PROJECT SYSTEMS ENGINEERING MANAGEMENT PLAN

Florida Department of Transportation (FDOT)

District Six

I-95/State Road (SR) 9 Project Development and Environment (PD&E) Study

From South of SR 860/Miami Gardens Drive to North of Broward County Line

Miami-Dade County, Florida

Financial Management Number: 414964-1

ETDM Number: 14419

April 2025

The environmental review, consultation, and other actions required by applicable federal environmental laws for this project are being, or have been, carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 26, 2022 and executed by Federal Highway Administration and FDOT.

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Financial Management Number: 414964-1-22-01
Federal Aid Project Number: N/A
Efficient Transportation Decision Making (ETDM): 14419

DISTRICT VI

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PROJECT SYSTEMS ENGINEERING MANAGEMENT PLAN (PSEMP)

Interstate 95 (I-95) / State Road (SR) 9 Project Development and Environment (PD&E) Study

FDOT Financial Project Identification Number: 414964-1-22-01
Efficient Transportation and Decision Making (ETDM) Number: 14419

Project Study Limits:
From South of SR 860/Miami Gardens Drive
to North of the Broward County Line
Miami-Dade County, Florida

Version: 2.0
Approval Date: TBD

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LIST OF ACRONYMS AND ABBREVIATIONS

APL ..... Approved Product List
AVI ..... Automatic Vehicle Identification
BCTED ..... Broward County Traffic Engineering Division
CCTV ..... Closed Circuit Television
CE&I ..... Construction Engineering and Inspection
CFP ..... Cost Feasible Plan
CMB ..... Change Management Board
CO ..... Central Office
ConOps ..... Concept of Operations
DDI ..... Diverging Diamond Interchange
DMS ..... Dynamic Message Sign
DMV ..... Department of Highway Safety and Motor Vehicles
FDOT ..... Florida Department of Transportation
EL ..... Express Lane
EOR ..... Engineer of Record
ERC ..... Electronic Review Comments
FDOT ..... Florida Department of Transportation
FHP ..... Florida Highway Patrol
FLATIS ..... Florida Advanced Traveler Information System
FMS ..... Freeway Management System
FPID ..... Financial Project Identification
FTE ..... Florida Turnpike Enterprise
GMX ..... Greater Miami Expressway
GPL ..... General Purpose Lane
HAR ..... Highway Advisory Radio
ITS ..... Intelligent Transportation Systems
LSDMS ..... Lane Status Dynamic Message Signs
MDX ..... Miami-Dade Expressway Authority
MOE ..... Measure of Effectiveness
MOP ..... Measure of Performance

MP ..... Milepost
MTR ..... Minimum Technical Requirements
MTS ..... GMX Toll Collection System
MVDS ..... Microwave Vehicle Detection System
OTM ..... Operations Task Manager
PD&E ..... Project Development and Environment
PITSA ..... Project Intelligent Transportation System Architecture
PM ..... Project Manager
PSEMP ..... Project Systems Engineering Management Plan
QM ..... Quality Management
RCTO ..... Regional Concept for Transportation Operations
RFP ..... Request for Proposal
RITSA ..... Regional Intelligent Transportation System Architecture
RTVM ..... Requirements Traceability Verification Matrix
SAT ..... Stand Alone Test
SEA ..... Systems Engineering Analysis
SEP ..... Systems Engineering Process
SFCS ..... South Florida Commuter Services
SITSA ..... Statewide Intelligent Transportation System Architecture
SR ..... State Road
TADMS ..... Toll Amount Dynamic Message Signs
TERL ..... Traffic Engineering Research Lab
TMC ..... Transportation Management Center
TSM&O ..... Transportation Systems Management and Operations
USC ..... United States Code
WBS ..... Work Breakdown Structure
WGS ..... Warning Gate System

1. OVERVIEW

The first section of the Project Systems Engineering Management Plan (PSEMP) document provides seven elements: an overview of the document, need for a PSEMP, project identification, purpose and scope, technical project summary schedule, relationship to other plans, and applicable documents. These elements are described in the following sections.

Per 23 United States Code, Part 940 (23 USC 940 or Rule 940), a Systems Engineering Analysis (SEA) is required for all Intelligent Transportation Systems (ITS) projects using federal funds. The Federal Highway Administration (FHWA) oversees compliance with Rule 940. The Florida Department of Transportation (FDOT) ensures compliance with Rule 940 by use of the FDOT Systems Engineering and Intelligent Transportation Systems (ITS) Architecture Procedure, 750-040-003.

1.1. Document Overview

This document is the PSEMP for the Interstate 95/SR 9 Project Development & Environment (PD&E) Study from South of SR 860/Miami Gardens Drive to North of the Broward County Line (I-95 Project) in District Six (D6). Figure 1 presents the Project Location Map.

This PSEMP is a plan that helps manage and control the project utilizing systems engineering processes (SEP). The PSEMP identifies what items are to be developed, delivered, integrated, installed, verified, and supported as a part of the project. It documents certain processes and procedures for technical management, procurement, installation, and acceptance of the project. The document satisfies the requirement for a PSEMP for high-risk Intelligent Transportation System (ITS) projects. The PSEMP details are scaled in proportion with the scope, risk, and complexity of the project.

This document is intended for stakeholders involved in the management and execution of the project as a reference. However, it may include a variety of people from multiple parties with various levels of technical knowledge. Therefore, it is important that the document be clearly written, define technical terms, and use layman's English for most of the text.

The document is organized as follows:

- Section 1 – Overview of the PSEMP document
- Section 2 – Systems Engineering Processes
- Section 3 – Project Management and Control

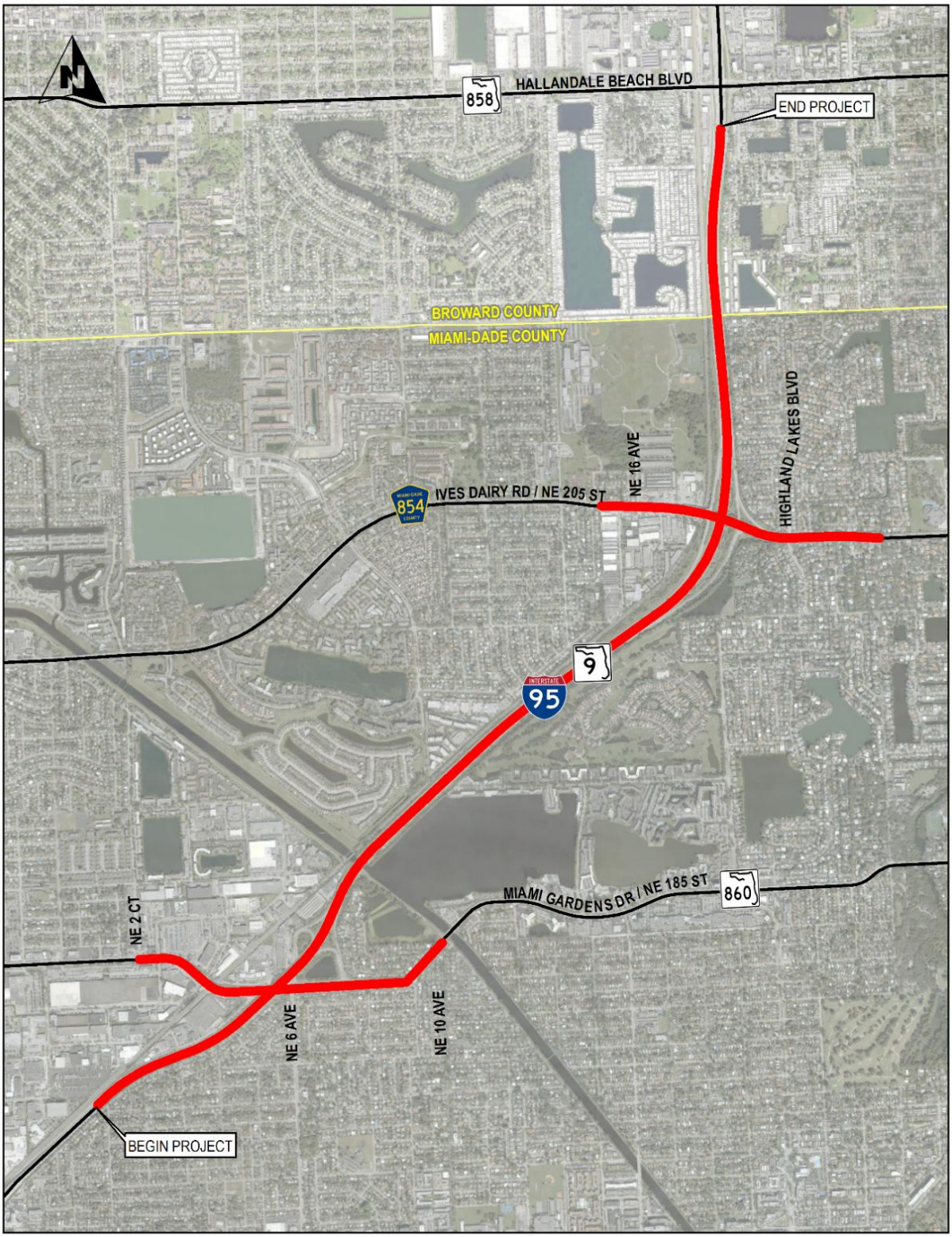

Figure 1 - Project Location Map

1.2. Need for a Project Systems Engineering Management Plan

The Florida Department of Transportation (FDOT) requires high-risk intelligent transportation systems (ITS) projects using federal funds to use Systems Engineering Processes (SEP). The PSEMP documents how systems engineering will be used for ITS project management. Florida's Statewide Systems Engineering Management Plan (SEMP) is used as a reference guide in the creation of this PSEMP.

1.3. Project Identification

Project Name: *I-95/SR 9 Project Development & Environment (PD&E) Study from South of SR 860/Miami Gardens Drive to North of the Broward County Line*

Financial Project Identification: *FM414964-1*

Federal Aid Project Number: *None at this time*

1.4. Project Purpose and Scope

This document serves as the PSEMP for the I-95 Project. It provides planning guidance for technical management, procurement, installation, and acceptance of the project, which includes various geometric improvements including additional express lane capacity and access points from South of SR 860/Miami Gardens Drive to North of the Broward County Line and mainline geometric and interchange improvements throughout the corridor. The concept minimizes modifications to programmed/planned improvements from other projects. The purpose of the improvements is to address growth in vehicular traffic volumes, improve highway safety, address noise levels, and improve system-to-system connectivity. Further details of the project can be obtained by reviewing other documents such as the Concept of Operations (ConOps) for the I-95/SR 9 section from South of SR 860/Miami Gardens Drive to the North of the Broward County Line.

1.5. Technical Project Summary Schedule

The high-level project schedule, based on the current work program, is summarized below:

	Fiscal Year
Project Development & Environmental Study	2021 - 2025
Design	2025 - 2028
Right of Way Acquisition (Being Funded)	2029 - 2032
Construction (After Golden Glades Interchange Lite Project)	2032 - 2037

1.6. Relationship to Other Plans

The relationship between the Proposed Project (FM414964-1) and other I-95 Improvement Projects within Districts Four and Six, is shown in Table 1.

Table 1 – Relationship to Other Plans

	FM	Name	Project Manager	Phase	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
D4	Varies	95X PHASE 3	Mark Moshier	PD&E														
				Design														
				Construction														
D6	431053-1/2/3/4/5 428358-1/4/5/8	GGI LIGHT (GGI INTERIM)	Raul Quintela	PD&E														
				Design														
				Construction														
D4	436903-1	SR-9/I-95 FR MD/BROW LINE TO N OF SR-820/HOLLYWOOD BLVD	Kenszot Jasmin	PD&E														
				Design														
				Construction														
	439170-1	SR-9/I-95 FROM MIAMI-DADE/BROWARD COUNTY LINE TO NORTH OF GRIFFIN ROAD	Leslie Wetherell	PD&E														
				Design														
				Construction														
D6	**414964-1**	**SR 9A/I-95 FROM S OF MIAMI GARDENS DRIVE TO N OF BROWARD COUNTY LINE**	Auraliz Lola Benitez	PD&E														
				Design														
				Construction														
	428358-3	SR 826/PALMETTO XWAY FROM W. OF NW 17TH AVENUE TO I-95 (EXPRESS LANES)	Raul Quintela	PD&E														
				Design														
				Construction														
	440228-2	I-195 IMPROVEMENTS (WITH CONNECTION TO 95 EXPRESS)	Ivette Funtanellas	PD&E														
				Design														
				Construction														
	428358-5	SR 9A/I-95 FROM N. OF BISCAYNE CANAL TO SR 860/MIAMI GARDENS DR	Raymond Valido	PD&E														
				Design				on hold										
				Construction														
	414964-8	SR 9A/I-95 FROM SOUTH OF NW 62ND STREET TO NORTH OF NW 143RD STREET	Bao-Ying Wang	PD&E														
				Design														
				Construction														
	414964-7	SR 9A/I-95 FROM US-1/SOUTH DIXIE HIGHWAY TO SOUTH OF NW 62ND STREET	Bao-Ying Wang	PD&E														
				Design														
				Construction														
	414964-9	SR 9A/I-95 FROM NORTH OF NW 143 STREET TO SOUTH OF SR 860/MIA GDNS DR	Bao-Ying Wang	PD&E														
				Design														
				Construction														

= Currently not funded (subject to change)

In addition, other related plans are listed below:

- Golden Glades Interchange from SR 826/Palmetto Expressway Eastbound to I-95 Northbound Project Development and Environment Study, FM No. 428358-1-22-01
- Southeast Florida Express Lanes Regional Concept for Transportation Operations (RCTO) dated May 2014
- Golden Glades Interchange Improvements – Overall, dated June 14, 2019
- Concept of Operations for Interstate 95/SR 9 from South of SR 860/Miami Gardens Drive to North of the Broward County Line, dated April 2025

1.6.1. Relationship to Florida's Ten-Year ITS Cost Feasible Plan

The Ten-Year ITS Cost Feasible Plan (CFP) is a ten-year program and resource plan that identifies ITS projects in the overall context of Florida's ITS Corridor Implementation Plans. It represents a commitment of state- and District-managed ITS funds to provide a coordinated statewide program to develop ITS infrastructure on Florida's major intrastate highways. The FDOT's current Ten-Year ITS CFP is available online at https://www.fdot.gov/traffic/its/projects-deploy/ten-year-cfp.shtm.

1.6.2. Relationship to Florida's Statewide ITS Architecture

The I-95 Project is included in the District Six Regional ITS architecture (RITSA), which will be developed as part of the Florida Statewide ITS Architecture (SITSA). More information on the current SITSA is available online at https://teo.fdot.gov/architecture/.

The FDOT District Six SunGuide® Transportation Management Center (TMC) monitors and controls the ITS field devices by using the Statewide SunGuide® Software. FDOT District Six SunGuide® TMC controls the functionality of the tolls with the SunGuide® Software. Figure 2 provides a high-level system overview for the I-95/SR 9 corridor, and the stakeholders along the corridor.

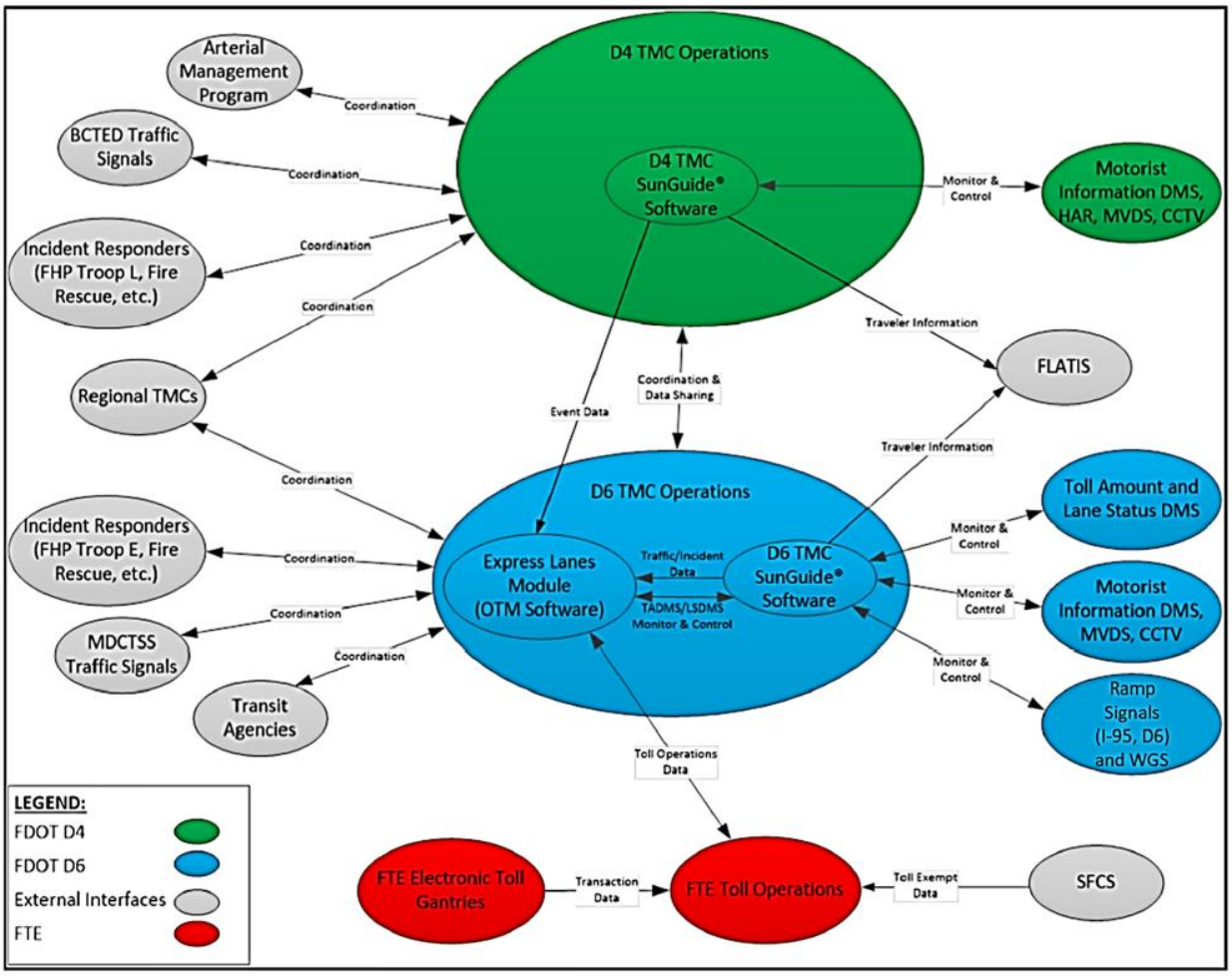

Figure 2 - I-95/SR 9 Express Lane System Overview

1.6.3. Relationship to Other "On-project" Plans

As the I-95 Project develops through the design phase, the FDOT Project Manager (PM) will be responsible with developing, maintaining, or updating the Quality Management (QM) Plan, ConOps, PSEMP, and the Requirements Traceability Verification Matrix (RTVM). In addition to this document which details planning and guidance for the I-95 Project, there is also a project level ConOps and PSEMP for the individual projects listed in the I-95 Corridor Planning Study.

1.7. Applicable Documents

The documents listed in Table 2 is part of this document to the extent specified herein. In the event of a conflict between the contents of the documents referenced herein and the contents of this PSEMP, the final Request for Proposal (RFP) and Minimum Technical Requirements (MTR), if required, shall be considered the superseding document for each project.

Table 2 – Referenced Documentation

Document	Information
Concept of Operations for Interstate 95/SR 9 from South of SR 860/Miami Gardens Drive to North of the Broward County Line	FDOT District Six Project Manager: Auraliz Benitez, P.E. 305-470-5471 FPID: 414964-1
National ITS Architecture, Version 7.0	United States Department of Transportation 1200 New Jersey Avenue SE, Washington, DC 20590 www.standards.its.dot.gov/LearnAboutStandards/NationalITSArchitecture
Florida Statewide ITS Architecture (SITSA)	Information on SITSA is available online at https://teo.fdot.gov/architecture/
Managed Lane Diagrams *- 95 Express Phase 3C (Estimated Operating Year 2025)* *- D6 PD&E (SR 860/ Miami Gardens Drive to Broward County Line)* *- GGI Improvements Light (Estimated Operating Year 2031)* *- 95 Express Ultimate (US-1 to I-595)*	FDOT District Six 1/13/2025

2. SYSTEMS ENGINEERING PROCESSES

Key processes that will be used are:

- Identify portions of the RITSA that are being implemented
- Develop the Project ITS Architecture (PITSA)
- Develop the project-specific ConOps
- Develop the PSEMP
- Development and/or Validation of High-level Functional Requirements
- Development and/or Validation of Detailed Functional Requirements
- Technical Reviews
- Risk Identification, Assessment, and Mitigation
- Creation of the RTVM
- Creation of performance measure metrics
- System testing, integration, and acceptance

2.1. Developing the Project ITS Architecture (PITSA)

The I-95 Project includes the following service packages:

- Transportation Decision Support and Demand Management
- Electronic Toll Collection
- Road Closure Management (includes Warning Gate System)

The Transportation Decision Support and Demand Management suggest actions that can be implemented by the operational personnel based on the data and information obtained. The personnel can have the travel demand or tolling status to influence traveler route. Figure 3 provides a high-level view on how the stakeholder operates with other entities (source: Florida Statewide ITS Architecture).

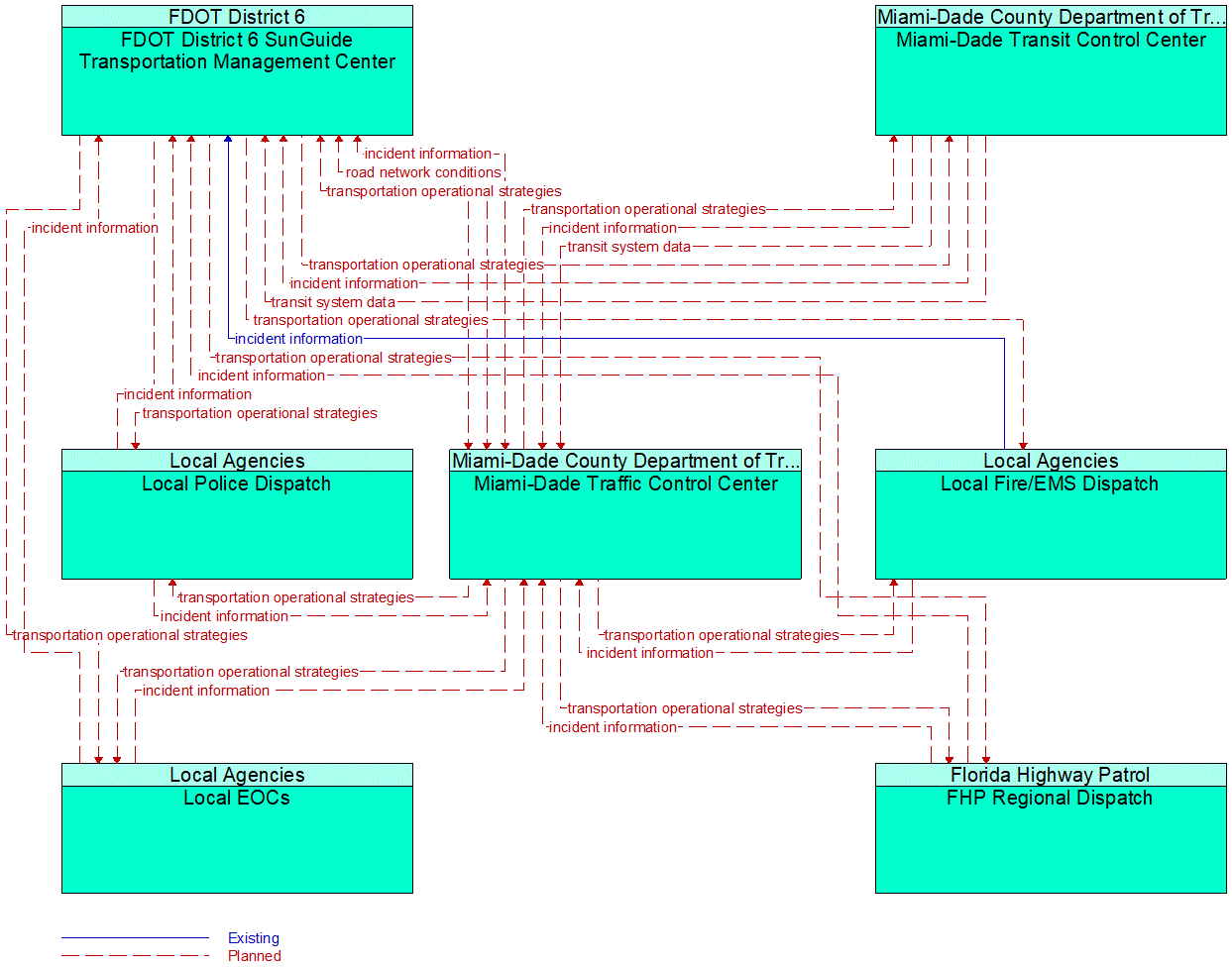

Figure 3 - Transportation Decision Support and Management Information Flow Diagram

The Electronic Toll Collection package provides the ability to charge tolls electronically and detect all violations to the system. The fees collected on the system may be adjusted depending on the demand. Figure 4 illustrates how each entity is related in the system (source: Florida Statewide ITS Architecture).

