602	Rigid Plastic Conduit 2”	LF	30
219B-A2	680.51090025	Pullbox	EA	2
219B-A2	680.80328901	Type B Cabinet	EA	1

The “paper” Bidder must **RETURN THE ATTACHED PAGE 219B-A2** with its bid for this Contract.

ADD the attached Special Specification for Items 651.99083125, 651.99083225, 662.74125325, 680.51090025, 680.80328901 pages **73A-A2** thru **78B-A2**.

PLANS

3. **DELETE** Drawing Number PL-10, Sheet 200 of 372, and **SUBSTITUTE** with the attached Drawing Number PL-10, Sheet 200-A2 of 372.

Additional notes and items were called out to clarify work associated with electrical and communication connectivity.

The Bidder **MUST** complete Page **234** of the Proposal acknowledging receipt of this amendment. If the Bidder fails to complete the “Amendment Acknowledgement” sheet, his bid could be declared informal thereby delaying award of the contract.

PLEASE BE GOVERNED ACCORDINGLY WHEN SUBMITTING BIDS.

Brent E. Howard, P.E.
Chief Engineer

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**1. DESCRIPTION:**

- 1.01 Under this item the Contractor shall install, and test a fiber optic communications system at the locations shown on the plans, as directed by the Engineer, and as specified herein. This work shall consist of furnishing and installing single mode fiber optic cable used for the communications backbone, distribution network and equipment drops, passive components and miscellaneous equipment necessary for a complete cable plant as shown in the plans and as directed by the Engineer.
- 1.02 **Manufacturer Experience:** The fiber optic system components to be furnished shall be the products of manufacturers with a minimum of five (5) years experience in the successful manufacturing of such components. The fiber manufacturer and cabler shall be ISO 9001 certified.
- 1.03 **Installer Experience:**
- A. The installer of the fiber optic system shall be established in the installation of such equipment and shall have installed, as a minimum, three (3) systems of this magnitude, with each system having been in satisfactory operation for a minimum of five (5) years.
 - B. The installer shall provide the names, addresses, and telephone numbers of references who can be contacted regarding these systems.
 - C. The Contractor shall submit as proof resumes of the personnel listing their names, addresses, telephone numbers and project worked on and the names of references who can be contacted regarding the installed fiber optic systems. Personnel shall meet the following requirements:
 - 1. Splicers shall have been trained and certified in fiber optic cable installation and handling procedures by the manufacturer of the fiber optic cable to be used.
 - 2. Installers shall have been trained and certified in fiber optic cable installation and handling procedures by the manufacturer of the fiber optic cable to be used.
 - 3. Personnel involved in testing shall have been trained and certified by the manufacturer of the fiber optic cable test equipment to be used, in fiber optic cable testing procedures.
 - 4. Proof of the appropriate training shall be submitted to the Engineer for approval a minimum of twenty (20) working days prior to start of installation.
- 1.04 **Existing Fiber Optic System:** The fiber optic system provided under this specification shall connect with existing fiber optic cable if so indicated in the plans. The Contractor shall be responsible for testing the existing fiber prior to splicing into it. When splices are complete, the Contractor shall perform end-to-end testing, inclusive of the existing fiber.

2. MATERIALS:

- 2.01 **General Description of Materials and Services:** The fiber optic communications system to be provided under this specification consists of the following major components:
- A. Fiber Optic Trunk (Backbone) Cable
 - B. Fiber Optic Drop (Distribution) Cable
 - C. Fiber Optic Splice Enclosures
 - D. Fiber Optic Patch Panels
 - E. Wall mounted Fiber Splice Box
 - F. Miscellaneous Fiber Work
 - G. Submittals and Documentation
 - H. Testing.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)**2.01 General Description of Materials and Services:** (cont'd)

The Trunk Cable shall interconnect the head-end communication equipment with the field communication equipment. The Drop Cable shall interconnect the Trunk Cable with the Patch panel in cabinets. The Fiber Optic Patch Cord Cable shall interconnect the Drop Cable with the communication equipment in cabinets.

The quantity of fibers contained in each cable shall be in accordance with the plans.

All work shall be done in accordance with the manufacturer's recommendations, the Contract Documents, and as ordered by the Engineer.

2.02 Number of Fibers: The number of single mode fiber specified for each cable as shown in the Contract Drawings shall be the guaranteed minimum number of fiber (i.e., minimum number of fibers in the cable which when installed shall comply with the specification). If no fiber count is shown, the number of fibers shall be six (6).

2.03 Fiber Optic Trunk Cable:

A. The single mode fiber optic cable shall incorporate a water swellable tape, loose buffer tube cable design. The fiber optic cable shall be suitable for installation in conduit or lashed to messenger cable in an outside cable plant environment. The cable shall be all dielectric and shall consist of the number of fibers specified in the plans.

B. The cable shall meet the following requirements:

1. United States Department of Agriculture Rural Utility Service (RUS) 7 CFR1755.900
2. The requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable,
3. ANSI/ICEA S-87-640-1999
4. ITU-T G.652 (Categories A,B,C, & D)
5. TIA/EIA 492-CAAB
6. Telcordia GR-20

C. The cable shall meet the following requirements:

1. **Optical Requirements:** The fiber shall meet the requirements of EIA/TIA-492CAAA "Detail Specification for Class IVa Dispersion – Unshifted Single-Mode Optical Fibers":
 - a. **Attenuation:** The nominal attenuation shall not exceed 0.4 dB/km at a wavelength of 1310 nm and 0.3 dB/km at a wavelength of 1550 nm. Fiber attenuation shall be uniform with no discontinuities greater than 0.1 dB. The attenuation at 1383±3 nm shall not exceed 2.1 dB/km. The attenuation measurements shall be in accordance with EIA/TIA Standards FOTP-20, 59, 61 and 78. The average change in attenuation at extreme operational temperatures (-76°F to 185°F) shall not exceed 0.05 dB/km at 1550 nm. The magnitude of the maximum attenuation change of each individual fiber shall not be greater than 0.15 dB/km at 1550 nm. The change in attenuation measurements shall be in accordance with EIA/TIA Standard FOTP-3.
 - b. **Cutoff Wavelength:** Not to exceed 1260 nm.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)**2.03 Fiber Optic Trunk Cable:** (cont'd)

- c. **Mode-Field Diameter:**
- $9.20 \pm 0.4 \text{ }\Phi\text{m}$ at 1310 nm.
 - $10.4 \pm 1.00 \text{ }\Phi\text{m}$ at 1550 nm.
- d. **Zero Dispersion Wavelength:** 1313 nm.
- e. **Zero Dispersion Slope:** Not to exceed $0.086 \text{ ps}/(\text{nm}^2 \bullet \text{km})$.
- f. **Polarization Mode Dispersion:** Not to exceed $0.2 \text{ ps}/\text{km}^{1/2}$.
- g. **Dispersion:** Less than $3.5 \text{ ps}/(\text{nm} \bullet \text{km})$ for 1285 nm through 1330 nm and less than $18 \text{ ps}/(\text{nm} \bullet \text{km})$ at 1550 nm as measured in accordance with EIA/TIA Standard FOTP-169.

2. Mechanical Requirements:

- a. **Fibers:** All optical fibers shall be Corning glass fibers (SMF28e) or approved equivalent. All fibers within a given cable shall be from the same manufacturer, and shall contain no factory splices. Each fiber shall conform to the following minimum requirements:

1)	Typical Core Diameter:	8.2 Φm
2)	Cladding Diameter:	$125 \pm 0.7 \text{ }\Phi\text{m}$
3)	Core-to Cladding Offset:	Not to exceed 0.5 Φm
4)	Cladding Non-Circularity:	Not to exceed 0.7%.

- b. **Color Coating:** Each fiber shall have a color coating applied to it by the manufacturer. The coating shall not affect the optical characteristics of the fiber. The basic color configuration shall be as follows, in accordance with EIA/TIA-598-A:

1)	Blue	5)	Slate	9)	Yellow
2)	Orange	6)	White	10)	Violet
3)	Green	7)	Red	11)	Rose
4)	Brown	8)	Black	12)	Aqua

The nominal colored fiber diameter shall be 250 Φm .

