



District 1

I-75 and I-4 Truck Parking Availability System

Requirements Traceability Verification Matrix (RTVM)

Financial Projects Number(s): 440212-1-52-01

Federal Aid Project Number(s): D117-046-B

Contract Number: E1R03

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Test Case	Document Section	Document Heading	Requirement Summary	Verification Method	Applicable to the Project Y/N	Compliant Y/N/Partial/NA	Notes/Comments	Contractor Initials	FDOT Initials
RFP									
SECTION I INTRODUCTION									
1	I	Introduction	The Design-Build Firm shall provide a parking detection system at the four rest areas identified in Table 1 of the RFP that is capable of determining the presence of a vehicle in all of the truck parking stalls through wireless in-ground detection sensors (WDS).	Inspection					
2	I	Introduction	The WDS shall be capable of detecting whether each parking space is occupied or not.	Inspection					
3	I	Introduction	The Design-Build Firm shall provide a microwave or radar vehicle detection system (MVDS) at the two weigh stations identified in Table 1 that is capable of monitoring the ingress and egress of vehicles into the parking location.	Inspection					
4	I	Introduction	The Design-Build Firm shall provide for complete Pan, Tilt and Zoom (PTZ) high definition CCTV coverage of all truck parking stalls.	Inspection					
5	I	Introduction	Ground mounted static signs with Embedded Dynamic Message Signs (DMS) shall be provided in advance of each location identified in Table 1 of the RFP to display the available number of parking spaces.	Inspection					
6	I	Introduction	The Design-Build firm shall provide system configuration information for successful system integration with the FDOT District 1 South West Interagency Facility for Transportation (SWIFT) SunGuide RTMC in Fort Myers, FL and the District 7 Tampa Bay SunGuide (TBSG) Center in Tampa, FL.	Inspection					
7	I	Introduction	The Design-Build Firm shall provide all power and communications equipment/infrastructure necessary to power the TPAS devices and ancillary equipment.	Inspection					
8	I	Introduction	All work associated with the previously listed elements shall be included in the Project. This includes, but is not limited to: site survey, utility coordination, constructing and maintaining power services, installing power to cabinets and road-side devices, power calculations, installation of poles, cabinets and other ITS-related structures, ITSM asset management data collection, acceptance testing of the constructed system, training on installed devices, traffic control coordination, removing existing materials as necessary, clearing and grubbing, performance turf, erosion control and any additional items necessary for a turn-key TPAS.	Inspection					
9	I	Introduction	The Design-Build Firm shall complete, submit and receive new IP addresses utilizing the Cabinet IP Assignment document included as an Attachment to this RFP for all devices associated with rest area facilities 10201 and 10202 located in Polk County.	Inspection					
10	I	Introduction	The Design Build Firm will provide complete design of the system, including equipment necessary to tie into the existing ITS network such that the information is transmitted to the FDOT District RTMC. The design will include, but is not limited to all fiber optic cabling and detail sheets for pull boxes, conduit, cabinet modifications, power service runs and modifications and all other equipment and incidentals for ITS infrastructure required for complete installation.	Inspection					
11	I	Introduction	The Design-Build Firm shall coordinate with the contacts listed in Table 3 of the RFP for the Polk county locations prior to construction activities.	Inspection					
12	I	Introduction	No construction activities shall be performed on the existing ITS network without notification to a representative from the ITS asset management contractor for the Polk county locations.	Inspection					
13	I	Introduction	The Design-Build Firm shall coordinate all utility relocations and shall not disturb any existing infrastructure or networks without prior approval from the Department.	Inspection					
14	I	Introduction	The Design-Build Firm shall complete all utility coordination and relocation efforts with all involved Utilities.	Inspection					
15	I	Introduction	The Design-Build Firm shall provide payment of utility adjustment, relocation, installation and/or removal of facilities when the project work necessitates utility relocation work.	Inspection					
16	I	Introduction	The Design-Build Firm will provide Litter Removal and Mowing in accordance with Specification Section 107.	Inspection					
17	I	Introduction	Areas to be maintained for Litter Removal and Mowing will be limited to a 5-foot radius around disturbed areas including trench lines, pull boxes, service poles, CCTV camera poles, MVDS poles, multi post signs, and cabinets.	Inspection					
18	I	Introduction	The Design-Build Firm shall mow and maintain vegetation within these areas to within 5 inches to 12 inches in height. Litter removal shall be performed at the same frequency as the mowing.	Inspection					

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SECTION V PROJECT REQUIREMENTS AND PROVISIONS FOR WORK									
19	C	Geotechnical Services	The Design-Build Firm shall be responsible for identifying and performing any geotechnical investigation, analysis and design of foundations, foundation construction, foundation load and integrity testing, and inspection dictated by the Project needs in accordance with Department guidelines, procedures and specifications.	Inspection					
20	E	Environmental Permits	The Design-Build Firm shall provide the Department with draft copies of any and all permit applications, including responses to agency Requests for Additional Information, requests to modify the permits and/or requests for permit time extensions, for review and approval by the Department prior to submittal to the agencies.	Deliverable					
21	E	Environmental Permits	If any design by the Design-Build Firm proposes wetland impacts such that mitigation is required, the Design-Build Firm shall be responsible for providing the Department information on the amount and type of wetland impacts as soon as the impacts are identified	Inspection					
22	G	Survey	The Design-Build Firm shall perform all surveying (Terrestrial, Mobile and/or Aerial) and mapping services necessary to complete the Project. Survey services must also comply with all pertinent Florida Statutes (Chapters 177 and 472, F.S.) and applicable rules in the Florida Administrative Code (Rule Chapter 5J-17, F.A.C.).	Inspection					
23	I	Submittals	The Design-Build Firm shall provide the following documents for the 90% Submittal to the the Department's Project Manager. 5 copies of 11" X 17" plans 1 signed and sealed geotechnical report 5 copies of signed and sealed geotechnical report 5 copies of design documentation 5 copies of Technical Special Provisions 5 copies of Concept of Operations 5 copies of Project System Engineering Plan 5 copies of Interface Control Document 3 CD's containing the above information in .pdf format	Deliverable					
24	I	Submittals	The Design-Build Firm shall provide the following documents for the Final Submittal to the the Department's Project Manager. Final Submittal 5 sets of signed and sealed 11" X 17" plans 5 copies of signed and sealed 11" X 17" plans 5 sets of signed and sealed design documentation 1 copies of signed and sealed design documentation 1 signed and sealed copy of Construction Specifications Package or Supplemental Specifications Package 5 copies of signed and sealed copy of Construction Specifications Package or Supplemental Specifications Package 2 sets of electronic copies of Technical Special Provisions on CD 5 copies of final Concept of Operations 5 copies of final Project System Engineering Plan 5 copies of final Interface Control Document 3 CD 's containing the above information in .pdf format	Deliverable					
25	I	Submittals	To begin construction the Design-Build Firm shall submit signed and sealed plans for the specific activity; submit a signed and sealed Construction Specifications Package or Supplemental Specifications Package; obtain regulatory permits as required for the specific activity; obtain utility agreements and permits, if applicable; and provide five (5) days' notice before starting the specific activity.	Deliverable					
26	I	Submittals	As-Built Plans shall include Global Positioning System (GPS) data utilizing the criteria set forth in the ITS Facility Management District One Implementation Plan.	Inspection					

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27	I	Submittals	The Design-Build Firm shall provide data as necessary for populating ITSFM based on the Implementation Plan with all new and existing equipment that the TPAS interacts with. This will include, but not be limited to, all new conduit runs, pull boxes, cabinets, field equipment including WDS sensors, wireless repeaters/relay nodes, access points/data collectors, CCTV, MVDS, cabinet equipment and others.	Inspection					
28	I	Submittals	The Design-Build Firm shall furnish to the Department, upon Project completion, the following: <ul style="list-style-type: none"> • 1 set of 11" X 17" signed and sealed plans • 3 sets of 11" X 17" copies of the signed and sealed plans • 3 sets of final documentation (if different from final component submittal) • ITSFM import templates, ITSFM master code lists applicable to this project. Provide all project data necessary to populate the District ITSFM database in Microsoft Excel format. • RTVM in Microsoft Excel format • CADD in Microstation and/or AutoCAD design files • 2 Final Project CD's • 2 CDs of the Final signed & sealed approved As-Built plans in PDF format 	Deliverable					
29	I	Submittals	Component submittals, in addition to the plan submittals listed in the previous test case will be required. In addition to various submittals mentioned throughout this document the following milestone submittals will be required. <ul style="list-style-type: none"> • Utility Clearance Certificate • Permit applications for Department review • Responses to requests for additional information (RAIs) from the permitting agencies for Department review • Approved permits package • Environmental Re-Evaluation information submitted to the Department • Environmental Re-Evaluation approval • 90% ITS Plans, Documents and TSPs • RTVM – Submitted monthly with the Certified Monthly Estimate and Payment • Final ITS Plans, Documents and TSPs • Test Evaluation Matrix • Test Plan Submittal • Training Plan Submittal • As-Built Plans 	Deliverable					
30	L	Key Personnel Staffing	In the event a change in key personnel is requested, the Design-Build Firm shall submit the qualifications of the proposed key personnel and include the reason for the proposed change.	Inspection					
31	N	Meetings and Progress Reports	The Design-Build Firm shall meet with the Department's Project Manager on a monthly basis and provide a one month look ahead of the activities to be completed during the upcoming month.	Inspection					
32	N	Meetings and Progress Reports	The Design-Build Firm shall meet with the Department's Project Manager on a weekly basis and provide a one-week look ahead for activities to be performed during the coming week.	Inspection					
33	N	Meetings and Progress Reports	The Design-Build Firm shall meet with the Department's Project Manager at least 30-calendar days before beginning system integration activities.	Inspection					
34	N	Meetings and Progress Reports	A minimum of 14 calendar days has elapsed following the complete and accurate submittal of required documents at the pre-integration meeting prior to the beginning of any integration activities.	Inspection					
35	N	Meetings and Progress Reports	The Design-Build Firm shall provide all documentation required to support system integration meetings, including detailed functional narrative text, system and subsystem drawings and schematics. Also included shall be the documentation to demonstrate all elements of the proposed design which includes, but is not limited to: technical, functional, and operational requirements; ITS/communications; equipment; termination/patch panels; performance criteria; and details relating to interfaces to other ITS subsystems.	Deliverable					
36	N	Meetings and Progress Reports	The Design-Build Firm shall, on a monthly basis, provide written progress reports that describe the items of concern and the work performed on each task.	Inspection					

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37	N	Meetings and Progress Reports	The Design-Build Firm shall submit to the Department for approval of a MOC Plan 30 calendar days in advance of the planned network outage detailing work to be performed and a strategy for minimizing the outage.	Deliverable					
38	O	Public Involvement	The Design-Build Firm shall include attendance at two meetings per month for the term of the contract to support the public involvement program	Inspection					
39	P	Quality Management Plan	The Design-Build Firm shall provide a Design Quality Management Plan, which describes the Quality Control (QC) procedures to be utilized to verify, independently check, and review all design drawings, specifications, and other documentation prepared as a part of the contract within fifteen (15) working days following issuance of the written Notice to Proceed.	Deliverable					
40	P	Quality Management Plan	The Design-Build Firm shall be responsible for developing and maintaining a Construction Quality Control Plan in accordance with Section 105 of Standard Specifications which describes their Quality Control procedures to verify, check, and maintain control of key construction processes and materials.	Inspection					
41	P	Quality Management Plan	The sampling, testing and reporting of all materials used shall be in compliance with the Sampling, Testing and Reporting Guide (STRG) provided by the Department.	Inspection					
42	P	Quality Management Plan	The Design-Build Firm shall prepare and submit to the Engineer a Job Guide Schedule (JGS) using the Department database in accordance with Section 105 of the Standard Specifications.	Deliverable					
43	T	Computer Animation	The Design-Build Firm will be required to submit final documents and files which shall include complete CADD design and coordinate geometry files in Intergraph / MicroStation format.	Deliverable					
44	V	Testing	The Design-Build Firm shall develop as part of the Test Plan Submittal and subsequent updates thereof, a Test Evaluation Matrix to be used as a tool to cross-reference each planned test to a specific contract requirement as shown in the RTVM. The Test Evaluation Matrix shall consist of all RTVM items which have a verification method of test.	Inspection					
45	V	Testing	The Design-Build Firm shall utilize this Test Evaluation Matrix to develop the project test plans for the Factory Acceptance Tests, Standalone Tests, Subsystem Tests and 30 consecutive calendar day Operational Test.	Inspection					
46	V	Testing	The Design-Build Firm shall develop a comprehensive test plan, submit it for approval by the Department, incorporate all of the Department's comments, execute the plan, and document the results.	Deliverable					
47	V	Testing	Test Plans shall be submitted for approval at least 30 calendar days prior to any planned test activity.	Inspection					
48	V	Testing	Any deviations or changes to the approved Test Plan shall be resubmitted for review and acceptance by the Department 30 calendar days prior to any planned test activity.	Inspection					
49	V	Testing	The Design-Build Firm shall not begin testing until the Department has approved the Test Plan and Test Evaluation Matrix, including detailed procedures and data forms.	Inspection					
50	V	Testing	The test results for each subsystem/component tested shall meet the performance requirements identified for the particular subsystem/component defined in this RFP and the applicable Specifications for each subsystem/component.	Inspection					
51	V	Testing	The Design-Build Firm shall develop as part of the Test Plan Submittal and subsequent updates thereof, a Test Evaluation Matrix to be used as a tool to cross-reference each planned test to a specific contract requirement as shown in the RTVM.	Inspection					
52	V	Testing	The Test Evaluation Matrix shall consist of all RTVM items which have a verification method of test.	Inspection					
53	V	Testing	The Design-Build Firm shall use this Test Evaluation Matrix to indicate the specific functional requirements as tested and the results achieved and verified by the Department.	Inspection					
54	W	Value Added	The minimum warranty duration from the date of Final Acceptance by the Engineer is in accordance with Section 5-11 and Section 608 of the Specifications listed in the RFP and applicable Specification for each device required to provide a turn-key TPAS.	Inspection					
55	X	Value Added	The Design-Build Firm shall be responsible for coordinating construction activities with other construction Projects that are impacted by or impact this Project. This includes Projects under the jurisdiction of local governments, the Department, or other regional and state agencies.	Inspection					

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SECTION VI DESIGN AND CONSTRUCTION CRITERIA									
56	C	Geotechnical Services:	The Design-Build Firm shall submit a certification package for the Department's review. The certification package shall include the results of all the field testing, instrumentation and lab testing performed and a signed and sealed letter by the GFDEOR certifying that the specialty geotechnical work meets the requirements.	Deliverable					
57	D	Utility Coordination	The Design-Build Firm shall provide a draft utility permit application acceptable to the Department for the placement of the utility owner's facilities based on the final design.	Deliverable					
58	E	Roadway Plans	The Design-Build Firm shall develop and submit a signed and sealed Drainage Analysis Report for review and concurrence by the Department and FHWA on Federal Aid Oversight Projects if impacts to drainage features result from the Design-Build Firm's design.	Deliverable					
59	H	Design Documentation, Calculations, and Computations	The Design-Build Firm shall submit to the Department design documentation, notes, calculations, and computations to document the design conclusions reached during the development of the construction plans.	Deliverable					
60	H	Design Documentation, Calculations, and Computations	The design notes and computation sheets shall be fully titled, numbered, dated, indexed, and signed by the designer and the checker. Computer output forms and other oversized sheets shall be folded to a standard size 8½" x 11".	Inspection					
61	H	Design Documentation, Calculations, and Computations	At the Project completion, a final set of design notes and computations, signed by the Design-Build Firm, shall be submitted with the As-Built Plans and tracings.	Deliverable					
62	H	Design Documentation, Calculations, and Computations	The design documentation, notes, calculations and computations shall include, but not be limited to the following data: 1. Design Standards and criteria used for the Project 2. Documentation of decisions reached resulting from meetings, telephone conversations or site visits 3. Power service voltage drop calculations to verify proper wire size for an electrical circuit based on voltage drop and current carrying capacity is sufficient at all proposed new equipment locations	Inspection					
63	H	Design Documentation, Calculations, and Computations	Prior to final acceptance, the Design-Build Firm shall furnish the District with two copies of the following documentary items obtained from the manufacturer for all of the electronic equipment: • Operation Manual • Troubleshooting and Service Manual • Assembly and installation instructions • Pictorial layout of components and schematics for circuit boards • Parts list • Diagram of the field installation wiring (not applicable to the detectors) • Warranty information	Deliverable					
64	I	Structure Plans	The Design-Build Firm shall insure that the final geotechnical recommendations and reports required for structure design are submitted with the 90% plans.	Deliverable					
65	K	Shop Drawings	The Design-Build Firm shall submit Shop Drawings in conformance with the Departments Plans Preparation Manual.	Deliverable					
66	M	Stormwater Pollution Prevention Plans (SWPPP)	The Design-Build Firm shall prepare a Storm Water Pollution Prevention Plan (SWPPP) as required by the National Pollution Discharge Elimination System (NPDES).	Inspection					
67	N	Temporary Traffic Control Plan	The Design-Build Firm shall maintain existing pedestrian access on all sidewalks	Inspection					
68	P	Signing and Pavement Marking Plans	The static sign with embedded DMS locations shall be located as shown in Table 6 of the RFP or the location established based on the following general criteria: • Two to five miles upstream of parking facility • Prior to exit ramp upstream of parking facility with a maximum distance of 10 miles upstream • Near existing ITS communication and power • With readability from existing CCTV for message verification • MUTCD spacing guidelines	Inspection					
69	P	Signing and Pavement Marking Plans	The Design-Build Firm shall show all details (anchor bolt size, bolt circle, bolt length, etc.) as well as all design assumptions (wind loads, support reactions, etc.) used in the analysis.	Inspection					

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70	P	Signing and Pavement Marking Plans	Mounting types for various signs shall not be changed by the Design-Build Firm (i.e. if the proposed or existing sign is shown as overhead it shall be overhead and not changed to ground mount) unless approved by the Department.	Inspection					
71	P	Signing and Pavement Marking Plans	Any existing sign structure to be removed shall not be relocated and reused, unless approved by the Department.	Inspection					
72	P	Signing and Pavement Marking Plans	The Design-Build Firm shall field inventory and show all existing signs within the Project limits and address all regulatory, warning and signage along the Project.	Inspection					
73	P	Signing and Pavement Marking Plans	Existing single and multi-post sign assemblies impacted by construction shall be entirely replaced and upgraded to meet current standards.	Inspection					
74	P	Signing and Pavement Marking Plans	The Design-Build Firm shall design all sign support structures to allow for the future installation of a sign right justified with the proposed sign. The sign support structures shall use a future sign with a width of six-feet and a height of four-feet. The sign support structure shall be designed with the top of the future sign located immediately below the bottom of the proposed sign.	Inspection					
75	R	Intelligent Transportation System Plans	The Design-Build Firm shall prepare design plans and provide necessary documentation for the procurement and installation of the Signalization and Intelligent Transportation System devices as well as overall system construction and integration.	Inspection					
76	R	Intelligent Transportation System Plans/General	The construction plan sheets shall include, but not be limited to: <ul style="list-style-type: none"> • Project Layout / Overview sheets outlying the locations of field elements. Detail sheets on: • Embedded DMS Structure, Embedded DMS attachment, Embedded DMS display/layout • CCTV structure, CCTV attachment, CCTV operation/layout • Dynamic Message Signs – Embedded DMS: sign location and placement, attachment to ground traffic signs, connections, display/layout • MVDS structure, MDVS attachment, MDVS operation/layout • Vehicle Presence Detection System – wireless detection system (WDS): detector placement, structure, attachment, connections, operation/layout • Fiber optic splice and conduit • Managed Field Ethernet Switches (MFES) 	Inspection					
77	R	Intelligent Transportation System Plans/General	The construction plan sheets shall be in accordance with Department requirements and include, but not be limited to: <ul style="list-style-type: none"> • Fiber optic cables, conduit, pull boxes, splice boxes, splice enclosures • Grounding and Grounding Array details • Surge Protection • Lightning protection, air terminals and dissipation • Directional Bore Details • System Overview Sheets Per District and Ring • Power Service Distribution • Commercial electric power service • Connection to existing electrical services • Wiring and connection details • Conduit, pull box, and vault installation 	Inspection					
78	R	Intelligent Transportation System Plans/General	The construction plan sheets shall be in accordance with Department requirements and include, but not be limited to: <ul style="list-style-type: none"> • Communication Hub and Field Cabinets • System-level block diagrams • Device-level block diagrams • Field hub/router cabinet configuration details • Fiber optic Splicing Diagrams • System configuration/Wiring diagram/Equipment Interface for field equipment at individual locations and communications hubs. • Maintenance of Communications (MOC) Plan 	Inspection					
79	R	Intelligent Transportation System Plans/General	The Design-Build Firm shall ensure project compliance with the Regional ITS Architecture and Rule 940 as applicable. This includes, but is not limited to, the development or update of a concept of operations, the development or update of a system engineering master plan (SEMP), and requirement traceability verification (RTVM) as well as coordination of document review.	Inspection					
80	R	Intelligent Transportation System Plans/General	The Design-Build Firm shall detail existing Intelligent Transportation System equipment and report which devices will be removed, replaced, or impacted by project work.	Inspection					

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81	R	Intelligent Transportation System Plans/General	The Design-Build Firm shall submit an interface control document (ICD) detailing how the truck parking availability system interfaces with external systems. These systems include but are not limited to: <ul style="list-style-type: none"> • SunGuide software • Existing fiber optic network • Wireless interface • All media to media conversions • Detector software and interface with the FDOT District Network Management Software (NMS). 	Deliverable					
82	R	Intelligent Transportation System Plans/General	The ICD shall contain protocol information that can be used by the SunGuide software team to communicate with the truck parking availability system /devices.	Inspection					
83	R	Intelligent Transportation System Plans/General	The ICD protocol shall include, but not be limited to, the number of truck parking spaces available (or enough information for the SunGuide software to calculate parking space availability), and the truck parking availability system status including errors with the system.	Inspection					
84	R	Intelligent Transportation System Plans/General	The ICD protocol shall describe how access security will be implemented and how data transmission security will be implemented for the interface being defined.	Inspection					
85	R	Intelligent Transportation System Plans/General	The ICD protocol shall give a description of how data will be protected during transmission and how data integrity will be guaranteed.	Inspection					
86	R	Intelligent Transportation System Plans/General	The ICD protocol shall have a description of how the two systems can be certain they are communicating with each other and not with another system masquerading as one of them.	Inspection					
87	R	Intelligent Transportation System Plans/General	The ICD protocol describes how an individual on one system can be audited and held accountable for resulting actions on the other component of the interface.	Inspection					
88	R	Intelligent Transportation System Plans/General	The Design-Build Firm shall use the Truck Parking ConOps Companion Software Architecture and System Requirements as a reference to develop the ICD.	Inspection					
89	R	Intelligent Transportation System Plans/General	In order to facilitate the development of the SunGuide software interface with the proposed Truck Parking Availability System, the Design-Build Firm shall provide a mock setup that includes the parking sensors, repeaters, access point, servers, hardware and mounting equipment as well all software within 30 calendar days following project execution.	Testing					
90	R	Intelligent Transportation System Plans/General	The mock setup shall also include the electronic display, its support equipment and software used for the TPAS signs.	Testing					
91	R	Intelligent Transportation System Plans/General	The mock setup shall be assembled at the FDOT Traffic Engineering Research Lab or a similar FDOT testing facility.	Testing					
92	R	Intelligent Transportation System Plans/General	The Design-Build Firm shall provide software support to aid in the development of the SunGuide software interface.	Inspection					
93	R	Intelligent Transportation System Plans/Design and Engineering Plans	All ITS system components shall be new unless otherwise identified for relocation.	Inspection					
94	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm shall not mount components to existing light poles.	Inspection					
95	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm provides approval from the Department to mount on equipment on existing structures.	Inspection					
96	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm shall provide complete design of the system, including equipment necessary to tie into the existing ITS network such that the information is transmitted to the FDOT District RTMC. The design will include, but is not limited to: all fiber optic cabling and detail sheets for pull boxes, conduit, cabinet modifications, power service runs and modifications and all other equipment and incidentals for ITS infrastructure required for complete installation.	Inspection					
97	R	Intelligent Transportation System Plans/Design and Engineering Plans	The design of the new system shall integrate with the existing devices. The design shall include the necessary infrastructure and components to ensure proper connection of the new ITS components. This shall include but not be limited to all proposed ITS components of this project as well as existing sub-systems that remain or are re-deployed as the final project.	Inspection					
98	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm shall replace any ITS System components that are impacted by the scope of work. All equipment shall be new unless otherwise specified.	Inspection					

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99	R	Intelligent Transportation System Plans/Design and Engineering Plans	All new ITS cabinets shall be mounted per Design Standard 18108 and shall provide for safe and efficient maintenance access. This cabinet shall meet the technical requirements of FDOT and be listed on the FDOT Approved Products List (APL).	Inspection					
100	R	Intelligent Transportation System Plans/Design and Engineering Plans	Separate breakers shall be installed for the new equipment and not piggybacked off the existing ITS system power configuration.	Inspection					
101	R	Intelligent Transportation System Plans/Design and Engineering Plans	Breakers and grounding and other electrical connections shall comply with FDOT Standard Specifications 620, 632, 639, 670 and 676 as well as the National Electric Code (NEC).	Inspection					
102	R	Intelligent Transportation System Plans/Design and Engineering Plans	A concrete technician pad measuring 36"x36"x4" shall be provided and spare conduit installed.	Inspection					
103	R	Intelligent Transportation System Plans/Design and Engineering Plans	A spare conduit shall be provided for each newly installed conduit.	Inspection					
104	R	Intelligent Transportation System Plans/Design and Engineering Plans	There shall be separate spare conduits for communication and power.	Inspection					
105	R	Intelligent Transportation System Plans/Design and Engineering Plans	Communication conduit shall be orange with a white stripe and orange, with the cable in the orange with white stripe conduit and the orange used for the spare.	Inspection					
106	R	Intelligent Transportation System Plans/Design and Engineering Plans	New underground and directional bored power conduits shall be gray in color and 2" inside diameter.	Inspection					
107	R	Intelligent Transportation System Plans/Design and Engineering Plans	Any new underground and directional bored power conduits shall be gray in color and 2" inside diameter.	Inspection					
108	R	Intelligent Transportation System Plans/Design and Engineering Plans	Every new conduit run (main run and drops) shall have installed one (1) additional spare communication conduit and one (1) additional power conduit for future use.	Inspection					
109	R	Intelligent Transportation System Plans/Design and Engineering Plans	All conduits shall have "jet-line" or equal pull string installed in each spare conduit run for future use.	Inspection					
110	R	Intelligent Transportation System Plans/Design and Engineering Plans	Electrical pull boxes shall not be spaced further than 500 feet apart in any power run.	Inspection					
111	R	Intelligent Transportation System Plans/Design and Engineering Plans	All pull boxes shall be a minimum Tier 15 and rated at 20K or more test static load.	Inspection					
112	R	Intelligent Transportation System Plans/Design and Engineering Plans	Pull boxes shall have FDOT "ITS" or "Electrical" stamped appropriately per FDOT standards.	Inspection					
113	R	Intelligent Transportation System Plans/Design and Engineering Plans	CCTV meets the following specifications: 1080p High Definition (HD), embedded encoder, H.264 stream, Pan, Tilt and Zoom (PTZ) IP-enabled cameras, power, and communication equipment to provide 100% CCTV coverage of truck parking areas from SunGuide.	Inspection					
114	R	Intelligent Transportation System Plans/Design and Engineering Plans	100% CCTV coverage is provided for verification of presence, including ability to view some portion of an empty truck parking stall even when a full-size truck-trailer rig is in the stall between the empty stall and the camera.	Inspection					
115	R	Intelligent Transportation System Plans/Design and Engineering Plans	Mounting height for all CCTV shall be no more than 50 feet above ground level.	Inspection					
116	R	Intelligent Transportation System Plans/Design and Engineering Plans	Minimum mounting height shall not be less than 30 feet.	Inspection					
117	R	Intelligent Transportation System Plans/Design and Engineering Plans	CCTV mounting heights greater than 40 feet above ground level shall have lowering devices.	Inspection					
118	R	Intelligent Transportation System Plans/Design and Engineering Plans	All prestressed concrete poles shall be backfilled with FDOT approved Class I nonstructural concrete.	Inspection					
119	R	Intelligent Transportation System Plans/Design and Engineering Plans	Embedded DMS shall be connected to electrical service, with the use of solar power prohibited.	Inspection					
120	R	Intelligent Transportation System Plans/Design and Engineering Plans	Embedded DMS shall provide a digital LED message to inform truck drivers of the number of available truck spaces or if the parking area is full.	Testing					
121	R	Intelligent Transportation System Plans/Design and Engineering Plans	Communication drops to the Embedded DMS shall be 12-strand single mode fiber optic cable.	Inspection					
122	R	Intelligent Transportation System Plans/Design and Engineering Plans	MVDSs accurately count vehicles entering and exiting designated truck parking areas at weigh stations and provide count data to SunGuide software.	Testing					
123	R	Intelligent Transportation System Plans/Design and Engineering Plans	MVDS placement, offsets, and mounting heights shall comply with manufacturer requirements or field adjusted as need to meet testing requirements.	Inspection					
124	R	Intelligent Transportation System Plans/Design and Engineering Plans	The detectors are installed on stand-alone concrete poles in a side-fired configuration to detect vehicle volume data from weigh station parking area entrances and exits.	Inspection					

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125	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm will provide a WDS – i+n-ground and above ground components, poles, power, communication, end user software, servers, and incidentals necessary to construct a wireless in-pavement detection system capable of accurately measuring presence of vehicles occupying designated truck parking areas in rest areas to provide vehicle presence data to SunGuide.	Inspection					
126	R	Intelligent Transportation System Plans/Design and Engineering Plans	The FDOT District SunGuide software shall interface seamlessly with the manufacturer's proprietary software and shall provide real-time presence and other relevant data.	Testing					
127	R	Intelligent Transportation System Plans/Design and Engineering Plans	WDS placement shall be in accordance with manufacturer requirements.	Inspection					
128	R	Intelligent Transportation System Plans/Design and Engineering Plans	Wireless in-pavement detectors shall be installed in each parking space in an array to detect presence.	Inspection					
129	R	Intelligent Transportation System Plans/Design and Engineering Plans	All WDS above-ground equipment shall be placed on new poles provided by the Design-Build Firm.						
130	R	Intelligent Transportation System Plans/Design and Engineering Plans	The WDS information shall be transmitted via the local Ethernet field switch to the Department's RTMC end-user via the FON.	Inspection					
131	R	Intelligent Transportation System Plans/Design and Engineering Plans	Protection shall be provided for all ITS field elements and ITS Field Cabinets. For the Polk county devices, the details shall be in accordance with the District 7 Design Standards	Inspection					
132	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm shall design, furnish, install and integrate a new ITS Field Cabinet with power supply, Managed Field Ethernet Switch (MFES), fiber connection to an existing switch inside an existing ITS cabinet, conduit, pull boxes, splice boxes, and all other equipment necessary to connect rest area/weigh station presence detection and CCTV to SunGuide.	Inspection					
133	R	Intelligent Transportation System Plans/Design and Engineering Plans	All new fiber optic cable from the existing trunk line to the ITS cabinet in the weigh stations shall be a minimum of two (2) twelve strand single mode.	Inspection					
134	R	Intelligent Transportation System Plans/Design and Engineering Plans	Embedded DMS shall be placed in the vicinity of an existing ITS Field Cabinet, where available.	Inspection					
135	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Embedded DMS will be connected to the SunGuide network through an existing port, as designated by the Department, on the MFES.	Inspection					
136	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm shall determine the necessary modifications to accommodate all new ITS devices and infrastructure. This includes: 1. Utility coordination with local power companies; 2. Developing voltage drop calculations to determine correct wire gauge and transformer size to effectively power all new equipment and leave room for additional equipment expansion; 3. Determining the most efficient and effective way to modify each power service; 4. Utilizing the National Electrical Code (NEC) and National Electrical Safety Code (NESC) at all times during construction of underground and overhead electrical power services; and 5. Developing electrical wiring diagrams necessary to successfully implement the intent of the project.	Inspection					
137	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm shall perform power calculations and install connections to existing electrical services, to the extent possible, in rest areas and weigh stations and at existing ITS field element electrical systems.	Inspection					
138	R	Intelligent Transportation System Plans/Design and Engineering Plans	When connecting to existing electrical systems, the Design-Build Firm shall verify that the additional equipment will not overload the existing circuits or otherwise interfere with power to other equipment on the circuit. If additional load required by this project overloads the existing circuit, the Design-Build Firm shall modify the power distribution as necessary.	Testing					
139	R	Intelligent Transportation System Plans/Design and Engineering Plans	The new circuit shall utilize an existing spare branch circuit breaker. If no spare breaker is available, then a new branch circuit breaker shall be provided.	Inspection					
140	R	Intelligent Transportation System Plans/Design and Engineering Plans	At a minimum all affected ITS field cabinets shall be calculated for 120% over peak electrical draw. Connection to existing lighting circuits shall not be allowed.	Inspection					
141	R	Intelligent Transportation System Plans/Design and Engineering Plans	All power to proposed TPAS devices shall be hard-wire connected (not solar or alternate), excluding the WDS.	Inspection					
142	R	Intelligent Transportation System Plans/Design and Engineering Plans	If a backbone fiber is modified, bi-directional testing shall occur to/from the nearest fiber hub shelter/cabinet upstream and downstream from the point of modification. Modification includes, but is not limited to, fiber splices, terminations, or relocations.	Testing					

