# Special Provisions Index

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This project provides for providing the necessary labor, material, equipment and work to install twenty-four (24) completely functional Dynamic Message Sign Systems (DMS), furnishing and installation of foundations, structures, power, and communication conduit and wiring. The signs will be supplied by the Commission. Also included are guiderail, paving and Maintenance and Protection of Traffic.

Work items include, but are not limited to:

- Install Full Color Full Matrix DMS Type 1
- Install Full Color Full Matrix DMS Type 2
- Centermount DMS Sign Structures
- Cantilever DMS Sign Structures
- Steel S or W Beam Posts (For Type A mounting)
- Excavation, various classes
- Type 2-S and Type 2-SC Guide Rail
- Permanent Impact Attenuating Devices
- REACT 350 Permanent Impact Attenuation Device with Concrete Transition
- HDPE Conduit
- Junction Boxes, Modified (Types JB-1, JB-2, JB-11, and JB-12)
- Class A Cement Concrete
- Reinforcing Bars, Epoxy Coated
- Mountable Concrete Curb
- Concrete Sidewalk
- Superpave HMA Wearing and Base Courses
- Subbase (2A)

The project is located on State and local roads in the vicinity of Turnpike exits 286, 298, 312, 320, 326, 333, 339, 340 and 343 in Lancaster, Berks, Chester, and Montgomery Counties, Pennsylvania.

A Prequalification Certification and Applicable Capacity Rating assigned by the Prequalification Office of the Pennsylvania Department of Transportation is a necessary prerequisite for bidding on this project.

The included Certificate (Bidder Certification of Prequalification and Work Capacity) must be executed and accompany the proposal.
Failure to comply with these requirements will be sufficient cause for rejection of the proposal.

A03.00 PREVAILING WAGES 04/01/16

The Provisions of the Pennsylvania Prevailing Wage Act of August 15, 1961, P.L. 987 as amended, together with the rates and regulations promulgated by the Secretary of Labor and Industry, are a part of these contract documents.

A04.00 ELECTRONIC DATA FILES 04/01/16

Following execution of the contract and upon written request, the Commission will provide the Contractor with electronic data files for this project to be used for information only. This information is not, nor shall be considered as, any part of the Contract Documents. No representation or warranty is made as to the compatibility of these files beyond the original software format and version or the ability to convert files to other formats or versions, the presence of viruses, or as to the possible erosion, erasure, and/or alteration, accidental or deliberate, from whatever source, of the data over time.

Since the data files are for information only, they are not to be used in lieu of the official documents and plans as published on the Commission’s EBS. The plans as published on the Commission’s EBS shall be referred to and shall govern in the event of any inconsistency, for whatever reason, between the plans as published on the Commission’s EBS and the electronic data. It is the Contractor’s responsibility to determine that the electronic data accurately reflects the plans as published on the Commission’s EBS and any subsequent change or addendum issued by the Commission.

Any and all use of the files by the Contractor will be at the Contractor’s risk and full legal responsibility. The Commission will not accept, review, hear or consider any construction claims arising from the electronic data provided. In the event there is a conflict between the electronic data and the Contract Documents, the Contract Documents take precedence.

The Commission is unable to provide technical support to parties who desire to use the electronic files. Likewise, since these files do not form a part of the Contract Documents, the Commission will not entertain any questions on the information provided.

All users will, to the extent of the law and necessity, indemnify and hold the Commission, its employees, agents, and consultants harmless from any and all suits, liabilities, demands or costs arising out of or resulting from their use of the electronic data.

C01.00 PROTECTION AND COORDINATION OF UTILITIES 04/01/16

Ascertain and locate any utility lines including Commission owned facilities, in the vicinity of the entire project and take all precautions to fully protect the (utility) facility and service. Prior to performing any work in the vicinity of any underground or overhead line or service, advise the facility owner at least 72 hours in advance of initiating work and provide all measures for protection in accordance with the National Electric Safety Code, the Occupational Safety and Health Administration's Regulations and as deemed necessary by the facility owner with the Representative's concurrence. Coordinate protection and relocation of utilities with the facility owner.

Attention is directed to the Provisions of Act 287 of 1974 and subsequent amendments which specify the responsibilities in regard to public health and safety during excavation and demolition operations in areas of underground utilities. Contact the One Call System at 1-800-242-1776 for all facilities prior to performing underground work.
Immediately report to the facility owner including the Commission any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of the premises and the employees of any emergency created or discovered.

Perform all work required for the location, replacement, adjustment or reconstruction of underground utilities in accordance with Section 105.06.

The Commission may have both underground and aerial utility facilities within the project limits, specifically the Maintenance, Interchange, Tunnel, and Service Plaza areas. In addition to service lines, the Commission has lighting and various other facilities throughout the Turnpike system. The Commission’s Tradesman Superintendent may be able to provide information about these sites and can be contacted through the Representative.

No work by facility owners with identified utility facilities within the project limits or Turnpike right-of-way is anticipated. Known utilities are listed within the contract documents. The correctness of the information is not guaranteed and the Commission will not pay costs incurred by the contractor or facility owners for work performed for their convenience, unless prior written consent is obtained from the Commission.

This work is incidental to the project.

**F01.00 PROJECT MEETING AND SITE REVIEW**

A prebid meeting will not be held for this project.

Prospective bidders will thoroughly familiarize themselves with the work to be performed, the area and the conditions throughout the length of the project. Prospective bidders are encouraged to visit the site; however, they will abide by all rules and regulations pertinent to traffic safety during this visit to the site. U-turns are not permitted at any time during such reviews. Non-revenue privileges are not extended to prospective bidders visiting the site.

Prior to visiting sites, contact the following PennDOT District Personnel:

District 5-0 Traffic Operations Manager, Donald Bouch, 610-871-4483 (Berks County Signs)
District 6-0 Traffic Management Center, 619-205-6934 (Chester and Montgomery County Signs)
District 8-0 Regional Traffic Management Center, Jason Hoffman 717-772-1938 (Lancaster County Signs)

**F02.00 TIME OF COMPLETION**

Complete all work under this contract on or before August 24, 2018. No work is permitted at DMS 326-4, DMS 326-5 or DMS 326-6 prior to March 1, 2017 unless otherwise authorized by the Representative. Utilize all available time, including multiple shifts, to complete the contract within the required time limit. The time of completion includes all required testing of the DMS.

**F03.00 DIVERSE BUSINESS REQUIREMENTS**

In accordance with Section 107.34 and as follows:

The Diverse Business minimum level of participation established for this project is:

| DB | 10% |

Network No. 7003880 3 SP (T-286.00M001-3-02)
F04.00 PROJECT COLLABORATION SYSTEM

All submittals, documentation, meeting minutes, and correspondence will be handled electronically via the Commission’s project collaboration system, Kahua.

There are costs associated with a Kahua Platform License and Construction Document Management License, as well as with some of the other, optional Kahua Applications. In addition, there are costs associated with setting up and training people to use Kahua. Visit the Kahua kStore for pricing information (http://www.kahua.com).

With a paid Kahua Platform License and Document Management Suite of Applications, a business partner can perform the following functions:

- Store files online (25 GB per user)
- Submit files for review and acceptance (e.g. - Shop Drawings, Sources of Supply, Catalog Cuts)
- Create and track Requests for Information
- Create, send and track, Correspondence
- Set up and Review Meeting Minutes, Agenda, and Action Items
- Send Messages to other Kahua users

With a free Kahua license, a business partner can perform the following functions:

- Store files online (1GB per company)
- Respond to requests for documents
- Send Messages to other Kahua users

The Contractor will need at least one paid Kahua Platform License, and one license for the Construction Document Management Suite of Applications to do business with the Commission. However, the Contractor may require more paid licenses. Visit Kahua (http://www.kahua.com) for more information regarding Paid versus Free Licenses.

Costs associated with Kahua Platform and Document Management Licenses and Kahua site setup and training are incidental to the contract.

F05.00 CONTRACTOR RESPONSIBILITIES

General – The Commission will furnish the DMS, controllers, controller cabinets and wireless equipment (except Item 4000-0011 WIRELESS COMMUNICATIONS SYSTEM PENNDOT which will be furnished by the Contractor). Furnish and warranty all other material and install and test all ITS equipment and supporting infrastructure, as identified on the contract plans and specifications. Supply (except the DMS, controllers, wireless equipment and controller cabinets ) and install all equipment at field locations, as shown on the contract plans to make a complete and operational system. Install all electric connections as shown on the plan.

Maintain all Commission equipment provided/procured under this Contract in proper working condition throughout the period of construction, testing, the guarantee period and successful completion of the Operational tests.

When equipment malfunctions occur, the Representative will contact the Contractor during normal business hours. Within 2 business days of notification of a non-emergency request as determined by the
Representative, and within 4 hours of an emergency request, provide a repair technician at the equipment location working to fix the problem.

For both emergencies and non-emergencies, restore the malfunctioning equipment to a fully operational condition within 5 working days of notification. If the malfunction cannot be repaired within the time allotted, notify the Representative immediately and provide a written explanation why. The Representative may extend the time limit on a case-by-case basis.

Keep a neat and accurate log of failures reported by the Commission or PennDOT and the corrective actions taken. Submit two copies of the logs to the Commission every 2 months. The logs become the property of the Commission upon final acceptance.

Keep an accurate inventory log of equipment including manufacture, model number, serial number, date installed, hardware revision, and software revision. Submit two copies of the logs to the Commission every 2 months. The logs become the property of the Commission upon acceptance.

If the equipment is damaged or rendered inoperable due to external reasons including, but not limited to, vehicular accidents on the roadway, rainstorm, snowstorm, or other natural disasters, restore to proper operating conditions within the applicable time frame. If such damage occurs after the start of the 60-Day operational test and before the guaranty period begins, the Contractor will be reimbursed for the repair in accordance with Section 110.03.

Dynamic Message Sign (DMS) System - Furnish and install DMS foundations and structures. Install DMS, controller and control cabinet provided by the Commission. Furnish and install all other DMS system components. Coordinate with the local electric companies and provide electric and communication services as specified. Coordinate with the DMS vendor to provide a fully functional and operational DMS system. Furnish the necessary central control hardware/software required to the Commission. Ensure accurate communications and messages are displayed without errors.

F06.00 GENERAL DMS REQUIREMENTS

This section describes the general requirements in furnishing and installing completely functional Dynamic Message Sign (DMS) Systems. Items not specifically covered in these Special Provisions will be governed by the applicable sections of Publication 408/2016, and the Commission Specifications.

A. Scope of Work. Perform the following major tasks, at a minimum, in order to provide completely functional and operational DMS:

1. Install Dynamic Message Sign systems.
2. Install communications systems for establishing two-way communication links between the field equipment/system and the Commission’s Traffic Operations Center in Highspire through established connections for most DMS. For DMS #286-4 install communications systems in accordance with section 1230.2(f).4.
3. Furnish and install field hardware necessary to make the DMS systems fully operational.
4. Coordinate with local electric companies for activating electric services. Provide a list of communications and electrical service numbers to the Commission.
5. Furnish and install conduit, fittings, terminations, termination panels, junction boxes, cable, cable strain relief hardware electrical identification, and other ancillary accessories.
6. Furnish and install surge and lightning protection for cables entering and leaving all cabinets (DMS equipment, communications, and power).
7. Fabricate and construct foundations for center mount and cantilever structures and Type A sign posts.
8. Fabricate, construct and install DMS center-mount and cantilever structures.
9. Fabricate, construct and install DMS Type A sign mountings and breakaway couplings.
10. Provide padlocks for the ladder cage and 2 doors of the control cabinet. Contractor’s locks will remain until the project is accepted.
11. Provide operations support during testing.
12. Conduct all required tests, and submit test procedures and results to the Representative.
13. Provide all incidental equipment and perform all necessary tasks to provide completely integrated (as stand-alone systems) and operational DMS systems.
14. Provide as-built plan and all necessary documentation.

B. Equipment Requirements

1. General
   a. Procure all equipment in a manner to minimize the number of manufacturers.
   b. Procure all material and equipment, which meet the latest applicable standards of National Electrical Manufacturers Association (NEMA), Electronics Industries Association (EI), National Electric Code (NEC), Underwriters Laboratory (UL), Publication 408, and these Special Provisions.
   c. Procure the equipment from a manufacturer or manufacturers who have been successfully engaged in the manufacture of such equipment for a period of at least five years, unless otherwise indicated.
   d. Submit certification(s) from the various manufacturer(s) of equipment supplied under this contract that they will carry in factory stock, for at least 10 years, all necessary parts and stock items to keep the equipment operational.

2. Parts and Material. In the selection of parts and materials, fulfillment of the requirements of these Special Provisions is of prime consideration. Design equipment to utilize the latest available techniques and utilize the minimum number of different parts, subassemblies, circuits, cards and/or modules, to maximize standardization and commonality.

3. Electrical Components. Use electrical components that are generally industry standard items available from several manufacturers. Comply with the latest industry standard practices, specifications and tests, or approved alternatives for all the components, being furnished under this contract to assure reliable operation of all the equipment.