- c. **Primary Coating:** Each fiber shall have a dual layered, UV acrylate coating applied to it by the manufacturer. The coating shall be mechanically strippable without damaging the fiber. The coating diameter shall be $245 \pm 5 \text{ }\Phi\text{m}$.
- d. **Central Strength Member:** The strength member shall consist of a dielectric, glass-reinforced plastic rod.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)**2.03 Fiber Optic Trunk Cable:** (cont'd)**2. Mechanical Requirements:** (cont'd)

- e. **Buffering:** All fibers shall be enclosed in non-conductive loose buffer tubes. Each buffer tube shall contain twelve (12) fibers. The Contractor shall submit the fiber count per buffer tube and the buffer tube count configuration to the Engineer for approval. The fiber shall not adhere to the inside of the buffer tube. Each buffer tube containing fibers shall be color coded in a similar scheme as the fiber color. The basic color configuration shall be as follows, in accordance with EIA/TIA-598-A:

1) Blue	5) Slate	9) Yellow
2) Orange	6) White	10) Violet
3) Green	7) Red	11) Rose
4) Brown	8) Black	12) Aqua

Cables requiring additional buffer tubes (greater than 144 strand) shall follow the same color scheme, except dashed.

In buffer tubes containing multiple fibers, the colors shall be stable during temperature cycling and not subject to fading or smearing onto each other or into the gel filling material. Colors shall not cause fibers to stick together. Buffer tubes shall be of dual-layer construction.

The buffer tubes shall be filled with a non-hygroscopic gel to prevent water and moisture penetration. The gel shall contain anti-oxidant additives, and the gel shall be readily removable with conventional solvents. The gel shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, and electrically non-conductive.

- f. **Filler Rods:** Fill rods shall be used to fill all unused buffer tubes, or shall be used instead of unused buffer tubes. The filler rod shall be a solid polyethylene material and shall be natural in color. The filler rods shall maintain the concentricity of the cable cross section where required.
- g. **Stranding:** The buffer tubes shall be stranded around the central strength member using the reverse oscillation (S-Z) stranding process. Water swellable yarns shall be applied longitudinally along the central member during stranding.
- h. **Water Swellable Tape:** A water swellable tape shall be applied longitudinally over the stranded tubes/fillers. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive and homogenous. It shall also be free from dirt and foreign matter.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)**2.03 Fiber Optic Trunk Cable:** (cont'd)**2. Mechanical Requirements:** (cont'd)

- i. **Tensile Strength Provisions:** Aramid yarn shall be helically stranded evenly around the cable core to provide tensile strength. The yarn shall enable the cable to withstand a maximum pulling force of 600 lb. during installation and 200 lb. long term installed without changing the characteristics of the optical fibers. Each length of cable shall have sufficient strength to be installed in continuous lengths as specified on the plans.
- j. **Outer Jacket:** A medium density polyethylene (or approved equal) outer jacket shall be applied over the entire cable assembly. The outer jacket shall have a minimum nominal jacket thickness of 1.25 mm. The polyethylene shall contain carbon black and shall not promote the growth of fungus. Jacketing material shall be applied directly over the strength members and the water swellable tape. The outer jacket shall contain no metallic elements and shall be of a consistent thickness.

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

- k. **Markings:** The outer cable jacket shall have sequential length markings in feet. The actual length of the cable shall be within $\pm 1\%$ of the length markings. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm.

The jacket shall be marked in contrasting color at three (3) foot intervals with the following information:

- Name of Cable Manufacturer
- Manufacturer's Catalog Number that includes information on type of fiber and fiber count
- NYSTA FIBER OPTIC CABLE – YYYY, where YYYY shall be the year that the cable was manufactured.

- l. **Ripcord:** The cable shall contain a ripcord under the sheath to facilitate cable preparation.
- m. **Bend Radius:** The cable shall be capable of withstanding a minimum bending radius of ten (10) times its outer diameter during operation and fifteen (15) times its outer diameter during installation without changing the characteristics of the optical fibers.
- n. **Fish Line:** Fish line shall be nylon or polypropylene material with a minimum test strength of 90 lb.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)**2.03 Fiber Optic Trunk Cable:** (cont'd)

3. **Manufacturer's Certification:** The cable manufacturer shall certify that each reel of cable furnished, meets or exceeds all of the optical and mechanical requirements mentioned above, plus the following specifications:
 - a. **Fluid Penetration:** When a three (3) foot static head of water or equivalent continuous pressure is applied at one end of a three (3) foot length of filled cable for one (1) hour, no water shall leak through the open cable end. The water penetration testing shall be performed in accordance with EIA/TIA Standard FOTP-82.
 - b. **Filling Compound Flow:** When tested in accordance with EIA/TIA Standard FOTP-81, the cable shall exhibit no flow (drip or leak) of filling or flooding compound at 160°F.
 - c. **Compressive Strength:** When tested in accordance with EIA/TIA Standard FOTP-41, the cable shall withstand a minimum compressive load of 22N/mm applied uniformly over the length of the sample and applied at the rate of 2.5 mm per minute. The load shall be maintained for a period of one (1) minute and then decreased to 110N/cm. The 110N/cm load shall be maintained for a period of ten (10) minutes. Attenuation measurements shall be performed before release of the 16 psi load. The change in attenuation shall not exceed 0.15 dB at 1550N/cm.
 - d. **Tensile Loading and Bending:** When tested in accordance with EIA/TIA Standard FOTP-33, using a maximum mandrel and sheave diameter of 22 inches, the cable shall withstand a rated tensile load of 600 pounds and a residual load of 30% of the rated installation load. The axial fiber strain shall be 20% of the fiber proof level after completion of ten (10) minutes of conditioning and while the cable is under the residual load. The change in attenuation at residual load and after load removal shall not exceed 0.15 dB at 1550 nm.
 - e. **Impact Resistance:** When tested in accordance with EIA/TIA Standard FOTP-25, except that the number of cycles shall be two at three locations along a three (3) foot cable length and the impact energy shall be at least 4.4Nm (in accordance with ICEA S-87-640), the change in attenuation shall not exceed 0.15 dB at 155 nm.
 - f. **Cable Flex:** When tested in accordance with EIA/TIA Standard FOTP-104, the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The fibers shall not experience an attenuation change greater than 0.15 dB at 1550 nm. The cable jacket shall exhibit no cracking or splitting when observed under 5X magnification.
 - g. **Temperature Cycling:** When tested in accordance with EIA/TIA Standard FOTP-3, the change in attenuation at extreme temperatures (-76°F to +185°F) shall not exceed 0.05 dB/km at 1550 nm.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)**2.03 Fiber Optic Trunk Cable:** (cont'd)**3. Manufacturer's Certification:** (cont'd)

- h. **Low or High Temperature Bending:** When tested in accordance with EIA/TIA Standard FOTP-37, the cable shall withstand four full turns around a mandrel of 20 times the cable diameter for four (4) hours at test temperatures of -22°F and +140°F. Neither the inner or outer surfaces of the jacket shall exhibit visible cracks, splits, tears or other openings. The fibers shall not exhibit a change in attenuation greater than .30 dB/km at 1550 nm.
- i. **Cable Twist:** When tested in accordance with EIA/TIA Standard FOTP-85, a length of cable no longer than six (6) feet shall withstand 10 cycles of mechanical twisting. The fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm. The cable jacket shall exhibit no cracking or splitting when observed under 5X magnification.

2.04 Fiber Optic Drop Cable

- A. **Optical Requirements:** The fiber optic Drop Cables shall have identical optical characteristics as the single-mode fiber optic Trunk Cable specified above.
- B. **Material Requirements:** The Drop Cable shall have the identical physical configuration as the single-mode fiber optic Trunk Cable specified above except for the fiber count in each buffer tube. The Contractor shall submit the Drop Cable buffer tube count configuration and fiber count per buffer tube to the Engineer for approval.
- C. **Manufacturer's Certification:** The fiber optic Drop Cables shall have identical manufacturer's certification as the single-mode fiber optic Trunk Cable specified above.

2.05 Packing and Shipment: All fiber cable shall be supplied on reels. Each reel shall have the following information clearly labeled on it:

- A. Customer
- B. Customer order number
- C. Reel number
- D. Destination
- E. Ship date
- F. Manufactured date (glass and cable)
- G. Manufacturer's name (glass and cable)
- H. Cable code
- I. Length of cable.