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143	R	Intelligent Transportation System Plans/Design and Engineering Plans	New fiber optic cable shall not be run in any conduit with energized (low or high voltage) conductors.	Inspection					
144	R	Intelligent Transportation System Plans/Design and Engineering Plans	Only di-electric, loose tube, non-gel single mode fiber optic cable shall be used to interface with the system fiber optic patch panels.	Inspection					
145	R	Intelligent Transportation System Plans/Design and Engineering Plans	Where existing conduit is used, locate wire shall be placed in the spare communications conduit and not in a conduit occupied by communications or power cables.	Inspection					
146	R	Intelligent Transportation System Plans/Design and Engineering Plans	A Maintenance of Communication Plan (MOC) shall be presented in writing to the Department 30 days prior to any planned network outages.	Deliverable					
147	R	Intelligent Transportation System Plans/Design and Engineering Plans	A limit of two (2) hours down time is permitted for network splicing or maintenance if approved by the Department.	Inspection					
148	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm shall submit for approval their planned access schedule prior to any activities requiring access to the existing ITS system including, but not limited to, fiber optic cable (handholes and pull boxes); ITS equipment control cabinet(s); ITS power facilities; ITS specific equipment (CCTV, MVDS, Repeaters or relay node, Access points or data aggregators or data collectors, etc.); and/or the RTMC.	Deliverable					
149	R	Intelligent Transportation System Plans/Design and Engineering Plans	The planned access schedule document shall identify access necessities, schedule expectation(s), specific ITS facilities to be accessed, and an action plan for potential failure. Submit access requests to the Department for approval within 60 days of project construction start or 90 days prior to system access for long duration project(s).	Inspection					
150	R	Intelligent Transportation System Plans/Design and Engineering Plans	All pole locations shall be identified in the plans and approved by the Department.	Inspection					
151	R	Intelligent Transportation System Plans/Design and Engineering Plans	The Design-Build Firm ensures that the projects improvements are entirely coordinated with existing and proposed ITS facilities and landscaping features.	Inspection					
152	R	Intelligent Transportation System Plans/Construction and Integration Services	The Design-Build Firm shall be responsible for all ITS construction and integration services relating to the Project.	Inspection					
153	R	Intelligent Transportation System Plans/Construction and Integration Services	The Design-Build Firm shall schedule a pre-integration meeting at least 14 calendar days prior to starting integration. The Design-Build Firm is responsible for providing all required information at the meeting. In the event the information is incomplete or inaccurate, the meeting shall be rescheduled with corrected information.	Inspection					
154	R	Intelligent Transportation System Plans/Construction and Integration Services	Integration hasn't proceeded until a minimum of 14 calendar days has elapsed following the complete and accurate submittal of required documents at the pre-integration meeting.	Inspection					
155	R	Intelligent Transportation System Plans/Construction and Integration Services	The integration efforts shall include, but not be limited to, complying with the District's Security Access Policies, installation of equipment at the District Server Room, and FDOT network security requirements.	Inspection					
156	R	Intelligent Transportation System Plans/Construction and Integration Services	The Design-Build Firm shall verify the manufacturer's proprietary end-user software reports all data and contains all features as required in the Specifications.	Inspection					
157	R	Intelligent Transportation System Plans/Construction and Integration Services	The Design-Build Firm shall verify all proposed IP addressable devices are configured to be detected by the District's Network Monitoring Software (NMS).	Testing					
158	R	Intelligent Transportation System Plans/Construction and Integration Services	The Design-Build Firm shall coordinate the software development of the SunGuide Truck Parking Sensor Driver with Derek Vollmer, State ITS Software Engineer, 850-410-5615.	Inspection					
159	R	Intelligent Transportation System Plans/Construction and Integration Services	The Design-Build Firm shall provide support for the development of the SunGuide Embedded DMS Driver.	Inspection					
160	R	Intelligent Transportation System Plans/Construction and Integration Services	The Design-Build Firm shall coordinate with the SunGuide software project manager to ensure the truck parking availability system data in its raw form is incorporated into the SunGuide software.	Testing					
161	R	Intelligent Transportation System Plans/Construction and Integration Services	Incidental to each ITS element installation, the Design-Build Firm shall provide support equipment.	Deliverable					
162	R	Intelligent Transportation System Plans/Construction and Integration Services	Support equipment shall consist of 10% of the major assemblies of the each ITS element including the ITS field cabinet assembly, as deemed necessary by the Department to provide continuous operations. Where 10% will result in less than one unit per each District, a minimum of one unit shall be furnished.	Deliverable					

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163	R	Intelligent Transportation System Plans/Construction and Integration Services	The support equipment shall not be used by the Design-Build Firm as spare or maintenance parts but shall be delivered to the Department at the time of final acceptance for field inventory support. The following support equipment parts are required: <ul style="list-style-type: none"> • Embedded Dynamic Message Sign (panels, power source, key components) • MVDS (detector unit, 60 foot manufacturers cable) • CCTV (camera, 100 foot manufactures cable) • WDS • ITS cabinet • District compatible MFES • District compatible Port Server and Media Converter 	Deliverable					
164	R	Intelligent Transportation System Plans/Testing and Acceptance	The Design-Build Firm shall provide comprehensive testing of new fiber optic cable and associated ITS infrastructure, including all new embedded DMS, CCTV, WDS, MVDS, ITS field cabinets, managed field Ethernet switch (MFES), new fiber cables into existing cabinets and pull boxes and other designated locations	Testing					
165	R	Intelligent Transportation System Plans/Testing and Acceptance	WDS testing shall verify continuous presence detection and reporting for each in-pavement sensor. WDS testing shall verify that each truck parking sensor in each stall is independently and discretely detected and reported.	Testing					
166	R	Intelligent Transportation System Plans/Testing and Acceptance	MVDS testing shall verify volume features necessary to ensure proper function of TPAS at designated MVDS locations. Conduct the test using a minimum of 100 passes of the detection points by vehicles provided by the Design-Build Firm.	Testing					
167	R	Intelligent Transportation System Plans/Testing and Acceptance	Testing plans shall be developed by the Design-Build Firm and approved by the Department no less than 30 working days prior to testing.	Inspection					
168	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The Design-Build Firm shall develop as part of the Test Plan Submittal and subsequent updates thereof, a Test Evaluation Matrix to be used as a tool to cross-reference each planned test to a specific contract requirement to be verified as shown in the RTVM prior to the start of any test activities.	Inspection					
169	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The Design-Build Firm shall use this Test Evaluation Matrix to indicate the specific functional requirements as tested and the results achieved and verified by the Engineer.	Inspection					
170	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	As a minimum, the Test Plan shall include the following: <ul style="list-style-type: none"> • A step-by-step outline of the test procedures and sequence to be followed, showing a test of every function for each of the individual subsystems/components. • A test set-up/configuration diagram showing what is being tested. • A description of expected operation, output, and test results. • An estimate of the test duration and proposed test schedule. • A data form to be used to record all data and quantitative results obtained during the tests. • A description of any special equipment, setup, manpower, or conditions required for the test. 	Inspection					
171	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The Design-Build Firm shall not begin tests until the Department has approved, in writing, the Test Plan including detailed procedures and data forms.	Inspection					
172	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The test results for each subsystem/component tested shall meet the performance requirements identified for the subsystem/component defined in the Specifications and in the RFP.	Testing					
173	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The Design-Build Firm shall furnish all necessary test equipment.	Inspection					
174	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	Testing of the equipment and system shall include, in the following order, each preceding test must be satisfactorily completed and accepted before subsequent test(s) may be started: <ol style="list-style-type: none"> 1. Factory Acceptance Tests 2. Standalone Tests 3. Subsystem Tests 4. Operational Tests 5. Burn-In Period 6. Final Acceptance 	Testing					
175	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The Design-Build Firm obtains all software and equipment needed to test the quality of the data obtained by each of the WDS field devices.	Testing					

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176	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The Design-Build Firm obtains all software and/or equipment needed to test the full functionality of the WDS system as defined in the RFP.	Testing					
177	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The Design-Build Firm validates that the most recent firmware and/or software is installed on all WDS components.	Testing					
178	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	All Design-Build Firm personnel installing WDS sensors shall have manufacturer training prior to installation of WDS units.	Inspection					
179	R	Intelligent Transportation System Plans/Testing and Acceptance/Testing and Training	The Design-Build Firm shall provide a WDS manufacturer training course to all technicians responsible for installation. This training shall consist of a complete overview of the WDS installation and setup based on the WDS manufacturer's User's Guide and general trouble shooting.	Inspection					
180	R	Intelligent Transportation System Plans/Testing and Acceptance/Factory Acceptance Tests	All Design-Build Firm furnished equipment shall be shipped from the factory certified that it has been tested and meets all requirements of the Plans, Specifications and the requirements of its own catalog specification sheet.	Inspection					
181	R	Intelligent Transportation System Plans/Testing and Acceptance/Factory Acceptance Tests	Certification for each item shall be sent to the Department or its representative.	Deliverable					
182	R	Intelligent Transportation System Plans/Testing and Acceptance/Stand Alone Test	The Design-Build Firm shall make arrangements to have a qualified manufacturer representative on site during the Standalone Test procedures.	Inspection					
183	R	Intelligent Transportation System Plans/Testing and Acceptance/Stand Alone Test	Testing will be performed to demonstrate the proper configuration, calibration and performance of the equipment installed and/or configured by the Design-Build Firm. Testing shall demonstrate the system is operating to the performance requirements specified by the manufacturer, the approved test plan and the requirements of the contract plans and documents.	Testing					
184	R	Intelligent Transportation System Plans/Testing and Acceptance/Stand Alone Test	Testing will be performed to demonstrate the capabilities of the equipment furnished by the Design-Build Firm in the areas of wireless detection, data communications, data collection, command and control of all components. These tests require the integration, assembly, and connection of equipment at their permanent field locations by the Design-Build Firm.	Testing					
185	R	Intelligent Transportation System Plans/Testing and Acceptance/Stand Alone Test	The Standalone Tests shall be performed on each ITS device and ancillary component, including, but not limited to the following: <ul style="list-style-type: none"> • Embedded DMS • Embedded DMS controllers • WDS • MVDS • CCTV • MFES • Fiber optic network • Grounding and lightning protection system components 	Testing					
186	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	The Design-Build Firm conducts the subsystem/component test in the presence of the Department's Project Manager or designated representative.	Testing					
187	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	The subsystem/component test begins within seven days after the Design-Build Firm advises the Department's Project Manager that they are ready to begin the test.	Testing					
188	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	The subsystem test begins after the Design-Build Firm has satisfied the Department that all work and standalone testing has been completed.	Testing					
189	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	The subsystem test verifies that all the requirements defined in the RFP for the subsystem/component that are tested have been met. This test shall be performed utilizing the project field equipment and communications system.	Testing					
190	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	The subsystem test shall demonstrate full control of the field device(s) from the SWIFT SunGuide® Center and TBSG Center over the Ethernet Network, as well as the functions of local/remote troubleshooting/diagnostics specified in the equipment's functional requirements.	Testing					

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191	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	The subsystem test shall be conducted with manufacturer-supplied software.	Testing					
192	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	The Design-Build Firm shall provide qualified personnel to support the diagnosis and repair of system equipment during the subsystem test as required.	Testing					
193	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	In the event the subsystem fails the test or is rejected by the Department, the Design-Build Firm shall correct the problem and repeat the test within seven days after receiving the rejection notice from the Department. The test shall be re-conducted until the Department accepts the test result.	Testing					
194	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	The Design-Build Firm shall furnish and maintain all required subsystem test equipment as part of their services. The test equipment – both hardware and software – shall be the property of the Department after the completion of the test.	Inspection					
195	R	Intelligent Transportation System Plans/Testing and Acceptance/Subsystem Tests	All subsystem test equipment utilized shall have a calibration certification in accordance with the manufacturer's recommendations or within the last six months.	Inspection					
196	R	Intelligent Transportation System Plans/Testing and Acceptance/Operational Tests	The Operational Test shall be planned, implemented and documented by the Design-Build Firm.	Inspection					
197	R	Intelligent Transportation System Plans/Testing and Acceptance/Operational Tests	The Design-Build Firm shall develop a comprehensive test plan, submit it for approval by the Engineer, incorporate all the Engineer's comments, execute the plan, and document the results.	Deliverable					
198	R	Intelligent Transportation System Plans/Testing and Acceptance/Operational Tests	The test shall demonstrate successful installation of all Project subsystems properly integrated with the SunGuide software and operable from the SWIFT SunGuide Center and TBSG Center, operating continuously for a period of 30 consecutive calendar-days without failure of any subsystem, ITS device, or ancillary component.	Testing					
199	R	Intelligent Transportation System Plans/Testing and Acceptance/Operational Tests	The Design-Build Firm shall notify the Department in writing of the scheduled date of the Operational Test 14 calendar-days prior to the commencement of said Operational Test. No Operational Testing shall be performed without prior written approval from the Department.	Inspection					
200	R	Intelligent Transportation System Plans/Testing and Acceptance/Operational Tests	If the total number of System Shutdowns exceeds three due to the same subsystem, ITS device, or ancillary component, the Design-Build Firm shall: <ul style="list-style-type: none"> Remove and replace the subsystem, ITS device or ancillary component with a new and unused unit as per the requirements of this RFP; Perform all applicable Stand-alone and Subsystem Tests, as deemed necessary by the Department; and Upon written approval from the Department, restart the Operational Test for a new 30-day period. 	Testing					
201	R	Intelligent Transportation System Plans/Testing and Acceptance/Operational Tests	All software required for diagnosing malfunctions of hardware and software/firmware shall be supplied by the Design-Build Firm and approved by the Department.	Deliverable					
202	R	Intelligent Transportation System Plans/Testing and Acceptance/Operational Tests	A copy of all diagnostic software shall be submitted to the Department with full documentation.	Deliverable					
203	R	Intelligent Transportation System Plans/Testing and Acceptance/Operational Tests	The Design-Build Firm shall submit Failure Report Logs each day in demonstration that error rates are within requirements.	Deliverable					
204	R	Intelligent Transportation System Plans/Testing and Acceptance/Burn-in Period	The Design-Build Firm shall submit, via a schedule, the start of the Burn-In Period to be approved by the Department.	Deliverable					
205	R	Intelligent Transportation System Plans/Testing and Acceptance/Burn-in Period	The Design-Build Firm shall certify in writing to the Department the configuration of all subsystems, ITS devices, and ancillary components prior to beginning the Burn-In Period.	Deliverable					
206	R	Intelligent Transportation System Plans/Testing and Acceptance/Burn-in Period	Corrective action by the Design-Build Firm for a failure shall be a part of the Design-Build Firm's Burn-In documentation process.	Inspection					
207	R	Intelligent Transportation System Plans/Testing and Acceptance/Burn-in Period	The Design-Build Firm shall provide technical personnel familiar with the Project that shall be available on-site within 24 hours of notification of the need for services.	Inspection					

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208	R	Intelligent Transportation System Plans/Testing and Acceptance/Burn-in Period	If the total number of System Shutdowns exceeds three due to the same subsystem, ITS device, or ancillary component, the Design-Build Firm shall: <ul style="list-style-type: none"> Remove and replace the subsystem, ITS device or ancillary component with a new and unused unit as per the requirements of this RFP; Perform all applicable Stand-alone, Subsystem, and Operational Tests, as deemed necessary by the Department; and Upon written approval from the Department, restart the Burn-In Period for a new 30-day period. 	Inspection					
209	R	Intelligent Transportation System Plans/Testing and Acceptance/Burn-in Period	The Design-Build Firm shall correct all failures during the Burn-In Period at no additional cost to the Department. All corrections shall be fully documented and provided to the Department upon request.	Deliverable					
210	R	Intelligent Transportation System Plans/Testing and Acceptance/Additional MVDS Testing Requirements	The Design Build Firm shall procure the needed equipment to test the MVDS.	Inspection					
211	R	Intelligent Transportation System Plans/Testing and Acceptance/Additional MVDS Testing Requirements	A minimum of 100 passes by the following vehicles shall be routed in front of the MVDS within a 4 hour period. The vehicles must contain a minimum of 50% trucks and a maximum of 80% trucks.	Testing					
212	R	Intelligent Transportation System Plans/Testing and Acceptance/Training	The Design-Build Firm or its designee shall conduct training for all Project subsystems and ITS field elements and shall accommodate up to 10 people at the SWIFT Sunguide Center and TBSG Center, or other location approved by the Department. All training shall be conducted prior to the written notice of Final Acceptance.	Testing					
213	R	Intelligent Transportation System Plans/Testing and Acceptance/Training	The total hours of training conducted shall be a minimum of four hours for each of the embedded DMS, CCTV camera and MVDS subsystems.	Inspection					
214	R	Intelligent Transportation System Plans/Testing and Acceptance/Training	Training shall be designed to familiarize the Department and/or its designees with the design, operation, and maintenance of the subsystems furnished under this Contract. The training shall cover functionality, theory of operation, installation, calibration, operation, testing, maintenance, trouble-shooting, repair, and performance and operating parameters.	Inspection					
215	R	Intelligent Transportation System Plans/Testing and Acceptance/Training	During each training class, time shall be included to discuss details of ITS field element placement, numbering and naming conventions, and any other information that shall assist the operations and maintenance personnel to become familiar with the ITS field elements, as required.	Inspection					
216	R	Intelligent Transportation System Plans/Testing and Acceptance/Training	Training shall be provided by personnel thoroughly familiar with the technology, operation, and maintenance of all equipment installed on the Project. This may be the combination of the Design-Build Firm's personnel and equipment manufacturer's representatives.	Inspection					
217	R	Intelligent Transportation System Plans/Testing and Acceptance/Training	The Design-Build Firm's personnel shall provide a single cohesive training session for the entire system as a unit in addition to specific ITS field element/subsystem training provided by the device vendor / manufacturer.	Inspection					
218	R	Intelligent Transportation System Plans/Testing and Acceptance/Training	The Design-Build Firm shall submit a complete course outline and summary of the experience and qualifications of the instructional personnel for approval prior to the start of training.	Deliverable					
219	R	Intelligent Transportation System Plans/Testing and Acceptance/Training	The Design-Build Firm or its designee shall provide the training materials.	Deliverable					
220	R	Intelligent Transportation System Plans/Testing and Acceptance/Training/WDS	The Design-Build Firm shall provide a Manufacture certified training course for FDOT District ITS maintenance staff and associated asset maintenance contractors.	Deliverable					
221	R	Intelligent Transportation System Plans/Testing and Acceptance/Training/WDS	Training provided by the Design-Build Firm shall consist of a complete overview of the WDS installation, setup and maintenance requirements based on the WDS requirements and shall consist of a minimum of two (2) four (4)-hour technical training session for a maximum of eight (8) participants each and one (1) two (2)-hour overview training for a maximum of four (4) participants.	Inspection					
222	R	Intelligent Transportation System Plans/Testing and Acceptance/Training/WDS	The Design-Build Firm shall provide a User Guide, Maintenance Manual and general trouble shooting guidance as part of the training.	Inspection					
223	R	Intelligent Transportation System Plans/Testing and Acceptance/Training/WDS	The Design-Build Firm shall provide both paper and digital copies of all training materials and manuals to each training participant.	Inspection					

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224	R	Intelligent Transportation System Plans/Testing and Acceptance/Final Acceptance	Upon completion of successful final acceptance testing, the Design-Build Firm shall document the acceptance date and project identification information and provide two (2) copies to the Department. Final acceptance notification shall be provided in writing from the Department.	Deliverable					
225	R	Intelligent Transportation System Plans/Existing Conditions	The Design-Build Firm shall detail existing ITS equipment and report which devices will be removed, replaced, or impacted by project work.	Inspection					
226	R	Intelligent Transportation System Plans/Testing and Acceptance/Final Acceptance	Any equipment removed shall be inventoried and stored for re-deployment or turned over to the Department by way of an equipment transmittal.	Deliverable					
227	R	Intelligent Transportation System Plans/Testing and Acceptance/Final Acceptance	The removed equipment shall be recorded by manufacturer name, model and serial number. A member of the Design-Build Firm and the Department shall sign the transmittal as responsible party and acknowledgment of ownership.	Inspection					

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FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, JULY 2017									
JULY 2017 FDOT SPECIFICATIONS SECTION 620 GROUNDING AND LIGHTNING PROTECTION									
1	620-1	Description	Ensure grounding and lightning protection system is in accordance with the details shown in the Design Standards unless otherwise shown on the Plans.	Inspection					
620-2 Materials									
2	620-2.1	Ground Rods	Use ground rods meeting the requirements of UL 467 that are listed by an OSHA Nationally Recognized Testing Laboratory (NRTL).	Inspection					
3	620-2.1	Ground Rods	Ground rods must be made of copper-clad steel with a nominal diameter of 5/8 inches.	Inspection					
4	620-2.1	Ground Rods	Ground rod sections must be a minimum of eight feet in length and manufactured for the sole purpose of providing electrical grounding.	Inspection					
5	620-2.2	Ground Rod Assembly:	Ensure ground rod assembly consists of one or more ground rods coupled together, such that the total length of the assembly is a minimum of 20 feet, driven into the earth at a single point, without disrupting the electrical continuity of the assembly.	Inspection					
6	620-2.3	Ground Rod Array:	Ensure ground rod arrays, as required, consists of two or more ground rod assemblies, bonded together and spaced a minimum of 40 feet apart.	Inspection					
7	620-2.4	Grounding Conductors:	Use solid copper insulated (green) conductor for electrical or lightning protection ground from the system ground bus or barrier plates to the ground rod assembly.	Inspection					
8	620-2.4	Grounding Conductors:	Ensure grounding conductors are sized as per NEC Section 250.122	Inspection					
9	620-2.4	Grounding Conductors:	Ensure grounding electrode conductors are sized as per NEC Section 250.66	Inspection					
10	620-2.5	Exothermic Grounding Bond:	Make all connections to the ground rod assemblies using exothermic welds.	Inspection					
11	620-2.6	Air Terminals:	Use air terminals that comply with UL 96A and NFPA 780 standards and are listed by a NRTL.	Inspection					
12	620-2.7	Surge Protective Devices (SPDs):	Provide SPDs to protect electronics from lightning, transient voltage surges, and induced current.	Inspection					
13	620-2.7	Surge Protective Devices (SPDs):	Install SPDs on all power, data, video and any other conductive circuit.	Inspection					
14	620-2.7	Surge Protective Devices (SPDs):	SPDs for traffic control devices, including intelligent transportation system (ITS) equipment, must be listed on the Department's Approved Product List (APL).	Inspection					
15	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	Install a SPD at the utility disconnect to the cabinet.	Inspection					
16	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	Ensure that the SPD at the utility disconnect includes L-N, L-G, and N-G protection and has a maximum surge current rating of 50 kA per phase or greater.	Inspection					
17	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	The SPD must meet the requirements of UL 1449, Third Edition and be listed by a NRTL.	Inspection					
18	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	Ensure an SPD is provided where the supply circuit enters the cabinet.	Inspection					
19	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	Locate the SPD on the load side of the main disconnect and ahead of any and all electronic devices and connected in parallel with the AC supply.	Inspection					
20	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	Ensure that the SPD in the cabinet includes L-N, L-G, and N-G protection and has a maximum surge current rating of 50 kA per phase or greater.	Inspection					
21	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	The SPD must meet the requirements of UL 1449, Third Edition and be listed by a NRTL.	Inspection					
22	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	Ensure that the SPD has a visual indication system that monitors the weakest link in each mode and shows normal operation or failure status and also provides one set of normally open (NO)/normally closed (NC) Form C contacts for remote alarm monitoring.	Inspection					
23	620-2.7.1	SPD for 120 Volt or 120/240 Volt Power:	The enclosure for a SPD shall have a NEMA 4 rating.	Inspection					
24	620-2.7.2	SPD at Point of Use:	Install a SPD at the point the ITS devices receive 120 volt power and connected in series with the circuits.	Inspection					
25	620-2.7.2	SPD at Point of Use:	Ensure that the units are rated at 15 or 20 amps load and are configured with receptacles.	Inspection					
26	620-2.7.2	SPD at Point of Use:	Ensure that these units have internal fuse protection and provide common mode (L+N-G) protection.	Inspection					
27	620-2.7.3	SPDs for Low-Voltage Power, Control, Data and Signal Systems	Install a specialized SPD on all conductive circuits including, but not limited to, data communication cables, coaxial video cables, and low-voltage power cables.	Inspection					
28	620-2.7.3	SPDs for Low-Voltage Power, Control, Data and Signal Systems	Ensure that these devices comply with the minimum functional requirements shown in Table 1 for all available modes.	Inspection					
29	620-2.7.3	SPDs for Low-Voltage Power, Control, Data and Signal Systems	Ensure that SPDs meet the requirements of UL 497B or UL497C, as applicable, and are listed by a NRTL.	Inspection					
30	620-2.7.4	Mechanical Specifications	Ensure equipment is permanently marked with manufacturer name or trademark, part number, and date of manufacturer or serial number.	Inspection					

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31	620-2.7.4	Mechanical Specifications	Ensure all parts are made of corrosion resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.	Inspection					
32	620-2.7.5	Environmental Conditions	Ensure that SPDs operate properly during and after being subjected to the temperature and humidity test described in NEMA TS 2, Section 2.2.7, and the vibration and shock tests described in NEMA TS 2, Sectios 2.2.8., and 2.2.9.	Inspection					
33	620-2.7.6	Manufacturer's Warranty	Ensure that the SPD has a manufacturer's warranty covering failures for a minimum of 10 years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.	Inspection					
620-3 Installation									
34	620-3.1	General:	Construct a single-point grounding system.	Inspection					
35	620-3.1	General:	Install the primary ground rod assembly in an electrical pull box so that the top four inches are accessible for inspection, resistance testing, and maintenance.	Inspection					
36	620-3.1	General:	The primary ground rod assembly and electrical pull box shall be installed between 12 inches to 36 inches from the element being grounded.	Inspection					
37	620-3.1	General:	The top of all other ground rod assemblies connected to the primary ground rod assembly in an array must be buried a minimum of 18 inches below grade.	Inspection					
38	620-3.1	General:	Direct bury grounding conductors used to connect ground rod assemblies a minimum of 18 inches below finished grade.	Inspection					
39	620-3.1	General:	Bond all ground rod assemblies and ground rod arrays together with solid bare tinned copper wire unless otherwise shown on the Plans.	Inspection					
40	620-3.1	General:	Install grounding conductors in a straight path.	Inspection					
41	620-3.1	General:	Make all bonds between ground wires and ground rod assemblies and ground rod arrays with an exothermic bond with the following exception: do not exothermically bond sections of ground rods to create the ground rod assembly and do not exothermically bond connections within a cabinet.	Inspection					
42	620-3.1	General:	Apply an anti-oxidant compound to all mechanical connections.	Inspection					
43	620-3.1	General:	Connect primary surge protection for power at the service entrance or main disconnect.	Inspection					
44	620-3.1	General:	Connect secondary surge protection at point of use, unless otherwise shown on the Plans.	Inspection					
45	620-3.1	General:	Ensure that lightning protection systems conform to the requirements of the National Fire Protection Association (NFPA) Code NFPA 780, Standard for the Installation of Lightning Protection Systems.						
46	620-3.1	General:	Install SPDs that have an operating voltage appropriate for the characteristics of the circuits they protect.	Inspection					
47	620-3.2	Minimum Grounding Resistance:	Obtain a resistance ground of not more than 5 ohms for the following grounding applications. Install multiple ground rod assemblies totaling a maximum length of up to 80 feet, as required to achieve minimum grounding resistance. 1. Power service for traffic control devices 2. Signal and ITS cabinets 3. ITS Poles/Structures with electronic equipment 4. DMS and DMS structures	Testing					
48	620-3.2	Minimum Grounding Resistance:	Install multiple ground rod assemblies totaling a maximum length of up to 80 feet, as required to achieve minimum grounding resistance.	Inspection					
49	620-3.2	Minimum Grounding Resistance:	Install a minimum of one primary ground rod assembly.	Inspection					
50	620-3.2	Minimum Grounding Resistance:	If a grounding and lightning protection system using a single ground rod assembly does not achieve the required resistance to ground, extend the length of the ground rod assembly an additional 20 feet or install an additional ground rod assembly 40 feet away and connect it to the main ground rod assembly to create a ground rod array.	Inspection					
51	620-3.2	Minimum Grounding Resistance:	Continue installing ground rod assemblies connected in an array until the required resistance is obtained or until the maximum required total length of ground rod is installed.	Inspection					
52	620-3.2	Minimum Grounding Resistance:	Grounding systems formed from horizontally constructed conductive radials are permitted if site conditions prohibit the use of vertically driven rods as permitted by the NEC Article 250.53(G). A grounding system consisting of the maximum total length of ground rod required is acceptable in cases where soil conditions prevent the grounding system from achieving the required resistance to ground.	Inspection					
53	620-3.2	Minimum Grounding Resistance:	Submit the site resistance measurement to the Engineer.	Deliverable					

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54	620-3.2	Minimum Grounding Resistance:	Install a single ground rod assembly for the following applications. No resistance to ground measurements are required. 1. Conventional lighting 2. External lighting for signs 3. Signal cable & span wire 4. Aerial interconnect messenger wire 5. Pedestals for pedestrian signals 6. Pull boxes with metal covers when 120 volts (or greater) AC power is present 7. Splice vaults with wire grounding units.	Inspection					
55	620-3.4	Grounding Traffic Control Systems on Highways:	Bond all metal components of the system (such as cabinets, steel poles, and concrete pole grounding wire) to the grounding system using a mechanical connection on the equipment side and an exothermically welded connection at the down cable.	Inspection					
56	620-3.4	Grounding Traffic Control Systems on Highways:	Do not use split bolts for grounding system connections.	Inspection					
57	620-3.4	Grounding Traffic Control Systems on Highways:	Connect all ground rod assemblies and any associated grounded electrical system within a 100 foot radius (but not beyond the edge of the roadway) of the primary ground rod assembly.	Inspection					
58	620-3.4	Grounding Traffic Control Systems on Highways:	Connect the primary ground rod assembly to a single point main grounding bar inside the equipment cabinet or mount it to the base of the traffic control device supporting structure unless otherwise shown on the Plans.	Inspection					
59	620-3.4	Grounding Traffic Control Systems on Highways:	Place multiple ground rod assemblies, as required, in a ground rod array as depicted in the Design Standards unless otherwise shown on the Plans.	Inspection					
620-4 Testing									
60	620-4.1	Testing:	Measure the ground resistance with an instrument designed specifically to measure and document earth/ground resistance, soil resistivity, and current flow.	Inspection					
61	620-4.1	Testing:	Conduct the test by using the fall-of-potential method as described in the Institute of Electronic and Electrical Engineers (IEEE) Standard 81.	Analysis, Inspection					
62	620-4.1	Testing:	If fall-of-potential tests cannot be performed, it is acceptable to measure resistance at each accessible ground rod using a clamp-on ground resistance tester.	Inspection					
63	620-4.1	Testing:	Submit to the Engineer certified test results for each testing location.	Deliverable					
64	620-4.1	Testing:	Submit the following information on the test results: 1. The formal name or ID for the location where the test was performed. 2. The GPS latitude and longitude for the location where the test was performed. 3. The date on which the test was performed. 4. The make and model number, serial number, and last date of calibration (by an independent testing facility within the previous 12 months) for the grounding resistance testing device used. 5. Contact information (including name, signature, and employer name) for each person conducting, witnessing, or certifying the test. 6. Description of the local environmental and soil conditions at the time of testing. 7. A rough sketch of the site grounding system; along with the corresponding measured data points. 8. Page numbering showing the current page number and total page count (e.g., Page 1 of 3)	Deliverable					
65	620-4.2	Inspection:	Do not backfill below-grade grounding installations and grounding connections until inspected and approved.	Inspection					
66	620-4.2	Inspection:	The Engineer will inspect the installation for proper connection types, tightness, workmanship, and conformance to Plans.	Inspection					
67	620-4.2	Inspection:	Replace any exothermic bonds that are deemed unsatisfactory with new exothermic bonds.	Inspection					
68	620-4.2	Inspection:	Repair or replace any mechanical connections that are deemed unsatisfactory.	Inspection					
69	620-4.2	Inspection:	Measure the resistance at each accessible ground rod using a clamp-on earth tester.	Inspection					
70	620-4.2	Inspection:	The measurement at any individual rod is the cumulative resistance of all rods in a parallel circuit.	Inspection					
71	620-4.2	Inspection:	Record all test results in a standardized format approved by the Engineer prior to testing.	Deliverable					
72	620-4.2	Inspection:	All recorded test report data shall be dated, witnessed, and signed by at least one representative of the Department and the Contractor. Remedy all deficiencies at no cost to the Department.	Deliverable					