4. Mechanical Components
   a. Hardware. Provide stainless steel external screws, nuts and lock washers. Do not use self-tapping screws. For internal screws, nuts and lock washers, use corrosion resistant material or material suitably plated to resist corrosion. Use material in accordance with the highest industry practices.
   b. Material. Provide parts made of corrosion resistant material, such as plastic, stainless steel, aluminum, or brass; or parts treated to resist corrosion, such as cadmium plating or galvanizing. Ensure dissimilar metals do not come in contact with each other.
   c. Component Mounting and Identification. Identify operating circuit components mounted on circuit boards by either identifying characters, which are legible and permanently printed on the circuit boards, and by the use of complete assembly drawings showing all components with values or by JEDEC numbers. Reference the identifying characters to their respective components in the schematic diagram and in the parts list.

C. Control Hardware/Software. The systems will operate 24 hours per day, unattended, with operator attention required only periodically. Provide control hardware/software for devices installed for this Contract as described in these Special Provisions for the purpose of system acceptance testing and troubleshooting any problems during the process. Assume responsibility for providing a working communications system and a fully functional system, between the field devices and the Traffic
Operations Center, using the communications equipment installed by the Contractor, wireless communication services and the Commission's electric and Wide Area Network system.

D. Construction. Construct equipment such that performance will not be impaired after it has been subjected to shock and vibration caused by installation, transportation, maintenance handling, and normal use. Install surge and lightning protection for all electrical and communication cables that are leaving or entering a cabinet. Provide resettable surge and lightning protection devices that can be subjected to multiple surges. Minimum requirements for surge protectors are defined in the appropriate sections herein.

1. Electrical
   a. Design Life. Design all components in their normal circuit applications to operate continuously for at least 10 years.
   b. Power Requirements. Provide equipment that meets the performance requirements at the specified power input level plus or minus 10% or as indicated.
   c. Primary Input Power Interruption. Provide equipment such that in the event of power failure, proper operation will commence immediately after restoration of power without creating false information or malfunction.
   d. High Frequency Interference and Line Voltage Transients. Protect the equipment power supply circuitry against high frequency electrical interference and line voltage transients.
   e. Wire Size. Procure all wiring of such size to meet the requirements of the National Electric Code.
   f. Wire Identification. Identify all wiring connected to terminal strips by the use of insulated preprinted sleeving slipped over the wire before final attachment.
   g. Wire Dressing. Procure wires cut to proper length before assembly. Do not double back wires to take up slack. Lace wires neatly into cables with nylon lacing or plastic straps. Secure cables with suitable clamps. Provide identification tags for all cables.
   h. Cable Termination. Terminate all cables, as required, using appropriate termination panels, with built-in surge protection and test access ports.
   i. Protection. Provide equipment containing readily accessible, manually replaceable circuit protection devices such as fuses, for equipment and power source protection.
   j. Fail Safe. Provide and install equipment such that failure of an individual component does not cause failure of the subsystem or system.
   k. Static, Lightning and Surge Protection. Fully protect each piece of equipment from damage due to static electricity accumulation or discharge during unpacking, normal handling, and installation. Provide static electricity protection by case construction and by the use of protective devices on wires connected to the equipment. Use material and type of finish, which will not permit the accumulation of static electric charge. Provide a static-inhibiting device that can fit on a person's wrist, in all the cabinets. Protect all electrical and communication cables entering or leaving the equipment cabinets and which might be subject to damage, with bleeder resistors, current limiting resistors, zener diodes, metal oxide varistors (MOVs), or other suitable means of limiting momentary current surges. Provide in-line surge protection to avoid damage from lightning induced surges or other power line transients for all cables entering and leaving all cabinets and racks. Provide transient suppression devices meeting the requirements of NEMA TS-2 specifications. Surge protection is incidental to the cost of equipment. Include surge protection details in the shop drawings for approval by the Representative. Coordinate with the equipment and surge protection device manufacturers to determine in-line voltage requirements.

2. Mechanical
   a. Modular Design. Design equipment in a modular fashion such that replaceable units may be readily removed and reinstalled in the field.
b. Keying. Mechanically key modules of unlike functions to prevent insertion into the wrong socket or connector.
c. Identification. Clearly identify all modules and assemblies with name, model number, serial number and any other pertinent information required to facilitate equipment maintenance.

E. Maintenance Provisions. Procure equipment designed for ease of maintenance. Make all component parts readily accessible for inspection and maintenance. Provide test points utilizing test jacks or equivalent to enable testing and troubleshooting with the equipment operating.

F. Environmental Design Requirements. Provide field equipment meeting all of its specified requirements during and after exposure conditions as follows:

Temperature Range: -22 degrees F to +165 degrees F, unless otherwise specified for each piece of equipment or subsystem.
Relative Humidity: Not to exceed 95%, non-condensing.

G. Personnel Safety. Procure equipment with provisions for personnel safety designed in. Design to prevent reversed assembly or installation of connectors, fasteners, etc., where possible malfunction or personnel hazards might occur. Properly ground in accordance with the requirements of the National Electric Code all external conductive material on the equipment. Provide electrical equipment having provisions to limit ground fault current and leakage current to levels below that prescribed by Underwriters Laboratories, Inc.

H. Quality Assurance Provisions. In cases where design tests are specified herein, documentation may be provided indicating that such tests have previously been satisfactorily completed and additional tests will not be required. Subject equipment to all tests as specified in the Special Provision entitled "Testing" to determine conformance with all the applicable requirements. The Representative reserves the right to witness all tests or to designate another to witness. The results of each test will be compared with the requirements specified herein. Failure to conform to requirements for any test will be subject to rejection by the Representative. Rejected equipment may be offered again for retest provided all non-compliances have been corrected and retested by the Contractor. Final inspection and acceptance of equipment will be made after delivery and successful completion of final system acceptance tests.

I. Preparation for Delivery. Package equipment to prevent shipping damage. All equipment must be in an undamaged and operational condition after delivery and unpacking in order to be accepted. Make all repairs or replacements to the satisfaction of the Representative at no additional cost.

J. Trenches. At the end of each working day, backfill all the trenches to a point that is within 10 feet from the end of each trench. Cover the 10-foot length of the open trench with a ½-inch thick steel plate. Mark on the center of each steel plate used for decking over trenches the following information:

Contractor's Name
Contact Person
Emergency Telephone Number

Each letter shall be four inches high, in a space four inches wide, and each stroke forming each character will be 3/4 inch wide. Provide clear and legible lettering. Use the appropriate method to label the trench plate so that the lettering will not be eradicated due to traffic or people movement over the trench plate. When placing trench plates over excavations, secure the plates to the surface to prevent lateral movement, avoiding an unsafe condition. Between the period of November 1st and April 1st, notify the Representative of any steel plates used to cover excavation made in snow emergency routes.
K. Exposed Conduit. Use UL listed conduit made of Galvanized Rigid Steel (GRS) for all exposed conduit, unless otherwise noted in the contract drawings.

L. Notification to the Representative. Submit a written request to the Representative for approval to visit the data recording rooms. Notify the Representative and the appropriate Assistant District Manager at least one week prior to starting any work at the data recording rooms.

M. Wide Area Network. After the Control hardware and software have been furnished, installed and tested, and all field equipment has been furnished, installed, and tested for each system (with the exception of DMS 286-4), it will be interfaced with the Commission’s Wide Area Network by Commission personnel. Provide notification to the PTC IT Department and allow 30 days for the Commission to complete the interface connection. After the Commission has completed the interface with the Commission’s Wide Area Network, the Commission will conduct the final system acceptance tests after which time the 60-day Operational Test will begin followed by the Warranty Period. Failure of the Commission’s provided equipment or system will suspend the tests until the Commission corrects these failures.

After the Control hardware and software have been furnished, installed and tested, and all field equipment has been furnished, installed, and tested for DMS 286-4, it will be interfaced with PennDOT’s Wide Area Network by PennDOT. Provide notification to the PennDOT Central Regional Traffic Management Center (Harrisburg) and allow 30 days for the PennDOT to complete the interface connection. After the PennDOT has completed the interface with their Wide Area Network, they will conduct the final system acceptance tests after which time the 60-day Operational Test will begin followed by the Warranty Period. Failure of the PennDOT equipment or system will suspend the tests until the PennDOT corrects these failures.”

F07.00  NOT USED

F08.00  COORDINATION OF WORK

In accordance with Section 105.07, as directed by the Representative and as follows:

During the course of this project, the following known contracts will be under construction:

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<th>Contract No.</th>
<th>Project Name</th>
<th>Location</th>
<th>Schedule</th>
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<td>A020.00T002-3-01</td>
<td>Total Reconstruction A26-A31 Smart Work Zone</td>
<td>• SR 3053 SB (SB Germantown Pike in advance Norristown Interchange)</td>
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<td>• SR 0309 SB (SB Ft. Washington Expressway at Highland Ave.)</td>
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<td>• SR 0309 NB (NB Ft. Washington Expressway in advance of Turnpike Exit ramp)</td>
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<td>• Segment 0070 Offset 0435</td>
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<tr>
<td>ECMS #104370</td>
<td>District Cable Median Barrier Program</td>
<td>• Various Locations in District 8 including on SR 0222</td>
<td>8/8/2016 to 8/11/2017</td>
</tr>
</tbody>
</table>
There may be other projects in the area of the DMS construction. Coordinate with the Pennsylvania Turnpike Commission, PennDOT District 8-0, PennDOT District 5-0, PennDOT District 6-0, Upper Merion Township, Plymouth Township and Upper Dublin Township prior to construction in their jurisdictions to determine if other projects will be ongoing.

If a lane or shoulder closure is to be set within 2 miles of these or other projects, the maintenance and protection of traffic signing must be coordinated with the Representative and the above contractors. Provide a minimum of 1 week advance notice to the Representative for any anticipated lane or shoulder closures.

F09.00 MEASUREMENT AND PAYMENT SCHEDULE

This section outlines the measurement and payment requirements for items 4000-0201, 4000-0211 (Install Full Color Matrix DMS Types 1 and 2), 4000-0010, 4000-0011 (Wireless Communications System PA Turnpike Commission and PennDOT), 3948-0300, 3948-0600, 3948-0601, 3948-0602, 3948-0603, 3948-0604 and 3948-0605 (Sign Structures).

Payment for items 3948-0300, 3948-0600, 3948-0601, 3948-0602, 3948-0603, 3948-0604 and 3948-0605 will be as follows:

- 90% of payment will be made upon complete installation of the structure and its incidentals.
- 10% of payment will be made upon acceptance of items 4000-0201 and 4000-0211.

Payment for items 4000-0201, 4000-0211, 4000-0010 and 4000-0011 shall be in accordance with the following schedule:

- 60% of payment will be made upon complete installation and energizing of the equipment at the site.
- 15% of payment will be made upon completion of the standalone acceptance tests.
- 15% of payment will be made upon completion of the 60-day operational test.
- 10% of payment will be made upon acceptance of the system.

F10.00 DOCUMENTATION FOR EQUIPMENT SUPPLIED BY THE CONTRACTOR

This Special Provision applies to the equipment supplied by the Contractor and is not applicable for the equipment supplied by the Commission.

Initial equipment submittals are required by the Contractor to demonstrate that the equipment they will supply for the project has the capability to meet the functional objectives and specifications required by these Special Provisions. The level of effort required for the submittal material could vary depending on the complexity of the equipment and the degree to which the proposed equipment is off-the-shelf or custom in nature.

Submit within 21 days following Notice-to-Proceed, system level block diagrams on 22 in. (H) x 34 in. (W) sheets which demonstrate the feasibility of the system as well as the interconnection of all equipment. Include in the block diagrams, the electrical and mechanical details and the interconnection details showing equipment part numbers, cable type, connectors, etc. Use separate sheets for field, central and complete system configurations. Include block diagrams for every major functional area.

Furnish a complete list of equipment and material within 30 calendar days after Notice to Proceed. Include the name, manufacturer, part number and material specifications as applicable.
Provide descriptive material, (manuals, cut-sheets, drawings, brochures, etc.), for each type of equipment and apparatus proposed for this project to demonstrate that the intended equipment or integration of intended equipment will meet the functional objectives and specifications of the system. Include in these documents sufficient technical data for complete evaluation of the proposed system by the Representative. Provide original manuals or brochures or copies equal to originals.

Design documentation consists of all drawings and text required to define the configuration of the system including both hardware and software documentation.

Describe methods of expansion and maximum capacities.

Provide all user manuals and maintenance manuals for third party equipment supplied by the Contractor.

Provide the following project documentation for all equipment supplied by the Contractor.

A. Equipment Manuals. Provide eight (8) hard and two (2) CD copies of operating, maintenance and installation manuals for each type of equipment item to be furnished. Include in the manuals sufficient information to operate and maintain the equipment including schematic wiring and interconnection diagrams; complete instructions for proper installation including equipment outlines, mounting, weight, power and cooling requirements; a complete parts list and a list of recommended spares.

Include text, which completely describes all functional capabilities of the equipment. Explain all adjustments, how they are performed and their effect on equipment operation. Include flow charts, which describe troubleshooting procedures in a logical manner. Define expected signal levels and waveforms at key test points. Describe required test equipment and incorporate descriptions of its use in manual sections dealing with maintenance and repair of equipment items.

Submit test procedures and checklists required for the various stages of equipment tests.

Include information necessary for the proper installation, start-up, initialization, operation and fine-tuning of the equipment item.

Include environmental and operational specifications such as operating temperature range, power requirements, equipment weight, special handling considerations and equipment power dissipation rates and cooling requirements.

Submit four (4) copies of all manuals to the Representative for approval at least 30 calendar days prior to the anticipated start of the on-site stand-alone testing for that equipment item.