2.06 Splice Enclosures:

- A. The Contractor shall furnish and install fiber optic Splice Enclosures in locations where splices require protection and as indicated in the plans. The Splice Enclosures shall meet the following minimum requirements:

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)**2.06 Splice Enclosures:** (cont'd)

1. The Outdoor Splice Enclosure shall be suitable for outdoor applications with a temperature range of -22°F to 140°F.
 2. The Outdoor Splice Enclosure shall be sized for placement as shown in the Contract Drawings and shall provide sufficient space to allow entry of fiber optic cable without exceeding the cable minimum bending radius.
 3. The Outer Enclosure shall protect the splices from moisture and mechanical damage and shall be resistant to salt corrosion. All materials in the enclosure shall be non-reactive and shall not support galvanic cell action.
 4. The enclosure shall be waterproof, re-enterable and shall be sealed with a gasket.
 5. The enclosure shall permit selective splicing to allow one (1) or more fibers to be cut and spliced to the Drop Cable without disrupting other fibers.
 6. The outer enclosure shall have strain relief for the Trunk Cable to prevent accidental tension from disturbing the splices.
 7. When installed, the case shall be capable of withstanding severe conditions of moisture, vibration, impact, cable stress and temperature extremes.
 8. The case shall be capable of holding the type of splice trays specified herein, for fusion splices. The case shall have the capability of holding trays from various manufacturers.
 9. The basic case shall have the input/output capacity of four (4) cables.
 10. The case shall be re-enterable without disturbing the fibers or the fiber splices. No special tools shall be required for installation or maintenance of the case. All hardware and miscellaneous parts shall be standard industry equipment.
 11. The splice case shall be mountable to standard U-shaped sign channels using stainless steel hardware, or manufacturer approved hardware. Mounting shall be as shown on the details.
 12. The splice case shall have a termination block to terminate the central strength members of the fiber optic cables.
- B. Splice Trays:** The Contractor shall furnish and install fiber optic splice trays to organize and store splices. The trays shall be compatible with the fiber optic splices and Splice Enclosures specified herein and shall meet the following minimum requirements:
1. The Splice Tray shall be compatible with the outer enclosure and be constructed of rigid plastic or metal. The number of Splice Trays per enclosure shall accommodate the number of splices required under the Contract.
 2. Polyethylene tubes shall be supplied to protect exposed individual fibers within the enclosure.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)2.06 **Splice Enclosures:** (cont'd)

3. Vinyl markers shall be supplied to identify each fiber to be spliced within the enclosure.
4. Each splice shall be individually mounted and mechanically protected on the splice tray.
5. The loose tube buffers shall be secured with a tube guide or channel snap. No cable ties are to be used.
6. Slack fiber within the tray shall be placed in an oval shape along an inside wall of the tray.
7. The fiber optic splice trays shall be stackable within the splice case. Any tray within a stack shall be accessible without disassembly of any of the other trays.

C. **Fiber Optic Breakout Kits:** The fiber optic breakout kits contain all the tools and materials necessary to complete the installation of the fiber optic backbone and Drop Cables. It shall include, as a minimum, the following equipment:

1. Pulling eyes with protective covering for the installation of preterminated fiber optic Drop Cable.
2. Fiber optic installer test equipment, fusion splicers, test cables, connector adapters, inspection tools, attenuators, tracers, continuity checkers, consumables and all ancillary equipment.

2.07 **Patch Panel:** Designated Drop Cable fibers shall terminate within a patch at locations shown in the plans. Patch panels shall be completed (pre-loaded) with splice trays and connector panels of suitable capacity for all Drop Cables as specified in the Contract.

Each Patch Panel shall have capacity for at least six (6) connections or as indicated in the drawings.

Fan-out kits of suitable capacity shall be provided with each Patch Panel.

Each interconnect panel shall be compatible for connection to the AT&T SC type connectors of the fiber Drop Cables and fiber optic patch cables.

A. **Fiber Optic Connectors:** Fiber optic connectors shall be factory installed. The connectors shall meet the following requirements:

1. The connector shall have a ceramic ferrule with a nickel plated nut and body.
2. The connector shall be an AT&T SC style compatible field mountable connector.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)2.07 **Patch Panel:** (cont'd)A. **Fiber Optic Connectors:** (cont'd)

3. The connector shall be compatible with a physical contact (PC) finish. All connectors shall be polished to a PC finish such that the return loss per mated pair of connectors is at least 25 dB. The return loss when the connector is mated with previously installed connectors shall be at least 18 dB.
4. The connector mean loss shall not be greater than 0.5 dB with a standard deviation of not greater than 0.2 dB.
5. Index matching fluids or gels shall not be used.
6. The connector loss shall not vary more than 0.2 dB after 1000 repeated matings.
7. The connector shall withstand an axial load of 135N.
8. The connectors shall be compatible with the optical fiber surrounding jacket and shall be installed on one end of the optical fiber in accordance with the manufacturer's recommended materials, equipment and practices.
9. The connector shall be suitable for the intended environment and shall meet the following environmental conditions:
 - a. Operating Temperature: -4°F to 122°F
 - b. Storage Temperature: -22°F to 140°F
10. The connector loss shall not vary more than 0.2 dB over the operating temperature range.
11. Connectors shall be protected by a suitable installed waterproof protection cap.

B. **Fiber Jumper Cables:**

1. Factory assembled single mode fiber jumper cables shall be provided to connect fibers terminated in a Patch Panel to the communications equipment in field cabinets.
2. Jumper cables shall be housed individually in protective jackets. Both ends of the cable shall be connectorized in the factory.
3. The cable shall be suitable for operation over the temperature range of -22°F to +140°F.
4. Jumper cables shall be of suitable length to be connected between the rack mounted interconnect panel and the communication equipment (e.g., modems, etc.). Sufficient slack shall be left to allow relocation of the equipment anywhere within the cabinet.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**2. MATERIALS:** (cont'd)2.07 **Patch Panel:** (cont'd)B. **Fiber Jumper Cables:** (cont'd)

5. The attenuation of a jumper cable after installation, not including the connector loss, shall not exceed 0.1 dB measured at 850 nm and 1300 nm.

2.08 **Wall Mounted Fiber Splice Box:** Each Wall Mounted Fiber Splice Box shall include splice trays of a suitable capacity for the Trunk Cable as specified in the contract and shall allow space for slack Trunk Cable and an interconnect panel.

- A. **Splice Trays:** Splice trays and splice kits for the wall mounted Splice Box shall be as specified under Section 2.06, B. of this specification.

The Splice Box shall contain space for a minimum of a 48-count interconnect panel. The panel provided shall be of suitable size to meet the number of fibers indicated in the Contract drawings.

- B. **Connectors and Fan-Out Kits:** Fan-out kits shall be provided for the number of fibers to be landed on the interconnect panel. Connectors and fan-out kits shall meet the requirements of Section 2.07 of this Specification.

3. CONSTRUCTION DETAILS:3.01 **General:** All fiber optic cable will be installed in innerduct, steel, or PVC conduit as indicated in these Contract Documents or otherwise directed by the Engineer. All fibers in the fiber optic cable shall be spliced and/or terminated in designated field cabinets or pull boxes only.3.02 **Design Documentation:** Prior to the installation of the fiber optic cable, the Contractor shall submit his proposed cable plant design to the Engineer for approval. No cable shall be installed until the proposed cable plant design submission is approved by the Engineer. The cable plant design shall include the following:

- A. Catalog cuts and shop drawings for all cable, connectors, splice equipment, Splice Enclosures, splice trays, Patch Panels, jumper cables, wall mounted cabinets, and cable installation and test equipment.
- B. Preliminary locations of all proposed splices.
- C. Preliminary fiber assignment diagrams.
- D. Fiber attenuation/loss budget. The Contractor's loss budget shall include losses for any existing fiber that is to be connected to under this Contract. The existing losses shall be obtained from the as-built documentation from the existing fiber plant. If this information is not available to the Contractor, the loss budget for existing fiber shall be determined later from testing done in Section 3.10 A. of this Specification.
- E. Proposed pull box locations where hand assists or intermediate assist winches will be required during installation.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**3. CONSTRUCTION DETAILS:** (cont'd)**3.02 Design Documentation:** (cont'd)

- F. Proof of the experience requirements as defined in this special specification.
- G. Cable manufacturer's recommended cable installation techniques and requirements such that the optical and mechanical properties of the cables are not degraded at the time of installation.
- H. The cable manufacturer's proposed recommendations shall include the following (that apply to this project):
 - 1. Cable manufacture's approved pulling lubricant for use on the cable and method of application. No other lubricants will be permitted.
 - 2. Installation set-up including size and types of rollers, feeder guides, tension gauge make and model number, attachment of pulling jig to jacket and direction to pull.
 - 3. Maximum pulling tensions, which shall specify both pulling from the cable's conductors and for pulling from the cable's outer jacket.
 - 4. Minimum bend radii, which shall specify a radius both loaded and unloaded.
 - 5. Method to install multiple cables.