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JULY 2017 FDOT SPECIFICATION SECTION 630 CONDUIT									
630-2 Materials									
73	630-2.1	Conduit:	Use materials that have been tested and listed by a Nationally Recognized Testing Laboratory as required by Section 630-2.1 of the Standard Specifications.	Inspection					
74	630-2.2	Locate Wire:	Ensure that locate wire is a single copper conductor with a minimum gauge of No. 12 AWG.	Inspection					
75	630-2.2	Locate Wire:	Ensure locate wire is insulated using a 45 mil minimum thickness polyethylene sheath that is orange in color and marked to identify the manufacturer and the conductor size.	Inspection					
76	630-2.3	Locate Wire Grounding Unit:	Ensure that locate wires are attached to a wire grounding unit (WGU) dedicated to safely dissipate high transient voltages or other foreign electrical surges induced into the designated system.	Inspection					
77	630-2.3	Locate Wire Grounding Unit:	Ensure the WGU conforms to the following: 1. Allows signals generated by locate system transmitters to pass through the protection system without going to ground. 2. The protection system automatically resets and passes locate system transmitter signals after the unit has been grounded to dissipate over-voltages. 3. Is intended for below or above grade applications. Ground the WGU to a driven rod within 10 feet of the system using a No. 6 AWG single conductor wire with green insulation. Ensure that the WGU is enclosed for protection from environmental hazards and is accessible for the connection of portable locate system transmitters. 4. The WGU system meets the minimum standards listed in Table 1 of Section 630-2.3 of the Minimum Specifications for surge protection.	Inspection					
78	630-2.4	Warning Tape:	Ensure that the buried cable warning tape is flexible, elastic material 3 inches wide, 6 mil thick, intended for burial and use as an underground utility warning notice, and that the surface of the warning tape is coated and sealed to prevent deterioration caused by harsh soil elements.	Analysis, Inspection					
79	630-2.4	Warning Tape:	Ensure that the warning tape color follows the American Public Works Association color code for underground utilities and has the repeating message "CAUTION: FDOT CABLE," or other wording approved by the Engineer, permanently printed on its surface.	Inspection					
80	630-2.4	Warning Tape:	Ensure that the tape material and ink colors do not change when exposed to acids, alkalis, and other destructive chemical variances commonly found in Florida soils.	Analysis, Inspection					
81	630-2.5	Route Markers:	Route markers may be either a standard route marker (SRM) type or an electronic route marker (ERM) type.	Inspection					
82	630-2.5	Route Markers:	Ensure the SRM is a rigid, tubular, driven post used for location and notification purposes only.	Inspection					
83	630-2.5	Route Markers:	Ensure the ERM is physically identical to the SRM, but also includes a termination board to provide aboveground access to locate wire buried alongside conduit and cable runs.	Inspection					
84	630-2.5	Route Markers:	Ensure that each SRM is labeled and identified as an FDOT fiber optic cable marker unless otherwise shown in the Plans.	Inspection					
85	630-2.5	Route Markers:	The labels must include the Department's logo, contact information for the local FDOT District, and a telephone number to call prior to any excavation in the area.	Inspection					
86	630-2.5	Route Markers:	Ensure that the identification information is permanently imprinted on the top fitting, and will not peel, fade, or deteriorate.	Inspection					
87	630-2.5.1	Standard Route Marker (SRM):	Ensure that SRM posts are white with an orange top fitting cover with black or white lettering and graphics.	Inspection					
88	630-2.5.1	Standard Route Marker (SRM):	Ensure that the SRM is a tubular configuration, and both the marker post and the top fitting are made from virgin Type 111 HDPE.	Inspection					
89	630-2.5.1	Standard Route Marker (SRM):	Ensure that any fasteners used with the SRM are constructed of stainless steel.	Inspection					
90	630-2.5.1	Standard Route Marker (SRM):	Ensure that all SRMs have a minimum outside diameter of 3.5 inches with a minimum wall thickness of 0.125 inches.	Inspection					
91	630-2.5.1	Standard Route Marker (SRM):	Ensure that the top fitting cover is a minimum of 1.5 feet long and has an outside diameter of 3.75 inches with a minimum wall thickness of 0.125 inches.	Inspection					
92	630-2.5.1	Standard Route Marker (SRM):	Ensure that each SRM provides a tensile strength of 4,200 pounds per square inch as required in ASTM D638.	Inspection					

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93	630-2.5.1	Standard Route Marker (SRM):	Ensure that each SRM is manufactured for use in temperatures range of minus 30° to 165°F in accordance with NEMA TS 2.	Inspection					
94	630-2.5.1	Standard Route Marker (SRM):	Ensure the SRM can withstand an impact force of 70 pounds per foot at 32°F in accordance with ASTM D2444, before and after UV conditioning for 2,000 hours in accordance with ASTM G154.	Inspection					
95	630-2.5.1	Standard Route Marker (SRM):	Ensure that the control sample of any material tested maintains a minimum of 70 percent of its original tensile strength.	Inspection					
96	630-2.5.1	Standard Route Marker (SRM):	Ensure that SRMs buried at a 2 foot depth can withstand at least one impact at 45 miles per hour by a vehicle weighing at least 3,500 pounds and that after impact, post returns to an upright position within 10 degrees of vertical alignment within 30 seconds from the time of impact.	Inspection					
97	630-2.5.2	Electronic Route Marker (ERM):	Ensure ERMs meet the same material and performance requirements as the SRMs with the following exceptions.	Inspection					
98	630-2.5.2	Electronic Route Marker (ERM):	Equip each ERM with a removable, top-fitting cover that is black with white lettering.	Inspection					
99	630-2.5.2	Electronic Route Marker (ERM):	Ensure that each ERM contains a terminal board equipped with locate wire and ground connectors.	Inspection					
100	630-2.5.2	Electronic Route Marker (ERM):	Ensure that the terminal board is made from corrosion-resistant materials and includes terminal facilities labeled according to function and provides uniform spacing between connection points.	Inspection					
630-3 Installation Requirements									
101	630-3.1	General:	Install the conduit in accordance with NEC or National Electrical Safety Code (NESC) requirements and the Design Standards.	Inspection					
102	630-3.1	General:	Construct conduit runs as straight as possible, and obtain the Engineer's approval for all major deviations in conduit locations from those shown in the Plans.	Inspection					
103	630-3.1	General:	Include buried cable warning tape with all trenched conduit.	Inspection					
104	630-3.1	General:	Mark the location of the conduit system with route markers as shown in the Plans and approved by the Engineer.	Inspection					
105	630-3.1	General:	Ensure that all route markers used are new and consistent in appearance.	Inspection					
106	630-3.1	General:	For conduit installed by directional bore, install in accordance with Section 555.	Inspection					
107	630-3.1	General:	For conduit installed by jack and bore, install in accordance with Section 556.	Inspection					
108	630-3.1	General:	Use only intermediate metal conduit, rigid galvanized metal conduit, rigid aluminum conduit or PVC coated intermediate metal conduit for above-ground electrical power service installations and rigid galvanized metal conduit or rigid aluminum conduit for underground electrical power service installations.	Inspection					
109	630-3.1	General:	Meet all requirements of Section 562 for coating all field cut and threaded galvanized pipe.	Inspection					
110	630-3.1	General:	Use Schedule 80 PVC or fiberglass reinforced epoxy conduit in structural elements in or on bridge decks	Inspection					
111	630-3.1	General:	Use HDPE with an SDR number less than or equal to 11, Schedule 80 PVC or Schedule 40 PVC for underground installations in earth or concrete for ITS and traffic control signal applications, except, use only HDPE with an SDR number less than or equal to 11 for blown fiber optic cable installations on limited access facilities.	Inspection					
112	630-3.1	General:	Use HDPE with an SDR number less than or equal to 13.5, Schedule 80 PVC, or Schedule 40 PVC for underground installations of electrical conduit in earth for lighting applications and landscape irrigation applications.	Inspection					
113	630-3.1	General:	Use HDPE with an SDR number less than or equal to 13.5, Schedule 80 PVC, Schedule 40 PVC, or rigid galvanized metal for underground installations of electrical conduit in concrete for lighting applications.	Inspection					
114	630-3.1	General:	Do not place more than the equivalent of three quarter bends or 270 degrees of bends, including the termination bends, between the two points of termination in the conduit, without a pull box.	Inspection					
115	630-3.1	General:	Obtain the Engineer's approval to use corrugated flexible conduits for short runs of 6 feet or less.	Inspection					
116	630-3.1	General:	When a conduit installation changes from underground to above-ground, make the change a minimum of 6 inches below finished grade.	Inspection					
117	630-3.1	General:	Install a No. 12 AWG pull wire or polypropylene cord inside the full length of all conduits.	Inspection					
118	630-3.1	General:	Ensure that a minimum of 24 inches of pull wire/cord is accessible at each conduit termination.	Inspection					

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119	630-3.1	General:	Ensure the conduit includes all required fittings and incidentals necessary to construct a complete installation.	Inspection					
120	630-3.1	General:	When earth backfill and tamping is required, place backfill material as per Section 120 in layers approximately 12 inches thick, and tamp each layer to a density equal to or greater than the adjacent soil.	Inspection					
121	630-3.1	General:	When backfilling trenches in existing pavement, use a flowable fill meeting the requirements of Section 121.	Inspection					
122	630-3.1	General:	Provide a standard clearance between underground control cable and electrical service cable or another parallel underground electrical service cable that meets NESC requirements.	Inspection					
123	630-3.1	General:	Prevent the ingress of water, dirt, sand, and other foreign materials into the conduit prior to, during, and after construction.	Inspection					
124	630-3.1	General:	Seal the ends of conduit after wiring is complete with a moisture resistant sealant that is designed for this specific application.	Inspection					
125	630-3.1.1	Fiber Optic Cable Conduit:	Install the conduit system so the fiber optic cable maintains a minimum bend radius of 20 times the cable diameter.	Inspection					
126	630-3.1.1	Fiber Optic Cable Conduit:	Use approved methods for connecting inner duct or conduit within or between plowed portions, trenched portions, and bored portions.	Inspection					
127	630-3.1.1	Fiber Optic Cable Conduit:	Submit the conduit manufacturer's coupling method and material to the Engineer for approval.	Deliverable					
128	630-3.2	Conduit Sizes:	Size the conduit to be used on all installations, unless otherwise shown in the Contract Documents.	Inspection					
129	630-3.2	Conduit Sizes:	Use conduit of sufficient size to allow the conductor to be installed without any damage and meeting NEC requirements.	Inspection					
130	630-3.2	Conduit Sizes:	Use conduit that is at least 2 inches in diameter, with the following exceptions: 1. For conduit protecting the ground wire on the side of a pole, use conduit that is at least 1/2 inch in diameter. 2. For ITS applications where Contractor chooses to install fiber optic cable by blowing, use conduit that is at least 1-1/4 inch in diameter. 3. For traffic control signal and device electrical service conduit, use the minimum conduit size required by the local maintaining agency and the electrical service provider.	Inspection					
131	630-3.3	Conduit Joints:	Make conduit joints using materials as specified by the manufacturer.	Inspection					
132	630-3.3	Conduit Joints:	When conduit crosses an expansion joint of a structure and where shown in the Plans, install an expansion or expansion/deflection fitting as specified by the manufacturer.	Inspection					
133	630-3.3	Conduit Joints:	Certify that expansion/deflection fittings are rated to accommodate a minimum rotation of 30 degrees and that both the expansion and expansion/deflection fittings are rated to accommodate the anticipated longitudinal movement (minimum of 2 inches for deflection fittings and 0.7 inches for expansion/deflection fittings).	Inspection					
134	630-3.3	Conduit Joints:	Ensure that all installed joints are waterproof.	Inspection					
135	630-3.3	Conduit Joints:	As an exception to the threaded coupling for intermediate metal conduit, at locations where it is not possible to screw the threaded coupling properly, the Contractor may use a waterproof slip-joint coupling approved by the Engineer.	Inspection					
136	630-3.3	Conduit Joints:	Secure the joint, and tighten threaded connections.	Inspection					
137	630-3.3	Conduit Joints:	Prior to insertion into the coupling, clean, prime and coat the ends of PVC conduit with solvent-type cement as specified by the manufacturer.	Inspection					
138	630-3.4	PVC Coating:	Apply PVC coating to exposed metal surfaces of the conduit, except for the threads, to attain a nominal thickness of 40 mils.	Inspection					
139	630-3.4	PVC Coating:	Ensure that the coating is free of sags and drips.	Inspection					
140	630-3.4	PVC Coating:	Attach the coupling to the conduit prior to the application of the coating for conduit of 1 inch diameter or less.	Inspection					
141	630-3.4	PVC Coating:	Use a coupling with sleeve extensions on conduit larger than 1 inch.	Inspection					
142	630-3.4	PVC Coating:	Ensure that the sleeve extensions on all threaded female openings have a length equal to the diameter of the conduit up to and including size number 53.	Inspection					
143	630-3.5	Conduit Terminations:	Fit the terminating ends of all metal conduit and metal conduit sleeves with an appropriate bushing.	Inspection					
144	630-3.5	Conduit Terminations:	For conduit to be encased in concrete, wrap with tape or otherwise protect all terminations to prevent the entrance of concrete.	Inspection					
145	630-3.5	Conduit Terminations:	Connect new underground conduits to existing underground conduits with a pull box.	Inspection					

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146	630-3.5	Conduit Terminations:	Install conduit terminating in a concrete strain pole through the cable entry hole and up the center of the pole to a location approximately 6 inches below the handhole.	Inspection					
147	630-3.5	Conduit Terminations:	Seal conduits terminating in a controller base, pole, pull box, junction box, or pedestal base with a moisture resistant sealant approved by the Engineer.	Inspection					
148	630-3.5	Conduit Terminations:	For a controller base, pole or pedestal base, and junction boxes, terminate conduit runs into the center of the base or box at least 2 inches above the surface of the base.	Inspection					
149	630-3.6	Restoration of Trench Areas:	Restore the conduit trench construction area to an acceptable condition.	Inspection					
150	630-3.7	Above-Ground Installation:	Use conduit designed and manufactured for use in long-term above-ground applications with UV stabilization to prevent material deterioration.	Inspection					
151	630-3.7	Above-Ground Installation:	Securely attach above-ground conduit installations to the surface of the supporting structure using conduit straps.	Inspection					
152	630-3.7	Above-Ground Installation:	At a minimum, use conduit straps located on 5 foot centers.	Inspection					
153	630-3.7	Above-Ground Installation:	Use galvanized metal conduit straps when installing intermediate metal conduit, fiberglass reinforced epoxy conduit, rigid galvanized conduit, rigid aluminum conduit or PVC coated intermediate metal conduit above ground.	Inspection					
154	630-3.7	Above-Ground Installation:	Use the same PVC coating for the metal straps as the conduit, when using PVC coated intermediate metal conduit.	Inspection					
155	630-3.8	Elbows:	The radius of curvature of the centerline of any bend shall not be less than shown in the table in Section 630-3.8 of the Minimum Specifications.	Inspection					
156	630-3.9	Fiber Optic Cable Locate Wire:	Install locate wire in the trench or bore with all underground conduits to provide end-to-end electrical continuity for electronically locating the underground conduit system.	Inspection					
157	630-3.9	Fiber Optic Cable Locate Wire:	Bury locate wire along the centerline of the top outer surface of installed conduit.	Inspection					
158	630-3.9	Fiber Optic Cable Locate Wire:	Do not install locate wire in a conduit with fiber optic cable.	Inspection					
159	630-3.9	Fiber Optic Cable Locate Wire:	Do not run locate wires into field cabinets.	Inspection					
160	630-3.9	Fiber Optic Cable Locate Wire:	Terminate locate wires at the first and last pull boxes in the conduit run or as shown in the Plans.	Inspection					
161	630-3.9	Fiber Optic Cable Locate Wire:	Ensure that wire termination occurs in a pull box as shown in the Design Standards, Index No. 17700.	Inspection					
162	630-3.9	Fiber Optic Cable Locate Wire:	In a trenching operation, install the locate wire no more than 3 inches above the conduit.	Inspection					
163	630-3.9	Fiber Optic Cable Locate Wire:	Ensure that the locate wire enters all pull and splice boxes, and that a minimum of 10 feet of slack locate wire is coiled and neatly stored in each box.	Inspection					
164	630-3.9	Fiber Optic Cable Locate Wire:	In a boring operation, install the locate wire in an encasement, install the conduit detection wire external to the conduit with no separation between conduit and wire, or use conduit with integral locate wire.	Inspection					
165	630-3.9	Fiber Optic Cable Locate Wire:	Locate wire may also be placed in the void between the inner wall of conduit and innerducts contained within the conduit as long as no other cables are present within the void.	Inspection					
166	630-3.9	Fiber Optic Cable Locate Wire:	Perform continuity tests and insulation resistance tests on all locate wires and provide the Engineer with all test results. Replace, or repair defective locate wire at no additional cost.	Testing, Deliverable					
167	630-3.9	Fiber Optic Cable Locate Wire:	Make locate wire splices in a flush grade-level box.	Inspection					
168	630-3.9	Fiber Optic Cable Locate Wire:	Ensure that locate wire splices are waterproof and suitable for direct burial.	Inspection					
169	630-3.9	Fiber Optic Cable Locate Wire:	Ensure that locate wire splices at the pull box meet NEC requirements.	Inspection					
170	630-3.9	Fiber Optic Cable Locate Wire:	Ensure that locate wire splices are constructed of and in the following order: a mechanical crimp connection with a butt sleeve, an oxide-preventing aerosol lacquer, mastic electrical splicing tape, and standard electrical tape.	Inspection					
171	630-3.9	Fiber Optic Cable Locate Wire:	At the completion of the installation, provide the Engineer with as-built drawings that document all splice locations.	Deliverable					
172	630-3.9	Fiber Optic Cable Locate Wire:	Install WGUs in pull boxes and splice boxes as shown in the Plans or directed by the Engineer.	Inspection					
173	630-3.9	Fiber Optic Cable Locate Wire:	Mount the device in a location high enough from the bottom of the box to allow access to terminal facilities without disturbing cables present within the box.	Inspection					
174	630-3.9	Fiber Optic Cable Locate Wire:	Terminate the locate wires and connect the WGU to ground in accordance with the manufacturer's instructions.	Inspection					
175	630-3.9	Fiber Optic Cable Locate Wire:	Test the locate wire system after installation to ensure that it functions and can be used to accurately locate the conduit system.	Testing					

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176	630-3.10	Route Markers:	Install route markers for fiber optic cable installations and ensure the following: 1. Markers are plumb and level and the notification information is clearly visible when viewed from the side facing the roadway. 2. Markers are set within the right of way. 3. Markers are placed at a 1 foot offset from the conduit system. 4. The top of the marker post is a minimum of 5 feet and maximum of 6 feet above the finish grade. 5. Markers are spaced a maximum of 500 feet apart. 6. A clear line of sight is maintained from one marker to the next. 7. Markers are installed on both sides of the roadway at any crossing point where the conduit system changes to the opposite side of the roadway. 8. Markers are installed at the center point of any conduit run between two pull or splice boxes. 9. Markers are installed at gate locations when the conduit system is adjacent to a fence line. 10. Markers are installed on both sides of a stream, river, or other water crossing and on both sides of aboveground attachments such as bridges and walls.	Inspection					
177	630-3.10	Route Markers:	Remove and replace all marker posts damaged during installation at no additional cost.	Inspection					
178	630-3.10	Route Markers:	Ensure that route marker signs are labeled with a unique identification number, as detailed in the Plans or as approved by the Engineer.	Inspection					
179	630-3.10	Route Markers:	Provide as-built documentation at the completion of installation that includes identification number and location of all installed route markers and correlates the marker to the fiber optic infrastructure that it signifies.	Deliverable, Inspection					
180	630-3.10	Route Markers:	Ensure that installation of ERMs includes connection of the route marker to the locate wire associated with the conduit run that the markers identify.	Inspection					
181	630-3.10	Route Markers:	Install locate wire through the base of the marker and terminate the locate wires to connectors mounted on the terminal board inside the marker.	Inspection					
182	630-3.10	Route Markers:	Install an underground magnesium anode a minimum of 10 feet away from the marker and perpendicular to the conduit system.	Inspection					
183	630-3.10	Route Markers:	Terminate the anode lead on the connector mounted on the terminal board inside the marker.	Inspection					
184	630-3.10	Route Markers:	Install the bond straps between the anode connector and all locate wire connectors to provide cathodic protection for the locate wire conductor.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 633 COMMUNICATION CABLE									
633-2 Materials									
185	633-2.1.1	Single Mode Fiber Optic Cable:	Provide all-dielectric, dry-filled, loose-tube, dispersion-unshifted, single-mode fiber (SMF) with low water peak, gel free, and suitable for underground (i.e., in conduit) and aerial outside plant installation.	Inspection					
186	633-2.1.1	Single Mode Fiber Optic Cable:	All fiber optic cable shall be splice-compatible with the Department's existing dispersion-unshifted SMF and require no electronic equipment for dispersion compensation between new and existing fiber.	Inspection					
187	633-2.1.1	Single Mode Fiber Optic Cable:	Ensure that all components that comprise a single length of cable are continuous and of the same material.	Inspection					
188	633-2.1.1	Single Mode Fiber Optic Cable:	Furnish only commercial off-the-shelf materials, equipment, and components.	Inspection					
189	633-2.1.1.1	Optical Fiber:	Ensure that the optical fibers used in the cable meet or exceed the Telecommunications Industry Association (TIA) and Electronic Industries Alliance (EIA) TIA/EIA-492-CAAB specification, the U.S. Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900, and International Telecommunication Union ITU-T G.652.D requirements.	Inspection					
190	633-2.1.1.1	Optical Fiber:	Use only optical fibers meeting the additional requirements in the table under Section 633-2.1.1.1 of the Minimum Specifications.	Inspection					
191	633-2.1.1.1	Optical Fiber:	Ensure that all fiber in the buffer tube is usable fiber that complies with attenuation requirements.	Inspection					
192	633-2.1.1.1	Optical Fiber:	Ensure that fibers do not adhere to each other.	Inspection					
193	633-2.1.1.1	Optical Fiber:	Ensure that the fiber is free of surface imperfections and inclusions.	Inspection					
194	633-2.1.1.1	Optical Fiber:	Ensure that all fiber optic core glass is from the same manufacturer.	Inspection					
195	633-2.1.1.2	Buffer Tubes:	Ensure that the fiber optic cable includes loose buffer tubes that isolate internal optical fibers from outside forces and provide protection from physical damage as well as water ingress and migration.	Inspection					
196	633-2.1.1.2	Buffer Tubes:	Ensure that buffer tubes provide freedom of movement for internal optical fibers.	Inspection					
197	633-2.1.1.2	Buffer Tubes:	Ensure buffer tubes allow for expansion and contraction of the cable without damage to internal optical fiber.	Inspection					
198	633-2.1.1.2	Buffer Tubes:	Ensure that fiber does not adhere to the inside of the tube.	Inspection					
199	633-2.1.1.2	Buffer Tubes:	Ensure that buffer tubes permit intentional scoring and breakout without damage to the fiber.	Inspection					
200	633-2.1.1.2	Buffer Tubes:	Ensure that each fiber optic cable buffer tube contains 12 fibers per tube unless otherwise shown in the Plans.	Inspection					
201	633-2.1.1.3	Color Code:	Ensure that the marking and color-coding of the fibers and buffer tubes conforms to the EIA/TIA-598-B standard.	Inspection					
202	633-2.1.1.3	Color Code:	Ensure that colors are permanent and stable during temperature cycling, and not subject to fading or smearing onto each other or into the water-blocking material.	Inspection					
203	633-2.1.1.3	Color Code:	Ensure that fibers are colored with UV curable inks that remain clearly distinguishable as the intended color.	Inspection					
204	633-2.1.1.4	Strength Member:	Ensure that the fiber optic cable contains a dielectric central strength member and dielectric outside strength member to prevent buckling of the cable and provide tensile strength.	Inspection					
205	633-2.1.1.4	Strength Member:	Ensure that the fiber optic cable can withstand a pulling tension of 600 lbs. without damage to any components of the fiber optic cable.	Inspection					
206	633-2.1.1.5	Water Blocking Compound:	Ensure that the fiber optic cable contains a dry water-blocking material to prevent the ingress of water within the outer cable jacket.	Inspection					
207	633-2.1.1.5	Water Blocking Compound:	Ensure that water-blocking materials are non-nutritive, dielectric, and homogeneous, and free from dirt and foreign matter.	Inspection					
208	633-2.1.1.5	Water Blocking Compound:	Use dry water-blocking material for fiber optic cables used for either aerial or underground installations.	Inspection					
209	633-2.1.1.5	Water Blocking Compound:	Apply dry water-blocking compound longitudinally around the outside of the central buffer tubes.	Inspection					
210	633-2.1.1.5	Water Blocking Compound:	Construct all cables with water-blocking material that complies with the requirements of the EIA/TIA-455-81B standard and is subjected to water penetration tests as defined in the EIA/TIA-455-82B standard.	Inspection					
211	633-2.1.1.6	Ripcord:	Ensure that the cable contains at least one ripcord under the sheath.	Inspection					
212	633-2.1.1.6	Ripcord:	Ensure that the ripcord permits the removal of the sheath by hand or with pliers.	Inspection					

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213	633-2.1.1.8	Outer Jacket:	Ensure that the fiber optic cable is jacketed with medium density polyethylene (MDPE) that is free of blisters, cracks, holes, and other deformities.	Inspection					
214	633-2.1.1.8	Outer Jacket:	Ensure that the nominal jacket thickness is a minimum of 0.03 inches.	Inspection					
215	633-2.1.1.8	Outer Jacket:	Ensure the outer jacket provides UV protection and does not promote the growth of fungus.	Inspection					
216	633-2.1.1.8	Outer Jacket:	Mark the jacket with the cable manufacturer's name, fiber type, fiber count, date of manufacture, the words "FDOT FIBER OPTIC CABLE" unless otherwise shown in the Plans, and the sequential cable lengths marked in feet.	Inspection					
217	633-2.1.1.8	Outer Jacket:	Ensure that the actual length of the cable is within 1% of the length indicated by the marking.	Inspection					
218	633-2.1.1.8	Outer Jacket:	Provide legible marking with contrasting color to that of the cable jacket.	Inspection					
219	633-2.1.1.9.1	Operating Temperature:	Ensure that the shipping and the operating temperature range of fiber optic cable meets or exceeds minus 30° to 158° F.	Inspection					
220	633-2.1.1.9.1	Operating Temperature:	Ensure that the installation temperature range of fiber optic cable meets or exceeds minus 22° to 140°F.	Inspection					
221	633-2.1.1.9.2	Bend radius:	Ensure that the fiber optic cable is capable of withstanding a minimum unloaded bend radius of 10 times the cable diameter and a minimum loaded bend radius of 20 times the cable diameter when loaded to pulling tension of 600 pounds.	Inspection					
222	633-2.1.1.9.2	Bend radius:	Test the cable as required in the TIA/EIA-455-33A standard.	Testing					
223	633-2.1.1.9.2	Bend radius:	Ensure that bending the fiber optic cable up to the minimum bend radius does not affect the optical characteristics of the fiber.	Inspection					
224	633-2.1.1.9.3	Cable Strength:	Ensure that the fiber optic cable is capable of withstanding a pulling tension of 600 pounds during installation without increasing the fiber attenuation more than 0.8 decibel per mile and without changing other optical fiber characteristics after the tensile load is removed.	Inspection					
225	633-2.1.1.9.3	Cable Strength:	Ensure that optical fiber is proof-tested by the fiber manufacturer at a minimum of 100 kilo pounds per square inch.	Inspection					
226	633-2.1.1.9.3	Cable Strength:	Ensure that the cable will withstand 25 impact cycles and the change in attenuation does not exceed 0.2 decibel at 1,550 nanometers when tested according to the requirements as detailed in the TIA/EIA-455-25B standard.	Inspection					
227	633-2.1.1.9.3	Cable Strength:	Ensure that the fiber optic cable can withstand a minimum compression load of 125 pounds per square inch when applied uniformly over the length of the sample at the rate of 0.15 inches to 0.8 inches per minute and maintained for 10 minutes as defined in the TIA/EIA-455-41A standard.	Inspection					
228	633-2.1.1.9.3	Cable Strength:	Ensure that the change in attenuation will not exceed 0.15 decibel during loading at 1,550 nanometers, and that no fiber displays a measurable change in attenuation after load removal.	Inspection					
229	633-2.1.1.9.4	Water Penetration:	Ensure that the fiber optic cable is capable of withstanding the tests for water penetration defined in the TIA/EIA-455-82 standard.	Inspection					
230	633-2.1.1.9.4	Water Penetration:	Ensure that a one-meter length of cable is able to withstand a one-meter static head of water applied at one end for 24 hours without water leaking through the other open cable end.	Inspection					
231	633-2.1.2	Fiber Optic Connection Hardware:	Ensure that all splice enclosures, organizers, cable end preparation tools, and procedures are compatible with the fiber optic cable, and are approved by the Engineer.	Inspection					
232	633-2.1.2.1	Splice Enclosures:	Contain all optical fiber splices within a splice enclosure.	Inspection					
233	633-2.1.2.1	Splice Enclosures:	Ensure that the enclosures provide storage for splices, fiber, and buffer tubes.	Inspection					
234	633-2.1.2.1	Splice Enclosures:	Ensure that the splice enclosure restores the mechanical and environmental integrity of the fiber optic cable, encases the sheath opening in the cable, and organizes and stores optical fiber.	Inspection					
235	633-2.1.2.1	Splice Enclosures:	Ensure all hinges and latching devices are stainless steel.	Inspection					
236	633-2.1.2.1	Splice Enclosures:	Ensure that the enclosure is airtight and prevents water intrusion.	Inspection					
237	633-2.1.2.1	Splice Enclosures:	Ensure that the splice enclosure can accommodate pressurization and has the ability to be reentered without requiring specialized tools or equipment.	Inspection					
238	633-2.1.2.1	Splice Enclosures:	Ensure that the enclosure provides fiber and splice organizers including splice trays and strain relief.	Inspection					
239	633-2.1.2.1	Splice Enclosures:	Ensure that splice enclosures are hermetically sealed to protect internal components from environmental hazards such as moisture, insects, and UV light. Fiber optic splice enclosures shall also: 1. Comply with the Telcordia Technologies' GR-711-CORE standard and all applicable NEC requirements. 2. Provide space for future expansion equal to 100% of the initial utilization.	Inspection					

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240	633-2.1.2.1	Splice Enclosures:	Provide fiber optic cable penetration end caps to accommodate a minimum installation of two trunk fiber optic cables and two fiber optic drop cables.	Inspection					
241	633-2.1.2.1	Splice Enclosures:	Ensure that the enclosure end caps are factory-drilled to the proper diameter to accept and seal the fiber optic cable entries.	Inspection					
242	633-2.1.2.1	Splice Enclosures:	Ensure that the cable entry locations can accommodate an assortment of cables with outside diameters ranging from 0.45 inches to 0.55 inches, plus 10%, without jeopardizing the waterproof characteristics of the enclosure.	Analysis, Inspection					
243	633-2.1.2.1	Splice Enclosures:	Provide fiber optic splice enclosures meeting the requirements as shown in the table under Section 633-2.1.2.1 of the Minimum Specifications.	Inspection					
244	633-2.1.2.2	Splice Trays:	Ensure that splice trays are securely attached and accessible, and provide sufficient storage for the fiber cable.	Inspection					
245	633-2.1.2.2	Splice Trays:	Ensure splice trays provide access to individual fibers without disrupting other fibers in the tray.	Inspection					
246	633-2.1.2.2	Splice Trays:	Ensure that splice trays hold the buffer tubes rigidly in place and provide protection for fusion splices.	Inspection					
247	633-2.1.2.2	Splice Trays:	Ensure that the raceway accommodates the minimum bend radius of the fiber.	Inspection					
248	633-2.1.2.2	Splice Trays:	Ensure that splice trays allow visible inspection of the fiber.	Inspection					
249	633-2.1.2.2	Splice Trays:	Ensure that splice trays include a cover with a locking mechanism to hold it in place.	Inspection					
250	633-2.1.2.3	Cable Terminations:	Use Type ST, SC, LC, or FC connectors only, as specified in the Plans or by the Engineer.	Inspection					
251	633-2.1.2.3	Cable Terminations:	Ensure that all ST-type fiber optic connectors, whether factory pre-terminated or field-installed, are 0.1 inch physical contact with preradiused tips.	Inspection					
252	633-2.1.2.3	Cable Terminations:	Ensure that ST and FC connectors include a ceramic ferrule and a metallic body, and provide a strain relief mechanism when installed on a single fiber cable that contains strength elements.	Inspection					
253	633-2.1.2.3	Cable Terminations:	Ensure that the ST-type connector provides a minimum 50 pound pullout strength.	Inspection					
254	633-2.1.2.3	Cable Terminations:	Ensure that the optical fiber within the body of all connectors is mechanically isolated from cable tension, bending, and twisting.	Inspection					
255	633-2.1.2.3	Cable Terminations:	Ensure that all connectors are compliant with the TIA/EIA-568-A and TIA/EIA-604 standards, as applicable, and are tested according to the Telcordia/Bellcore GR-326-CORE standard.	Inspection					
256	633-2.1.2.3	Cable Terminations:	When tested according to the TIA and EIA's Fiber Optic Test Procedure (FOTP)-171 (TIA/EIA-455-171), ensure that the connectors test to an average insertion loss of less than or equal to 0.4 decibel and a maximum loss of less than or equal to 0.75 decibel.	Testing					
257	633-2.1.2.3	Cable Terminations:	Test the connectors as detailed in FOTP-107 (TIA/EIA-455-107) to reflectance values of less than or equal to minus 50 decibels.	Testing					
258	633-2.1.3.1	Pre-terminated Connector Assemblies (Pigtails):	Ensure that pre-terminated cable assemblies consist of fiber optic cables with factory-installed connectors on one end of the cable and an un-terminated optical fiber on the other.	Inspection					
259	633-2.1.3.1	Pre-terminated Connector Assemblies (Pigtails):	Ensure that the pre-terminated connector assemblies are installed with fusion splices. Ensure that all buffer tubes and fibers are protected once the attachment of pre-terminated connector assemblies is complete.	Inspection					
260	633-2.1.3.2	Buffer Tube Fan-out Kits:	Ensure that a buffer tube fan-out kit is installed when fiber optic cables are terminated.	Inspection					
261	633-2.1.3.2	Buffer Tube Fan-out Kits:	Use a kit compatible with the fiber optic cable being terminated and that is color-coded to match the optical fiber color scheme.	Inspection					
262	633-2.1.3.2	Buffer Tube Fan-out Kits:	Ensure that the buffer tube fan-out kit supports 12 fiber strands. Ensure that output tubing and the fiber strands contained therein are of sufficient length for routing and attachment of fiber optic cable to connected electronics or as directed by the Engineer.	Inspection					
263	633-2.1.3.2	Buffer Tube Fan-out Kits:	Ensure that the kit and the connectors are supplied by the same manufacturer.	Inspection					
264	633-2.1.4	Patch Panels:	Ensure that the patch panel is compatible with the fiber optic cable being terminated and color coded to match the optical fiber color scheme.	Inspection					
265	633-2.1.4	Patch Panels:	Ensure that the patch panel has a minimum of 12 ST-type panel connectors unless otherwise shown in the Plans.	Inspection					
266	633-2.1.4	Patch Panels:	Ensure that the patch panel dimensions do not exceed 14 inches x 6 inches x 4 inches for fiber counts of twelve or less.	Inspection					
267	633-2.1.4	Patch Panels:	Ensure the patch panel is suitable for mounting within an approved cabinet at the field device location.	Inspection					