B. Shop Drawings. Section 105.02(c) and as follows:

Submit shop drawings on 22 in. (H) x 34 in. (W) sheets.

Include, at a minimum the following in shop drawings:

1. Wiring Diagrams
2. Installation Drawings
3. Detail Drawings

C. Control Cabinet and Service Panel Drawings. Provide drawings, which show all terminals, terminations and connections within each equipment cabinet. At each terminal illustrate the terminal
designation for the other end of the wire or cable. Cross-reference connections that go to equipment harnesses or connectors to the nomenclature used in that equipment's manual.

Tailor drawings to each individual cabinet.

Submit all drawings to be attached in cabinets to the Representative for approval at least 30 calendar days prior to the on-site standalone testing. Supply marked up copies of all cabinet drawings to the Representative at the time of cabinet installation. Enclose drawings in a clear, plastic, waterproof enclosure.

Do not conduct the on-site standalone tests if the four draft copies of all drawings are not submitted to the Representative for approval at least thirty (30) calendar days prior to the anticipated start of the stand-alone testing.

Provide to the Representative one set of final reproducible Mylar originals and four copies for each set of control cabinet and service panel drawings within 14 days following the start of 60-day operational test.

D. Installation Summary. Compile and furnish as-built installation summaries within 14 days of start of the 60-day operational test for each field installation. This summary will include the following information:

1. Equipment inventory including quantities of all equipment supplied under this contract, model number, manufacturer, and distributors for all equipment.
2. Cable lists specifying cable, wire pair and connector and pin assignments for all signal, power and ground leads.
3. Composite drawing of the system.
4. As-built plans, including project grid coordinates.

The Representative has the right to stop the 60-day operational test if the installation summaries are not submitted within 14 days of the start of the test.

E. System Operations and Maintenance Manuals. Develop and deliver eight (8) hard copies and two (2) electronic .pdf copies on CD of the comprehensive systems operation and maintenance manuals for all the systems furnished under this contract. The objective of each manual is to present a systems oriented view of the operation and maintenance requirements of the system. Include a detailed functional description of the system. Include a description and step-by-step procedures for all routine operating events. Include equipment preventative maintenance procedures and equipment fine-tuning and adjustment procedures.

Submit four (4) copies of all manuals to the Representative for approval at least 30 calendar days prior to the anticipated start of the 60-day operational test.

F. NTCIP Compliance. Where applicable, provide third-party certification that the delivered field devices, control software and controller/firmware are NTCIP compliant as per the latest approved standards. See additional requirements in other sections.

G. Communications Protocol Manual. Submit detailed information as to which specific National Transportation Communications for ITS Protocol (NTCIP) standards (from the latest approved version), if any, applicable conformance groups, applicable data objects and associated range values will be provided to meet the functional requirements as specified.
Additionally, the communications protocol used shall be documented sufficiently to allow a 3rd party systems integrator to write a software driver for the Central System Software to communicate with and fully access all features of the field device (i.e., DMS). The communications protocol manual shall include, but not be limited to, the following:

- List of all NTCIP-compliant data elements/objects supported by the field device Controller, within a Profile Implementation Performance Statement (PICS) or similar listing of data elements, their descriptions, supported values as well as default values, which indicates whether a data element is supported. A listing of the MIB is not an acceptable substitute for the PICS.
- A traceability matrix that lists each of the functional requirements of relevant sections below and identifies the objects used to support the specific functional requirements.
- List of the agency-specific (and potentially additional, non-required manufacturer- specific) objects supported by the field device that contains the format of the object and includes a detailed description of the objects’ data fields.
- Hexadecimal data dump of the MIB supported by the field device.
- A list of all supported communications protocols including, but not limited to, a list of all supported NTCIP communications protocols stacks including supported options.
  - This listing shall be organized to show the different supported communications stack consisting of the (minimum) three (3) NTCIP Profile standards. An example is “NTCIP 2101, NTCIP 2201, NTCIP 2301”, but this listing must indicate which of the optional functions within each of the NTCIP Profile standards are supported.
  - This listing shall also follow the above-mentioned PICS format (or similar approved format).
  - All information contained in the communications protocol manual shall be non-proprietary and may subsequently be specified and published in future Commission contracts.

Supplying the information required by this special provision is incidental to the project and no separate payment will be made.

F11.00 GUIDERRAIL AND IMPACT ATTENUATORS
(ITEMS: 3619-0460, 0620-0503, 0620-0862, 0620-1075, 0620-1100, 3619-0100, 3619-0101)

F11.01 Description - This work is for the furnishing, installing, removing, resetting and replacing of permanent impact attenuators and guiderail for access and length of need at various locations during construction as indicated.

F11.02 Material - Section 619.02 and 620.2

F11.03 Construction - Section 619.03, 620.3 and as follows:

Where guiderail is proposed to be removed for construction access to a DMS site, obtain approval of the Representative prior to the removal. Protect traffic from any hazards presented by the guiderail removal by using temporary impact attenuators, temporary barrier or other approved means. Carefully remove and stockpile all rails, posts, blocks, hardware and other appurtenances. If any are damaged, lost or can’t be reused for any reason, replace in kind at no cost to the Commission.

In areas where new or reset permanent impact attenuators are indicated, grade area to 1:10 in accordance with Sheet 4 of 7 of RC-54M. Grading is incidental to cost of impact attenuating device.
Where guiderail and/or other related elements are listed for removal, remove all elements to 2 feet below existing grade.

Where Permanent Impact Attenuators are indicated for removal and resetting, the following will apply:

- Determine the manufacturer and model number of the impact attenuator to be reset. Obtain shop drawing for the attenuator from the manufacturer.
- Carefully remove and stockpile the existing components of the impact attenuator including all rails, posts, blocks, hardware and other appurtenances. If any are damaged, lost or can’t be reused for any reason, repair or dispose and replace in kind at no additional cost to the Commission.
- Reinstall the impact attenuator in accordance with the original shop drawings and as directed by the Representative.

F11.04 Measurement and Payment –

(a) Guide Rail – Linear Feet for type indicated
(b) Remove Guide Rail – Linear Feet
(c) Type 2-S Post Anchorage – Each
(d) Permanent Impact Attenuator – Each
(e) Remove and Reset Permanent Impact Attenuator - Each.

F12.00 REACT 350, TYPE V (REUSABLE), TEST LEVEL 3 MODIFIED (ITEM: 3619-0641)

F12.01 Description - This work is for the furnishing and installing a REACT 350 Type V (Reusable), Test Level 3 Permanent Impact Attenuator along with its reinforced concrete supporting slab and concrete backup transition as indicated.

F12.02 Material – In accordance with Section 619.2, 1001.2 and as noted below:

Provide Class AAA concrete to construct reinforced concrete slab and concrete backup transition.

Provide epoxy coated grade 60 reinforcing steel bars and welded wire fabric.

Provide a REACT 350 Type V, Test Level 3 Permanent Impact Attenuator as manufactured by Trinity Highway Products, Energy Absorption Systems, 2525 Stemmons Freeway, Dallas Texas, 75207. This is a system that is 36 inches wide with nine reusable cylinders with the side mounted anchor system, as listed in Bulletin 15.

F12.03 Construction – In accordance with Section 619.3, 1002.3, as shown on the plans and as follows:

Construct reinforced concrete slab as well as the concrete backup transition and install the REACT 350 system as indicated and in strict accordance with the manufacturer’s installation instructions.

F12.04 Measurement and Payment – Each. Includes all material, equipment, labor and incidentals required to construct the reinforced concrete slab, concrete transition barrier and REACT 350 system to the satisfaction of the Representative.
F13.00 **SIGN STRUCTURES**  

F13.01 **Description** – This work is the fabrication, furnishing and construction of center mounted structures, cantilever structure, catwalks with ladders, ladder cage, and DMS supports as indicated. The following structures are part of this contract:

- DMS #286-1 Large Centermount with Catwalk and Ladder, Ladder Cage
- DMS #286-2 Large Centermount with Catwalk and Ladder, Ladder Cage
- DMS #286-3 Small Centermount
- DMS #286-4 Large Centermount with Catwalk and Ladder, Ladder Cage
- DMS #320-2 Cantilever
- DMS #333-1 Small Centermount
- DMS #343-1 Small Centermount

F13.02 **Material** – Sections 948.2 and 1105.02, and as follows:

A. Provide materials and workmanship in accordance with the above Sections and the AASHTO/AWS/D1.5 Bridge Welding Code. Use ANSI/AWS/D1.1 for welding not covered in AASHTO/AWS/D1.5.

B. Provide structural steel conforming to ASTM A709, Grade 36 designation except where noted otherwise.

C. Provide welded or seamless steel pipe conforming to ASTM A53, Grade B. As an alternate, provide welded or seamless steel pipe conforming to ASTM A 500, Grade B.

D. Provide high-strength steel bolts conforming to ASTM A325. Provide anchor bolts conforming to ASTM F 1554, Grade 55. Mechanically galvanize all bolts, nuts, and washers. Provide U-bolts conforming to ASTM A449.

F13.03 **Fabrication** - Construct structures true to dimension, free from kinks, twists or bends, and uniform in appearance. Assemble completed sections in the shop and check for straightness, alignment, and dimension. Correct any variations to the satisfaction of the Representative.

Form masts for the structures in accordance with the Tube and Pipe Association international recommended standards for induction bending of pipe and tube (TPA-IBS-98).

Affix clips, eyes, or removable brackets to all masts and mast arms as necessary, to secure the sign structures during shipping and for lifting and moving during erection. Remove brackets on sign structure after erection. Include details of such devices on the shop drawings.

Fabricate sign structures into the largest practical section prior to galvanizing. Submit splice locations for approval. Do not commence fabrications until such splice locations are approved.

Grind all areas to be welded to bright metal. Butt weld splices are not permitted, unless shown on the plans. Complete all welding and required testing before any material is galvanized. Non-destructively test all circumferential and stiffener welds using methods and procedures in accordance with Section 948. The acceptable criteria are stated in Table 6.1 of ANSI/AWS D1.1. Provide full penetration groove welds for all longitudinal welds within 6” of a full penetration circumferential groove weld and inspect as specified above. Provide maximum weld uncut of 0.01”.
Hot-dip galvanize all components (except reinforcement bars, aluminum, and non-ferrous incidentals) after fabrication per ASTM A 123 or ASTM A 153, as appropriate.

Structural steel, including all connection hardware and mounting components, shall be hot-dip galvanized.

F13.04 **Construction** – Section 948.3 and as follows:

Submit detailed shop drawings for review and acceptance. All material and workmanship will be inspected at the fabrication shop. All structures shall provide a minimum of 17’ 6” clearance from the bottom of the sign to the shoulder or roadway beneath the sign as indicated.

Provide connections between the sign and sign supports in accordance with the sign manufacturer’s recommendations. Provide neoprene or other synthetic polymer to separate dissimilar metals.

Include connection details for the catwalk and ladder assemblies shown on the drawings. Ladder mount brackets must be connected to the column with bolted straps. Welding to the columns for the ladder or catwalk attachments is not permitted. Provide details for the catwalk, handrail, grating, and connections in accordance with the BC-744M and BC-745M standard drawings as applicable. Construct catwalk and ladder in accordance with DMS manufacturer’s recommendations. Provide ladder assembly with lockable security assembly to prevent unauthorized ladder access.

Sign structures indicated to have a catwalk shall be furnished with an anti-skid catwalk with platform, handrails to provide safe access to the access door in the end of the DMS, ladders, and ladder cages, permanently attached to the catwalk and the structure.

Provide required conduit and communication cables and coordinate the installation of power and communication cables with the sign manufacturer and the Representative.

Repair any damage to the shoulder or pavement resulting from the construction at no cost to the Commission.

F13.05 **Measurement and Payment** – Lump Sum for each structure. Includes structure, catwalk, ladder, ladder cage, and other material required to complete the work as indicated. See Special Provision F09.00 Measurement and Payment Schedule. Installation of DMS will be paid for separately.

F14.00 **PAINTING FABRICATED STRUCTURAL STEEL**

(FORM: 4000-0215)

F14.01 **Description** -- This work consists of the painting of new fabricated structural steel in accordance with Section 1060 for the controller cabinet, the service equipment, the back of the DMS and the posts and hardware for DMS #326-4, DMS #326-5, DMS #326-6, DMS #340-1, DMS #340-2 and DMS #340-3.

F14.02 **Material** – Section 1060.2

F14.03 **Construction** -- Section 1060.3 and as follows:
For DMS #326-4, DMS #326-5 and DMS #326-6, provide a finish coat color of Black (Flat) Federal Standard 595B Color No. 37038.

For DMS #340-1, DMS #340-2 and DMS #340-3, provide a finish coat color of Brown (Flat) equivalent in color to Sherwin Williams SW7020 Black Fox.

Submit color chips to the Representative for approval prior to purchasing and application of paint.

F14.04 Measurement and Payment – PDA

Item 4000-0215 Painting Control Cabinet and Back of DMS is compensation for the factory application of the color to the control cabinets and the backs of the DMS.

Painting the posts and hardware is incidental to Item 0930-0101, Steel S or W Beam Posts; painting the service equipment is incidental to 3910-7032, 3910-7034 or 3910-7035 ITS System Complete Power Supply Type A (Two Disconnects, with Cabinet), Type C or Type D.