3.03 Splicing Requirements: All optical fibers shall be spliced to provide continuous runs. Splices shall be allowed only at locations designated in the approved cable plant layout or as approved by the Engineer. All splices shall be performed in a controlled, clean environment such as a Contractor designated splicing truck or van.

The splices shall meet the following requirements:

- A. All splices shall use the fusion technique. Fusion splicing equipment shall be provided by the Contractor and shall be cleaned, calibrated and specifically adjusted to the fiber and environmental conditions at the start of each shift. Splice enclosures, tools and procedures, shall be approved by the cable manufacturer as being compatible with the cable type being delivered.
- B. Only buffered tubes containing fibers to be spliced shall be opened. The other tubes shall be neatly looped and stored in the enclosure. When buffer tubes do not need to be opened, at least 4 m of unopened buffer tube shall be coiled in the fiber optic Splice Enclosure. Unsevered fibers in an open fiber buffer tube shall be neatly coiled in the splice tray.
- C. Each spliced fiber shall be packaged in a protective sleeving or housing. Bare fibers shall be completely re-coated with a protective RTV, gel or similar substance, prior to application of the sleeve or housing, so as to protect the fiber from scoring, dirt or microbending.
- D. Rack mounted organizer trays shall be used to hold the spliced fibers, with each fiber neatly secured to the tray.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**3. CONSTRUCTION DETAILS:** (cont'd)**3.03 Splicing Requirements:** (cont'd)

- E. The average splice loss shall not exceed 0.1 dB per link, with a standard deviation of no more than 0.07 dB. A link is defined as the fiber optic path between two (2) active components. No splice loss shall exceed 0.15 dB. If a splice is measured to exceed 0.15 dB during the splicing process, it shall be remade until its loss falls below 0.15 dB or the Engineer waives the 0.15 dB requirement. Each attempt shall be recorded for purposes of acceptance. If the mean exceeds 0.1 dB in any link, splices in the link shall be remade until the mean loss does not exceed 0.1 dB.
- F. All splice losses shall be recorded in tabular form and submitted to the Engineer in electronic format for approval. If an optical time domain Reflectometer (OTDR) is used to record splice loss, chart recordings of the "signature" shall be submitted with the splice data with a record of all OTDR settings and the OTDR locations written on the trace.
- G. At butt-end connections, all optical fibers shall be spliced to provide continuous runs.

3.04 Cable Installation: Fiber optic cable shall be installed in accordance with the approved manufacturer's recommendations. In addition, the following requirements shall be met:

- A. Prior to any installation of cable, the Contractor shall verify that conduits are clean and free of obstructions.
- B. The number of pull boxes and their locations shall be as shown on the Contract Documents. The Contractor may be required to install the cable one pull box at a time. The direction of the cable pull shall be determined by the Contractor.
- C. Personnel equipped with two (2) way radios shall be stationed at each maintenance hole, cabinet, Splice Enclosure, communications box and junction box through which the cable is to be pulled to observe and lubricate the cable.
- D. Fish line shall be installed in all communications ducts or conduits along with fiber optic communication cables. A six (6) foot length of fish line shall be left coiled, tied and accessible in each cabinet and pull box. The fish line shall be installed according to manufacturer's specifications and shall be "free" and NOT helicoil about communications cables.
- E. A minimum of 30 feet of cable slack shall be provided in pull boxes containing splices or otherwise designated on the Contract Documents or as directed by the Engineer. Additional slack, as indicated on the approved cable installation plan, may be provided for closure preparation and splicing.
- F. The cable shall be securely fastened in place within Splice Enclosures and cabinets to prevent pull-out or shifting of the cable.
- G. The Contractor shall be responsible for ensuring the cable length is sufficient to allow for connection between the communication equipment and the Splice Enclosures including provision for slack, vertical runs, cable necessary for splicing, wastage and cable to allow for the removal of the Splice Enclosure for future splicing.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**3. CONSTRUCTION DETAILS:** (cont'd)**3.04 Cable Installation:** (cont'd)

- H. No fiber optic cable shall be pulled through more than one (1) 90 degree bend unless so indicated on the approved Contract Documents or specifically approved by the Engineer.
- I. The cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends.
- J. The cable shall be looped in and out of cabinets and pull boxes to provide adequate slack and the least amount of stress on the fibers. The Contractor shall ensure that the cable is not damaged during storage or installation.
- K. Fiber optic cable ends shall be kept sealed at all times during installation, using a method recommended by the cable manufacturer and approved by the Engineer. The cable end shall remain sealed until the Contractor terminates the fiber cables. Cables that are not immediately terminated shall have a minimum of six (6) feet of slack.
- L. When using lubricants, the Contractor shall adhere to the cable manufacturer's requirements for the proper amount, application tools and method, and removal of the lubricant from the exposed cable.
- M. Optical fiber cable shall be installed in continuous lengths without intermediate splices throughout the project except where splices are indicated on the Contract Documents or approved by the Engineer. Splices shall only be in re-enterable Splice Enclosures mounted in pull boxes, junction boxes and underground vaults.
- N. The fiber optic Drop Cable shall be spliced to the backbone cable at the locations indicated in the Contract Documents or as directed by the Engineer.
- O. The maximum pulling tensions and minimum bending radii shall not be violated at any time during installation. The Contractor shall consult with the Engineer concerning existing conduit, pull boxes, and rises, which could force the violation of the minimum bending radius for the fiber optic cable. The Contractor shall obtain approval from the Engineer if modifications to these existing facilities are required. Violation of these parameters shall be cause for rejection of the installed cable.
- P. Following installation of the cable in the ducts, all duct entrances at Splice Enclosures and cabinets shall be sealed with an innerduct termination plug (provided under separate pay item) or a duct sealing compound (if plugs are not provided under separate pay item) to prevent the ingress of moisture, foreign materials, and rodents.
- Q. Where Trunk Cable terminations are left "dead ended", a minimum of 80 feet of cable shall be left coiled.
- R. Slack cable and innerduct where pulled through a pull box shall be racked to the pull box wall.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**3. CONSTRUCTION DETAILS:** (cont'd)**3.05 Drop Cable:**

- A. Drop cables that go to multiple Patch Panels shall be looped through intermediate cabinets and panels such that fibers not needed at that particular site pass through, splice free and uncut. The Drop Cable fiber shall be fusion spliced to the appropriate trunk fiber or left in a splice tray for future use as indicated in the drawings. The other end of the fiber shall be fusion spliced to a connector fan-out kit and mounted in the Patch Panel. Field installed connectors shall not be used without written consent of the Engineer and shall be reviewed on a site by site basis. The Contractor, at his option may propose to provide factory installed connectors on the Patch Panel side for distribution cable runs that go to only one cabinet or Patch Panel. If Drop Cable is provided with factory installed connectors, the manufacturer shall factory test the cable assembly and provide the results to the Engineer for approval.
- B. The Drop Cable shall be of sufficient length to be installed as shown on the plans, with a minimum of 10 feet of slack provided on either end or as indicated in the drawings.
- C. The Contractor shall follow the Drop Cable manufacturer's recommendation in the installation of the Drop Cables, including the individual breakout fibers.

3.06 Splice Enclosures:

- A. Splice enclosures shall be installed in accordance with the manufacturer's recommendation and as directed by the Engineer. After final assembly of the Splice Enclosure, it shall be pressure tested in accordance with the manufacturer's recommendations. If the pressure test is not passed, the enclosure shall be resealed and the test repeated. The Engineer shall be notified of any failed attempts and shall reserve the right to reject the Splice Enclosure and any others with similar problems.
- B. The Contractor shall submit the test results to the Engineer for approval and acceptance of the enclosure.