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268	633-2.1.4	Patch Panels:	Ensure patch panels are sized to accommodate specified coupler housings and maintain sufficient bend radius for cables.	Inspection					
269	633-2.1.4	Patch Panels:	Ensure the patch panel is sized to occupy the minimum space required for capacity.	Inspection					
270	633-2.1.4.1	Pre-terminated Patch Panels:	Ensure that the pre-terminated patch panel includes a factory installed all-dielectric SMF cable stub.	Inspection					
271	633-2.1.4.1	Pre-terminated Patch Panels:	Ensure that the panel includes factory installed and terminated ST-type panel connectors unless otherwise shown in the Plans.	Inspection					
272	633-2.1.4.1	Pre-terminated Patch Panels:	Ensure that the cable stub is of sufficient length to splice the stub and provide a fiber connection between the panel and the backbone fiber cable or as directed by the Engineer.	Inspection					
273	633-2.1.4.2	Field Assembled and Terminated Patch Panels:	Ensure that the field-assembled patch panel is a termination panel that includes a connector panel and the hardware required to mount the patch panel within an approved cabinet at the field device location and connect the panel to the backbone fiber cable.	Inspection					
274	633-2.1.4.2.1	Connector Panel:	Ensure that the connector panel provides 12 ST-type, bulkhead-mount coupling connectors unless otherwise shown in the Plans.	Inspection					
275	633-2.1.4.2.1	Connector Panel:	Ensure that each coupling connector allows connection of a cable terminated on one side of the panel to a cable on the opposite side.	Inspection					
276	633-2.1.4.2.1	Connector Panel:	Ensure that each bulkhead-mount coupling connector includes a locknut for mounting the connector in predrilled or punched holes in the connector panel.	Inspection					
277	633-2.1.5.1	Cable End Sealing:	Ensure that fiber optic cable ends are capped or sealed to prevent the entry of moisture during shipping, handling, storage, and installation. Equip one end of the fiber optic cable with flexible pulling eyes.	Inspection					
278	633-2.1.5.2	Protective Wrap:	Ensure that the fiber optic cable is shipped and stored with a protective wrap or other approved mechanical reel protection device over the outer turns of the fiber optic cable on each reel.	Inspection					
279	633-2.1.5.2	Protective Wrap:	Ensure that the wrap is weather resistant and protects the cable reel from environmental hazards.	Inspection					
280	633-2.1.5.2	Protective Wrap:	Ensure that the cable reel remains wrapped until cable is to be installed.	Inspection					
281	633-2.1.5.3	Packaging, Shipping and Receiving:	Ensure that the packaging and delivery of fiber optic cable reels comply with the following minimum requirements: 1. Ensure cable is shipped on reels of marked continuous length. 2. Ensure each cable is shipped on a separate, strongly constructed reel designed to prevent damage to the cable during shipment and installation. 3. Ensure each reel has a minimum of 6 feet on each end of the cable available for testing. 4. Ensure that all fiber optic cable is continuous and free from damage. 5. Ensure no point discontinuities greater than 0.1 decibel per reel. 6. Submit the transmission loss test results as required by the EIA/TIA-455-61 standard, as well as results from factory tests performed prior to shipping. 7. Ensure that the manufacturer submits the date of manufacture; product and serial numbers; cable data, including the reel length; refraction index; the project name and location; type of fiber and quantity of strands used; technical product data sheets; and reel numbers.	Inspection, Deliverable					
282	633-2.1.6	Manufacturer Testing and Certification:	Submit documentation of all factory tests performed by the manufacturer for all fiber optic cable, splicing material, cable terminations, and patch panels.	Deliverable					
283	633-2.2	Twisted Pair Cable:	Use shielded underground and aerial cable with separate support wire conforming to Rural Electrification Administration (REA) Specification PE-39, filled telephone cables.	Inspection					
284	633-2.2	Twisted Pair Cable:	Use shielded aerial copper communication with integral support wire conforming to REA Specification PE-38, aerial telephone cables.	Inspection					
285	633-2.2	Twisted Pair Cable:	Use only No. 22 AWG solid cables for copper connections in traffic signal closed loop systems.	Inspection					
633-3 Installation Requirements									
286	633-3.1	Fiber Optic Cable Installation:	Install all materials and equipment according to the latest version of the manufacturer's installation procedures.	Inspection					
287	633-3.1	Fiber Optic Cable Installation:	Ensure that all materials and installation practices are in accordance with the applicable OSHA requirements as found in 29 CFR Part 1926, Safety and Health Standards for Construction.	Inspection					

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288	633-3.1	Fiber Optic Cable Installation:	In addition, perform the following: 1. Ensure conduit and inner-duct is clean and free from damage prior to installing fiber optic cable. 2. Document the sequential cable length markings at each splice box and pull box wall that the cable passes through, and include the information with the as-built documentation.	Deliverable, Inspection					
289	633-3.1	Fiber Optic Cable Installation:	Provide all incidental parts needed to complete the installation, but not specified in the Plans, as necessary for a complete and properly operating system.	Inspection					
290	633-3.1.1	Cable Identification:	Develop a nomenclature plan for identification of fiber optic cable.	Inspection					
291	633-3.1.1	Cable Identification:	Submit the nomenclature plan to the Engineer for approval.	Deliverable					
292	633-3.1.1	Cable Identification:	Use approved cable nomenclature to create cable tags for the identification of fiber optic cable.	Inspection					
293	633-3.1.1	Cable Identification:	Provide cable tag identification on all test results or fiber related documents submitted to the Engineer.	Inspection					
294	633-3.1.1	Cable Identification:	Install cable tags within 1 foot of each splice and/or termination point indicating the cable type, fiber count, and each fiber optic cable origination and termination points.	Inspection					
295	633-3.1.1	Cable Identification:	Ensure that the cable tags are permanent labels suitable for outside plant applications and are affixed to all fiber optic cables.	Inspection					
296	633-3.1.1	Cable Identification:	Ensure that lettering is in permanent ink and displays the phrase "FDOT FIBER OPTIC CABLE".	Inspection					
297	633-3.1.2	Pulling:	Install the fiber optic cable by hand or by using a mechanical pulling machine.	Inspection					
298	633-3.1.2	Pulling:	If a mechanical pulling machine is used, equip the machine with a monitored or recording tension meter.	Inspection					
299	633-3.1.2	Pulling:	Ensure that at no time the manufacturer's recommended maximum pulling tension is exceeded.	Inspection					
300	633-3.1.2	Pulling:	Ensure that the central strength member and aramid yarn are attached directly to the pulling eye during cable pulling.	Inspection					
301	633-3.1.2	Pulling:	Use pulling attachments, such as "basket grip" or "Chinese finger" type, to ensure that the optical and mechanical characteristics are not degraded during the fiber optic cable installation.	Inspection					
302	633-3.1.2	Pulling:	Ensure that excess cable is coiled in a figure eight and fed manually when pulling through pull boxes and splice boxes by hand.	Inspection					
303	633-3.1.2	Pulling:	If pulleys and sheaves will be used to mechanically pull through pull boxes and splice boxes, submit a drawing of the proposed layout showing that the cable will never be pulled through a radius less than the manufacturer's minimum bend radius.	Deliverable					
304	633-3.1.2	Pulling:	Use large diameter wheels, pulling sheaves, and cable guides to maintain the appropriate bend radius.	Inspection					
305	633-3.1.2	Pulling:	Provide tension monitoring at all times during the pulling operation.	Inspection					
306	633-3.1.2	Pulling:	Ensure that cable pulling lubricant used during installation is recommended by the optical fiber cable manufacturer.	Inspection					
307	633-3.1.3	Blowing:	Use either the high airspeed blowing (HASB) method or the piston method.	Inspection					
308	633-3.1.3	Blowing:	When using the HASB method, ensure that the volume of air passing through the conduit does not exceed 600 cubic feet per minute or the conduit manufacturer's recommended air volume, whichever is more restrictive.	Inspection					
309	633-3.1.3	Blowing:	When using the piston method, ensure that the volume of air passing through the conduit does not exceed 300 cubic feet per minute or the conduit manufacturer's recommended air volume, whichever is more restrictive.	Inspection					
310	633-3.1.4	Slack Cable Storage:	Provide and store fiber optic cable at each pull box and splice box to allow for future splices, additions, or repairs to the fiber network.	Inspection					
311	633-3.1.4	Slack Cable Storage:	Store the fiber optic cable without twisting or bending the cable below the minimum bend radius.	Inspection					
312	633-3.1.4	Slack Cable Storage:	Store a total of 200 feet of fiber optic cable in splice boxes, with 100 feet of cable on each side of the cable splice point or as shown in the Plans.	Inspection					
313	633-3.1.4	Slack Cable Storage:	Store 50 feet of spare fiber optic cable in pull boxes.	Inspection					
314	633-3.1.5	Fiber Optic Connection - Splicing:	Perform all optical fiber splicing using the fusion splicing technique, and according to the latest version of the manufacturer's cable installation procedures; industry accepted installation standards, codes, and practices; or as directed by the Engineer.	Inspection					
315	633-3.1.5	Fiber Optic Connection - Splicing:	Ensure that all splices match fiber and buffer tube colors unless shown otherwise in the Plans.	Inspection					

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316	633-3.1.5	Fiber Optic Connection - Splicing:	Where a fiber cable is to be accessed for lateral or drop signal insertion, only open the buffer tube containing the fiber to be accessed and only cut the actual fiber to be accessed.	Inspection					
317	633-3.1.5	Fiber Optic Connection - Splicing:	If a fiber end is not intended for use, cut the fiber to a length equal to that of the fiber to be used and neatly lay it into the splice tray.	Inspection					
318	633-3.1.5	Fiber Optic Connection - Splicing:	Treat any fibers exposed during splicing with a protective coating and place in a protective sleeve or housing to protect the fiber from damage or contaminants.	Inspection					
319	633-3.1.5	Fiber Optic Connection - Splicing:	Neatly store all splice enclosures within a splice box. Attach the splice enclosure to the splice box interior wall to prevent the enclosure from lying on the bottom of the splice box.	Inspection					
320	633-3.1.5.1	Splice Plan:	Submit a splice plan showing the location and configuration of splices in the system for approval by the Engineer.	Deliverable					
321	633-3.1.5.1	Splice Plan:	Perform all splicing according to the splice plan.	Inspection					
322	633-3.1.5.1	Splice Plan:	Document each splice location and identify the source and destination of each fiber in each splice tray.	Deliverable, Inspection					
323	633-3.1.5.1	Splice Plan:	Document all fiber colors and buffer jacket colors used during installation, and develop a sequential fiber numbering plan as required in the TIA/EIA-598-A standard for color-coding in the documentation.	Inspection, Deliverable					
324	633-3.1.5.2	Splice Equipment:	Use a fusion splice machine to splice all optical fiber.	Inspection					
325	633-3.1.5.2	Splice Equipment:	Ensure that splice equipment is new from the factory, or serviced and certified by the factory or its authorized representative within the previous 6 months from the commencement of its use.	Inspection					
326	633-3.1.5.2	Splice Equipment:	Submit to the Engineer documentation from the manufacturer or his authorized representative certifying compliance.	Deliverable					
327	633-3.1.5.2	Splice Equipment:	Clean all splicing equipment and calibrate according to the manufacturer's recommendations prior to each splicing session at each location.	Inspection					
328	633-3.1.6	Cable Termination Installation:	Ensure that cables, buffer tubes, or strands are neatly routed, secured and terminated in a patch panel.	Inspection					
329	633-3.1.6	Cable Termination Installation:	Ensure all cable termination points include documentation regarding the identification, route, and function of each fiber installed at that location.	Inspection					
330	633-3.1.6	Cable Termination Installation:	Ensure that a copy of this information is placed alongside the installed equipment (for instance, in a document pouch or drawer within a field cabinet).	Deliverable, Inspection					
331	633-3.1.7	Patch Panel Installation:	Ensure that patch panels are neatly installed and secured in a weather proof enclosure. Ensure all patch panel connectors are clearly and permanently labeled.	Inspection					
332	633-3.1.7	Patch Panel Installation:	Ensure all installed patch panels include documentation regarding the identification, route, and function of each patch panel connector at that location.	Inspection					
333	633-3.1.7	Patch Panel Installation:	Ensure that a copy of this information is placed alongside the installed equipment.	Deliverable, Inspection					
334	633-3.1.8	Installation Testing:	Notify the Engineer of cable testing at least 14 calendar days in advance.	Testing, Deliverable					
335	633-3.1.8	Installation Testing:	Submit the testing procedures to the Engineer for approval prior to commencement of testing.	Testing, Deliverable					
336	633-3.1.8	Installation Testing:	Perform all tests at 1,310/1,550 nanometer wavelengths, and include the last calibration date of all test equipment with the test parameters set on the equipment in the test documentation.	Testing					
337	633-3.1.8	Installation Testing:	Test all installed fibers (terminated and un-terminated) using methods approved by the Engineer.	Testing					
338	633-3.1.8.1	End to End Attenuation Testing:	Perform testing on all fibers to ensure that end to end attenuation does not exceed allowable loss (0.4 db/km for 1310 nanometer wavelength, 0.3 db/km for 1550 nanometer wavelength, plus 0.5 db for any connectors and 0.1 db for splices).	Testing					
339	633-3.1.8.1	End to End Attenuation Testing:	Repair or replace cable sections exceeding allowable attenuation at no cost to the Department.	Testing					
340	633-3.1.8.2	OTDR Tracing:	Test all fibers from both cable end points with an optical time domain reflectometer (OTDR) at wavelengths of 1310 and 1550 nanometer.	Testing					
341	633-3.1.8.2	OTDR Tracing:	Test the fibers that are not terminated at the time of installation using a bare fiber adapter. Present the results of the OTDR testing (i.e., traces for each fiber) and a loss table showing details for each splice or termination tested to the Engineer in an approved electronic format.	Testing, Deliverable					
342	633-3.1.8.2	OTDR Tracing:	Ensure all OTDR testing complies with the EIA/TIA-455-61 standard.	Inspection, Testing					
343	633-3.1.8.3	Splice Loss Testing:	Ensure that the splice loss for a SMF fusion splice does not exceed a maximum bidirectional average of 0.1 decibel per splice.	Inspection					

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344	633-3.1.8.3	Splice Loss Testing:	Repair or replace splices that exceed allowable attenuation at no cost to the Department.	Deliverable, Inspection					
345	633-3.1.8.4	Connector Loss Testing:	Ensure that the attenuation in the connector at each termination panel and its associated splice does not exceed 0.5 decibel.	Inspection					
346	633-3.1.8.4	Connector Loss Testing:	Repair or replace connectors exceeding allowable attenuation at no cost to the Department.	Deliverable, Inspection					
347	633-3.2	Twisted Pair Cable Installation:	Install all materials and equipment according to the latest version of the manufacturer's installation procedures.	Inspection					
348	633-3.2	Twisted Pair Cable Installation:	Install copper communication cables in continuous lengths to and between cabinets and junction boxes.	Inspection					
349	633-3.2	Twisted Pair Cable Installation:	The Contractor may install junctions at intervals less than shown in the Plans; however, the Contractor must provide any additional materials (such as junction boxes, cabinets, risers, and mounting hardware) and labor for additional junctions and terminations at no expense to the Department. Obtain the Engineer's approval for any additional junctions or terminations.	Deliverable, Inspection					
350	633-3.2.1	Cable type and Number of Conductors:	Determine the appropriate cable type and conductor count required for each twisted pair communication cable unless specified in the Contract Documents.	Inspection					
351	633-3.2.1	Cable type and Number of Conductors:	Identify all spare conductors.	Inspection					
352	633-3.2.2	Number of Cables:	Do not install more than four separate cables at any point on a single support wire.	Inspection					
353	633-3.2.2	Protection of Cable:	Ensure cable drawn through conduit, ducts, drilled holes protected by a rubber grommet, or support structures is installed in such a manner as to prevent damage to conductors or insulation.	Inspection					
633-4 Warranty									
354	633-4	Warranty	Ensure that the fiber optic cable, the splice enclosures, and terminations have a manufacturer's warranty covering defects for a minimum of two years from the date of final acceptance in accordance with 5-11 and Section 608. Ensure the warranty includes providing replacements, within 10 calendar days of notification, for defective parts and equipment during the warranty period at no cost to the Department or the maintaining agency.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 635 PULL, SPLICE AND JUNCTION BOXES									
635-2 Materials									
355	635-2.1	General:	Use pull and splice boxes listed on the Department's Approved Product List (APL).	Inspection					
356	635-2.2.1	General:	Manufacturers of concrete pull and splice boxes and covers seeking inclusion on the APL shall meet the requirements of Section 105 and this Section and be listed on the Department's Production Facility Listing.	Inspection					
357	635-2.2.1	General:	Ensure box bodies and covers are free of flaws such as cracks, sharp, broken, or uneven edges, and voids.	Inspection					
358	635-2.2.1	General:	Ensure in-ground boxes have an open bottom design.	Inspection					
359	635-2.2.2	Marking:	Ensure the following information is permanently cast into the top surface of all pull and splice box covers: 1. Unless otherwise shown in the Plans, mark application as follows: FDOT TRAFFIC SIGNAL for signalized intersections; FDOT FIBER OPTIC CABLE for fiber optic cable; FDOT LIGHTING for highway lighting; FDOT TRAFFIC MONITORING for traffic monitoring; FDOT ELECTRICAL for other electrical applications 2. Manufacturer's name or logo 3. FDOT APL approval number 4. TIER rating	Inspection					
360	635-2.2.2	Marking:	Ensure the date of manufacture (month/day/year, or date code) is permanently located on the top or bottom of the cover.	Inspection					
361	635-2.2.2	Marking:	Ensure the interior of the box body has a permanent marking that includes the manufacturer part/model number and date of manufacture near the top of box in a location that is visible after installation when the cover is removed.	Inspection					
362	635-2.2.3	Dimensions:	Unless otherwise shown in the Plans, provide pull and splice boxes with the following dimensions. 1. For signalized intersection and lighting applications, provide pull boxes with nominal cover dimensions of 13 inches wide by 24 inches long or larger and no less than 12 inches deep. Ensure the inside opening area is a minimum of 240 square inches and no inside dimension is less than 12 inches. 2. For fiber optic cable applications, provide pull boxes with nominal cover dimensions of 24 inches wide by 36 inches long or larger and no less than 24 inches deep. Provide rectangular splice boxes with nominal cover dimensions of 30 inches wide by 60 inches long or larger and no less than 36 inches deep. Provide round splice boxes with a nominal cover diameter of 36 inches or larger and no less than 36 inches deep.	Inspection					
363	635-2.2.4	Fabrication:	Provide box covers constructed of concrete, polymer concrete or other materials meeting the requirements of this Section.	Inspection					
364	635-2.2.4	Fabrication:	Provide box covers with lifting slots and a flush-seating lockdown mechanism.	Inspection					
365	635-2.2.4	Fabrication:	Use penta-head lockdown lag bolts. Ensure lockdown bolts and lifting slots are Type 316, 304, or 302 passivated stainless steel or brass.	Inspection					
366	635-2.2.4	Fabrication:	Ensure lockdown bolt assembly is designed to prevent seizing and can be removed without damaging the cover or box body.	Inspection					
367	635-2.2.4	Fabrication:	Ensure the lockdown bolt threaded insert/nut assembly is field replaceable.	Inspection					
368	635-2.2.5	Testing Requirements	Ensure pull and splice boxes meet the American National Standards Institute/Society of Cable Telecommunications Engineers (ANSI/SCTE) 77 2013 Specification for Underground Enclosure Integrity for TIER 15 loading with the following additional clarifications and requirements: 1. Apply all environmental tests to the box and its cover. 2. All flexural testing must be conducted in accordance with an appropriate ASTM standard and clearly stated in the report. 3. Perform repetitions of Cycle 1 in Table X2.1 of ASTM G154 for a minimum duration of 1000 hours for the simulated sunlight exposure test. 4. Use deflection-measuring devices positioned to measure vertical and lateral deflection (wherever maximum deflection occurs) for the vertical sidewall load test. 5. Conduct the lateral sidewall pressure, vertical sidewall load and cover vertical load tests without any removable or permanent wall to wall supporting beams located in the interior or top of the box opening.	Inspection, Testing					

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369	635-2.3.1	Fabrication:	Provide galvanized steel, aluminum or NEMA 4X non- metallic junction boxes.	Inspection					
370	635-2.3.1	Fabrication:	Ensure all attachment hardware is Type 316 or 304, passivated stainless steel.	Inspection					
371	635-2.3.1	Fabrication:	Ensure the outside surface has a smooth, uniform finish.	Inspection					
372	635-2.3.1	Fabrication:	Ensure boxes are free of burrs, pits, sharp corners and dents.	Inspection					
373	635-2.3.1	Fabrication:	Ensure all welds are neatly formed and free of cracks, blow holes, and other irregularities.	Inspection					
374	635-2.3.2	Barrier Terminal Blocks:	Provide a barrier terminal block with a minimum of ten positions and rated at 600 VAC in all aerial and mounted junction boxes.	Inspection					
375	635-2.3.2	Barrier Terminal Blocks:	Ensure each terminal block position has two screws electrically connected by a shorting bar or other Department approved method.	Inspection					
376	635-2.3.2	Barrier Terminal Blocks:	Ensure all terminal block positions are numbered sequentially.	Inspection					
635-3 Installation									
377	635-3.1	General:	Do not install power and communication cables in the same box unless otherwise shown in the Plans.	Inspection					
378	635-3.1	General:	When signal or 120 volt (or greater) power is present, ground all metal covers in accordance with Section 620.	Inspection					
379	635-3.2	Pull and Splice Boxes:	Install pull and splice boxes in accordance with the Design Standards, Index No. 17700.	Inspection					
380	635-3.2	Pull and Splice Boxes:	Ensure pull and splice boxes are sized for the amount of cable to be placed inside.	Inspection					
381	635-3.2	Pull and Splice Boxes:	Ensure that the pull or splice box cover is flush with the concrete apron or sidewalk.	Inspection					
382	635-3.2	Pull and Splice Boxes:	Do not install pull or splice boxes in roadways, driveways, parking areas, ditches or public sidewalk curb ramps.	Inspection					
383	635-3.2	Pull and Splice Boxes:	Avoid placing pull and splice boxes in low-lying locations with poor drainage.	Inspection					
384	635-3.2	Pull and Splice Boxes:	Ensure that pull and splice boxes house fiber optic cable without subjecting the cable to a bend radius less than 14 times the diameter of the cable.	Inspection					
385	635-3.2.1	Placement and Spacing:	Place pull and splice boxes as shown in the Plans and at the following locations, unless directed otherwise by the Engineer: 1. At all major fiber optic cable and conduit junctions. 2. Approximately every 2,500 feet for fiber optic cable applications in rural areas with any continuous section of straight conduit if no fiber optic cable splice is required. 3. At a maximum of 1,760 feet for fiber optic cable applications in metropolitan areas. 4. At each end of a tunnel, and on each side of a river or lake crossing. 5. On each side of an aboveground conduit installation, such as an attachment to a bridge or wall. 6. At all turns in the conduit system. 7. Near the base of a service pole or communication cabinet to provide: a. A transition point between the fiber optic conduits extending from the fiber backbone and the conduit feeding the communication cabinet. b. An assist point for the installation of fiber optic drop cable. c. Storage of slack fiber optic drop cable.	Inspection					
386	635-3.2.2	Electronic Box Marker:	Equip all pull and splice boxes buried below finish grade with an electronic box marker inside the pull or splice box to mark the location.	Inspection					
387	635-3.2.2	Electronic Box Marker:	Ensure that the electronic box marker is a device specifically manufactured to electronically mark and locate underground facilities.	Inspection					
388	635-3.2.2	Electronic Box Marker:	Ensure that the electronic box marker includes circuitry and an antenna encased in a waterproof polyethylene shell.	Inspection					
389	635-3.2.2	Electronic Box Marker:	Ensure that the outer shell is impervious to minerals, chemicals, and temperature extremes normally found in underground plant environments.	Inspection					
390	635-3.2.2	Electronic Box Marker:	Ensure that the electronic box marker does not require any batteries or active components to operate.	Inspection					
391	635-3.2.2	Electronic Box Marker:	Ensure that electronic box markers used to mark fiber optic cable and general telecom applications are orange in color and operate at 101.4 kHz.	Inspection					
392	635-3.2.2	Electronic Box Marker:	Ensure that the electronic box marker's passive circuits produce an RF field when excited by a marker locator to direct the locator to the marker's position.	Inspection					
393	635-3.2.2	Electronic Box Marker:	Ensure that the electronic box marker has a minimum operating range of 5 feet from the marker locator.	Inspection					
397	635-3.2.5	Cable Terminations:	Make cable terminations in junction boxes in accordance with Section 632.	Inspection					
398	635-3.2.5	Cable Terminations:	Route and form the cable to allow access to the terminal screws.	Inspection					
399	635-3.2.5	Cable Terminations:	Do not cover the terminal identification numbers with the cable.	Inspection					

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635-4 Relocation of Pull, Splice, and Junction Boxes									
400	635-4	Relocation of Pull, Splice, and Junction Boxes	Relocation of pull, splice, and junction boxes shall consist of removing an existing box and installing the box at the location shown in the Plans.	Inspection					
401	635-4	Relocation of Pull, Splice, and Junction Boxes	Restore the area of the box removal and relocation to the condition of the adjacent area.	Inspection					
402	635-4	Relocation of Pull, Splice, and Junction Boxes	Boxes damaged due to the Contractor's operations must be replaced by the Contractor at no cost to the Department. Replacement boxes must be of the same material and size of the existing box, unless directed otherwise by the Engineer.	Inspection					
635-5 Warranty									
403	635-5	Warranty	Ensure all pull, splice, and junction boxes have a manufacturer's warranty covering defects for a minimum of one year from the date of final acceptance in accordance with 5-11 and Section 608.	Inspection					
404	635-5	Warranty	Ensure the warranty includes providing replacements, within 30 calendar days of notification, for defective parts and equipment during the warranty period at no cost to the Department or the maintaining agency.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 639 ELECTRICAL POWER SERVICE ASSEMBLIES									
639-1 Description									
405	639-1	Description	Install electrical power service assemblies for either overhead service or underground service in accordance with the details shown in the Design Standards, Index No. 17736.	Inspection					
639-2 Definitions									
406	639-2	Definitions	Include with an overhead electrical power service assembly the following components: a. Weatherhead b. Conduit c. Electrical Service wire d. Meter base (when required) e. Service disconnect f. Surge Protective Device	Inspection					
407	639-2	Definitions	Include with an underground electrical power service assembly the following components: a. Conduit b. Electrical Service wire c. Meter base (when required) d. Service disconnect e. Surge Protective Device	Inspection					
639-3 Materials									
408	639-3.1	Weatherhead:	Use a weatherhead made of a copper free aluminum alloy with three electrical service wire entrance holes, meeting National Electric Code (NEC) requirements.	Inspection					
409	639-3.2	Conduit	Use conduit meeting the requirements of Section 630. Meet the requirements of Section 562 for coating all field cut and threaded galvanized pipe	Inspection					
410	639-3.4	Meter Base:	Use meter bases approved by the local electric power company	Inspection					
411	639-3.5.1	Enclosure (Cabinet):	Use an enclosure conforming to National Electrical Manufacturers Association (NEMA) Standards for Type 3R, Type 3S or Type 4, made of galvanized steel, aluminum, stainless steel or other materials approved by the Engineer.	Inspection					
412	639-3.5.1	Enclosure (Cabinet):	Ensure that the enclosure has a hinged door which can be locked with a padlock. Provide padlock and two keys. Do not use external handles or switches.	Inspection					
413	639-3.5.1	Enclosure (Cabinet):	Ensure that the inside dimensions meet NEC requirements	Inspection					
414	639-3.5.2	Circuit Breaker:	Use a manually resettable circuit breaker which has a current rating above the current rating of the circuit breaker to which electrical power is provided. Do not use less than a 40A circuit breaker.	Inspection					
415	639-3.6	Surge Protective Device:	Use a lightning arrester rated for a maximum permissible line to ground voltage of 175 VAC	Inspection					
416	639-3.7	Attachment Hardware:	Use attachment hardware that meets the requirements of Section 603	Inspection					
639-4 Installation Requirements									
417	639-4.1	General:	Consider the location of electrical power service assemblies as shown in the Plans to be approximate, and coordinate with the appropriate electrical power company authority to determine the exact locations of each assembly.	Inspection					
418	639-4.2	Weatherhead:	Securely attach the weatherhead to the upper end of the conduit which extends upward from the meter base (or service disconnect if a meter base is not required) to a minimum height of 22 feet above grade.	Inspection					
419	639-4.3	Conduit:	Securely attach all conduit to the pole or cabinet with a maximum distance of 5 feet between conduit attachment hardware.	Inspection					
420	639-4.4	Electrical Service Wire:	Install the electrical service wire in a manner which will ensure that damage to the installation will not occur.	Inspection					
421	639-4.4	Electrical Service Wire:	Ensure that the service wire is of sufficient length after installation in the conduit to provide for attachment to the power company service and for termination within the cabinet for which power is required.	Inspection					
422	639-4.5	Meter Base:	When a meter base is required, securely fasten the meter base to the pole or cabinet.	Inspection					
423	639-4.5	Meter Base:	Install pole mounted meter bases at a minimum height of 5-1/2 feet above grade when measured from the center of the meter base or meet the local electric power company requirement, whichever is greater.	Inspection					