F15.00 TEMPORARY SHORING

ITEM: 2203-2101

F15.01 Description – This work is the geotechnical investigation, design, construction, maintenance, monitoring, and removal of temporary shoring. This specification applies to all temporary shoring identified on the plans and any shoring required by the Contractor’s means and methods.

F15.02 Materials – Materials need not be new but must be in serviceable condition. Provide certification or laboratory test results verifying material properties. For used steel, the salvage design values from the AASHTO Guide Design Specifications for Bridge Temporary Works may be used in lieu of testing. Any temporary shoring material used does not have to be from a Bulletin 15 source, but must meet the following:

- Structural Steel..........AASHTO M270 (ASTM A709)(Grade 36, Grade 50 or Grade 50W)
- Steel Sheet Piling.......ASTM A328 (ASTM A572)
- Sheet H-Piles..........AASHTO M270 (ASTM A709)(Grade 36)
- Cement..................AASHTO M85 and AASHTO M 240
- Pre-Stressing Steel.....ASTM A416 Grade 270 and ASTM A722 Grade 150
- Welding Wire Fabric .AASHTO M55 (ASTM A185)
- Reinforcement Bars ...AASHTO M31 (ASTM A615), AASHTO M42 (ASTM A616, ASTM A617)(Grade 60)
- Other Material……..In accordance with applicable sections of Publication 408

F15.03 Construction –

(a) Qualifications – Superintendent or Foreman – Experienced in the construction of the approved temporary shoring system constructed in similar subsurface conditions. Submit a resume showing at least 5 projects which demonstrate a minimum of 5 years of the
required experience. Include a brief description of each project, including location and project contract value, and the name and phone number of the owner's representative knowledgeable in each project listed.

Professional Engineer – Licensed in Pennsylvania and experienced in the design of a temporary shoring system in similar subsurface conditions. Submit a resume showing at least 5 projects which demonstrate a minimum of 5 years of the required experience. Include a brief description of each project, including location and project contract value, and the name and phone number of the owner's representative knowledgeable in each project listed.

Inspector – Submit for review and approval the name and certification number of the PennDOT certified drilling inspector responsible for boring inspection and relogging of existing borings.

Drilling Contractor – Must possess PennDOT prequalification work class code C2.

(b) Geotechnical Investigation – No historic data review, geotechnical reconnaissance, investigation of static groundwater conditions or geotechnical laboratory testing has been performed for the specific purpose of supporting the temporary shoring design. A limited number of borings have been drilled in the vicinity of the locations where temporary shoring is anticipated. The boring logs are included in the plans. Coordinate with the Commission’s Drilling Manager for access to core boxes; allow for a minimum of 3 days advance notice. Testing of soil and rock samples from any existing core boxes is permitted after the contract has been awarded. Have any soil, rock, and water sample testing performed by an AMRL certified laboratory.

It is the Contractor’s responsibility to fully characterize the relevant site conditions and to perform any needed additional investigation or testing. This includes performing additional borings, at locations and to depths recommended by the Contractor’s engineer, to support the design of the Contractor’s shoring system. Borings are to be advanced by an approved drilling contractor and in accordance with the drilling procedures of PennDOT Publication 222. Provide a PennDOT certified drilling inspector to relog any existing borings from the core boxes which the Contractor’s engineer intends to use for the shoring design. Also provide a PennDOT certified drilling inspector to inspect any new borings. Boring logs from the additional borings performed by the Contractor will become property of the Commission.

The subsurface investigation, boring logs from relogged borings and any new boring logs are to be prepared, signed and sealed in accordance with PennDOT Publication 222 requirements, by a Professional Engineer licensed in the Commonwealth of Pennsylvania.

Traffic control required for the additional borings will be in accordance with the Maintenance and Protection of Traffic special provision.

(c) Design – Allowable shoring types for the locations indicated are:

The temporary excavation support and protection system will be selected by the Contractor.

These systems may be comprised of one or more of the following: Soldier Piles, Timber Lagging, Steel Sheet Piling, Caissons, or other methods.
Cut slopes in lieu of structural shoring are not permitted at locations where temporary shoring is indicated.

Design the temporary shoring in accordance with AASHTO LRFD Bridge Design Specifications, Design Manual Part 4, current FHWA guidelines, and AASHTO Guide Specifications. The temporary shoring calculations and drawings will be prepared, signed and sealed by a Professional Engineer licensed in the Commonwealth of Pennsylvania. Design shoring to resist both earth and water forces. Design temporary shoring for all construction conditions, including groundwater influences and potential pore pressure variations (e.g. dewatering activities, perched water conditions, etc.). Include measures to prevent infiltration of surface water run-off from entering backfill behind shoring and excavated area. Where appropriate in the design, include surcharge loads due to vehicle traffic and other construction equipment and/or other conditions identified by the Contractor’s engineer during the design. In the design calculations, include all material properties, design loads, and design assumptions. On the completed detailed drawings of the temporary shoring system, include all design dimensions, limits of work, elevations, ground profiles, cross sections, materials, member sizes and the construction sequence. Provide cutoff elevations of steel and wooden components for work in streambeds. As a part of the design submission, include all results of investigations performed to support the design. This includes boring logs for the Contractor’s subsurface investigation, relogged borings, laboratory testing data, piezometric data, subsurface profiles and cross sections, etc.

Submit the temporary shoring calculations and drawings to the Representative for approval 21 days prior to beginning temporary shoring work. The submission will only be reviewed by the Commission for compliance with the requirements of this specification and for recognition that the design was completed and sealed by a Professional Engineer licensed in the Commonwealth of Pennsylvania. The suitability and performance of the temporary shoring system is solely the responsibility of the Contractor.

(d) Installation and Monitoring – The work must be supervised by a Superintendent or Foreman that will be on site during the installation of the temporary shoring.

Install temporary shoring in accordance with the applicable sections of Publication 408, current FHWA guidelines, AASHTO Guide Specifications, and the approved temporary shoring drawings. Install temporary shoring no closer to any paved roadway or shoulder than allowed by the Traffic Control Plan.

Have a Professional Engineer, registered in the State, certify that the temporary shoring system has been installed as shown on the Professional Engineer’s approved signed and sealed Temporary Shoring plans. Submit the certification to the Representative prior to beginning work in the shored area. The Contractor is responsible for the adequacy and safety of the temporary shoring, and its compliance with the traffic control for the project.

Monitor the temporary shoring for vertical and horizontal movement on a weekly basis, or at a shorter frequency as determined by the Contractor’s engineer, throughout the construction duration of the project. Ensure the safety of the motoring public as well as project workers.

1. Establish a survey pattern of ground surface points to include points both at the wall face spaced a maximum of 20 feet in profile and in cross section as necessary to detect movements on the order of 0.001H (where ‘H’ is equal to the maximum exposed wall height in feet at any time during construction).
2. Record baseline readings prior to performing any excavation.
3. The monitoring program shall include, as a minimum, the following:
   a. Measurement of vertical and horizontal deflection at the top of wall, as well as
      the ground surface and/or roadway behind the wall.
   b. Measurement and recording of the location and width of ground cracks and other
      signs of disturbance in the ground behind the top of wall, through weekly visual
      inspection during construction. Repair cracks in bituminous surfaces on a weekly
      basis with infilling of bitumastic material.
   c. Record and report measurements to an accuracy of a tenth of an inch.

Permissible horizontal and/or vertical deflections include the following, unless more
stringent criteria are determined to be required by the Contractor’s engineer:

- 1.0 inch or 0.005H, whichever is less, (where ‘H’ is equal to the maximum exposed
  wall height in feet at any time during construction) at top of wall supporting traffic.
- No (zero) ground movement is permitted at the limit of right of way or limit of
  temporary construction easement.

When detected movement exceeds 75% of the permissible movement criteria, notify the
Representative and monitor the temporary shoring at a frequency determined by the
Representative. In the event that any of the monitoring program locations identify
horizontal and/or vertical deflections exceeding the permissible movement criteria,
immediately stop work in the areas adjacent to the temporary shoring and notify the
Representative. Perform an evaluation of the condition and submit a report to the
Representative. Prepare and implement remediation plan to resolve the issues. Work
cannot resume until all necessary actions, as determined by the Contractor’s engineer and
accepted by the Representative, are taken to stabilize the temporary shoring. Remediation
actions and costs are the responsibility of the Contractor.

At no cost to the Commission, repair any damage to roadway surfaces or other facilities
that are adversely affected as the result of the installation, movement, and/or instability of
the temporary shoring.

c) Maintenance and Removal – Maintain the temporary shoring in a serviceable condition.

   Remove the temporary shoring when no longer required, unless otherwise indicated or
approved to remain in place. Where temporary shoring is allowed to remain in place, at a
minimum, remove all temporary shoring within 3 feet of the finished grade or roadway
surfaces. The limits of removal may be ordered to any depth or limits by the
Representative, based on site conditions or needs of the project.

No adjustments in contract time will be allowed as the result of delays due to incomplete
submissions, subsurface investigation, temporary shoring design, failure of the shoring
system, and/or for repair of the failed shoring system and affected roadway or other
improvements.

F15.04 Measurement and Payment – Lump Sum, for the structure(s) and/or location(s) indicated.

Temporary shoring required by the Contractor’s means and methods is incidental to the class
of excavation where the temporary shoring is needed.
F16.00 MAINTENANCE AND PROTECTION OF TRAFFIC
(ITEMS: 0901-0001, 0901-0203, 0901-0231, 0901-0240)

F16.01 Description - This work is the furnishing, installing, maintaining, resetting, relocating, storing, repairing, and if necessary replacing of all traffic control devices necessary for maintenance and protection of traffic during construction. At the conclusion of the project, remove all temporary signs and mountings and properly repair and restore the area. The work is also maintaining and protecting traffic adjacent to and within the Work Zones within public rights-of-way.

All work shall be done as specified in these Specifications, Publication 212, the Special Provisions, Standard Drawings, and approved Traffic Control Plan (TCP), Publication 213, the Manual on Uniform Traffic Control Devices (MUTCD), and as directed.

F16.02 Materials – In accordance with Section 901.2 and as follows:

For all barricades, provide barricade rails constructed of non-metallic materials.

For this project, use fluorescent orange retroreflective sheeting for all signs and devices.

All vinyl roll up material used to overlay overhead and all type (A, B, C, D, E and F) signs shall be reflectorized including the letters and shields.

Provide new traffic control signs and devices. Do not use reflective sheeting that is scratched, scarred, dirty or shows evidence of loss of reflectivity. Do not use signs or devices that are cracked, bent, dented or broken.

Immediately repair or replace damaged, defaced or dirty signs, devices or barrier.

Replace reflective sheeting should it become damaged where reflectivity becomes impaired.

For any sign over 25 pounds that uses plywood or aluminum material, the contractor should consider using a plastic lightweight substrate material from a source listed in Bulletin 15.

F16.03 Construction - Perform maintenance and protection of traffic according to Section 901.3, the contract drawings and as follows:

Furnish, install and maintain all required lights, guides, sandbags and appurtenances as deemed necessary by the Representative for the proper maintenance and protection of traffic and to warn of any obstruction or hazard to traffic. Use Type A and Type B flasher units and Type C steady burn units on this project as indicated on the required PATA figures and project plans. Furnish, install and maintain all shadow vehicles as indicated on the required PATA figures. Shadow vehicles without a truck mounted attenuator must be a 33,000 lb GVW (Gross Vehicle Weight) or larger vehicle and loaded to weigh a minimum of 22,000 lbs. in addition to meeting the requirements of Publication 212.

Provide signs with PennDOT approved Type XI reflectorized material.

ADVANCE REQUIREMENTS - Provide at least 14 working days (excluding weekend and holidays) advance notice in writing to Townships, emergency services, local school districts, local transit authorities, PennDOT District Community Relations Coordinators, PennDOT
District Hauling Permit Office, and the Pennsylvania State Police prior to beginning any work or imposing any traffic restrictions (e.g. lateral width restrictions less than 18 feet). Additionally, provide notification to all affected businesses and property owners four days prior to the erection of the Work Zones. Keep them informed at all times of changes to traffic restrictions as they occur.

Notify property owners ten days in advance of driveway restrictions affecting their properties.

Prior to beginning construction, make a survey with the Representative or his authorized representative by videotaping and voice recording onto a DVD format the location of all existing pavement markings, existing signs, road conditions, and all potential driveway and/or private properties within the project limits. Use this information in placing all pavement markings and signs. Provide an additional copy of the DVD to the Representative before construction begins. Notify the Representative in advance to allow coordination with the District Traffic Engineers or Township Public Works Departments before making any changes to the current pavement marking patterns, signs, or other devices.

Once the notice-to-proceed has been granted by the Commission, establish the current traffic control pattern that is in operation. Safely store all traffic devices that are removed in a location approved by the Representative. This work is incidental to the maintenance and protection of traffic during construction.

Remove all existing signs as required to accommodate construction operations. Reinstall these signs at the completion of the project and/or as directed by the Representative.

Maintain the minimum number of lanes and widths specified on the contract bid documents.

Fourteen calendar days prior to construction at the DMS #286-3 site, erect advance construction advisory signs on Type III barricades with the legend below.

ROAD WORK
BEGIN (date)
NO PARKING
DURING CONSTRUCTION

Use 6” Series C black letters on a reflective orange background with a 1/2” black border and 6” corner radius.

Erect signs at each limit of work as directed by the Representative. Remove the signs when construction begins.