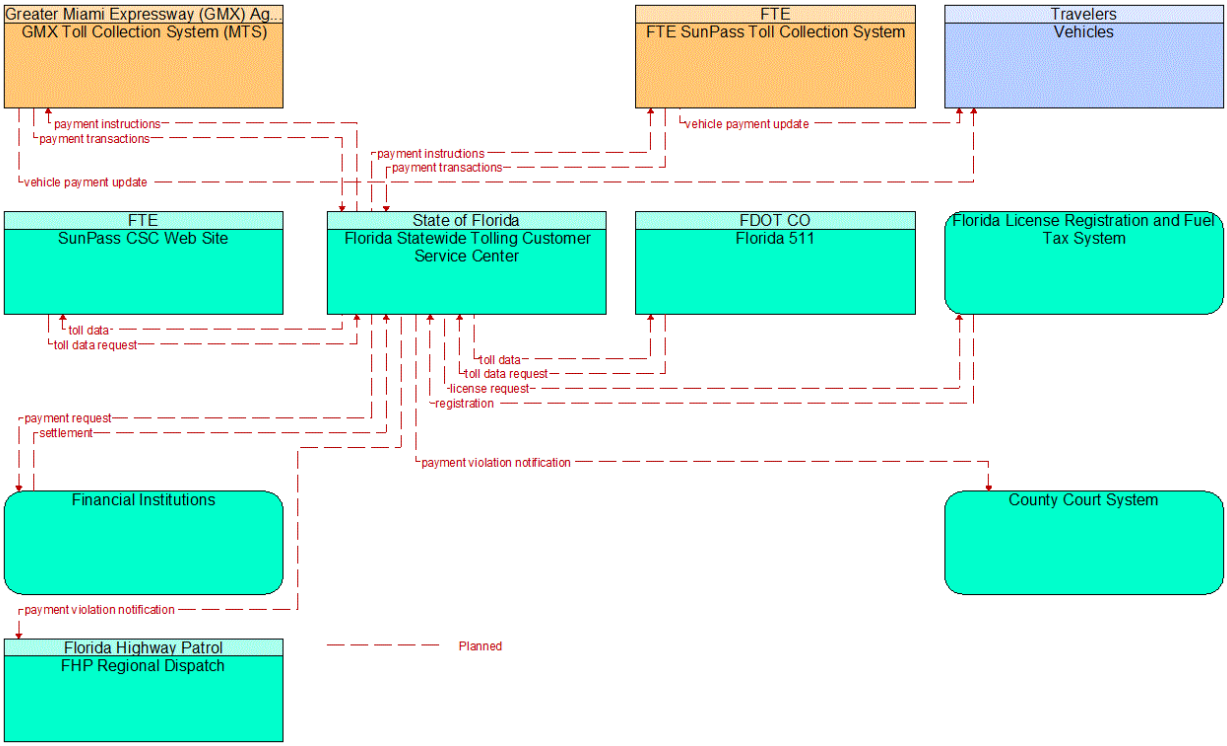

Figure 4 - Electronic Toll Collection Information Flow Diagram

The Road Closure Management package has the ability to close the road or the system once it is not safe for traffic vehicles, and the package closes the road with automatic or remotely controlled gates or barriers which control access to the road. FDOT District Six currently operates and maintains a Warning Gate System (WGS) as it relates to specific ingress (entrance) locations for I-95 Express Lanes (EL) in Miami-Dade County. The I-95 Project should consider, during the design phase, if expansion of the WGS is warranted with the introduction of new ingress locations between the I-95/SR 9 interchanges with SR 860/Miami Gardens Drive and I-95/SR 9 CR 854/Ives Dairy Road. Figure 5 is an illustration of how the stakeholder manages the roadway closure (source: Florida Statewide ITS Architecture). Figure 6 is a high-level overview of the relationship of the system to SunGuide® Software.

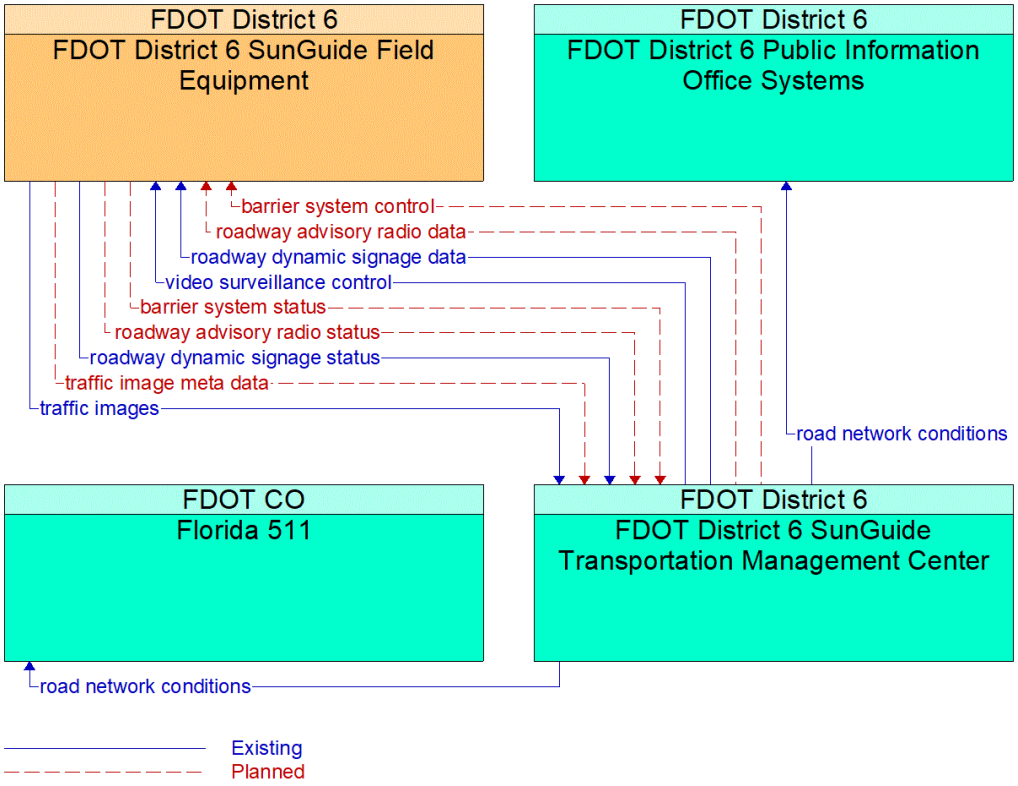

Figure 5 - Road Closure Management

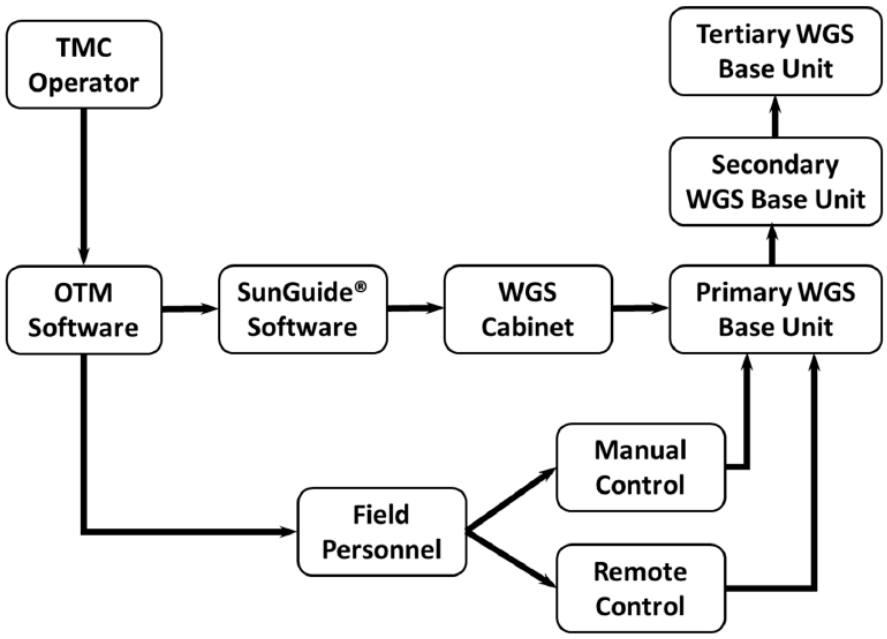

Figure 6 - Warning Gate System (WGS) High Level Overview

2.2. Identifying High-Level Functional Requirements (System)

The ConOps document for this project describes the preliminary high-level project requirements from the customer and stakeholder perspectives. These requirements are similar to those for the existing deployments within FDOT District Six and Florida's Turnpike and, therefore, will result in a similar deployment. Regionally, the RCTO can also be referred to for high-level functional requirements for the region. Please refer to the ConOps (Tables 3, 4, and 5) for detailed information regarding the roles and responsibilities of the stakeholder partners, specifically FDOT District Six and FTE.

2.3. Developing Detailed Requirements

The detailed requirements for the project will be developed based on the FDOT Standard Specifications for Road and Bridge Construction and FDOT Design Standards. Only products listed on the FDOT Approved Products List (APL) will be installed on this project unless approved by the Department. APL approved products have been tested by the FDOT Traffic Engineering Research Lab (TERL) and found to be compliant with the requirements of the FDOT Standard Specifications for Road and Bridge Construction. The detailed requirements will be documented in a project-specific Requirements Traceability Verification Matrix (RTVM) – see Appendix A.

2.4. Performing Trade-off Studies, Gap Analyses, or Technology Assessments

The ConOps compares the program needs with the capabilities of the existing system components, functions, and features. The I-95 Project PD&E Study ConOps indicates that while the proposed project introduces new access points (ingress/egress) to the existing EL facility, the existing ITS devices (e.g., DMSs, CCTV cameras, vehicle detectors) and fiber optic communications are assumed to be replaced with new equipment complying with the current FDOT standards, specifications, and Approved Product List (APL).

2.5. Performing Technical Reviews

During design of the I-95 Project, FDOT requires submittal of Phase I, II, III, and Signed and Sealed Plans and specifications. FDOT personnel and their consultants will be given 21 days to review each phase submittal and provide their comments via the FDOT Electronic Review Comments (ERC) system. Comments will be addressed by the designer and comment resolutions will be provided to the commenter for their review and approval.

During the implementation phase, the contractor will submit product information and specifications for all materials and devices to demonstrate their adherence to project requirements. The designer will review this documentation to determine whether the product meets the project specifications or not. If the product does not meet project specifications, the designer shall reject the product, noting the project specification is not met by the product. For any rejected products, the contractor shall submit additional documentation proving the product meets the specification or shall submit another product for review. In addition to the products and specifications, the contractor will also be required to submit test plans and procedures, system and subsystem testing plans, and as-built documentation, based on the RFP and other contract documents.

2.6. Identifying, Assessing and Mitigating Risk

Risk Management is an important part of the SEP and must be incorporated into every portion of the project. Most ITS projects have inherent risks such as availability of power, permitting, available right of way and conflicting projects. Risks are categorized into the following areas:

- **Low Risk** defines an area in which technical and project metrics are within plan or tolerances.
- **Medium Risk** defines an area in which one or more major technical or performance metrics are out of tolerance but are within the maximum established limits for low-impact recovery techniques.
- **High Risk** defines an area with potential serious failures in accomplishment, which requires major milestone re-planning or intensive reallocation of personnel and resources.

The risks associated with proposed changes to the system for the I-95/SR 9 project, or with the management of the schedule or budget, are listed below in Table 3. This risk register should be updated by the Engineer-of-Record (EOR) and Construction Engineering & Inspection (CE&I) staff as the project advances from planning to the design and construction phases.

Table 3 – Risk Register

Risk #	Risk Owner	Description of Risk and Impact	Likelihood (1-4)	Impact (1-4)	Rating (L + I) (2-8)	Mitigation Strategy
1	FDOT D6	Blockage in Elevated NB Collector/Distributor Ramp to ELs, thereby causing delays, queuing and potential for secondary crashes	2	4	6	Automated Incident Detection, and Road Ranger response in accordance with predefined incident response plan including warning gate system
2	FDOT FTE	Emerging Technologies to replace Legacy ITS/Toll Collection Systems, thereby providing opportunities for O&M cost efficiency	3	3	6	Coordination with FTE and FDOT Central Office Emerging Technology Division
3	FDOT D4/6 FTE	Cut in Fiber Optic Communications during construction, thereby resulting in temporary outages	2	4	6	Coordination with CE&I firms to share as-builts with Contractors to avoid fiber optic cuts
4	FDOT D4/6 FTE	Construction Timing in relation to FDOT District Four I-95/SR 9 ELs, thereby impacting Signing and Tolling Systems	2	3	5	Coordination with FDOT District Four to schedule adjacent projects to minimize throw-aways

Risk #	Risk Owner	Description of Risk and Impact	Likelihood (1-4)	Impact (1-4)	Rating (L + I) (2-8)	Mitigation Strategy
5	FDOT D6	DDI Safety / Operational Risk at CR 854/Ives Dairy Road	2	3	5	Public Education and Outreach program prior to operational start-up
6	FDOT FTE	Changes in Pricing Policies to address either congestion in ELs and/or public acceptance	2	2	4	Analysis of toll pricing changes and anticipated impact on travel behavior and free flow traffic
7	FDOT FTE	Cybersecurity Risks impacting reliability of ITS / Tolling Systems	1	3	4	Strict compliance with FDOT IT standards

Note: This table uses estimates of likelihood (1-4) and impact (1-4) of the risk. When added, they become a risk rating (2-8), which can be used to rank the risks.

Mitigation action plans are required for all medium-risk and high-risk items. These plans assign specific actions to specific individuals to achieve detailed and correct analyses of each addressed risk and execute corrective actions. The FDOT District Six or their representative formulate these directive plans and intensely monitor progress against directives.

Effective mitigation plans will be developed by the FDOT District Six or their representatives, during the design and construction phases with the assistance of other key individuals. These individuals initiate mitigation actions, continually monitor the mitigation progress, and perform follow-up activities, as required. Mitigation action plans, procedures, schedules, and responsibility definitions are maintained by the FDOT District Six Project Manager or their representative.

The designer will be responsible for performing duties to mitigate the associated risks to the extent possible within the design phase. As the project proceeds, the designer will have to establish coordination with local power companies to define the project's utilities. There will be permits which the designer will need to request from the local agencies.

2.7. Creating the Requirements Traceability Verification Matrix (RTVM)

A RTVM consists of the functional, performance, and environmental requirements of the system. The designer will not be required to create a RTVM but will be responsible for the creation and use of appropriate test plans to demonstrate adherence to the requirements outlined within the contract and the FDOT Standard Specifications for Road and Bridge Construction. A Preliminary RTVM for this project is included in the Appendix. The designer should update the RTVM as needed throughout the life of the project.

2.8. Conducting System Testing, Integration, Verification, Validation, and Acceptance Planning for ITS

As the I-95 Project is developed, it will be necessary to prepare an Integration and Test Plan that describes the performance and control of all aspects and levels of integration and testing. This plan will include milestones defining the completion of each test procedure and the beginning of the next corresponding test procedure. The plan will cover all processes to the extent possible and needed to ensure the FDOT of a properly tested, configured, and fully functional system.

The I-95 Project will require coordination with the FDOT TSM&O staff to define the optimum integration sequence for the various hardware and software functions and develop schedules and procedures for testing those products as they are integrated. Some tests which will be developed for the device's accuracy are the following:

- System Integration and Testing
- Stand-Alone Testing
- Subsystem Testing
- End-to-End Testing
- System Acceptance Testing
- Project Completion and Close Out

2.8.1. System Integration and Testing

The contractor will be responsible for all Integration and Testing for the System, and the Construction, Engineering and Inspection (CE&I) engineer will be responsible for oversight of all Integration and Testing efforts. Arrangements must be made with FDOT District Six and Florida's Turnpike personnel prior to performing any testing or integration that uses an existing communications system component. As part of the Integration and Test Plan, the contractor shall provide Stand-Alone, Subsystem and System Acceptance Testing Procedures as described in detail in the following sections. Due to the overlap of tolling equipment and operations between Florida's Turnpike and FDOT District Six, these procedures will be reviewed by Florida's Turnpike, FDOT District Six, and Consultant personnel to ensure that the procedures will demonstrate full compliance with the project requirements.

As a part of this integration, the construction contractors shall be responsible for integrating all ITS components installed in their contract into the SunGuide® software and the Statewide Express Lanes Software (SELS), as well as testing and confirming a fully functioning ITS/toll system.

2.8.2. Stand-Alone Testing

As previously described, the contractor is responsible for developing Stand-Alone Test (SAT) Procedures for each device used on the I-95 Project. The Stand-Alone Test Procedures are to be submitted as part of the Project Integration and Testing Plan. The procedures will be reviewed by Florida's Turnpike, FDOT District Six, and Consultant personnel to ensure that the contractor clearly demonstrates their adherence to Project Requirements.

Each piece of equipment at each individual site must be tested to show compliance with the Project Requirements. Stand-Alone Testing of a site will be accomplished only after all equipment at that site can be shown to work as a stand-alone unit. Stand-Alone Testing must be completed prior to any System Integration efforts.

2.8.3. Subsystem Testing

The Subsystem Test Procedures are to be submitted as part of the Project Integration and Test Plan. The Subsystem Test shall be developed such that it demonstrates connectivity to the entire system and can demonstrate adherence to the project requirements for each of the systems being deployed. The procedures will be reviewed by Florida's Turnpike, FDOT District Six, and Consultant personnel to ensure that the contractor clearly demonstrates their adherence to Project Requirements.

2.8.4. End-to-End Testing

After successful completion of the subsystem testing, the contractor will be responsible for demonstrating all components of the project are detecting and tolling all vehicles. This shall be achieved by driving probe vehicles, with preestablished transponder serial numbers, within the express lanes to successfully show each vehicle is properly identified and charged for the segments in which the vehicle traveled. The contractor will provide documentation of the end-to-end test.

2.8.5. System Acceptance Testing

The contractor, while being observed by the CEI, Florida's Turnpike, and FDOT District Six personnel, shall perform a systemwide test at the Florida's Turnpike TMC in Pompano, Florida's Turnpike Customer Service Center in Boca Raton, and the FDOT District Six TMC in Miami-Dade County. The contractor will be responsible for ensuring all ITS components are operational at both TMCs. Due to the complexity of equipment being owned by Florida's Turnpike and FDOT District Six, with I-95/SR 9 EL equipment being operated by both Florida's Turnpike and FDOT District Six, it is imperative that the system be fully functional at both TMCs and the Customer Service Center.

2.8.6. Project Completion and Close Out

Upon successful completion of the final system test, the contractor will turn over responsibility for all components of the project to FDOT District Six and Florida's Turnpike. The contractor will provide documentation of the final system test. The contractor will also provide as-built documentation for all infrastructure as well as device warranties and all other applicable documentation.

2.9. System Validation

System Validation performance measures are discussed in the ConOps. The development and use of Performance Measures is an effective means of showing the value of an ITS project. It is recommended that FDOT generate a comprehensive performance measure program to accurately measure how successfully the system is performing. The FDOT ITS Central Office compiles an annual report summarizing the progress of the Statewide ITS System. This annual report is supplemented with performance measures on ITS managed roadways provided by the individual districts. These performance measures are generated from the SunGuide® Software Performance Measures Reporting System and include both Measures of Effectiveness (MOEs) and Measures of Performance (MOPs). As the I-95 Project is consistent with existing operations of ELs, GPLs, and other ITS subsystems, no change is recommended with the existing FDOT District Six list of MOEs and MOPs.

2.9.1. Measures of Effectiveness (MOE)

The MOEs will be used to determine how well the system design meets the requirements and will quantify the project specific benefits. The following MOEs should be considered by FDOT District Six and Florida's Turnpike on a monthly and annual basis:

- Monthly Performance Reporting/General Data Requests:
  - Total Trips
  - Tolls (Florida's Turnpike Reporting)
    - Monthly Revenue
    - Total Revenue
    - Minimum and Maximum Range
    - Average Weekday
    - Average Peak Period
    - Toll Distribution by amount/by hour
    - Average Weekend
    - Average Off Peak
    - 85th Percentile Weekday
    - Exempt Vehicle data
    - Exempt Vehicle data during Peak Periods
- Volume (Express Lanes and General Use Lanes)
  - Average Weekday
  - Average Weekend
  - Average Peak Periods
- Speed (Express Lanes and General Use Lanes)
  - Average Overall
  - Average Peak Periods
  - Percentage of Time Above 45 MPH
  - Percentage of Time Below 40 MPH
- Facility Availability
  - Percentage of Time Closed due to Planned Events
  - Percentage of Time Closed due to Non-Recurring Events
- Travel Time Reliability Measures
  - Travel Time Index
- Mobility Measures
  - Travel Time (i.e., between toll gantries)
  - Vehicle Miles Traveled
  - Vehicle Hours Traveled
  - Delay
- Safety Measures
  - Crash Rate by type
  - Crash Frequency by type
- Vehicle classification
- EL utilization

- Conduct periodic analysis when system approaches undesirable performance:
    - Speeds drop below 45 MPH in the Express Lanes during peak periods (speed reliably)
    - Extended or frequent closures that impact availability of the Express Lanes

2.9.2. Measures of Performance (MOP)

The MOPs are the engineering performance measures that provide the design requirements needed to satisfy the MOEs. After functional system requirements are defined and low-level requirements are allocated by the Systems Engineer to the subsystems, components, and elements of the system, the Systems Engineer will select or specify the requirements that are testable. Testable requirements are MOPs that can be traced to stakeholder requirements and their MOEs. The following MOPs should be considered for:

- Accuracy of EL-MVDS, compared against each other and to the associated toll gantry, within each toll segment
- Minimum Repair Times
    - Fiber Optic Cable
    - Closed-Circuit Television (CCTV) Cameras
    - Microwave Vehicle Detection System (MVDS)
    - Dynamic Message Signs (DMS)
    - Power Systems
    - Tolling equipment
    - Automatic Vehicle Identification (AVI)
    - Ramp Signal System (RSS)
    - Warning Gate System (WGS)
- Downtime of each device and device type
- Downtime of overall system (aggregated over a specified period of time)
- Time to detect failures of device
- Number of times device/system is down
- MVDS Accuracy Levels
- DMS Message Accuracy

3. PROJECT MANAGEMENT AND CONTROL

The tasks in this activity include risk assessment and mitigation planning, technical project management monitoring, budget reallocation, and maintaining the cost and schedule status. The responsibilities of the FDOT Project Manager or their representative and the CE&I during this task are to ensure that the engineering process is complete and that the system design information is released to the appropriate users. Figure 7 provides an illustration of the ITS project stages.

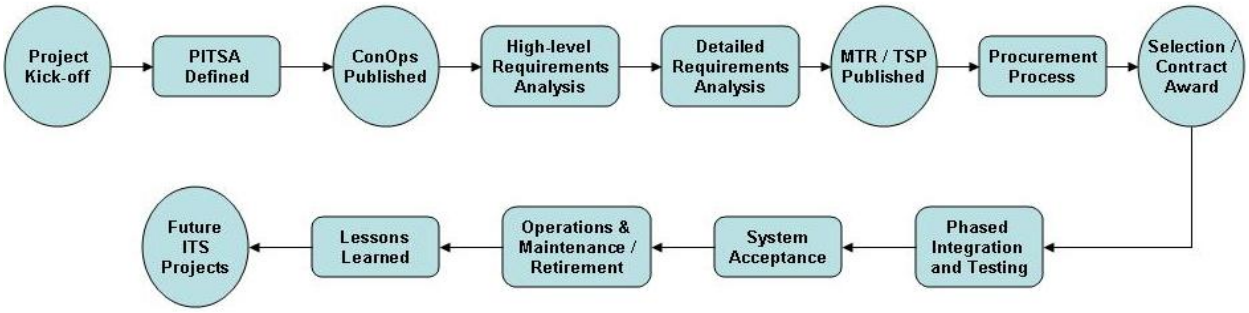

Figure 7 - ITS Project Stages

3.1. Organization Structure

The designer and contractor will work with the FDOT Project Managers, Florida's Turnpike and/or their representative and the CEI to facilitate the successful and efficient completion of the project. The CE&I will have the primary responsibility for construction inspection and oversight; however, the FDOT Project Manager, Florida's Turnpike and/or their representatives may share some of the inspection responsibilities for the project.

The contractor will be required to submit an organizational structure for the project as well. The designer will be responsible for all design aspects to include coordination with power companies, all utility schedules, obtaining all permits, all survey and geotechnical investigation, etc. The contractor's responsibilities are further defined in the RFP/Scope for the project.

3.2. Work Breakdown Structure (WBS) and Work Plan

The tasks, activities and outputs anticipated to be included in the WBS and Work Plan are listed in Table 4.

Table 4 – Work Breakdown Structure Tasks

Kick-off Meeting	System Test Plan and System Test Procedure
Project Management	System Deployment
RTVM Updates / Maintenance	SELS Integration
Risk Register Updates / Maintenance	OTM Enhancements, if necessary
Project Schedule Updates / Maintenance	System Acceptance Testing
Requirements Analysis	System Training
Preliminary Design	Operational Startup
Final Design (Plans and Specifications)	Operations, Maintenance and Support

3.3. Managing the Schedule

An initial schedule will be developed during the plans and specifications package development, which will be fine-tuned when the contractor is selected. The final project schedule will be developed with coordination between the FDOT Project Manager and/or their representatives, the CEI, and the contractor.

3.4. Procurement Management

The contractor and their sub-contractors will be responsible for procurement of all materials, devices, structures, etc. required to complete the construction, integration, and testing of the project. Any items to be used on the project must be submitted to the designer for their review and approval. The designer is responsible for reviewing the submittal to ensure that it is on the FDOT APL, as applicable, and meets all contract specifications and requirements. The contractor will only be compensated for items which have received approval of the designer and are performing as required by the project requirements.

3.5. Risk Management

The preliminary risk identification, assessment, and mitigation approach is described in Section 2.6 herein. The FDOT Project Manager reviews the matrix created by the Systems Engineer and adds some project-level or external risks that are deemed appropriate. This generates a new risk matrix. The new risk matrix will be evaluated by the FDOT Project Manager and the Systems Engineer on a regular basis, especially during or after major reviews.

3.6. Subcontractor Management

The contractor is considered the “Prime” of the project. The prime contractor may hire or team up with subcontractors as needed. In such cases, the prime is directly responsible for managing the sub-contractors/sub-consultants. Sublet documentation is required to be submitted to FDOT District Six and Florida’s Turnpike by the Contractor for any subcontractors who will be working on the project. The subcontractors sublet paperwork must be approved by FDOT District Six prior to them performing any work on the project.

3.7. Engineering Specialty Integration

Engineering specialties are highly focused engineering disciplines included in the I-95 Project to support the FDOT District Six TMS&O Project Manager. These specialists increase the expertise available to the project team and support the specialty requirements of the project. For the I-95 Project, it is not anticipated that anyone outside of FDOT/ Florida’s Turnpike Tolling, Construction, TMS&O, and Consultant staff will be required to assist with the Design, Construction Oversight, Integration or Testing for the Project. For the I-95 Project, all ITS related engineering and implementation will be provided by the ITS Design Team and/or the ITS Contractor. The design and construction contractor representatives will be supported by other FDOT/ Florida’s Turnpike resources as required.

This engineering specialty is responsible for determining the total support required for a system to ensure operational readiness and sustainability throughout its life cycle. The inclusion of integrated logistics support and maintenance engineering will be further evaluated during the design phase of the I-95 Project.