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424	639-4.6	Service Disconnect:	Securely fasten the service disconnect to the pole (or cabinet with the Engineers approval), and electrically position the service disconnect between the service meter and the traffic control device cabinet to which electrical service is being supplied.	Inspection					
425	639-4.6	Service Disconnect:	Install pole mounted service disconnects a minimum of 4 feet above grade when measured from the bottom of the disconnect.	Inspection					
426	639-4.6	Service Disconnect:	For cabinet installations, mount the service disconnect at a height approved by the Engineer or as shown in the Plans.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 641 PRESTRESSED CONCRETE POLES									
641-1 Description									
427	641-1	Description:	Furnish and install prestressed concrete poles as shown in the Plans.	Inspection					
428	641-1	Description:	Obtain precast, prestressed concrete poles from a manufacturing plant that is currently on the Department's Production Facility Listing.	Inspection					
429	641-1	Description:	Ensure that each pole is constructed and permanently and legibly marked in accordance with Design Standards, Index No. 17725, including the date cast.	Inspection					
430	641-1	Description:	Concrete closed circuit television (CCTV) poles must be constructed and permanently and legibly marked in accordance with Design Standards, Index No. 18113, unless shown otherwise in the Plans. The marking shall be visible after installation.	Inspection					
431	641-1	Description:	Ensure that the shipment of the products to the job site meets the requirements of 450-16.3 and Section 105.	Inspection					
432	641-1	Description:	Ensure that the shipment of the products to the job site meets the requirements of 450-16.3 and Section 105.	Inspection					
641-2 Materials									
433	641-2.2	Camera Lowering Device:	Use lowering devices that are listed on the Department's Approved Product List (APL).	Inspection					
434	641-2.2	Camera Lowering Device:	Permanently mark the lowering device with manufacturer name or trademark, model or part number, date of manufacture, and serial number.	Inspection					
435	641-2.2	Camera Lowering Device:	The lowering device must provide the electrical connection between the control cabinet and the equipment installed on the lowering device without reducing the function or effectiveness of the equipment	Inspection					
436	641-2.2	Camera Lowering Device:	The lowering device system support arm must be capable of withstanding service tension and shear up to 1 kip minimum	Inspection					
437	641-2.2	Camera Lowering Device:	The lowering device must include a disconnect unit and power, data, and video cables (as applicable) for connecting equipment, a divided support arm, pole attachment provisions, a rotatable pole-top tenon, and a pole-top junction box, unless otherwise shown in the Plans	Inspection					
438	641-2.2	Camera Lowering Device:	All external components are to be made of corrosion-resistant materials that are powder-coated, galvanized, or otherwise protected from the environment	Inspection					
439	641-2.2	Camera Lowering Device:	All finished castings must have a smooth finish free from cracks, blow-holes, shrinks, and other flaws.	Inspection					
440	641-2.2	Camera Lowering Device:	All roller fairlead frames must be corrosion resistant stainless steel or aluminum	Inspection					
441	641-2.2	Camera Lowering Device:	All pulleys used in the lowering device and portable lowering tool must have sealed, self-lubricated or oil-tight bearings, or sintered bronze bushings	Inspection					
442	641-2.2	Camera Lowering Device:	Provide a minimum of 100 feet of composite power and signal cable prewired to the lowering device at the factory unless otherwise shown in the Plans. Splices will not be allowed	Inspection					
443	641-2.2	Camera Lowering Device:	Use only lowering devices designed to withstand the design wind speeds defined in the Department's Structures Manual, Volume 9	Inspection					
444	641-2.2.1	Equipment Connection Box:	Include a 1-1/2 inch National Pipe Thread (NPT) pipe connection point for attaching a camera. Ensure that the equipment connection box has an ingress protection rating of no less than IP55.	Inspection					
445	641-2.2.2	Disconnect Unit:	The disconnect units must have a minimum load capacity of 600 pounds with a 4:1 safety factor and be capable of securely holding the lowering device and any installed equipment.	Inspection					
446	641-2.2.2	Disconnect Unit:	Fixed and movable components of the disconnect unit must have a locking mechanism between them, with at least two mechanical latches for the movable assembly	Inspection					
447	641-2.2.2	Disconnect Unit:	The fixed unit must have a heavy-duty cast tracking guide that allows latching in the same position each time	Inspection					
448	641-2.2.2	Disconnect Unit:	The load must be transferred from the lowering cable to the mechanical latches when the system is in the latched position	Inspection					
449	641-2.2.2	Disconnect Unit:	Interface and locking components must be constructed of stainless steel or aluminum	Inspection					
450	641-2.2.2.1	Disconnect Unit Housing:	The disconnect unit housing must be weather-proof with an ingress protection rating of no less than IP55	Inspection					
451	641-2.2.2.2	Connector Block:	Provide modular, self-aligning and selfadjusting female and male socket contact halves in the connector block	Inspection					
452	641-2.2.2.2	Connector Block:	Equip the lowering device with enough contacts to permit operation of all required functions of the camera, up to a maximum of 20 contacts and include at least two spare contacts	Inspection					

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453	641-2.2.2.2	Connector Block:	Provide contact connections between the fixed and movable lowering device components that are capable of passing EIA- 232, EIA-422, EIA-485, and Ethernet data signals and 1 volt peak to peak (Vp-p) video signals, as well as 120 VAC, 9-24 VAC, and 9-48 VDC power	Inspection					
454	641-2.2.2.2	Connector Block:	The lowering device connections must be capable of carrying the signals, voltages, and current required by the devices connected to them under full load conditions	Inspection					
455	641-2.2.2.2	Connector Block:	Use only corrosion-resistant stainless steel hardware. Lubricate all components, including the connector block and contacts, in accordance with the manufacturer's recommendations	Inspection					
456	641-2.2.2.2	Connector Block:	Ensure that male contacts used for grounding mate first and break last. All contacts and connectors must be self-aligning and self-adjusting mechanical systems	Inspection					
457	641-2.2.2.2	Connector Block:	Provide a spring-assisted contact assembly to maintain constant pressure on the contacts when the device is in the latched position	Inspection					
458	641-2.2.2.2	Connector Block:	Provide connector pins made of brass- or gold-plated nickel, or gold-plated copper	Inspection					
459	641-2.2.2.2	Connector Block:	Ensure that the current-carrying male and female contacts are a minimum of 0.09 inch in diameter and firmly affixed to the connector block. Ensure mated connectors do not allow water penetration	Inspection					
460	641-2.2.3	Lowering Tool:	Provide a portable metal-frame lowering tool manufactured of corrosion-resistant materials with winch assembly and a cable with a combined weight less than 35 lbs that is capable of securely supporting itself and the load.	Inspection					
461	641-2.2.3	Lowering Tool:	The lowering tool must include a quick release cable connector, and a torque limiter that will prevent overtensioning of the lowering cable and be equipped with gearing that reduces the manual effort required to operate the lifting handle to raise and lower a capacity load.	Inspection					
462	641-2.2.3	Lowering Tool:	Ensure that the lowering tool can be powered using a 1/2 inch chuck, variable-speed reversible industrial-duty electric drill capable of matching the manufacturer-recommended revolutions per minute.	Inspection					
463	641-2.2.3	Lowering Tool:	Provide an adapter with a clutch mechanism and torque limiter for use with the drill.	Inspection					
464	641-2.2.3	Lowering Tool:	The winch assembly must have a minimum drum size width of 3.75 inches and a positive braking mechanism to secure the cable reel during raising and lowering operations, and to prevent freewheeling.	Inspection					
465	641-2.2.3	Lowering Tool:	The lowering cable must wind evenly on the winch drum during operation. Provide a manual winch handle that incorporates a non-shear pin type torque limiter that can be used repeatedly and will not damage the lowering system.	Deliverable					
466	641-2.2.3	Lowering Tool:	Provide a minimum of one lowering tool and any additional tools as required in the Plans. Deliver the lowering tool to the Department before final acceptance.	Deliverable					
467	641-2.2.4	Lowering Cable:	The lowering cable must be 0.125 inch minimum diameter Type 316 stainless steel aircraft cable (7 strands x 19 gauge) with a minimum breaking strength of 1,760 pounds. Additionally, the lowering cable assembly (as installed with thimble and crimps on one end and a cable clamp inside the latch on the lowering device end), must have a minimum breaking strength of 1,760 lbs.	Inspection					
468	641-2.2.4	Lowering Cable:	All lowering cable accessories, such as connecting links, must have a minimum workload rating that meets or exceeds that of the lowering cable.	Inspection					
469	641-2.2.4	Lowering Cable:	Prefabricated components for the lift unit support system must prevent the lifting cable from contacting the power or video cables.	Inspection					
470	641-2.2.5	Wiring:	All wiring must meet NEC requirements and be installed in accordance with the equipment manufacturers' recommendations for each device connected on the pole, at the lowering device, and in the field cabinet.	Inspection					
471	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	The system must include an upper mounting/junction box, winch assembly and all external conduit and cabling necessary for mounting to existing structures.	Inspection					
472	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	Provide a NEMA 4 rated lower lockable pole-mounted cabinet, constructed of corrosion resistant 5052 sheet aluminum with a minimum thickness of 1/8 inch, to house the winch assembly.	Inspection					
473	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	The cabinet must allow for unobstructed operation of the winch, access for servicing and provide sufficient clear area for operation of the winch manually and with an electric drill.	Inspection					

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474	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	The outside surface of the cabinet must have a smooth, uniform natural aluminum finish.	Inspection					
475	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	All inside and outside edges of the winch cabinet must be free of burrs, and all welds must be neatly formed, free of cracks, blow holes, and other irregularities.	Inspection					
476	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	Cabinet hinges must be vandal-resistant and constructed of 14 gauge stainless steel or 1/8 inch aluminum with stainless steel hinge pins	Inspection					
477	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	The cabinet door must be double-flanged and include neoprene closed-cell gaskets permanently secured on the interior door surfaces that contact the door opening. The cabinet door must not snag.	Inspection					
478	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	Include a pin tumbler lock keyed for use with a No. 2 key and two keys, unless otherwise directed by the Plans.	Inspection					
479	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	The cabinet door handle must include a lock hasp that will accommodate a padlock with a 7/16 inch diameter shackle.	Inspection					
480	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	The upper mounting/junction box must include a maintenance access door with captive attachment hardware. Provide all necessary mounting hardware, conduits, standoffs, and conduit mounts required for a complete and functional system	Inspection					
481	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	The external conduit must be galvanized Schedule 40 with National Pipe Thread Taper (NPT) threads and have a minimum ID of 3 inches at the lower winch cabinet entrance and allow the lowering cable to wind evenly on the winch drum without binding.	Inspection					
482	641-2.2.6	External-Mount Lowering System Enclosure for Mounting to Existing Structures:	All conduit couplings and connections between the pole-mounted cabinet and upper mounting/junction box must be watertight.	Inspection					
641-3 Concrete Pole Construction									
483	641-3	Concrete Pole Construction	Construct concrete poles in accordance with Section 450.	Inspection					
484	641-3	Concrete Pole Construction	The Design Build firm assumes responsibility for performance of all quality control testing and inspections required by Sections 346 and 450; however, the PCI personnel certifications are not required.	Testing					
641-4 Installation Requirements									
485	641-4.2	Footings:	Provide footings for concrete CCTV poles in accordance with Design Standards, Index No. 18113.	Inspection					
486	641-4.2	Footings:	Provide footings for all other pole applications as specified in the Plans.	Inspection					
487	641-4.2	Footings:	Construct the footings with concrete as specified in Section 347.	Inspection					
488	641-4.2	Footings:	For the excavation and backfill of the footing, meet the requirements specified in 125-4 and 125-8.2 with the exception of the backfill density.	Inspection					
489	641-4.2	Footings:	In lieu of the requirements for obtaining the specified density, the Contractor may hand tamp the backfill in 4 inch maximum layers or machine tamp the backfill in 6 inch maximum layers.	Inspection					
490	641-4.2	Footings:	When performing such operations, ensure that the material is neither dry nor saturated. The Contractor may backfill with concrete.	Inspection					
491	641-4.2	Footings:	Use forms, when required, meeting the requirements of 400-5. If the footing is cast in an oversize hole, place the concrete in the top 6 inches in a form. Trowel all exposed surfaces to a smooth finish.	Inspection					
492	641-4.4	Camera Lowering Device:	Install the lowering device in a manner that does not place the operator directly under the device when it is being raised or lowered.	Inspection					
493	641-4.4	Camera Lowering Device:	Submit documentation showing connector block pin assignment for approval prior to installation.	Inspection					
494	641-4.4	Camera Lowering Device:	The divided support arm and receiver brackets must self-align the contact unit with the pole centerline during installation.	Inspection					
495	641-4.4	Camera Lowering Device:	Additionally, the lowering device support arm must self-align the disconnect unit and attached device with the pole centerline and remain centered after installation, without moving or twisting.	Inspection					
496	641-4.4	Camera Lowering Device:	House the stainless steel lowering cable inside 1.25 inch PVC conduit and provide a conduit mount adapter for the interface between the conduit and the internal back side of the lowering device.	Inspection					
497	641-4.4	Camera Lowering Device:	The connection between the lowering device and tenon must be weather resistant.	Inspection					
498	641-4.4	Camera Lowering Device:	Use conduit straps to secure lowering cable conduit to the pole for externally mounted lowering systems. Stainless steel bands will not be allowed.	Inspection					

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499	641-4.4	Camera Lowering Device:	Ensure that only the lowering cable is in motion inside the pole when the lowering device is operated. All other cables must remain stable and secure during lowering and raising operations.	Inspection					
500	641-4.4	Camera Lowering Device:	Label all wire leads with their function, label spares as spares.	Inspection					
501	641-4.4	Camera Lowering Device:	Install the correct length of lowering cable to prevent cable slack and to prevent the cable from jumping off the winch spool.	Inspection					
502	641-4.4	Camera Lowering Device:	The lowering cable strands must not twist or unwind when the lowering device is operated.	Inspection					
503	641-4.4	Camera Lowering Device:	Ensure that crimps and other cable connection hardware associated with the lowering cable do not come in direct contact with the winch tool or guides when operating the system.	Inspection					
504	641-4.4	Camera Lowering Device:	Furnish the Engineer with the manufacturer recommended field installation instructions, inspection instructions (including recommended schedules and procedures), and operating instructions.	Deliverable					

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JULY 2017 FDOT SPECIFICATION SECTION 660 VEHICLE DETECTION SYSTEM									
660-1 Description									
505	660-1	Description	Use vehicle detection systems and loop sealant that meet the requirements of this Specification and are listed on the Department's Approved Product List (APL).	Inspection					
660-2 Materials									
506	660-2.1.2	Technology Types:	Provide the detection technology type detailed in the Plans.	Inspection					
507	660-2.1.2.3	Microwave	Ensure that sidfire MVDS sensors used for data collection have a minimum of 200-foot range	Inspection					
508	660-2.1.2.3.1	Configuration and Management	Ensure that the MVDS is provided with software that allows local and remote configuration and monitoring	Inspection					
509	660-2.1.2.3.1	Configuration and Management	Ensure that the system software can display detection zones and detection activations in graphical format.	Inspection					
510	660-2.1.2.3.1	Configuration and Management	Ensure that the MVDS allows a user to edit previously defined configuration parameters, including size, placement, and sensitivity of detection zones.	Inspection					
511	660-2.1.2.3.1	Configuration and Management	Ensure that the MVDS retains its programming in nonvolatile memory.	Inspection					
512	660-2.1.2.3.1	Configuration and Management	Ensure that the detection system configuration data can be saved to a computer and restored from a saved file. Ensure that all communication addresses are user programmable.	Inspection					
513	660-2.1.2.3.1	Configuration and Management	Ensure that the detection system software offers an open API and software development kit available to the Department at no cost for integration with third party software and systems.	Inspection					
514	660-2.1.2.3.2	Communications	Ensure that major components of the detection system (such as the sensor and any separate hardware used for contact closures), include a minimum of one serial or Ethernet communications interface.	Inspection					
515	660-2.1.2.3.2	Communications	Ensure the serial interface and connector conforms to TIA-232 standards.	Inspection					
516	660-2.1.2.3.2	Communications	Ensure that the serial ports support data rates up to 115200 bps; error detection utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2)	Inspection					
517	660-2.1.2.3.2	Communications	Ensure that wired Ethernet interfaces provide a 10/100 Base TX connection.	Inspection					
518	660-2.1.2.3.2	Communications	Verify that all unshielded twisted pair/shielded twisted pair network cables and connectors comply with TIA-568.	Inspection					
519	660-2.1.2.3.2	Communications	Ensure wireless communications are secure and that wireless devices are FCC-certified.	Inspection					
520	660-2.1.2.3.2	Communications	Ensure that the FCC identification number is displayed on an external label and that all detection system devices operate within their FCC frequency allocation.	Inspection					
521	660-2.1.2.3.2	Communications	Ensure cellular communications devices are compatible with the cellular carrier used by the agency responsible for system operation and maintenance	Inspection					
522	660-2.1.2.3.2	Communications	Ensure the system can be configured and monitored via one or more communications interface	Inspection					
523	660-2.1.2.3.3	Solid State Detection Outputs	Ensure outputs meet the requirements of NEMA TS2-2003, 6.5.2.26	Inspection					
524	660-2.1.2.3.4	Electrical Requirements	Ensure the microwave detector will operate with a nominal input voltage of 12 Vdc.	Inspection					
525	660-2.1.2.3.4	Electrical Requirements	Ensure the microwave detector will operate with an input voltage ranging from 89 to 135 Vac.	Inspection					
526	660-2.1.2.3.4	Electrical Requirements	Ensure a voltage convertor is supplied if any system devices requires operating voltages other than 120 Vac.	Inspection					
527	660-2.1.2.3.4	Electrical Requirements	Ensure the detector is FCC-certified and that the FCC identification number is displayed on an external label.	Inspection					
528	660-2.1.2.3.4	Electrical Requirements	Ensure that the detector has been granted authorization to operate within a frequency range established and approved by the FCC.	Inspection					
529	660-2.1.2.4.1	Wireless Magnetometer Configuration and Management	Ensure that the detection system is provided with software that allows local and remote configuration and monitoring.	Inspection					
530	660-2.1.2.4.1	Configuration and Management:	Ensure that the WMDS allows a user to edit previously defined configuration parameters.	Inspection					
531	660-2.1.2.4.1	Configuration and Management:	Ensure that the WMDS retains its programming in nonvolatile memory.	Inspection					
532	660-2.1.2.4.1	Configuration and Management:	Ensure that the detection system configuration data can be saved to a computer and restored from a saved file.	Inspection					
533	660-2.1.2.4.1	Configuration and Management:	Ensure that all communication addresses are user programmable.	Inspection					
534	660-2.1.2.4.1	Configuration and Management:	Ensure that the detection system software offers an open API and software development kit available to the Department at no cost for integration with third party software and systems.	Inspection					

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535	660-2.1.2.4.2	Communications:	Ensure that components of the detection system (such as sensors, access points, and contact closure cards) include a minimum of one serial or Ethernet communications interface.	Inspection					
536	660-2.1.2.4.2	Communications:	Ensure the serial interface and connector conforms to TIA-232 standards. Ensure that the serial ports support data rates up to 115200 bps; error detection utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2).	Inspection					
537	660-2.1.2.4.2	Communications:	Ensure that wired Ethernet interfaces provide a 10/100 Base TX connection.	Inspection					
538	660-2.1.2.4.2	Communications:	Verify that all unshielded twisted pair/shielded twisted pair network cables and connectors comply with TIA-568.	Inspection					
539	660-2.1.2.4.2	Communications:	Ensure wireless communications are secure and that wireless devices are FCC-certified. Ensure that the FCC identification number is displayed on an external label and that all detection system devices operate within their FCC frequency allocation.	Inspection					
540	660-2.1.2.4.2	Communications:	Ensure cellular communications devices are compatible with the cellular carrier used by the agency responsible for system operation and maintenance.	Inspection					
541	660-2.1.2.4.2	Communications:	Ensure the system can be configured and monitored via one or more communications interface.	Inspection					
542	660-2.1.2.4.3	Solid State Detection Outputs:	Ensure outputs meet the requirements of NEMA TS2-2003, 6.5.2.26.	Inspection					
543	660-2.1.2.4.4	Electrical Requirements:	Ensure the detection system will operate with an input voltage ranging from 89 to 135 VAC. If any system device requires operating voltages other than 120 VAC, supply a voltage converter.	Inspection					
544	660-2.1.3	Mechanical Requirements for all Detectors:	Ensure equipment is permanently marked with manufacturer name or trademark, part number, and date of manufacture or serial number.	Inspection					
545	660-2.1.3	Mechanical Requirements for all Detectors:	Ensure that all parts are made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.	Inspection					
546	660-2.1.3	Mechanical Requirements for all Detectors:	Ensure that all fasteners exposed to the elements are Type 304 or 316 passivated stainless steel.						
547	660-2.1.4	Environmental Requirements for all Detectors:	Meet the environmental requirements of NEMA TS-2-2003.	Inspection					
548	660-2.2	Vehicle Presence Detection System Performance Requirements:	Ensure presence detectors provide a minimum detection accuracy of 98%.	Inspection					
549	660-2.2	Vehicle Presence Detection System Performance Requirements:	Ensure presence detectors meet the requirements for modes of operation in NEMA TS2-2003, 6.5.2.17.	Inspection					
550	660-2.2.1	Vehicle Presence Detection Accuracy:	To verify conformance with the accuracy requirements in this Section and as a precondition for listing on the APL, sample data collected from the vehicle detection system will be compared against ground truth data collected during the same time by human observation or by another method approved by the FDOT Traffic Engineering Research Laboratory (TERL).	Inspection					
551	660-2.2.1	Vehicle Presence Detection Accuracy:	Ensure sample data is collected over several time periods under a variety of traffic or parking conditions.	Inspection					
552	660-2.2.1	Vehicle Presence Detection Accuracy:	Weight each data sample to represent the predominant conditions over the course of a 24-hour period. Samples will consist of 15- and 30-minute data sets collected at various times of the day. Representative data periods and their assigned weights are provided in Table 660-1.	Inspection					
553	660-2.2.1.1	Calculation of Vehicle Presence Detection Accuracy:	Compute presence detection accuracy as described in this subsection.	Testing					
554	660-2.2.1.2	Vehicle Presence Detection System Field Acceptance Testing:	Compare sample data collected from the detection system with ground truth data collected by human observation. For site acceptance tests, collect samples and ground truth data for each site for a minimum of five minutes during a peak period and five minutes during an off-peak period.	Testing					
555	660-2.2.1.2	Vehicle Presence Detection System Field Acceptance Testing:	Perform site acceptance tests in the presence of the Engineer.	Testing					
556	660-2.3.1	Data Accuracy:	To verify conformance with the accuracy requirements in this Section and as a precondition for listing on the APL, sample data collected from the vehicle detection system will be compared against ground truth data collected during the same time by human observation or by another method approved by the TERL.	Inspection					
557	660-2.3.1	Data Accuracy:	Ensure sample data is collected over several time periods under a variety of traffic conditions.	Inspection					
558	660-2.3.1	Data Accuracy:	Weight each data sample to represent the predominant conditions over the course of a 24-hour period. Samples will consist of 15- and 30-minute data sets collected at various times of the day. Representative data periods and their assigned weights are provided in Table 660-1.	Testing					

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559	660-2.3.1.1	Calculation of Volume Accuracy:	Determine individual lane volume accuracy per period by calculating the percentage of absolute difference of the total volume measured by the detection system and the true volume computed using a method approved by the Engineer, divided by the true volume for the period under consideration.	Testing					
560	660-2.5	Truck Parking Detection System Performance Requirements:	Ensure that all materials furnished, assembled, fabricated, or installed are new products.	Inspection					
561	660-2.5.1	Technology Types:	Meet the requirements as described in 660-2.1.2.4 for wireless in-ground technologies.	Inspection					
562	660-2.5.2	Functional Requirements:	The detection system must be capable of detecting whether each parking space is occupied or not, including partial occupancy, and be capable of detecting FHWA Vehicle Class 2 and above non-commercial vehicles.	Inspection					
563	660-2.5.2	Functional Requirements:	The detectors must be capable of detection in all weather conditions including heavy rain, fog, snow, ice and high winds.	Inspection					
564	660-2.5.3	Mechanical Requirements:	Requirements must comply with 660-2.1.3 Mechanical Requirements for all Detectors.	Inspection					
565	660-2.5.4	Environmental Requirements:	Requirements must comply with 660-2.1.4 Environmental Requirements for all Detectors.	Inspection					
566	660-2.5.5	Detection System Performance Requirements:	The detection system at each location must be tested to meet the following minimum performance requirements conducted over two 15-hour (6 p.m. to 9 a.m.) sessions: • Turnover accuracy: 90% • Occupancy accuracy: 95%	Inspection					
567	660-2.5.6	Installation Requirements:	All installations must be in accordance with the manufacturer's requirements.	Inspection					
568	660-2.5.6	Installation Requirements:	Wireless detection must be activated and communicating with the repeaters/relay nodes and access point/data collector/data aggregator before installing them into the ground.	Inspection					
569	660-2.5.6	Installation Requirements:	Provide evidence of functionality to the Engineer prior to installation.	Inspection					
570	660-2.5.6	Installation Requirements:	Utilize a loop sealant listed on the Approved Product List.	Inspection					
571	660-2.5.6	Installation Requirements:	All above ground components must be placed on new poles and have a minimum mounting height of 15 feet above ground level.	Inspection					
572	660-2.5.6	Installation Requirements:	Cabinets provided must be listed on the Approved Product List.	Inspection					
573	660-2.5.7	Security Requirements:	Provide a Cyber Security Plan to the Engineer that includes security for all interfaces within the FDOT communications network, as well as all FDOT server vulnerabilities introduced by the proposed system.	Deliverable					
574	660-2.5.8	Warranty:	Requirements must comply with 660-4 Warranty. All wireless magnetometer batteries must include a 5-year warranty.	Inspection					
660-3 Installation Requirements									
575	660-3.1	Installation Requirements for all detectors:	Connect all field equipment to the existing communication network, and provide all materials specified in the Contract Documents.	Inspection					
576	660-3.1	Installation Requirements for all detectors:	Install all equipment according to the manufacturer's recommendations.	Inspection					
577	660-3.1	Installation Requirements for all detectors:	Ensure that above-ground detectors can be mounted on existing poles or sign structures, or on new poles, as shown in the Plans.	Inspection					
578	660-3.1	Installation Requirements for all detectors:	Furnish all equipment with the appropriate power and communication cables.	Inspection					
579	660-3.1	Installation Requirements for all detectors:	Install the power cable and the communication cables according to the manufacturer's recommendation.	Inspection					
580	660-3.1	Installation Requirements for all detectors:	Ensure that the cables comply with NEC sizing requirements and meet all other applicable standards, specifications, and local code requirements.	Inspection					
581	660-3.1	Installation Requirements for all detectors:	Do not install communication cables in the same conduit or pull boxes as power cables carrying voltage greater than 24 VDC/VAC or current in excess of 1.5 amps.	Inspection					
582	660-3.1	Installation Requirements for all detectors:	Cut all wires to their proper length before assembly. Do not double back any wire to take up slack. Neatly lace wires into cables with nylon lacing or plastic straps. Secure cables with clamps and provide service loops at all connections.	Inspection					
583	660-3.1	Installation Requirements for all detectors:	In the event that power to the vehicle detection system or a subcomponent thereof is interrupted, ensure that the equipment automatically recovers after power is restored. Ensure that all programmable system settings return to their previous configurations and the system resumes proper operation.	Inspection					

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584	660-3.4	Microwave Detector Installation:	Install detector and configure detection zones and settings in accordance with the Contract Documents, manufacturer's recommendations, and as directed by the Engineer.	Inspection					
585	660-3.4	Microwave Detector Installation:	Submit configuration settings (including, but not limited to, detector names, communication settings, and output assignments) and configuration file backups to the Engineer.	Inspection					
586	660-3.5	Wireless Magnetometer Installation:	Install in accordance with the Contract Documents, manufacturer's recommendations, and as directed by the Engineer.	Inspection					
587	660-3.5	Wireless Magnetometer Installation:	Ensure that materials used for the installation of magnetometers in the road surface have cured completely before allowing vehicular traffic to travel over them.	Inspection					
660-4 Warranty									
588	660-4	Warranty	Ensure the warranty includes providing replacements, within 10 calendar days of notification, for defective parts and equipment during the warranty period at no cost to the Department or the maintaining agency.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 676 TRAFFIC EQUIPMENT									
676-2 Materials									
589	676-2.5	Intelligent Transportation System Cabinets:	Ensure that the minimum cabinet dimensions set forth in Table 1 of this section is adhered to accordingly	Inspection					
590	676-2.5	Intelligent Transportation System Cabinets:	The cabinet must be weather resistant and constructed with a crowned top to prevent standing water.	Inspection					
591	676-2.5	Intelligent Transportation System Cabinets:	All exterior cabinet welds must be gas tungsten arc (TIG) welds and all interior cabinet welds must be gas metal arc (MIG) or TIG welds.	Inspection					
592	676-2.5	Intelligent Transportation System Cabinets:	All exterior cabinet and doorseams must be continuously welded and smooth and all inside and outside edges of the cabinet must be free of burrs, rounded and smoothed for safety.	Inspection					
593	676-2.5	Intelligent Transportation System Cabinets:	All welds must be neatly formed and free of cracks, blow holes and other irregularities.	Inspection					
594	676-2.5	Intelligent Transportation System Cabinets:	Use ER5356 aluminum alloy bare welding electrodes conforming to AWS A5.10 requirements for welding on aluminum.	Inspection					
595	676-2.5	Intelligent Transportation System Cabinets:	Procedures, welders and welding operators must conform to AWS requirements as contained in AWS B3.0 and C5.6 for aluminum.	Inspection					
596	676-2.5	Intelligent Transportation System Cabinets:	The cabinet must have a lifting eye plate on either side of the top for lifting the cabinet and positioning it. Each lifting eye opening must be a minimum diameter of 0.75 inches and capable of supporting a weight load of 1,000 pounds.	Inspection					
597	676-2.5	Intelligent Transportation System Cabinets:	All external bolt heads must be tamperproof.	Inspection					
598	676-2.5	Intelligent Transportation System Cabinets:	Ground-mount cabinets must include a removable base plate and two aluminum plates, welded inside, for anchoring the cabinet to a concrete or composite type base as shown in the Plans.	Inspection					
599	676-2.5	Intelligent Transportation System Cabinets:	Fabricate the plates from aluminum alloy 5052-H32 a minimum of 4 inches wide by 0.125 inches thick.	Inspection					
600	676-2.5	Intelligent Transportation System Cabinets:	Provide the cabinet with four 1 inch diameter holes for anchoring.	Inspection					
601	676-2.5.1	Doors:	Provide cabinets with front and rear doors, each equipped with a lock and handle.	Inspection					
602	676-2.5.1	Doors:	Doors must be full size, matching the height and width dimensions of the cabinet enclosure, with no fewer than three stainless steel hinges or; alternately, one full-length "piano" hinge.	Inspection					
603	676-2.5.1	Doors:	Hinges must be constructed of 14 gauge stainless steel with stainless steel hinge pins that are spot-welded at the top. Mount the hinges so that they cannot be removed from the door or cabinet without first opening the door.	Inspection					
604	676-2.5.1	Doors:	Brace the door and hinges to withstand 100 pounds per vertical foot of door height load applied vertically to the outer edge of the door when standing open.	Inspection					
605	676-2.5.1	Doors:	Ensure there is no permanent deformation or impairment of any part of the door or cabinet body when the load is removed.	Inspection					
606	676-2.5.1	Doors:	Door opening must provide a flange that allows the door gasket to mate with a flat surface.	Inspection					
607	676-2.5.1	Doors:	Include a gasket made of closed-cell material resistant to UV, weathering, elevated temperatures, and permanent deformation that is permanently bonded to the inside of each door forming a weather-tight seal when the door is closed.	Inspection					
608	676-2.5.2	Latches:	Provide all cabinets with a three-point draw roller latching system for the doors. The latching system must have the following latching points. 1. Center of the cabinet (lock). 2. Top of the cabinet – controlled by the door handle. 3. Bottom of the cabinet – controlled by the door handle.	Inspection					
609	676-2.5.2	Latches:	The latching points on the top and bottom of the cabinet must remain in the locked position until the main cabinet door lock is unlocked. The locking mechanism must be equipped with nylon rollers to secure the top and bottom of the door.	Inspection					
610	676-2.5.2	Latches:	Provide the cabinet with a door stop that retains the main door open in a 90 degree and 120 degree position.	Inspection					
611	676-2.5.2	Latches:	Outfit the doors with an industrial standard pin tumbler lock with No. 2 key, or an approved alternate, and hardware that allows the door to be secured using a padlock. Provide two keys for each cabinet lock.	Inspection					