TRAFFIC CONTROL/DEVICES REQUIREMENTS - The signs and traffic control devices listed or indicated on the Traffic Control Plan or Publication 213 represent the minimum requirements for this item and as such, are for information only. The number and types of traffic control signs and devices for this project will be predicated on the number and location of work sites, the extent of repairs and the planned sequence of operations.

Mount all construction warning signs (W series) for long-term operations on Type III barricades. Include a Type B light on first two lead in signs and on all Road Work Ahead signs on each side road. If it is not possible to mount construction warning or other signing as indicated or specified, submit an alternate method for approval by the Representative.
Mount any diamond, rectangular, octagonal, and triangular sign having a maximum weight of less than 25 pounds on a skid-mounted metal sign support in accordance with TC-8716.

Provide additional channelizing devices and barricades at intersections and major driveways to prevent vehicles from turning onto any lane closed for construction. Space channelizing devices at 5-foot intervals or as directed by the Representative.

Use channelizing devices with Type C steady burn lights for all nighttime lane restrictions. Mount a light on each device used in transition areas and every third device used in tangent sections.

Space channelizing devices in the tangent sections at one times the posted (regulatory) speed limit unless otherwise noted on the Traffic Control Plan or as directed by the Representative.

Erect “ROAD WORK AHEAD” (W20-1, W30-1-6) signs with Type B lights attached on each intersecting road and major drive as shown on Publication 213, for the appropriate situation.

Provide a Traffic Control Supervisor or Supervisors and phone numbers where they can be reached on a 24-hour – 7 days a week basis for the duration of the project. The Traffic Control Supervisor must be knowledgeable of work zone traffic control including incident management. The Traffic Control Supervisor must have a thorough understanding of the Manual on Uniform Traffic Control Devices (MUTCD) and Publications 212 and 213. The Traffic Control Supervisor shall attend the pre-construction meeting. The Supervisor’s responsibilities are as follows:

1. Coordinate with the Representative to notify Districts’ Public Relations Office, affected municipalities and property owners of all traffic restrictions. Prepare news releases and submit to the Representative for his concurrence prior to the final submission to the District Office.

2. Implement and maintain traffic control schemes. Place and maintain all traffic control signs and devices used on the project.

3. Conduct daily reviews and document the performance of traffic control signs, devices and temporary pavement markings during the day and night; document adverse weather conditions and active and inactive construction operations, as directed. The Traffic Control Supervisor will present all MPT problems and discrepancies in writing to the Representative each day.

4. Prepare and submit the proposed corrective action to the Representative. Correct any deficiencies or damage discovered during the daily review immediately.

Provide sufficient number of properly attired flaggers (yellow/green (ANSI II) vests and leggings and hard hat) to adequately control traffic flow through the work zone, which includes any intersecting streets in the work zone, and as directed. At night flaggers shall be illuminated, except in emergencies. These flaggers are incidental to Item 0901-0001 Maintenance and Protection of Traffic during Construction. Equip flaggers with “STOP” and “SLOW” (W21-10 24” x 24”) paddles with a minimum 72-inch staff from the top of ground to the bottom of sign. Refer to Section 901.3(y) – Flagger Training for additional information.

Ensure that all workers wear yellow/green (ANSI II) vests.
Do not change any part of the Traffic Control Plan and/or Section 901 without prior written approval of the Representative. This includes but is not limited to:

- Traffic Control Phasing
- Times and/or dates when traffic may not be restricted.

When installing painted standard pavement markings or roadways where traffic is to be maintained, install “WET PAINT DO NOT CROSS LINE” (R16-102) sign as directed.

Completely remove all existing conflicted pavement markings prior to installing any temporary markings. DO NOT paint over existing pavement markings. During inclement weather, where it is not possible to install pavement markings, install “NO PAVEMENT MARKINGS” (W21-16) signs with Type B light attached at intervals of 1/4 mile and/or as directed by the Representative. In addition, as a minimum, place cones at one times the posted speed limit along the centerline of the travel lanes.

Limit any lane closure to the length necessary to safely perform the required work.

Do not allow employees to park their personal vehicles on any traveled roadway, shoulder, median or seeded area along the highway.

Do not park, stop, or store equipment that is not being used for the current work operation adjacent to an active travel lane.

When using plates in open travel lanes provide a metal plate of sufficient thickness and recess the plate so that the top of plate is flush with the roadway surface.

Store all equipment offsite in an appropriate, protected staging area.

Please be advised that most of the boroughs and townships have noise ordinances. Please obtain the necessary permits prior to construction.

**TRAFFIC/CONSTRUCTION RESTRICTIONS**

In addition to work limitations outlined in the traffic control plans for this project, the Contractor must adhere to the following Restrictions:

**General Restrictions:** - When setting or resetting temporary barrier, work in the direction of adjacent traffic flow so that no blunt ends are exposed to oncoming traffic during non-working hours. Also, when removing temporary barrier, work in the direction opposite to adjacent traffic flow so that no blunt ends are exposed to oncoming traffic during non-working hours. If a blunt end must be exposed to oncoming traffic during non-working hours, protect it using a temporary impact attenuator designed for 55 mph. When barrier is being used in conjunction with temporary markings, place all temporary pavement markings prior to beginning the barrier placement.

**Covering Signs** - Remove, cover or fold existing and work zone signs that are conflicting, inappropriate, or are not applicable to existing and temporary conditions so that they are not readable by oncoming traffic. When covering signs, completely cover them with a material that will prevent the sign from being read during all conditions of light and weather. A single layer of burlap or non-opaque materials are not permitted to be used to cover a sign since
those materials may let the underlying sign message be seen at night because headlights reflect the message through the material. When a flagger is not directing traffic, remove or cover any flagger signs. Remove or deactivate any warning lights during those periods when signs are covered or folded.

Maintain access to all residential and business driveways at all times and keep residents and businesses aware of any driveway restrictions or changes during each stage/phase of construction.

Furnish equipment working adjacent to traffic with a yellow flashing light attached to the equipment to indicate its outer limit, visible 360 degrees. Lights are to be according to Section 901.

Use PennDOT approved vertical panels with self-ballasting bases for channelizing devices. The entire face of the vertical panel visible to traffic is to be reflectorized with PennDOT approved reflectorized material.

Lane restrictions will not be permitted during non-working hours.

If the shoulder work zone is not behind temporary concrete barrier, backfill all shoulders and excavated areas adjacent to the right lane so that the dropoff does not exceed 2 inches from the existing adjacent pavement and complete any required slope improvements, guide rail, abutment transition piece, or concrete barrier installations prior to opening the right lanes for traffic.

F16.04 Measurement and Payment – In accordance with Section 901.4 and as follows:

Revise Section 901.4(a) by adding the following:

Includes floodlights, shadow vehicles, truck mounted attenuators, and associated maintenance, fuel, relocations and operating costs for the duration of the project.

Revise Section 901.4(b) Separate Pay Items by deleting the 6th bullet and 26th bullet.

F17.00 ITS DEVICE TESTING, COMPLETE
(ITEM: 3201-3000)

F17.01 General

1. The Representative shall have the right to witness and/or assign a representative to witness any test required in the Contract Documents. Each field test will be attended by the Representative and the Commission’s DMS vendor. Coordinate time and date of tests with the Representative and DMS vendor. The Commission’s DMS vendor will provide up to four hours of on-site commissioning per sign, on a schedule of two signs per day.

2. All tests shall be conducted in accordance with approved test procedures. Testing is to be conducted by a qualified representative of the manufacturer of the element to be tested. Pertinent quantitative and qualitative test results shall be recorded on data summary sheets. All test records shall be submitted to Commission immediately following the test.

3. Except for the Operational Acceptance Test (OAT), complete testing for each element and subsystem within 2 calendar weeks of completion.
4. Provide all testing equipment necessary to perform and complete the testing described in the Contract Documents.

5. All test procedures shall document what equipment function is being tested, the exact testing procedures, and outcome. All tests will be pass or fail. At the end of each testing section, an area for Contractor signature, Commission signature and date will be required. Also, at the end of each testing section, an Ad-hoc area (1 page) will be required for Commission and its consultant to document any other tests performed.

6. Complete testing for each equipment unit in as few consecutive days as possible as determined by the Representative. Schedule testing with additional time allotted for the Representative to request that certain portions of a test be repeated. The Representative has the right to witness and/or assign their designee to witness any test.

7. The acceptance of test procedures and witness of such tests does not relieve the responsibility to provide a completely acceptable and operating subsystem that meets the indicated requirements.

F17.02 Equipment Tests

1. Perform all tests required by the Contract Documents to ensure that the equipment and assemblies intended to be furnished and installed, meet or exceed the requirements of the Contract Documents and are ready to be integrated into the overall existing ITS System at the Commission’s Highspire facility.

2. Conduct the System Acceptance Test (SAT), Wireless Communication Test and 60-Day Operational Acceptance Test (OAT) on each subsystem that will be furnished and installed under this Contract. Costs for testing and re-testing any parts within project testing, shall be the responsibility of the Contractor.

   a. System Acceptance Testing (SAT): After the equipment has been installed and commissioned at the designated locations, perform system acceptance testing. This testing shall verify that equipment has been installed properly and is fully functional in the field, all communications links are fully functional, and that the signs can be operated from the Highspire or PennDOT Traffic Management Center as appropriate. It will be the responsibility of the Contractor, during SAT testing, to demonstrate through testing procedures that each piece of field equipment is fully functional in the field as a stand-alone unit, as well as a piece of equipment that is part of the entire system and can be operated from the Highspire or PennDOT Traffic Management Center as appropriate. Obtain the approval by the Commission of the SAT testing plan a minimum of 30-days before the start of SAT testing. Utilize a traceability matrix format to the testing procedures to demonstrate compliance to the specifications.

   b. Communication Tests: Concurrent to the SAT, all communication equipment will be tested in the field. For this testing, all the communication equipment shall be fully operational for Commission personnel to operate.

   c. 60-day Operational Acceptance Testing (OAT): Upon installation of all field equipment of this contract and completion of the SAT, 60-day Operational Acceptance Testing (OAT) will begin. For this testing, the entire system shall be fully operational for Commission and PennDOT personnel to operate.
3. Testing shall be conducted at key points in time, at the developmental, or production stage in order to find and eliminate problems associated with the design and operation of the equipment. The completion of each test shall not relieve the Contractor from any re-testing that may be necessary to eliminate subsequent test failures. Re-testing of any test is to be conducted to the level necessary to isolate the problem and establish a course of action to resolve the failure. Be responsible for all costs for retesting, delays resulting from re-testing and correcting previous test failures.

F 17.03 System Acceptance Testing (SAT)

1. System Acceptance Tests shall verify that all equipment has been installed properly in the field and is fully operational in a local mode (at the field site) as well as in the Highspire facility. Be in direct communications with the DMS Vendor and the Commission Construction Inspection Representatives to coordinate the testing. Two weeks advance notice of the scheduled date for on-site testing shall be provided to the DMS Vendor, who must be present for all testing. Provide support (access in to the sign, Maintenance of Traffic, technical, electrical, etc.) for the testing. It will be the joint responsibility of the Contractor and the DMS vendor, during SAT testing, to demonstrate through testing procedures that each piece of field equipment is fully functional in the field as a stand-alone unit, as well as a piece of equipment that is part of the entire system and can be operated from the Highspire facility. SAT approval of all contract equipment is required before the start of Operation Acceptance Testing (OAT).

2. Prepare System Acceptance Test (SAT) documentation for approval before SAT begins. The SAT shall be conducted on all field devices, as well as on the central software at the Highspire facility. Give the Commission a minimum of twenty (20) business-days’ notice and a complete testing schedule to assure availability of Commission personnel, or their designee.

3. SAT tests shall be conducted by the Contractor and approved by the Commission prior to the start of Operational Acceptance Testing.

4. During SAT testing, if there are more than 3 failures of any ITS device testing procedure, the testing will be stopped and the Contractor shall make any and all necessary repairs. All repairs will be documented. Once the repairs are completed, and the systems are retested by the Contractor to verify proper functionality, send a written letter to the Commission requesting the continuance of SAT testing, and provide verification that the system is functional. Re-testing, due to equipment failure, or due to Contractor delay, will not be at the expense of the Commission.

5. When testing the DMS, utilize generic messages approved by the Commission depicting that the sign is under test. At no time during testing shall the Contractor utilize words such as “Road Closed”, “Emergency”, or other words that can indicate an incident to the motorists.

6. After installation and agreement by the Commission to initiate testing, the system shall be tested in compliance with the System Acceptance Test Plan. The System Acceptance Test shall be conducted with all devices and components integrated as a system at the construction site with use of simulation expressly limited to perform stress and performance testing. The test scripts developed by the Contractor shall be used to validate the intended function and performance of all field devices and infrastructure components,
e.g., local processors, network components, etc. System Acceptance Testing shall demonstrate that all equipment satisfies the specification requirements herein and design changes approved by Commission.

7. All repairs, construction, or modifications as required to comply with this Section shall be performed by the Contractor without additional cost to the Commission.

8. Submit to Commission a System Acceptance Test Report at the conclusion of the test for the purpose of verifying and validating the accuracy and integrity of the system as installed. The Commission will review the report and respond; indicating approval or noting changes required either in the performance of the work or in the report. Make all changes or perform additional work as the Commission may direct prior to the start of the Operational Test.