3.8. Communications Management

The Engineer of Record (EOR), designer, and contractor will have periodic meetings with the FDOT PM or their representative and other agencies as required for the resolution of concept, design, and/or construction issues. These meetings may include:

- Action Item reviews and resolution
- County technical issue resolution
- Permit agency coordination
- Local government agency coordination
- Scoping meetings
- Pre-construction meeting
- Major risk item reviews
- Critical path item status review
- Risk Analysis

The contractor will, on a monthly basis, provide an updated Project Schedule and provide written progress reports that describe the items of concern and the work performed on each task. In addition to the project specific progress meetings, the EOR, designer, or contractor will have periodic meetings with the other I-95 corridor projects being planned/designed/constructed simultaneously. This will help with the in-depth coordination that will need to take place to ensure the success of the I-95 corridor. It is recommended that at minimum, FDOT PMs, TSM&O/TMC staff, and tolling operations staff from every project listed in this document attend these meetings.

3.9. Change Management

Changes related to the operations of the express lanes or the software used to manage them, SunGuide®, require careful review. The CE&I, acting for the Construction Project Manager, will inform stakeholders of changes to requirements, systems, and functionality to exhibit the subsequent outcomes. The CE&I is responsible for coordinating with the ITS Project Manager and the Construction Project Manager to determine acceptance of any changes. All changes after the preliminary design must be well documented and distributed to all relevant stakeholders. A single document, developed in accordance with the Construction Project Administration Manual, will be compiled throughout the duration of the Project, which documents all changes that have been made to the Specifications and Plans. Design changes or field changes, due to unforeseen field conditions, must be documented as previously described as well as being included in the as-built set of plans.

Proposed changes to the SunGuide® software that improve the operational strategies used to manage the transportation network shall be brought before the Change Management Board (CMB) that governs the changes to the software. These changes shall be proposed, evaluated, and accepted prior to the completion of construction and will be evaluated during the testing of the system.

3.10. Quality Management

The EOR shall provide a Quality Management (QM) plan that describes the procedures to be utilized to verify, independently check, and review all design drawings, specifications, and other documentation prepared as a part of this project. The FDOT Project Manager shall describe how the checking and review processes are to be documented to verify that the required procedures will be followed.

The QM Plan may be one utilized by the designer as part of their normal operation or may be one specifically designed for this I-95 Project. The designer shall utilize any FDOT's quality control checklist, depending on which entity operates the system in question. The responsible Professional Engineer that performed the Quality Control (QC) review shall sign a statement certifying that the review will be conducted.

The contractor shall be responsible for developing and maintaining a Construction QC Plan which describes their quality control procedures to verify, check, and maintain control of key construction processes and materials.

3.11. Systems Acceptance

The systems acceptance process is critical because this is where FDOT District Six becomes responsible for the continued maintenance and management of the systems, products, and processes delivered. The Construction Project Manager will assign a FDOT District Six, Consultant or CE&I staff member to oversee the project testing. The person designated to oversee the testing must be familiar with the FDOT District Six and Florida's Turnpike's Network Architectures and ITS Systems. The designated individual will use the plans, specifications, and RTVM to supervise the entire testing process. They will provide the status of all tests in report form to the FDOT Project Manager, who will carefully review the reports and decide upon the final acceptance of the system.

3.12. Operations and Maintenance, Upgrade, and Retirement

At the start of construction, the construction contractor will be responsible for the maintenance of ITS devices within the project limits or as otherwise defined in the Contract. As a part of this maintenance support, the construction contractor will prepare an ITS Repair Plan for submittal and approval by FDOT District Six and Florida's Turnpike. Once completed, the ITS Repair Plan will become an Appendix to this PSEMP. This plan will be supplemented with a written assessment of all existing ITS devices and acceptance of the current condition of all ITS devices and infrastructure on the project. Any failures of devices within the project limits after the assessment is complete will be the contractor's responsibility to maintain.

It is recommended that, at minimum, shared use of CCTV cameras owned by one agency but in close proximity to the other is addressed to increase the surveillance capabilities of each agency without the unnecessary cost of installing new cameras. For sharing video streaming, the TMC with the CCTV in their network allows the other TMC's IPs to pass through. For devices that will not be shared, the understanding is that along Florida's Turnpike facilities, they will own and maintain all the ITS and Tolling devices, with the exception of any Toll Amount Dynamic Message Signs (TADMS) and Lane Status Dynamic Message Signs (LSDMS) that display information from

FDOT District Six. Those signs will be operated by FDOT District Six but maintained by Florida's Turnpike as they are within Florida's Turnpike right of way.

FDOT District Six will own and maintain all ITS devices, LSDMS, and TADMS within their jurisdiction, while all tolling equipment will be operated and maintained by Florida's Turnpike. Each agency will be responsible for upgrading and retiring all devices at the conclusion of the warranty period within their jurisdiction in the same manner as discussed earlier in this paragraph.

3.13. Lessons Learned

At the completion of the I-95 Project, the contractor, FDOT Construction, Tolling (w/ Florida's Turnpike), TSM&O personnel, and project CE&I personnel will meet to discuss lessons learned. These lessons will then be incorporated into this document by FDOT District Six TSM&O Staff, or their designee, prior to being considered final.

APPENDIX A –
Requirements Traceability Verification Matrix

REQUIREMENTS TRACEABILITY VERIFICATION MATRIX

Project Name:	*I-95 PD&E Study*
Project Description:	*Interstate 95/SR 9 from South of SR 860/Miami Gardens Drive to North of the Broward County Line*
Project Manager Name:	*Auraliz Benitez, P.E.*
Agency/Firm:	*FDOT District Six*

User Need ID	User Need Summary	Detailed Requirement ID	Detailed Requirement Summary	Document Section	DR Source Document	Verification Test Case ID	Compliance (Y/N/Partial/NA)	Notes/ Comments/ Date	Reviewer Initials	FDOT Initials
FDOT Standard Specification for Road and Bridge Construction, FY 2025-26 - Section 630 – Conduit										
1	Description		Furnish and install conduit for traffic control signals and devices, highway lighting, and other electrically powered or operated devices as shown in the Contract Documents.	630-1	FDOT Standard Specs					
FDOT Standard Specification for Road and Bridge Construction, FY 2025-26 - Section 630-2 – Materials										
2	Locate Wire		Ensure that locate wire is a single copper conductor with a minimum gauge of No. 12 AWG. 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.	630-2.2	FDOT Standard Specs					
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. 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 for surge protection: Table 1: Minimum Standards for Surge Protection Surge Element: 3-element maximum duty fail-safe gas tube. Rating: 40,000 A surge capacity (single-cycle, 8 by 20 microsecond waveform). Life: Minimum 1,000 surges (1000 A to ground). Fail-Safe: Integral fail-shorted device. Insulation Resistance: 1,000 megohm minimum at 100 volts of direct current (VDC). Clamp Voltages: a. Impulse at 100 volts per microsecond: Typically 500 volts. b. Direct Current: 300 to 500 volts.	630-2.3	FDOT Standard Specs					

User Need ID	User Need Summary	Detailed Requirement ID	Detailed Requirement Summary	Document Section	DR Source Document	Verification Test Case ID	Compliance (Y/N/Partial/NA)	Notes/ Comments/ Date	Reviewer Initials	FDOT Initials
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. 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.	630-2.4	FDOT Standard Specs					
5	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.	630-2.4	FDOT Standard Specs					
6	Route Markers		Route markers may be either a standard route marker (SRM) type or an electronic route marker (ERM) type. Ensure the SRM is a rigid, tubular, driven post used for location and notification purposes only.	630-2.5	FDOT Standard Specs					
7	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.	630-2.5	FDOT Standard Specs					
8	Route Markers		Ensure that each SRM is labeled and identified as an FDOT fiber optic cable marker unless otherwise shown in the Plans. 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.	630-2.5	FDOT Standard Specs					
9	Route Markers		Ensure that the identification information is permanently imprinted on the top fitting, and will not peel, fade, or deteriorate.	630-2.5	FDOT Standard Specs					
10	Standard Route Marker (SRM)		Ensure that SRM posts are white with an orange top fitting cover with black or white lettering and graphics.	630-2.5.1	FDOT Standard Specs					
11	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 Ensure that the SRM is a tubular configuration, and both the marker post and the top fitting are made from virgin Type 111HDPE.	630-2.5.1	FDOT Standard Specs					
12	Standard Route Marker (SRM)		Ensure that any fasteners used with the SRM are constructed of stainless steel.	630-2.5.1	FDOT Standard Specs					
13	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.	630-2.5.1	FDOT Standard Specs					
14	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.	630-2.5.1	FDOT Standard Specs					
15	Standard Route Marker (SRM)		Ensure that each SRM provides a tensile strength of 4,200 pounds per square inch as required in ASTM D638. Ensure that each SRM is manufactured for use in temperatures range of minus 30° to 165°F in accordance with NEMA TS 2.	630-2.5.1	FDOT Standard Specs					
16	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.	630-2.5.1	FDOT Standard Specs					
17	Standard Route Marker (SRM)		Ensure that the control sample of any material tested maintains a minimum of 70 percent of its original tensile strength.	630-2.5.1	FDOT Standard Specs					
18	Standard Route Marker (SRM)		Ensure that SRMs installed at the minimum 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.	630-2.5.1	FDOT Standard Specs					

User Need ID	User Need Summary	Detailed Requirement ID	Detailed Requirement Summary	Document Section	DR Source Document	Verification Test Case ID	Compliance (Y/N/Partial/NA)	Notes/ Comments/ Date	Reviewer Initials	FDOT Initials
19	Electronic Route Marker (ERM)		Ensure ERMs meet the same material and performance requirements as the SRMs with the following exceptions. Equip each ERM with a removable, top-fitting cover that is black with white lettering. Ensure that each ERM contains a terminal board equipped with locate wire and ground connectors.	630-2.5.2	FDOT Standard Specs					
20	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.	630-2.5.2	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 630-3 - Installation Requirements										
21	General		Install the conduit in accordance with NEC or National Electrical Safety Code (NESC) requirements and the Design Standards. Consider the locations of conduit as shown in the Plans as approximate.	630-3.1	FDOT Standard Specs					
22	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. Include buried cable warning tape with all trenched conduits.	630-3.1	FDOT Standard Specs					
23	General		Mark the location of the conduit system with route markers as shown in the Plans and approved by the Engineer. Ensure that all route markers used are new and consistent in appearance.	630-3.1	FDOT Standard Specs					
24	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. Meet the requirements of Section 562 for coating all field cut and threaded galvanized pipe.	630-3.1	FDOT Standard Specs					
25	General		Use Schedule 80 PVC or fiberglass reinforced epoxy conduit in structural elements in or on bridge decks.	630-3.1	FDOT Standard Specs					
26	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 traffic control signal and device applications.	630-3.1	FDOT Standard Specs					
27	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.	630-3.1	FDOT Standard Specs					
28	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.	630-3.1	FDOT Standard Specs					
29	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. Obtain the Engineer's approval to use corrugated flexible conduits for short runs of 6 feet or less.	630-3.1	FDOT Standard Specs					
30	General		When a conduit installation changes from underground to above-ground, make the change a minimum of 6 inches below finished grade.	630-3.1	FDOT Standard Specs					
31	General		Install a No. 12 AWG pull wire or polypropylene cord inside the full length of all conduits. Ensure that a minimum of 24 inches of pull wire/cord is accessible at each conduit termination.	630-3.1	FDOT Standard Specs					
32	General		Ensure the conduit includes all required fittings and incidentals necessary to construct a complete installation.	630-3.1	FDOT Standard Specs					

User Need ID	User Need Summary	Detailed Requirement ID	Detailed Requirement Summary	Document Section	DR Source Document	Verification Test Case ID	Compliance (Y/N/Partial/NA)	Notes/ Comments/ Date	Reviewer Initials	FDOT Initials
33	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.	630-3.1	FDOT Standard Specs					
34	General		When backfilling trenches in existing pavement, use a flowable fill meeting the requirements of Section 121.	630-3.1	FDOT Standard Specs					
35	General		Provide a standard clearance between underground control cable and electrical service cable or another parallel underground electrical service cable that meets NESC requirements.	630-3.1	FDOT Standard Specs					
36	General		Prevent the ingress of water, dirt, sand, and other foreign materials into the conduit prior to, during, and after construction. Exclude water and debris from buried conduit and from the top riser assembly of above-ground conduit using a foam-sealing material, rubber plug, or other device designed for this application and approved by the Engineer.	630-3.1	FDOT Standard Specs					
37	Fiber Optic Cable Conduit		Install the conduit system so the fiber optic cable maintains a minimum bend radius of 20 times the cable diameter.	630-3.1.1	FDOT Standard Specs					
38	Fiber Optic Cable Conduit		Use approved methods for connecting inner duct or conduit within or between plowed portions, trenched portions, and bored portions.	630-3.1.1	FDOT Standard Specs					
39	Fiber Optic Cable Conduit		Submit the conduit manufacturer's coupling method and material to the Engineer for approval	630-3.1.1	FDOT Standard Specs					
40	Conduit Sizes		Size the conduit to be used on all installations, unless otherwise shown in the Contract Documents.	630-3.2	FDOT Standard Specs					
41	Conduit Sizes		Use conduit of sufficient size to allow the conductor to be installed without any damage and meeting NEC requirements.	630-3.2	FDOT Standard Specs					
42	Conduit Sizes		Use conduit that is at least 2 inches in diameter, with the following exceptions: - For conduit protecting the ground wire on the side of a pole, use conduit that is at least 1/2 inch in diameter. - 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.	630-3.2	FDOT Standard Specs					
43	Conduit Joints		Make conduit joints using materials as specified by the manufacturer.	630-3.3	FDOT Standard Specs					
44	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.	630-3.3	FDOT Standard Specs					
45	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).	630-3.3	FDOT Standard Specs					
46	Conduit Joints		Ensure that all installed joints are waterproof. 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. Secure the joint and tighten threaded connections.	630-3.3	FDOT Standard Specs					

User Need ID	User Need Summary	Detailed Requirement ID	Detailed Requirement Summary	Document Section	DR Source Document	Verification Test Case ID	Compliance (Y/N/Partial/NA)	Notes/ Comments/ Date	Reviewer Initials	FDOT Initials
47	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.	630-3.3	FDOT Standard Specs					
48	PVC Coating		Apply PVC coating to exposed metal surfaces of the conduit, except for the threads, to attain a nominal thickness of 40 mils. Ensure that the coating is free of sags and drips.	630-3.4	FDOT Standard Specs					
49	PVC Coating		Attach the coupling to the conduit prior to the application of the coating for conduit of 1 inch diameter or less.	630-3.4	FDOT Standard Specs					
50	PVC Coating		Use a coupling with sleeve extensions on conduit larger than 1 inch. 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.	630-3.4	FDOT Standard Specs					
51	Conduit Terminations		Fit the terminating ends of all metal conduit and metal conduit sleeves with an appropriate bushing.	630-3.5	FDOT Standard Specs					
52	Conduit Terminations		For conduit to be encased in concrete, wrap with tape or otherwise protect all terminations to prevent the entrance of concrete.	630-3.5	FDOT Standard Specs					
53	Conduit Terminations		Connect new underground conduits to existing underground conduits with a pull box.	630-3.5	FDOT Standard Specs					
54	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.	630-3.5	FDOT Standard Specs					
55	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.	630-3.5	FDOT Standard Specs					
56	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.	630-3.5	FDOT Standard Specs					
57	Restoration of Trench Areas		Restore the conduit trench construction area to an acceptable condition. Such work includes repair or replacement of all pavement areas, sidewalks, driveways, curbs, structures, landscaping, grass areas (including removal of excavated materials and spoils), removal and disposal of drilling fluids, and backfilling areas disturbed by the conduit installation.	630-3.6	FDOT Standard Specs					
58	Above-Ground Installation		Use conduit designed and manufactured for use in long-term above-ground applications with UV stabilization to prevent material deterioration.	630-3.7	FDOT Standard Specs					
59	Above-Ground Installation		Securely attach above-ground conduit installations to the surface of the supporting structure using conduit straps. As a minimum, use conduit straps located on 5 foot centers. 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. Use the same PVC coating for the metal straps as the conduit, when using PVC coated intermediate metal conduit.	630-3.7	FDOT Standard Specs					

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60	Elbows		The radius of curvature of the centerline of any bend shall not be less than shown below: Table 630-2 Elbow Curvature Size / Standard Radius 1/2 inch / 4 inches 3/4 inch / 4-1/2 inches 1 inch / 5-1/2 inches 1-1/4 inches / 7-1/4 inches 1-1/2 inches / 8-1/4 inches 2 inches / 9-1/2 inches 2-1/2 inches / 10-1/2 inches 3 inches / 13 inches 3-1/2 inches / 15 inches 4 inches / 16 inches 5 inches / 24 inches 6 inches / 30 inches	630-3.8	FDOT Standard Specs					
61	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. Bury locate wire along the centerline of the top outer surface of installed conduit. Do not install locate wire in a conduit with fiber optic cable.	630-3.9	FDOT Standard Specs					
62	Fiber Optic Cable Locate Wire		Do not run locate wires into field cabinets. Terminate locate wires at the first and last pull boxes in the conduit run or as shown in the Plans.	630-3.9	FDOT Standard Specs					
63	Fiber Optic Cable Locate Wire		Ensure that wire termination occurs in a pull box as shown in the Design Standards, Index No. 17700.	630-3.9	FDOT Standard Specs					
64	Fiber Optic Cable Locate Wire		In a trenching operation, install the locate wire no more than 3 inches above the conduit. 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.	630-3.9	FDOT Standard Specs					
65	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. 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.	630-3.9	FDOT Standard Specs					
66	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.	630-3.9	FDOT Standard Specs					
67	Fiber Optic Cable Locate Wire		Make locate wire splices in a flush grade-level box.	630-3.9	FDOT Standard Specs					
68	Fiber Optic Cable Locate Wire		Ensure that locate wire splices are waterproof and suitable for direct burial. Ensure that locate wire splices at the pull box meet NEC requirements.	630-3.9	FDOT Standard Specs					
69	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.	630-3.9	FDOT Standard Specs					
70	Fiber Optic Cable Locate Wire		At the completion of the installation, provide the Engineer with as-built drawings that document all splice locations.	630-3.9	FDOT Standard Specs					

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71	Fiber Optic Cable Locate Wire		Install WGUs in pull boxes and splice boxes as shown in the Plans or directed by the Engineer. 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.	630-3.9	FDOT Standard Specs					
72	Fiber Optic Cable Locate Wire		Terminate the locate wires and connect the WGU to ground in accordance with the manufacturer's instructions.	630-3.9	FDOT Standard Specs					
73	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.	630-3.9	FDOT Standard Specs					
74	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.	630-3.10	FDOT Standard Specs					
75	Route Markers		Remove and replace all marker posts damaged during installation at no additional cost.	630-3.10	FDOT Standard Specs					
76	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.	630-3.10	FDOT Standard Specs					
77	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.	630-3.10	FDOT Standard Specs					
78	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.	630-3.10	FDOT Standard Specs					
79	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. Install an underground magnesium anode a minimum of 10 feet away from the marker and perpendicular to the conduit system.	630-3.10	FDOT Standard Specs					
80	Route Markers		Terminate the anode lead on the connector mounted on the terminal board inside the marker.	630-3.10	FDOT Standard Specs					
81	Route Markers		Install the bond straps between the anode connector and all locate wire connectors to provide cathodic protection for the locate wire conductor.	630-3.10	FDOT Standard Specs					

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FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 633 - Communication Cable										
82	Description		Furnish and install underground and aerial communication cable as shown in the Plans and Design Standards.	633-1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 633-2 – Materials										
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 633-2.1 – Fiber Optic Cable and Connections										
83	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.	633-2.1.1	FDOT Standard Specs					
84	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.	633-2.1.1	FDOT Standard Specs					
85	Single Mode Fiber Optic Cable		Ensure that all components that comprise a single length of cable are continuous and of the same material. Furnish only commercial off-the-shelf materials, equipment, and components.	633-2.1.1	FDOT Standard Specs					
86	Single Mode Fiber Optic Cable		Ensure that the optical fibers used in the cable meet or exceed the Telecommunications Industry Association (TIA) TIA-492-CAAB specification, U.S. Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.902, and International Telecommunication Union ITU-T G.652.D requirements.	633-2.1.1.1	FDOT Standard Specs					
87	Optical Fiber		Use only optical fibers meeting the additional requirements as follows: Table 633-1 Geometry Core-to-Cladding Concentricity: ≤0.5 µm Cladding Noncircularity: ≤0.7% Mode Field Diameter: 1,550 nm; 10.4 µm, ±0.5 µm Optical Cabled Fiber Attenuation: 1,310 nm, ≤0.35 dB/km; 1,550 nm, ≤0.25 dB/km Dispersion: 1,550 nm ≤18.0 ps/(nm·km) Polarization Mode Dispersion Link Design Value (PMDQ): ≤0.04 $ps/\sqrt{km}$	633-2.1.1.1	FDOT Standard Specs					
88	Optical Fiber		Ensure that all fiber in the buffer tube is usable fiber that complies with attenuation requirements. Ensure that fibers do not adhere to each other. Ensure that the fiber is free of surface imperfections and inclusions. Ensure that all fiber optic core glass is from the same manufacturer.	633-2.1.1.1	FDOT Standard Specs					
89	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.	633-2.1.1.2	FDOT Standard Specs					
90	Buffer Tubes		Ensure that buffer tubes provide freedom of movement for internal optical fibers. Ensure buffer tubes allow for expansion and contraction of the cable without damage to internal optical fiber. Ensure that fiber does not adhere to the inside of the tube.	633-2.1.1.2	FDOT Standard Specs					
91	Buffer Tubes		Ensure that buffer tubes permit intentional scoring and breakout without damage to the fiber.	633-2.1.1.2	FDOT Standard Specs					
92	Buffer Tubes		Ensure that each fiber optic cable buffer tube contains 12 fibers per tube unless otherwise shown in the Plans.	633-2.1.1.2	FDOT Standard Specs					

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93	Color Code		Ensure that the marking and color-coding of the fibers and buffer tubes conforms to the E IA/TIA-598-B standard.	633-2.1.1.3	FDOT Standard Specs					
94	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.	633-2.1.1.3	FDOT Standard Specs					
95	Color Code		Ensure that fibers are colored with UV curable inks that remain clearly distinguishable as the intended color.	633-2.1.1.3	FDOT Standard Specs					
96	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.	633-2.1.1.4	FDOT Standard Specs					
97	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.	633-2.1.1.4	FDOT Standard Specs					
98	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.	633-2.1.1.5	FDOT Standard Specs					
99	Water Blocking Compound		Ensure that water-blocking materials are non-nutritive, dielectric, and homogeneous, and free from dirt and foreign matter.	633-2.1.1.5	FDOT Standard Specs					
100	Water Blocking Compound		Use dry water-blocking material for fiber optic cables used for either aerial or underground installations.	633-2.1.1.5	FDOT Standard Specs					
101	Water Blocking Compound		Apply dry water-blocking compound longitudinally around the outside of the central buffer tubes.	633-2.1.1.5	FDOT Standard Specs					
102	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.	633-2.1.1.5	FDOT Standard Specs					
103	Ripcord		Ensure that the cable contains at least one ripcord under the sheath.	633-2.1.1.6	FDOT Standard Specs					
104	Ripcord		Ensure that the ripcord permits the removal of the sheath by hand or with pliers.	633-2.1.1.6	FDOT Standard Specs					
105	Fillers		Fillers or rods may be included in the cable core to lend symmetry to the cable cross section if required.	633-2.1.1.7	FDOT Standard Specs					
106	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.	633-2.1.1.8	FDOT Standard Specs					
107	Outer Jacket		Ensure that the nominal jacket thickness is a minimum of 0.03 inches.	633-2.1.1.8	FDOT Standard Specs					
108	Outer Jacket		Ensure the outer jacket provides UV protection and does not promote the growth of fungus.	633-2.1.1.8	FDOT Standard Specs					
109	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. Ensure that the actual length of the cable is within 1% of the length indicated by the marking.	633-2.1.1.8	FDOT Standard Specs					
110	Outer Jacket		Provide legible marking with contrasting color to that of the cable jacket.	633-2.1.1.8	FDOT Standard Specs					

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FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 633-2.1.1.9 – Performance Requirements										
111	Operating Temperature		Ensure that the shipping and the operating temperature range of fiber optic cable meets or exceeds minus 30º to 158º F.	633-2.1.1.9.1	FDOT Standard Specs					
112	Operating Temperature		Ensure that the installation temperature range of fiber optic cable meets or exceeds minus 22º to 140ºF.	633-2.1.1.9.1	FDOT Standard Specs					
113	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.	633-2.1.1.9.2	FDOT Standard Specs					
114	Bend Radius		Test the cable as required in the TIA/EIA-455-33A standard.	633-2.1.1.9.2	FDOT Standard Specs					
115	Bend Radius		Ensure that bending the fiber optic cable up to the minimum bend radius does not affect the optical characteristics of the fiber.	633-2.1.1.9.2	FDOT Standard Specs					
116	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. Ensure that optical fiber is proof-tested by the fiber manufacturer at a minimum of 100 kilo pounds per square inch.	633-2.1.1.9.3	FDOT Standard Specs					
117	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.	633-2.1.1.9.3	FDOT Standard Specs					
118	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.	633-2.1.1.9.3	FDOT Standard Specs					
119	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.	633-2.1.1.9.3	FDOT Standard Specs					
120	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.	633-2.1.1.9.4	FDOT Standard Specs					
121	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.	633-2.1.1.9.4	FDOT Standard Specs					
122	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.	633-2.1.2	FDOT Standard Specs					
123	Splice Enclosures		Contain all optical fiber splices within a splice enclosure.	633-2.1.2.1	FDOT Standard Specs					
124	Splice Enclosures		Ensure that the enclosures provide storage for splices, fiber, and buffer tubes.	633-2.1.2.1	FDOT Standard Specs					
125	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.	633-2.1.2.1	FDOT Standard Specs					