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612	676-2.5.3	Rails:	Provide the cabinet with four cabinet rails that form a cage for mounting miscellaneous wiring panels and various mounting brackets.	Inspection					
613	676-2.5.3	Rails:	Use rails constructed of either 0.1345 inch thick plated steel or 0.105 inch thick stainless steel that extend the length of the cabinet's sides, starting from the bottom of the enclosure.	Inspection					
614	676-2.5.3	Rails:	Rails must be keyhole designed with slots 2 inches on center with a top opening of 5/8 inch in diameter to allow the insertion of a 5/8inch by 1 inch carriage bolt.	Inspection					
615	676-2.5.3	Rails:	Rails must be 1-1/2 to 2 inches wide by 1/2 inches deep, drilled and tapped for 10-32 screws or rack screws with EIA universal spacing. Do not use unistruts or other rail types.	Inspection					
616	676-2.5.4	Racks:	The cabinet must include a standard 19 inch EIA/TIA equipment rack centered in the cabinet for mounting devices to be installed inside. Clearance in the rack between the rails must be 17-3/4 inches.	Inspection					
617	676-2.5.5	Shelf:	Provide a level, rollout internal shelf with a minimum work area measuring 10 inches by 10 inches. The shelf must be capable of sustaining a constant 20 pound load and the shelf position must be adjustable.	Inspection					
618	676-2.5.6	Sunshield:	Sunshields must be mounted on standoffs that provide an air gap of at least of one inch between the exterior cabinet walls and the sunshields.	Inspection					
619	676-2.5.6	Sunshield:	Construct sunshields of 0.125 inch thick 5052-H32 aluminum sheet with corners that are rounded and smoothed for safety.	Inspection					
620	676-2.5.7	Ventilation:	Provide ventilation through the use of a louvered vent at the bottom of the door. Vent depth must not exceed 0.25 inch.	Inspection					
621	676-2.5.7	Ventilation:	Provide an air filter a minimum of 192 square inches and 1 inch thick behind the vent. The filter must be removable and held firmly in place so that all intake air is filtered.	Inspection					
622	676-2.5.7	Ventilation:	Provide a bottom trough and a spring-loaded upper clamp to hold the filter in place. The bottom trough must drain any accumulated moisture to the outside of the field cabinet.	Inspection					
623	676-2.5.7	Ventilation:	ITS field cabinets must have dual thermostatically controlled fans, rated for continuous duty with a service life of at least three years and mounted on the inside top of the cabinet.	Inspection					
624	676-2.5.7	Ventilation:	Thermostats must be user adjustable to allow temperature settings ranging from a minimum of 70°F to a maximum of 140°F and capable of activating the fans within plus or minus 5 degrees of the set temperature.	Inspection					
625	676-2.5.7	Ventilation:	Use UL-listed exhaust fans having a minimum air flow rating of 100 cubic feet per minute.	Inspection					
626	676-2.5.7	Ventilation:	Electric fan motors must have ball or roller bearings. Vent the exhaust air from openings in the roof of the field cabinet.	Inspection					
627	676-2.5.8	Electrical Requirements:	All equipment must conform to applicable UL, NEC, EIA, ASTM, ANSI, and IEEE requirements.	Inspection					
628	676-2.5.8	Electrical Requirements:	SPD's must be accessible from the front of any panel used in the cabinet.	Inspection					
629	676-2.5.8	Electrical Requirements:	Connect the SPD for the cabinet's main AC power input on the load side of the cabinet circuit breaker.	Inspection					
630	676-2.5.8	Electrical Requirements:	All wiring must be laced and conductors must be stranded copper.	Inspection					
631	676-2.5.8.1	Service Panel Assembly:	Provide a service panel assembly to function as the entry point for AC power to the cabinet and the location for power filtering, transient suppression and equipment grounding.	Inspection					
632	676-2.5.8.1	Service Panel Assembly:	Provide branch circuits, SPDs, and grounding as required for the load served by the cabinet, including ventilation fans, internal lights, electrical receptacles, etc.	Inspection					
633	676-2.5.8.2	Terminal Blocks:	Terminate electrical inputs and outputs on terminal blocks where the voltage and current rating of the terminal block is greater than the voltage and current rating of the wire fastened to it.	Inspection					
634	676-2.5.8.2	Terminal Blocks:	Terminate conductors on terminal blocks using insulated terminal lugs large enough to accommodate the conductor to be terminated. When two or more conductors are terminated on field wiring terminal block screws, use a terminal ring lug for termination of those conductors.	Inspection					
635	676-2.5.8.2	Terminal Blocks:	Number all terminal block circuits and cover the blocks with a clear insulating material to prevent inadvertent contact.	Inspection					
636	676-2.5.8.3	Ground Buss Bar:	Fabricate ground buss bars of copper alloy material compatible with copper wire and provide at least two positions where a No. 2 AWG stranded copper wire can be attached.	Inspection					

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637	676-2.5.8.3	Ground Buss Bar:	Mount the ground buss bar on the side of the cabinet wall adjacent to the service panel assembly for the connection of AC neutral wires and chassis ground wires.	Inspection					
638	676-2.5.8.3	Ground Buss Bar:	If more than one ground buss bar is used in a cabinet, use a minimum of a No. 10 AWG copper wire to interconnect them.	Inspection					
639	676-2.5.8.3	Ground Buss Bar:	Connect the equipment rack to the ground buss bar in the cabinet to maintain electrical continuity throughout the cabinet.	Inspection					
640	676-2.5.8.3	Ground Buss Bar:	Follow the PANI recommendations of USDA-RUS-1751 for connections to the ground buss bar. Producer (P) or electrical power and sources of stroke current connections shall be on the left end of the buss bar. Absorbing (A) or grounding wires shall be connected immediately right of the P connections. Non-isolated (N) connections such as doors and vents shall be connected to the right of the A connections. Isolated (I) equipment grounds from equipment in the cabinet shall be connected on the right end of the buss bar.	Inspection					
641	676-2.5.8.4	Power Distribution Assembly:	Furnish a power distribution assembly that fits in the EIA 19 inch rack and provides for protection and distribution of 120 VAC power unless otherwise shown in the Plans..	Inspection					
642	676-2.5.8.5	Interior Lighting:	Provide the ITS cabinet with two light fixtures, each capable of producing a minimum of 950 lumens, with clear shatter-proof shields.	Inspection					
643	676-2.5.8.5	Interior Lighting:	Mount a fixture on the inside front and rear top of the cabinet and include door switches so that the lights automatically turn on when a cabinet door is opened and turn off when the door is closed. Light fixtures must be unobstructed and able to cast light on the equipment in the cabinet.	Inspection					
644	676-2.6	Generator and Auxiliary Power Connection:	Cabinets with generator and auxiliary power connection must include provisions for the connection of an external power source, such as a portable generator, through a weatherproof, secure interface. This feature must allow authorized personnel to access, connect, and secure an external power source to the cabinet in order to restore power within five minutes of arrival time at the cabinet.	Inspection					
645	676-2.6	Generator and Auxiliary Power Connection:	Provide the cabinet with either a manual or automatic transfer switch as shown in the Plans.	Inspection					
646	676-2.6	Generator and Auxiliary Power Connection:	The transfer switch must meet UL 1008 and be rated equal to or higher than the design load of the cabinet's main breaker and the generator input twist-lock connector rating.	Inspection					
647	676-2.6	Generator and Auxiliary Power Connection:	The transfer switch must provide a means of switching between normal utility power and auxiliary backup generator power. Switching time cannot exceed 250 milliseconds.	Inspection					
648	676-2.6	Generator and Auxiliary Power Connection:	Ensure that the transfer switch does not allow simultaneous active power from more than one source and does not allow generator backflow into normal utility AC circuits.	Inspection					
649	676-2.6.1	Manual Transfer Switch:	Provide a two-position manual transfer switch with the switch positions labeled "Generator Power" and "Utility Power".	Inspection					
650	676-2.6.1	Manual Transfer Switch:	Equip the transfer switch with a "Utility-on" indicator, which will illuminate when normal utility power service is available and the switch is in the "Generator Power" position.	Inspection					
651	676-2.6.1	Manual Transfer Switch:	The indicator must turn off when the transfer switch is moved to the "Utility Power" position.	Inspection					
652	676-2.6.1	Manual Transfer Switch:	The Utility-on indicator must be clearly visible outside the cabinet and the indicator's on/off state must be obvious from a distance of 30 feet.	Inspection					
653	676-2.6.2	Automatic Transfer Switch:	An automatic transfer switch may be used instead of a manual transfer switch to provide for automatic transition from generator power back to normal utility service after utility power is restored.	Inspection					
654	676-2.6.2	Automatic Transfer Switch:	Provide the automatic transfer switch with indicators that display the status of connected power sources and indicate which power source is actively energizing the cabinet.	Inspection					
655	676-2.6.2	Automatic Transfer Switch:	If a relay circuit is used to provide switching, the normally closed circuits must be connected to normal utility power. The relay must be energized solely by the generator.	Inspection					
656	676-2.6.2	Automatic Transfer Switch:	When energized, the relay must break the connection to normal utility power and make connection to the generator power input.	Inspection					
657	676-2.6.2	Automatic Transfer Switch:	Any automatic transfer switch or relay operated switch must include a bypass switch that disables automatic switching and permits manual selection of the power sources connected to the cabinet.	Inspection					

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658	676-2.6.3	Generator Access Panel:	Include a generator connection panel consisting of, at a minimum, the manual transfer switch and a three-prong, 30 amp twist-lock connector with recessed male contacts for generator hookup.	Inspection					
659	676-2.6.3	Generator Access Panel:	Locate the access panel as close as possible to the main AC circuit breaker with the bottom of the access panel no less than 24 inches above the bottom of the cabinet.	Inspection					
660	676-2.6.3	Generator Access Panel:	Do not place the generator access panel on the main cabinet door or back door.	Inspection					
661	676-2.6.3	Generator Access Panel:	Locate and label the transfer switch and twist lock connector on a panel easily accessible behind a weatherproof lockable exterior access door equipped with a tamper-resistant hinge.	Inspection					
662	676-2.6.3	Generator Access Panel:	Label this access door "Generator Access Door" Provide the access door with a No. 2 lock unless otherwise specified in the Plans.	Inspection					
663	676-2.6.3	Generator Access Panel:	The access door must include a weatherproof opening for the generator cable.	Inspection					
664	676-2.6.3	Generator Access Panel:	The generator hookup compartment must be recessed no more than six inches into the cabinet but be deep enough to allow closing and locking of the access door when the generator cable is connected and avoids blocking access to any other equipment in the cabinet.	Inspection					
676-3 Installation Requirements									
665	676-3.3	Intelligent Transportation System Cabinet Installation:	Ensure that pole and structure-mounted field cabinets have mounting brackets on the side so that both cabinet doors are fully functional.	Inspection					
666	676-3.3	Intelligent Transportation System Cabinet Installation:	Make provisions for all telephone, data, control, and confirmation connections between the ITS device and field cabinet and for any required wiring harnesses and connectors.	Inspection					
667	676-3.3	Intelligent Transportation System Cabinet Installation:	Place a heavy-duty resealable plastic bag on the backside of the main cabinet door for containing cabinet prints, a list of terminal block connections, and other documentation.	Inspection					
668	676-3.3	Intelligent Transportation System Cabinet Installation:	Place all equipment in the cabinet according to the recommendations of the manufacturer. Maintain a minimum clearance of 6 inches between the top of the cabinet and the top of any equipment placed on the top shelf of the cabinet and a minimum clearance of 2 inches between each side of the cabinet and any equipment placed on the cabinet shelves.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 682 VIDEO EQUIPMENT									
682-1 CCTV Camera									
669	682-1.2.1	Camera:	Use either a dome-type or external positioner-type CCTV camera assembly.	Inspection					
670	682-1.2.1	Camera:	Ensure that the appropriate type is used at the locations shown in the Plans.	Inspection					
671	682-1.2.1	Camera:	Use only equipment and components that meet the requirements of these minimum specifications, and are listed on the Department's Approved Product List (APL).	Inspection					
672	682-1.2.2	Lens:	Ensure that the high definition CCTV camera has a minimum 18x motorized optical zoom lens with automatic iris.	Inspection					
673	682-1.2.2	Lens:	Ensure that the lens is capable of automatic and manual focus and iris control.	Inspection					
674	682-1.2.2	Lens:	Ensure that the lens depth of field provides a clear image of roadside areas under all lighting conditions and that the lens has a maximum aperture of at least f/1.6.	Inspection					
675	682-1.2.3	Installation Requirements:	Install the CCTV camera on a pole in accordance with Design Standards, Index Nos. 18100 through 18111 and as shown in the Plans.	Inspection					
676	682-1.2.3	Installation Requirements:	Furnish and install the power supplies, local control equipment, and any other camera-related field electronic equipment and transient voltage surge suppressors within a pole- or base-mounted lockable cabinet.	Inspection					
677	682-1.2.3	Installation Requirements:	Ensure that the cabinet protects these electrical and electronic devices from rain, dust, dirt, and other harmful elements of nature.	Inspection					
678	682-1.2.3	Installation Requirements:	Furnish and install all power, video, and data cables necessary to provide connection points for camera video and pan/tilt/zoom (PTZ) control signals within the cabinet.	Inspection					
679	682-1.2.3	Installation Requirements:	Furnish and install any and all ancillary equipment required to provide a complete and fully operational CCTV camera.	Inspection					
680	682-1.2.3	Installation Requirements:	Verify that all wiring meets National Electric Code (NEC) requirements where applicable.	Inspection					
681	682-1.2.3	Installation Requirements:	Ensure that data and video cables from the pole or support structure to the camera are routed inside the mounting hardware and protected from exposure to the outside environment.	Inspection					
682	682-1.2.3	Installation Requirements:	Coat the exterior of the dome-type enclosure's lower half with a clear, rain repellant product prior to final acceptance.	Inspection					
683	682-1.4.1	General:	Subject the equipment covered by these specifications to a field acceptance test (FAT).	Testing					
684	682-1.4.1	General:	Develop and submit a test plan to the Engineer for review and approval.	Deliverable					
685	682-1.4.1	General:	Ensure that the test plan demonstrates each and every functional requirement specified for the device or system under test. The Engineer reserves the right to witness all tests.	Testing					
686	682-1.4.2	Field Test Requirements:	Perform local field operational tests at CCTV field sites according to the following: 1. Verify that physical construction has been completed as specified in the Plans. 2. Verify the quality and tightness of ground and surge protector connections. 3. Verify proper voltages for all power supplies and related power circuits. 4. Verify all connections, including correct installation of communication and power cables. 5. Verify that the video signal from the camera is present and of consistent quality at all connection points between the camera, the cabinet, and any video devices therein. 6. Exercise PTZ and focus in all directions and execute a minimum of three other unique programming commands to ensure that the communication link between the cabinet and the camera is functioning properly.	Testing					
682-3 Warranty									
687	682.3.1	General	Ensure that CCTV cameras and video display equipment have a manufacturer's warranty covering defects for a minimum of three years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608. Ensure that the warranty requires the manufacturer to furnish replacements for any part or equipment found to be defective during the warranty period at no cost to the Department or the maintaining agency within 10 calendar days of notification.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 684 NETWORK DEVICES									
684-1 Managed Field Ethernet Switch									
688	684-1.1	Description	Use only equipment and components that meet the requirements of these minimum specifications, and are listed on the Department's Approved Product List (APL).	Inspection					
689	684-1.2.1	General:	Ensure that the ITS network administrator will be able to manage each MFES individually and as a group for switch configuration, performance monitoring, and troubleshooting.	Inspection					
690	684-1.2.1	General:	Ensure that the MFES includes Layer 2+ capabilities, including, QoS, IGMP, rate limiting, security filtering, and general management.	Inspection					
691	684-1.2.1	General:	Ensure that the furnished MFES is fully compatible and interoperable with the ITS trunk Ethernet network interface, and that the MFES supports half and full duplex Ethernet communications.	Inspection					
692	684-1.2.1	General:	Furnish an MFES that provides 99.999% error-free operation, and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber optic transmission medium and Category 5E copper transmission medium.	Inspection					
693	684-1.2.1	General:	Provide a switched Ethernet connection for each remote ITS field device.	Inspection					
694	684-1.2.1	General:	Ensure that the MFES has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.	Inspection					
695	684-1.2.2	Networking Standards:	Ensure that the MFES complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to: 1. IEEE 802.1D Standard for Media Access Control (MAC) Bridges used with the Rapid Spanning Tree Protocol (RSTP). 2. IEEE 802.1Q standard for port-based virtual local area networks (VLANs). 3. IEEE 802.1P standard for Quality of Service (QoS). 4. IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications. 5. IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX. 6. IEEE 802.3x standard regarding flow control with full duplex operation.	Inspection					
696	684-1.2.3	Optical Ports:	Ensure that all fiber optic link ports operate at 1,310 or 1,550 nanometers in single mode.	Inspection					
697	684-1.2.3	Optical Ports:	Ensure that the optical ports are Type ST, SC, LC, or FC only, as specified in the plans or by the Engineer.	Inspection					
698	684-1.2.3	Optical Ports:	Do not use mechanical transfer registered jack (MTRJ) type connectors.	Inspection					
699	684-1.2.3	Optical Ports:	Provide an MFES having a minimum of two optical 100 Base FX ports capable of transmitting data at 100 megabits per second unless otherwise shown in the plans.	Inspection					
700	684-1.2.3	Optical Ports:	Ensure the MFES is configured with the number and type of ports detailed in the Contract Documents.	Inspection					
701	684-1.2.3	Optical Ports:	Provide optical ports designed for use with a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data.	Inspection					
702	684-1.2.3	Optical Ports:	The optical ports shall have an optical power budget of at least 15 dB, or as detailed in the Contract Documents.	Inspection					
703	684-1.2.4	Copper Ports:	Provide an MFES that includes a minimum of four copper ports unless otherwise shown in the plans.	Inspection					
704	684-1.2.4	Copper Ports:	All copper ports shall be Type RJ-45 and shall auto-negotiate speed (i.e., 10/100 Base) and duplex (i.e., full or half). All 10/100 Base TX ports shall meet the specifications detailed in this section and shall be compliant with the IEEE 802.3 standard pinouts.	Inspection					
705	684-1.2.4	Copper Ports:	Ethernet over very high speed digital subscriber line (EoVDSL) ports are permitted for use in applications where fiber optic cable is not available.	Inspection					
706	684-1.2.4	Copper Ports:	EoVDSL ports must support standard telephone-grade twisted copper pair and automatically negotiate the fastest data rate possible depending on cable length and quality.	Inspection					

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707	684-1.2.5	Management Capability:	<p>Ensure that the MFES supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:</p> <ol style="list-style-type: none"> 1. An MFES that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table. 2. A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second. 3. A minimum 4 kilobit MAC address table. 4. Support of, at a minimum, Version 2 of the Internet Group Management Protocol (IGMP). 5. Support of remote and local setup and management via telnet and secure Web-based GUI. 6. Support of the Simple Network Management Protocol (SNMP). Verify that the MFES can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP). 7. Port security through controlling access by the users. Ensure that the MFES has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network. 8. Support of remote monitoring (RMON) of the Ethernet agent and the ability to be upgraded to switch monitoring (SMON), if necessary. 9. Support of TFTP and either Network Time Protocol (NTP) or the Simple Network Time Protocol (SNTP). Ensure that the MFES supports port mirroring for troubleshooting purposes when combined with a network analyzer. 	Inspection					
708	684-1.2.6	Mechanical Specifications:	Ensure equipment is permanently marked with manufacturer name or trademark, part number, and serial number.	Inspection					
709	684-1.2.6	Mechanical Specifications:	Ensure that every conductive contact surface or pin is gold-plated or made of a noncorrosive, nonrusting, conductive metal.	Inspection					
710	684-1.2.6	Mechanical Specifications:	Do not use self-tapping screws on the exterior of the assembly.	Inspection					
711	684-1.2.6	Mechanical Specifications:	All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.	Inspection					
712	684-1.2.7	Electrical Specifications:	MFES must operate on a nominal voltage of 120 volts alternating current (VAC). Supply an appropriate voltage converter for devices that require operating voltages of less than 120 VAC.	Inspection					
713	684-1.2.7	Electrical Specifications:	Ensure that the MFES has diagnostic light emitting diodes (LEDs), including link, TX, RX, and power LEDs.	Inspection					
714	684-1.2.8	Environmental Specifications:	Ensure that the MFES operates properly during and after being subjected to the environmental testing procedures described in NEMA TS 2, Sections 2.2.7, 2.2.8., and 2.2.9.	Inspection					
715	684-1.3	Installation Requirements:	Mount the MFES inside a field site cabinet.	Inspection					
716	684-1.3	Installation Requirements:	Ensure that the MFES is resistant to all electromagnetic interference (EMI).	Inspection					
717	684-1.3	Installation Requirements:	Ensure that the MFES is mounted securely and is fully accessible by field technicians.	Inspection					
718	684-1.3	Installation Requirements:	Ensure that all unshielded twisted pair/shielded twisted pair Ethernet network cables are compliant with the EIA/TIA-568-B standard.	Inspection					
719	684-1.4.1	General:	Subject the MFES to field acceptance tests (FATs).	Testing					
720	684-1.4.1	General:	Develop and submit a test plan for FATs to the Engineer for consideration and approval.	Deliverable					
721	684-1.4.1	General:	The Engineer reserves the right to witness all FATs. Complete the tests within five calendar days.	Testing					
722	684-1.4.2	Field Testing:	<p>Once the MFES has been installed, conduct local FATs at the MFES field site according to the submitted test plan. Perform the following:</p> <ol style="list-style-type: none"> 1. Verify that physical construction has been completed as detailed in the plans. 2. Inspect the quality and tightness of ground and surge protector connections. 3. Verify proper voltages for all power supplies and related power circuits. 4. Connect devices to the power sources. 5. Verify all connections, including correct installation of communication and power cables. 6. Verify configuration of the MFES Internet Protocol (IP) addresses and subnetwork mask. 7. Verify the network connection to the MFES through ping and telnet sessions from a remote personal computer (PC). 8. Perform testing on multicast routing functionality. 	Testing					

Test Case	Document Section	Document Heading	Requirement Summary	Verification Method	Applicable to the Project Y/N	Compliant Y/N/ Partial/NA	Notes/Comments	Contractor Initials	FDOT Initials
684-2 Device Server									
723	684-2.1	Description:	Provide a device server that allows connection of serial devices with EIA-232, EIA-422, and EIA-485 connections to an Ethernet network.	Inspection					
724	684-2.1	Description:	Use only equipment and components that meet the requirements of these minimum specifications, and are listed on the APL.	Inspection					
725	684-2.2.1	General:	Ensure that the device server provides a TCP/IP interface to one or more field devices using EIA-232/422/485 standard connections.	Inspection					
726	684-2.2.1	General:	Ensure that the device server supports TCP/IP, User Datagram Protocol (UDP)/IP, Dynamic Host Configuration Protocol (DHCP), Address Resolution Protocol (ARP), Internet Control Message Protocol (ICMP), Simple Network Management Protocol (SNMP), Hypertext Transfer Protocol (HTTP), and telnet.	Inspection					
727	684-2.2.1	General:	Ensure that the device server provides 99.999% error-free operation and EIA-compatible Ethernet data communication by way of a Category 5E copper or fiber optic transmission medium, as shown in the plans.	Inspection					
728	684-2.2.1	General:	Ensure that the device server is resistant to all electromagnetic interference.	Inspection					
729	684-2.2.1	General:	Use a device server having an encryption feature that provides data security and prevents interception or "sniffing" of transmitted information by unauthorized parties.	Inspection					
730	684-2.2.1	General:	Data security shall comply with Version 2 of the Secure Shell Protocol (SSHv2), or the NIST requirements as defined in the Federal Information Processing Standard (FIPS) Publication (PUB)-197 for the Advanced Encryption Standard (AES).	Inspection					
731	684-2.2.1	General:	Ensure that the device server has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours.	Inspection					
732	684-2.2.2	Serial Interface:	Ensure that the device server provides a minimum of one serial data interface and connector as specified in the plans that conforms to EIA-232/422/485 standards.	Inspection					
733	684-2.2.2	Serial Interface:	Ensure that the serial interface supports 2-wire and 4-wire EIA-485 connections.	Inspection					
734	684-2.2.2	Serial Interface:	Ensure that the serial ports support data rates up to 230 kbps; error detection procedures utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2).	Inspection					
735	684-2.2.2	Serial Interface:	Ensure that the device server provides flow control (request to send [RTS]/clear to send [CTS] and transmit on/transmit off [XON/XOFF]), as well as allow control of the data terminal ready (DTR), data carrier detect (DCD), data set ready (DSR), CTS, and RTS signals. Ensure that the device server supports RTS toggle for half-duplex emulation.	Inspection					
736	684-2.2.3	Network Interface:	Ensure that the device server includes a minimum of one Ethernet port, which must provide a 10/100 Base TX or a 10/100 Base FX connection as specified in the plans.	Inspection					
737	684-2.2.3	Network Interface:	Verify that all copper-based network interface ports utilize registered jack (RJ)-45 connectors.	Inspection					
738	684-2.2.3	Network Interface:	Verify that the optical ports are Type ST, SC, LC, or FC only, as specified in the plans or by the Engineer.	Inspection					
739	684-2.2.3	Network Interface:	Mechanical transfer registered jack (MTRJ) type connectors are not allowed.	Inspection					
740	684-2.2.4	Configuration and Management:	Provide a device server that supports local and remote configuration and management, which must include access to all userprogrammable features, including but not limited to addressing, port configuration, device monitoring, diagnostic utilities, and security functions.	Inspection					
741	684-2.2.4	Configuration and Management:	Ensure that the device server supports configuration and management via serial login, SNMP, telnet login, and browser-based interface.	Inspection					
742	684-2.2.5	Mechanical Specifications:	Ensure equipment is permanently marked with manufacturer name or trademark, part number, date of manufacture and serial number.	Inspection					
743	684-2.2.5	Mechanical Specifications:	Do not use self-tapping screws on the exterior of the assembly.	Inspection					
744	684-2.2.5	Mechanical Specifications:	Ensure that all parts are made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.	Inspection					
745	684-2.2.5	Mechanical Specifications:	Ensure that the dimensions of the device server accommodate the unit's installation in a control cabinet as specified in the plans.	Inspection					
746	684-2.2.6	Electrical Specifications:	Verify that all wiring meets applicable NEC requirements and that the device server operates using a nominal input voltage of 120 volts alternating current (VAC).	Inspection					
747	684-2.2.6	Electrical Specifications:	If the device requires nominal input voltage of less than 120 VAC, furnish the appropriate voltage converter.	Inspection					
748	684-2.2.6	Electrical Specifications:	Verify that the maximum power consumption does not exceed 12 watts.	Inspection					

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749	684-2.2.6	Electrical Specifications:	Ensure that the device server has diagnostic LEDs, including link, TX, RX, and power LEDs.	Inspection					
750	684-2.2.7	Environmental Specifications:	Ensure the device server performs all required functions during and after being subjected to the environmental testing procedures described in NEMA TS2, Sections 2.2.7, 2.2.8, and 2.2.9.	Inspection					
751	684-2.3	Installation Requirements:	Mount the device server securely in a location in the equipment cabinet that allows the unit to be fully accessible by field technicians.	Inspection					
752	684-2.3	Installation Requirements:	Ensure that all unshielded twisted pair/shielded twisted pair Ethernet network cables are compliant with the EIA/TIA-568-B standard.	Inspection					
753	684-2.3	Installation Requirements:	Furnish and install digital video encoder (DVE) and digital video decoder (DVD) hardware and software to create a video-over-IP network system, as shown in the plans.	Inspection					
754	684-2.3	Installation Requirements:	Use only equipment and components that meet the requirements of these minimum specifications, and are listed on the APL.	Inspection					
684-3 Digital Video Encoder and Decoder									
755	684-3.2.1	General	Use DVEs and DVDs that are specialized network-based hardware devices and software which allow video and data signals to be transmitted across IP networks.	Inspection					
756	684-3.2.1	Description	Ensure that the video and data packets produced by the DVE and placed onto the network allow reconstruction of digital video signals by hardware-based and software-based DVDs that are also attached to the network.	Inspection					
757	684-3.2.1	Description	Ensure that the complete video and data transmission system, defined as the combination of DVE and DVD hardware together with the existing or planned network infrastructure, simultaneously transports video and data from multiple remote field locations to multiple monitoring locations for roadway surveillance and traffic management.	Inspection					
758	684-3.2.2	Software:	Provide a software decoding and control package that allows the viewing of any video source connected to the network through a DVE, and which allows the pan-tilt-zoom (PTZ) control of any PTZ camera on the network, the discovery of DVE and DVD devices on the network, and the control and adjustment of programmable parameters in the DVE and DVD equipment, including the network addresses of these devices, at no additional cost.	Inspection					
759	684-3.2.2	Software:	Provide all setup, control programs, and diagnostic software related to the DVE or DVD.	Inspection					
760	684-3.2.2	Software:	Provide all equipment licenses, where required for any software or hardware in the system.	Deliverable					
761	684-3.2.3	MPEG-2 Format:	Furnish DVE and DVD components that utilize the Moving Picture Experts Group's MPEG-2 video compression technology in accordance with the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 13818 standard.	Inspection					
762	684-3.2.3	MPEG-2 Format:	Ensure that the DVE and DVD are capable of unicast and multicast operation. Ensure DVEs support the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974.	Inspection					
763	684-3.2.3	MPEG-2 Format:	Ensure that the DVE provides 99.999% error-free operation. Ensure MPEG-2 DVE and DVD equipment supports programmable bit rates. Ensure that MPEG-2 equipment supports fixed bit rate mode.	Inspection					
764	684-3.2.4	H.264 Format:	Furnish DVE and DVD components that utilize video compression technology in accordance with the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) requirements detailed in the ISO/IEC 14496-10:2009 standard.	Inspection					
765	684-3.2.4	H.264 Format:	Ensure that the DVE and DVD are capable of unicast and multicast operation.	Inspection					
766	684-3.2.4	H.264 Format:	Ensure that DVEs support the Session Announcement Protocol (SAP) as recommended by the Internet Engineering Task Force (IETF) RFC 2974, and Real Time Streaming Protocol (RTSP).	Inspection					
767	684-3.2.4	H.264 Format:	Ensure that the DVE provides 99.999% error-free operation.	Inspection					
768	684-3.2.4	H.264 Format:	Ensure H.264 DVE and DVD equipment supports programmable bit rates.	Inspection					
769	684-3.2.4	H.264 Format:	Ensure that H.264 equipment supports fixed bit rate mode.	Inspection					
770	684-3.2.5	Digital Video Decoder:	Provide a DVE that is a hardware-based network device able to accept a minimum of one analog National Television System Committee (NTSC) video input and digitize it for transport across IP networks.	Inspection					
771	684-3.2.5	Digital Video Decoder:	Use a DVE that provides a minimum of one serial data interface for transmission of command and control data to other devices (typically camera PTZ commands), as well as console and configuration functions.	Inspection					

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772	684-3.2.5	Digital Video Decoder:	Provide compatible decoder software along with the DVE at no additional cost.	Inspection					
773	684-3.2.6	Digital Video Decoder:	Provide a DVD that is either a hardware-based network device or a software application that resides on a workstation PC.	Inspection					
774	684-3.2.6.1	Hardware-based Decoder:	Provide a hardware-based decoder that has a minimum of one video output.	Inspection					
775	684-3.2.6.1	Hardware-based Decoder:	Use a DVD that has a minimum of one data interface for configuration functions.	Inspection					
776	684-3.2.6.1	Hardware-based Decoder:	Use a DVD that includes an Ethernet interface for connection to IP networks.	Inspection					
777	684-3.2.6.2	Software-based Decoder:	Ensure that any software-based decoder applications do not interfere with SunGuide® software operating when installed and used together on a shared hardware platform.	Inspection					
778	684-3.2.6.2	Software-based Decoder:	Ensure that the software application provides PC desktop display of IP network video streams. Ensure that the software-based decoder offers an open Application Programming Interface (API) and software development kit available to the Department at no cost for integration with third party software and systems.	Inspection					
779	684-3.2.7	Interoperability:	Provide DVE and DVD devices and software that are interoperable and interchangeable with DVE and DVD devices and software from other manufacturers.	Inspection					
780	684-3.2.7	Interoperability:	Ensure that the DVE is compatible and fully interoperable with software and hardware DVDs from the DVE manufacturer, as well as a minimum of two software and hardware DVDs from other manufacturers.	Inspection					
781	684-3.2.7	Interoperability:	Ensure that the DVD is compatible and fully interoperable with DVEs from the DVD manufacturer, as well as a minimum of two other DVEs from other manufacturers.	Inspection					
782	684-3.2.7	Interoperability:	Ensure DVE and DVD can be controlled using SunGuide® or support stream selection and switching using ONVIF commands.	Inspection					
783	684-3.2.8	Video Specifications:	Ensure that composite video inputs and outputs utilize BNC connectors.	Inspection					
784	684-3.2.8	Video Specifications:	Ensure analog video inputs and outputs support 1 volt peak-to-peak (Vp-p) NTSC composite video. Ensure that the DVE and DVD operate with both color and monochrome video, and that DVEs allow the user to select and adjust video resolution.	Inspection					
785	684-3.2.8	Video Specifications:	Ensure that the DVE and DVD support resolutions that include, but are not limited to, those defined in Table 3.1.	Inspection					
786	684-3.2.8	Video Specifications:	Ensure that the DVE and DVD are capable of delivering color and monochrome video at 30 fps regardless of resolution.	Inspection					
787	684-3.2.9	Serial Interface:	Ensure that hardware-based DVEs provide a minimum of one serial data interface that supports EIA/TIA-232 and TIA-422.	Inspection					
788	684-3.2.9	Serial Interface:	Ensure that the serial ports support data rates up to 115 kbps; error detection procedures utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2).	Inspection					
789	684-3.2.9	Serial Interface:	Ensure that hardware-based DVEs provide a TCP/IP interface to their serial port using a network socket connection with configurable IP address and port number. Serial interface ports may utilize RJ-45 connectors, D-sub connectors, or screw terminals.	Inspection					
790	684-3.2.10	Network Interface:	Ensure that the DVE/DVD local area network (LAN) connection supports the requirements detailed in the IEEE 802.3 standard for 10/100 Ethernet connections.	Inspection					
791	684-3.2.10	Network Interface:	Provide a DVE/DVD having a minimum of one Ethernet port, which shall be a 10/100 Base TX connection or a 100 Base FX ST, SC, LC or FC interface.	Inspection					
792	684-3.2.10	Network Interface:	Ensure that the connector complies with applicable EIA and TIA requirements.	Inspection					
793	684-3.2.10	Network Interface:	Provide copperbased network interface ports that utilize RJ-45 connectors.	Inspection					
794	684-3.2.10	Network Interface:	Ensure that fiber ports are single mode with a minimum link budget of 30 dB or the type and power detailed in the Contract Documents.	Inspection					
795	684-3.2.10	Network Interface:	Ensure that the network communication conforms to User Datagram Protocol (UDP), Version 4 of the Internet Protocol (IP) and Version 2 of the Internet Group Multicast Protocol (IGMP).	Inspection					
796	684-3.2.11	Front Panel Status Indicators:	Provide DVEs and DVDs that have LED displays, liquid crystal displays (LCDs), or similar illuminated displays to indicate status for power and data activity.	Inspection					
797	684-3.2.12	Configuration and Management:	Provide DVEs and DVDs that support local and remote configuration and management. Configuration and management functions shall include access to all user-programmable features, including but not limited to addressing, serial port configuration, video settings, device monitoring, and security functions.	Inspection					