3.07 Patch Panel/Panel:

- A. All Drop Cables entering a cabinet shall connect to a Patch Panel.
- B. Fiber optic splitters and taps (FOS's and FOT's) shall be housed within the cavity of the Patch Panel.
- C. All fiber optic patch cord cables between the Patch Panel and Fiber Optic Communication Equipment shall exit the Patch Panel via the Interconnect Panel.
- D. The unused ports of the Interconnect Panel shall be provided with dust jackets for protection.

3.08 Wall Mounted Fiber Splice Boxes: At the Trunk Cable terminus, within a building, cables shall be installed in Wall Mounted Splice Boxes as indicated in the Contract Drawings.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**3. CONSTRUCTION DETAILS:** (cont'd)**3.09 Labeling:**

- A. All fiber optic cables shall be identified by circuit numbers in all cabinets, pull boxes, wireways, and other enclosures and access locations and at all terminal points. Cable designations shall be as shown on the Contractor's approved shop drawings. The tag ties shall be wrapped around all cables comprising the circuit to be identified.
- B. Cable tags shall be suitable for wet locations and shall be stainless steel tags, No. 28 gauge and 7.5 inches wide, embossed with letters and numbers approximately 3/8 inch high, fastened to the cable or wire with nylon cable ties.
- C. Tags shall indicate which subsystem and trunk or Drop Cable it is connected to and the cabinet number for the other end of the link as indicated in the Contract Drawings.
- D. The Contractor shall label the fiber connectors at the Patch Panel. The labeling scheme selected shall clearly identify the fiber number and connecting device. The labeling scheme is to be approved by the Engineer.

3.10 Testing Requirements:

- A. The following tests shall be conducted. All tests shall be conducted in accordance with approved test procedures. The Contractor shall submit test procedures and forms in paper and electronic formats for approval to the Engineer.
- B. As required in 3.03, the Contractor shall measure and record the splice quality of each fusion splice performed. This information shall be submitted to the Engineer as part of the final testing documentation.
- C. An OTDR shall be used for backscattered light measurements. The OTDR shall operate at a nominal wavelength of 1310 nm and 1550 nm and shall include all necessary hardware required to couple it with unconnectorized single mode fiber.
 1. **Existing Fiber Cable Verification Test:** Prior to splicing fibers installed under this contract to existing fibers (where designated in the plans), the Contractor shall verify and record the loss characteristics of the existing fiber. Any anomalies shall be reported to the Engineer. Testing the existing fiber and splicing to the existing fiber shall be paid for under the work described in Section 4.7 (Miscellaneous Fiber Work) of this specification.
 2. **Pre-Installation Tests:**
 - a. The fiber optic cable shall be inspected and tested at the site storage area prior to installation.
 - b. Proper fiber cladding and fiber tube colors shall be verified by visual inspection. Any difference discovered from approved fiber optic cable plant layout or approved catalog cut sheets for the cable shall be grounds for rejection of the cable.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**3. CONSTRUCTION DETAILS:** (cont'd)**3.10 Testing Requirements:** (cont'd)

- c. Each optical fiber in the cable shall be tested from one end with an OTDR compatible with wavelength and fiber type. Testing shall check for continuity, length, anomalies, and approximate attenuation at both 1310 nm and 1550 nm wavelengths. Each measurement shall be recorded with color, location and type of fiber measure. In the event that a meaningful measurement cannot be made from one end, it shall be performed from the opposite end of that fiber.
- d. If the measured attenuation does not meet or exceed the specified performance criteria of these specifications, the cable shall be rejected.
- e. The Contractor shall assure that the specifications of the fiber optic cable are met prior to installation.

3. Proof of Performance Test:

- a. After the fiber cable has been installed, but prior to any splicing, the Contractor shall conduct a proof of performance test.
- b. The Contractor shall measure the attenuation of a minimum of 10% of the total fibers selected at random. The Contractor shall sequence the fibers which are to be measured after each pull, such that the same fibers are not measured on consecutive lengths.
- c. The Contractor shall record the reel number from which the cable came, the identification of the fibers measured and the attenuation in dB/km of the fibers measured.
- d. If the measured attenuation does not meet or exceed the specified performance criteria of these specifications, additional testing may be necessary or the cable shall be rejected.

4. Acceptance Testing: After each splice and connector installation, all optical fiber spans (including all dark/spare fibers and unconnectorized fibers) shall undergo the following tests after installation of all connectors and splices. A span is defined as a continuous length of fiber including all splices and connectors:

- a. Using an OTDR test each span bi-directionally at 1310 nm and 1550 for fiber attenuation, continuity, length, and anomalies. Each optical fiber shall meet the following acceptance criteria:
 - 1) **Attenuation:** Not to exceed 0.3 dB/km at 1550 nm and 0.4 dB/km at 1310 nm + 0.15 dB/splice + 0.5 dB/connector. The number of splices and cable attenuation shall be based upon the approved cable plant layout.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**3. CONSTRUCTION DETAILS:** (cont'd)**3.10 Testing Requirements:** (cont'd)

- 2) **Anomalies:** No event shall exceed 0.3 dB. If any event is detected at that value, the Contractor shall repair or replace that section of cable.
- b. Using an optical source and a power meter, measure the attenuation from both ends. The measured attenuation shall meet the criteria defined for the attenuation using the OTDR.
- c. All cable that fails to meet the aforementioned requirements shall be replaced.
- d. The Contractor shall maintain a test result record of each span and each fiber. Optical fiber spans shall be identified in the test results by identifying the fiber under test and by identifying the field cabinet at which the OTDR and power meter was connected.
- e. The test results shall include the following measurement:
 - 1) Total length of the single mode link
 - 2) Total attenuation of the single mode link
 - 3) Attenuation of each splice in the link under test
 - 4) Attenuation per kilometer of each interconnected fiber in the link under test.
- f. Attenuation shall be measured in decibels referencing optical power.
- g. Each single mode fiber and splice tested shall be tested to meet the performance requirements in accordance with the contract.
- h. The Contractor shall submit to the Engineer a tabulated list of fibers and the actual end-to-end measured values from the above tests and all traces and loss length printouts and in electronic format (with .sor file extension). This test data shall be the basis of acceptance for the fiber.
- i. For optical fibers spliced to existing fibers, this test shall be repeated between the control center and the field termination after the new and existing fibers have been spliced together. If a fiber fails to meet the loss characteristics for the spliced section fiber, the Contractor shall determine whether the excessive loss is the result of an anomaly in the new section of fiber, splice or existing section of fiber. The Contractor shall, however, be responsible for the new section of fiber and the splice between the two sections.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**3. CONSTRUCTION DETAILS: (cont'd)****3.11 Close-out Documentation:**

- A. Five (5) complete sets of operation and maintenance manuals shall be provided. As-built drawings are required to be completed in MicroStation (.dgn) format and shall include, but not be limited to the following items: the location of the fiber facilities as determined by offsets from the edge of travel lanes (from yellow or white solid pavement stripe/markings) and depths of the facilities at every delineator; whether the facilities are bored, trenched, or attached to bridge structures; culvert locations in close proximity to the facilities; all ducts, hand holes, fiber optic cables and associated facilities. The as-builts must show every mile and tenth of a mile delineator, the Thruway ROW fence, all cross streets, ramps, streams, rivers and railroads. The beginning and end points of bores, and all culvert and hand hole/manhole locations are to be shown measured along the edge of travel lanes (from yellow or white solid pavement stripe/markings and) from the nearest tenth of a mile marker to the South or East. All splice enclosures, man/hand holes shall be located by coordinates obtained from a hand held GPS unit with minimum accuracy of ± 1 foot. As-builts also need to be organized by milepost with a reference chart to locate the desired location. If so provided under other items (such as the innerduct item), the Contractor shall obtain the electronic plan drawings of the innerduct path for use in developing the fiber plans.
- B. The manuals shall, as a minimum, include the following:
1. Complete and accurate as-built plans showing the fiber optic cable plant, actual fiber distance readings (from the fiber cable jacket), and locations of all splice enclosures. Splice enclosures shall be located by coordinates (obtained from a hand help GPS unit with an accuracy of at least ± 15 feet) and shown on the as-built plans.
 2. Complete fiber assignment diagram. If available, the Contractor will be provided with an electronic copy of the existing fiber assignment diagrams that the Contractor shall use in the development of the as-built fiber assignment diagrams for this project.
 3. Complete performance data of the cable plant showing the complete fiber run, including losses at each splice joint and each terminal connector.
 4. Installation, splicing, terminating and testing procedures.
 5. Complete parts list including names of vendors.
 6. Complete maintenance and trouble-shooting procedures.