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126	Splice Enclosures		Ensure all hinges and latching devices are stainless steel. Ensure that the enclosure is airtight and water intrusion. Ensure that the splice enclosure can accommodate pressurization and has the ability to be reentered without requiring specialized tools or equipment.	633-2.1.2.1	FDOT Standard Specs					
127	Splice Enclosures		Ensure that the enclosure provides fiber and splice organizers including splice trays and strain relief.	633-2.1.2.1	FDOT Standard Specs					
128	Splice Enclosures		Ensure that splice enclosures are hermetically sealed to protect internal components from environmental hazards such as moisture, insects, and UV light.	633-2.1.2.1	FDOT Standard Specs					
129	Splice Enclosures		Fiber optic splice enclosures shall also: - Comply with the Telcordia Technologies' GR-711-CORE standard and all applicable NEC requirements. - Provide space for future expansion equal to 100% of the initial utilization. - Provide fiber optic cable penetration end caps to accommodate a minimum installation of two trunk fiber optic cables and two fiber optic drop cables. - Ensure that the enclosure end caps are factory-drilled to the proper diameter to accept and seal the fiber optic cable entries. 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. - Ensure that splice enclosures are permanently labeled using machine printed, waterproof labels suitable for outside plant applications							
130	Splice Enclosures		Provide fiber optic splice enclosures meeting the following requirements: **Mechanical** - Resist compression deformation to a maximum of 400 pounds. - Withstand an impact energy to a maximum of 40 foot-pounds at 0°F. - Axial Tension: 100 pounds for 30 minutes. - Cable Torsion: ten 90-degree rotations. - Cable Flexing: ten 90-degree bends. **Environmental** - Hydrostatic Pressure Head: Up to 20 foot-pounds (-9 pounds per square inch). - Withstand 40 freeze/thaw temperature cycles. - Ultraviolet resistant during a maximum 30-day exposure in compliance with the requirements detailed in the ASTM B117 standard. **Chemical** - Withstand a 90-day exposure to solutions of 3% sulfuric acid, 0.2 normal of sodium hydroxide, 10% Igepal, kerosene, and be fungus resistant as required in the ASTM G21 standard.	633-2.1.2.1	FDOT Standard Specs					
131	Splice Trays		Ensure that splice trays are securely attached and accessible and provide sufficient storage for the fiber cable.	633-2.1.2.2	FDOT Standard Specs					
132	Splice Trays		Ensure splice trays provide access to individual fibers without disrupting other fibers in the tray.	633-2.1.2.2	FDOT Standard Specs					
133	Splice Trays		Ensure that splice trays hold the buffer tubes rigidly in place and provide protection for fusion splices.	633-2.1.2.2	FDOT Standard Specs					

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134	Splice Trays		Ensure that the raceway accommodates the minimum bend radius of the fiber.	633-2.1.2.2	FDOT Standard Specs					
135	Splice Trays		Ensure that splice trays allow visible inspection of the fiber.	633-2.1.2.2	FDOT Standard Specs					
136	Splice Trays		Ensure that splice trays include a cover with a locking mechanism to hold it in place.	633-2.1.2.2	FDOT Standard Specs					
137	Cable Terminations		Use Type ST, SC, LC, or FC connectors only, as specified in the Plans or by the Engineer.	633-2.1.3	FDOT Standard Specs					
138	Cable Terminations		Ensure that all ST-type fiber optic connectors, whether factory pre-terminated or field-installed, are 0.1 inch physical contact with preadjusted tips.	633-2.1.3	FDOT Standard Specs					
139	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.	633-2.1.3	FDOT Standard Specs					
140	Cable Terminations		Ensure that the ST-type connector provides a minimum 50 pound pullout strength.	633-2.1.3	FDOT Standard Specs					
141	Cable Terminations		Ensure that the optical fiber within the body of all connectors is mechanically isolated from cable tension, bending, and twisting.	633-2.1.3	FDOT Standard Specs					
142	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.	633-2.1.3	FDOT Standard Specs					
143	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.	633-2.1.3	FDOT Standard Specs					
144	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.	633-2.1.3	FDOT Standard Specs					
145	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.	633-2.1.3.1	FDOT Standard Specs					
146	Pre-terminated Connector Assemblies (Pigtails)		Ensure that the pre-terminated connector assemblies are installed with fusion splices.	633-2.1.3.1	FDOT Standard Specs					
147	Pre-terminated Connector Assemblies (Pigtails)		Ensure that all buffer tubes and fibers are protected once the attachment of pre-terminated connector assemblies is complete.	633-2.1.3.1	FDOT Standard Specs					
148	Buffer Tube Fan-out Kits		Ensure that a buffer tube fan-out kit is installed when fiber optic cables are terminated.	633-2.1.3.2	FDOT Standard Specs					
149	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.	633-2.1.3.2	FDOT Standard Specs					
150	Buffer Tube Fan-out Kits		Ensure that the buffer tube fan-out kit supports 12 fiber strands.	633-2.1.3.2	FDOT Standard Specs					

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151	Buffer Tube Fan-out Kits		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.	633-2.1.3.2	FDOT Standard Specs					
152	Buffer Tube Fan-out Kits		Ensure that the kit and the connectors are supplied by the same manufacturer.	633-2.1.3.2	FDOT Standard Specs					
153	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.	633-2.1.4	FDOT Standard Specs					
154	Patch Panels		Ensure that the patch panel has a minimum of 12 ST-type panel connectors unless otherwise shown in the Plans.	633-2.1.4	FDOT Standard Specs					
155	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.	633-2.1.4	FDOT Standard Specs					
156	Patch Panels		Ensure the patch panel is suitable for mounting within an approved cabinet at the field device location.	633-2.1.4	FDOT Standard Specs					
157	Patch Panels		Ensure patch panels are sized to accommodate specified coupler housings and maintain sufficient bend radius for cables.	633-2.1.4	FDOT Standard Specs					
158	Patch Panels		Ensure the patch panel is sized to occupy the minimum space required for capacity.	633-2.1.4	FDOT Standard Specs					
159	Pre-terminated Patch Panels		Ensure that the pre-terminated patch panel includes a factory installed all-dielectric SMF cable stub.	633-2.1.4.1	FDOT Standard Specs					
160	Pre-terminated Patch Panels		Ensure that the panel includes factory installed and terminated ST-type panel connectors unless otherwise shown in the Plans.	633-2.1.4.1	FDOT Standard Specs					
161	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.	633-2.1.4.1	FDOT Standard Specs					
162	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	633-2.1.4.2	FDOT Standard Specs					
163	Connector Panel		Ensure that the connector panel provides 12 ST-type, bulkhead-mount coupling connectors unless otherwise shown in the Plans.	633-2.1.4.2.1	FDOT Standard Specs					
164	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.	633-2.1.4.2.1	FDOT Standard Specs					
165	Handling		Ensure that each bulkhead-mount coupling connector includes a locknut for mounting the connector in predrilled or punched holes in the connector panel.	633-2.1.5	FDOT Standard Specs					
166	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.	633-2.1.5.1	FDOT Standard Specs					
167	Cable End Sealing		Equip one end of the fiber optic cable with flexible pulling eyes.	633-2.1.5.1	FDOT Standard Specs					
168	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.	633-2.1.5.2	FDOT Standard Specs					
169	Protective Wrap		Ensure that the wrap is weather resistant and protects the cable reel from environmental hazards.	633-2.1.5.2	FDOT Standard Specs					
170	Protective Wrap		Ensure that the cable reel remains wrapped until cable is to be installed.	633-2.1.5.2	FDOT Standard Specs					

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171	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. Provide a copy of 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 provides 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.	633-2.1.5.3	FDOT Standard Specs					
172	Manufacturer Testing and Certification		Provide documentation of all factory tests performed by the manufacturer for all fiber optic cable, splicing material, cable terminations, and patch panels.	633-2.1.6	FDOT Standard Specs					
173	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.	633-2.2	FDOT Standard Specs					
174	Twisted Pair Cable		Use shielded aerial copper communication with integral support wire conforming to REA Specification PE-38, aerial telephone cables.	633-2.2	FDOT Standard Specs					
175	Twisted Pair Cable		Use only No. 22 AWG solid cables for copper connections in traffic signal closed loop systems.	633-2.2	FDOT Standard Specs					
176	Cable Support Wire		Meet the requirements of 632-2.2.	633-2.3	FDOT Standard Specs					
177	Cable Attachment Hardware		Meet the requirements of 632-2.3.	633-2.4	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 633-3 – Installation Requirements										
178	Fiber Optic Cable Installation		Install all materials and equipment according to the latest version of the manufacturer's installation procedures.	633-3.1	FDOT Standard Specs					
179	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. 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.	633-3.1	FDOT Standard Specs					
180	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.	633-3.1	FDOT Standard Specs					

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181	Cable Identification		Develop a nomenclature plan for identification of fiber optic cable.	633-3.1.1	FDOT Standard Specs					
182	Cable Identification		Submit the nomenclature plan to the Engineer for approval.	633-3.1.1	FDOT Standard Specs					
183	Cable Identification		Use approved cable nomenclature to create cable tags for the identification of fiber optic cable.	633-3.1.1	FDOT Standard Specs					
184	Cable Identification		Provide cable tag identification on all test results or fiber related documents provided to the Engineer.	633-3.1.1	FDOT Standard Specs					
185	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.	633-3.1.1	FDOT Standard Specs					
186	Cable Identification		Ensure that the cable tags are permanent labels suitable for outside plant applications and are affixed to all fiber optic cables.	633-3.1.1	FDOT Standard Specs					
187	Cable Identification		Ensure that lettering is in permanent ink and displays the phrase “FDOT FIBER OPTIC CABLE”.	633-3.1.1	FDOT Standard Specs					
188	Pulling		Install the fiber optic cable by hand or by using a mechanical pulling machine.	633-3.1.2	FDOT Standard Specs					
189	Pulling		If a mechanical pulling machine is used, equip the machine with a monitored or recording tension meter.	633-3.1.2	FDOT Standard Specs					
190	Pulling		Ensure that at no time the manufacturer’s recommended maximum pulling tension is exceeded.	633-3.1.2	FDOT Standard Specs					
191	Pulling		Ensure that the central strength member and aramid yarn are attached directly to the pulling eye during cable pulling.	633-3.1.2	FDOT Standard Specs					
192	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.	633-3.1.2	FDOT Standard Specs					
193	Pulling		Ensure that excess cable is coiled in a figure eight and fed manually when pulling through pull boxes and splice boxes by hand.	633-3.1.2	FDOT Standard Specs					
194	Pulling		If pulleys and sheaves will be used to mechanically pull through pull boxes and splice boxes, provide a drawing of the proposed layout showing that the cable will never be pulled through a radius less than	633-3.1.2	FDOT Standard Specs					
195	Pulling		Use large diameter wheels, pulling sheaves, and cable guides to maintain the appropriate bend radius.	633-3.1.2	FDOT Standard Specs					
196	Pulling		Provide tension monitoring at all times during the pulling operation.	633-3.1.2	FDOT Standard Specs					
197	Pulling		Ensure that cable pulling lubricant used during installation is recommended by the optical fiber cable manufacturer.	633-3.1.2	FDOT Standard Specs					
198	Blowing		Use either the high airspeed blowing (HASB) method or the piston method.	633-3.1.3	FDOT Standard Specs					
199	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.	633-3.1.3	FDOT Standard Specs					

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200	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.	633-3.1.3	FDOT Standard Specs					
201	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.	633-3.1.4	FDOT Standard Specs					
202	Slack Cable Storage		Store the fiber optic cable without twisting or bending the cable below the minimum bend radius.	633-3.1.4	FDOT Standard Specs					
203	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.	633-3.1.4	FDOT Standard Specs					
204	Slack Cable Storage		Store 50 feet of spare fiber optic cable in pull boxes.	633-3.1.4	FDOT Standard Specs					
205	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.	633-3.1.5	FDOT Standard Specs					
206	Fiber Optic Connection - Splicing		Ensure that all splices match fiber and buffer tube colors unless shown otherwise in the Plans.	633-3.1.5	FDOT Standard Specs					
207	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.	633-3.1.5	FDOT Standard Specs					
208	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.	633-3.1.5	FDOT Standard Specs					
209	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.	633-3.1.5	FDOT Standard Specs					
210	Fiber Optic Connection - Splicing		Neatly store all splice enclosures within a splice box.	633-3.1.5	FDOT Standard Specs					
211	Fiber Optic Connection - Splicing		Attach the splice enclosure to the splice box interior wall to prevent the enclosure from lying on the bottom of the splice box.	633-3.1.5	FDOT Standard Specs					
212	Splice Plan		Provide a splice plan showing the location and configuration of splices in the system for approval by the Engineer.	633-3.1.5.1	FDOT Standard Specs					
213	Splice Plan		Perform all splicing according to the splice plan.	633-3.1.5.1	FDOT Standard Specs					
214	Splice Plan		Document each splice location and identify the source and destination of each fiber in each splice tray.	633-3.1.5.1	FDOT Standard Specs					
215	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.	633-3.1.5.1	FDOT Standard Specs					
216	Splice Equipment		Use a fusion splice machine to splice all optical fiber.	633-3.1.5.2	FDOT Standard Specs					

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217	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.	633-3.1.5.2	FDOT Standard Specs					
218	Splice Equipment		Provide the Engineer with a letter from the manufacturer or his authorized representative certifying compliance.	633-3.1.5.2	FDOT Standard Specs					
219	Splice Equipment		Clean all splicing equipment and calibrate according to the manufacturer's recommendations prior to each splicing session at each location.	633-3.1.5.2	FDOT Standard Specs					
220	Cable Termination Installation		Ensure that cables, buffer tubes, or strands are neatly routed, secured and terminated in a patch panel.	633-3.1.6	FDOT Standard Specs					
221	Cable Termination Installation		Ensure all cable termination points include documentation regarding the identification, route, and function of each fiber installed at that location.	633-3.1.6	FDOT Standard Specs					
222	Cable Termination Installation		Ensure that at least one copy of this information is placed alongside the installed equipment (for instance, in a document pouch or drawer within a field cabinet).	633-3.1.6	FDOT Standard Specs					
223	Patch Panel Installation		Ensure that patch panels are neatly installed and secured in a weather proof enclosure.	633-3.1.7	FDOT Standard Specs					
224	Patch Panel Installation		Ensure all patch panel connectors are clearly and permanently labeled.	633-3.1.7	FDOT Standard Specs					
225	Patch Panel Installation		Ensure all installed patch panels include documentation regarding the identification, route, and function of each patch panel connector at that location.	633-3.1.7	FDOT Standard Specs					
226	Patch Panel Installation		Ensure that at least one copy of this information is placed alongside the installed equipment.	633-3.1.7	FDOT Standard Specs					
227	Installation Testing		Notify the Engineer of cable testing at least 14 calendar days in advance.	633-3.1.8	FDOT Standard Specs					
228	Installation Testing		Provide the testing procedures to the Engineer for approval prior to commencement of testing.	633-3.1.8	FDOT Standard Specs					
229	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.	633-3.1.8	FDOT Standard Specs					
230	Installation Testing		Test all installed fibers (terminated and un-terminated) using methods approved by the Engineer.	633-3.1.8	FDOT Standard Specs					
231	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).	633-3.1.8.1	FDOT Standard Specs					
232	End to End Attenuation Testing		Repair or replace cable sections exceeding allowable attenuation at no cost to the Department.	633-3.1.8.1	FDOT Standard Specs					
233	OTDR Tracing		Test all fibers from both cable end points with an optical time domain reflectometer (OTDR) at wavelengths of 1310 and 1550 nanometer.	633-3.1.8.2	FDOT Standard Specs					
234	OTDR Tracing		Test the fibers that are not terminated at the time of installation using a bare fiber adapter.	633-3.1.8.2	FDOT Standard Specs					
235	OTDR Tracing		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.	633-3.1.8.2	FDOT Standard Specs					

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236	OTDR Tracing		Ensure all OTDR testing complies with the EIA/TIA-455-61 standard.	633-3.1.8.2	FDOT Standard Specs					
237	Splice Loss Testing		Ensure that the splice loss for a SMF fusion splice does not exceed a maximum bidirectional average of 0.1 dB per splice.	633-3.1.8.3	FDOT Standard Specs					
238	Splice Loss Testing		Repair or replace splices that exceed allowable attenuation at no cost to the Department.	633-3.1.8.3	FDOT Standard Specs					
239	Connector Loss Testing		Ensure that the attenuation in the connector at each termination panel and its associated splice does not exceed 0.5 dB.	633-3.1.8.4	FDOT Standard Specs					
240	Connector Loss Testing		Repair or replace connectors exceeding allowable attenuation at no cost to the Department.	633-3.1.8.4	FDOT Standard Specs					
241	Twisted Pair Cable Installation		Install all materials and equipment according to the latest version of the manufacturer's installation procedures.	633-3.2	FDOT Standard Specs					
242	Twisted Pair Cable Installation		Install copper communication cables in continuous lengths to and between cabinets and junction boxes.	633-3.2	FDOT Standard Specs					
243	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.	633-3.2	FDOT Standard Specs					
244	Twisted Pair Cable Installation		Obtain the Engineer's approval for any additional junctions or terminations.	633-3.2	FDOT Standard Specs					
245	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.	633-3.2.1	FDOT Standard Specs					
246	Cable type and Number of Conductors		Identify all spare conductors.	633-3.2.1	FDOT Standard Specs					
247	Number of Cables		Do not install more than four separate cables at any point on a single support wire.	633-3.2.2	FDOT Standard Specs					
248	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.	633-3.2.3	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 633-4 - Warranty										
249	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.	633-4	FDOT Standard Specs					
250	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.	633-4	FDOT Standard Specs					

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FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 635 - Pull Boxes, Splice Boxes, Junction Boxes, and Fiber Optic Splice Vaults										
251	Description		Furnish and install pull boxes, splice boxes, junction boxes, and fiber optic splice vaults as shown in the Plans.	635-1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 635-2 - Materials										
252	General		Meet the following requirements: Pull and Splice Boxes* ..... 996-5 Fiber Optic Splice Vault ..... 996-5 Junction Boxes ..... 635-2.3 Toll Site Pull Boxes* ..... 996-5 *Use products listed on the Department's Approved Product List (APL).	635-2.1	FDOT Standard Specs					
253	Pull Boxes, Splice Boxes, and Fiber Optic Splice Vaults		Ensure the bodies and covers of these products are free of flaws such as cracks, sharp, broken, or uneven edges, and voids. Mark boxes in accordance with 996-5.	635-2.2	FDOT Standard Specs					
254	General		Manufacturers of concrete pull and splice boxes and covers seeking inclusion on the APL shall meet the requirements of 105-3 and this Section and be listed on the Department's list of Incidental Precast/Prestressed Concrete Producers with Accepted Quality Control Programs.	635-2.2.1	FDOT Standard Specs					
255	General		Ensure box bodies and covers are free of flaws such as cracks, sharp, broken, or uneven edges, and voids.	635-2.2.1	FDOT Standard Specs					
256	General		Ensure in-ground boxes have an open bottom design.	635-2.2.1	FDOT Standard Specs					
257	Fabrication		Provide galvanized steel, aluminum or NEMA 4X non-metallic junction boxes.	635-2.3.1	FDOT Standard Specs					
258	Fabrication		Ensure all attachment hardware is Type 316 or 304, passivated stainless steel.	635-2.3.1	FDOT Standard Specs					
259	Fabrication		Ensure the outside surface has a smooth, uniform finish.	635-2.3.1	FDOT Standard Specs					
260	Fabrication		Ensure boxes are free of burrs, pits, sharp corners and dents.	635-2.3.1	FDOT Standard Specs					
261	Fabrication		Ensure all welds are neatly formed and free of cracks, blow holes, and other irregularities.	635-2.3.1	FDOT Standard Specs					
262	Aerial Junction Boxes		Unless otherwise shown in the Plans, provide aerial junction boxes with minimum inside dimensions of 8 inches wide by 8 inches long and at least 3 inches deep.	635-2.3.1.1	FDOT Standard Specs					
263	Mounted Junction Boxes		Provide mounted junction boxes fabricated of 5052 sheet aluminum alloy with a minimum thickness of 1/8 inch.	635-2.3.1.2	FDOT Standard Specs					
264	Mounted Junction Boxes		Ensure all mounted junction boxes have a hinged door and lock as specified in Section A676.	635-2.3.1.2	FDOT Standard Specs					
265	Mounted Junction Boxes		Unless otherwise shown in the Plans, provide mounted junction boxes for the following installations: For pole and cabinet mounted installations, provide junction boxes with minimum inside dimensions of 13 inches long by 10 inches wide and at least 3 inches deep. For base mounted installations, provide junction boxes with minimum inside dimensions of 21 inches long by 10 inches wide and at least 8 inches deep.	635-2.3.1.2	FDOT Standard Specs					
266	Embedded Junction Boxes		Provide weatherproof embedded junction boxes for use in concrete substructures or superstructures.	635-2.3.1.3	FDOT Standard Specs					

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267	Embedded Junction Boxes		Include gasketed weatherproof covers made of the same material as the box and Type 316 or 304, stainless steel, tamper resistant screws for securing the cover.	635-2.3.1.3	FDOT Standard Specs					
268	Embedded Junction Boxes		Fabricate galvanized steel boxes and their covers from steel meeting the requirements of ASTM A36 and galvanized in accordance with ASTM A123	635-2.3.1.3	FDOT Standard Specs					
269	Embedded Junction Boxes		For embedded junction boxes not exposed to vehicular impacts, provide the following types of junction boxes.	635-2.3.1.3	FDOT Standard Specs					
270	Embedded Junction Boxes		Where the structure's environmental classification is slightly or moderately aggressive, provide a galvanized steel or NEMA 4X (non-metallic) box, as approved by the Engineer.	635-2.3.1.3	FDOT Standard Specs					
271	Embedded Junction Boxes		Where the structure's environmental classification is extremely aggressive, provide a NEMA 4X (non-metallic) box, unless otherwise directed by the Engineer.	635-2.3.1.3	FDOT Standard Specs					
272	Embedded Junction Boxes		For embedded junction boxes exposed to vehicular impacts, provide a galvanized steel box regardless of the structure's environmental classification.	635-2.3.1.3	FDOT Standard Specs					
273	Barrier Terminal Blocks		Provide a barrier terminal block with a minimum of ten positions and rated at 600 V AC in all aerial and mounted junction boxes.	635-2.3.2	FDOT Standard Specs					
274	Barrier Terminal Blocks		Ensure each terminal block position has two screws electrically connected by a shorting bar or other Department approved method.	635-2.3.2	FDOT Standard Specs					
275	Barrier Terminal Blocks		Ensure all terminal block positions are numbered sequentially.	635-2.3.2	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 635-3 - Installation										
276	General		Do not install power and communication cables in the same box unless otherwise shown in the Plans.	635-3.1	FDOT Standard Specs					
277	General		When signal or 120V (or greater) power is present, ground all metal covers in accordance with Section 620.	635-3.1	FDOT Standard Specs					
278	General		Ensure metal junction boxes are grounded and bonded in accordance with the NEC Section 314.4.	635.3.1	FDOT Standard Specs					
279	General		Covers must be flush with concrete apron or sidewalk.	635.3.1	FDOT Standard Specs					
280	General		Do not install in roadways, driveways, parking areas, public sidewalk curb ramp, or in low-lying locations with poor drainage.	635.3.1	FDOT Standard Specs					
281	General		Do not subject the cable to a bend radius less than 14 times the diameter of the cable.	635.3.1	FDOT Standard Specs					
282	Pull and Splice Boxes		Install pull and splice boxes in accordance with the Design Standards, Index No. 17700.	635-3.2	FDOT Standard Specs					
283	Pull and Splice Boxes		Ensure pull and splice boxes are sized for the amount of cable to be placed inside.	635-3.2	FDOT Standard Specs					
284	Pull and Splice Boxes		Ensure that the pull or splice box cover is flush with the concrete apron or sidewalk.	635-3.2	FDOT Standard Specs					
285	Pull and Splice Boxes		Do not install pull or splice boxes in roadways, driveways, parking areas, ditches or public sidewalk curb ramps.	635-3.2	FDOT Standard Specs					
286	Pull and Splice Boxes		Avoid placing pull and splice boxes in low-lying locations with poor drainage.	635-3.2	FDOT Standard Specs					
287	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.	635-3.2	FDOT Standard Specs					

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288	Placement and Spacing		Place pull and splice boxes as shown in the Plans and at the following locations: 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.	635-3.2.1	FDOT Standard Specs					
289	Electronic Box Marker		Use an electronic box marker to mark the location of products buried below the finish grade surface.	635-3.1.2	FDOT Standard Specs					
290	Electronic Box Marker		Ensure that the electronic box marker is a device specifically manufactured to electronically mark and locate underground facilities.	635-3.1.2	FDOT Standard Specs					
291	Electronic Box Marker		Ensure that the electronic box marker includes circuitry and an antenna encased in a waterproof polyethylene shell.	635-3.1.2	FDOT Standard Specs					
292	Electronic Box Marker		Ensure that the outer shell is impervious to minerals, chemicals, and temperature extremes normally found in underground plant environments.	635-3.1.2	FDOT Standard Specs					
293	Electronic Box Marker		Ensure that the electronic box marker does not require any batteries or active components to operate.	635-3.1.2	FDOT Standard Specs					
294	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.	635-3.1.2	FDOT Standard Specs					
295	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.	635-3.1.2	FDOT Standard Specs					
296	Electronic Box Marker		Ensure that the electronic box marker has a minimum operating range of 5 feet from the marker locator.	635-3.1.2	FDOT Standard Specs					
297	Pull and Splice Boxes		Install pull and splice boxes in accordance with Standard Plans, Index 635-001.	635-3.2	FDOT Standard Specs					
298	Fiber Optics Splice Vault		Install fiber optic vaults in accordance with Standard Plans, Index 635-005. 635-3.4.	635-3.3	FDOT Standard Specs					
299	Toll Site Pull Boxes		Install at locations shown in the Plans, according to the pull box installation instructions in this Section, except that toll site pull boxes may be installed in the maintenance pull off area.	635-3.4	FDOT Standard Specs					
300	Aerial Junction Boxes		Install aerial junction boxes in accordance with Standard Plans, Index 634-002.	635-3.5	FDOT Standard Specs					
301	Mounted Junction Boxes		Install mounted junction boxes in accordance with the Design Standards, Index No. 17841.	635-3.6	FDOT Standard Specs					