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798	684-3.2.12	Configuration and Management:	Ensure that the DVE and DVD support configuration and management via serial login, telnet login, web browser, or Simple Network Management Protocol (SNMP).	Inspection					
799	684-3.2.13	Mechanical Specifications:	Ensure equipment is permanently marked with manufacturer name or trademark, part number, date of manufacture and serial number.	Inspection					
800	684-3.2.13	Mechanical Specifications:	Do not use self-tapping screws on the exterior of the assembly.	Inspection					
801	684-3.2.13	Mechanical Specifications:	Ensure that equipment intended for installation in a roadside cabinet uses parts made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.	Inspection					
802	684-3.2.13	Mechanical Specifications:	Ensure that the dimensions of the DVE accommodate the unit's installation in a control cabinet as specified in the plans.	Inspection					
803	684-3.2.14	Electrical Specifications:	Provide equipment that operates on a nominal voltage of 120 volts alternating current (VAC). If the device requires operating voltages of less than 120 VAC, supply the appropriate voltage converter.	Inspection					
804	684-3.2.15	Environmental Specifications:	Ensure DVEs and DVDs installed in roadside cabinets perform all required functions during and after being subjected to the environmental testing procedures described in NEMA TS2, Sections 2.2.7, 2.2.8, and 2.2.9.	Inspection					
805	684-3.2.15	Environmental Specifications:	Ensure that a hardware DVD installed in a climate-controlled environment, such as a TMC computer room, has an operating temperature range of 32° to 104°F.	Inspection					
806	684-3.2.15	Environmental Specifications:	Ensure that the DVE is shelf- and/or rackmountable, and designed for use in roadside control cabinets without climate control.	Inspection					
807	684-3.3	Installation Requirements:	Ensure that front panel status indicators remain unobstructed and visible.	Inspection					
808	684-3.4	Installation Requirements:	Ensure that all unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B standard.	Inspection					
809	684-3.4.1	General:	Subject the DVEs and DVDs to field acceptance tests (FATs).	Testing					
810	684-3.4.1	General:	Develop and submit a test plan for FATs to the Engineer for consideration and approval.	Deliverable					
811	684-3.4.1	General:	The Engineer reserves the right to witness all FATs. Complete the tests within five calendar days.	Testing					
812	684-3.4.2	Field Testing:	Perform local field operational tests at the device field site and end-to-end video streaming tests in order to demonstrate compliance with Department specifications. Testing will include, but not be limited to, the following: 1. Verify that physical construction has been completed as detailed in the plans. 2. Inspect the quality and tightness of ground and surge protector connections. 3. Verify proper voltages for all power supplies and related power circuits. 4. Connect devices to the power sources. 5. Verify all connections, including correct installation of communication and power cables. 6. Verify video image is present and free from oversaturation and any other image defect in both color and monochrome mode. 7. Verify network connection to the DVE and DVD through ping and telnet session from a remote PC. 8. Verify serial data transmission through the DVE and DVD serial ports. 9. Verify support of unicast, multicast, and SAP.	Testing					
684-4 Media Convertor									
813	684-4.1	Description	Furnish and install a media converter as shown in the Plans. Use only equipment and components that meet the requirements of these minimum specifications, and are listed on the APL.	Inspection					
814	684-4.2.1	General:	Use a media converter that connects different transmission media for the purpose of transmitting Ethernet data.	Inspection					
815	684-4.2.1	General:	The media converter must allow transition between the transmission media shown in the Plans or required to construct a functional system, such as conversion from twisted pair to optical fiber or from twisted pair to coaxial cable.	Inspection					
816	684-4.2.2	Network Interface:	Ensure that the media converter local area network (LAN) connection supports the requirements detailed in the IEEE 802.3 standard for 10/100 Ethernet connections.	Inspection					
817	684-4.2.2	Network Interface:	Provide a media converter having a minimum of one Ethernet port, which shall be, at a minimum, a 10/100 Base TX connection or a 100 Base FX ST, SC, LC 939 or FC interface.	Inspection					

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818	684-4.2.2	Network Interface:	Ensure that the connector complies with applicable EIA and TIA requirements. Provide copper-based network interface ports that utilize RJ-45 connectors.	Inspection					
819	684-4.2.2	Network Interface:	Ensure that fiber ports are single mode with a minimum link budget of 30 dB or the type and power detailed in the Contract Documents.	Inspection					
820	684-4.2.3	Mechanical Specifications:	Ensure equipment is permanently marked with manufacturer name or trademark, part number, date of manufacture and serial number.	Inspection					
821	684-4.2.3	Mechanical Specifications:	Ensure that every conductive contact surface or pin is gold-plated or made of a noncorrosive, nonrusting, conductive metal.	Inspection					
822	684-4.2.3	Mechanical Specifications:	Do not use self-tapping screws on the exterior of the assembly.	Inspection					
823	684-4.2.3	Mechanical Specifications:	All parts must be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.	Inspection					
824	684-4.2.3	Electrical Specifications:	Ethernet to coax media converters must operate using power over Ethernet (POE). Media converters must operate on a nominal voltage of 120 volts alternating current (VAC) if POE is unavailable.	Inspection					
825	684-4.2.3	Electrical Specifications:	Supply an appropriate voltage converter for devices that require operating voltages of less than 120 VAC.	Inspection					
826	684-4.2.3	Electrical Specifications:	Ensure that the media converter has diagnostic LEDs, including link, TX, RX, and power LEDs.	Inspection					
827	684-4.2.4	Environmental Specifications:	Ensure media converters perform all required functions during and after being subjected to the environmental testing procedures described in NEMA TS2, Sections 2.2.7, 2.2.8, and 2.2.9.	Inspection					
828	684-4.3	Installation Requirements:	Ensure that status indicators remain unobstructed and visible.	Inspection					
829	684-4.3	Installation Requirements:	All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized or painted aluminum, brass, or gold-plated metal.	Inspection					
830	684-4.3	Installation Requirements:	Ensure that all unshielded twisted pair/shielded twisted pair Ethernet network cables are compliant with the EIA/TIA-568-B standard.	Inspection					
684-5 Warranty									
831	684-5.1	General:	Ensure that the manufacturer will furnish replacements for any part or equipment found to be defective during the warranty period at no cost to the Department or the maintaining agency within 10 calendar days of notification.	Inspection					
832	684-5.2	MFES:	Ensure that the MFES has a manufacturer's warranty covering defects for five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.	Inspection					
833	684-5.3	Device Server:	Ensure that the device server has a manufacturer's warranty covering defects for five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.	Inspection					
834	684-5.4	Digital Video Encoder and Decoder	Ensure that the DVE or DVD has a manufacturer's warranty covering defects for two years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.	Inspection					
835	684-5.5	Media Converter	Ensure that the media converter has a manufacturer's warranty covering defects for five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 685 TRAFFIC CONTROL SYSTEM AUXILIARIES									
685-1 Description									
836	685-1	Description	Furnish and install traffic control system auxiliaries as shown in the Plans.	Inspection					
685-2 Materials									
837	685-2.2	Uninterruptible Power Supply (UPS):	Use a line interactive or online/double- conversion UPS as shown in the Plans.	Inspection					
838	685-2.2	Uninterruptible Power Supply (UPS):	UPS assemblies must be designed for installation in a roadside NEMA 3R enclosure to provide battery backup functionality for traffic control systems, including traffic signal and intelligent transportation system (ITS) devices.	Inspection					
839	685-2.2	Uninterruptible Power Supply (UPS):	UPS assemblies must include batteries provided by the UPS manufacturer or in accordance with manufacturer's requirements.	Inspection					
840	685-2.2	Uninterruptible Power Supply (UPS):	Loss of utility power, transfer from utility power to battery power, and transfer back to utility power must not interfere with normal operation of connected equipment.	Inspection					
841	685-2.2	Uninterruptible Power Supply (UPS):	In the event of UPS failure or battery depletion, connected equipment must be energized automatically upon restoration of utility power.	Inspection					
842	685-2.2	Uninterruptible Power Supply (UPS):	The UPS must operate in hot standby mode with power transfer being accomplished in 40 milliseconds or less.	Inspection					
843	685-2.2	Uninterruptible Power Supply (UPS):	Removal and replacement of the UPS must not disrupt the operation of the equipment being protected.	Inspection					
844	685-2.2	Uninterruptible Power Supply (UPS):	All harnesses necessary to connect and operate the system must be included. All connectors must be keyed to prevent improper connection.	Inspection					
845	685-2.2.1	Configuration and Management:	Provide a UPS that supports local and remote configuration and management, including access to all user-programmable features as well as alarm monitoring, event logging, and diagnostic utilities.	Inspection					
846	685-2.2.1	Configuration and Management:	Configuration and management functions must be password protected.	Inspection					
847	685-2.2.1	Configuration and Management:	Alarm function monitoring must include the following: loss of utility power, inverter failure, low battery, battery temperature, and inverter active/utility fail.	Inspection					
848	685-2.2.1	Configuration and Management:	The UPS must include an event log that indicates the date and time of the following events: AC high, AC low, AC frequency high, AC frequency low, AC fail/blackout, overload, over temperature, battery voltage high, battery voltage low, battery disconnected, battery temperature high, temperature probe disconnected, and short circuit.	Inspection					
849	685-2.2.1	Configuration and Management:	The UPS event log must be able to store a minimum of 200 events.	Inspection					
850	685-2.2.1	Configuration and Management:	The UPS must include a front panel display and controls that allows programming of configurable parameters, features, and functions without the need for another input device.	Inspection					
851	685-2.2.1	Configuration and Management:	The UPS must have visual indications for Power-On, Mode of Operation (utility power or inverter), Battery Status, Alarm Status, Load Levels, and AC Output Voltage.	Inspection					
852	685-2.2.2	Communication Interfaces:	Provide a serial data connection port and an Ethernet port (RJ45) for local control using a laptop PC and remote control via a network connection.	Inspection					
853	685-2.2.3	Batteries:	Use only AGM or Gel type external batteries.	Inspection					
854	685-2.2.3	Batteries:	Batteries must be sealed and require no maintenance, cause no corrosion, and be capable of maintaining 80% of original capacity and performance for a minimum of five years.	Inspection					
855	685-2.2.3	Batteries:	The UPS must be supplied with a wiring harness for battery connections.	Inspection					
856	685-2.2.3	Batteries:	The battery wiring harness must allow 6 feet of separation between the UPS and its battery bank.	Inspection					
857	685-2.2.3	Batteries:	Battery terminals must include a protective covering to prevent accidental spark or shorting.	Inspection					
858	685-2.2.3	Batteries:	The UPS must include battery management functions that include active or equalized balancing; monitoring of temperature, voltage, and amperage of charge and discharge; and temperature compensated automatic charging to maximize the life of the batteries.	Inspection					
859	685-2.2.4	Electrical:	UPS assemblies used to provide backup power in an ITS cabinet must provide a minimum of 350 watts (at 120VAC) of continuous backup power for a minimum of two hours unless otherwise shown in the Plans.	Inspection					
860	685-2.2.4	Electrical:	UPS assemblies used to provide backup power in a traffic signal controller cabinet must provide a minimum 400 watts (at 120VAC) of continuous power for a minimum of 6.5 hours unless otherwise shown in the Plans.	Inspection					
861	685-2.2.4	Electrical:	Frequency must be regulated to 60 Hz, plus or minus 0.5 Hz, while the UPS is supplying power.	Inspection					

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862	685-2.2.4	Electrical:	The UPS must operate on 85 to 154 VAC without requiring assistance from the batteries.	Inspection					
863	685-2.2.4	Electrical:	Double-conversion UPS must be capable of simultaneously producing fully regenerated and regulated, conditioned, True Sine Wave power and hot standby AC output, and have a minimum operating efficiency of 90%.	Inspection					
864	685-2.2.4	Electrical:	Ensure the UPS is listed to the requirements of UL 1778.	Inspection					
865	685-2.2.4	Electrical:	Upstream back-feed voltage from the UPS must be less than 1 VAC.	Inspection					
866	685-2.2.6	Mechanical:	All parts must be made of corrosion-resistant materials such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.	Inspection					
867	685-2.2.6	Mechanical:	All fasteners exposed to the elements must be Type 304 or 316 passivated stainless steel.	Inspection					
868	685-2.2.7	Environmental:	UPS assemblies, including batteries, must provide continuous power with specified wattage and operate properly during and after being subjected to the environmental testing procedures described in NEMA TS 2, Sections 2.2.7, 2.2.8, and 2.2.9.	Inspection					
685-3 Installation									
869	685-3	Installation.	Install UPS assemblies in accordance with the manufacturer's recommendations.	Inspection					
870	685-3	Installation.	All equipment used to keep the intersection signalized must be backed up and protected by the UPS.	Inspection					
871	685-3	Installation.	Include a UPS operation and maintenance manual in the cabinet where the UPS is installed that includes cabinet wiring schematics, electrical interconnection drawings, parts layout and parts lists.	Inspection					
685-4 Testing									
872	685-4	Testing.	Provide a field acceptance test plan to the Engineer for approval at least 14 days prior to commencement of testing.	Testing					
873	685-4	Testing.	After approval of the acceptance test plan, perform testing of the installed UPS equipment. Furnish all equipment, software, and supplies necessary for conducting the test.	Testing					
685-5 Warranty									
874	685-5	Warranty	Ensure the UPS includes a manufacturer's warranty covering defects for a minimum of three years (5 years for the external batteries in accordance with 685-2.2.3) from the date of final acceptance in accordance with 5-11 and Section 608.	Inspection					
875	685-5	Warranty	The warranty must include provisions for providing a replacement UPS within 10 calendar days of notification for any UPS found to be defective during the warranty period at no cost to the FDOT or the maintaining agency.	Inspection					

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JULY 2017 FDOT SPECIFICATION SECTION 700 HIGHWAY SIGNING									
700-1 General Requirements									
876	700-1.2.2	Concrete:	Use concrete meeting the requirements of Section 346. Obtain concrete from a plant that is listed on the Department's Production Facility Listing.	Inspection					
700-4 DMS									
877	700-4.1	General	Dynamic Message Signs (DMS) must meet the requirements of NEMA TS4-2005.	Inspection					
878	700-4.1	General	Provide monochrome, tri-color, or full-color signs as shown in the Contract Documents.	Inspection					
879	700-4.1	General	Use only equipment and components that meet the requirements of these minimum specifications and are listed on the APL.	Inspection					
880	700-4.2	Sign Housing Requirements for all DMS:	Ensure that the external skin of the sign housing is constructed of aluminum alloy 5052 H32 that is a minimum of 0.125 inches thick for a walk-in DMS and 0.090 inch thick for front or embedded DMS.	Inspection					
881	700-4.2	Sign Housing Requirements for all DMS:	Ensure the interior structure is constructed of aluminum.	Inspection					
882	700-4.2	Sign Housing Requirements for all DMS:	Ensure that the sign housing design and appearance is approved by the Engineer.	Inspection					
883	700-4.2	Sign Housing Requirements for all DMS:	Ensure that no internal frame connections or external skin attachments rely upon adhesive bonding or rivets.	Inspection					
884	700-4.2	Sign Housing Requirements for all DMS:	Ensure the sign enclosure meets the requirements of NEMA TS 4-2005, Section 3.1.1.	Inspection					
885	700-4.2	Sign Housing Requirements for all DMS:	Ensure that all drain holes and other openings in the sign housing are screened to prevent the entrance of insects and small animals.	Inspection					
886	700-4.2	Sign Housing Requirements for all DMS:	Ensure that the sign housing complies with the fatigue resistance requirements of the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.	Inspection					
887	700-4.2	Sign Housing Requirements for all DMS:	Design and construct the DMS unit for continuous usage of at least 20 years and the sign structure for a 50 year design life.	Inspection					
888	700-4.2	Sign Housing Requirements for all DMS:	The sign assembly must be designed and constructed to withstand loads, including a wind load of 150 miles per hour, as defined in the Department's Structures Manual.	Inspection					
889	700-4.2	Sign Housing Requirements for all DMS:	Ensure that the top of the housing includes multiple steel lifting eyebolts or equivalent hoisting points.	Inspection					
890	700-4.2	Sign Housing Requirements for all DMS:	Ensure hoist points are positioned such that the sign remains level when lifted.	Inspection					
891	700-4.2	Sign Housing Requirements for all DMS:	Ensure that the hoist points and sign frame allow the sign to be shipped, handled, and installed without damage.	Inspection					
892	700-4.2	Sign Housing Requirements for all DMS:	Ensure all assembly hardware, including nuts, bolts, screws, and locking washers less than 5/8 inch in diameter, are Type 304 or 316 passivated stainless steel and meet the requirements of ASTM F593 and ASTM F594.	Inspection					
893	700-4.2	Sign Housing Requirements for all DMS:	All assembly hardware greater than or equal to 5/8 inch in diameter must be galvanized and meet the requirements of ASTM A307.	Inspection					
894	700-4.2	Sign Housing Requirements for all DMS:	Ensure all exterior, excluding the sign face, and all interior housing surfaces are a natural aluminum mill finish. Ensure signs are fabricated, welded, and inspected in accordance with the requirements of the current ANSI/AWS Structural Welding Code-Aluminum.	Inspection					
895	700-4.2	Sign Housing Requirements for all DMS:	Ensure the sign housing meets the requirements of NEMA TS 4-2005, Section 3.2.8 for convenience outlets.	Inspection					
896	700-4.2.2	Sign Housing for Front Access and Embedded DMS:	Ensure front access and embedded signs meet the requirements of NEMA TS 4-2005, Section 3.2.4.	Inspection					
897	700-4.2.2	Sign Housing for Front Access and Embedded DMS:	Ensure access does not require specialized tools or excessive force to operate.	Inspection					
898	700-4.2.3	Housing Face for Front Access and Embedded DMS:	Ensure the sign face meets the requirements of NEMA TS 4-2005, Section 3.1.3.	Inspection					
899	700-4.2.3	Housing Face for Front Access and Embedded DMS:	Ensure that all sign face surfaces are finished with a matte black coating system that meets or exceeds American Architectural Manufacturers Association (AAMA) Specification No. 2605.	Inspection					
900	700-4.2.3	Housing Face for Front Access and Embedded DMS:	Provide certification that the sign face parts are coated with the prescribed thickness.	Inspection					
901	700-4.2.3	Housing Face for Front Access and Embedded DMS:	Except for embedded DMS, ensure the sign face includes a contrast border that meets the requirements of NEMA TS 4-2005, Section 3.1.6.	Inspection					
902	700-4.2.3.2	Housing Face for Front Access and Embedded DMS:	Any exposed fasteners on the housing face must be the same color and finish as the housing face. Only captive fasteners may be used on the housing face.	Inspection					

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903	700-4.2.3.3	External Fascia Panels:	If the sign includes external fascia panels, ensure that they are constructed using aluminum.	Inspection					
904	700-4.2.3.3	External Fascia Panels:	Finish each fascia panel with a matte black coating system that meets or exceeds AAMA Specification No. 2605.	Inspection					
905	700-4.2.3.4	Lens Panel Assembly:	If the sign includes lens panel assemblies, ensure they are modular in design, removable, and interchangeable without misalignment of the lens panel and the LED pixels.	Inspection					
906	700-4.2.3.4	Lens Panel Assembly:	The lens panel assembly must consist of an environmental shielding layer coating to protect and seal the LED and internal electronics.	Inspection					
907	700-4.2.3.4	Lens Panel Assembly:	The coating must be a minimum 90% UV opaque.	Inspection					
908	700-4.2.3.4	Lens Panel Assembly:	Lens panels must have a matte black coating that meets or exceeds AAMA Specification No. 2605.	Inspection					
909	700-4.2.3.4	Lens Panel Assembly:	Lens panels must include a mask constructed of 0.080 inch minimum thickness aluminum.	Inspection					
910	700-4.2.3.4	Lens Panel Assembly:	Ensure that the mask is perforated to provide an aperture for each pixel on the display module. Ensure that the apertures do not block the LED output at the required viewing angle.	Inspection					
911	700-4.2.4	Sign Housing Ventilation System:	The ventilation systems for walkin, front-access, and embedded DMS must meet the requirements of NEMA TS 4-2005, Section 3.1.2.	Inspection					
912	700-4.2.4	Sign Housing Ventilation System:	Ensure that air drawn into the sign is filtered upon entry.	Inspection					
913	700-4.2.4	Sign Housing Ventilation System:	Ensure the ventilation system is automatically tested once each day and that it may be tested on command from remote and local control access locations.	Inspection					
914	700-4.2.4	Sign Housing Ventilation System:	Ensure the sign includes a sensor or a sensor assembly to monitor airflow volume to predict the need for a filter change.	Inspection					
915	700-4.2.4	Sign Housing Ventilation System:	Ensure the ventilation system fans possess a 100,000 hour, L10 life rating.	Inspection					
916	700-4.2.5	Sign Housing Temperature Sensor:	Ensure that the sign controller continuously measures and monitors the temperature sensors.	Inspection					
917	700-4.2.5	Sign Housing Temperature Sensor:	Ensure that the sign blanks when a critical temperature is exceeded and that the sign reports this event when polled.	Inspection					
918	700-4.2.5	Sign Housing Temperature Sensor:	Ensure that remote and local computers can read all temperature measurements from the sign controller.	Inspection					
919	700-4.2.6	Sign Housing Humidity Sensor:	Humidity sensors must detect from 0 to 100% relative humidity in 1% or smaller increments.	Inspection					
920	700-4.2.6	Sign Housing Humidity Sensor:	Sensors must operate and survive in 0 to 100% relative humidity, and have an accuracy that is better than plus or minus 5% relative humidity. Use of a humidistat is not acceptable.	Inspection					
921	700-4.2.7	Sign Housing Photosensors:	Ensure the sign meets the requirements of NEMATS 4-2005, Section 8.8.	Inspection					
922	700-4.2.7	Sign Housing Photosensors:	Ensure that the sensors provide accurate ambient light condition information to the sign controller for automatic light intensity adjustment.	Inspection					
923	700-4.2.7	Sign Housing Photosensors:	Ensure that the automatic adjustment of the LED driving waveform duty cycle occurs in small enough increments that the sign's brightness changes smoothly, with no perceivable brightness change between adjacent levels.	Inspection					
924	700-4.2.7	Sign Housing Photosensors:	Ensure that stray headlights shining on the photoelectric sensor at night do not cause LED brightness changes.	Inspection					
925	700-4.2.7	Sign Housing Photosensors:	Ensure that the brightness and color of each pixel is uniform over the sign's entire face within a 30 degree viewing angle in all lighting conditions.	Inspection					
926	700-4.3	Display Modules:	Provide display modules manufactured by one source and fully interchangeable throughout the manufacturer's sign system.	Inspection					
927	700-4.3	Display Modules:	Ensure that removal or replacement of a complete display module or LED board can be accomplished without the use of special tools.	Inspection					
928	700-4.3	Display Modules:	Ensure display modules contain solid-state electronics needed to control pixel data and read pixel status.	Inspection					
929	700-4.3	Display Modules:	Ensure that the sign has a full matrix display area as defined in the glossary of NEMA TS 4-2005.	Inspection					
930	700-4.3.1	LED and Pixel Specifications:	Ensure that LED lamps have a minimum viewing angle of 30 degrees.	Inspection					
931	700-4.3.1	LED and Pixel Specifications:	Ensure that all pixels in all signs in a project, including operational support supplies, have equal color and on-axis intensity.	Inspection					
932	700-4.3.1	LED and Pixel Specifications:	Ensure that the sign display meets the luminance requirements of NEMA TS 4-2005, Section 5.4, for light emitting signs connected at full power.	Inspection					
933	700-4.3.1	LED and Pixel Specifications:	Ensure that amber displays produce an overall luminous intensity of at least 9200 candelas per square meter when operating at 100% intensity.	Inspection					
934	700-4.3.1	LED and Pixel Specifications:	Provide the LED brightness and color bins that are used in each pixel to the Engineer for approval.	Inspection					

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935	700-4.3.1	LED and Pixel Specifications:	Ensure that the LED manufacturer demonstrates testing and binning according to the International Commission on Illumination (CIE) 127-1997 Standard.	Inspection					
936	700-4.3.1	LED and Pixel Specifications:	Ensure that all LEDs operate within the LED manufacturer's recommendations for typical forward voltage, peak pulsed forward current, and other ratings.	Inspection					
937	700-4.3.1	LED and Pixel Specifications:	Component ratings must not be exceeded under any operating condition.	Inspection					
938	700-4.3.1	LED and Pixel Specifications:	Provide a pixel test as a form of status feedback to the transportation management center (TMC) from the local sign controller.	Inspection					
939	700-4.3.1	LED and Pixel Specifications:	Ensure that the operational status of each pixel in the sign can be automatically tested once a day.	Inspection					
940	700-4.3.1	LED and Pixel Specifications:	Ensure that the pixel status test determines the functional status of the pixel as defined by the pixel Failure Status object in National Transportation Communications for ITS Protocol (NTCIP) 1203 v02.39 and does not affect the displayed message for more than half a second.	Inspection					
941	700-4.3.1	LED and Pixel Specifications:	Ensure that LEDs are individually mounted directly on a printed circuit board (PCB).	Inspection					
942	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure the display modules are rectangular and have an identical vertical and horizontal pitch between adjacent pixels.	Inspection					
943	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure that the separation between the last column of one display module and the first column of the next module is equal to the horizontal distance between the columns of a single display module.	Inspection					
944	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Full-color signs must have a pitch equal to or less than 35 mm.	Inspection					
945	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure that the LED circuit board is a NEMA FR4-rated, single 0.062 inch, black PCB. Ensure that no PCB has more than two PCB jumper wires present.	Inspection					
946	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Finish all PCBs with a solder mask and a component-identifying silk screen.	Inspection					
947	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Provide PCBs with conformal coating meeting the material requirements of MIL-I-46058C Military Standard, United States Department of Defense (USDOD).	Inspection					
948	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure that any devices used to secure LEDs do not block air flow to the LED leads or block the LED light output at the required viewing angle.	Inspection					
949	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure that all components on the LED side of a PCB are black.	Inspection					
950	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure that there are a minimum of two power supplies that are wired in a parallel configuration for redundancy.	Inspection					
951	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure that if one, or 25% of the supplies in a group, whichever is greater, completely fails, the sign shall still be supplied with enough power to run 40% of all pixels at a 100% duty cycle with an ambient operating temperature of 165°F.	Inspection					
952	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure that the sign controller continuously measures and monitors all LED module power supply voltages and provides the voltage readings to the TMC or a laptop computer on command.	Inspection					
953	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Ensure that LEDs are protected from external environmental conditions, including moisture, snow, ice, wind, dust, dirt, and UV rays.	Inspection					
954	700-4.3.2	Optical, Electrical, and Mechanical Specifications for Display Modules:	Do not use epoxy to encapsulate the LEDs.	Inspection					
955	700-4.4	Characters, Fonts, and Color:	Ensure that the signs are capable of displaying American Standard Code for Information Interchange (ASCII) characters 32 through 126, including all uppercase and lowercase letters, and digits 0 through 9, at any location in the message line.	Inspection					
956	700-4.4	Characters, Fonts, and Color:	Submit a list of the character fonts to the Engineer for approval.	Inspection					
957	700-4.4	Characters, Fonts, and Color:	All signs must be loaded (as a factory default) with a font in accordance with or that resembles the standard font set described in NEMA TS 4-2005, Section 5.6.	Inspection					
958	700-4.4	Characters, Fonts, and Color:	For signs with a pixel pitch of 35 mm or less, ensure the sign is loaded (as a factory default) with a font set that resembles the FHWA Series E2000 standard font.	Inspection					

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959	700-4.4	Characters, Fonts, and Color:	Ensure DMS fonts have character dimensions that meet the MUTCD, Section 2L.04, paragraph 08.	Inspection					
960	700-4.5	Main Power Supply and Energy Distribution Specifications:	Provide a nominal single-phase power line voltage of 120/240 VAC.	Inspection					
961	700-4.5	Main Power Supply and Energy Distribution Specifications:	Ensure the DMS meets the requirements of NEMA TS 4-2005, Section 10.2.	Inspection					
962	700-4.5	Main Power Supply and Energy Distribution Specifications:	Ensure all 120 VAC wiring has an overall nonmetallic jacket or is placed in metal conduit, pull boxes, raceways, or control cabinets and installed as required by the NEC.	Inspection					
963	700-4.5	Main Power Supply and Energy Distribution Specifications:	Do not use the sign housing as a wiring raceway or control cabinet.	Inspection					
964	700-4.5	Main Power Supply and Energy Distribution Specifications:	Provide Type XHHW power cables sized as required by the NEC for acceptable voltage drops while supplying alternating current to the sign.	Inspection					
965	700-4.5	Main Power Supply and Energy Distribution Specifications:	Ensure surge protective devices (SPD) are installed or incorporated in the sign system by the manufacturer to guard against lightning, transient voltage surges, and induced current.	Inspection					
966	700-4.5	Main Power Supply and Energy Distribution Specifications:	Ensure that SPDs meet or exceed the requirements of Section 620. Ensure SPDs protect all electric power and data communication connections.	Inspection					
967	700-4.6	Uninterruptible Power Supply (UPS):	If a UPS is required in the Contract Documents for front access and embedded signs, ensure the UPS is installed within the control cabinet or as shown in the Plans.	Inspection					
968	700-4.6	Uninterruptible Power Supply (UPS):	The UPS system must be capable of displaying the current messages on a sign when a power outage occurs.	Inspection					
969	700-4.6	Uninterruptible Power Supply (UPS):	Signs with an UPS must be able to operate on battery power and display text messages for a minimum of two hours.	Inspection					
970	700-4.6	Uninterruptible Power Supply (UPS):	Ensure the system uses sealed absorbed glass mat (AGM) batteries.	Inspection					
971	700-4.7	Operational Support Supplies:	Furnish the operational support supplies listed in Table 700-2 of the Standard Specifications for every group of 10 or fewer DMS's provided or required. Promptly replace any of the supplies used to perform a warranty repair.	Inspection					
972	700-4.8	Components:	All components must meet the requirements of NEMA TS 4-2005, Section 8.	Inspection					
973	700-4.8.1	Mechanical Components:	Ensure that all fasteners, including bolts, nuts, and washers less than 5/8 inch in diameter, are passivated stainless steel, Type 316 or 304 and meet the requirements of ASTM F593 and ASTM F594 for corrosion resistance.	Inspection					
974	700-4.8.1	Mechanical Components:	Ensure that all bolts and nuts 5/8 inch and over in diameter are galvanized and meet the requirements of ASTM A307.	Inspection					
975	700-4.8.1	Mechanical Components:	Do not use self-tapping screws.	Inspection					
976	700-4.8.1	Mechanical Components:	Ensure that all parts are fabricated from corrosion resistant materials, such as plastic, stainless steel, aluminum, or brass.	Inspection					
977	700-4.8.1	Mechanical Components:	Ensure that construction materials are resistant to fungus growth and moisture deterioration.	Inspection					
978	700-4.8.1	Mechanical Components:	Ensure that all dissimilar metals are separated with an inert, dielectric material.	Inspection					
979	700-4.8.2	Sign Controller:	Ensure that the sign controller monitors the sign in accordance with NEMA TS 4-2005, Section 9.	Inspection					
980	700-4.8.2	Sign Controller:	Ensure the sign monitors the status of any photocells, LED power supplies, humidity, and airflow sensors.	Inspection					
981	700-4.8.2	Sign Controller:	Ensure sign controllers use fiber optic cables for data connections between the sign housing and ground-level cabinet.	Inspection					
982	700-4.8.2	Sign Controller:	Ensure that the sign controller meets the requirements of NEMA TS 4-2005, Sections 8.9 and 8.10.	Inspection					
983	700-4.8.2	Sign Controller:	Ensure that the sign controller is capable of displaying a selfupdating time and date message on the sign.	Inspection					
984	700-4.8.2	Sign Controller:	Ensure that sign controllers within ground cabinets are rack-mountable, designed for a standard Electronic Industries Alliance (EIA) EIA-310 19 inch rack, and includes a keypad and display.	Inspection					
985	700-4.8.3	Display System Hardware:	Ensure the sign utilizes a system data interface circuit for communications between the sign controller and display modules.	Inspection					
986	700-4.8.3	Display System Hardware:	Except for embedded DMS, ensure that the following components reside inside the sign housing: sign controller (master or slave), display system interface circuits, display modules, power supplies, local and remote control switches, LED indicators, EIA-232 null modem cables (minimum of four feet long for connecting laptop computer to sign controller), and surge protective devices.	Inspection					
987	700-4.8.4	Control Cabinet:	Provide a control cabinet that meets the requirements of Section 676.	Inspection					
988	700-4.8.4	Control Cabinet:	Ensure that the minimum height of the cabinet is 46 inches.	Inspection					