9. Demonstrate that the communications subsystem is fully functional. In the event of test failure, perform a partial or total re-test to demonstrate the subsystem is functioning as a whole. Conduct system tests on all subsystems and components that are being furnished under this contract. Conduct tests from the TOC as indicated, exercising functional and interface requirements as required.

F17.04 Wireless Communication Test - The Wireless Communications tests shall be included in the SAT testing plans. The Commission’s and/or PennDOT’s Representative(s) will be present for all communications testing. Coordinate with and support (access to the cabinet, Maintenance of Traffic, technical, electrical, etc.) the Commission’s and/or PennDOT’s Representative(s) during the testing of the interface between the controller and the wireless communication.

F17.05 60-Day Operational Acceptance Test (OAT)

1. Upon notification from the Commission of approval of the System Acceptance Test Report including all of the subsystems and the Contractor’s certification that all of the DMS Systems are ready for operational testing, an Operational Test phase shall commence. The Operational Test will be for all DMS locations simultaneously and shall be performed by the Commission staff with the advice and assistance of the Contractor during a sixty (60) consecutive day period.

2. The OAT will be conducted on all field devices, as well as on the central software at the Highspire facility. Give the Commission a minimum of 5-days notice and a complete testing schedule to assure availability of Commission personnel, or their designee.

3. During this period, the Commission’s operating staff will operate the System as specified in the Operational Acceptance Test Plan using the final version of all applicable manuals, printed guides and procedures. During the test, field elements must be continuously monitored with daily reports generated to confirm proper integration with the software. Correct, as determined by the Commission, any failure or malfunction of material significance during the test period. Said malfunctions include, but are not to be limited to, equipment failure or failure of the system or any subsystem to comply with the requirements stipulated in the Contract. A failure that requires correction before proceeding with the testing is defined as any failure of any item of the equipment or software, or both, that prevents the Commission operating staff from performing meaningful use of the system or any subsystem.
4. If a subsystem has a failure, as determined by the Commission or its representatives, then the Operational Test for that subsystem shall restart from day one. After the Contractor corrects a failure for two (2) or more subsystems, the Operational Test for the entire system shall restart at day one, and shall continue until the results meet the conditions and terms of the performance period. During the Operational Test phase, the Commission, based upon information provided by the Commission operating staff, will determine the system’s standard of performance as described herein and whether any failure shall be considered a failure.

5. In the case where ten percent (10%) of similar components malfunction during the test period, the Commission may declare a system defect and require replacement of similar components. When a system defect is declared, restart the 60-Day test for that specific system. The 60-day test period is to begin when all similar components are replaced and a system acceptance retest has been successfully completed. A total of 90 calendar days is provided for all testing.

(a) Performance Period – The Performance Period for operational testing shall begin on the date of notification to the Contractor by the Commission to commence operational testing and shall end when the System has met the Standard of Performance for the consecutive days required by operating in conformity with the Contract as stated in the Specifications.

(b) Exchange and Expansion Equipment During System and Operational Testing – Certify in writing to the Commission when exchange or expansion equipment, devices, or components are installed and ready for use. For the purpose of this Section, “expansion” is used to denote equipment, which is not specified in the approved final design Bill of Materials. Provide an Equipment or Component Installation Certificate, including date, for the equipment or component. If this occurs during the 60-Day Operational Test, the performance period of 60 consecutive calendar days for the operational test shall recommence on the first Commission work day following acceptance of the Contractor’s Equipment or Component Installation Certificate, at which time operational testing shall commence. It is not required that one sixty day period expire in order for another performance period to begin.

Make available a systems technician who is fully knowledgeable and capable of operating all functions of the specified subsystem on an on-call basis for technical support during the 60-day test period.

Following the completion of 60-day test, clear the inside of all ITS enclosures using brushes and vacuums, as appropriate, perform component cleaning and filter replacements at all enclosures installed in the project. During the 60-day test, power and communication costs associated with the operation of the ITS devices will be the responsibility of the Contractor. Ownership of the subsystem will be transferred to the Commission upon successful completion of the 60-day test and final acceptance of the project.

F17.06 Test Documentation

1. Provide test documentation, including at a minimum, test equipment, special test software, test procedures, checklist, test forms and data summary sheets. Test documentation shall:
(a) Demonstrate that the System satisfies the intended project functionalities.
(b) Demonstrate that the communications system satisfies the intended project functionalities.
(c) Reference the requirements matrix to show that all requirements will be tested to demonstrate compliance with the Basic Design Criteria.

2. Test procedures, test forms and checklists shall be referenced to the Contract Document requirements, listing each requirement to be tested.

3. Test documentation shall be submitted for Representative’s approval, at least 30 days prior to the scheduled start of testing. Test documentation that does not receive the Commission’s approval shall be reworked until approved. Testing shall not start until test documentation has been approved. After test documentation is approved, provide at least twenty (20) working days’ notice prior to all tests to permit the Commission to schedule and observe each test.

F17.07 Test Results and Analysis

1. The outcome of each test shall be compared with the specified functional performance and operational requirements. Failure to conform to the requirements of any test shall be considered a defect, and equipment and/or subsystems shall be subject to rejection by the Commission.

2. When an element unit is modified as a result of a defect, prepare a report for the Commission’s approval. The report shall describe the nature of the failure and the corrective action taken. If a failure pattern develops, the Commission may direct that design and construction modifications be made.

3. Equipment rejected because of defects limited to the specific unit being tested, may be offered for retest provided all non-compliant items have been corrected and re-tested by the Contractor and evidence thereof submitted to Commission.

4. Analyze and categorize all defects as to whether they are limited to the specific unit being tested or are potential problems for all units.

5. For the case of defects common to multiple units, all deliverable units shall be modified without additional cost to the Commission. This modification includes design changes required to pass design approval tests.

6. If any of the test results fail to conform to the requirements of the applicable Technical Requirement, the equipment, subsystem or system failing shall be considered a defective item and shall be subject to rejection by the Commission. Rejected elements, sub-system or system may be offered for re-test, provided all the defects have been rectified by the Contractor and/or manufacturer and the required documentation thereof submitted to the Commission.

F17.08 System Testing and Acceptance

1. In addition to or as a supplement to all testing requirements described elsewhere in this part and the specifications, conduct a full program of testing, the purpose of which shall be to demonstrate to the Commission’s satisfaction that the system fulfills all of the specifications and requirements as set forth herein.
2. Pre-Acceptance Testing

(a) The Contractor shall be allowed to proceed with pre-acceptance testing without regular monitoring by the Commission. Without interrupting the Contractor’s installation and testing schedule, the Commission and its representatives shall reserve the right to review testing progress and to witness the Contractor pre-acceptance tests. Test milestones for pre-acceptance testing shall be reflected in the Project Plan and Schedule, and testing progress shall be documented in the Contractor’s regularly issued project status reports. Conduct all pre-acceptance tests to ensure compliance with the specification requirements herein and design changes approved by the Commission. Before proceeding with the assembly and integration of the subsystem equipment, test each unit of installed equipment on a stand-alone basis. Subsequent to stand-alone equipment testing, test the software and hardware components as an integrated subsystem.

(b) Certify the results of all pre-acceptance tests and submit a certification to the Commission.

3. Acceptance Testing Provisions - Prepare and deliver to the Commission a comprehensive Acceptance Test Plan that describes all the activities and tasks associated with testing during each test phase at least 30-days prior to the scheduled start of each test phase (System and Operational). The Acceptance Test Plan for each phase shall describe the activities and tasks associated with the tests to be performed during the appropriate acceptance test phase. At a minimum, the Acceptance Test Plan shall contain the following elements:

(a) A summary statement of the purpose and goal of each test phase
(b) The method of testing
(c) A description of the overall test environment
(d) A block diagram of all equipment and components used in the test
(e) Configuration
(f) Specification of the hardware and software required for the test which describes the number and type of devices to be used, describes what real-world inputs and outputs will be simulated and how the inputs and outputs will be simulated
(g) A detailed matrix that identifies all design requirements and indicates where each requirement will be demonstrated as part of the test procedure. The matrix shall include, at a minimum, references to both the individual specification requirements and each approved design change.
(h) A detailed test procedure which:
1) Demonstrates that every feature and function to be provided in the furnished hardware and software conforms to the requirements of the Contract.
2) Identifies the contract requirements to be demonstrated as part of each individual test procedure through the specific references to both the specification requirements and the approved design changes.
3) Identifies the steps for each test to be performed, test purpose, conditions which will exist at the start of the test, and conditions/results expected at the conclusion of the test.
4) Identifies the success/failure status of each test along with adequate space for comments of the test witness to be recorded.
5) Describes the outputs to be provided to the Commission to document the test results (reports, database listings, statistical analyses, message displays, etc.).
(i) After receipt of each Acceptance Test Plan, the Commission will review and comment on its content, and if necessary, make appropriate changes to the Acceptance Test Plan to address the Commission’s comments and resubmit the plan for Commission review and approval. The Commission requires a minimum of fifteen (15) workdays to review and comment or approves resubmitted test plans. Incorporate adequate time in the project schedule to address comments, resubmit a revised test plan, seek approval and perform each Acceptance test without changing the scheduled Acceptance test date. Be responsible for maintaining the scheduled date of all acceptance tests.

(j) When all tests for a testing phase have been executed to the satisfaction of the Commission, prepare and deliver to the Commission an Acceptance Test Report along with the Contractor’s written certification that the System has successfully passed all tests for that specific test phase. The Acceptance Test Report shall contain at a minimum the following sections:
1) Summary of the test phase
2) Description of the tests performed to include, test conditions at start and end of each test, expected test results with Pass/Fail criteria, actual test results, signature block for individuals who witnessed the successful completion of the test, itemized list of unresolved items that were not completely compliant with the contract items and require correction prior to initiation of the next level of testing
3) Action plan to conduct the next iteration of the test phase or a statement that the phase was completed successfully

(k) The Commission and its representatives will evaluate each Acceptance Test Report and notify the Contractor of its evaluation. No acceptance test phase shall be initiated without the Commission’s written approval of the Acceptance Test Plan specific to that phase, and no test phase shall be considered complete, nor may the Contractor proceed to the next step until the Commission has approved, in writing, the Contractor’s Acceptance Test Report for the previous phase.

F17.09 Measurement and Payment – Lump Sum.

F18.00 WIRELESS COMMUNICATIONS SYSTEM PA TURNPIKE COMMISSION
(ITEM: 4000-0010)

F18.01 General – Coordinate, install and test a communications system to convey data between DMS Field Locations and the TOC at the Highspire facility. The communications system will utilize a 4G LTE capable wireless WAN (WWAN) router for network connectivity to transfer the control and status data between the DMS location and the Commission’s TOC in Highspire. The WWAN router and antennas along with other materials will be provided by the Commission.

Install, integrate and test the communication system at the locations noted in this contract, to the approval of the Commission. No additional payments will be for the communication system.

F18.02 Applicable Standards, Codes and Publications – Perform all work in accordance with the latest codes, standards and specifications listed below and all local codes.

1. National Electrical Code (NEC), Latest Edition
2. Occupational Safety and Health Act (OSHA)
3. Underwriters Laboratories, Inc. (UL)
4. Institute of Electrical and Electronics Engineers (IEEE)
F18.03 WWAN Communications Equipment (Provided by the Commission) – The Commission will provide the equipment listed below for installation by the Contractor. Coordinate the delivery and testing of the WWAN equipment with Mr. Mike Metz at 717-831-7410.

In general, the Commission will provide the following:

- A pre-configured WWAN router
- Antennas
- RF surge protection devices
- RF connection cables
- Ethernet cable
- IP address, subnet mast, and default gateway for the CCTV controller
- An installation checklist

The specific equipment that the Commission will supply is as follows:

- Cisco 809 Industrial ISR 4G/LTE
  - IR809G-LTE (quantity 1)
- 4G/3G multiband antennas (quantity 2)
  - Laird Technologies TRA6927M3PWN-001 (or equivalent)
- RF surge protectors (quantity 2)
  - Polyphaser TSX-NFM (or equivalent)
  - Polyphaser BFN bulkhead adaptor (or equivalent)
- RF cables (quantity 2)
  - 48” long LMR-200 (or equivalent) cable with N-male connector and TNC male connector
- Ethernet cable (quantity 1)
  - Ethernet straight through RJ-45 cable
- DC Power supply
  - Traco Power TML 40124C (quantity 1)

F18.04 Construction – Coordinate with the controller cabinet supplier and the WWAN equipment supplier and install the WWAN equipment in the cabinet. Provide a shelf for router mounting and antenna layout space. Provide the necessary labor, supplies and materials to provide 120 VAC power to the WWAN router's DC power supply and to ground the WWAN router and RF surge protectors to grounding system and perform all other work necessary to make the communications system operational. When both the DMS and the communication equipment are installed and operational, provide support for complete testing of the communications system as part of system testing. Provide antenna location in shop drawing submittal. Utilize 100% silicone sealant on both interior and exterior of cabinet to ensure waterproofing. Mount Cisco equipment on shelf as noted in plans.

F18.05 Measurement and Payment – Each. Includes all labor, cabling, connectors, converters, materials, testing and configuration for a fully operational two-way communication system.

F19.00 WIRELESS COMMUNICATIONS SYSTEM PENNDOT (ITEM: 4000-0011)

F19.01 General – Coordinate, procure, install and test a communications system to convey data between DMS 286-4 and the PennDOT Central Regional Traffic Management Center in Harrisburg, PA. The communications system will utilize a digital wireless communications for network connectivity to transfer the control and status data between the DMS location and
the Central Regional Traffic Management Center in Harrisburg. All communications equipment, cables, wires, interfaces and appurtenances to establish a connection will be procured by the contractor.

Install, integrate and test the communication system at this location, to the satisfaction of the PennDOT and the Commission. No additional payments will be for the communication system for this location.

F19.02 Materials – In accordance with the applicable portions of Section 1230.02.

F19.03 Construction - In accordance with the applicable portions of Section 1230.03.

F19.04 Measurement and Payment - Each. Includes all equipment, labor, cabling, connectors, converters, materials, testing and configuration for a fully operational two-way communication system.

F20.00 ITS SYSTEM COMPLETE POWER SUPPLY (ITEMS: 3910-7030, 3910-7031, 3910-7032, 3910-7033, 3910-7034 and 3910-7035)

F20.01 Description – This work is furnishing, installation, and wiring of the complete power supply system, including the electrical power and distribution system at ITS device locations in accordance with Sections 910 and 1101, as applicable and as indicated. The following summarizes the types of power supplies.

- Type A (One Disconnect) - 120/240 V Service for a single sign, pole mounted, one fused disconnect at service equipment
- Type A (Two Disconnects) - 120/240 V Service for a single sign, pole mounted, one fused disconnect at service equipment and one unfused disconnect at controller cabinet
- Type A (Two Disconnects, with Cabinet) - 120/240 V Service for a single sign, mounted in/on cabinet, one fused disconnect at service equipment and one unfused disconnect at controller cabinet
- Type B - 120/240 V Service for a single sign, pole mounted, one fused disconnect and transformer at service equipment and one unfused disconnect and transformer at controller cabinet
- Type C - 120/208 V Three Phase Service for a three signs, cabinet mounted, one fused disconnect at service equipment and one unfused disconnect at each controller cabinet
- Type D - 120/240 V Service for two signs, mounted in/on cabinet, one fused disconnect at service equipment and one unfused disconnect at each controller cabinet

F20.02 Material – Section 910.2 as applicable and as follows:

Provide 3” galvanized steel pipe, 1” galvanized steel strut, Class A concrete and hardware to construct a service pedestal to mount meter socket and disconnect in accordance with the minimum design requirements of the Electric Utility and in accordance with ITS-1201.

Provide NEMA-3R, 100A, 120/240V, single phase, three wire, meter socket or a NEMA-3R, 100A, three phase, four wire meter socket, as indicated, at the locations indicated in the drawings. Provide a meter socket in accordance with electric utility company standards.

Provide NEMA 3R, fusible primary service disconnects as indicated. The switch will be lockable in the “ON” position. This “lock on” feature will be manufacturer installed or
provided. Provide Class RK5 time delay current limiting fuses of voltage and current ratings as indicated. Provide black phenolic engraved plastic-laminate tags with white lettering, screw on type for the disconnect. Provide black self-tapping screws for installation on equipment. Label the tag with device prefix such as “DMS- (use DMS number as determined during integration) DISCONNECT”.

Provide NEMA 3R, non-fused disconnects at the controller cabinets as indicated. The switch will be lockable in the “ON” position. This “lock on” feature will be manufacturer installed or provided. Provide black phenolic engraved plastic-laminate tags with white lettering, screw on type for the disconnect. Provide black self-tapping screws for installation on equipment. Label the tag with device prefix such as “DMS- (use DMS number as determined during integration) DISCONNECT”.

Provide a NEMA 3R, cabinet for all locations were a separate service cabinet is required.

Provide 3/4”x 10’ copper clad steel ground rods as specified.

Provide #4 AWG Bare copper ground conductor to the ground rod. The conductor will be connected to the ground rod by an exothermic weld.

For Type B power supplies, provide step-up and step-down transformer as indicated in the plans. The unit must feature a front-accessible compartment with high and low voltage connectors. Supply a single phase, 60 hertz unit with NEMA 3R and UL Listed Enclosure. Include two (2) 5% full capacity taps (minimum).

Equipment must be treated with an ultraviolet protective coating to minimize maintenance.

F20.03 Construction – Section 910.3 as applicable and as follows:

Construct and connect power supplies as shown in the contract drawings, Electric Utility Design Manuals, standard specifications/drawings and as specified herein to provide complete electrical service for each ITS device.

Coordinate the electric utility company work as required.

Before starting Construction, verify existing drainage/utility lines.

Provide junction boxes as shown on the plans. Provide a cover and watertight, closed-cell neoprene gasket with brass or stainless steel tamperproof screws to secure cover.

Provide factory installed grounding stud and hex nut in rear of box, as applicable.

Provide service head – UL listed, weatherproof, for applicable conduit and cables.

Paint exposed service equipment at DMS #326-4, #326-5 and #326-6 black and service equipment at DMS #340-1, #340-2 and #340-3 brown. See “Painting Structural Steel” Special Provision for further details.

F20.04 Measurement and Payment – Each, for the type indicated.

Where painting of the cabinets is required, the cost is incidental to this item.

Separate payment will be made for poles, conduit, junction boxes, and underground cables.
F21.00 WOODEN UTILITY POLE  
(ITEM: 4000-6060)

F21.01 Description – This work is furnishing and installation of a wooden utility pole to install aerial electric and/or communications service lines.

F21.02 Materials – Furnish southern yellow pine, Class 7 wooden poles that conform to ANSI Specification 05.1. Provide 35’ wooden poles with a minimum circumference of 1.75 feet on the top, 2.63 feet at the height of 6 feet from the base. Provide chemical preserved treated pole.

Furnish, as part of the pole assemblies, the following material if required:

- Required length of galvanized steel messenger cable of 0.43-inch diameter made of seven strands and conforming to ASTM-A75, Class A Specification.
- Single strand lashing wire 0.006-inch diameter and made of Type 430 stainless steel.
- Suspension and attachment hardware made of galvanized steel, hardware galvanized in accordance with ASTM-A1 53 Specification.

F21.03 Construction – Pole treatment process to conform to AWPA-C4 and to provide retention of CCA dry salts of 0.6 lb per cubic feet. Install the poles within the Commission’s right of way. Tension messenger cable at 60°F for the poles or as directed by the Representative. Dead end messenger cable at the poles as directed by the Representative. Install poles, in accordance with the current specifications and standards of NELA, EE1 and NESC. Dig holes with vertical sides and with a diameter large enough to permit use of a mechanical tamper around the pole. The installation of the poles is subject to the inspection and approval by the Representative prior to backfilling.

Provide down guys as needed.

Provide plate on the pole indication owner (PTC), contact phone number (TOC Manager) and pole number. Use the first four digits of the location latitude and longitude for the pole numbering convention.


F22.00 JUNCTION BOXES, J.B.-1, J.B. 2, JB-11 AND J.B.-12, MODIFIED  
(ITEMS: 3910-0001, 3910-0002, 3910-0004 and 3910-0005)

F22.01 Description – This work is furnishing and installing junction boxes at locations indicated.

F22.02 Material – Section 910.2

F22.03 Construction – Section 910.3, except revise Section 910.3(p) by adding:

a. Bond metal framed junction box and cover to ground. The bond shall provide a solid electrical and mechanical connection.

b. Cast the label “PENNSYLVANIA TURNPIKE COMMISSION ELECTRIC CABLE” into the covers of junction boxes used for Power.

c. Cast the label “PENNSYLVANIA TURNPIKE COMMISSION COMMUNICATION” into the covers of junction boxes used for communication cable.

d. Ground all junction boxes in accordance with NEC Article 250.
e. Place on top of at least 12” of No. 57 coarse aggregate, 18” in poor drainage areas, as shown on the plans.

F22.04 Measurement and Payment – Each.

F23.00 DYNAMIC MESSAGE SIGNS
(ITEMS: 4000-0201 and 4000-0211)

F23.01 Description – This work is the installation, integration, coordination, and the testing of full color Light Emitting Diode (LED) Dynamic Message Signs (DMS) provided by the Commission as described herein.

The Commission will provide the following material for this contract:

- 3 LED Full Matrix Dynamic Message Signs, Model No. VF-2020-96x288-20-RGB, as Manufactured by Daktronics.
- 21 LED Full Matrix Dynamic Message Signs, Model No. VF-2420-64x160-20-RGB, as Manufactured by Daktronics.
- 21 VFC 3000 DMS Controllers.
- 1 VFC DMS Controller
- 3 Pole Mount 336S Control Cabinets.
- 19 Ground Mount 334 Control Cabinets

Assume sole responsibility for installation, and integration of a fully functional DMS system at the locations denoted in this contract, to the approval of the Commission. No additional payments will be made to the Contractor for the DMS system, unless it is additional work items mutually agreed upon by both the Contractor and the Commission.

F23.02 Mutual Inspection and Acceptance of DMS at delivery - Coordinate directly with the Commission Vendor for the delivery of the DMS. Provide the Commission Vendor at least 3 weeks prior written notice to the requested delivery date. If the contractor delays shipment of DMS beyond 60 days after the initial request from the Commission Vendor it will be the responsibility of the contractor to store the DMS and all delivered materials, in a manner suitable to the Commission, until installation of the device.

A truckload, consisting of two Type 1 DMS, or four Type 2 DMS, will be delivered to no more than two locations identified by the contractor and approved by the Commission. Ensure that the Contractor, Commission and its vendor has appropriate personnel on site for inspection when the signs are delivered. Inspect the DMS at this time along with the Commission and its vendor for any damage. Document any damage to the DMS and agree to accept delivery. Be responsible for any damage to the DMS that is not documented at delivery acceptance and all damages to the DMS until installation.

Provide the necessary equipment to unload the DMS from the truck and properly secure, protect from vandalism and damages and store the sign after it is unloaded. Store the DMS at least 4-inches off the ground and outside of the clear-zone of all roadways.

F23.03 General Requirement – The DMS supplied are full color Light Emitting Diode (LED) pixel based matrix modules arranged to form a full matrix display.
Type 1 signs will have a full 96 row by 288 column matrix with a 20 mm pixel pitch. They will be capable of displaying variable text and graphics and at a minimum, three (3) rows of fifteen (15) characters each with a nominal character size of 18-inches using a 23x15 pixel matrix for each character. The overall sign dimensions will be approximately 7'-11” x 21'-6” x 4'-0” (Height x Width x Depth) including rear mounting brackets.

Type 2 signs will have a full 64 row by 160 column matrix with a 20 mm pixel pitch. They will be capable of displaying variable text and graphics and at a minimum, three (3) rows of Twelve (12) characters each with a nominal character size of 12-inches using a 15x10 pixel matrix for each character. The overall sign dimensions will be approximately 5’-8” x 12”-2” x 1’-2” (Height x Width x Depth) including rear mounting brackets.

Each new DMS will be compatible with the existing Turnpike’s Central Software System (MIST). The Commission will configure each DMS (except DMS #286-4) into the MIST system with pre-established IP addresses provided by the Commission. The Contractor will configure DMS #286-4 as directed by PennDOT.

The structure and foundation for the structure mounted DMS will be furnished by the Contractor in accordance with Special Provision F13.00 SIGN STRUCTURES. Vertical clearances over all shoulders and roadways shall be a minimum 17’ 6” as indicated in the plans.

The posts, breakaway brackets and foundations for the Type A mounted signs will be provided by the Contractor. All conduits on the sign structures and the conduits and conduit breakaway couplings on the posts for Type A mountings will be provided by the contractor.

The signs will be capable of being mounted without gaining access to the inside of the enclosure. Any mounting eyes shall be attached to the DMS enclosure structural framing. The LED DMS enclosure shall be adaptable for mounting as shown on the Contract Drawings and/or PennDOT Publication 647.

**Construction** – Provide installation and layout plans to the Representative and receive approval before construction. Position sign for optimum view for motorists as per sign specifications. Install all interconnection cables inside conduits, which run between the sign controller unit and the sign support structure and within the sign support structure itself.

Install ground mounted and pole mounted cabinets as indicated and as set forth in Standard ITS-1201, including foundations, maintainer pads and safety rails if required.

Remove obstructions such as trees, shrubs, vines, and others to provide an unobstructed view of the DMS for up to 1000-feet.

**Associated Cables and Wiring** – Provide all wiring and grounding conforming to the requirements of Section 1104.05. Install power and control cables as necessary to operate the dynamic message signs.

Install the cables in liquid tight conduit in concealed locations as indicated, between the nipples on the sign support and sign case. The cables will use the sign support beams and legs as raceway and will be installed in continuous, un-spliced lengths between the sign case and the DMS controller. Provide sufficient slack to ensure that the connections to the controller and the power source will be possible without the need to add or splice any cables.
Dynamic Message Sign Bonding – Electrically bond the DMS to the support structure at all mounting bolt locations, consisting of an electrical bond wire or properly prepared electrical contact points.

F23.05 Measurement and Payment – Each. For INSTALL FULL COLOR MATRIX DMS TYPE 1 AND TYPE 2 for Type indicated and as indicated in Special Provision F09.00, MEASUREMENT AND PAYMENT SCHEDULE. Payment includes all labor, material, equipment and appurtenances necessary for the installation of the DMS, controllers, controller cabinets and control cables between the controller and the DMS. Also included in this item are all structure mounted conduits; conduit breakaway couplings; excavation, concrete and reinforcement for the foundations of the Type A mountings; grading, #57 coarse aggregate, reinforcing, and concrete for maintainer pads and ground mounted controller cabinets. The Type A posts will be paid for separately.

F24.00 REMOVE AND RESET RIGHT-OF-WAY FENCE, TYPE 1 (ITEMS: 4000-0600)

F24.01 Description – This work is the removal and resetting of existing right-of-way fence in the vicinity of DMS #333-3 for construction access as needed.

F24.02 Material – Section 624.2

F24.03 Construction – Section 624.3 and as follows:

Prior to removing any right-of-way fence or posts, document their condition with pictures and written descriptions, noting any existing damage, and submit copy of documentation to the Representative.

Carefully remove only the fence fabric and posts that are required for safe and efficient access and construction of DMS #333-3. Carefully store and protect all removed material.

Provide and install temporary fence (4’ high polyethylene construction fencing) to close temporary opening when work is not ongoing.

Sequence the work so that the permanent fencing is not in place for not more than one month, unless otherwise authorized by the Representative.

When access is no longer required, reinstall posts and fence to the satisfaction of the Representative. Do not damage fence. Repair or replace any fence or posts damaged to the satisfaction of the Representative at no additional cost to the Commission.

F24.04 Measurement and Payment – Lump Sum.

F25.00 HDPE COMMUNICATIONS/POWER CONDUIT (ITEMS: 0937-0322, 4910-5005, 3954-0151 and 3954-0500)

F25.01 Description – This work is the furnishing and installation of high-density polyethylene (HDPE) conduits by method of Trench Modified, Type I (unpaved surfaces) and/or Directional Boring under the roadway and flexible delineator posts as shown on the plans or ordered by the Representative.
F25.02 Material –

(a) HDPE Conduit – SDR11 with smooth interior wall and smooth exterior wall. Manufactured in accordance with ASTM F2160 and ASTM D3035 from thermoplastic polymer conforming to the minimum standards defined in ASTM 3350 (See Table 1).

<table>
<thead>
<tr>
<th>ASTM Test</th>
<th>Description</th>
<th>Values HDPE</th>
</tr>
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<tbody>
<tr>
<td>D-1505</td>
<td>Density g/CM³</td>
<td>.941 - .955</td>
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<td>D-1238</td>
<td>Melt Index, g/10 min. Condition E</td>
<td>.05 - .50</td>
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<td>D-790</td>
<td>Flexural Modulus, MPa (PSI)</td>
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<td>D-1693</td>
<td>Environmental Stress Crack Resistance Condition B,F10</td>
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<tr>
<td>D-638</td>
<td>Tensile strength at yield ((PSI)</td>
<td>3000 min.</td>
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<tr>
<td>D-746</td>
<td>Brittleness Temperature</td>
<td>-75°C</td>
</tr>
</tbody>
</table>

(b) Plastic Marking Tape, Red - Section 1101.12(e)

(c) Pulling Lines – (Woven polyester or Aramid fiber with an average tensile strength in excess of that which is required to pull all proposed service cables) – Muletape as manufactured by Neptco Inc. – Teltek Sales 215-477-5888, Bull-Line; as manufactured by Arnco Corp. 1-800-321-7914; or approved equal.

(d) Tracer Wire – Provide solid copper, or copper clad steel wire.

(e) Flexible Delineator Post – Sections 937.2 and 938.2, and as follows:

1. Flexible Delineator Post – Similar to a Type 2 Guide Post manufactured by Safe-Hit Corporation, 1930 W Winton Ave., Building 11, Hayward, CA 94545, (510) 783-6550 or approved equal and as detailed on the plans. Red for Power and Orange for Communications.

2. Decals – Non-reflective with warning message of “Buried Electrical Cable” or “Buried Communications Cable”.

F25.03 Construction –

(a) HDPE Conduit – Section 910.3(g), as indicated, and as follows:

Place communications and power conduits (SDR11) at locations indicated on the drawings. Place conduits such that it is a continuous run with no splicing between junction boxes.

Prevent conduits from twisting during installation and minimize variation in the horizontal and vertical alignment. Orientation of the conduits must be consistent throughout the project in and out of each junction box. Install conduit with the tracer wire in the upper left position, at approximately 10 o’clock on the conduit circumference. A tracer wire shall be included in one conduit in each trench.

At obstructions, taper conduit runs to provide vertical or horizontal offset at a rate of 20:1 or flatter.
Identify the conduits within the trench with 6” wide red plastic marker tape placed a minimum of 12” directly above each conduit.

After placing the conduit between junction boxes, provide red flexible delineator post electrical cable markers as required. Flexible markers are to be placed at the junction box and are to identify the conduit as underground electrical cable.

Install pulling lines in each individual conduit to insure that the conduit has not been damaged during installation and use for subsequent testing. Test the conduit after conduit is installed and after guiderail is installed and as directed by the Representative. If conduit is damaged, replace the conduit at no additional expense to the Commission. The pulling lines will remain in unused conduits for future use by others.

Seal all conduits at both ends with manufacturer’s plugs to make conduits watertight.

(b) Trench Modified, Type I – Section 9 10.3(c), as indicated and as follows: Spider plow trenching is an acceptable method of construction.

Where conduit is to cross a drainage pipe or other lateral obstruction, identify the location in the field with paint or another method acceptable to the Representative prior to beginning trenching operations and provide suitable crossing method as per the Contract Plans.

Install conduit in trench as indicated on plans.

Install metallic warning tape, red in color, for power trenches.

(c) Flexible Delineator Posts – Install decals, sheeting, letters, and numbers on the posts as indicated on Standard Drawings.

For soil installations use a chisel pointed, drivable, reusable metal anchor into which the post is inserted and held in place with a locking mechanism.

Install red flexible delineator post power cable marker at junction boxes, and horizontal bend points in power conduit, as indicated and as directed by the Representative.

(d) Directional Boring – Section 954.3(b).

F25.04 Measurement and Payment –

(a) HDPE Conduit – Linear Foot. Includes all pulling lines, marking tape and tracer wire.
(b) Trench Modified, Type I – Linear Foot
(c) Directional Boring – Linear Foot – Including conduit
(d) Flexible Delineator Post– Each. For the type indicated, includes decal.

F26.00 ELECTRICAL CABLE
(ITEMS: 3910-4112, 3910-4113, 3910-4114 and 3910-4115)

F26.01 Description - This work is furnishing and installation of electrical cable at locations indicated.

F26.02 Material - Section 910.2 and as follows:
Revise Section 1101.08, by adding:

A. Supply electrical 600 Volt rated electrical cable. Installation shall be in accordance with Section 910.3(h).

B. Provide soft drawn copper conductors per ASTM B-3. Provide Type THWN/THHN insulation. Provide 600 Volt rated, UL Listed conductors.

C. Conductors sized AWG #8 or larger shall be Class B concentrically stranded per ASTM B-8. Conductors sized AWG #10 or smaller shall be solid.

D. Use rubber molded breakaway connectors in accordance with PENNDOT RC-84M. Drawing for all electrical cables that will be installed on breakaway posts.

E. Triplex cable may be used in lieu of individual cables for aerial runs. Aluminum conductors are not acceptable.

F26.03 Construction – Section 910.3.

F26.04 Measurement and Payment – Linear Foot, for the size indicated.

F27.00 ENERGY SERVICES
(ITEM: 4000-0020)

F27.01 Description – This item incorporates coordination to obtain new services and paying monthly energy charges to the appropriate electric supplier until the Operational Acceptance Test is completed and the final acceptance of the project.

F27.03 Construction – Coordinate and apply for new service drops from the appropriate utility company. Service will be made in the Commission’s name but all bills will be received by the Contractor at the Contractor's address. Comply with all requirements, including providing adequate notice. Request from the appropriate utility company an extension of their electrical services to the point of services (POS) indicated. All work to extend the utilities services to the POS will be performed by the utility. Be responsible for energy charges up to the completion of the 60-day Operational Test period and Final acceptance by the Commission.

After the 60 day Operational test and final acceptance by the Commission, transfer the billing address to appropriate Commission address as provided by the Representative.

F27.04 Measurement and Payment – Predetermined Amount. Payment will be on a force account basis in accordance with Section 110.03(d) 4. Services by others.

F28.00 REMOVE AND DISPOSE EXISTING HAR, SIGN AND EQUIPMENT
(ITEM: 4000-0300)

F28.01 Description - This work is for the removal and disposal of existing Highway Advisory Radio (HAR) equipment, cabinets, signs, posts and foundations.

F28.03 Construction - Seven calendar days before any demolition work begins, contact Mr. Ray Zanzinger of Transcore at (717) 831-7630 or 717-645-5586 to inform him of the schedule for removal to allow them to remove salvageable equipment from the site. Receive express permission by the Representative prior to taking any equipment out of service or removing it.
Safely disconnect and permanently terminate any electrical service that will not be needed for the final conditions.

Remove all foundations that do not conflict with the new construction to at least 1 foot below finished grade. If foundations conflict with new construction, remove them completely.

Safely remove HARs, sign assemblies, beacons, structures, foundations and all other appurtenances and properly dispose of all items outside of the PennDOT and/or Turnpike rights-of-way.

\[ F28.04 \] **Measurement and Payment** – Each, for each location to be removed.

\[ F29.00 \] **TRIMMING VEGETATION TO PROVIDE SIGHT DISTANCE**  
(ITEM: 4000-0500, 4000-0501, 4000-0502, 4000-0503, 4000-0504)

\[ F29.01 \] **Description** - This work is the trimming of selected trees and shrubs as required to provide adequate site distance for DMS viewing and for clearing the installation area for the power, conduits, cabinets and/or structures. Selective tree trimming for DMS viewing shall provide a minimum of 1000-feet of clear viewing distance.

\[ F29.03 \] **Construction** - Sections 810.3 (c), (d), and (e).

\[ F29.04 \] **Measurement and Payment** – Each.

\[ F30.00 \] **RESTORE LANDSCAPING IN ISLAND**  
(ITEM: 4000-0400)

\[ F30.01 \] **Description** – This item is to document, protect and restore the landscaping items, including plant materials, ground cover and mulch on the surface of the traffic island where DMS #326-5 will be installed.

\[ F30.02 \] **Materials** – In accordance with Sections 805.2 and 808.2.

\[ F30.03 \] **Construction** – Prior to construction, document the location, size and condition of the existing plant materials and mulch within the island. Documentation shall be in form of scale drawings and sketches as well as keyed photographs of the existing landscaping contained on the traffic island. Submit the documentation to the Representative for approval prior to beginning any construction in the area.

Coordinate all work with the management of the King Of Prussia Mall and Upper Merion Township.

After the installation of the DMS, the controller cabinet and all junction boxes and conduit is complete, re-establish all plant material to preconstruction conditions in accordance with the preconstruction documentation. Provide watering and required fertilizer to ensure that new plantings and transplantings survive and thrive. If there is plant loss, replace plants at no additional expense to the Commission. All work will be completed to the satisfaction of the Representative.

\[ F30.04 \] **Measurement and Payment** – Lump Sum - to be paid after all plants have been established and all work associated with this item is accepted by the Representative.
F31.00  EROSION CONTROL MULCH BLANKET WITH FORMULA D SEEDING  
(ITEM: 3806-0051)

F31.01  Description – This item is furnishing, placement and maintenance of erosion control mulch blankets and seeding with Formula D seeding of all grassed disturbed areas.

F31.02  Materials – In accordance with Sections 804.2 and 806.2.

F31.03  Construction – In accordance with Section 804.3 and 806.3 and as indicated.

F31.04  Measurement and Payment – Square Yard of mulch blanket placed.

F32.00  ENUMERATION OF DRAWINGS

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FOR INFORMATION ONLY
4 Sheets  DMS Drawings and Details

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION STANDARD DRAWINGS

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<td>RC-45M</td>
<td>INLET TOPS, GRATES AND FRAMES</td>
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<td>TYPE 2 STRONG POST GUIDE RAIL</td>
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<td>HIGHWAY LIGHTING-LIGHTING AND ELECTRIC DETAILS</td>
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<td>BC-736M</td>
<td>REINFORCEMENT BAR FABRICATION DETAILS</td>
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<td>PAVEMENT MARKINGS (EXPRESSWAY/FREeway, CONVENTIONAL, LEGENDS &amp; SYMBOLS)</td>
<td>JUNE 13, 2013</td>
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<tr>
<td>TC-8604</td>
<td>DELINEATION</td>
<td>JUNE 13, 2013</td>
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<tr>
<td>TC-8702A</td>
<td>POST-MOUNTED SIGNS, TYPE A</td>
<td>JUNE 13, 2013</td>
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<tr>
<td>TC-8702B</td>
<td>POST-MOUNTED SIGNS, TYPE B</td>
<td>JUNE 13, 2013</td>
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<td>TC-8716</td>
<td>TYPE III BARRICADE</td>
<td>JUNE 13, 2013</td>
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<td>TC-8717</td>
<td>TEMPORARY PORTABLE SIGN POST, “H” BASE AND “X” BASE</td>
<td>JUNE 13, 2013</td>
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<tr>
<td>ITS-1201</td>
<td>ITS DEVICES - GENERAL</td>
<td>MARCH 1, 2013</td>
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<tr>
<td>ITS-1230</td>
<td>DYNAMIC MESSAGE SIGNS</td>
<td>MARCH 1, 2013</td>
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