4. METHOD OF MEASUREMENT:

- 4.01 **Fiber Optic Trunk Cable:** The unit price bid per foot shall include procurement, storage, installation, fish line, labeling, and pre-installation testing. Work shall be considered complete when a length of cable between splice points, inclusive of the cable slack in enclosures, is satisfactorily installed, tested and accepted by the Engineer.

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**4. METHOD OF MEASUREMENT:** (cont'd)

- 4.02 **Fiber Optic Drop Cable:** The unit price bid per foot shall include procurement, storage, installation, fish line, labeling, and pre-installation testing. Work shall be considered complete when a length of cable between splice points, inclusive of the cable slack in enclosures, is satisfactorily installed, tested and accepted by the Engineer.
- 4.03 **Fiber Optic Splice Enclosure (Butt-End Splice):** The unit price bid per each Splice Enclosure shall include the installation and assembly of all required fiber termination components of the enclosure, splice trays, splice kits, fusion splicing, and pressure testing.
- 4.04 **Fiber Optic Splice Enclosure (Drop Cable):** The unit price bid per each Splice Enclosure shall include the installation and assembly of all required fiber termination components of the enclosure, splice trays, splice kits, fusion splicing, and pressure testing.
- 4.05 **Fiber Optic Patch Panel:** The unit price bid per each fiber optic Patch Panel shall include the procurement and installation of the Patch Panel including: bulkhead connectors, splice trays, splice kits, fan-out kits, jumper cables, and fusion splicing.
- 4.06 **Wall Mounted Fiber Splice Box:** The unit price bid per each wall mounted Fiber Splice Box shall include the procurement and installation of the Fiber Splice Box including: cross-connect panels, splice trays, splice kits, jumper cables, and fusion splicing.
- 4.07 **Miscellaneous Fiber Work:** The lump sum price bid for this item shall include all materials, labor, and incidentals necessary to complete the work as described in the Special Notes of the Contract and elsewhere within this specification. (See Section 3.10.C.1)

5. BASIS OF PAYMENT:

- 5.01 The price bid for each item shall include the cost of furnishing all equipment, materials, incidentals, labor, tools, testing equipment, documentation, and testing required to complete the work.
- 5.02 Payment for each item will be made on a partial payment staged basis as follows:

<u>Milestone No.</u>	<u>Description</u>	<u>Payment Percentage</u>
1	Completion of Pre-Installation Testing	30%
2	Proof of Performance Testing	50%
3	System Acceptance and Documentation	20%

ITEM 651.9908XX25 - FIBER OPTIC COMPONENTS**5. BASIS OF PAYMENT:** (cont'd)

5.03 Units of payment for each item described in this specification shall be established as outlined below:

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>PAY UNIT</u>
651.99083025	BACKBONE FIBER OPTIC CABLE	FOOT
651.99083125	FIBER OPTIC DISTRIBUTION CABLE	FOOT
651.99083225	FIBER OPTIC SPLICE ENCLOSURE (BUTT-END)	EACH
651.99083325	FIBER OPTIC SPLICE ENCLOSURE (DROP)	EACH
651.99083425	FIBER OPTIC PATCH PANEL	EACH
651.99083525	WALL MOUNTED FIBER SPLICE BOX	EACH
651.99083625	MISCELLANEOUS FIBER WORK	LUMP SUM
651.99083725	BACKBONE FIBER OPTIC CABLE (THRUWAY SUPPLIED)	FOOT
651.99083825	BACKBONE FIBER OPTIC CABLE (48 COUNT)	FOOT
651.99083925	BACKBONE FIBER OPTIC CABLE (72 COUNT)	FOOT
651.99084025	BACKBONE FIBER OPTIC CABLE (144 COUNT)	FOOT
651.99084125	BACKBONE FIBER OPTIC CABLE (216 COUNT)	FOOT
651.99084225	BACKBONE FIBER OPTIC CABLE (288 COUNT)	FOOT

ITEM 662.74125325 - HDPE INNERDUCT 1¼ INCH ID**1. DESCRIPTION:**

- 1.01 This work shall consist of furnishing all labor, tools, and equipment necessary for installing high density polyethylene (HDPE) innerduct as indicated on the plans or as directed by the Engineer. The innerduct is to be used for fiber optic cable facilities and will be placed as direct burial, drilled, or in sleeves as shown in the plans.
- 1.02 The innerduct shall include the following work items:
- A. Innerduct
 - B. Splicing
 - C. Trace Wire
 - D. Warning Tape
 - E. Path Markers
 - F. Plugs and Lashing Ties
 - G. Documentation

Conduit excavation, backfill, sleeves, and directional drilling or jacking are paid for under separate items as shown in the plans.

2. MATERIALS:**2.01 Innerduct.**

- A. The innerduct shall be smooth-walled, inside and outside, High Density Polyethylene (HDPE) plastic Type SIDR9 deliverable to the site on reels. All innerduct shall be the same inner and outer diameter and shall be acquired from the same vendor.
- B. The innerduct shall be extruded from high-density polyethylene (HDPE) resin and conforming to the minimum standards for polyethylene PE345430B as defined in ASTM D3350.
- C. Each innerduct shall be solid color coded as shown on the plans.
- D. The innerduct shall be suitable for heat fusion welding using a fusion duct splicer.
- E. Innerducts shall be pre-lubricated during the manufacturing process such that the lubricant becomes permanently impregnated in the inner walls of the innerducts. The process shall provide a dynamic co-efficient of friction of .06 to .09 in accordance with Bellcore Standard GR-TSY-356-CORE, Oct. 1995, Section 4.1.5.
- F. The lubricant shall be compatible with the proposed fiber optic cable jacket.

- 2.02 **Underground Warning Tape.** Underground Warning Tape shall be a heavy-duty polyethylene material that is compounded for direct burial service and which will resist acids, alkalis and other soil substances. The tape shall be orange with a continuous legend "CAUTION BURIED FIBER OPTIC CABLE" print in black. The underground warning tape shall be six (6) inches wide and have a minimum thickness of 4 mils.

ITEM 662.74125325 - HDPE INNERDUCT 1¼ INCH ID

- 2.03 **Path Markers.** The Contractor shall provide above-grade markers to identify the path of the buried duct. The markers shall be orange and shall bear the permanent factory-printed text as shown on the plans. The markers shall be 12 inches tall by four (4) inches wide by 1/8 inch thick and constructed of polyethylene rated for a minimum of 10 year outdoor durability. The markers shall be resistant to UV rays, scratches, fading, and cracking. Galvanized steel posts shall be provided as necessary to mount the markers in areas as indicated in the plans. Attachment hardware shall be galvanized steel, stainless steel, or other non-corrosive materials approved by the Engineer.
- 2.04 **Innerduct Plugs.** Innerduct plugs and terminating plugs shall be corrosion proof, chemical resistant, removable, reusable and provide a light, air and gas tight seal to seal the Innerduct. The terminating plug shall have an individual entry port for each installed cable.
- 2.05 **Lashing Ties.** Lashing ties shall be weather resistant nylon, non-releasable with a minimum loop tensile strength of 250 pound force.