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989	700-4.8.4	Control Cabinet:	Provide a ground control cabinet that includes the following assemblies and components: power indicator, surge suppression on both sides of all electronics, communication interface devices, connection for a laptop computer for local control and programming, a four foot long cable to connect laptop computers, a workspace for a laptop computer, and duplex outlets.	Inspection					
990	700-4.8.4	Control Cabinet:	Provide for all telephone, data, control, power, and confirmation connections between the sign and ground control box, and for any required wiring harnesses and connectors.	Inspection					
991	700-4.8.5	Sign Controller Communication Interfaces:	Ensure the sign controller has communication interfaces in accordance with NEMA TS 4-2005, Section 8.7.1. Ensure that EIA-232 serial interfaces support the requirements as per Table 700-3.	Inspection					
992	700-4.8.5	Sign Controller Communication Interfaces:	Ensure the sign controller has a 10/100 Base TX 8P8C port or a 100 Base FX port Ethernet interface.	Inspection					
993	700-4.8.5	Sign Controller Communication Interfaces:	Ensure that the TMC or a laptop computer can be used to remotely reset the sign controller.	Inspection					
994	700-4.9	Message and Status Monitoring:	Ensure the DMS provides two modes of operation: (1) remote operation, where the TMC commands and controls the sign and determinesthe appropriate message or test pattern; and (2) local operation, where the sign controller or a laptop computer commands and controls the sign and determines the appropriate message or test pattern.	Inspection					
995	700-4.9	Message and Status Monitoring:	Ensure that the sign can perform the following functions: 1. Control Selection – Ensure that local or remote sign control can be selected. Ensure that there is a visual indicator on the controller that identifies whether the sign is under local or remote control. 2. Message Selection – Ensure that the sign controller can select a blank message or any one of the messages stored in the sign controller’s nonvolatile memory when the control mode is set to local. 3. Message Implementation – Ensure that the sign controller can activate the selected message.	Inspection					
996	700-4.9	Message and Status Monitoring:	Ensure that the sign can be programmed to display a user-defined message, including a blank page, in the event of power loss.	Inspection					
997	700-4.9	Message and Status Monitoring:	Ensure that message additions, deletions, and sign controller changes may be made from either the remote TMC or a local laptop computer.	Inspection					
998	700-4.9	Message and Status Monitoring:	Ensure that each font may be customized, and modifications to a font may be downloaded to the sign controller from the TMC or a laptop computer at any time without any software or hardware modifications.	Inspection					
999	700-4.9	Message and Status Monitoring:	Ensure that there is no perceivable flicker or ghosting of the pixels during sign erasure and writing periods.	Inspection					
1000	700-4.10	TMC Communication Specification for all DMS:	Ensure that the sign controller is addressable by the TMC through the Ethernet communications network using software that complies with the NTCIP 1101 base standard (formerly the NEMA TS 3.2-1996 Standard), including all amendments as published at the time of contract letting, the NTCIP Simple Transportation Management Framework, and conforms to Compliance Level 1.	Inspection					
1001	700-4.10	TMC Communication Specification for all DMS:	Ensure that the software implements all mandatory objects in the supplemental requirement SR-700-4.1.1, Dynamic Message Sign NTCIP Requirements, as published on the Department’s State Traffic Engineering and Operations Office web site at the time of contract letting.	Inspection					
1002	700-4.10	TMC Communication Specification for all DMS:	Ensure that the sign complies with the NTCIP 1102v01.15, 2101v01.19, 2103v02.07, 2201v01.15, 2202v01.05, and 2301v02.19 Standards.	Inspection					
1003	700-4.10	TMC Communication Specification for all DMS:	Ensure that the sign complies with NTCIP 1103v02.17, Section 3.	Inspection					
1004	700-4.10	TMC Communication Specification for all DMS:	Ensure that the controller’s internal time clock can be configured to synchronize to a time server using the network time protocol (NTP). NTP synchronization frequency must be user-configurable and permit polling intervals from once per minute to once per week in one-minute increments.	Inspection					
1005	700-4.10	TMC Communication Specification for all DMS:	The controller must allow the user to define the NTP server by internet protocol (IP) address.	Inspection					
1006	700-4.10	TMC Communication Specification for all DMS:	Provide communications line circuits that are point-to-point or multipoint, and that provide full duplex asynchronous data transmissions at the rate shown in the contract documents or directed by the Engineer.	Inspection					
1007	700-4.10	TMC Communication Specification for all DMS:	Assign each sign controller a unique address.	Inspection					

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1008	700-4.11	Sign Control Software:	Ensure that the sign is provided with computer software from its manufacturer that allows an operator to program, operate, exercise, diagnose, and read current status of all sign features and functions using a laptop computer.	Inspection					
1009	700-4.11	Sign Control Software:	Ensure that sign control software provides a graphical representation that visibly depicts the sign face and the current ON/OFF state of all pixels as well as allows messages to be created and displayed on the sign.	Inspection					
1010	700-4.11	Sign Control Software:	Ensure that the laptop computer and sign can communicate when connected directly by an EIA-232 cable and via Ethernet.	Inspection					
1011	700-4.11	Sign Control Software:	Ensure that the software allows communication between multiple users and multiple signs across the same communication network.	Inspection					
1012	700-4.12	Sign Support Structure:	Meet the requirements of 700-2.2.	Inspection					
1013	700-4.13	Installation Requirements:	Do not install the sign prior to the availability of electric power.	Inspection					
1014	700-4.13	Installation Requirements:	Verify that any ventilation system incorporated within the sign is operational within 72 hours after sign installation.	Inspection					
1015	700-4.13	Installation Requirements:	Ensure that the location of the lifting eyebolts, left in place or removed, is sealed to prevent water entry after installation.	Inspection					
1016	700-4.13	Installation Requirements:	Load the initial message libraries on both the sign control software and the sign controller.	Inspection					
1017	700-4.13	Installation Requirements:	The Engineer will furnish the messages to be placed in these libraries.	Inspection					
1018	700-4.14	Documentation:	Provide documentation for electronic equipment in accordance with 603-8.	Deliverable					
1019	700-4.15	Licensing:	Ensure that the manufacturer grants the Department a license that allows the Department to use and internally distribute any and all sign communications protocols, operating systems, drivers, and documentation.	Deliverable					
1020	700-4.15	Licensing:	Ensure that a manufacturer's representative is available to assist the Contractor's technical personnel during pre-installation testing and installation.	Inspection					
1021	700-4.15	Licensing:	Do not provide initial power to the signs without the permission of the manufacturer's representative.	Inspection					
1022	700-4.17	Environmental Requirements:	The DMS must meet the requirements of NEMA TS 4-2005, Section 2.	Inspection					
1023	700-4.18	Pre-installation Field Testing:	Conduct pre-installation tests on all units at a Contractor-provided facility within the appropriate District.	Testing					
1024	700-4.18	Pre-installation Field Testing:	Perform the tests on each unit supplied to verify that no damage was done to any sign during the shipment and delivery process.	Testing					
1025	700-4.18	Pre-installation Field Testing:	Notify the Engineer a minimum of 10 calendar days before the start of any tests.	Testing					
1026	700-4.18	Pre-installation Field Testing:	Conduct all tests according to the approved test procedures detailed in this Section.	Testing					
1027	700-4.18	Pre-installation Field Testing:	Each DMS must pass the individual tests detailed below prior to installation.	Testing					
1028	700-4.18.1	Material Inspection:	Examine each DMS carefully to verify that the materials, design, construction, markings, and workmanship comply with all applicable standards, specifications, and requirements.	Inspection					
1029	700-4.18.2	Operational Test:	Operate each DMS long enough to permit equipment temperature stabilization, and to check and record an adequate number of performance characteristics to ensure compliance with applicable standards, specifications, and requirements.	Testing					
1030	700-4.18.3	Pre-Installation Test Failure Consequence:	If any unit fails, the unit shall be corrected or another unit substituted in its place and the test repeated.	Testing					
1031	700-4.18.3	Pre-Installation Test Failure Consequence:	If a unit has been modified as a result of a failure, a report shall be prepared and delivered to the Engineer. The report shall describe the nature of the failure and the corrective action taken.	Deliverable					
1032	700-4.18.3	Pre-Installation Test Failure Consequence:	If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or an extension of the Contract Time.	Testing					
1033	700-4.19	Installed Site Tests:	Conduct an approved, stand-alone equipment installation test at the field site.	Testing					
1034	700-4.19	Installed Site Tests:	Test all stand-alone (i.e., non-network) functions of the field equipment using equipment installed as detailed in the Plans and as approved by the Engineer.	Testing					
1035	700-4.19	Installed Site Tests:	Complete approved data forms and turn them over to the Engineer for review and as a basis for rejection or acceptance.	Deliverable					
1036	700-4.19	Installed Site Tests:	Provide a minimum notice of 30 calendar days prior to all tests to permit the Engineer or his representative to observe each test.	Deliverable					

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1037	700-4.19	Installed Site Tests:	If any unit fails to pass its stand-alone test, correct the unit or substitute another unit in its place, then repeat the test.	Testing					
1038	700-4.19	Installed Site Tests:	If a unit has been modified as a result of a stand-alone test failure, prepare a report describing the nature of the failure and the corrective action taken and deliver it to the Engineer prior to re-testing the unit.	Deliverable					
1039	700-4.19	Installed Site Tests:	If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or an extension of the Contract Time.	Testing					
1040	700-4.20	System Testing:	Conduct approved DMS system tests on the field equipment with the master equipment including, at a minimum, all remote control functions.	Testing					
1041	700-4.20	System Testing:	Display the return status codes from the sign controller for a minimum of 72 hours.	Testing					
1042	700-4.20	System Testing:	Complete approved data forms and turn them over to the Engineer for review, and as a basis for rejection or acceptance.	Deliverable					
1043	700-4.20	System Testing:	Demonstrate the sign's ability to display the proper predefined message or remain blank when power is restored following an AC power interruption.	Testing					
1044	700-4.20	System Testing:	If the system test fails because of any subsystem component, repair that component or substitute another in its place, then repeat the test.	Testing					
1045	700-4.20	System Testing:	If a component has been modified as a result of a system test failure, prepare a report and deliver it to the Engineer prior to retesting.	Deliverable					
1046	700-4.21	Operational Testing:	After the system testing is successfully completed; conduct one continuous 72 hour, full-operating test prior to conducting the 30 day acceptance test.	Testing					
1047	700-4.21	Operational Testing:	The Engineer will approve the type of tests to be conducted. Include in the tests all control, monitoring, and communications functions of the field equipment by the master equipment.	Testing					
1048	700-4.22	Acceptance Testing:	Conduct a 30 day acceptance test after the successful completion of the approved 72 hour operational test.	Testing					
1049	700-4.22	Acceptance Testing:	During the 30 day test period, limit downtime due to mechanical, electrical, or other malfunctions to a maximum total of five calendar days.	Testing					
1050	700-4.22	Acceptance Testing:	If the equipment fails to operate for a total of five or more calendar days, testing will be restarted.	Testing					
1051	700-4.22	Acceptance Testing:	The Engineer may select to pause and extend the 30 day test period by the number of days lost by failure and repair time in lieu of restarting the full 30 day test.	Testing					
1052	700-4.22	Acceptance Testing:	The Engineer will furnish the Contractor with a letter of approval and completion stating the first and last day of the 30 day test period.	Deliverable					
1053	700-4.23	Warranty:	Ensure that the DMS system and equipment has a manufacturer's warranty covering defects for a minimum of five years from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.	Inspection					

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ITS FACILITY MANAGEMENT DISTRICT ONE IMPLEMENTATION PLAN									
SECTION 8 Minimum Equipment Attributes									
1	8.1	Fiber Optic Cable	Ensure the minimum equipment attribute requirements for Fiber Optic Cables are inputted into ITSFM as per Section 8.1.	Inspection					
2	8.1.1	Fiber Cable Splice Locations	Ensure the minimum equipment attribute requirements for Fiber Cable Splice Locations are inputted into ITSFM as per Section 8.1.1.	Inspection					
3	8.1.2	Fiber Cable Slack Loops	Ensure the minimum equipment attribute requirements for Fiber Cable Slack Loops are inputted into ITSFM as per Section 8.1.2.	Inspection					
4	8.3	Electric Cables	Ensure the minimum equipment attribute requirements for Electric Cables are inputted into ITSFM as per Section 8.3	Inspection					
5	8.4	Conduit Duct Bank & Access Points	Ensure the minimum equipment attribute requirements for Conduit Duct Bank & Access Points are inputted into ITSFM as per Section 8.4	Inspection					
6	8.4.1	Conduit	Ensure the minimum equipment attribute requirements for Conduits are inputted into ITSFM as per Section 8.4.1	Inspection					
7	8.4.2	Innerduct	Ensure the minimum equipment attribute requirements for Innerducts are inputted into ITSFM as per Section 8.4.2	Inspection					
8	8.4.3	Conduit Access Point	Ensure the minimum equipment attribute requirements for Conduit Access Points are inputted into ITSFM as per Section 8.4.3	Inspection					
9	8.5	Support Structures	Ensure the minimum equipment attribute requirements for Support Structures are inputted into ITSFM as per Section 8.5	Inspection					
10	8.6	Equipment Sites	Ensure the minimum equipment attribute requirements for Equipment Sites are inputted into ITSFM as per Section 8.6	Inspection					
11	8.6.3	ITS Equipment Cabinet	Ensure the minimum equipment attribute requirements for ITS Equipment Cabinet are inputted into ITSFM as per Section 8.6.3	Inspection					
12	8.6.5	Electric Site	Ensure the minimum equipment attribute requirements for Electric Sites are inputted into ITSFM as per Section 8.6.5	Inspection					
13	8.6.6	Utility Demarcation Site	Ensure the minimum equipment attribute requirements for Utility Demarcation Sites are inputted into ITSFM as per Section 8.6.6	Inspection					
14	8.6.6.1	Power Service	Ensure the minimum equipment attribute requirements for Power Services are inputted into ITSFM as per Section 8.6.6.1	Inspection					
15	8.7.3	Closed Circuit Television (CCTV)	Ensure the minimum equipment attribute requirements for CCTVs are inputted into ITSFM as per Section 8.7.3	Inspection					
16	8.7.4	Dynamic Message Sign (DMS)	Ensure the minimum equipment attribute requirements for DMSs are inputted into ITSFM as per Section 8.7.4	Inspection					
17	8.7.11	Vehicle Detection System	Ensure the minimum equipment attribute requirements for VDSs are inputted into ITSFM as per Section 8.7.11	Inspection					
18	8.12.1	ITS Equipment Controllers	Ensure the minimum equipment attribute requirements for ITS Equipment Controllers are inputted into ITSFM as per Section 8.12.1	Inspection					
19	8.12.1.2	Ethernet Switch / Router	Ensure the minimum equipment attribute requirements for Ethernet Switch / Routers are inputted into ITSFM as per Section 8.12.1.2	Inspection					
20	8.12.1.5	Media Convertor	Ensure the minimum equipment attribute requirements for Media Convertors are inputted into ITSFM as per Section 8.12.1.5	Inspection					
21	8.12.1.6	Optical Patch Panel	Ensure the minimum equipment attribute requirements for Optical Patch Panels are inputted into ITSFM as per Section 8.12.1.6	Inspection					
22	8.12.2.3	Cabinet Surge Protection	Ensure the minimum equipment attribute requirements for Cabinet Surge Protection are inputted into ITSFM as per Section 8.12.2.3	Inspection					
23	8.12.2.4	Electric Meter	Ensure the minimum equipment attribute requirements for Electric Meters are inputted into ITSFM as per Section 8.12.2.4	Inspection					
24	8.12.2.5	Panel/Enclosure/Disconnect	Ensure the minimum equipment attribute requirements for Panel/Enclosure/Disconnects are inputted into ITSFM as per Section 8.12.2.7	Inspection					
25	8.12.2.7	Power Supply – Electronics	Ensure the minimum equipment attribute requirements for Power Supply – Electronics are inputted into ITSFM as per Section 8.12.1.10	Inspection					
26	8.12.2.11	Surge Protection Device	Ensure the minimum equipment attribute requirements for Surge Protection Devices are inputted into ITSFM as per Section 8.12.2.11	Inspection					
27	8.12.2.13	Transformer	Ensure the minimum equipment attribute requirements for Transformers are inputted into ITSFM as per Section 8.12.2.13	Inspection					
28	8.12.2.14	Uninterrupted Power Service	Ensure the minimum equipment attribute requirements for Uninterrupted Power Services are inputted into ITSFM as per Section 8.12.2.14	Inspection					

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TRUCK PARKING CONOPS COMPANION SOFTWARE ARCHITECTURE AND SYSTEM REQUIREMENTS									
SECTION 3 TRANSPORTATION MANAGEMENT CENTER USER INTERACTION									
1	3.2	Periodic TMC Operator Verification of Truck Parking Facilities	Ensure that TMC operators can verify operational status and accuracy of the available truck parking facilities and their availability.	Inspection					
2	3.2	Periodic TMC Operator Verification of Truck Parking Facilities	Ensure that the operator can bring up the details and video to visually count the number of available spaces and compare it to what SunGuide software is reporting.	Inspection					
3	3.2	Periodic TMC Operator Verification of Truck Parking Facilities	If the number of spaces is incorrect, the operator can enter the correct value and click on the "Send Count Correction" button to correct the number of spaces reported by SunGuide software for that facility.	Inspection					
4	3.3	TMC Operator Handling Alerts for Low Truck Parking Availability	Ensure that TMC operators will be alerted by the system when the available truck parking spaces initially goes below the low availability threshold.	Inspection					
5	3.3	TMC Operator Handling Alerts for Low Truck Parking Availability	Ensure that the operator can invoke the associated preset for the camera and visually verify the number of available spaces to ensure accuracy when the value is low.	Inspection					
6	3.3	TMC Operator Handling Alerts for Low Truck Parking Availability	If the number of reported spaces is inaccurate compared to what is observed through the camera video, ensure that the operator can correct that number and dismiss the alert.	Inspection					
7	3.3	TMC Operator Handling Alerts for Low Truck Parking Availability	If truck parking availability for a facility goes below the low availability alarm threshold, ensure that the operator will only be alerted with the first instance.	Inspection					
8	3.3	TMC Operator Handling Alerts for Low Truck Parking Availability	Ensure that these alerts will be suppressed in a manner consistent with other SunGuide software alert types.	Inspection					
9	3.3	TMC Operator Handling Alerts for Low Truck Parking Availability	Ensure that each facility can be configured to have recovery threshold, used to indicate how many parking spaces need to become available before the facility is considered to be recovered.	Inspection					
10	3.4	Minimum Parking Availability Presented to Motorists	Ensure that if the truck parking availability for a facility goes below the configured minimum number of parking spaces before showing the facility as full, the system will report and display zero spaces available.	Inspection					
11	3.5	Facility Under Maintenance	Ensure that the TMC operator can disable the facility so that truck parking availability will not be calculated and will not be sent to DMS, persistent storage, or FL511.	Inspection					
SECTION 4 SOFTWARE ARCHITECTURE DESCRIPTION									
12	4.1	Truck Parking Availability System	Truck parking facilities will be configured within the TPS with a name, geographical location, roadway, one or more roadway directions, and total number of spaces.	Inspection					
13	4.1	Truck Parking Availability System	Presence and passage detection devices will be associated with each facility in such a way that current availability can be calculated.	Inspection					
14	4.1	Truck Parking Availability System	Presence devices will detect vehicle presence for each parking spot within the parking lot and will be counted.	Inspection					
15	4.1	Truck Parking Availability System	Passage devices will count the number of vehicles that pass the entrance and the exit of the lot and TPS will add or subtract, respectively, to calculate the currently available parking spaces.	Inspection					
16	4.1	Truck Parking Availability System	TPS will calculate current truck parking availability for each facility from the TPS detection information associated with the facility.	Inspection					
17	4.1	Truck Parking Availability System	It will store this information in persistent storage to be used for historical analysis and prediction.	Inspection					
18	4.1	Truck Parking Availability System	TPS will also calculate a predicted truck parking availability for the future through a configurable duration at a configurable interval.	Inspection					
19	4.1	Truck Parking Availability System	Before implementing predictability, the algorithm would be tested and verified for accuracy and the findings would be presented to the Change Management Board before incorporating predictability into SunGuide software.	Testing					
20	4.1	Truck Parking Availability System	TPS will post the available number of truck parking spots onto DMS modules embedded in a static sign.	Inspection					
21	4.1	Truck Parking Availability System	TPS will blank the DMS embedded module when parking availability information is not available.	Inspection					
22	4.1	Truck Parking Availability System	TPS will show zero parking spaces available before showing the facility is full if the number of spaces available is less than the configured minimum number of spaces.	Inspection					
23	4.2	SunGuide Software Operator Map – Graphical User Interface	The SunGuide software operator map is the component that interfaces with the TMC operators. The map will depict the truck parking facilities with an icon shown in Figure 4.2 of this Document.	Inspection					

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24	4.2	SunGuide Software Operator Map – Graphical User Interface	Operators will be able to hover on the icon to reveal a brief table of truck parking availability information and click on the icon to open a detail status window of the facility and access associated devices and cameras.	Inspection					
25	4.2	SunGuide Software Operator Map – Graphical User Interface	The truck parking facility detail status window dialog will contain the list of truck parking facilities.	Inspection					
26	4.2	SunGuide Software Operator Map – Graphical User Interface	The selected truck parking facility will have its detailed status information and parking availability override control shown below the list.	Inspection					
27	4.2	SunGuide Software Operator Map – Graphical User Interface	Below the detailed status, an embedded video on desktop panel can be revealed to show video from all associated CCTV cameras with on-screen pan-tilt-zoom (PTZ) controls if the camera supports PTZ.	Inspection					
28	4.2	SunGuide Software Operator Map – Graphical User Interface	If the visually confirmed count of spaces does not match the value detected and calculated by the TPS and presented in the detail status window, the operator will be able to override the currently available spaces from this detail status window.	Inspection					
29	4.3	Data Archive	Data Archive (DA) is a SunGuide software component responsible for subscribing to data produced by other subsystems and storing the information in persistent storage. DA will be modified to include storing TPS-produced data, including a historical account for each of the following: a) Added and deleted truck parking facilities, b) Modifications to truck parking facility properties, and c) Current truck parking availability at facilities.	Inspection					
30	4.4	Dynamic Message Sign Subsystem	TPS will use DMS to send messages to the embedded DMS segments within the static message sign.	Inspection					
31	4.5	Connected Vehicle Subsystem (Future)							
32	4.6	SunGuide Software Center-to-Center Publisher Plug-in	C2C Publisher will request and subscribe to all TPS information from databus, package it in the C2C XML structure, and publish it to a C2C provider.	Inspection					
33	4.7	FL511 Plug-In	The FL511 Plug-In will receive truck parking availability information published by the SunGuide software C2C Publisher plug-in for everything needed by FL511.	Inspection					
34	4.8	FL511 Web Site	The FL511 web site will receive truck parking facility and availability from the FL511 plug-in and display it to users on a map.	Inspection					
35	4.8	FL511 Web Site	The facilities will be represented by the same truck parking icon as shown in Figure 4.5, and when hovered over, will display a table showing the current and predicted parking availability for that truck parking facility.	Inspection					

SECTION 5 SunGuide Software System Requirements

36	5	SunGuide Software System Requirements	Ensure that the SunGuide software shall allow users to configure the following information for the truck parking facilities: name, location, roadway, one or more roadway directions, total number of parking spaces, minimum number of parking spaces before reporting the facility is full, associated DMSs, associated cameras, associated presence or passage detection, low availability alarm threshold, and low availability recovery threshold.	Inspection					
37	5	SunGuide Software System Requirements	Ensure that SunGuide software shall allow the user to associate entrance volume detection links to a facility.	Inspection					
38	5	SunGuide Software System Requirements	Ensure that SunGuide software shall allow the user to associate exit volume detection links to a facility.	Inspection					
39	5	SunGuide Software System Requirements	Ensure that SunGuide software shall allow the user to associate TSS links with occupancy detection to a facility.	Inspection					
40	5	SunGuide Software System Requirements	Ensure that SunGuide software shall allow the user to associate DMSs with a sign use of the truck parking subsystem to a maximum of one truck parking subsystem facility.	Inspection					
41	5	SunGuide Software System Requirements	Ensure that SunGuide software shall allow the user to associate cameras to a truck parking subsystem facility.	Inspection					
42	5	SunGuide Software System Requirements	SunGuide software shall obtain truck parking availability information from associated truck parking facilities at a configurable interval.	Inspection					
43	5	SunGuide Software System Requirements	SunGuide software shall use presence detection, if available, to calculate current parking availability.	Inspection					
44	5	SunGuide Software System Requirements	SunGuide software shall use entrance and exit volume detection to calculate current parking availability if available and presence is not available.	Inspection					
45	5	SunGuide Software System Requirements	SunGuide software shall use the operator-corrected number of parking spaces available as an offset to adjust the current number of parking spaces available for a facility.	Inspection					
46	5	SunGuide Software System Requirements	The offset value from the operator-corrected number of parking spaces will be used until modified by subsequent operator-corrected number of parking spaces is set.	Inspection					

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47	5	SunGuide Software System Requirements	The offset value from the operator-corrected number of parking spaces will be stored in persistent storage.	Inspection					
48	5	SunGuide Software System Requirements	The offset value from the operator-corrected number of parking spaces will be automatically adjusted when needed to prevent the system from reporting a number of available parking spaces less than zero or greater than the spots available at the facility.	Inspection					
49	5	SunGuide Software System Requirements	SunGuide software shall maintain the operational status of truck parking facilities. This includes user changing op status, facility going into error status when data or devices are not all available, and slow polling of any truck parking subsystem devices. Detailed requirements can be part of the software.	Inspection					
50	5	SunGuide Software System Requirements	SunGuide software shall store truck parking availability information for truck parking facilities in persistent storage when the truck parking facility is in an active operational status.	Inspection					
51	5	SunGuide Software System Requirements	SunGuide software shall store the following information when the number of available parking spaces is corrected by an operator: Operator's User ID, date and time of the change, the old parking availability value, the new corrected parking availability value, and the ID of an alert for that facility if one is active while the change was made.	Inspection					
52	5	SunGuide Software System Requirements	SunGuide software shall calculate predicted truck parking availability information for truck parking facilities when the truck parking facility is in an active operational status.	Inspection					
53	5	SunGuide Software System Requirements	SunGuide software shall calculate predicted truck parking availability at a configurable number of minute interval with a default value of 5 minutes.	Inspection					
54	5	SunGuide Software System Requirements	SunGuide software shall calculate predicted truck parking availability through a configurable number of minutes into the future with a default value of 120 minutes.	Inspection					
55	5	SunGuide Software System Requirements	SunGuide software shall allow the future truck parking availability for a maximum of 24 hours in the future.	Inspection					
56	5	SunGuide Software System Requirements	SunGuide software shall use historical data included in the parking availability prediction.	Inspection					
57	5	SunGuide Software System Requirements	SunGuide software shall use time of day in the parking availability prediction.	Inspection					
58	5	SunGuide Software System Requirements	SunGuide software shall use day of week in the parking availability prediction.	Inspection					
59	5	SunGuide Software System Requirements	SunGuide software shall use day of year in the parking availability prediction.	Inspection					
60	5	SunGuide Software System Requirements	SunGuide software shall post the number of currently available parking spaces on the associated DMSs when the truck parking facility is in an active operational status.	Inspection					
61	5	SunGuide Software System Requirements	SunGuide software shall blank the associated DMSs when the truck parking facility is not in an active operational state.	Inspection					
62	5	SunGuide Software System Requirements	SunGuide software shall blank the associated DMSs when parking availability information is not available for a truck parking facility.	Inspection					
63	5	SunGuide Software System Requirements	SunGuide software shall post zero for the currently available parking spaces on the DMSs when the currently available parking spaces at truck parking facilities is less than the configured minimum number of parking spaces.	Inspection					
64	5	SunGuide Software System Requirements	SunGuide software shall publish truck parking availability information through center-to-center when the truck parking facility is in an active operational status.	Inspection					
65	5	SunGuide Software System Requirements	SunGuide software shall publish truck parking facility configuration information through center-to-center publisher.	Inspection					
66	5	SunGuide Software System Requirements	Truck parking facility configuration information shall include name, location, roadway, one or more roadway directions, total number of parking spaces, associated DMSs, and associated cameras.	Inspection					
67	5	SunGuide Software System Requirements	SunGuide software shall publish the operational status of each facility through center-to-center publisher.	Inspection					
68	5	SunGuide Software System Requirements	SunGuide software shall publish the current number of available truck parking spaces for each facility through center-to-center publisher.	Inspection					
69	5	SunGuide Software System Requirements	SunGuide software shall publish zero for the currently available parking spaces through center-to-center publisher when the currently available parking spaces at the truck parking facility is less than the configured minimum number of parking spaces.	Inspection					
70	5	SunGuide Software System Requirements	SunGuide software shall publish a table of the predicted number of available truck parking spaces for each facility for each interval calculated through a configurable time in the future, with a default value of 120 minutes through center-to-center publisher.	Inspection					

Test Case	Document Section	Document Heading	Requirement Summary	Verification Method	Applicable to the Project Y/N	Compliant Y/N/Partial/NA	Notes/Comments	Contractor Initials	FDOT Initials
71	5	SunGuide Software System Requirements	SunGuide software shall publish truck parking availability information to connected vehicles when the truck parking facility is in an active operational status.	Inspection					
72	5	SunGuide Software System Requirements	SunGuide software shall publish truck parking facility configuration information to connected vehicles.	Inspection					
73	5	SunGuide Software System Requirements	Truck parking facility configuration information shall include name, location, roadway, one or more roadway directions, total number of parking spaces.	Inspection					
74	5	SunGuide Software System Requirements	SunGuide software shall publish the current number of available truck parking spaces for each facility to connected vehicles.	Inspection					
75	5	SunGuide Software System Requirements	SunGuide software shall publish a table of the predicted number of available truck parking spaces for each facility for each interval calculated through a configurable time in the future, with a default value of 120 minutes to connected vehicles.	Inspection					
76	5	SunGuide Software System Requirements	SunGuide software shall alert operators when truck parking facilities enter into a low availability alarm state.	Inspection					
77	5	SunGuide Software System Requirements	SunGuide software shall transition truck parking facilities to a low availability alarm state when the availability goes below the low availability alarm threshold.	Inspection					
78	5	SunGuide Software System Requirements	SunGuide software shall transition truck parking facilities to a low availability warning state when the availability goes between the low availability alarm threshold and the low availability recovering threshold.	Inspection					
79	5	SunGuide Software System Requirements	SunGuide software shall transition truck parking facilities to a sufficient availability state when the availability goes above the low availability recovery threshold.	Inspection					
80	5	SunGuide Software System Requirements	SunGuide software shall present a truck parking low availability alert to the operator when the facility transitions from a sufficient availability state to a low availability alarm state.	Inspection					
81	5	SunGuide Software System Requirements	SunGuide software shall automatically dismiss a truck parking low availability alert when the facility transitions from a low availability alarm state to a sufficient availability state.	Inspection					
82	5	SunGuide Software System Requirements	SunGuide software shall present the operator with a truck parking availability facility status dialog when the operator clicks on the low availability alert.	Inspection					
83	5	SunGuide Software System Requirements	SunGuide software shall dismiss a truck parking low availability alert when the operator invokes the dismiss alert button from the status dialog for that facility.	Inspection					
SECTION 6 FL 511 SYSTEM REQUIREMENTS									
84	6	FL511 System Requirements	The FL511 system shall receive truck parking availability information from center-to-center publisher software	Inspection					
85	6	FL511 System Requirements	The FL511 system shall provide information to motorists through the web site, mobile apps, and third-party data feed.	Inspection					
86	6	FL511 System Requirements	The FL511 mobile app shall display the current value of available truck parking.	Inspection					
87	6	FL511 System Requirements	FUTURE: The FL511 mobile app shall display the predicted value of available truck parking.	Inspection					
88	6	FL511 System Requirements	The FL511 mobile app shall display the truck parking facilities with their truck parking information on a map.	Inspection					
89	6	FL511 System Requirements	The FL511 mobile app shall display the truck parking facilities with their truck parking information on a list.	Inspection					
90	6	FL511 System Requirements	The FL511 mobile app shall select a subset of the truck parking facilities to display.	Inspection					
91	6	FL511 System Requirements	The FL511 mobile app shall use the user's location and heading to determine the truck parking facilities for which parking availability information will be displayed.	Inspection					
92	6	FL511 System Requirements	The FL511 mobile app shall allow the user to extend the distance range to include additional truck parking facilities to display.	Inspection					
93	6	FL511 System Requirements	The FL511 mobile app shall allow the user to change the time range to include additional facilities.	Inspection					