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302	Mounted Junction Boxes		Ensure that the bottom surface of pole mounted junction boxes is a minimum of 4 feet above the finished grade.	635-3.6	FDOT Standard Specs					
303	Cable Terminations		Make cable terminations in junction boxes in accordance with Section 632.	635-3.7	FDOT Standard Specs					
304	Cable Terminations		Route and form the cable to allow access to the terminal screws. Do not cover the terminal identification numbers with the cable.	635-3.7	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 635-4 - Warranty										
305	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.	635-4	FDOT Standard Specs					
306	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.	635-4	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 20256-26 - Section 639 - Electrical Power Service Assemblies										
307	Description		Power service assemblies are utilized for signals, lighting, ITS, and other roadway applications.	639-1	FDOT Standard Specs					
308	Description		Install electrical power service assemblies for either overhead service or underground service in accordance with the details shown in Standard Plans, Index 639-001 or 639-002	639-1	FDOT Standard Specs					
309	Description		Coordinate with the power company to provide electrical service to the locations shown in the Plans	639-1	FDOT Standard Specs					
310	Description		Consult and cooperate with the power company when power is needed at the service point.	639-1	FDOT Standard Specs					
311	Description		Furnish and install only those parts of the metering equipment or connections that are required by the power company in the locality involved.	639-1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 639-3 - Materials										
312	Weatherhead		Use a weatherhead made of a copper free aluminum alloy with three electrical service wire entrance holes, meeting National Electric Code (NEC) requirements.	639-3.1	FDOT Standard Specs					
313	Conduit		Use conduit meeting the requirements of Section 630. Meet the requirements of Section 562 for coating all field cut and threaded galvanized pipe.	639-3.2	FDOT Standard Specs					
314	Electrical Service Wire		For signal and ITS service points, use stranded copper wire with XHHW (cross-linked polyethylene (XLPE) high heat-resistant, water-resistant) insulation, rated at 600 V in dry and wet conditions, no smaller than No. 6 AWG for connections between service disconnect and traffic and ITS cabinets, unless otherwise shown in the Plans.	639-3.3	FDOT Standard Specs					
315	Electrical Service Wire		For lighting service points, use single-conductor cable Type THWN-2 no smaller than No. 6 AWG for connections between service disconnect and load center.	639-3.3	FDOT Standard Specs					
316	Meter Base		Use meter bases approved by the local electric power company.	639-3.4	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 639-3.5 - Service Disconnect										
317	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.	639-3.5.1	FDOT Standard Specs					
318	Enclosure (Cabinet)		Ensure that the enclosure has a hinged door which can be locked with a padlock.	639-3.5.1	FDOT Standard Specs					

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319	Enclosure (Cabinet)		Provide padlock and two keys. Do not use external handles or switches.	639-3.5.1	FDOT Standard Specs					
320	Enclosure (Cabinet)		Ensure that the inside dimensions meet NEC requirements.	639-3.5.1	FDOT Standard Specs					
321	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.	639-3.5.2	FDOT Standard Specs					
322	Surge Protective Device		Use a lightning arrester rated for a maximum permissible line to ground voltage of 175 VAC.	639-3.6	FDOT Standard Specs					
323	Electrical Power Transformer		Provide a dry type, air-cooled, factory assembled transformer	639-3.7	FDOT Standard Specs					
324	Electrical Power Transformer		All units must be UL listed under the requirements of UL 5085 and UL 1561, IEEE Standard 259, and meet the requirements of NEMA ST-20.	639-3.7	FDOT Standard Specs					
325	Electrical Power Transformer		Provide transformers for the primary and secondary voltages indicated on the Plans.	639-3.7	FDOT Standard Specs					
326	Electrical Power Transformer		Provide two 2.5% full capacity below normal taps and two 2.5% above normal taps on the primary side	639-3.7	FDOT Standard Specs					
327	Electrical Power Transformer		All taps are full capacity taps.	639-3.7	FDOT Standard Specs					
328	Enclosure		Use an enclosure conforming to NEMA Standards for Type 3R, made of hot-dip galvanized steel, aluminum, stainless steel or other materials approved by the Engineer		FDOT Standard Specs					
329	Electrical Rating		Transformer electrical ratings may range from 3 KVA to 300 KVA, 120V to 600 V, single phase or three phase, primary or secondary, as shown in the plans.		FDOT Standard Specs					
330	Attachment Hardware		Use attachment hardware that meets the requirements of Section 603.	639-3.8	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 639-4 - Installation Requirements										
331	General		Meet the following requirements for the installation of individual components of the electrical power service assembly: - Use extreme care and caution in the installation of all components of the electrical power service assembly. - Follow installation procedures recommended by NEC and National Electrical Safety Code (NESC). 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.	639-4.1	FDOT Standard Specs					
332	General		Do not use transformers or spliced electrical wire on a traffic signal power service.	639-4.1	FDOT Standard Specs					
333	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.	639-4.2	FDOT Standard Specs					
334	Conduit		Securely attach all conduit to the pole or cabinet with a maximum distance of 5 feet between conduit attachment hardware.	639-4.3	FDOT Standard Specs					

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335	Electrical Service Wire		Install the electrical service wire in a manner which will ensure that damage to the installation will not occur.	639-4.4	FDOT Standard Specs					
336	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.	639-4.4	FDOT Standard Specs					
337	Meter Base		When a meter base is required, securely fasten the meter base to the pole or cabinet.	639-4.5	FDOT Standard Specs					
338	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.	639-4.5	FDOT Standard Specs					
339	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.	639-4.6	FDOT Standard Specs					
340	Service Disconnect		Install pole mounted service disconnects a minimum of 4 feet above grade when measured from the bottom of the disconnect	639-4.6	FDOT Standard Specs					
341	Service Disconnect		For cabinet installations, mount the service disconnect at a height approved by the Engineer or as shown in the Plans.	639-4.6	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 641 - Prestressed Concrete Poles										
342	Description		Furnish and install prestressed concrete poles as shown in the Plans.	641-1	FDOT Standard Specs					
343	Description		Obtain precast, prestressed concrete poles from a manufacturing plant that is currently on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.	641-1	FDOT Standard Specs					
344	Description		Ensure that each pole is constructed and permanently and legibly marked in accordance with Design Standards, Index No. 17725, including the date cast.	641-1	FDOT Standard Specs					
345	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.	641-1	FDOT Standard Specs					
346	Description		Ensure that the shipment of the products to the job site meets the requirements of 450- 16.3 and 1053.2.	641-1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 641-2 - Materials										
347	Poles		Meet the following requirements: Portland Cement Concrete* ..... Section 346 Reinforcing Steel ..... 931-1 Prestressed Strands..... 933-1 Spiral Reinforcing.....ASTM A1064 * Class VI	641-2.1	FDOT Standard Specs					
348	Camera Lowering Device		Use lowering devices that are listed on the Department's Approved Product List (APL).	641-2.2	FDOT Standard Specs					
349	Camera Lowering Device		Permanently mark the lowering device with manufacturer name or trademark, model or part number, date of manufacture, and serial number.	641-2.2	FDOT Standard Specs					
350	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.	641-2.2	FDOT Standard Specs					

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351	Camera Lowering Device		The lowering device system support arm must be capable of withstanding service tension and shear up to 1 kip minimum.	641-2.2	FDOT Standard Specs					
352	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.	641-2.2	FDOT Standard Specs					
353	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.	641-2.2	FDOT Standard Specs					
354	Camera Lowering Device		All finished castings must have a smooth finish free from cracks, blow-holes, shrinks, and other flaws.	641-2.2	FDOT Standard Specs					
355	Camera Lowering Device		All roller fairlead frames must be corrosion resistant stainless steel or aluminum.	641-2.2	FDOT Standard Specs					
356	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.	641-2.2	FDOT Standard Specs					
357	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.	641-2.2	FDOT Standard Specs					
358	Camera Lowering Device		Use only lowering devices designed to withstand the design wind speeds defined in the Department's Structures Manual, Volume 9.	641-2.2	FDOT Standard Specs					
359	Equipment Connection Box		Include a 1-1/2 inch National Pipe Thread (NPT) pipe connection point for attaching a camera.	641-2.2.1	FDOT Standard Specs					
360	Equipment Connection Box		Ensure that the equipment connection box has an ingress protection rating of no less than IP55.	641-2.2.1	FDOT Standard Specs					
361	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.	641-2.2.2	FDOT Standard Specs					
362	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.	641-2.2.2	FDOT Standard Specs					
363	Disconnect Unit		The fixed unit must have a heavy-duty cast tracking guide that allows latching in the same position each time.	641-2.2.2	FDOT Standard Specs					
364	Disconnect Unit		The load must be transferred from the lowering cable to the mechanical latches when the system is in the latched position.	641-2.2.2	FDOT Standard Specs					
365	Disconnect Unit		Interface and locking components must be constructed of stainless steel or aluminum.	641-2.2.2	FDOT Standard Specs					
366	Disconnect Unit Housing		The disconnect unit housing must be weather-proof with an ingress protection rating of no less than IP55.	641-2.2.2.1	FDOT Standard Specs					
367	Connector Block		Provide modular, self-aligning and self-adjusting female and male socket contact halves in the connector block.	641-2.2.2.2	FDOT Standard Specs					
368	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.	641-2.2.2.2	FDOT Standard Specs					

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369	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.	641-2.2.2.2	FDOT Standard Specs					
370	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.	641-2.2.2.2	FDOT Standard Specs					
371	Connector Block		Use only corrosion-resistant stainless steel hardware.	641-2.2.2.2	FDOT Standard Specs					
372	Connector Block		Lubricate all components, including the connector block and contacts, in accordance with the manufacturer's recommendations.	641-2.2.2.2	FDOT Standard Specs					
373	Connector Block		Ensure that male contacts used for grounding mate first and break last.	641-2.2.2.2	FDOT Standard Specs					
374	Connector Block		All contacts and connectors must be self-aligning and self-adjusting mechanical systems.	641-2.2.2.2	FDOT Standard Specs					
375	Connector Block		Provide a spring-assisted contact assembly to maintain constant pressure on the contacts when the device is in the latched position.	641-2.2.2.2	FDOT Standard Specs					
376	Connector Block		Provide connector pins made of brass- or gold-plated nickel, or gold-plated copper.	641-2.2.2.2	FDOT Standard Specs					
377	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.	641-2.2.2.2	FDOT Standard Specs					
378	Connector Block		Ensure mated connectors do not allow water penetration.	641-2.2.2.2	FDOT Standard Specs					
379	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.	641-2.2.3	FDOT Standard Specs					
380	Lowering Tool		The lowering tool must include a quick release cable connector, and a torque limiter that will prevent over-tensioning 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.	641-2.2.3	FDOT Standard Specs					
381	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.	641-2.2.3	FDOT Standard Specs					
382	Lowering Tool		Provide an adapter with a clutch mechanism and torque limiter for use with the drill.	641-2.2.3	FDOT Standard Specs					
383	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.	641-2.2.3	FDOT Standard Specs					
384	Lowering Tool		The lowering cable must wind evenly on the winch drum during operation.	641-2.2.3	FDOT Standard Specs					
385	Lowering Tool		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.	641-2.2.3	FDOT Standard Specs					
386	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.	641-2.2.3	FDOT Standard Specs					

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387	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.	641-2.2.4	FDOT Standard Specs					
388	Lowering Cable		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.	641-2.2.4	FDOT Standard Specs					
389	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.	641-2.2.4	FDOT Standard Specs					
390	Lowering Cable		Prefabricated components for the lift unit support system must prevent the lifting cable from contacting the power or video cables.	641-2.2.4	FDOT Standard Specs					
391	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.	641-2.2.5	FDOT Standard Specs					
392	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.	641-2.2.6	FDOT Standard Specs					
393	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.	641-2.2.6	FDOT Standard Specs					
394	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.	641-2.2.6	FDOT Standard Specs					
395	External-Mount Lowering System Enclosure for Mounting to Existing Structures		The outside surface of the cabinet must have a smooth, uniform natural aluminum finish.	641-2.2.6	FDOT Standard Specs					
396	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.	641-2.2.6	FDOT Standard Specs					
397	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.	641-2.2.6	FDOT Standard Specs					

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398	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 sag.	641-2.2.6	FDOT Standard Specs					
399	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.	641-2.2.6	FDOT Standard Specs					
400	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.	641-2.2.6	FDOT Standard Specs					
401	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.	641-2.2.6	FDOT Standard Specs					
402	External-Mount Lowering System Enclosure for Mounting to Existing Structures		Provide all necessary mounting hardware, conduits, standoffs, and conduit mounts required for a complete and functional system.	641-2.2.6	FDOT Standard Specs					
403	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.	641-2.2.6	FDOT Standard Specs					
404	External-Mount Lowering System Enclosure for Mounting		All conduit couplings and connections between the pole-mounted cabinet and upper mounting/junction box must be watertight.	641-2.2.6	FDOT Standard Specs					
Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 641-3 - Concrete Pole Construction										
405	Concrete Pole Construction		Construct concrete poles in accordance with Section 450.	641-3	FDOT Standard Specs					
406	Concrete Pole Construction		Assume responsibility for performance of all quality control testing and inspections required by Sections 346 and 450; however, the PCI personnel certifications are not required.	641-3	FDOT Standard Specs					
407	Concrete Pole Construction		Plant certification, in accordance with Section 105, is not required for plants that manufacture prestressed concrete poles.	641-3	FDOT Standard Specs					

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FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 641-4 - Installation Requirements										
408	General		Furnish poles of the type and length shown in the Plans.	641-4.1	FDOT Standard Specs					
409	General		Provide catenary cable of the size shown in the Plans.	641-4.1	FDOT Standard Specs					
410	General		Ground poles in accordance with Section 620.	641-4.1	FDOT Standard Specs					
411	General		Install span wire assemblies in accordance with Section 634.	641-4.1	FDOT Standard Specs					
412	General		Do not consider the poles acceptable for use if the camber of the pole, measured as the maximum deviation between the centerline of the pole and a straight line connecting the centroids of the cross- sections at each end of the pole, is greater than the total pole length in inches divided by 140.	641-4.1	FDOT Standard Specs					
413	Footings		Provide footings 3 feet 6 inches in diameter and of the depth specified in the Plans for strain poles used for span wire support of traffic signals.	641-4.2	FDOT Standard Specs					
414	Footings		Provide footings for concrete CCTV poles in accordance with Design Standards, Index No. 18113.	641-4.2	FDOT Standard Specs					
415	Footings		Provide footings for all other pole applications as specified in the Plans.	641-4.2	FDOT Standard Specs					
416	Footings		Construct the footings with concrete as specified in Section 347.	641-4.2	FDOT Standard Specs					
417	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.	641-4.2	FDOT Standard Specs					
418	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.	641-4.2	FDOT Standard Specs					
419	Footings		When performing such operations, ensure that the material is neither dry nor saturated.	641-4.2	FDOT Standard Specs					
420	Footings		The Contractor may backfill with concrete.	641-4.2	FDOT Standard Specs					
421	Footings		Use forms, when required, meeting the requirements of 400-5.	641-4.2	FDOT Standard Specs					
422	Footings		If the footing is cast in an oversize hole, place the concrete in the top 6 inches in a form.	641-4.2	FDOT Standard Specs					
423	Footings		Trowel all exposed surfaces to a smooth finish.	641-4.2	FDOT Standard Specs					
424	Orientation of Poles		For poles supporting one catenary wire, orient the pole so that the load face is perpendicular to the catenary wire.	641-4.3	FDOT Standard Specs					
425	Orientation of Poles		For poles supporting two catenary wires, orient the pole so that the load face is perpendicular to a line bisecting the angle between the two catenary wires.	641-4.3	FDOT Standard Specs					
426	Orientation of Poles		Rake pole back from the span wire as necessary to achieve a final rake of 1/2 inch per foot, plus or minus 1/4 inch.	641-4.3	FDOT Standard Specs					
427	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.	641-4.4	FDOT Standard Specs					

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428	Camera Lowering Device		Submit documentation showing connector block pin assignment for approval prior to installation.	641-4.4	FDOT Standard Specs					
429	Camera Lowering Device		The divided support arm and receiver brackets must self-align the contact unit with the pole centerline during installation.	641-4.4	FDOT Standard Specs					
430	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.	641-4.4	FDOT Standard Specs					
431	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.	641-4.4	FDOT Standard Specs					
432	Camera Lowering Device		The connection between the lowering device and tenon must be weather resistant.	641-4.4	FDOT Standard Specs					
433	Camera Lowering Device		Use conduit straps to secure lowering cable conduit to the pole for externally mounted lowering systems.	641-4.4	FDOT Standard Specs					
434	Camera Lowering Device		Stainless steel bands will not be allowed.	641-4.4	FDOT Standard Specs					
435	Camera Lowering Device		Ensure that only the lowering cable is in motion inside the pole when the lowering device is operated.	641-4.4	FDOT Standard Specs					
436	Camera Lowering Device		All other cables must remain stable and secure during lowering and raising operations.	641-4.4	FDOT Standard Specs					
437	Camera Lowering Device		Label all wire leads with their function, label spares as spares.	641-4.4	FDOT Standard Specs					
438	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.	641-4.4	FDOT Standard Specs					
439	Camera Lowering Device		The lowering cable strands must not twist or unwind when the lowering device is operated.	641-4.4	FDOT Standard Specs					
440	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.	641-4.4	FDOT Standard Specs					
441	Camera Lowering Device		Furnish the Engineer with the manufacturer recommended field installation instructions, inspection instructions (including recommended schedules and procedures), and operating instructions.	641-4.4	FDOT Standard Specs					
442	Pole Removal		When shallow pole removal is specified in the Plans, the remaining pole, foundation and any protrusions, such as pole keys, dead men, guying apparatus, conduit, anchor bolts, or reinforcing steel, must be removed to a minimum depth of 4 feet below existing grade.	641-5	FDOT Standard Specs					
443	Pole Removal		When deep pole removal is specified in the Plans completely remove each pole including the foundation and all accessories and attachments, such as pole keys, dead men, guying apparatus, conduit, anchor bolts, and reinforcing steel.	641-5	FDOT Standard Specs					
444	Pole Removal		Disconnect span wires carefully at the pole and salvage all usable hardware and attachment devices as determined by the Engineer.	641-5	FDOT Standard Specs					
445	Pole Removal		Remove all devices supported by the span wire (including wiring) prior to the removal of the span wire.	641-5	FDOT Standard Specs					

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FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 649 - Galvanized Steel Strain Poles, Mast Arms and Monotube Assemblies										
446	Description		The work in this Section consists of furnishing and installing galvanized steel strain poles, galvanized steel mast arms and galvanized steel monotube assemblies in accordance with the details shown in the Contract Documents, subject to a five year warranty period as defined herein.	649-1	FDOT Standard Specs					
447	Description		The warranty period will apply only when strain poles, mast arms or steel monotube assemblies are painted as called for in the Contract Documents.	649-1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 649-2 - Materials										
448	Materials		Meet the following requirements: Camera Lowering Device* ..... 641-2.2 Membrane Curing Compounds*.....Section 925 Grouts*.....Section 934 Galvanizing- Components .....ASTM A123 Galvanizing- Fasteners*.....Section 962 Coatings* .....Section 975 *Use products listed on the Department's Approved Product List (APL).	649-2	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 649-3 - Fabrication										
449	Fabrication		Fabricate poles, mast arm, and monotube assemblies and miscellaneous hardware in accordance with the Contract Documents	649-3	FDOT Standard Specs					
450	Fabrication		Cut all materials to the final dimensions and complete all welding prior to galvanizing.	649-3	FDOT Standard Specs					
451	Fabrication		Obtain all components for individual strain poles, mast arm and monotube assemblies from the same fabricator.	649-3	FDOT Standard Specs					
452	Fabrication		Obtain the luminaire and bracket from other sources, when necessary	649-3	FDOT Standard Specs					
453	Fabrication		All welds must be visually inspected for final approval by an actively certified welding inspector, qualified through the American Welding Society.	649-3	FDOT Standard Specs					
454	Fabrication		A certifying statement from the welding inspector must be provided with the components.	649-3	FDOT Standard Specs					
455	Fabrication		The document must identify the project information, date of inspection, welding inspector name, and inspector certification number	649-3	FDOT Standard Specs					
456	Fabrication		Affix an aluminum identification tag which will be visible from the handhole or located inside the terminal box containing the information described in the Standard Plans.	649-3	FDOT Standard Specs					
457	Fabrication		Before shipping, assemble monotube assemblies to assure proper fit. Monotube assemblies may be separated for shipment	649-3	FDOT Standard Specs					
458	Fabrication		For mast arms, use adequate manufacturing controls to assure proper fit, ensuring dimensional tolerances are met and that mast arm to pole connections can achieve a snug-tight condition as defined in 649-7.	649-3	FDOT Standard Specs					
459	Fabrication		Ensure all components are protected from damage during shipping and handling by wrapping or other effective methods	649-3	FDOT Standard Specs					
460	Fabrication		Replace any component, which the Engineer determines is damaged beyond repair, at no additional cost to the Department.	649-3	FDOT Standard Specs					
461	Fabrication		If components are wrapped for shipment, remove wrappings no later than five days after receipt of components or immediately if the wrappings become saturated.	649-3	FDOT Standard Specs					

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462	Fabrication		Post these instructions in brightly colored wording on the wrapper. Failure to comply with these instructions may lead to damage of the coating system and will be cause for the rejection of the component.	649-3	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 649-4 – Coatings										
463	Galvanizing		Galvanize all components in accordance with ASTM A123, except galvanize all fastener assemblies in accordance with Section 962.	649-4.1	FDOT Standard Specs					
464	Galvanizing		Use galvanizing methods which provide surfaces suitable for painting.		FDOT Standard Specs					
465	Surface Preparation		Prepare all galvanized surfaces to be painted in accordance with ASTM D6386 and the manufacturer of the coating system's specifications. Provide a clean and suitable galvanized surface that maximizes coating system adhesion.	649-4.2	FDOT Standard Specs					
466	Surface Preparation		Measure the thickness of the zinc coating after completion of surface preparation using a magnetic thickness gage in accordance with ASTM A123.	649-4.2	FDOT Standard Specs					
467	Surface Preparation		Ensure sufficient galvanizing remains on the substrate to meet the requirements of ASTM A123 and the Contract Documents.	649-4.2	FDOT Standard Specs					
468	Surface Preparation		Correct any deficient areas to the satisfaction of the Engineer at no additional cost to the Department.	649-4.2	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 649-4.3 – Painting										
469	General		When required by the Contract Documents, provide painted poles, mast arms and monotube assemblies. Provide products from a fabricator on the Department's list of Prequalified Painted Galvanized Steel and Aluminum Products Fabricators List	649-4.3.1	FDOT Standard Specs					
470	General		Provide products that will meet specification requirements throughout the warranty period. Meet the color requirement as specified in the Contract Documents	649-4.3.1	FDOT Standard Specs					
471	General		Provide the Engineer with two metal sample coupons, a minimum of 2 inches by 4 inches, painted concurrently and with the same paint as was used on the first LOT of any poles, mast arms and monotube assemblies delivered to the jobsite.	649-4.3.1	FDOT Standard Specs					
472	General		Submit sample coupons and manufacturer product data sheets to the Engineer along with the delivery of the first shipment of any painted poles, mast arms or monotube assemblies delivered to the jobsite	649-4.3.1	FDOT Standard Specs					
473	General		At the time of their delivery, the sample coupons described in this paragraph shall match the color of the poles, mast arms and monotube assemblies to within 1ΔE when measured as specified in 975-4.	649-4.3.1	FDOT Standard Specs					
474	General		The Engineer will perform a visual color comparison between the delivered products and sample coupons. The Engineer may evaluate and document any color difference by measuring as specified in 975-4.	649-4.3.1	FDOT Standard Specs					
475	General		If the delivered sample coupons exhibit a difference in color from the poles, mast arms and monotube assemblies greater than 1ΔE then the sample coupons will be considered unacceptable and no payment shall be made for the materials which the sample coupons represent.	649-4.3.1	FDOT Standard Specs					
476	General		Those materials shall not be accepted by the Department until acceptable representative sample coupons in accordance with the requirements of this Section have been submitted to the Engineer	649-4.3.2	FDOT Standard Specs					

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477	Responsible Party Warranty		When the Contract Documents call for painted galvanized steel poles, mast arms or monotube assemblies, the Contractor shall designate a responsible party to accept responsibility.	649-4.3.2						
478	Responsible Party Warranty		The responsible party designated by the Contractor must execute and submit to the Department a form, provided by the Department, prior to the first delivery to the jobsite of any painted poles, mast arms or monotube assemblies, stipulating that the responsible party accepts responsibility for ensuring the coating system adhesion and color retention requirements as specified in 975-4 are met for a period of five years after final acceptance in accordance with 5-11.	649-4.3.2	FDOT Standard Specs					
479	Responsible Party Warranty		The responsible party shall also bear the continued responsibility for performing all remedial work associated with repairs of any adhesion or color retention failure as defined in Section 975, as to which notice was provided to the responsible party within the five-year warranty period.	649-4.3.2	FDOT Standard Specs					
480	Responsible Party Warranty		Failure to timely designate the responsible party will result in the Contractor being the responsible party unless otherwise agreed to in writing by the Department.	649-4.3.2	FDOT Standard Specs					
481	Responsible Party Warranty		The responsible party shall be either the Contractor or the fabricator. When the responsible party is the fabricator, the responsible party shall be one of the fabricators listed on the Prequalified Painted Galvanized Steel and Aluminum Products Fabricators List.	649-4.3.2	FDOT Standard Specs					
482	Responsible Party Warranty		This list may be viewed on the Department's website at the following URL: https://www.fdot.gov/construction/Engineers/PaintedPoleSuppliers.shtm	649-4.3.2	FDOT Standard Specs					
483	Responsible Party Warranty		Upon final acceptance of the Contract in accordance with 5-11, the Contractor's responsibility to ensure that the coating system adhesion and color retention requirements specified in 975-4 will terminate.	649-4.3.2	FDOT Standard Specs					
484	Responsible Party Warranty		The obligations of the responsible party set forth in this Section shall start at final acceptance of the Contract in accordance with 5-11 and continue thereafter until expiration of the five-year warranty period.	649-4.3.2						
485	Installation		Install foundations for strain poles, mast arm and monotube assemblies in accordance with Section 455.	649-7	FDOT Standard Specs					
486	Installation		Do not install the strain poles, mast arm pole, or monotube pole until the foundation has achieved 70% of the specified 28 day concrete strength and verifying test results have been provided to the Engineer.	649-7	FDOT Standard Specs					
487	Installation		Determine concrete strength from tests on a minimum of two test cylinders prepared and tested in accordance with ASTM C31 and ASTM C39.	649-7	FDOT Standard Specs					
488	Installation		Before erecting the pole, clean the top of the foundation of any laitance, oils, grease or any other deleterious materials.	649-7	FDOT Standard Specs					
489	Installation		Erect strain poles in an orientation which considering the rake and the application, cable forces will produce a plumb pole.	649-7	FDOT Standard Specs					
490	Installation		Erect monotubes plumb at the time of installation. Plumb the pole supporting mast arms after the mast arms, traffic signals or sign panels have been placed.	649-7	FDOT Standard Specs					
491	Installation		If the traffic signals and/or sign panels are not in place within two working days after the mast arm is erected, furnish and install a 3 foot x 2 foot blank sign panel on the bottom of each mast arm within 6 feet of the mast arm tip and plumb the pole.	649-7	FDOT Standard Specs					

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492	Installation		Re-plumb the pole supporting mast arms after installation of traffic signals and sign panels.	649-7	FDOT Standard Specs					
493	Installation		Install ASTM A325 bolt, nut and washer assemblies in accordance with the following.	649-7	FDOT Standard Specs					
494	Installation		Use bolt, nut and washer assemblies that are free of rust and corrosion and are lubricated properly as demonstrated by being able to easily hand turn the nut on the bolt thread for its entire length.	649-7	FDOT Standard Specs					
495	Installation		Tighten nuts to a snug tight condition to bring the faying surfaces of the assembly into full contact which is referred to as snug-tight.	649-7	FDOT Standard Specs					
496	Installation		Nug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12 inch long wrench or equivalent.	649-7	FDOT Standard Specs					
497	Installation		After bringing the faying surfaces to a snug-tight condition, tighten nuts in accordance with Table 4607, Nut Rotation from the Snug Tight Condition.	649-7	FDOT Standard Specs					
498	Installation		Maintain uniform contact pressure on the faying surfaces during snugging and turn-of-nut process, by using a bolt tightening pattern that balances the clamping force of each bolt, as closely as possible, with the equal clamping force of a companion bolt.	649-7	FDOT Standard Specs					
499	Installation		Base plate installation steps are as follows: 1. Clean and lubricate the exposed threads of all anchor bolts. Clean and lubricate the threads and bearing surfaces of all nuts. Use hardware lubricants approved by the hardware manufacturer. Re-lubricate the exposed threads of the anchor bolts and the threads and bearing surfaces of nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated. 2. Verify that each leveling nut can be turned onto the bolts past the elevation corresponding to the final elevation of the bottom of the leveling nut and be turned by the effort of a person using an ordinary spud wrench, without employing a pipe extension on the wrench handle. 3. Turn the leveling nuts onto the anchor bolts and align the nuts to the same elevation less than or equal to one anchor bolt diameter from the top of the foundation. 4. Place structural plate washers on top of the leveling nuts; one washer on each anchor bolt. 5. Install the base plate onto the leveling nut washers, place structural plate washers on top of the base plate; one washer on each anchor bolt and turn anchor nuts onto the anchor bolts. 6. Tighten anchor nuts against the top of the structural plate washers and base plate to a snug-tight condition in a star pattern. A star tightening pattern is one in which the nuts on opposite or near opposite sides of the bolt circle are successively tightened in a pattern resembling a star. For an 8-bolt circle with bolts sequentially numbered 1 to 8, tighten nuts in the following bolt order: (1, 5, 7, 3, 8, 4, 6, 2).	649-7	FDOT Standard Specs					

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			7. Tighten leveling nuts to a snug-tight condition in a star pattern. The distance from the bottom of the leveling nuts to the top of the concrete must not exceed one anchor bolt diameter after tightening. 8. Before final tightening of the anchor nuts, mark the reference position of each snug-tight anchor nut on one flat with a corresponding reference mark on the base plate. Incrementally turn the anchor nuts using a star pattern until achieving the required nut rotation specified in Table 649-1. Tighten the anchor nuts in two tightening cycles (passes), each approximately one-half the required amount of rotation, up to the final rotation in Table 649-1. After tightening, verify the anchor nut rotation with respect to the reference mark on the base plate. Do not exceed the Table 649-1 value by more than 20 degrees. 9. Turn retainer nuts onto the anchor bolts and tighten each until it is in firm contact with the top surface of the anchor nut. Hold the anchor nut to prevent rotation and tighten the retainer nuts to a snug-tight condition. The final condition is an anchor nut that is rotated with respect to the reference mark on the base plate in accordance with Table 649-1, and a retainer nut that is snug-tight with respect to the anchor nut. 10. Install a screen over the gap between the base plate and foundation concrete in accordance with 649-6, or place a structural grout pad in accordance with 649-7. Table 649-1 Anchor Bolt Diameter (inches) / Nut Rotation from Snug-Tight Condition ≤ 1-1/2 / 1/3 turn > 1-1/2 / 1/6 turn							
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 649-8 - Screen Installation										
500	Screen Installation		On steel strain poles and steel monotube assemblies, install a screen that will prevent vermin and debris from entering the gap between the bottom of the base plate and the top of the concrete foundation.	649-8	FDOT Standard Specs					
501	Screen Installation		Cover the entire gap with a wire screen, the bottom horizontal wire of which shall be in full contact with the surface of the concrete foundation and the top horizontal wire of which shall not extend beyond the top surface of the base plate.	649-8	FDOT Standard Specs					
502	Screen Installation		For the screen, use standard grade plain weave galvanized steel wire cloth with 1/2 inch x1/2 inch mesh and 0.063 inch diameter wires.	649-8	FDOT Standard Specs					
503	Screen Installation		Vertical screen wires shall not extend beyond the top and bottom horizontal wires of the screen.	649-8	FDOT Standard Specs					
504	Screen Installation		Use one continuous section of screen with only one overlapping splice where the ends come together and overlap the layers 3 inches minimum.	649-8	FDOT Standard Specs					
505	Screen Installation		Attach the screen to the vertical side of the base plate with self-tapping stainless steel screws (No. 8, 1/2 inch long) with stainless steel washers (1/4 inch inside diameter).	649-8	FDOT Standard Specs					
506	Screen Installation		Drill pilot holes into the base plate to facilitate screw installation.	649-8	FDOT Standard Specs					
507	Screen Installation		Install screws on 9 inch centers maximum and at least one screw shall be installed through the overlapping splice to clamp the layers together.	649-8	FDOT Standard Specs					

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508	Screen Installation		Also clamp the overlapping splice layers together just above the concrete foundation with an all stainless steel fastener assembly consisting of a machine screw (No. 8, 5/8 inch long), nut and two flat washers (1/4 inch inside diameter) and lock washer.	649-8	FDOT Standard Specs					
509	Screen Installation		Tightly clamp the screen layers between the flat washers.	649-8	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 649-9 – Structural Grout Pads										
510	Structural Grout Pads		On mast arm support structures, install a structural grout pad in accordance with the Design Standards and manufacturer's instructions.	649-9	FDOT Standard Specs					
511	Structural Grout Pads		Prior to grout placement, flush the top of the foundation with water to remove any dirt and debris.	649-9	FDOT Standard Specs					
512	Structural Grout Pads		Mix grout to a fluid state with an efflux time of 20 to 30 seconds. Test the grout fluidity using ASTM C939 Flow Cone Method. Discard any grout with an unacceptable efflux time.	649-9	FDOT Standard Specs					
513	Structural Grout Pads		Do not use mechanical means to push or vibrate the grout. Clean any excess grout from the base plate.	649-9	FDOT Standard Specs					
514	Structural Grout Pads		Verify that water inside the pole will drain freely through the installed drain hole.	649-9	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 660 - Vehicle Detection System										
515	Description		Furnish and install a vehicle detection system in accordance with the Contract Documents and this Section. Meet the requirements of Section 603.	660-1	FDOT Standard Specs					
516	Materials		Meet the following requirements: Traffic Data Detection System- Microwave*.....Section 995 Vehicle Detector- Microwave*..... 995-2.4 Traffic Data Detection System- Video* .....Section 995 Vehicle Detector- Video* ..... 995-2.3 Traffic Data Detection System- LiDAR* .....Section 995 Vehicle Detector- LiDAR*.....Section 995 Vehicle Loop Detector*..... 995-2.2 Wireless Magnetometer Assembly* ..... 995-2.5 Automatic Vehicle Identification*..... 995-2.6 Wrong Way Vehicle Detection Systems*..... 995-2.7 Loop Sealant* ..... 995-3 Highlighted Signs*..... 995-15 Hardware and Fittings..... 603-2.4 Galvanizing..... 962-11 *Use products listed on the Department's APL.	660-2	FDOT Standard Specs					
517	Vehicle Presence Detection Systems		Vehicle presence detection systems produce a corresponding output any time that a vehicle occupies the physical or virtual area of the detector.	660-2.2.1.1	FDOT Standard Specs					
518	Traffic Data Detection Systems		Traffic data detection systems provide presence, volume, occupancy, and speed data for the lanes they are configured to monitor.	660-2.2.1.2	FDOT Standard Specs					
519	Wrong Way Vehicle Detection Systems		Wrong way vehicle detection systems produce an alarm output when a vehicle is detected traveling in the wrong direction and may consist of more than one detection zone and may use any of the technology types.	660-2.2.1.4	FDOT Standard Specs					

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520	Wrong Way Vehicle Detection Systems		For both mainline and ramp installations, the detection system must monitor all lanes for one direction, including shoulders.	660-2.2.1.4	FDOT Standard Specs					
521	Wrong Way Vehicle Detection Systems		The wrong way detection system must not interfere with other vehicle presence or traffic data detection systems	660-2.2.1.4	FDOT Standard Specs					
522	Technology Types		Provide the detection technology type detailed in the Plans.	660-2.2.2	FDOT Standard Specs					
523	Technology Types		Detection technology types include inductive loop, video, thermal, microwave, wireless magnetometer, AVI, and Light Detection and Ranging (LiDAR) systems.	660-2.2.2	FDOT Standard Specs					
524	Inductive Loop		An inductive loop detection system uses a minimum of one inductive loop and loop detector.	660-2.2.2.1	FDOT Standard Specs					
525	Inductive Loop		The system operates by energizing and monitoring wire embedded in the road surface to detect vehicle presence and provide an output to traffic controllers or other devices that can generate volume, occupancy, and speed data (detection output).	660-2.2.2.1	FDOT Standard Specs					
526	Loop Wire		Use No. 12 AWG or No. 14 AWG stranded copper wire with Type XHHW cross-linked polyethylene insulation and an additional outer sleeve composed of polyvinylchloride or polyethylene insulation that meets the requirements of International Municipal Signal Association (IMSA) 51-7.	660-2.2.2.1.1	FDOT Standard Specs					
527	Shielded Lead-in Cable		Use No. 14 AWG two conductor, stranded copper wire with shield and polyethylene insulation, meeting the requirements for IMSA 50-2.	660-2.2.2.1.2	FDOT Standard Specs					
528	Splicing Materials		Butt-end connectors may be used for splicing the loop wire to the lead-in cable. Butt-end connectors must be non-insulated. Use resin-core solder for soldered splices.	660-2.2.2.1.3	FDOT Standard Specs					
529	Splicing Materials		Splicing tape must be self-fusing silicone rubber. Ensure insulated tubing used to cover splice is heat-shrinkable, cross-linked polyethylene with a silicon sealant inside the tubing and an insulation rating of at least 600 V.	660-2.2.2.1.3	FDOT Standard Specs					
530	Video		A video vehicle detection system (VVDS) uses one or more cameras recommended by the manufacturer or an integrated thermal sensor and video analytics hardware and software to detect vehicle presence, provides a detection output, or generates volume, occupancy, and speed data.	660-2.2.2.2	FDOT Standard Specs					
531	Microwave		A microwave vehicle detection system (MVDS) transmits, receives, and analyzes an FCC-certified, low-power microwave radar signal to detect vehicle presence, provide a detection output, or generate volume, occupancy, and speed data.	660-2.2.2.3	FDOT Standard Specs					
532	Light Detection and Ranging (LiDAR)		A LiDAR detection system uses one or more LiDAR sensors and perception hardware and software to detect vehicle presence, provide a detection output, or generate volume, occupancy, and speed data.	660-2.2.2.6	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 660-3 – Installation Requirements										
533	Installation Requirements for all detectors		Install, configure, and demonstrate a fully functional vehicle detection system, as shown in the Plans.	660-3.1	FDOT Standard Specs					

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534	Installation Requirements for all detectors		Connect all field equipment to the existing communication network, and provide all materials specified in the Contract Documents.	660-3.1	FDOT Standard Specs					
535	Installation Requirements for all detectors		Install all equipment according to the manufacturer's recommendations.	660-3.1	FDOT Standard Specs					
536	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.	660-3.1	FDOT Standard Specs					
537	Installation Requirements for all detectors		All equipment with the appropriate power and communication cables.	660-3.1	FDOT Standard Specs					
538	Installation Requirements for all detectors		Install the power cable and the communication cables according to the manufacturer's recommendation.	660-3.1	FDOT Standard Specs					
539	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.	660-3.1	FDOT Standard Specs					
540	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.	660-3.1	FDOT Standard Specs					
541	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.	660-3.1	FDOT Standard Specs					
542	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.	660-3.1	FDOT Standard Specs					
543	Installation Requirements for all detectors		Ensure that all programmable system settings return to their previous configurations and the system resumes proper operation.	660-3.1	FDOT Standard Specs					
544	Inductive Loop Detector Installation		Install vehicle loops in accordance with the manufacturer's instructions and the Design Standards, Index No. 17781.	660-3.2	FDOT Standard Specs					
545	Inductive Loop-Detector Units		Adjust the operating frequency of each detector unit, if required, to prevent crosstalk of the units.	660-3.2.1	FDOT Standard Specs					
546	Saw Cuts		Use a chalk line or equivalent method to outline the perimeter of the loop on the pavement and routes for lead-in cables.	660-3.2.2	FDOT Standard Specs					
547	Saw Cuts		Do not allow the saw cut in the pavement to deviate by more than 1 inch from the chalked line.	660-3.2.2	FDOT Standard Specs					
548	Saw Cuts		Ensure that all saw cuts are free of any dust, dirt, or other debris and completely dry prior to installation of the loop wire, loop wire twisted pair lead, or lead-in cable.	660-3.2.2	FDOT Standard Specs					
549	Saw Cuts		Ensure that the top conductor of the loop wire or lead-in cable is a minimum of 1 inch below the final surface of the roadway.	660-3.2.2	FDOT Standard Specs					

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550	Loop Wire		Ensure that all loops are wound in a clockwise manner and the first turn of the loop wire is placed in the bottom of the saw cut, with each subsequent turn placed on top of the preceding turn.	660-3.2.3	FDOT Standard Specs					
551	Loop Wire		Push the loop wire to the bottom of the saw cut with a nonmetallic tool which will not damage the insulation.	660-3.2.3	FDOT Standard Specs					
552	Loop Wire		Tag and identify the clockwise “lead” of each loop.	660-3.2.3	FDOT Standard Specs					
553	Loop Wire		Use alternate polarity on adjacent loops.	660-3.2.3	FDOT Standard Specs					
554	Loop Wire		Ensure that the hold down material is non-metallic, is placed in the saw slot using segments 1 to 2 inches long, spaced 12 inches apart, and that the distance from the top of the hold down material to the final surface of the roadway is not less than 1-1/2 inches.	660-3.2.3	FDOT Standard Specs					
555	Loop Wire Twisted Pair Lead		Create a loop wire twisted pair lead by twisting the loop wire pair a minimum of 10 turns per foot to form a loop wire twisted pair lead from the edge of the loop to the pull box located adjacent to the roadway. Place only one loop wire twisted pair lead in a saw cut.	660-3.2.4	FDOT Standard Specs					
556	Loop Wire Twisted Pair Lead		Ensure that the distance between a twisted loop wire pair lead within the roadway is a minimum of 6 inches from any other twisted loop wire pair lead or loop, until they are within 1 foot of the edge of pavement or curb, at which point they may be placed closer together.	660-3.2.4	FDOT Standard Specs					
557	Loop Wire Twisted Pair Lead		Provide a minimum of 3 feet of twisted loop wire pair lead in the pull box located adjacent to the roadway.	660-3.2.4	FDOT Standard Specs					
558	Loop Wire Twisted Pair Lead		Do not route twisted loop wire pair lead directly through conduits to the cabinet, unless otherwise shown in the Plans.	660-3.2.4	FDOT Standard Specs					
559	Loop Sealant		Prepare and apply loop sealant in accordance with the manufacturer’s instructions.	660-3.2.5	FDOT Standard Specs					
560	Loop Sealant		Ensure that the loop sealant has cured completely before allowing vehicular traffic to travel over the sealant.	660-3.2.5	FDOT Standard Specs					
561	Shielded Lead-in Cable		Place the lead-in cable in the bottom of the saw cut. Do not damage the insulation.	660-3.2.6	FDOT Standard Specs					
562	Shielded Lead-in Cable		Install no more than four lead-in cables in a saw cut.	660-3.2.6	FDOT Standard Specs					
563	Shielded Lead-in Cable		Ensure that the hold down material is not longer than 1 inch and that the distance from the top of the hold down material to the final surface of the roadway is not less than 1-1/2 inches.	660-3.2.6	FDOT Standard Specs					
564	Splicing		Perform the splicing in a pull box located off the roadway, not in the roadway itself.	660-3.2.7	FDOT Standard Specs					
565	Splicing		Splice the black conductor of the lead-in cable to the clockwise “lead” of the loop.	660-3.2.7	FDOT Standard Specs					
566	Splicing		Ensure that the ends of the cable jackets, twisted pair, and lead-in are encased in the loop splice material.	660-3.2.7	FDOT Standard Specs					
567	Splicing		Ensure that each loop has an individual return to the cabinet and series splicing is performed on a separate terminal block in the cabinet.	660-3.2.7	FDOT Standard Specs					

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568	Terminations		Using insulated terminal lugs, terminate lead-in cables or twisted pair loop wire on a terminal strip, which is located in the controller or detector cabinet.	660-3.2.8	FDOT Standard Specs					
569	Terminations		Use a calibrated ratchet type crimping tool to attach the lugs to the conductors of the lead-in cable or twisted loop wire.	660-3.2.8	FDOT Standard Specs					
570	Loop Assembly Identification		Identify and tag each loop assembly in the controller or detector cabinet by lane and movement number.	660-3.2.9	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 660-3.2.10 - Inductive Loop Detector Testing and Turn-on										
571	Series Resistance		Obtain Department of Transportation Traffic Signal Resistance Measurement Data Sheets from the Engineer.	660-3.2.10.1	FDOT Standard Specs					
572	Series Resistance		Measure and record the series resistance of each loop assembly on these data sheets. Leave a copy in the controller cabinet.	660-3.2.10.1	FDOT Standard Specs					
573	Series Resistance		If the series resistance of a loop assembly is greater than 10 Ω, inspect the loop assembly to find the cause of the excessive resistance. Correct the cause of the excessive resistance at no additional cost to the Department.	660-3.2.10.1	FDOT Standard Specs					
574	Insulation Resistance		Measure and record the insulation resistance of each loop assembly and verify that the resistance is greater than 100 MΩ.	660-3.2.10.2	FDOT Standard Specs					
575	Insulation Resistance		Use a 500 VDC insulation tester to measure the resistance.	660-3.2.10.2	FDOT Standard Specs					
576	Insulation Resistance		Reference all measurements to a good earth ground (ground rod, metallic water pipe, etc.).	660-3.2.10.2	FDOT Standard Specs					
577	Insulation Resistance		Disconnect the transient suppression devices from the loop assemblies before taking any measurements.	660-3.2.10.2	FDOT Standard Specs					
578	Insulation Resistance		If the insulation resistance is less than 100 MΩ, determine if the lead-in cable or the loop wire is causing the problem, and replace the defective cable or loop wire at no additional cost to the Department.	660-3.2.10.2	FDOT Standard Specs					
579	Loop Detector Turn-on		Connect the loop assemblies to the appropriate inductive loop vehicle detectors and tune the detectors in accordance with the manufacturer's instructions.	660-3.2.10.3	FDOT Standard Specs					
580	Loop Detector Turn-on		Separate the operating frequencies of vehicle detectors, in adjacent lanes, by at least 2 kHz.	660-3.2.10.3	FDOT Standard Specs					
581	Loop Detector Turn-on		Verify operation proper operation in accordance with 660-2.2.1.2.	660-3.2.10.3	FDOT Standard Specs					
582	Video Detector Installation		Install cameras and configure detection zones and settings in accordance with the Contract Documents, manufacturer's recommendations, and as directed by the Engineer.	660-3.3	FDOT Standard Specs					
583	Video Detector Installation		Submit configuration settings (including, but not limited to detector names, communication settings, and output assignments) and configuration file backups to the Engineer.	660-3.3	FDOT Standard Specs					
584	Video Detector Installation		Submit a graphical depiction of each camera site, its pole location, mounting height, the ratio of distance away from the camera versus the mounting height, the camera's mounting type (i.e., pole or structure), camera aiming procedures, and the placement of the proposed detection zone for each lane.	660-3.3	FDOT Standard Specs					
585	Video Detector Installation		Do not use coaxial cable runs in excess of 500 feet.	660-3.3	FDOT Standard Specs					

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586	Video Detector Installation		Mount and aim cameras in a manner that eliminates as much environmentally generated glare as possible.	660-3.3	FDOT Standard Specs					
587	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.	660-3.4	FDOT Standard Specs					
588	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.	660-3.4	FDOT Standard Specs					
589	Wireless Magnetometer Installation		Install in accordance with the Contract Documents, manufacturer's recommendations, and as directed by the Engineer.	660-3.5	FDOT Standard Specs					
590	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.	660-3.5	FDOT Standard Specs					
591	AVI Detection System Installation		Install in accordance with the Contract Documents, manufacturer's recommendations, and as directed by the Engineer.	660-3.6	FDOT Standard Specs					
592	Wrong Way Vehicle Detection Systems (WWVDS) Installation		Wrong Way Vehicle Detection Systems (WWVDS) Installation	660-3.7	FDOT Standard Specs					
593	LiDAR Detection System Installation		Install in accordance with the Contract Documents, manufacturer's recommendations, and as directed by the Engineer	660-3.8	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 676 - Traffic Cabinets										
594	General		Furnish and install traffic cabinets as shown in the Plans. Meet the requirements of Section 603.	676-1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 676-2 - Materials										
595	Materials		Use Traffic Cabinets (995-11) on the Department's Approved Product List (APL)	676-2	FDOT Standard Specs					
596	Materials		Provide the cabinet with an automatic transfer switch if shown in the Plans. New signal installations must include controller cabinets that will interface with the dimming circuit of LED street lighting with an auxiliary relay if shown in the Plans.	676-2	FDOT Standard Specs					
597	Materials		Provide cabinets with No. 2 locks unless otherwise shown in the Plans. Provide two keys for each cabinet unless otherwise shown in the Plans. Electronic locking systems, including keys, shall be compatible with the existing system used by the Department and the maintaining agency.	676-2	FDOT Standard Specs					
598	Materials		Coordinate selection, installation, configuration, and use of electronic locking systems with the Department.	676-2	FDOT Standard Specs					

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FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 676-3 - Installation Requirements										
599	General		Ground all cabinets in accordance with the requirements of Section 620. Keep the ground wire from the cabinet ground busbar to the ground rod assembly or array as short as possible. Ensure the ground wire is not in contact with any other part of the cabinet.	676-3.1	FDOT Standard Specs					
600	General		All field drilled conduit entrance holes or other holes must be reamed and free of burrs. All conduit connections to cabinets and small equipment enclosures must be weatherproof. Ensure cabinet doors do not pinch or damage interior cables or displace equipment when doors are open, closed, or in motion.	676-3.1	FDOT Standard Specs					
601	General		Construct cabinet bases and maintenance service slabs as shown in Standard Plan 676-010 unless otherwise shown in the Plans. Construct cabinet bases and maintenance service slabs without risers using concrete in accordance with Section 347. Construct cabinet bases and maintenance service slabs with risers using concrete in accordance with Section 346. Make the concrete base and maintenance service slab level, free of honeycombs, and with a broomed finish. Temporarily seal the end of conduit risers located in the base before placing the concrete. Ensure conduit remains clear of debris. Position the end of the conduit risers a minimum of 2 inches above the finished surface of the concrete base.	676-3.1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 676-3.2 - Controller Cabinet Installation										
602	Pole Mounted Cabinets		Fasten the pole mounted hardware, which is furnished with the cabinet to the cabinet, making all connections watertight.	676-3.2.1	FDOT Standard Specs					
603	Pole Mounted Cabinets		Use stainless steel bands for mounting cabinets onto steel strain poles.	676-3.2.1	FDOT Standard Specs					
604	Pole Mounted Cabinets		Use stainless steel bands or lead anchors (or equivalent) for mounting cabinets onto concrete strain poles.	676-3.2.1	FDOT Standard Specs					
605	Pole Mounted Cabinets		Use stainless steel bands or lag bolts for mounting cabinets onto wood poles.	676-3.2.1	FDOT Standard Specs					
606	Ground Mounted Cabinets		Use anchor bolts to fasten ground mounted cabinets to the concrete	676-3.2.2	FDOT Standard Specs					
607	Ground Mounted Cabinets		Seal the joint between the bottom of the cabinet and the concrete base (inside and outside of cabinet) with a clear silicone rubber sealant.	676-3.2.2	FDOT Standard Specs					
608	Field Wiring		Terminate signal cable, interconnect cable, and loop lead-in wires on the appropriate terminal strips in the controller cabinet with insulated terminal lugs.	676-3.2.3	FDOT Standard Specs					
609	Field Wiring		Label spare circuits of the signal and interconnect cables and connect them to the cabinet ground busbar.	676-3.2.3	FDOT Standard Specs					
610	Field Wiring		Neatly bundle and identify all field wiring cables in the controller cabinet.	676-3.2.3	FDOT Standard Specs					
611	Intelligent Transportation System Cabinet Installation		Mount the cabinet as shown in the Plans and provide the cabinet with the necessary base or pole mount hardware. Ensure that pole and structure-mounted field cabinets have mounting brackets on the side so that both cabinet doors are fully functional.	676-3.3	FDOT Standard Specs					

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612	Intelligent Transportation System Cabinet Installation		Provide an adapter bracket for pole mounted cabinets that is designed to allow banding straps to be installed without obstructing pole handholes.	676-3.3	FDOT Standard Specs					
613	Intelligent Transportation System Cabinet Installation		Make provisions for all data, control, and confirmation connections between the ITS device and field cabinet and for any required wiring harnesses and connectors.	676-3.3	FDOT Standard Specs					
614	Intelligent Transportation System Cabinet Installation		Place a heavy-duty resealable plastic bag on the backside of the main cabinet door for storing a list of terminal block connections and other cabinet documentation.	676-3.3	FDOT Standard Specs					
615	Intelligent Transportation System Cabinet Installation		Place all equipment in the cabinet according to the recommendations of the manufacturer.	676-3.3	FDOT Standard Specs					
616	Intelligent Transportation System Cabinet Installation		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.	676-3.3	FDOT Standard Specs					
617	Small Enclosure Installation		Mount the enclosure on a pole or support structure as shown in the Plans and provide any hardware necessary for a complete and accepted Installation	676-3.4	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 676-4 - Warranty										
618	Warranty		Ensure cabinets, enclosures, and risers have a manufacturer's warranty covering defects for a minimum of 2 years from the date of final acceptance.	676-4	FDOT Standard Specs					
619	Warranty		The warranty must include providing replacements, within 10 calendar days of notification, for defective parts and equipment during the warranty period at no cost to the Department or maintaining agency.	676-4	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26- Section 677 – Equipment Shelter										
620	General		Furnish and install an equipment shelter as shown in the Plans.	677-1	FDOT Standard Specs					
621	General		Ensure that all materials furnished, assembled, fabricated, or installed are new products.	677-1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 677-2 – Materials										
622	General		Ensure that the shelter includes a secure door; power distribution panels; a heating, ventilation, and air conditioning (HVAC) system; lightning protection, grounding, and any other components necessary for a completely integrated communication building.	677-2.1	FDOT Standard Specs					
623	General		Ensure that the shelter is constructed and installed according to local building codes.	677-2.1	FDOT Standard Specs					
624	General		Provide a shelter designed to withstand loads as follows: wind: 150 MPH; floor: 200 lbs. per square foot; slab: 200 lbs. per square foot; roof: 100 lbs. per square foot.	677-2.1	FDOT Standard Specs					
625	General		Provide design drawings that meet all minimum design standards and are signed and sealed by a registered Professional Engineer in the State of Florida.	677-2.1	FDOT Standard Specs					

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626	General		The shelter's exterior shall have an exposed concrete aggregate finish.	677-2.1	FDOT Standard Specs					
627	General		The shelter must have a bullet-resistant exterior surface in accordance with UL 752.	677-2.1	FDOT Standard Specs					
628	General		The shelter's exterior color is to be earth tone.	677-2.1	FDOT Standard Specs					
629	General		Alternative exterior finishes or colors may be approved by the Engineer.	677-2.1	FDOT Standard Specs					
630	General		Ensure that the equipment shelter's heat transfer coefficient does not exceed 0.07 British Thermal Units (BTUs) per hour per square foot per degree Fahrenheit (F) for the roof and 0.28 BTUs per hour per square foot per degree F for the exterior wall.	677-2.1	FDOT Standard Specs					
631	Shelter Floor and Foundation		The floor is to be constructed of concrete or concrete composite material.	677-2.2	FDOT Standard Specs					
632	Shelter Floor and Foundation		The foundation is a monolithic slab with appropriate footings and the final top of slab elevation is set a minimum of 2 feet above final grade, or as shown in the Plans.	677-2.2	FDOT Standard Specs					
633	Shelter Floor and Foundation		Concrete is to be Class I for extremely aggressive environments and in accordance with Section 346.	677-2.2	FDOT Standard Specs					
634	Shelter Floor and Foundation		Perform concrete structures work in accordance with Section 400.	677-2.2	FDOT Standard Specs					
635	Shelter Floor and Foundation		The equipment shelter must not bend or break during moving, towing, or hoisting.	677-2.2	FDOT Standard Specs					
636	Shelter Floor and Foundation		The equipment room's interior floor covering is to be industrial-grade vinyl flooring fastened to the shelter floor with waterproof adhesive.	677-2.2	FDOT Standard Specs					
637	Shelter Floor and Foundation		Provide an air gap between the equipment shelter floor and the foundation slab, or alternatively, construct the foundation slab with a vapor barrier to prevent moisture penetration. Insulate the floor to provide a minimum insulating factor of R-11.	677-2.2	FDOT Standard Specs					
638	Door		The exterior door is to be 36 inches wide by 78 inches tall, insulated, bullet-resistant, corrosion-resistant steel door with a door check and doorstop secured with a mortised deadbolt security lock keyed as directed.	677-2.3	FDOT Standard Specs					
639	Door		The door is to have a lever type handle on both the inside and outside.	677-2.3	FDOT Standard Specs					
640	Door		Provide the Department with four keys to each door lock.	677-2.3	FDOT Standard Specs					
641	Walls		Vapor shield the walls to prevent moisture penetration and insulate the walls for a minimum insulating factor of R-14.	677-2.4	FDOT Standard Specs					
642	Walls		Interior surfaces are to have a white textured finish wall covering with molding on all corners.	677-2.4	FDOT Standard Specs					
643	Walls		All floor/wall intersections are to have 4 inch vinyl baseboards installed using waterproof adhesive.	677-2.4	FDOT Standard Specs					
644	Ceiling and Roof		The interior room height is to be no less than 8 feet above the floor and capable of supporting the proposed electrical fixtures and cable trays.	677-2.5	FDOT Standard Specs					
645	Ceiling and Roof		The roof section shall have a 1/8 inch per foot minimum pitch for drainage.	677-2.5	FDOT Standard Specs					

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646	Ceiling and Roof		Fill all voids between the ceiling and roof with a vapor shield and minimum Type R-21 insulation.	677-2.5	FDOT Standard Specs					
647	Entrance		The entrance steps shall be concrete with ADA approved hand rail.	677-2.6	FDOT Standard Specs					
648	Entrance		The maximum distance from the final grade or final step to the shelter floor must not exceed 8 inches.	677-2.6	FDOT Standard Specs					
649	Lighting		Fluorescent light fixtures are to provide a uniform initial light level of 125 to 150 foot candles at 4 feet above the floor with a 3:1 ratio of maximum to minimum light levels as measured throughout the shelter's interior.	677-2.7	FDOT Standard Specs					
650	Lighting		Mount a light switch inside the shelter, adjacent to the entry door, for the interior lighting.	677-2.7	FDOT Standard Specs					
651	Lighting		Install one 2250 lumen floodlight that is vandal resistant and mounted on the outside near the entrance door with a photocell and interior light switch. Install an auxiliary powered interior emergency light that illuminates when primary power fails.	677-2.7	FDOT Standard Specs					
652	HVAC System		Install appropriately sized exterior wall-mounted air conditioners.	677-2.8	FDOT Standard Specs					
653	HVAC System		Ensure the system has a dry contact closure alarm output for failure monitoring and has an installed adjustable start time delay, initially set to 5 minutes.	677-2.8	FDOT Standard Specs					
654	HVAC System		The HVAC unit must be capable of operating when the outside temperature falls below 60ºF and have sufficient capacity to cool from a 95ºF ambient temperature to 75ºF, including the equipment heat load, providing continuous interior equipment cooling and dehumidification.	677-2.8	FDOT Standard Specs					
655	HVAC System		The unit shall have a device installed to reduce the starting current required during a cold start or under high-head pressure conditions.	677-2.8	FDOT Standard Specs					
656	HVAC System		Provide an IP addressable thermostat which provides a secure web based interface that displays the current thermostat settings and allows remote adjustments.	677-2.8	FDOT Standard Specs					
657	Cable Trays		Cable trays are to be 12 inches wide capable of supporting the transmission lines, control and data wires, and alarm wires associated with communication equipment.	677-2.9	FDOT Standard Specs					
658	Cable Trays		Use cable trays constructed of aluminum or painted steel fabricated in an open ladder type arrangement that are suspended from the ceiling. Electrically bond by mechanical means, on non-painted surface areas, all rack and cable tray units together.	677-2.9	FDOT Standard Specs					
659	Cable Trays		After bonding all rack and cable tray units, cover these areas with an antioxidant compound.	677-2.9	FDOT Standard Specs					
660	Cable Trays		Cable trays and rack frames are to be connected to the shelter interior ground.	677-2.9	FDOT Standard Specs					
661	Cable Trays		The clearance height between the floor and bottom of the cable tray is to be no less than 86 inches.	677-2.9	FDOT Standard Specs					
662	Cable Trays		Equip the cable trays with overhead receptacles as shown in the Plans.	677-2.9	FDOT Standard Specs					
663	Equipment Rack		Include at least one standard 19 inch EIA/TIA equipment rack capable of mounting and supporting all devices indicated in the Plans.	677-2.10	FDOT Standard Specs					

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664	Equipment Rack		Include provisions for vertical and horizontal cable management and for power strips.	677-2.10	FDOT Standard Specs					
665	Equipment Rack		Secure the top of each rack to the cable tray above using C channel or J	677-2.10	FDOT Standard Specs					
666	Fire/Smoke Detection and Suppression		Install at least one smoke detector that operates on alternating current. Mount the smoke detector on the ceiling 1 foot clear of all obstructions and ensure that it includes a dry contact closure that will activate during prescribed conditions.	677-2.11	FDOT Standard Specs					
667	Fire/Smoke Detection and Suppression		Where the equipment shelter is to be furnished with an automatic fire protection system, it is to be an FM-200 waterless, residue-free fire suppression system that conforms to NFPA and ISO 14520 standards.	677-2.11	FDOT Standard Specs					
668	Fire/Smoke Detection and Suppression		Mount a hand-held carbon dioxide ABC fire extinguisher on the wall near the door. Verify that the extinguisher has a valid inspection tag and is rechargeable.	677-2.11	FDOT Standard Specs					
669	Alarm Specification		Wire, label and terminate all alarms on a Type 66 block.	677-2.12	FDOT Standard Specs					
670	Alarm Specification		Provide the following shelter alarms: 1. A magnetic dry contact door alarm. 2. A dry contact air conditioner failure alarm for each installed unit. 3. Dry contact fire alarms. 4. Dry contact high- and low-temperature alarms with thresholds adjustable between 50 and 90ºF. 5. A power failure alarm that is wired from a dedicated circuit breaker. 6. A main fuse alarm that is wired from the main fuse disconnect.	677-2.12	FDOT Standard Specs					
671	Alarm Specification		Provide provisions on each exterior side of the shelter that can be used for installation of security cameras. Provide these weatherproof conduit entries at locations near the corner of the shelter just below the roofline to allow wiring for cameras and other security devices to pass into the shelter.	677-2.12	FDOT Standard Specs					
672	Electrical		The standard electrical configuration is single-phase 120/240 VAC at 60 Hz with a 150 A minimum service and a 42 circuit distribution panel.	677-2.13	FDOT Standard Specs					
673	Electrical		Provide power service drop and site-specific power needs in accordance with Section 639.	677-2.13	FDOT Standard Specs					
674	Primary AC Surge Protective Device		Install a primary AC surge protective device (SPD) that meets the requirements of Section 620, wired to protect the system while utilizing either utility or emergency power.	677-2.13.1	FDOT Standard Specs					
675	SPDs at Point of Use		Install SPDs that meet the requirements in Section 620 so that all outlets are protected.	677-2.13.2	FDOT Standard Specs					
676	Communication Cable Wall Entry		Install four, 4 inch diameter exterior wall penetrations with weather-sealed boots as shown in the Plans.	677-2.14	FDOT Standard Specs					
677	Circuit Termination Backboard		Install a backboard for the termination of communication circuits of 3/4 inch AC-grade plywood no less than 48 inches square and painted with two coats of gray, flame-retardant paint.	677-2.15	FDOT Standard Specs					
678	Circuit Termination Backboard		All ground wires and conductors are to be insulated from the backboard, which must be securely mounted to the wall and capable of supporting the hardware fastened to it.	677-2.15	FDOT Standard Specs					

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679	Warranty		The equipment shelter, its components, and hardware must have a manufacturer's warranty covering defects for a minimum of one year.	677-2.16	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, July 2015 - Section 677-3 - Installation Requirements										
680	General		Provide and detail the equipment shelter installation, including site layout, fencing, and all other features. Submit this drawing for approval prior to the start of construction.	677-3.1	FDOT Standard Specs					
681	General		Concrete is to be Class I in accordance with Section 346. Perform concrete structures work in accordance with Section 400.	677-3.1	FDOT Standard Specs					
682	General		Obtain precast products from a plant that is currently on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of 105.	677-3.1	FDOT Standard Specs					
683	General		Submit to the Engineer all permit documents for approval prior to starting the work.	677-3.1	FDOT Standard Specs					
684	Electrical		Install and connect electrical power to the equipment shelter and install all wires and cables in a neat, orderly fashion.	677-3.2	FDOT Standard Specs					
685	Electrical		Provide underground power service unless otherwise specified in the Plans.	677-3.2	FDOT Standard Specs					
686	Electrical		Make all electrical connections from the service drop to the equipment shelter's receptacles.	677-3.2	FDOT Standard Specs					
687	Electrical		Use a minimum of No. 12 AWG copper wires to install the receptacles, switches, and light fixtures.	677-3.2	FDOT Standard Specs					
688	Electrical		Run all wire in a minimum 0.75 inch inside diameter electrical metallic conduit.	677-3.2	FDOT Standard Specs					
689	Electrical		Divide the electrical loads among as many load centers as necessary to contain the quantity of circuit breakers required to protect the equipment shelter facility.	677-3.2	FDOT Standard Specs					
690	Electrical		Load centers must contain separate, appropriately sized circuit breakers for the HVAC units, each major branch as is necessary, each receptacle, and each remaining location in the 42 circuit panel.	677-3.2	FDOT Standard Specs					
691	Electrical		Each interior side of the four walls will have a duplex receptacle 18 inches above the floor, or as shown in the Plans. Protect receptacles with an individual 20 A circuit breaker. Install a separate 20 A single-pole circuit breaker to protect the lighting circuits.	677-3.2	FDOT Standard Specs					
692	Provision for Backup Power		The equipment shelter must be capable of utilizing a mobile emergency generator during power outages.	677-3.3	FDOT Standard Specs					
693	Provision for Backup Power		The emergency generator connection shall allow Department personnel to power the site from a portable generator in the event that both the utility power and emergency power is lost.	677-3.3	FDOT Standard Specs					
694	Provision for Backup Power		Install a primary power switch to allow for the disconnection of commercial power at the main power entrance that is interconnected to an automatic transfer switch to facilitate a switch to emergency generator power in the event utility power is lost.	677-3.3	FDOT Standard Specs					
695	Provision for Backup Power		Emergency generator power must route through a manual power switch on the outside of the shelter prior to connection to the automatic transfer switch panel.	677-3.3	FDOT Standard Specs					
696	Grounding		Meet the requirements of Section 620.	677-3.4	FDOT Standard Specs					

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697	Site Preparation		Meet the requirements of Section 110.	677-3.5	FDOT Standard Specs					
698	Site Preparation		Coordinate the extent and schedule for all land clearing activities with the Engineer.	677-3.5	FDOT Standard Specs					
699	Fencing		Furnish Type B chain-link perimeter fencing and gates according to the requirements of Section 550 and Design Standards, Index No. 802 with barbed wire attachment.	677-3.6	FDOT Standard Specs					
700	Fencing		Install the fence to form a rectangle or square shape, unless otherwise specified in the Plans.	677-3.6	FDOT Standard Specs					
701	Fencing		Allow for a minimum clearance of 5 feet between the fence and any enclosed item.	677-3.6	FDOT Standard Specs					
702	Fencing		Construct sliding gates in accordance with Design Standards, Index No. 803 with barbed wire, configure as shown in the Plans.	677-3.6	FDOT Standard Specs					
703	Fencing		Provide a hardened, four digit combination gate lock with the combination set as directed.	677-3.6	FDOT Standard Specs					
704	Weed Prevention		As necessary, treat the fenced area with a Department approved herbicide used in accordance with 71. Install a woven plastic weed barrier in accordance with manufacturer's recommendations prior to gravel installation with a minimum 10% overlap for each barrier section and secure the edges of the mat with stakes.	677-3.7	FDOT Standard Specs					
705	Compound Gravel		Place gravel or crushed rock covering all unimproved areas within the limits of the fenced area to a depth of 6 inches. Gravel or crushed rock shall not exceed 3 inches in diameter.	677-3.8	FDOT Standard Specs					
706	Site Restoration		Provide performance turf in accordance with Section 570.	677-3.9	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 677-4 - Inspection and Verification										
707	General		The Department may perform an inspection witnessed by the Engineer at completion of the work.	677-4.1	FDOT Standard Specs					
708	General		Notify the Engineer at least 10 days prior to completion of the installation to schedule the inspection.	677-4.1	FDOT Standard Specs					
709	General		The inspection will verify that all equipment is correctly installed and functional.	677-4.1	FDOT Standard Specs					
710	General		Record all test results in a format approved by the Engineer prior to testing.	677-4.1	FDOT Standard Specs					
711	General		All recorded test report data shall be signed and dated, witnessed, and validated by signature from a Department representative. Remedy all noted deficiencies at no cost to the Department.	677-4.1	FDOT Standard Specs					
712	Mechanical Inspection		Test all equipment associated with the shelter. Test and verify the HVAC system performance for heating, cooling, and dehumidification.	677-4.2	FDOT Standard Specs					
713	Mechanical Inspection		Inspect the building for the proper sealing of all wall penetrations. Correct any deficiencies at no cost to the Department.	677-4.2	FDOT Standard Specs					
714	Electrical Inspection		Verify and provide a report to the Engineer prior to acceptance that all shelter lights and smoke detectors operate properly, and proper electrical power load balances are realized. Correct any deficiencies at no cost to the Department.	677-4.3	FDOT Standard Specs					
715	Site Inspection		The site is to be free of debris and all excavations backfilled and restored to natural grade conditions.	677-4.4	FDOT Standard Specs					

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716	Performance Period		Following the completion of all acceptance testing and inspections, subject the installed site to a minimum 20 day performance period, or alternately, the operational test period for the project, whichever is greater.	677-4.5	FDOT Standard Specs					
717	Performance Period		For the purpose of a successful performance period, failure of operation is defined as the failure of a major site component (i.e., HVAC systems, lighting, alarms, fire or smoke detection, etc.). Conduct the performance verification inspection with the Engineer present.	677-4.5	FDOT Standard Specs					
718	Performance Period		Complete performance testing within 45 days of shelter installation and inspection.	677-4.5	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 682 - Video Equipment										
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 682-1 - CCTV Camera										
719	Description		Furnish and install a closed-circuit television (CCTV) camera at the location(s) shown in the Plans.	682-1.1	FDOT Standard Specs					
720	Description		Ensure that the installed equipment provides unobstructed video images of the roadway, traffic, and other current conditions around a roadside CCTV field site that it responds to camera control signals from the operator; and that the video images can be transmitted to remote locations for observation.	682-1.1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 2025-26 - Section 682-2 - Materials										
721	Materials		All equipment shall be permanently marked with manufacturer name or trademark, part number, and date of manufacture or serial number. Meet the requirements of Section 603.	682-1.2.1	FDOT Standard Specs					
722	Materials		Provide a CCTV camera that is compatible with any camera operating software indicated in the Contract Documents. Cameras are classified by camera type and video type. Provide the appropriate type for the locations shown in the Plans. Use only equipment and components that meet the requirements of Section 996 and are listed on the Department's Approved Product List (APL).	682-1.2.1	FDOT Standard Specs					
723	Materials		All CCTV cameras must support the communication links shown in the Plans. Unshielded twisted pair/shielded twisted pair network cables must be compliant with the TIA-568 Standard.	682-1.2.1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY 20256-26 - Section 682-1.3 - Installation										
724	Installation		Install the CCTV camera on a pole in accordance with Standard Plans, Indexes 641-020, 649-020, and 659-020, and as shown in the Plans.	682-1.3	FDOT Standard Specs					
725	Installation		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. Ensure that the cabinet protects these electrical and electronic devices from rain, dust, dirt, and other harmful elements of nature.	682-1.3	FDOT Standard Specs					
726	Installation		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.	682-1.3	FDOT Standard Specs					
727	Installation		Furnish and install any and all ancillary equipment required to provide a complete and fully operational CCTV camera.	682-1.3	FDOT Standard Specs					
728	Installation		Verify that all wiring meets National Electric Code (NEC) requirements where applicable.	682-1.3	FDOT Standard Specs					

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729	Installation		Furnish and install any and all ancillary equipment required to provide a complete and fully operational CCTV camera.	682-1.3	FDOT Standard Specs					
730	Installation		Coat the exterior of the dome-type enclosure's lower half with a clear, rain repellant product prior to final acceptance.	682-1.3	FDOT Standard Specs					
731	Field Acceptance Testing		Conduct field acceptance testing in accordance with Section 611.	682-1.4	FDOT Standard Specs					
732	Field Acceptance Testing		Perform local field inspection at each local CCTV field site to verify and confirm the following: 1. Physical construction has been completed as specified in the Plans and all existing and proposed lanes are clearly visible with no line of site obstructions. 2. The quality and tightness of ground and surge protector connections. 3. Proper voltages for all power supplies and related power circuits. 4. All connections, including correct installation of communication and power cables.	682-1.4	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 682-2 - Video Display Equipment										
733	Description		Furnish and install video display equipment as shown in the Plans.	682-2.1	FDOT Standard Specs					
734	Materials		Video display equipment must have the capability to display analog, digital, and other images associated with the operation of the transportation management center (TMC).	682-2.2	FDOT Standard Specs					
735	Materials		Provide equipment, mounting hardware, cabling, and other video display components that are compatible with each other.	682-2.2	FDOT Standard Specs					
736	Materials		All equipment and materials furnished and installed must be reviewed and approved by the Engineer.	682-2.2	FDOT Standard Specs					
737	Video Display Control System		Furnish a video display control system that meets the requirements of Section 996.	682-2.2.1	FDOT Standard Specs					
738	Video Display Control System		Provide the video display control system with a minimum configuration of 4 composite video inputs, 4 component (red, green, and blue (RGB)) video inputs, and 4 DVI inputs as well as network connections, decoders, and associated hardware and software required to display 32 inputs simultaneously at a minimum resolution of 720 pixels x 480 pixels and a frame rate of 30 fps, or as shown in the Plans.	682-2.2.1	FDOT Standard Specs					
739	Video Display Control System		Provide the video display control system with a minimum configuration of 4 composite video outputs, 2 component (RGB video outputs), and 4 DVI outputs, or as shown in the Plans. If the projection device requires an analog signal, then breakout cables may be used to convert the DVI output connector to a HD15 analog RGB connector.	682-2.2.1	FDOT Standard Specs					
740	Video Wall Display		Furnish and install a video wall display consisting of display devices described below arranged in a wall, as shown in the Plans, together with a video display control system.	682-2.2.2	FDOT Standard Specs					
741	Video Wall Display		The video wall display must produce, at a minimum, a large-scale, high resolution video image having accurate color rendition, sufficient image brightness, and a high contrast ratio, as described in 682-2.2.8. The display system must provide access to serviceable components for repair and replacement of electronics, lamps, and optical components without removing the device from service for a period longer than 30 minutes	682-2.2.2	FDOT Standard Specs					

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742	Video Wall Display		Integrate the individual display units in a single, seamless display that provides a continuous image across the entire active display area provided, under the complete control of the TMC operators from their individual shared workstations.	682-2.2.2	FDOT Standard Specs					
743	Video Wall Display		Source all major wall display components from a single provider or manufacturer to ensure that the various devices are compatible with each other and able to function together as an integrated display.	682-2.2.2	FDOT Standard Specs					
744	Video Wall Display		The individual video images must exhibit a uniformity of color quality across the multiple displays. Colors must be displayed evenly across the video wall and the video wall must maintain uniform brightness characteristics from one video display unit to the next in the tiled display, with no degradation in color or brightness uniformity over time. The video wall display must provide features that allow physical and electronic alignment of the separate high resolution display units that comprise the wall.	682-2.2.2	FDOT Standard Specs					
745	Video Wall Support Structure		Furnish and install an aluminum or steel-frame structure that supports the video display units as mounted and stacked to form the matrix for the video wall display. The support structure must consist of stackable display units that maintain a consistent maximum horizontal and vertical spacing of 0.04 inches between adjacent display units in the video wall matrix.	682.2.2.3	FDOT Standard Specs					
746	Video Wall Support Structure		Fabricate the support structure specifically to ensure that a continuous, accurate image is provided on the screens without any distortion or unused screen space and that no observable distortions are present in the installed video wall display due to normal building vibration. Each completed structure must be enclosed such that there is no ambient light effect on the screen from behind the display.	682.2.2.3	FDOT Standard Specs					
747	Video Wall Support Structure		Ensure that the components of the individual video displays can be serviced without disturbing the integrity of the entire video wall display	682.2.2.3	FDOT Standard Specs					
748	Rear Projection Video Display		Use rear projection video displays that are suitable for digital video wall applications in mission-critical TMCs where video wall image quality, operational reliability, and serviceability objectives as stated in this Specification can be achieved.	682-2.2.4	FDOT Standard Specs					
749	Rear Projection Video Display		Use rear projection video displays that display a minimum of a single or quad-split, four-paned CCTV camera video image. Each video display must be able to be independently controlled from any of the central operator or shift supervisor workstations, and that each video display can be integrated with additional video units to form a single video display, or a virtual desktop where video windows can be positioned and resized by the operator.	682-2.2.4	FDOT Standard Specs					
750	Rear Projection Video Display		Ensure that the rear projection video display facilitates lamp replacement without the need to readjust the image being projected on the screen.	682-2.2.4	FDOT Standard Specs					
751	Rear Projection Video Display		The rear projection video display intensity must be sufficient for effective and comfortable viewing by TMC operations personnel under normal lighting conditions, subject to approval by the Department. The unit's display engine must produce a minimum light output of 550 ANSI lumens.	682-2.2.4	FDOT Standard Specs					

