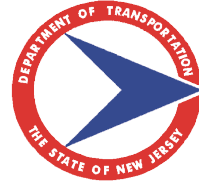


New Jersey Department of Transportation
1035 Parkway Avenue, PO Box 600, Trenton, New Jersey 08625-0600



Baseline Document Change Announcement

ANNOUNCEMENT: BDC16S-03

DATE: August 24, 2016

SUBJECT: ITS related changes
- **Revision to Subparts/Subsections/Section 101.03, 159.03.02, 701.03.02, 701.03.03, 701.03.06, 701.03.07, 701.03.15, 701.04, 704, and 1001.04 of the 2007 Standard Specifications for Road and Bridge Construction**

Subparts/Subsections/Section 101.03, 159.03.02, 701.03.02, 701.03.03, 701.03.06, 701.03.07, 701.03.15, 701.04, 704, and 1001.04 of the 2007 Standard Specifications have been revised to reflect the current ITS related requirements. Major changes include: Changes to Dynamic Message System (DMS) and addition of Variable Speed Limit System (VSLS) specifications along with minor revisions to various sections reflecting current standards and practices.

The following revisions have been incorporated into the Standard Input SI2007 as of August 24, 2016.

101.03 TERMS

THE FOLLOWING TERM IS ADDED.

ITS commissioning. Completion of Level A testing of an Intelligent Transportation System per [704.03.01](#). This does not constitute Acceptance by the Department of the work.

159.03.02 Traffic Control Devices

THE FOLLOWING IS ADDED TO THE SECOND PARAGRAPH:

- 8. Portable Variable Message Sign with Remote Communication (PVMSRC).** Place the PVMSRC at the locations directed by the RE for the duration of the project. Ensure that a designated representative familiar with the operation and programming of the unit is available on the Project for On-Site Configuration. Only display messages on the PVMSRC authorized by the Department for the Project in accordance with the plans or as directed by the RE and make the signs available for use remotely from the Traffic Operation Center (TOC) specified in [105.07.01.B](#). Program within 8 hours, any message requested by the RE to be displayed on the PVMS at a scheduled time and verify that the message is displayed correctly and notify the RE. If the PVMSRC fails to function, repair the equipment within 48 hours of receiving notice from the Department that the PVMSRC is not functioning.

Integrate the PVMSRC for remote operation from TOC using Vanguard DMS software or the Department's central DMS control software at the time of installation as directed by the RE.

Provide for one week of testing by the TOC for remotely operating the PVMSRC before the start of construction operations that require lane or shoulder closures, or other impacts to traffic. At least 10 days before testing, submit to the RE for approval a plan for any work to be completed in the TOC. Submit a request to the RE at least 4 days in advance to access the TOC for any work.

- 9. Portable Trailer Mounted CCTV Camera Assembly (PTMCCA).**

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IF THE PTMCCA IS REQUESTED BY CONSTRUCTION MANAGEMENT, REVISE THIS AND OTHER REQUIREMENTS WILL NEED TO BE INCLUDED.

SME CONTACT – MSE; TRAFFIC OPERATIONS/CONSTRUCTION MANAGEMENT AS APPLICABLE

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Place the PTMCCA at the location directed by the RE. Ensure that a designated representative familiar with the operation and programming of the unit is available on the Project for initial installation. If the PTMCCA fails to function, repair the equipment within 48 hours of receiving notice from the Department that the PTMCCA is not functioning.

Provide a system that includes a robotic network camera remotely controllable, including Pan, Tilt and Zoom (PTZ). Provide broadband internet service connection and On-Site Camera Configuration for remote operation and control of the camera via the Department’s existing Head-End Camera Control System, Genetec. No other Head-End Camera Control System substitution is permitted. A Management user system is also to be provided for remote system programming to the camera sites. This includes a website that is to be provided and hosted by the vendor. This website is to have secure authentication and is to show the current devices with their location, status, and display links for each device. Provide continuous viewable image at a minimum of 320H x 240V resolution and 1 frame per sec (fps) through the website. As directed by the Traffic Operation Center (TOC) specified in [105.07.01.B](#), establish password level designations, camera presets, and camera image displays. Provide all incidental equipment and material required for successful remote operation and communications.

Provide for one week of testing by the TOC for remotely operating the PTMCCA before the start of construction operations that require lane or shoulder closures, or other impacts to traffic.

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DESIGNERS MUST CHECK WITH MSE’S MOBILITY MANAGEMENT WORK ZONE UNIT AND TRAFFIC OPERATIONS TO CONFIRM IF REAL TIME WORK ZONE TRAFFIC SYSTEM (RTWZTS) IS REQUIRED. ONCE CONFIRMED AND IF RTWZTS IS REQUESTED BY TRAFFIC OPERATIONS, THEN REQUEST THE SPECIFICATIONS FROM MSE AND INCLUDE HEREAFTER MODIFYING THE SPECIFICATIONS TO INCLUDE THE NUMBER OF PVMSRC REQUIRED WITH LOCATIONS AND ANY OTHER ADDITIONAL REQUIREMENTS SPECIFIC TO THE PROJECT. DEVELOP AND INCLUDE A REAL TIME MESSAGE TABLE LISTING THE DESIGNATED ROUTE, LOCATION OF EXISTING/PROPOSED SIGN AND THE TRAVEL TIME MESSAGE TO BE DISPLAYED.

SME CONTACT –MSE’S MOBILITY MANAGEMENT WORK ZONE UNIT, TRAFFIC OPERATIONS

10. REAL TIME WORK ZONE TRAFFIC SYSTEM (RTWZTS)

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DIVISION 700 – ELECTRICAL

SECTION 701 – GENERAL ITEMS

701.03.02 Rigid Metallic Conduit (Earth)

B. Installation.

THE FOLLOWING IS ADDED:

In rigid metallic conduit used exclusively for fiber optic cable, install a tracer wire continuously for the entire run of conduit, including through the junction boxes, mounting it on the wall. Splice the tracer wire only in the junction

box. Seal the ends of rigid metallic conduit carrying the tracer wire. If wire or cable is not scheduled to be installed within 6 months of conduit installation, cap and seal the other conduits leaving the true tape inside. Install warning tape in the trench above the conduit.

701.03.03 Rigid Metallic Conduit (Roadway)

B. Installation.

THE FOLLOWING IS ADDED:

Ensure that jacking or drilling and receiving pits are not within 2 feet from the edge of the pavement.

In rigid metallic conduit used exclusively for fiber optic cable, install a tracer wire continuously for the entire run of conduit, including through the junction boxes, mounting it on the wall. Splice the tracer wire only in the junction box. Seal the ends of rigid metallic conduit carrying the tracer wire. If wire or cable is not scheduled to be installed within 6 months of conduit installation, cap and seal the other conduits leaving the true tape inside. Install warning tape in the trench above the conduit.

701.03.06 Flexible Metallic Conduit

THE ENTIRE SUBSECTION TEXT IS CHANGED TO:

Install liquidtight flexible metallic conduit according to NEC requirements. Cut liquidtight flexible metallic conduit according to manufacturer’s recommendations. Ensure that conduit used for fiber optic cables meets the minimum bend and radius requirements as specified in the Contract and according to the fiber optic cable manufacturer. Utilize NEMA-4X weather-tight hubs for conduit connections to ITS and electrical enclosures.

701.03.07 Flexible Nonmetallic Conduit

B. Installation.

THE SECOND PARAGRAPH IS DELETED.

THE THIRD PARAGRAPH IS CHANGED TO:

Construct flexible nonmetallic conduit runs so that there are no joints or splices in the conduit between adjacent junction boxes. Ensure flexible nonmetallic conduit runs are terminated in the junction boxes according to manufacturer’s recommendations.

701.03.15 Cable and Wire

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C. Connection and Coordination with Utility Services.

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FOR ITS FACILITIES DESIGN, CONFIRM ON THE REQUIREMENTS FOR INTERIM COMMUNICATION AND POWER CONNECTIONS, AND CONNECTIONS TO NJTA NETWORK. ALSO, FOR ESTABLISHMENT OF IP ADDRESSES, INTERIM AND PERMANENT.

SME CONTACT – MSE

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INCLUDE THE FOLLOWING WHEN ITS FACILITIES ARE PROPOSED THAT REQUIRES ANY NEW UTILITY SERVICES.

SME CONTACT – MSE

THE FOLLOWING IS ADDED:

Obtain and provide for utility services required for testing and operation of ITS systems until interim acceptance of each system or device. Utility Services may be governed by differing Authorities Having Jurisdiction (AHJ). Along with Utility Requirements, comply with all AHJ requirements. Upon successful completion of level C testing and acceptance of any device, provide the RE with a letter requesting transfer of utility services providing the latest copy of the utility bill from each utility company. Such transfers are to be effective beginning the next monthly billing

cycle after completion of successful ITS system testing as specified in [Section 704](#) and interim acceptance of the device or as directed by the RE.

Once new utility services have been energized or activated and the utility company has de-energized and unhooked the old service connection; remove existing pole risers and service heads, cut back one foot below grade, and plug the conduits.

Service Requests

Device Site No.	Primary Route	Final MP	Direction	Location	Township	County	Utility Territory	Job No.	Utility Contact Person	Utility Pole No.

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701.04 MEASUREMENT AND PAYMENT
THE FOLLOWING IS ADDED:

The Department will not include payment for restoring disturbed areas in the various Items of this Section. The Department will pay for restoring disturbed areas (pavement, curb, sidewalk, driveway or island) as specified in [104.03.03](#).

The Department will not include payment when the RE directs the installation of a new conduit or a repair to the defective conduit in the various Items of this Section. The Department will pay for the installation, when directed by the RE, of a new conduit or a repair to the defective conduit as specified in [104.03.03](#)

The Department will not include payment when the RE directs the installation of a tracer wire in existing conduit in the various Items of this Section. The Department will pay for the installation, when directed by the RE, of a tracer wire in existing conduit as specified in [104.03.03](#).

SECTION 704 – INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

THE ENTIRE SECTION TEXT IS CHANGED TO:

704.01 DESCRIPTION

This Section describes the requirements for providing, installing, configuring, calibrating, testing and placing into operation Advanced Traveler Information Systems (ATIS) and Advanced Traffic Management Systems (ATMS).