3. CONSTRUCTION DETAILS:**3.01 Innerduct.**

- A. The innerducts shall be placed as direct burial or in sleeves where shown on the plans.
- B. Innerduct shall be installed in accordance with industry standards, manufacture's written instructions, as shown on the Plans or as ordered by the Engineer. Guide wheels, bending shoes or quadrant guides shall be used to achieve a smooth transition from road grade to conduit depth. All bends in the Innerduct shall be made without kinking, flattening or appreciably reducing the internal diameter of the Innerduct and as recommended by the manufacturer.
- C. The configuration of the color-coded innerducts shall be as shown on the plans. The innerducts shall be bundled together using lashing tape every six (6) feet to prevent duct separation and entanglement.
- D. If existing pull boxes require resetting or other modifications, this work shall be completed prior to the installation of innerduct into the subject pull box.
- E. Innerduct shall be installed in continuous lengths to the extent possible. Splicing of innerduct will be permitted as required to facilitate the installation. Innerduct shall be butt-fused together using a heat fusion welder. Heat fusion welding shall be conducted using a machine specifically designed for the application and materials being used and shall have been widely used in the industry for a minimum of 5 years. The fused innerduct shall have been tested and demonstrated to provide an impermeable seal with a tensile strength equal to or greater than the duct without splices.
- F. All Innerducts shall be sealed during installation and when being stored to prevent contaminants from entering the innerduct. All Innerducts terminating in pull boxes with installed wires or cables shall have a terminating plug installed in accordance with the manufacturer's instructions. Unused innerduct shall pass through the pull boxes uncut.
- G. Where the innerducts terminate at pull boxes, the Contractor shall break into the pull box and seal the opening between the innerduct and pull box with a watertight sealer approved by the Engineer.
- H. Warning tape, trace wire and path markers shall be installed along the entire innerduct path as shown in the plans and as directed by the Engineer. Wherever possible, the markers shall be affixed to permanent roadside features within 30 feet of the conduit path. The Contractor shall submit a list of intended mounting locations for the Engineer's approval.

ITEM 662.74125325 - HDPE INNERDUCT 1¼ INCH ID

- I. After installation each innerduct shall be tested for continuity using a nominal 1¼ inch diameter non-collapsible mandrel. The testing equipment shall be approved by the Engineer. Notification of all tests shall be made at least 48 hours prior to testing. All testing shall be witnessed by the Engineer and a third party (if involved).
- J. The minimum bend radius shall be as indicated on the plans, or as recommended by the manufacturer, whichever is greater.

3.02 Documentation.

- A. As-built drawings are required to be completed in MicroStation (.dgn) format and shall include, but not be limited to the following items: the location of the fiber facilities as determined by off-sets from the edge of travel lanes (from yellow or white solid pavement stripe/markings) and depths of the facilities at every delineator; whether the facilities are bored, trenched, or attached to bridge structures; culvert locations in close proximity to the facilities; all ducts, hand holes, fiber optic cables and associated facilities. The as-builts must show every mile and tenth of a mile delineator, the Thruway ROW fence, all cross streets, ramps, streams, rivers and railroads. The beginning and end points of bores, and all culvert and hand hole/manhole locations are to be shown measured along the edge of travel lanes (from yellow or white solid pavement stripe/markings and) from the nearest tenth of a mile marker to the South or East. All splice enclosures, man/hand holes shall be located by coordinates obtained from a hand held GPS unit with minimum accuracy of ± 1 foot. As-builts also need to be organized by milepost with a reference chart to locate the desired location.

4. METHOD OF MEASUREMENT:

- 4.01 The innerducts shall be measured by feet along the axis of the innerduct, of the size and type specified, installed according to the plans, Proposal, or as directed by the Engineer. Measurement shall include all couplings and bends.

5. BASIS OF PAYMENT:

- 5.01 The unit price bid per foot shall include the innerduct and all labor and materials necessary to complete the work, including splicing, testing and connection to pull boxes.
- 5.02 Progress payments will be made in the following percentages:

<u>Payment Milestone</u>	<u>Description</u>	<u>Percentage</u>
1	Duct Installed and Plugged	50%
2	Completion of Testing	40%
3	Markers and Documentation	10%

ITEM 680.5109--25 - PULLBOX - B

1. DESCRIPTION:

1.01 Under this item, the Contractor shall furnish and install pullboxes as shown at locations shown on the plans and as ordered by the Engineer.

2. MATERIALS:

2.01 Pullboxes shall be manufactured in accordance with Section 680-3.14 of the Standard Specifications. The pullbox shall have a length of 36 inches, a width of 24 inches and a depth of 24 inches.

2.02 The pullbox shall have a solid vertical divider to separate the box into two halves. The divider shall span the width of the box.

2.03 The cover shall consist of two halves, in addition to the frame, to isolate one half of the box at a time.

3. CONSTRUCTION DETAILS:

3.01 Pullboxes shall be installed per the plans and as ordered by the Engineer.

4. METHOD OF MEASUREMENT:

4.01 This work will be measured by the number of pullboxes furnished and installed.

5. BASIS OF PAYMENT:

5.01 The unit price bid for each pullbox shall cover the cost of all labor, material, and equipment necessary to complete the work.

ITEM 680.80328901 - TYPE B CABINET**DESCRIPTION:**

Under this item, the Contractor shall furnish and install empty cabinets of the type shown in the Proposal at locations shown on the Plans and as ordered by the Engineer.

MATERIALS:

The cabinets shall be weatherproof outdoor mounting cabinets and be clean-cut design and appearance and have minimum inside dimensions as follows:

TYPE	DEPTH	WIDTH	HEIGHT
B	12 in	20 in	32 in

Cabinet housings shall be fabricated from sheet aluminum Grade 5052-H32. The sheet aluminum shall be at least 0.12 inch thick and adequately reinforced. All construction shall be free of dents, scratches, weld burn through and abrasions harmful to the strength and general appearance. All seams shall be of continuously welded construction or alternative weatherproof construction consisting of non-continuous welds provided the connection is mechanically sound and weather resistant because of material overlap when approved by the procuring agency.

A certificate of compliance from the manufacturer shall be furnished certifying that the material used in the construction of the cabinet housing complies with the requirements of the preceding paragraph.

The housing shall have a door, securely gasketed, which shall include substantially the full area of the front of the cabinet.

Gasketing shall be provided on all door openings. The gasketing shall be of a dust-tight permanent type that will not peel off or deteriorate. Gaskets shall be closed cell neoprene and shall be installed with contact cement for a permanent bond. The mating surface of the gasketing shall be sprayed with a silicone lubricant to prevent sticking to said mating surface.

The lock for the door of the cabinet shall be of the self-locking heavy duty five (5) pin tumbler cylinder rim type. It shall be keyed to the master key of the appropriate Region and to the grand master key designated 1-10D. Two keys shall be furnished for each lock.

No part of the cabinet shell assembly shall extend further than 0.875 inches in front of the plane formed by the front of the cabinet shell.

No part of the cabinet door or any attachment to it shall extend further than 1.25 inches from the door into the area of cabinet.

The front door shall have at least two aluminum hinges with stainless steel hinge pins along the right edge when viewed from the front. The hinges shall be crimped or welded to prevent removal of the hinge pins. The cabinet door hinges shall be bolted to the cabinet housing in a manner that prevents unauthorized personnel from removing the door with commonly available tools.

Each cabinet shall be provided with one adjustable shelf.

ITEM 680.80328901 - TYPE B CABINET

Each cabinet shall be provided with suitable top and bottom vents properly designed to provide natural ventilation of the cabinet interior and to prevent the entrance of rain, snow and insects.

Louvered vents shall be designed and constructed so that a stream of water from a pressure head, such as a Rainbird sprinkler or other type sprinkler, will not enter the cabinet. The cabinet top shall be crowned or sloped to prevent standing water and shall be constructed to shield the top of the cabinet door to prevent water from entering between the top door gasket and the cabinet.

The cabinet shall be constructed such that there is approximately 1 inch of clearance between the bottom of the door when closed and the bottom of the cabinet. This will allow the door to be opened and closed when cabinet is sitting flush on a flat surface.

The cabinets' finish shall be anodized aluminum.

A #6 connection ground bus attached to the cabinet shall be bonded to a ground rod by the use of a ground clamp and a #6 AWG or larger stranded bare copper wire.

Terminal strip(s) will be required. As a minimum, all connections to and from the loops and piezos shall terminate at the terminal strip(s).

Cabinets will be accepted upon the manufacturer's certification that they meet the requirements of this specification.

CONSTRUCTION DETAILS:

Type B cabinets shall be post mounted or pole mounted as indicated in the Plans and as ordered by the Engineer.

The Contractor shall submit details for mounting of the cabinet on either steel post or pole for approval of the Engineer.

The Contractor will make all connections between the Shielded Lead-In wire and the terminal block. Wires new and existing shall be labeled.

The Contractor shall establish ground from cabinet to pullbox as described in the specification.