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752	Rear Projection Video Display		The rear projection video units must have the following minimum features and characteristics: 1. Screen brightness achieved by a combination of projection techniques and screen materials, so that the video display has a minimum brightness measurement of 130 candelas per square meter (cd/m2) across the outside viewing surface of the projection screen. 2. Brightness uniformity that meets or exceeds 80 percent across the display unit, as measured using a photometer. 3. A multi-lamp optical engine must be provided for rear projection video units that do not use light-emitting diodes (LEDs) for illumination. Multi-lamp optical engines must provide a failover feature whereby a second lamp can be automatically activated when the first lamp fails. Ensure displays with multi-lamp optical engines provide indication of lamp status. 4. Multi-lamp optical engines must include both a “hot standby” mode in which failover to the second lamp takes no more than two seconds and a “cold standby” mode in which failover and the time for the display to return to full light output does not exceed 30 seconds. 5. A display module that uses modular component architecture to permit service or replacement of serviceable parts without removing the projection engine. 6. Each unit must be completely enclosed and light tight, with fixed panels for access to the lamp, power supply, and projection engine.	682-2.2.4	FDOT Standard Specs					
753	Flat Panel Display		Furnish and install a flat panel display unit to reproduce video and computer graphics information.	682-2.2.5	FDOT Standard Specs					
754	Flat Panel Display		The device must display, at a minimum, a high-resolution, distortion-free image and maintain a consistent level of illumination across the entire screen area.	682-2.2.5	FDOT Standard Specs					
755	Flat Panel Display		Ensure that it has the following minimum features and characteristics: 1. Dimensions of 24 inches high by 41 inches wide by 4 inches deep, or as shown in the Plans. 2. Ability to be installed on the face of a standard wall or flush mounted within the wall system.	682-2.2.5	FDOT Standard Specs					
756	Cabling		Furnish each video display component with all required appurtenances, including all the necessary cables, with proper length and connectors for power and communication, as defined by the manufacturer.	682-2.2.6	FDOT Standard Specs					
757	Cabling		Ensure that cabling conforms to applicable EIA/TIA standards.	682-2.2.6	FDOT Standard Specs					
758	Cabling		Size the power cables to meet NEC requirements. Provide communication cables from each video display component to the network communication devices that are appropriate for and compatible with the technology employed (e.g., fiber optic, twisted pair, or coaxial), and meet the minimum size and bandwidth specifications the manufacturer requires.	682-2.2.6	FDOT Standard Specs					
759	Cabling		Provide all cabling of adequate length, along with the compatible connectors and any ancillary equipment necessary to fully interconnect the video components and display control systems needed to achieve the functions required. Label all cables at both ends, as approved by the Engineer.	682-2.2.6	FDOT Standard Specs					

<table>
<tr><th>User Need ID</th><th>User Need Summary</th><th>Detailed Requirement ID</th><th>Detailed Requirement Summary</th><th>Document Section</th><th>DR Source Document</th><th>Verification Test Case ID</th><th>Compliance (Y/N/Partial/NA)</th><th>Notes/ Comments/ Date</th><th>Reviewer Initials</th><th>FDOT Initials</th></tr>
<tr><td>760</td><td>Electrical</td><td></td><td>Provide equipment that operates on 120 VAC at a frequency of 60 Hz. Furnish a transformer or other necessary means of power conversion for any device that requires another voltage or frequency.</td><td>686-2.2.7</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>761</td><td>Electrical</td><td></td><td>Conduct TMC field reviews to examine the electrical distribution panels allocated for various equipment items and the electrical schedules for each</td><td>686-2.2.7</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>762</td><td>Electrical</td><td></td><td>Make any changes, additions, or corrections to the electrical panels, wiring, outlets, and connectors that may be deemed necessary to adequately power all of the equipment proposed for a video display project at the intended location, subject to the approval of the Engineer.</td><td>686-2.2.7</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>763</td><td>Electrical</td><td></td><td>Make any changes to the building’s electrical wiring in accordance with applicable codes and permits, and with the NEC.</td><td>686-2.2.7</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>764</td><td>Electrical</td><td></td><td>Modifications to an existing building’s wiring or the video wall electrical wiring plans must be signed and sealed by a Specialty Engineer and submitted for approval.</td><td>686-2.2.7</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>765</td><td>Performance</td><td></td><td>Use only display devices meeting the following minimum requirements.
Table 682-1
Minimum Requirements for Display Devices<table><tr><th></th><th colspan="3">Flat Panel Display</th><th>Rear Projection Video Display</th></tr><tr><td>Type</td><td colspan="3">Direct View LCD</td><td>DLP or LCD</td></tr><tr><td>Size</td><td colspan="4">(dependent on TMC design, as shown in the Plans)</td></tr><tr><td>Aspect Ratio</td><td colspan="4">(dependent on TMC design, as shown in the Plans)</td></tr><tr><td>Resolution</td><td colspan="3">1600 x 1200 / 1280 x 768 pixels; 16.7 million colors</td><td>1024 x 768 pixels</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Viewing Angle</td><td>170 degrees horizontally and vertically</td><td>160 degrees horizontally and vertically</td><td></td><td>160 degrees horizontally and vertically</td></tr><tr><td>Half Gain Angle</td><td>—</td><td>—</td><td></td><td>±40 degrees horizontally and vertically</td></tr><tr><td>Contrast Ratio</td><td>500:1</td><td>600:1</td><td></td><td>600:1</td></tr><tr><td>Screen Brightness *</td><td>250 cd/m2</td><td>450 cd/m2</td><td></td><td>130 cd/m2</td></tr><tr><td>Lamp Life</td><td>—</td><td>—</td><td></td><td>8,000 hrs. (avg.)</td></tr><tr><td>Video Inputs</td><td>Analog/digital via 15-pin D-sub (HD-15) connector; DVI-D connector.</td><td>Composite video (NTSC) on RCA connector; analog/digital via 15-pin D-sub (HD-15) connector; DVI-I connector; HDMI.</td><td></td><td>Composite video (NTSC) on BNC; RGB via 15-pin D-sub (HD-15) connector; DVI-D connector.</td></tr></table></td><td>686-2.2.7</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>766</td><td>Installation</td><td></td><td>Do not proceed with any part of the procurement, construction, or installation of the video display equipment until the construction plans and materials are approved by the Engineer.</td><td>682-2.3</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>767</td><td>Installation</td><td></td><td>Submit to the Engineer documentation, including the manufacturers’ product specification sheets and a detailed description of each item’s function as well as a compliance matrix that confirms all equipment meets or exceeds the requirements of these Specifications.</td><td>682-2.3</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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768	Installation		Configure each video display unit to provide individual, independent control from each operator workstation.	682-2.3	FDOT Standard Specs					
769	Installation		Create the video wall display by arranging individual video display units in a framework or apparatus that creates the video wall configuration as shown in the Plans.	682-2.3	FDOT Standard Specs					
770	Installation		The finished video wall must provide a single, apparently seamless display area. The adjacent individual display units must be aligned physically and electronically so that image content stretched across multiple monitors align within plus or minus 2 lines of horizontal and vertical resolution.	682-2.3	FDOT Standard Specs					
771	Installation		All rear projection video unit controls must be accessible at all times when the devices are permanently installed. Ensure that installation and positioning does not conceal or limit access to any display unit controls at any time during active use.	682-2.3	FDOT Standard Specs					
772	Installation		Follow proper ventilation and cooling procedures for the equipment installed, as determined by the equipment manufacturers. Provide electrical requirements and power distribution units and power supplies for the video display components as-needed.	682-2.3	FDOT Standard Specs					
773	Testing		Submit a detailed system acceptance test plan to the Engineer for review and approval. Prepare a test plan that covers all areas of system function described in this Section, and that is developed according to the various equipment manufacturers' recommendations.	682-2.4	FDOT Standard Specs					
774	Testing		Check and test the satisfactory operation of all video display components upon completion of the equipment's Installation At minimum, include in the video display system test the testing of each color video monitor type, each secondary display output at workstations, each rear projection video display unit, and the video wall display's image alignment and control functions.	682-2.4	FDOT Standard Specs					
775	Testing		Subject the video wall display to a 90 day operational observation period. During this time, perform any and all maintenance, recalibration, system checking, and display modifications required by the Engineer. The Engineer has the option to require a restart of the observation period if a major system flaw or failure occurs.	682-2.4	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 682-3 - Warranty										
776	Warranty		Ensure that CCTV cameras and video display equipment have a manufacturer's warranty covering defects for a minimum of one year from the date of final acceptance.	682-3	FDOT Standard Specs					
777	Warranty		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.	682-3	FDOT Standard Specs					
778	Warranty		Warranty repairs of the video display control system and related TMC display equipment must commence within 24 hours after notification by the Department.	682-3	FDOT Standard Specs					

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FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 684 - Network Devices										
779	General		Furnish and install network devices as shown in the Plans. Meet the requirements of Section 603.	684-1	FDOT Standard Specs					
780	Materials		Meet the following requirements: Managed Field Ethernet Switch*.....Section 996 Managed Hub Ethernet Switch.....Section 996 Device Server*.....Section 996 Wireless Communication System*.....Section 996 Media Converter*.....Section 996 Cellular Modem*.....Section 996 *Use products listed on the Department's APL.	684-2.1	FDOT Standard Specs					
781	Managed Field Ethernet Switch		Ensure that the managed field Ethernet switch (MFES) provides Ethernet connectivity between devices, systems, and locations as required by the Contract Documents	684-2.2	FDOT Standard Specs					
782	Managed Field Ethernet Switch		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.	684-2.2	FDOT Standard Specs					
783	Managed Field Ethernet Switch		Ensure that the MFES is fully compatible and interoperable with connected Ethernet devices and the traffic control system network.	684-2.2	FDOT Standard Specs					
784	Managed Field Ethernet Switch		Ensure the MFES provides a switched Ethernet connection for each connected device and at least one open RJ45 Ethernet port for technician access.	684-2.2	FDOT Standard Specs					
785	Optical Ports		Ensure that all fiber optic link ports operate at 1,310 or 1,550 nanometers in single mode.	684-2.2.1	FDOT Standard Specs					
786	Optical Ports		Ensure that the optical ports are Type ST, SC, LC, or FC only, as specified in the plans or by the Engineer.	684-2.2.1	FDOT Standard Specs					
787	Optical Ports		Do not use mechanical transfer registered jack (MTRJ) type connectors.	684-2.2.1	FDOT Standard Specs					
788	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.	684-2.2.1	FDOT Standard Specs					
789	Optical Ports		Ensure the MFES is configured with the number and type of ports detailed in the Contract Documents.	684-2.2.1	FDOT Standard Specs					
790	Optical Ports		Ensure that all fiber optic link ports operate at 1,310 or 1,550 nanometers in single mode.	682-2.2.1	FDOT Standard Specs					
791	Optical Ports		Ensure that the optical ports are Type ST, SC, LC, or FC only, as specified in the Plans or by the Engineer.	682-2.2.1	FDOT Standard Specs					
792	Copper Ports		Do not use mechanical transfer registered jack (MTRJ) type connectors.	682-2.2.1	FDOT Standard Specs					
793	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. Ensure the MFES is configured with the number and type of ports detailed in the Contract Documents	682-2.2.1	FDOT Standard Specs					

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794	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. The optical ports must have an optical power budget of at least 15 dB, or as detailed in the Contract Documents	682-2.2.2	FDOT Standard Specs					
795	Copper Ports		Provide an MFES that includes a minimum of four copper ports unless otherwise shown in the Plans	682-2.2.2	FDOT Standard Specs					
796	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.	682-2.2.2	FDOT Standard Specs					
797	Managed Hub Ethernet Switch		Ensure that the managed hub Ethernet switch (MHES) provides wire-speed Ethernet connectivity at transmission rates of up to ten gigabits per second to and from adjacent MHES within the traffic control network.	684-2.3	FDOT Standard Specs					
798	Managed Hub Ethernet Switch		Ensure that the ITS network administrator will be able to manage each MHES individually and as a group for switch configuration, performance monitoring, and troubleshooting.	684-2.3	FDOT Standard Specs					
799	Managed Hub Ethernet Switch		Ensure that the MHES is fully compatible and interoperable with field devices and the traffic control system network.	684-2.3	FDOT Standard Specs					
800	Managed Hub Ethernet Switch		Ensure the MHES includes any license(s) required to utilize all Layer 3 features	684-2.3	FDOT Standard Specs					
801	Managed Hub Ethernet Switch		Ensure the MHES provides a switched Ethernet connection for each connected device and at least one open RJ45 Ethernet port for technician access.	684-2.3	FDOT Standard Specs					
802	Optical Ports		Ensure that all fiber optic link ports are modular SFP/SFP+ ports that operate at 1310 or 1550 nanometers in single mode and support 100BaseFX, 1000Base-X, and 10GBase-X. Ensure that the optical ports are Type LC unless otherwise shown in the Plans.	684-2.3.1	FDOT Standard Specs					
803	Optical Ports		Provide an MHES having a minimum of six optical Gigabit Ethernet ports as required to interface adjacent network devices.	684-2.3.1	FDOT Standard Specs					
804	Optical Ports		Optical ports must be capable of 100M, 1G, and 10Gbps data rates unless otherwise shown in the Plans	684-2.3.1	FDOT Standard Specs					
805	Optical Ports		Ensure the MHES is configured with the number and type of ports detailed in the Contract Documents.	684-2.3.1	FDOT Standard Specs					
806	Optical Ports		Furnish hot-swappable fiber optical transceivers. Provide optical ports designed for use with a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data.	684-2.3.1	FDOT Standard Specs					
807	Optical Ports		The optical ports must have an optical power budget of at least 15 dB, or as detailed in the Contract Documents.	684-2.3.1	FDOT Standard Specs					
808	Copper Ports:		Provide an MHES that includes a minimum of twelve gigabit Ethernet copper ports unless otherwise shown in the Plans. All copper ports must be Type RJ-45 and auto-negotiate speed (e.g., 10/100/1000 Base) and duplex (i.e., full or half).	684-2.3.2	FDOT Standard Specs					
809	Device Server		Ensure that the device server provides Ethernet connectivity to devices with serial data interfaces as required by the Contract Documents. The device server must operate using a nominal input voltage of 120 VAC. If the device req	684-2.4	FDOT Standard Specs					

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810	Wireless Communication System		The wireless communication system (WCS) must provide connectivity between devices, systems, and locations as required by the Contract Documents. Ensure that the WCS is fully compatible and interoperable with connected Ethernet devices and the traffic control system network.	684-2.5	FDOT Standard Specs					
811	Media Converter		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	684-2.6	FDOT Standard Specs					
812	Media Converter		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.	684-2.6	FDOT Standard Specs					
813	Media Converter		Media converters must operate on a nominal voltage of 120 VAC if POE is unavailable. Supply an appropriate voltage converter for devices that require operating voltages of less than 120 VAC.	684-2.6	FDOT Standard Specs					
814	Cellular Modem		The cellular modem must provide connectivity between devices, systems, and locations as required by the Contract Documents	684-2.6	FDOT Standard Specs					
815	Cellular Modem		Ensure that the cellular modem is fully compatible and interoperable with connected Ethernet devices and the traffic control system network	684-2.7	FDOT Standard Specs					
816	Cellular Modem		Coordinate cellular services, network configuration, and settings for cellular modems with the Department a minimum of thirty (30) days prior to scheduled Installation	684-2.7	FDOT Standard Specs					
817	Installation		Install network devices at the locations shown in the Plans. Ensure that network devices are mounted securely and are fully accessible by field technicians.	684-3	FDOT Standard Specs					
818	Installation		Ensure that all unshielded twisted pair/shielded twisted pair Ethernet network cables are compliant with the EIA/TIA-568-B standard.	684-3	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 684-4 - Field Acceptance Testing										
819	General		Conduct field acceptance testing in accordance Section 611.	684-4.1	FDOT Standard Specs					
820	MFES Field Acceptance Testing		Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform 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 network connection and MFES configuration using a laptop PC.	684-4.2	FDOT Standard Specs					
821	MHES Field Acceptance Testing		Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform 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 network connection and MHES configuration using a laptop PC.	684-4.3	FDOT Standard Specs					

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822	Device Server Field Acceptance Testing		Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform 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. Connect devices to the power sources. 5. Verify all connections, including correct installation of communication and power cables. 6. Verify network connection and device server configuration using a laptop PC. 7. Verify serial data transmission through the device server	684-4.4	FDOT Standard Specs					
823	Wireless Communication System Field Acceptance Testing		Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform 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 all device settings comply with the network configurations and settings provided by the Department using a laptop PC. 7. Verify connectivity and data exchange between the WCS, connected devices, and the traffic control network.	684-4.5	FDOT Standard Specs					
824	Cellular Modem Field Acceptance Testing		Conduct inspection and testing at the installed equipment location according to the approved test plan. Perform 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 all device settings comply with the network configurations and settings provided by the Department using a laptop PC. 7. Verify connectivity and data exchange between the cellular modem, connected devices, and the traffic control network.	684-4.6	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 684-5 - Warranty										
825	Warranty		Ensure that network devices have a manufacturer's warranty covering defects for 1 year from the date of final acceptance	684-5	FDOT Standard Specs					
826	Warranty		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.	684-5	FDOT Standard Specs					

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FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 700 - Highway Signing										
827	General		Furnish and install roadway signs in accordance with the details in the Standard Plans and as shown in the Plans	700-1	FDOT Standard Specs					
828	General		Erect ground traffic signs as signs on the shoulders, slopes, or medians. Signs are classified as single column(post), multi-column, or In-Street signs.	700-1	FDOT Standard Specs					
829	General		Erect overhead traffic signs partially or completely over the traveled roadway or mounted on bridges. Overhead traffic signs are classified as span wire mounted, mast arm mounted, overhead cantilever structure, or overhead span structure traffic signs.	700-1	FDOT Standard Specs					
830	General		The sign face(s) may be a single or combination of static sign panels, illuminated sign panels, dynamic message signs, or electronic display signs.	700-1	FDOT Standard Specs					
831	General		Fabricate standard sign panel messages in accordance with details included in the Standard Highway Signs (SHS) manual published by the U.S. Department of Transportation, the Plans, or Standard Plans. Submit shop drawings to the Department for approval, as specified in Section 5.	700-1	FDOT Standard Specs					
832	General		All Traffic Control Signals and Devices must meet the requirements of Section 603.	700-1	FDOT Standard Specs					
833	Materials: General Requirements		Meet the following requirements: Flowable Fill for precast foundation.....Section 121 Structural Concrete .....Section 346 Non-Structural Concrete .....Section 347 Reinforcing Steel .....Section 415 Structural Steel Welding.....Section 460 Repair of Galvanized Surfaces.....Section 562 Transformer Base.....Section 965 Structural Steel and Miscellaneous Metal Items (other than aluminum).....Section 962 Aluminum Items .....Section 965 Retroreflective Sign Sheeting* .....Section 994 Sign Panel Fabrication .....Section 994 Internally Illuminated Signs*..... Section 995-14 Highlighted Signs*..... Section 995-15 Dynamic Message Signs*..... Section 995-16 Electronic Display Signs (ERS, ESFS, BOS)*..... Section 995-17 Sign Beacon* ..... Section 995-18 In-street Sign*..... Section 995-19 *Use products listed on the Department's Approved Products List (APL).	700-2.1	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 700-2.2 - Static Sign Assembly Requirements										
834	Static Sign Panels		Provide aluminum sheets for sign panels meeting the requirements of Section 965 and Section 994. Meet the minimum thickness requirements of Table 700-1. For flip signs, use continuous hinges constructed of ANSI grade 316 stainless steel. For In-Street signs, see 700-7. Table 700-1 Static Sign Panel Requirements Type: Minimum Thickness Single column ground sign: 0.08 inch All other sign panels: 0.125 inch	700-2.2.1	FDOT Standard Specs					

<table>
<tr><th>User Need ID</th><th>User Need Summary</th><th>Detailed Requirement ID</th><th>Detailed Requirement Summary</th><th>Document Section</th><th>DR Source Document</th><th>Verification Test Case ID</th><th>Compliance (Y/N/Partial/NA)</th><th>Notes/ Comments/ Date</th><th>Reviewer Initials</th><th>FDOT Initials</th></tr>
<tr><td>835</td><td>Sign Panel Mounting Hardware</td><td></td><td>Provide aluminum materials (plates, bars, shapes, bolts, nuts, and washers) in accordance with Section 965. Stainless steel mounting hardware meeting Table 962-6 (ASTM F593 for bolts and ASTM F594 for nuts) may be substituted. Steel plates, shapes and hardware must meet Section 962.</td><td>700-2.2.2</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>836</td><td>Retroreflective Sign Sheeting</td><td></td><td>Sign sheeting must meet the requirements of Section 994 and Table 700-2.
<table>
<tr><th colspan="3">Table 700-2
Retroreflective Sign Sheeting*</th></tr>
<tr><th>Application</th><th>Sheeting System Type</th><th>Notes</th></tr>
<tr><td>All signs and retroreflective strips, except as otherwise noted below</td><td>Type XI</td><td></td></tr>
<tr><td>School: S1-1, S3-1, S3-2, S4-5, S4-5a, S5-1 (SCHOOL portion)
Bicycle: W11-1
Pedestrian: R1 6, R1 6a, R1 6b, R1 6c, R1 9, R1 9a, R10 15, W11 2
Shared Use Path (trail): W11 15, W11 15a</td><td>Type XI fluorescent yellow green sheeting**</td><td>Includes supplemental panels</td></tr>
<tr><td colspan="3">* All digitally printed signs and red silkscreen inks require a clear overlay for UV protection.
**Do not mix signs having fluorescent yellow green sheeting with signs having yellow retroreflective sheeting.</td></tr>
</table></td><td>700-2.2.3</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="11">FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 700-6 - Dynamic Message Signs</td></tr>
<tr><td>837</td><td>General</td><td></td><td>Provide monochrome, tri-color, or full-color signs as shown in the Plans.</td><td>700-6.1</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>838</td><td>Sign Housing Requirements for all DMS</td><td></td><td>Ensure that the sign housing design and appearance is approved by the Engineer.</td><td>700-6.2</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>839</td><td>Characters, Fonts, and Color</td><td></td><td>Submit a list of the character fonts to the Engineer for approval.</td><td>700-6.3</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>840</td><td>Main Power Supply and Energy Distribution Specifications</td><td></td><td>Provide Type XHHW power cables sized as required by the NEC for acceptable voltage drops while supplying alternating current to the sign.</td><td>700-6.4</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>841</td><td>Uninterruptible Power Supply (UPS)</td><td></td><td>The UPS system must be capable of displaying the current messages on a sign when a power outage occurs. Signs with an UPS must be able to operate on battery power and display text messages for a minimum of two hours.</td><td>700-6.5</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>842</td><td>Operational Support Supplies</td><td></td><td>Furnish the operational support supplies listed in Table 700-3. Promptly replace any of the supplies used to perform a warranty repair prior to final acceptance. For every group of 10 or fewer DMSs provided or required, provide one set of supplies as follows:
<table>
<tr><th colspan="2">Table 700-3
DMS Operational Support Supplies</th></tr>
<tr><td>1 each</td><td>Sign controller and I/O board(s)</td></tr>
<tr><td>1 per DMS</td><td>LED display modules</td></tr>
<tr><td>1 each</td><td>Display power supply</td></tr>
<tr><td>1 each</td><td>Uninterruptible power supply</td></tr>
<tr><td>2 each</td><td>Surge suppression sets</td></tr>
<tr><td>1 each</td><td>Fan assembly</td></tr>
</table></td><td>700-6.6</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>843</td><td>Message and Status Monitoring</td><td></td><td>Ensure that the sign can perform the following functions:
1. Control Selection – Ensure that local or remote sign control can be selected.</td><td>700-6.7</td><td>FDOT Standard Specs</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

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			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.							
844	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.	700-6.7	FDOT Standard Specs					
845	Message and Status Monitoring		Ensure that there is no perceivable flicker or ghosting of the pixels during sign erasure and writing periods.	700-6.7	FDOT Standard Specs					
846	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	700-6.8	FDOT Standard Specs					
847	TMC Communication Specification for all DMS		Assign each sign controller a unique address	700-6.8	FDOT Standard Specs					
848	Sign Control Software		Ensure that the laptop computer and sign can communicate when connected directly by an EIA-232 cable and via Ethernet. Ensure that the software allows communication between multiple users and multiple signs across the same communication network.	700-6.9	FDOT Standard Specs					
849	Sign Support Structure		Meet the requirements of 700-2.3.	700-6.10	FDOT Standard Specs					
850	Installation Requirements		Provide a walk-in DMS for locations over interstate travel lanes. Verify that any ventilation system incorporated within the sign is operational per the manufacturer's recommendations.	700-6.11	FDOT Standard Specs					
851	Installation Requirements		Install the DMS in accordance with the manufacturer's recommendations and Standard Plans, Index 700-090.	700-6.11	FDOT Standard Specs					
852	Installation Requirements		Ensure that the location of the lifting eyebolts, left in place or removed, is sealed to prevent water entry after Installation	700-6.11	FDOT Standard Specs					
853	Installation Requirements		Load the initial message libraries on both the sign control software and the sign controller. The Engineer will furnish the messages to be placed in these libraries	700-6.11	FDOT Standard Specs					
854	Documentation		Submit documentation for electronic equipment in accordance with 603-6	700-6.12	FDOT Standard Specs					
855	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	700-6.13	FDOT Standard Specs					
856	Technical Assistance		Ensure that a manufacturer's representative is available to assist the Contractor's technical personnel during pre-installation testing and Installation	700-6.14	FDOT Standard Specs					
857	Technical Assistance		Do not provide initial power to the signs without the permission of the manufacturer's representative	700-6.14	FDOT Standard Specs					

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858	Pre-installation Field Testing		Conduct pre-installation tests on all units at a Contractor-provided facility within the appropriate District. Perform the tests on each unit supplied to verify that no damage was done to any sign during the shipment and delivery process	700-6.15	FDOT Standard Specs					
859	Pre-installation Field Testing		Notify the Engineer a minimum of 10 calendar days before the start of any tests	700-6.15	FDOT Standard Specs					
860	Pre-installation Field Testing		Conduct all tests according to the approved test procedures detailed in this Section. Each DMS must pass the individual tests detailed below prior to installation	700-6.15	FDOT Standard Specs					
861	Material Inspection		Examine each DMS carefully to verify that the materials, design, construction, markings, and workmanship comply with all applicable standards, specifications, and requirements	700-6.15.1	FDOT Standard Specs					
862	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.	700-6.15.2	FDOT Standard Specs					
863	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.	700-6.15.3	FDOT Standard Specs					
864	Pre-Installation Test Failure Consequence		If a unit has been modified as a result of a failure, a report shall be prepared and submitted to the Engineer. The report shall describe the nature of the failure and the corrective action taken.	700-6.15.3	FDOT Standard Specs					
865	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.	700-6.15.3	FDOT Standard Specs					
866	Installed Site Tests		Conduct Intelligent Transportation System Device Installation testing in accordance with Section 611.	700-6.16	FDOT Standard Specs					
867	System Testing		Conduct Intelligent Transportation System Device Installation testing in accordance with Section 611.	700-6.17	FDOT Standard Specs					
FDOT Standard Specifications for Road and Bridge Construction, FY2025-26 - Section 700-8 - Warranty										
868	Warranty		Refer to Section 608 for Contractor Requirements. Transfer all warranties from the Manufacturer to the Department	700-8	FDOT Standard Specs					