704.02 MATERIALS

704.02.01 Materials

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MOST COMMON ITS MATERIAL SPECIFICATIONS ARE AVAILABLE ON THE DEPARTMENT’S WEBSITE AND A QPL OF PRE-QUALIFIED MATERIALS IS POSTED, DOWNLOAD THE REQUIRED SPECIFICATIONS FROM THE DEPARTMENT’S WEBSITE AND LIST THEM HERE IN THE TABLE REFERRING TO THE APPROPRIATE SUB SECTION OF SECTION 918 AND INCLUDE THE SPECIFICATIONS IN THAT SECTION
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Provide materials as specified in:

Coarse Aggregate (No. 57)	901.03
Concrete	903.03
Grout	903.08.02.A
Precast Concrete.....	904.01
Reinforcement Steel	905.01

- Anchor Bolts [908.01.03](#)
- Miscellaneous Hardware [908](#)
- Coal Tar Epoxy Paint [912.01.03](#)
- Guide Rail, Fence, and Railing [913](#)
- Landscaping Materials [917](#)
- Conduit and Fittings [918.01](#)
- Cable and Wire [918.02](#)
- Loop Detector Lead [918.02.01](#)
- Loop Wire [918.02.02](#)
- Bonding and Grounding Materials [918.03](#)
- Resin Splicing Kits [918.05](#)
- Electrical Tape [918.06](#)
- Cable Racks [918.07](#)
- Cabinets [918.09](#)
- Panel Boards and Circuit Breakers [918.10](#)
- Standards [918.12](#)

Follow the accepted standards of ANSI, NEMA, UL, NEC, ITE, and ASTM for materials not specified in the Contract.

For fittings and mounting hardware not specified, follow the manufacturer’s recommendations.

Provide materials as specified in the Contract and in the New Jersey Electrical Materials Specifications that are available on the Department’s website. A listing of pre-qualified materials is also available on the QPL.

Submit the system working drawings in a complete package for approval. The complete package of the system working drawings includes but is not limited to the ITS System Block Diagrams, Fiber Assignment Diagrams, and Rack/Cabinet Equipment Layout Diagrams; Certified Structural Details & Calculations. All components must be approved in the system working drawings before use on the Contract. List the ITS and EE approval numbers of each component in the equipment list on the system block diagram when a pre-approved product from the QPL is proposed to be used. For all components that are proposed without a pre-approved number, submit eight copies of catalog cut sheets along with the working drawings. Submit all structural components that are not listed on QPL separately for structural review and approval with the required certification and include a copy of all approvals when submitting the system working drawings to meet the complete package requirement. For materials furnished and installed, provide a minimum 2-year warranty from the date of Completion against any imperfections in workmanship, components and materials. Submit a warranty certificate to the RE from each material manufacturer, with the Department named as holder of the certificate.

704.02.02 Equipment

Provide equipment as specified in:

- Traffic Control Equipment [1001](#)
- Vibrator [1005.04](#)
- Pavement Saw [1008.04](#)
- Hot-Air Lance [1008.06](#)
- Concrete Batching Plant [1010.01](#)
- Concrete Trucks [1010.02](#)

704.03 CONSTRUCTION

704.03.01 General System (GS)

- A. Components.** A GS consists of the specified Items needed to modify an existing system or construct a proposed system. The system includes, but is not limited to, electronic and electrical devices, cabinets, wiring, programming, configuration, communication and electric service connections, service charges, utility software, grounding, and surge protection
- B. Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown will begin at 10 P.M. daily and continue through to 4 A.M. on weekdays, 5 A.M. on Saturdays, and 6 A.M. on Sunday mornings unless otherwise noted in the Special Provisions. The Department will recover the cost of damages for exceeding the allowable time frames as specified in [107.16](#).

When installing a new system or modifying an existing system, ensure the respective manufacturer’s certified field representative of ITS components and related equipment is on site to commission the equipment into operation. Restore the operation of the overall system to its original condition, the conditions specified in the Contract, or as directed by the RE.

When leased services are specified to be used, provide advance notice to Internet Service Providers to verify current status of service requests for all required ISP services. Perform necessary coordination required to re-establish and revise any service requests that may have expired due to time constraints, or due to a change in the system requirements.

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CONTACT TRAFFIC OPERATIONS TO CONFIRM THE EXISTING SYSTEM SHUTDOWN TIME. REVISE AS DIRECTED AND INSERT HERE

SME CONTACT – TRAFFIC OPERATIONS AND MSE

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PROVIDE THE COST OF DAMAGES FOR EXCEEDING THE ALLOWABLE TIME FRAMES

SME CONTACT – MSE

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1. Junction Box ITS.

- a. **Installation.** Excavate as specified in [202.03.02](#). Install junction boxes only in areas where the slope is not less than 22H:1V. Place junction boxes on 10 inches of coarse aggregate No. 57. With each junction box, provide six (6) coiling brackets, inserts and fasteners, and a ground rod and clamp. Backfill and compact using the directed method as specified in [203.03.02.C](#). Restore disturbed areas to the original conditions, the conditions specified in the Contract, or as directed by the RE.

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IF REMOVAL OR RELOCATION OF ITS JUNCTION BOX IS NOT FEASIBLE IN A PROJECT THAT REQUIRES TRAFFIC TO BE SHIFTED IN THE AREA OVER THIS JUNCTION BOX DURING ANY STAGE OF CONSTRUCTION THEN IT MUST BE PROTECTED DURING CONSTRUCTION AND MUST INCLUDE DETAILS FOR PROTECTING THE ITS JUNCTION BOX.

SME CONTACT – MSE

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- b. **Relocation.** Submit plans showing the proposed method of relocation of junction box including provisions for maintaining network operation and/or cut-over during the process to the RE for approval. Remove existing ITS junction box by excavating around the junction box, cutting back conduits, pulling the cable slack equally to adjacent junction boxes and notching the portion of junction box below the conduits sufficient to slide the fiber optic cable. After removal of the junction box, re-couple the conduit(s), and terminate them using approved conduit repair kits and backfill with approved material and compact using the directed method as specified in [203.03.02.C](#). Install the Junction Box after approval by the RE. Ensure that the cut conduit ends are terminated at the entrance of the junction box wall using a manufacturer recommended kit depending upon the type of conduits. Ensure that the fiber optic cable is pulled back from the adjacent junction boxes in equal length to maintain the required slack for immediate and future splicing. Ensure that a ground rod and clamp are installed.

- 2. **Communication Cable.** Install communication cable from the utility pole or manhole to the controller. Provide and install the material necessary to provide a complete installation, including a weather-tight terminal block enclosure on the utility pole as required by the Utility, cable ties, cable tags, labels, clamps, jumpers, and connectors. Ensure that there are no splices in the section of cable between the terminal block and the devices.

Provide the standard allowable slack for cable and wire, as specified in [701.03.15.A](#), within the in-ground rectangular junction boxes. Provide 3 feet of slack with an appropriate connector in the cabinet for connection to devices and utility service. Provide 10 feet of slack to allow for the Utility to make their connections in the manholes or on utility poles.

- 3. **Foundation ITS.** Construct the foundation as specified in [701.03.12](#).
- 4. **Controller ITS.** At least 30 days before beginning the work, submit working drawings for approval that include a block wiring diagram illustrating the interconnections of the system components from the field location to the designated control center. Identify each component by manufacturer and model number.

Securely bolt the controller, equipped with communications and electronic devices for a fully functional and operational system, to the foundation in a vertical position using stainless steel hardware.
- 5. **Communication Hub.** At least 30 days before beginning the work, submit working drawings for approval that include a block wiring diagram illustrating the interconnections of the system components from the field location to the designated communication hub or control center or both. Identify each component by manufacturer and model number. Procure technicians that are certified by the existing operating system providers to integrate the ITS devices into existing operating systems. Coordinate with NJ Office of Information Technology (NJOIT) through the RE to establish Firewall/Network/IP addresses as required. Ensure that a fully functional and operational system is provided.
- 6. **Control Center System.** At least 30 days before beginning the work, submit working drawings for approval that include a block wiring diagram illustrating the interconnections of the system components from the field location to the designated communication hub or control center or both. Identify each component by manufacturer and model number. Procure technicians that are certified by the existing operating system providers to integrate the ITS devices into existing operating systems. Coordinate with NJOIT through the RE to establish Firewall/Network/IP addresses as required. Ensure that a fully functional and operational system is provided.

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INCLUDE THE WORK TO BE PERFORMED AT EACH CONTROL CENTER (TOC, HUB OR ANY BUILDING/CABINET WITH A NETWORK NODE) CLEARLY AND REMOVE THE PORTION OF THE WORK THAT IS NOT APPLICABLE TO ANY PARTICULAR PROJECT AS THE BID PRICE FOR THIS ITEM WILL BE BASED ON THE WORK INVOLVED AT THE DESIGNATED CONTROL CENTER. THE DESIGNERS MUST INCLUDE SYSTEM BLOCK DIAGRAMS AND FIBER ASSIGNMENT DIAGRAMS IN THE SET OF CONSTRUCTION PLANS. THE CONTRACTOR WILL USE THESE AS WORKING DRAWINGS BY ADDING A LIST OF EQUIPMENT AND NETWORK IP ADDRESSES.

SME CONTACT – MSE

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Ensure the ITS System Network working drawing is submitted in a format acceptable to the Department. Sample ITS Working Drawings are available at:

<http://www.state.nj.us/transportation/eng/elec/ITS/pdf/sampledrawings.pdf>

Ensure the working drawing contains the following information:

- 1. Affected network nodes are shown in nodal format with Latitude/Longitude.
- 2. Each node shows equipment type and the proposed communication links between them.
- 3. Distances between Ethernet switches and calculated dB loss between them.
- 4. A Communication Network Assignment Table specifying Equipment Location (Node, Site ID, Lat/Long, Plan sheet reference, Route, Mile Post), Equipment Information (Item No., Description, Function, VLAN No., Subnet Mask, and IP Address).

Supply and install equipment, software, software revisions, firmware, miscellaneous wiring and cabling, at the specified Control Centers to ensure the remote operation and control of all ITS field devices from the Traffic Operation Centers. Comply with building installation requirements, restrictions, access, and security requirements in the performance of work. The material and work required for the integration of the various ITS installations into the various existing operating systems or subsystems used by the Department includes, but is not limited to, the following:

- a. At least 5 (five) business days in advance of requiring access to the designated Control Center, submit a Facility Daily Access Request Form available on Department’s ITS website.
- b. Ensure complete functionality with field devices. Coordinate with the Department for access, rack space, and LAN connections to Client Workstations, respectively.

- c. Ensure CCTV encoders are compatible with approved camera system especially for PTZ and focus control and CCTV Controller Software.
- d. Ensure CCTV Controller Software is updated by integrating new cameras installed and ensure video and control is available to all necessary Traffic Operations personnel.
- e. Ensure DMS signs are integrated and remotely operable by the DMS Controller Software.
- f. Ensure TTS Devices are integrated and operational in accordance with Contract requirements. Develop the required travel time routes and the appropriate travel time sign messages as directed by the Department.
- g. Ensure CTSS components are fully integrated and all the necessary functionality is demonstrated in the designated CTSS Controller Software.
- h. Secure and provide all necessary Network configurations and assignments as directed by the Department.
- i. Provide and install other electronic equipment that may become necessary as a result of network protocol translation, electrical signal transmission degradation or communications media translation (fiber optic, coax, DSL interface, network interface, etc.)
- j. Provide for software support to integrate new ITS devices into new and existing platforms for workstations and servers utilized by DOT operators. This includes work required from each of the software suppliers for workstations located remotely from the Traffic Operation Centers. The Department will provide information regarding the respective system, on particulars for authorized remote users.
- k. Provide for the installation of network assignments for field devices as well as enabling the network and device management protocols as directed by the Department.
- l. Ensure that network support requests through the RE to the Department are made at least 60 days prior to the installation of all devices to be included in the network.
- m. For RWIS, integrate weather station(s) into the appropriate password protected website as directed by the Department.
- n. For WIMS, integrate the system for live data retrieval by the designated staff with password protected website as directed by the Department.

7. Meter Cabinet ITS. Install cabinets, meters, control and distribution systems, including the grounding of all materials, and internal wire and wiring. Install the metering systems as required by the Utility.

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THIS INCLUDES A FNMC RESERVED FOR ELECTRICAL SERVICE CONDUCTORS THAT MAY REQUIRE SEPARATE JUNCTION BOXES AT SHORT INTERVALS. COORDINATE WITH MSE BEFORE PROCEEDING WITH THE DESIGN PLANS TO DETERMINE WHAT IS EXACTLY REQUIRED. IF A FIBER GLASS SLEEVE IS REQUIRED, SPECIFY IT AND INCLUDE WITH BRIDGE STRUCTURE ATTACHMENTS AND EXPANSION FITTINGS AS PER MANUFACTURER REQUIREMENTS. WHEN FIBERGLASS CONDUIT IS NOT PROPOSED ACROSS AN EXISTING STRUCTURE, BUILT-IN SLEEVES WITHIN THE PARAPET CAN BE UTILIZED IF EMPTY AND AVAILABLE.

ITS CONDUIT TYPE A INCLUDES THREE (3) FNMC. IF THE PROJECT SPECIFIC CONSTRUCTION REQUIREMENTS NEED DIFFERENT SIZE CONDUITS, MODIFY THE STANDARD DETAIL TO INCORPORATE THE PROPOSED CHANGES AND INCLUDE IT IN THE SET OF PLANS REFLECTING THE CORRECT SIZE AND TYPE OF CONDUITS. ALSO, REVISE THE SPECIFICATIONS BELOW TO LIST ANY CHANGES NEEDED TO MATCH THE TYPE OF CONDUITS OTHER THAN FNMC.

SME CONTACT – MSE

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8. ITS Conduits. Install Flexible Nonmetallic Conduits as specified in [701.03.07](#) with the following exceptions:

- a. Do not install mechanical joints on conduit runs between junction boxes.
- b. Obtain RE approval for fusion joints that may be permitted under special circumstances on conduit runs between junction boxes.
- c. Provide an as-built list indicating the location of all joints to the RE.
- d. Install a continuous tracer wire without any splice in the conduits and from junction box to a termination point in the field cabinet.
- e. Ensure that conduits and ducts entering a junction box, foundation, cabinet, hub, or building are terminated based on manufacturer’s recommendation and are rodent proofed and sealed around cables, or plugged if conduit is built for future use.

- f. Ensure that the ITS Conduits facilitate the various means of cable and wire installations including but not limited to pulling, jetting, and blowing of fiber optic cable and electrical wires.
 - g. Install conduits simultaneously with proposed curb work and prior to constructing resurfacing courses.
 - h. Install true tape marked in 1-foot increments for the length of the ITS Conduit.
 - i. Install warning tape in the trench above the conduit.
 - j. Restore disturbed areas to the original conditions, the conditions specified in the Contract, or as directed by the RE.
- 9. Fiber Cross-Connect Cabinet.** Submit working drawings for approval that include a block wiring diagram illustrating the interconnection of the system components within the cabinet. Identify each component by manufacturer and model number. Install a Fiber Cross Connect Cabinet on Foundation ITS Type A with concrete pads on front and back of the cabinet. Ensure all fiber optic cables entering this cabinet are terminated into individual patch panels. Provide and install jumpers between multiple patch panels as required to complete the fiber network continuity.
- 10. ITS Integration.** Procure the services of a Systems Integrator to ensure ITS systems and individual components are integrated as shown on the plans and in the specifications. Submit proof of the integrator's qualifications demonstrating 3 years of experience on similar ITS construction projects and on similar magnitude to the RE for review and approval. Provide certifications and credentials demonstrating the integrator is certified as a Professional and authorized by Cisco® to provide the services required for the network devices. Ensure that all ITS network drawings are prepared and certified by the Systems Integrator.
- C. Testing.** Perform wiring and cable testing, as specified in [701.03.15.D](#), before performing other testing. Complete the device and system testing as indicated on the Department provided forms and instructions. Provide trained personnel to test the system and subsystems. This includes providing manufacturer certified representatives to ensure complete functionality of said systems and subsystems. The period of testing under this section and in the various testing forms available from the Department's website are in terms of working days. The test will be extended if there are state holidays during the designated testing period. When a device fails during any phase of the testing period, the testing period will be rescheduled to progress again starting from day one of that phase after the problem is addressed for the testing time period specified.
- 1. Device Testing.** Before beginning system testing, complete individual device testing as follows:
 - a. Level A.** Demonstrate that the individual devices at each work site are fully operational.
 - b. Level B.** Demonstrate that each device is fully operational from the designated control center to the work site with the original equipment manufacturer software. The Department will operate and monitor the device for a minimum of 7 working days to observe its functionality.
 - c. Level C.** Demonstrate that each device is fully operational from the designated control center to the device work site after integration into the designated control center software management systems. Conduct a test to verify that the device and communications meet the specified requirements of the Contract. After the Contractor's verification test, the Department will conduct a 14-day observational and functional test period. Provide support as needed during this testing, including adjustments to or replacements of the equipment and materials installed, modified, or otherwise disturbed until the full 14-day observation period is completed without failure as determined by the Department.

Upon successful completion of level C testing of a device, the Department will accept the device on an interim basis and will pick up the cost of associated utility services for that device from the next billing cycle as specified in [701.03.15](#).
 - 2. Project Testing.** After completion of device testing, verify the operation of the individual devices from all locations interconnected and functioning as a complete and integrated system by exercising control with the central control software of Level C. In the presence of the RE, ensure that the manufacturer's authorized technician is present to assist with installation, configuration, and testing of system hardware and software.
- After the Contractor's verification test, the Department will conduct a 14-day observational and functional test period of all systems on the Project. Provide support including adjustments to or replacements of equipment and materials until the 14-day observation and functional test period is completed.

In the event of a failure as determined by the RE, the RE will suspend the observation and functional test period until corrective action is completed. After the corrective action is completed, the RE will resume the observation and functional test period.

D. Maintenance. Perform maintenance as follows:

1. **Regular Maintenance.** Perform regular maintenance and repairs as specified in [108.09](#) after interim acceptance of a device or project testing or both until acceptance of the project and as follows:
 1. Troubleshoot malfunctioning equipment within 48 hours of failure notification by the RE.
 2. If the Contractor cannot complete the repairs in the time specified by the RE, the Department may repair the equipment and recover the cost as specified in [107.16](#). The Department will assess liquidated damages at a minimum of \$1000 per hour for each hour after the specified time until the completion of the repair.
 3. Record the work performed and submit the record to the RE. Include an explanation of the exact repairs made and identification of parts replaced by part number and circuit number.

If the Contractor fails to respond to a failure or damage notification and begin work within 2 hours of notification, the Department may respond with its own forces to restore normal operation. If the Contractor begins the work but does not finish the work within a reasonable time period as determined by the RE, the Department will also respond with its own forces to restore normal operation. If the Department mobilizes its forces to perform repairs, the Contractor agrees to pay the Department's cost of performing the work including the cost of material and labor used for the repair and the actual costs for police traffic protection and maintenance and protection of traffic.

2. **Operational Maintenance.** If an Item has completed system device testing before Substantial Completion, perform operational maintenance in 6 month intervals as follows:
 1. Exercise the equipment functionality, including uploads, downloads, fans, lights, and sensors.
 2. Replace filters, clean lenses, and check communications.
 3. Run diagnostics.
 4. Record all work and submit it to the RE.

E. Final Documentation. Submit 2 sets of the complete schematics and maintenance manuals of the equipment for each type of device provided. Include a complete sub-component parts list with each maintenance manual. Place one complete set of manuals of each device in the respective controller cabinet installed in the field, and provide a set to the RE. Also, send an electronic set to the RE. Provide documentation listed under this section at or prior to Substantial Completion of the project.

Submit as-built documentation showing the function and detail of each individual fiber and termination connection installed. Submit as-built drawings for each subsystem, including wiring and set up configurations, and software versions.

Provide drawings and diagrams in the Department's CADD format in accordance with the file structure and standards of the Department. Provide reports in MS Word format.

At a minimum, also include the following documentation:

1. Controller equipment layout and wiring.
2. System wiring diagram that illustrates the connections and cross-connections between equipment components from the field device through to the designated control center equipment and rack profiles. Include work site and designated control center set up configurations and firmware versions installed.
3. Licensed copies of the software needed for complete operation and testing of the system. Include software necessary to read the electronic files of the test results and documentation and needed to program and configure devices for any software not covered by an existing Department license. Ensure software is compatible with the Department's current operating software.
4. Controller communication protocol and System Development Kit.
5. As-Built (GPS) Inventory Report on forms provided by the Department and in the required format.
6. The original signature certification from an independent laboratory that the devices have been tested and comply with the NTCIP protocol requirements of this Contract.

7. 2 CD-R copies of the final documentation and 2 paper copies. Compile and organize the test results in 3-ring binders.
8. Troubleshooting guidelines that identify symptoms, rank their possible causes in order of highest probability, and recommend remedial actions and the required testing equipment.
9. Installation, operation, configuration, programming, maintenance, data, and schematic manuals.
10. Certification of successful deployment of ITS components from the respective equipment manufacturers with complete details of any repair work performed under warranty.
11. Commissioning reports.
12. Warranty certificates.

- F. Equipment Training.** Provide, for use by the Department, equipment necessary for proper instruction, demonstration, and testing of the system materials. Submit software used for testing to the Department for use in equipment maintenance. The software will become the property of the Department.

Provide training for installation, control, testing, and maintenance of the systems for ten (10) Department personnel. Schedule the training with the designated control center personnel to avoid interruption of daily Department operations. If necessary, conduct the training over several sessions or in multiple groups.

- G. Warranty.** In addition to the provisions set forth in [108.21](#), procure a service agreement for parts and labor to cover the period between the commissioning of the device by the manufacturer and Completion. Document the repairs made, by the manufacturer or its designated representative, to the device prior to Completion. Include an explanation of the exact repairs made and identification of parts replaced by part number and circuit number. Provide the necessary equipment for safe access to the installed device along with traffic control promptly upon request by the manufacturer to perform the repairs under the service agreement during this period. Provide the Department with a complete record of the repairs made to each device as part of the Final Documentation. Ensure that a minimum two-year warranty certificate by the manufacturer is provided and transferred to the Department with documentation as set forth in [704.02.01](#) for any repairs to be performed by the manufacturer after the date of Completion. Ensure that the start and end dates of the warranty are clearly stated on the certificate. Ensure the warranty includes shipping costs, a statement for the repair or replacement of all failed components or both to be performed by a factory authorized depot repair facility located in the United States, and that the components are returned to the Department within two weeks of the date of receipt at the repair depot. Ensure that unlimited technical support from the manufacturer or authorized dealer is provided within 4 hours of the time a call is made by the Department.

- H. Networking Requirements.** Provide ITS network devices as directed by both the Department and the State Office of Information Technology (OIT) to ensure the efficient operation, security and diagnostic capability of the ITS network being installed or modified. Provide trained personnel with the proper credentials (specifically with a Cisco Certified Network Professional certification) to properly interface and configure the ITS network to the State's network and to also interface with OIT and the Department's IT staff. Ensure the Cisco Certified Network Professional (CCNP) has at least three 3 years of experience on similar ITS networks with similar in size, complexity, and scope of this contract. Provide credentials of the CCNP to the Department for approval. Obtain a Virtual Private Network (VPN) into the Department's network to set up and monitor the network under construction by CCNP. This includes, but is not limited to the following:

1. Providing necessary Layer 3 configurations
2. Obtaining and installing network assignments
3. Security provisions
4. Multiple Virtual Local Area Network's (VLAN's) for IP switches, routers and ITS devices as directed
6. Enabling Rapid Spanning Tree protocols
7. Internet Group Management Protocol (IGMP)
8. Setting up VPNs, White lists, and Black lists
9. NATting, multicasting,
10. Configuring routers for broadband services
11. Other settings as deemed necessary by the Department
12. Other hardware configurations that are required at the behest of the Department and OIT

Ensure the correct Fiber Optic Transceiver is utilized for each switch and the correct transceiver power is used based on distance and dB loss

Ensure all Internetwork Operating System (IOS) and protocols for the network devices are compatible across the network.

Ensure that the default IP addresses and passwords set from the manufacturer are changed for all electronic devices where applicable and forward that information to the RE for each device. This includes but is not limited to ITS devices, IP switches, routers, modems and wireless equipment.

Provide an Ethernet Networking Block Diagram along with an Excel spreadsheet that includes the networking devices and the descriptions of device type, Network Assignment, and corresponding switch port and other requirements as it pertains to Ethernet networking.

- I. IT Requirements.** At least three (3) months prior to systems roll-out supply the RE with the software systems installation CD/DVDs, End User License Agreement (EULA) & other applicable licenses, instructions and configurations/settings that are required. Turn over the licenses indicating NJDOT as being the licensee at the time of acceptance.

Provide the above information in an acceptable way for NJDOT's Division of Information Technology's Security and Services personnel to perform the Server-side and Client-side installation, support and troubleshoot of the application without the need of a third-party. Refer to [704.03.01.F](#) Equipment Training for the required training.

Failure to comply with this time-constraint will result in delayed Substantial and Final Completion. The Department reserves the right to seek Liquidated Damages, as specified in [108.20](#) of the Special Provisions, for each day delayed for Substantial and Final Completion.

704.03.02 Camera Surveillance System (CSS)

- A. Components.** CSS consists of the specified components in order to provide a complete system capable of processing video and control data to and from the designated control center. The system also includes but is not limited to wiring, communication and power connections, network equipment, encoder/decoder, service charges, software, grounding, and surge protection.
- B. Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown and cost of damages for exceeding the allowable time frames will be as specified in [704.03.01.B](#). If directed by the RE, provide a bucket truck with safety equipment that can reach the height of the camera. Operate the bucket truck for the Department to use to determine the camera's final location and orientation, and for testing

Construct components as follows:

1. **Foundation CSS.** Construct the foundation as specified in [701.03.12](#).

Ensure that the anchor bolts are placed after verifying the orientation of the camera lowering system to minimize the obstruction of desired camera view by the Camera Standard.

2. **Camera Standard.** Bolt the standard securely to the foundation, and erect the standard with sufficient rake to assume a vertical position after all attachments and appurtenances are in place. Install a ground wire that extends to the ground rod from the standard.

At least 30 days before beginning construction, submit working drawings for approval that include structural calculations meeting the specified criteria. Ensure the calculations are signed and sealed by a Professional Engineer.

3. **Camera.** Mount the camera housing and camera according to the manufacturer's recommendation. Ensure that the camera's field of view is unobstructed. Perform tree trimming and site clearing to provide an unobstructed field of view as directed by the RE. Set up "On Screen Display" to indicate the quadrant views with directional titles (e.g. NB view, EB view, SB view, WB view) displayed in the bottom right corner of the screen for each camera. Leave the display blank for any quadrant not representing any highway view. For a camera with multiple highway views, include route and directional title (e.g. Rt 1 NB view). Also, establish a pan and tilt zones system and set up 4 presets for quick pan-tilt-zoom views prior to level B testing. At least 6 days prior to Level C testing, submit a request to the RE for the Department to integrate each camera into the designated control center CSS control software management system in use at the time of construction.

Ensure the camera is equipped with video and control cables that have weatherproof connectors and strain relief. Ensure cables are factory assembled and tested according to the camera manufacturer’s recommendations. Make all wire and cable camera connections to the camera controller.

Apply a polymer spray recommended by the camera manufacturer to enhance rainwater sheeting and runoff on the dome and positional housing.

- 4. **Controller, Camera.** Submit working drawings for approval that include a block wiring diagram illustrating the interconnections of the required CSS components for successful transmission of video from the field location to the designated control center and the remote operation from TOC using central CSS software. Identify each component by manufacturer and model number.

Mount the camera controller cabinet to a foundation as specified in [704.03.01.B.4](#). Ensure that the conduit entry points are properly closed off with duct sealing compound. Install the controller according to the manufacturer’s recommendations. Provide and install all required components.

- C. **Testing.** Perform testing as specified in [704.03.01.C](#).
- D. **Maintenance.** Perform maintenance as specified in [704.03.01.D](#).
- E. **Final Documentation.** Provide the documentation specified in [704.03.01.E](#).
- F. **Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.

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PROVIDE RECOMMENDATION PRIOR TO FINAL DESIGN SUBMISSION FOR ANY SPECIAL TRAINING,
AND/OR IF MORE THAN 10 PERSONNEL REQUIRE THE TRAINING.

SME CONTACT – MSE

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- G. **Warranty.** Perform repairs under warranty and provide documentation as specified in [704.03.01.G](#).
- H. **Networking Requirements.** Comply with the networking requirements and perform work as specified in [704.03.01.H](#).
- I. **IT Requirements.** Comply with the IT requirements and perform work as specified in [704.03.01.I](#) and in the Contract documents.

704.03.03 Fiber Optic Cable

- A. **Components.** When installing fiber optic cable, provide a complete communications path between 2 or more ITS devices. Installing fiber optic cable includes, but is not limited to, providing and installing conduit, junction boxes, cables, splicing, communication and power connections, service charges, terminations, software, and grounding.

At least 30 days before beginning work, submit to the RE for approval a fiber optic installation plan that lists the following items and includes a brief narrative on each:

1. Cable layout with splice locations and linear distances between splice points.
2. Fiber specific connection assignments to devices.
3. Catalog cut of the cable lubricant.
4. The manufacturer's minimum allowable cable and fiber strand bending radii.
5. Pulley wheel sizes.
6. Manufacturer's maximum outer jacket pulling tensions and monitoring device.
7. If using an air pressure system, list the blowing pressures applied to each cable size and conduit type.
8. Provide certifications from the fiber optic splice unit, OTDR, and power meter equipment manufacturer that verify the qualifications of each individual employed to perform the work.

- B. **Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown and cost of damages for exceeding the allowable time frames will be as specified in [704.03.01.B](#).

Provide and install the material necessary for a complete, functional installation including cables, cable ties, jumpers, cable identification tags, pigtailed, breakout kits, connectors, patch panels, splices, splice enclosures, testing, end caps, consumables, attenuators, and related documentation. Ensure that cable tags follow the industry standard CLEI GR-485-CORE format and nomenclature for communications and electronic components.

After the connections are completed, provide the minimum amount of slack for each cable that enters a junction box or termination enclosure as specified in [Table 701.03.15-1](#). Provide additional slack as required to meet the proposed installation as follows:

1. For an ITS Junction Box provide a total of sixty (60) feet of slack (30 feet from each entry point.)
2. For a Hub provide 10 feet of slack
3. For a Cabinet provide 3 feet of slack

Attach cable tags to cables at junction boxes that contain multiple cables and at all cabinets. Secure them with nylon cable ties.

For armored cables, install a ground rod, ground and bond all armor casings at any existing or proposed junction box at which electrical power conductors are also present.

Before installing the tracer wire, obtain RE approval of the installation locations of the tracer wire. Install a continuous tracer wire in the conduit. Do not splice tracer wire in the conduit. Provide 10 feet of slack in each junction box. If approved by the RE, the Contractor may splice the tracer wire in the junction box. If more than one conduit is installed in a single trench, the Contractor may install the tracer wire in only one conduit. When installing fiber optic cable in existing conduits, install a tracer wire as specified in [701.03.15.A](#). Perform testing of existing tracer wires for continuity and perform splicing as required in junction boxes to ensure access to the tracer wire from cabinet to cabinet.

Ensure that splices are fusion splices. Install splices only in ITS junction boxes or ITS cabinets. Use splice enclosures for splices made in junction boxes. For mid-span termination cable entry, cut only those individual fiber bundle/strands needed (ring cut) for connection to the devices. For those fibers designated for trunk line communications, do not cut the fibers or install cables that require splices at lengths less than 2500 feet.

Splice a manufacturer recommended fiber optic breakout kit with connectors to each end of the strands for a cable that terminates at a device cabinet. Label each strand using machine-printed, laminated, self-adhesive labels. Fully document the connections and individual splices in the as-built drawings.

C. Testing. Perform wiring and cable testing as specified in [701.03.15.D](#) before performing any other testing. The Department will provide forms detailing the testing requirements for the following tests:

1. **Level 1.** Test each splice with the fusion splicing unit at the time the splice is made. Record each splice decibel value electronically with the splicing machine at 1310 nanometers. Provide 2 paper copies and 1 electronic copy of the results immediately to the RE for review and approval. Clearly identify each fiber on the report. Ensure that the maximum splice loss does not exceed 0.05 decibels. If the 0.05-decibel value cannot be reached in 3 attempts, the RE may employ a third party vendor to redo the work. The Department will recover the cost as specified in [107.16](#). Provide the RE with certification from the equipment manufacturer that the splice machine was calibrated within 3 months of its use on the Contract. Recalibrate the splice machine at 6-month intervals from the initial calibration by the manufacturer.
2. **Level 2.** Perform the following Level 2 tests:
 - a. **OTDR.** Test each individual fiber after completion of splicing and connections. Perform the testing at 1310 and 1550 nanometers in both directions. Ensure that the maximum decibel loss for any single event is not greater than 0.3 decibels at 1310 nanometers; however, ensure that the OTDR machine threshold is set to record events greater than or equal in absolute value to 0.05 decibels along the positive and negative axes. Events revealed by the OTDR machine bi-directional trace average to exceed 0.3 decibels are cause for the rejection of the cable. If directed, remove and replace the cable.

Ensure that the net result of the bi-directional trace average at 1310 nanometers across a splice event is not greater than 0.15 decibels. Redo splices revealed by the OTDR machine to be greater than 0.15 decibels up to 2 additional times in order to achieve 0.15 decibels or less. If the 0.15-decibels value cannot be reached in 3 attempts, the RE may employ a third party vendor to redo the work. The Department will recover the cost as specified in [107.16](#).

Ensure that reflectance at each connector is better than (-55) decibels. Ensure the fiber loss across each fiber segment is not greater than 0.4 decibels per kilometer when tested at 1310 nanometers.

Also test, and include in the report, the dark fiber segments that are not being utilized by the signal transmission equipment. Provide connectors as necessary to test unterminated fibers.

Provide 2 paper copies and 1 electronic copy of the results immediately to the RE for review and approval. Clearly identify each fiber on the report. Provide the RE with certification from the equipment manufacturer that the OTDR was calibrated within 3 months of its use on the Contract. Recalibrate the OTDR at 6-month intervals.

- b. Power Meter.** Measure and record fiber segment optical budgets including each end connector, according to the meter manufacturer instructions. Compile the test results in a binder and submit 2 copies with the final documentation. Perform power meter tests at 1310 nanometers and 1550 nanometers in both directions after completion of cable and connector splicing. Ensure that the maximum connector loss tested at 1310 nanometers is 0.8 decibels with the average of all connectors in the tested fiber segment being 0.5 decibels.

Provide 2 paper copies and 1 electronic copy of the results immediately to the RE for review and approval. Clearly identify each fiber on the report and the work site location of the end points. Provide the RE with a certification from the equipment manufacturer that the power meters were calibrated within 3 months of their use on the Contract. Recalibrate at 6-month intervals.

After completion of Level 1 and 2 tests, perform network communication system testing and demonstrate that the communication system is fully operational to meet the material specifications and project requirements. Complete the testing as specified on the Department provided forms and instructions.

- D. Maintenance.** Perform maintenance as specified in [704.03.01.D](#).

- E. Final Documentation.** Provide the following:

1. Individual splice connection as-built drawings in the format specified by the Department.
2. Splice machine, OTDR, and power meter readings with manufacturer’s software disks to read the test results. Include power meter test results for each individual fiber section showing the optical budget between the termination point connectors. Include all unused fibers. Include OTDR electronic trace files and computer software so that the user can set any threshold values desired for all parameters and can view all ranges of events.
3. Cable identification key sheet.
4. Spreadsheets that identify the file names of the same fiber shot in both directions. Identify the individual common events and calculate the true event loss by averaging the point value of the fiber traces from each direction. Include this calculation in the spreadsheet tables. Supply 2 CD-R copies of the final documentation and 2 paper copies. Compile and organize the test results in 3-ring binders.
5. Licensed copies of splice and test equipment software. Ensure that the software is compatible with Windows XP operating system.
6. Communications system equipment fiber optic interconnections, including patch panel cross connections.
7. Inventory Report on the form provided by the Department.

- F. Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.

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**PROVIDE RECOMMENDATION PRIOR TO FINAL DESIGN SUBMISSION FOR ANY SPECIAL TRAINING,
 AND/OR IF MORE THAN 10 PERSONNEL REQUIRE THE TRAINING.**

SME CONTACT – MSE

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704.03.04 Controlled Traffic Signal System (CTSS)

- A. Components.** CTSS consists of the Items needed to provide a complete system that is capable of controlling a series of interconnected signalized intersections and processing control data to and from the designated control center. The system also includes, but is not limited to, electronic and electrical devices, network equipment, servers, cabinet,

wiring, programming, configuration, communication and electric service, service charges, connections, software, grounding, and surge protection.

- B. Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown and cost of damages for exceeding the allowable time frames will be as specified in [704.03.01.B](#). Prior to beginning any work, coordinate with Traffic Operations and NJOIT to confirm the system architecture and placement of the specified servers.

Construct components as follows:

1. **Controller, CTSS.** Submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the CTSS components from the field location to the designated control center. Identify each component by manufacturer and model number.

Construct as specified in [702.03.01](#) and configure the CTSS software.

Configuration of the CTSS software includes the following at a minimum:

- a. Setup of intersection parameters, coordination parameters, system parameters, and graphics including all GIS shape files and aerials
 - b. Configuration of control operations and coordination
 - c. Development of intersection operational databases
 - d. Configuring and programming local traffic controllers
 - e. Inputting the timing plans into the CTSS software and traffic controller software to be utilized as a fallback backup for intersections that are not running in the adaptive mode
 - f. Integration of the CTSS server, workstations and local traffic controllers with the communication network
 - g. Integration of the Image Detection units and System Detection units with traffic controller.
 - h. Configuration and calibration of Image Detection units
 - i. Configuration and calibration of System Detection units
 - j. Integration of the Image Detection server and Image Detection units with the communication network
 - k. Configuration of Image Detection System
 - l. Integration of the System Detection server and System Detection units with the communication network
 - m. Configuration of System Detection System
2. **CTSS Controller Unit.** Submit working drawings that include a block wiring diagram that illustrates the interconnections of the CTSS components from the field location to the designated control center. Identify each component by manufacturer and model number.

Provide and install a traffic controller unit, NEMA “D” panel and harness to maintain compatibility in the existing traffic signal controller cabinet. Perform: the required wiring; CTSS software configuration, programming and testing; and remove the existing controller unit from the traffic signal control cabinet. Provide and install traffic signal controller module hardware and software necessary to satisfy the communications and manufacturer requirements of the requested type of CTSS. Clean dust, dirt, and debris from the inside of the cabinet and replace air filters and light fixtures. Employ a manufacturer’s certified representative to program and configure the controllers with the timing plan directive parameters. Place the intersection into cabinet flash during installation of the CTSS controller unit.

Configure the CTSS software as specified in [704.03.04.B.1](#). Controller, CTSS.

3. **Controller, CTSS Turn On.** Controller CTSS Turn On consists of supplying a technician authorized by the controller manufacturer at the work site when each controller is placed into flash mode and into final operation. Provide the RE a letter at least 48 hours in advance of the work, from the controller manufacturer, stating the technician is authorized and qualified to perform the work. Ensure that the technician is available at all times during flash mode testing. Ensure that traffic signals complete a successful flash period for 3 consecutive days as part of the required testing. The Department will allow the signal to be on flash mode between 11:00 pm and 4:00 am. Program the Department’s existing signal timing directives as a fallback for when the system is not running in adaptive operation.

- 4. System Detector, Type Radar.** At least 30 days before beginning construction, submit working drawings for approval that include structural calculations for the pole-mounted System Detector equipment. Ensure the calculations are signed and sealed by a NJ-licensed Professional Engineer. Submit a block wiring diagram and cabinet layout diagram for integration of the System Detectors in the applicable traffic signal cabinet back panels, the existing Department Traffic Management System, and the CTSS. Identify each component by manufacturer and model number. Provide and install a local disconnect switch and grounding components in accordance with NEC requirements. Ensure that the work conforms to the NEC and does not violate the High Voltage Proximity Act.

Mount the radar detectors as displayed on the Plans. Provide and install the required components at the System Detector locations and in the CTSS controller cabinets, including but not limited to communications components, firmware, contact closures, and applicable network components.

Provide and install pole-mounted cabinet enclosures and hardware required to house equipment at System Detector locations. Provide and install material, equipment, and wiring required to control and power the equipment.

Obtain and provide software licensing required to successfully interface and integrate the radar detectors with NJDOT’s head-end traffic data storage server, existing Traffic Management System, and CTSS. Provide for the transmission of detector-collected data to the NJDOT storage server. Coordinate with NJOIT and the Department to determine and verify data port assignments in the field and at the server to automatically transmit the archived data to an FTP server.

- C. Testing.** Perform testing as specified in [704.03.01.C](#) and in accordance with the Verification Plan and Department Testing and Certification Procedures using the forms found at the following link:

<http://www.state.nj.us/transportation/eng/elec/ITS/testing.shtm>

After the Contractor’s verification testing of the Adaptive CTSS is completed in accordance the Verification Plan and the Department’s CTSS Testing and Certification forms, the Department will conduct an observational and functional “burn-in” test period of the systems on the Project which may last up to 6 months. During this period the Department will validate the CTSS in accordance with the Validation Plan with the contractor providing assistance and support where necessary.

Also, before delivery to the Project Limits, perform a 168-hour burn in test period for the assembled, programmed and configured CTSS controller and CTSS controller unit following the requirements of [702.03.01](#) for continuous operation without failure.

- D. Maintenance.** Perform maintenance as specified in [704.03.01.D](#).

- E. Final Documentation.** Provide the documentation specified in [704.03.01.E](#) and the following:

- For CTSS controller, provide a detailed drawing of the controller back panel and subpanel wiring and equipment layout. For CTSS controller unit, provide the detailed “D” harness wiring drawing and the connections to the back panel.
- Original signature certification of the CTSS controller and CTSS controller unit to verify that the equipment has been programmed, configured, wired, functions, and operates as specified in the Contract.
- For Image Detectors and System Detectors, provide configuration and calibration parameters for each detector.
- Provide documents and information related to installation of CTSS devices, servers and workstations communicating on the NJDOT network as required by OIT and IT.

- F. Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.

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PROVIDE RECOMMENDATION PRIOR TO FINAL DESIGN SUBMISSION FOR ANY SPECIAL TRAINING, AND/OR IF MORE THAN 10 PERSONNEL REQUIRE THE TRAINING.

SME CONTACT – AAM UNIT OF MSE

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- G. Warranty.** Perform repairs under warranty and provide documentation as specified in [704.03.01.G](#).

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CONTACT MSE'S AAM UNIT FOR ANY SPECIFIC WARRANTY REQUIREMENTS AND MODIFY THE ABOVE TO MEET THEIR REQUIREMENTS AND INSERT HERE

SME CONTACT – AAM (ADVANCED ARTERIAL MANAGEMENT) OF MSE

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H. Networking Requirements. Comply with the networking requirements and perform work as specified in [704.03.01.H](#) and in the Special Provisions.

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PROVIDE ADDITIONAL NETWORKING REQUIREMENTS

SME CONTACT – NJOIT

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I. IT Requirements. Comply with the IT requirements and perform work as specified in [704.03.01.I](#) and in the Special Provisions.

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PROVIDE ADDITIONAL IT REQUIREMENTS

SME CONTACT – NJOIT

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704.03.05 Travel Time Systems (TTS)

- A. Components.** A TTS consists of the specified components needed to provide a complete system that is capable of measuring traffic speed, time, and volume, can process data to and from the designated control center and is integrated into the central control system for the purpose of determining and reporting travel time information. The system also includes, but is not limited to, the electronic and electrical equipment, wiring, central system database configurations, communication and electric service connections, service charges, software, grounding, and surge protection.
- B. Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown and cost of damages for exceeding the allowable time frames will be as specified in [704.03.01.B](#).

Construct components as follows:

- 1. Foundation, TTS.** Construct the foundation as specified in [701.03.12](#).
- 2. Detector Standard.** Bolt the standard securely to the foundation, and erect the standard with sufficient rake to assume a vertical position after the attachments and appurtenances are in place. Install a ground wire that extends to the ground rod from the standard.
- 3. Controller, TTS.** Submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the TTS components from the field location to the designated control center. Identify each component by manufacturer and model number.

Securely bolt the controller cabinet to the foundation in a vertical position using stainless steel hardware. Seal the underground conduit entrance to the controller with a sealing compound.
- 4. TTS Detector.** Submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the TTS components from the field location to the designated control center. Identify each component by manufacturer and model number.

Install the detector according to the manufacturer's recommendations.

Mark wire and cable detector connections to the controller.

C. Testing. Perform testing as specified in [704.03.01.C](#). Ensure that the system demonstrates accurate posting of travel times during AM, Midday, and PM peaks in accordance with TTS test forms and specified requirements.

D. Maintenance. Perform maintenance as specified in [704.03.01.D](#).

E. **Final Documentation.** Provide the documentation specified in [704.03.01.E](#), including configuration data and parameters with channel assignments per traveled lane.

F. **Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.

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PROVIDE RECOMMENDATION PRIOR TO FINAL DESIGN SUBMISSION FOR ANY SPECIAL TRAINING, AND/OR IF MORE THAN 10 PERSONNEL REQUIRE THE TRAINING.

SME CONTACT – MSE

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G. **Warranty.** Perform repairs under warranty and provide documentation as specified in [704.03.01.G](#).

H. **Networking Requirements.** Comply with the networking requirements and perform work as specified in [704.03.01.H](#) and in the Contract documents.

I. **IT Requirements.** Comply with the IT requirements and perform work as specified in [704.03.01.I](#) and in the Contract documents.

704.03.06 Road Weather Information System (RWIS)

A. **Components.** A RWIS consists of the specified components needed to provide a complete system that is capable of processing sensor and control data to and from the designated control center for wind speed and direction, gusts, precipitation, visibility, humidity, pavement surface, and subsurface temperature. The system also includes, but is not limited to, the electronic and electrical equipment, cabinet, wiring, configuration, communication and power connections, service charges, software, grounding, and surge protection.

B. **Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown and cost of damages for exceeding the allowable time frames will be as specified in [704.03.01B](#).

Construct components as follows:

1. **Weather Station.** Construct the foundation as specified in [701.03.12](#).

Submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the RWIS components from the field location to the designated control center. Identify each component by manufacturer and model number.

Install RWIS devices and materials, including cabinet enclosure, camera, electric power devices, remote microprocessor controlled unit, software, back panel, main power disconnect, surge suppression, communication modems, atmospheric sensors, road, subsurface and bridge sensors, sensor leads, grounding, and wires and incidental material. Aim the camera for proper functioning of the system. Follow the manufacturer’s recommended installation, calibration, and configuration instructions.

Install sensors embedded in the pavement according to the manufacturer’s recommendations. Sawcut the pavement, pressure wash, and dry the sawcut before installing the sensors. Install each cable from the sensor in a separate individual sawcut to the conduit at the curb leading to the nearest junction box. Install bridge sensors according to the manufacturer’s recommendations.

Do not splice cables and sensor leads.

If not connected into the fiber optic network, obtain and provide communications with a utility service provider from the field microprocessor to the existing Department RWIS designated control center.

2. **Weather Station, Roadway Devices.** Install sensors embedded in the pavement and on bridges according to the manufacturer’s requirements for connections into existing weather stations. Sawcut the pavement, pressure wash, and dry the sawcut before installing the sensors.

Install each cable from the sensor in a separate individual sawcut to the conduit at the curb leading to the nearest junction box. Do not splice cables and sensor leads.

C. **Testing.** Perform testing as specified in [704.03.01.C](#).

- D. **Maintenance.** Perform maintenance as specified in [704.03.01.D](#).
- E. **Final Documentation.** Provide the documentation specified in [704.03.01.E](#) and the following:
 1. Configuration data and parameters, port and channel assignments for each traveled lane.
 2. Calibration coefficient data for each sensor.
- F. **Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.

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PROVIDE RECOMMENDATION PRIOR TO FINAL DESIGN SUBMISSION FOR ANY SPECIAL TRAINING, AND/OR IF MORE THAN 10 PERSONNEL REQUIRE THE TRAINING.

SME CONTACT – BUREAU OF PERMITS, ELECTRICAL MAINTENANCE & CLAIMS

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- G. **Warranty.** Perform repairs under warranty and provide documentation as specified in [704.03.01.G](#).
- H. **Networking Requirements.** Comply with the networking requirements and perform work as specified in [704.03.01.H](#) and in the Contract documents.
- I. **IT Requirements.** Comply with the IT requirements and perform work as specified in [704.03.01.I](#) and in the Contract documents.

704.03.07 Dynamic Message System (DMS)

- A. **Components.** DMS consists of the specified components needed to provide a complete system that is capable of processing control data to and from the designated control center. The system also includes, but is not limited to, wiring, communication and power connections, networking equipment, service charges, software, grounding, and surge protection.

2*****2

COMPLETE AND INCLUDE THE FOLLOWING WHEN DMS SIGNS ARE INCLUDED IN THE PROJECT. ALSO, INCLUDE THE APPROPRIATE NOTES AND INFORMATION FOR EACH DMS PROPOSED IN THE CONTRACT.

SME CONTACT – MOBILITY & SYSTEMS ENGINEERING

The following are the Model numbers for the various DMS to be provided and installed in this project:

Location	Communication Type	DMS Type	Manufacturer/Model No.

Ensure that the designated Model numbers for the various DMS signs are provided as specified in the Contract documents.

Ensure that Controller, DMS is purchased with pre-installed controller, pre-wired with the equipment listed below along with specialized communications cables (minimum 120' Fiber Optic Cable with Connectors for each sign).

As part of the specified model numbers, ensure the DMS manufacturer supplies the cabinet and controller for each DMS sign with pre-installed uninterruptable power supply (UPS), a media converter and a TCP/IP wireless modem conforming to the wireless provider requirements. Provide other equipment not listed here but required for the remote operation of the DMS.

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Ensure that the installation of DMS is coordinated with the power service company in such a manner that the DMS sign is powered up within two weeks of installation. If this is not achieved, provide a generator on site for electrical power along with needed maintenance of the generator and refueling until the electrical service by the power company is installed.

When the final communication using fiber or other leased ISP services is delayed by more than two weeks upon initial installation of DMS sign, activate the wireless service for temporary or interim use until final communications service is installed so the TOC can use the DMS during this delay beyond two weeks.

For DMS sign that will be communicating over fiber optic communication media, provide and install an Ethernet Switch Type B and a fiber optic cable patch panel with interconnecting cables for each DMS controller.

For DMS sign that will be communicating over leased ISP services, provide and install a Router as specified in the Special Provisions and in the Contract Documents.

- B. Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown and cost of damages for exceeding the allowable time frames will be as specified in [704.03.01.B](#).

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Construct the DMS sign mounting structure and foundation as specified in [Division 500](#).

DMS STRUCTURE REQUIRES THE CONTRACTOR TO FOLLOW DIVISION 500 SPECIFICATIONS FOR STRUCTURAL DETAILS AND OTHER REQUIREMENTS.INCLUDING FOUNDATION

SME CONTACT –STRUCTURES

2*****2

Construct components as follows:

- 1. DMS Sign.** At least 30 days before beginning construction, submit working drawings for approval that include sign mounting and lifting calculations. Ensure the calculations are signed and sealed by a Professional Engineer. Mount the sign on the standard or structure and install the controller according to the manufacturer’s recommendations. Securely bolt the controller to the foundation in a vertical position using stainless steel hardware. Seal the underground conduit entrance to the controller with a sealing compound. Install cables and wire connections between the sign and controller according to the manufacturer’s recommendations. Ensure that the conduit entry points are properly closed off with duct sealing compound. Provide sign manufacturer technician for commissioning the sign and coordinate with the sign manufacturer by providing access and support during commissioning and for any warranty work covered by the DMS manufacturer.

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THIS ITEM IS FOR DMS SIGNS OF VARIOUS TYPES AND SIZES WHEN PROPOSED TO BE PROVIDED AND INSTALLED BY THE CONTRACTOR. INCLUDE THE MAKE AND MODEL NUMBER OF DMS SIGN IN SECTION 918 AND IN THE TABLE IN SECTION 704.03.07.A. ALSO, INCLUDE IT IN THE ITS PLANS. CONTACT MSE FOR FURTHER DETAILS. WHEN THIS ITEM IS USED IN A PROJECT, “CONTROLLER DMS” AND “FOUNDATION ITS TYPE D” OR “FOUNDATION ITS TYPE D-MC” AS APPLICABLE WILL BE REQUIRED FOR CONTROLLER/METER CABINET MOUNTING.

SME CONTACT – MSE

2*****2

Ensure control cables are factory assembled and tested according to the sign manufacturer’s recommendations. Make wire and cable connections to the DMS sign controller according to the sign manufacturer’s recommendations.

Perform tree trimming and site clearing to provide an unobstructed field of view up to 1000 feet from the sign as directed by the RE.

- 2. Controller, DMS.**

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THIS ITEM IS REQUIRED WHEN INSTALLING NEW DMS SIGNS AND MUST BE PURCHASED FROM THE DMS SIGN MANUFACTURER. PROVIDE THE MODEL NUMBER OF THE DMS SIGNS TO THE MANUFACTURER FOR WHICH CONTROLLER DMS ARE REQUIRED. ADDITIONAL PAY ITEMS LIKE “FOUNDATION ITS TYPE D” OR “FOUNDATION ITS TYPE D-MC” FOR MOUNTING CONTROLLER/METER CABINETS AS APPLICABLE WILL BE REQUIRED.

SME CONTACT – MSE

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At least 30 days before beginning construction, submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the DMS components from the field location to the designated control center. Identify each component by manufacturer and model number.

Securely bolt the controller to the foundation in a vertical position using stainless steel hardware. Seal the underground conduit entrance to the controller with a sealing compound.

Install cables and wire connections between the sign and controller according to the manufacturer’s recommendations. Ensure that the conduit entry points are properly closed off with duct sealing compound.

- C. **Testing.** Perform testing as specified in [704.03.01.C](#).

For DMS, perform both Level B and Level C Testing after integration into the Central DMS control software system.

- D. **Maintenance.** Perform maintenance as specified in [704.03.01.D](#).

- E. **Final Documentation.** Provide the documentation specified in [704.03.01.E](#).

- F. **Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.

2*****2

PROVIDE RECOMMENDATION PRIOR TO FINAL DESIGN SUBMISSION FOR ANY SPECIAL TRAINING, AND/OR IF MORE THAN 10 PERSONNEL REQUIRE THE TRAINING.

SME CONTACT – MSE

2*****2

- G. **Warranty.** Perform repairs under warranty and provide documentation as specified in [704.03.01.G](#).

- H. **Networking Requirements.** Comply with the networking requirements and perform work as specified in [704.03.01.H](#) and in the Contract documents.

- I. **IT Requirements.** Comply with the IT requirements and perform work as specified in [704.03.01.I](#) and in the Contract documents.

704.03.08 Weigh in Motion System (WIMS)

- A. **Components.** A WIMS consists of the specified components needed to provide a complete system that is capable of processing pavement sensor and control data to and from the control center in Trenton. The WIMS is composed of electronic and electrical equipment, pavement sensors, cables, wiring, control cabinet, site processor, remote communication modems, operating software, and software used to process and generate reports on the collected raw vehicle record files. The system also includes, but is not limited to, wiring, cabinet, foundation, communication and power connections, service charges, software, grounding, and surge protection.

- B. **Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown will begin at 10 P.M. daily and continues through to 4 A.M. on weekdays, 5 A.M. on Saturdays, and 6 A.M. on Sunday mornings unless otherwise noted in the Special Provisions and the cost of damages for exceeding the allowable time frames is specified in the Special Provisions. The Department will recover the cost as specified in [107.16](#).

2*****2

CONTACT TRAFFIC OPERATIONS TO CONFIRM THE EXISTING SYSTEM SHUTDOWN TIME. REVISE AS DIRECTED AND INSERT HERE

SME CONTACT – TRANSPORTATION DATA AND SAFETY

PROVIDE THE COST OF DAMAGES FOR EXCEEDING THE ALLOWABLE TIME FRAMES

SME CONTACT – TRANSPORTATION DATA AND SAFETY

2*****2

If not connected into the fiber optic network, obtain and provide communications with a Utility service provider from the field microprocessor to the Department WIMS control center in Trenton.

Make operational electronic and electrical components to monitor volume, speed, length, gap, headway, vehicle type classification by axle configuration, and axle weights. The roadway sensors are composed of inductive loop detectors, loop leads, weight sensors, and temperature sensor. The WIMS electronics are installed at each work site with electrical power and communications for remote station programming, monitoring and failure diagnosis, and data retrieval.

Construct components as follows:

1. Controller, WIMS. Construct the foundation as specified in [701.03.12](#).

At least 30 days before beginning construction, submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the WIMS components from the field location to the control center in Trenton. Identify each component by manufacturer and model number.

Securely bolt the controller cabinet to the foundation in a vertical position using stainless steel hardware. Seal the underground conduit entrance to the controller with a sealing compound.

2. WIM Roadway Devices. Install the devices according to the manufacturer's requirements. Pressure wash and dry the sawcut as recommended by the manufacturer. Ensure that sensors, loop detector wires, and cables are installed in separate conduit per type of device and that conduit is waterproofed and sealed. Ensure that the temperature sensor is installed in a schedule 80 PVC conduit in the shoulder of the roadway. Maintain at least 3 feet of space between the sawcut loops and the sensors. After completion of the HMA, re-establish the location of each loop edge to facilitate and mark for cutting of the slot for the axle weight sensor. Ensure that the lengths of weight sensors do not exceed the width of the lanes. Do not splice cables. Grind the top of the encapsulation material flushed with the road.

Ensure that the piezoelectric sensors are installed perpendicular to the flow of traffic and are without twists or curls. Position shorter sensors (6 feet length) to one side in a wheel path, not in the center of the lane; position longer sensors in the center of the lane. Cut a slot for the sensor that is 8 inches longer than the sensor. Do not mix or place the epoxy until the RE has approved the cleaning operations.

C. Testing. Perform testing as specified in [704.03.01.C](#), except do not perform Level B as specified in [704.03.01.C.1.b](#). Also perform the testing as follows:

Use an LCR Meter to measure the capacitance, resistance, and dissipation factor of each sensor. When the lane is opened to traffic, perform a functional test on the sensor using an oscilloscope.

Provide a 5-axle tractor-trailer combination (3-axle tractor and 2-axle semi-trailer) and driver for calibration of the WIM system. Weigh the calibration truck on a certified, multi-draft public scale. Also weigh the steering axle, drive tandem axles, and trailer tandem axles. Record and provide the weight data to the RE at the start of the test. Include the total gross weight of the combination. Ensure that the truck has an air-ride suspension and is in good mechanical condition. Ensure that the trailer is a dry van type and loaded with a non-shifting load so that the gross weight of the tractor-trailer combination is between 75,000 and 80,000 pounds. Ensure that the axle-loads do not exceed New Jersey Title 39 limits, and do not violate the Federal Bridge Formula.

Drive the truck over each lane a minimum of 5 times and record the axle and gross weights as determined by the WIM system by each sensor for each pass. Use the average values among the 5 passes to calculate a calibration factor for each sensor. Perform this test twice.

After the calibration, ensure that the average values recorded by the WIM system are within 10 percent of each axle weight (average axle weight of each axle group) and within 5 percent of the gross weight of the combination of the weights recorded at the public scale.

If the system cannot be properly calibrated after 3 attempts, the RE may employ a third party vendor to redo the work. The Department will recover the cost as specified in [107.16](#).

D. Maintenance. Perform maintenance as specified in [704.03.01.D](#).

E. Final Documentation. Provide the documentation specified in [704.03.01.E](#) and the following:

1. Configuration data and parameters, port and channel assignments for each traveled lane.

2. Calibration coefficient data for each sensor.

F. **Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.

2*****2

PROVIDE RECOMMENDATION PRIOR TO FINAL DESIGN SUBMISSION FOR ANY SPECIAL TRAINING, AND/OR IF MORE THAN 10 PERSONNEL REQUIRE THE TRAINING.

SME CONTACT – TRANSPORTATION DATA AND SAFETY

2*****2

G. **Warranty.** Perform repairs under warranty and provide documentation as specified in [704.03.01.G](#).

H. **Networking Requirements.** Comply with the networking requirements and perform work as specified in [704.03.01.H](#) and in the Contract documents.

I. **IT Requirements.** Comply with the IT requirements and perform work as specified in [704.03.01.I](#) and in the Contract documents.

704.03.09 Traffic Volume System (TVS)

A. **Components.** A TVS consists of the specified components needed to provide a complete system that is capable of processing traffic control data to and from the control center in Trenton including pavement loop and vehicle detectors, electronic devices to measure and record vehicle volume, speed, length, gap, and headway in each lane connected to the respective monitoring devices in a cabinet. The system also includes wiring, cabinet, foundation, communication and power connections, service charges, software, grounding, and surge protection.

B. **Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown will begin at 10 P.M. daily and continues through to 4 A.M. on weekdays, 5 A.M. on Saturdays, and 6 A.M. on Sunday mornings unless otherwise noted in the Special Provisions and the cost of damages for exceeding the allowable time frames is specified in the Special Provisions. The Department will recover the cost as specified in [107.16](#).

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COMPLETE AND INCLUDE THE FOLLOWING.

INSERT THE EXISTING SYSTEM SHUTDOWN TIME FRAMES, INCLUDING DAYS OF THE WEEK, SPECIFIC DATES, AND/OR HOURS OF THE DAY(S).

SME CONTACT – TRANSPORTATION DATA AND SAFETY

The Department will allow existing TVS system shutdowns from _____.

PROVIDE THE COST OF DAMAGES FOR EXCEEDING THE ALLOWABLE TIME FRAMES

SME CONTACT – TRANSPORTATION DATA AND SAFETY

2*****2

If not connected into the fiber optic network, obtain and provide communications with a Utility service provider from the field microprocessor to the Department TVS control center in Trenton.

Construct components as follows:

1. **Controller, TVS.** Construct the foundation as specified in [701.03.12](#).

Submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the TVS components from the field location to the control center in Trenton. Identify each component by manufacturer and model number.

Make operational electronic and electrical components to monitor volume, speed, length, gap, and headway. Ensure the roadway sensors are composed of inductive loops and loop leads. Ensure the TVS electronics are installed at each work site with electrical power and communications for remote station programming, monitoring and failure diagnosis, and data retrieval.

Securely bolt the controller cabinet to the foundation in a vertical position using stainless steel hardware. Seal the underground conduit entrance to the controller with a sealing compound.

- 2. **TVS Roadway Devices.** Sawcut the pavement. Pressure wash then dry the sawcut according to the manufacturer’s recommendations. Ensure that sensors, loop detector wires, and cables are installed in separate conduit per type of device and that the conduit is waterproofed and sealed. Maintain at least 3 feet of space between the sawcut loops and the sensors. Do not splice cables. Grind the top of the encapsulation material flush with the road.
- C. **Testing.** Perform testing as specified in [704.03.01.C](#), except do not perform Level B as specified in [704.03.01.C.1.b](#). Also perform the testing as follows:
 - Use an LCR Meter to measure the capacitance, resistance, and dissipation factor of each sensor. When the lane is opened to traffic, perform a functional test on the sensor using an oscilloscope.
 - Measure the ratio of loop inductance to lead inductance and ensure it is within the requirements of the sensor manufacturer.
- D. **Maintenance.** Perform maintenance as specified in [704.03.01.D](#).
- E. **Final Documentation.** Provide the documentation specified in [704.03.01.E](#) and the following:
 - 1. Configuration data and parameters, port and channel assignments.
 - 2. Calibration data for each sensor.
- F. **Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.

2*****2
**PROVIDE RECOMMENDATION PRIOR TO FINAL DESIGN SUBMISSION FOR ANY SPECIAL TRAINING,
 AND/OR IF MORE THAN 10 PERSONNEL REQUIRE THE TRAINING.**

SME CONTACT – TRANSPORTATION DATA AND SAFETY
 2*****2
- G. **Warranty.** Perform repairs under warranty and provide documentation as specified in [704.03.01.G](#).
- H. **Networking Requirements.** Comply with the networking requirements and perform work as specified in [704.03.01.H](#) and in the Contract documents.
- I. **IT Requirements.** Comply with the IT requirements and perform work as specified in [704.03.01.I](#) and in the Contract documents.

704.03.10 Variable Speed Limit System (VSLS)

- A. **Components.** A VSLS consists of the specified components needed to provide a complete system that is capable of processing traffic speed data to and from the control center, including electronic devices to measure and record vehicle speed in each lane connected to the respective monitoring devices in a cabinet. The system also includes wiring, cabinet, foundation, communication and power connections, service charges, software, grounding, and surge protection.
 - Ensure that the designated Model numbers for the various VSLS signs are provided as specified in the Special Provisions and the Contract Plans.
 - Procure VSLS auxiliary control panel with the speed limit sign from the VSLS manufacturer. Install VSLS auxiliary control panel inside VSLS, Controller. Provide Ethernet cables from VSLS sign to controller, VSLS (length as required per contract plans). Provide other equipment not listed here but required for the remote operation of the VSLS.
- B. **Installation.** Before beginning the work and during the work, comply with the requirements of [701.03.01](#). The allowable time frame for existing system shutdown and cost of damages for exceeding the allowable time frames will be as specified in [704.03.01.B](#).
 - Construct components as follows:

- 1. **VSLS Sign.** Submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the VSLS components from the field location to the control center. Identify each component by manufacturer and model number. Mount the sign on the VSLS sign support structure as specified in the contract documents and install the controller according to the manufacturer’s recommendations. Construct the foundation for Controller VSLS as specified in [701.03.12](#) and as per contract documents. Securely bolt the controller to the foundation in a vertical position using stainless steel hardware. Seal the underground conduit entrance to the controller with a sealing compound. Install cables and wire connections between the sign and controller according to the manufacturer’s recommendations. Ensure that the conduit entry points are properly closed off with duct sealing compound. Provide a manufacturer technician for commissioning the VSLS and coordinate with the manufacturer by providing access and support during commissioning and for warranty work covered by the VSLS manufacturer under their service agreement with the contractor.

Make operational electronic and electrical components of VSLS to display the desirable speed limit based on field conditions collected by roadway sensors and as per specific information provided by NJDOT during designated times of the day and based on other criteria specified in the contract documents. Ensure that the VSLS signs are installed at the designated locations with power and communications for remote operation of programming, monitoring, failure diagnosis, and data retrieval.

- 2. **Controller, VSLS.**

2*****2

THIS ITEM IS REQUIRED WHEN INSTALLING NEW VSLS SIGNS AND MUST BE PURCHASED FROM THE VSLS SIGN MANUFACTURER. PROVIDE THE MODEL NUMBER OF THE VSLS SIGNS TO THE MANUFACTURER FOR WHICH CONTROLLER VSLS ARE REQUIRED. ADDITIONAL PAY ITEMS FOR MOUNTING CONTROLLER/METER CABINETS AS APPLICABLE WILL BE REQUIRED.

SME CONTACT – MSE & TRAFFIC OPERATIONS

2*****2

At least 30 days before beginning construction, submit working drawings for approval that include a block wiring diagram that illustrates the interconnections of the VSLS components from the field location to the designated control center. Identify each component by manufacturer and model number.

Securely bolt the controller to the foundation in a vertical position using stainless steel hardware. Seal the underground conduit entrance to the controller with a sealing compound.

Install cables and wire connections between the sign and controller according to the manufacturer’s recommendations. Ensure that the conduit entry points are properly closed off with duct sealing compound.

- C. **Testing.** Perform testing as specified in [704.03.01.C](#) and in the Special Provisions.
- D. **Maintenance.** Perform maintenance as specified in [704.03.01.D](#).
- E. **Final Documentation.** Provide the documentation specified in [704.03.01.E](#).
- F. **Equipment Training.** Provide training as specified in [704.03.01.F](#) and in the Special Provisions.
- G. **Warranty.** Perform repairs under warranty and provide documentation as specified in [704.03.01.G](#).
- H. **Networking Requirements.** Comply with the networking requirements and perform work as specified in [704.03.01.H](#) and in the contract documents.
- I. **IT Requirements.** Comply with the IT requirements and perform work as specified in [704.03.01.I](#) and in the Contract document.

704.04 MEASUREMENT AND PAYMENT

1*****1

OBTAIN THE LATEST REVISED STANDARD DETAIL SHEETS THAT ARE AVAILABLE FROM NJDOT MOBILITY AND SYSTEMS ENGINEERING (MSE) FOR INCLUSION IN THE CONTRACT PLANS UNTIL THEY ARE ISSUED VIA BDC

SME CONTACT – MSE

1*****1

The Department will measure and make payment for Items as follows:

<i>Item</i>	<i>Pay Unit</i>
JUNCTION BOX ITS TYPE ____	UNIT
JUNCTION BOX ITS, RELOCATION	UNIT
COMMUNICATION CABLE	LINEAR FOOT
FOUNDATION ITS TYPE ____	UNIT
CONTROLLER, ITS	UNIT
COMMUNICATION HUB	UNIT
CONTROL CENTER SYSTEM, LOCATION ____	LUMP SUM
METER CABINET ITS	UNIT
ITS CONDUITS, TYPE _____	LINEAR FOOT
FIBER CROSS CONNECT CABINET	UNIT
FOUNDATION CSS	UNIT
CAMERA STANDARD TYPE ____	UNIT
CAMERA	UNIT
CONTROLLER, CAMERA	UNIT
FIBER OPTIC CABLE TYPE ____	LINEAR FOOT
CONTROLLER, CTSS	UNIT
CTSS CONTROLLER UNIT	UNIT
CONTROLLER, CTSS TURN ON	UNIT
SYSTEM DETECTOR, TYPE ____	UNIT
FOUNDATION TTS TYPE ____	UNIT
DETECTOR STANDARD	UNIT
CONTROLLER, TTS	UNIT
TTS DETECTORS TYPE _____	UNIT
WEATHER STATION	UNIT
WEATHER STATION ROADWAY DEVICES ____ LANES	UNIT
DMS SIGN	UNIT
CONTROLLER DMS	UNIT
CONTROLLER, WIM	UNIT
WIM ROADWAY DEVICES ____ LANES	UNIT
CONTROLLER, TVS	UNIT
TVS ROADWAY DEVICES ____ LANES	UNIT
VSLs SIGN	UNIT
CONTROLLER, VSLs	UNIT

The Department will consider ITS CONDUITS, TYPE _____ as a single conduit comprised of multiple individual conduits as shown in details along with a tracer wire and will be measured as one pay unit.

The Department will make payment for each item, except for FIBER OPTIC CABLE, TYPE____, STANDARDS, JUNCTION BOXES, and FOUNDATIONS, as follows:

Work Completed	Payment
Installing the Item	60% of Total Contract Price
Successful completion of Level A testing	10% of Total Contract Price
Successful completion of Level B testing	10% of Total Contract Price
Successful completion of Level C testing	10% of Total Contract Price
Successful completion of Project testing	10% of Total Contract Price

If a level of testing is not required, the Department will include the percentage specified for that level of payment in the Installing the Item percentage.

The Department will make payment for FIBER OPTIC CABLE, TYPE____, as follows:

Work Completed	Payment
Installing the fiber optic cable	80% of Total Contract Price
Successful completion of Level 1 testing	10% of Total Contract Price
Successful completion of Level 2 testing	10% of Total Contract Price

DIVISION 1000 – EQUIPMENT

SECTION 1001 – TRAFFIC CONTROL EQUIPMENT

1001.04 PORTABLE VARIABLE MESSAGE SIGN WITH REMOTE COMMUNICATION

THE ENTIRE SUBSECTION IS CHANGED TO:

Provide a NTCIP compliant portable variable message sign as described under [1001.02](#) with the exceptions noted below and each equipped with broadband cellular modem.

Ensure that the sign panel is color full matrix model that displays a combination of letters and graphic images.

Ensure that the sign panel is capable of displaying three lines of text with variable size characters.

Ensure nine characters are displayed per line for posting travel times. For this nine character requirement, smaller size characters may be allowed that meets MUTCD guidelines.

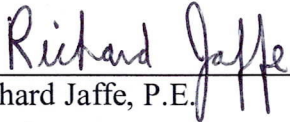
Ensure that the panel is also capable of displaying eight (8) characters per line with a minimum character height of eighteen (18) inches.

Ensure that the PVMSRC can be integrated with the Department's central DMS control software for remote operation.


Implementation Code R (ROUTINE)

Changes must be implemented in all applicable Department projects scheduled for Final Design Submission at least one month after the date of the BDC announcement. This will allow designers to make necessary plan, specifications, and estimate/proposal changes without requiring the need for an addenda or postponement of advertisement or receipt of bids.

Recommended By:


Richard Jaffe, P.E.
Director
Capital Program Support

Approved By:


Eli D. Lambert III, P.E.
Assistant Commissioner
Capital Program Management