In unpaved areas, the Contractor shall install a class "A" concrete work pad. Work pad shall be 3.28 FT x 3.28 FT x 4 IN, located in front of the cabinet door. The work pad shall meet the requirements of Section 608 of the Standard Specifications for concrete sidewalk, and include concrete, fill or excavating, and all grading as necessary.

METHOD OF MEASUREMENT:

This work will be measured by the number of cabinets furnished and installed.

BASIS OF PAYMENT:

The unit price bid for each cabinet shall cover the cost of all labor, material and equipment necessary to complete the work.



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AASHTOWare Project™ Version 5.00 Revision 031

Proposal Schedule of Items

Proposal ID: D214944

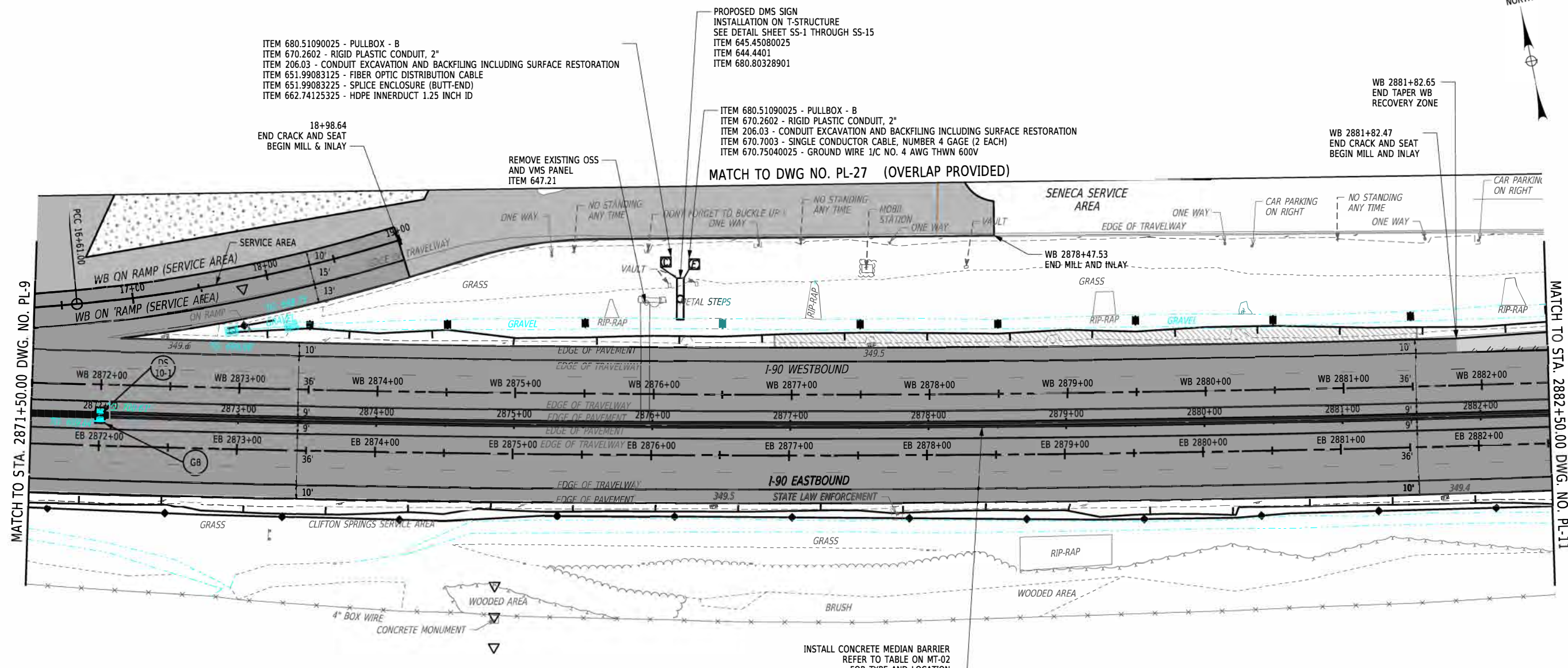
Project(s): S53059

Contractor: _____

SECTION: 0001 SECTION 1

Alt Set ID: **Alt Mbr ID:**

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0500	206.03 CONDUIT EXCAVATION AND BACKFILL INCLUDING SURFACE RESTORATION	30.000 LF	_____	_____	_____	_____
0502	210.481201 REMOVAL AND DISPOSAL OF MISCELLANEOUS ACM (BV14)	1,100.000 SF	_____	_____	_____	_____
0504	210.481202 REMOVAL AND DISPOSAL OF MISCELLANEOUS ACM (BV14)	4,500.000 SF	_____	_____	_____	_____
0506	651.99083125 FIBER OPTIC DISTRIBUTION CABLE	15.000 LF	_____	_____	_____	_____
0508	651.99083225 FIBER OPTIC SPLICE ENCLOSURE (BUTT-END)	1.000 EACH	_____	_____	_____	_____
0510	662.74125325 HDPE INNERDUCT (1 1/4IN)	15.000 LF	_____	_____	_____	_____
0512	670.2602 RIGID PLASTIC CONDUIT, 2"	30.000 LF	_____	_____	_____	_____
0514	680.5109 25 PULLBOX - B	2.000 EACH	_____	_____	_____	_____
0516	680.80328901 TYPE B CABINET	1.000 EACH	_____	_____	_____	_____
			Total:		_____	_____
			Total Bid:		_____	_____



NOTES

- AFTER REMOVAL OF THE SIGN STRUCTURE AND EXISTING VMS CABINET, THE AREA WHERE THE EXISTING PAD, CABINET, PULLBOXES, ETC SHALL BE GRADED TO MATCH THE EXISTING CONTOUR. WORK TO BE PAID UNDER ITEM 647.21.
- THE EXISTING VMS CABINET AND ALL COMPONENTS SHALL BE REMOVED BY THE CONTRACTOR. ALL COMPONENTS SHALL BE RETURNED TO THE AUTHORITY WHILE THE CONTRACTOR SHALL DIPOSE OF THE CABINET. THE EXISTING COMPONENTS SHALL BE CAREFULLY REMOVED NOT TO DAMAGE THE EXISTING POWER OR COMMUNICATION CABLES. WORK TO BE PAID UNDER ITEM 647.21.
- INSTALL TYPE-B PULLBOX AT THE LOCATION OF THE REMOVED VMS AND EXPOSED CONDUITS FOR BOTH POWER AND FIBER COMMUNICATIONS CABLES. SPLICE POWER CABLES WITHIN PULLBOX AND EXTEND TO NEW STRUCTURE PAID UNDER THE RESPECTIVE WIRE OR CABLE ITEMS.
- CONTRACTOR SHALL REMOVE EXISTING COMMUNICATION EQUIPMENT FROM VMS CABINET AND RETURN TO THE AUTHORITY. WORK TO BE PAID UNDER ITEM 647.21.

NOTES

- SEE GR PLAN SHEETS FOR GUIDERAIL REMOVAL AND INSTALLATION.
- SEE GR PLAN SHEETS FOR CONCRETE MEDIAN BARRIER LIMITS.

ALTERED ON: AFFIXED ON: 06/21/2024

SIGNATURE: STAMP: SIGNATURE: STAMP:

LEGEND

CRACK AND SEAT	UNDERDRAIN
MILL & INLAY	CHECK DAM
FULL DEPTH RECONSTRUCTION	DRY SWALE
	ROLLED EROSION CONTROL PRODUCT

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

REVISIONS

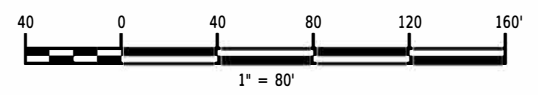
DATE	DESCRIPTION	BY	SYM.

NEW YORK STATE OF OPPORTUNITY

Thruway Authority

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TITLE OF PROJECT PAVEMENT REHABILITATION EXIT 44 TO EXIT 45	CONTRACT NUMBER: TAS 24-1
LOCATION OF PROJECT SYRACUSE DIVISION I-90 MP 347.1 TO 351.4	DATE: 06/21/2024
TITLE OF DRAWING ROADWAY PLAN	DRAWING NUMBER: PL-10



PW/ R. BENNETT C. CLARK R. BENNETT C. ECKLUND W. DALEY
 CHECKED BY: DRAFTED BY: CHECKED BY: DESIGNED BY: DESIGN SUPERVISOR: