FDOT TSM&O

Transportation Systems Management & Operations

District Five

Smart Signal

Design Guidance V2.0

Updated: March 4, 2025

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This document and its contents have been prepared and are intended exclusively for the Florida Department of Transportation (FDOT) District Five.

Document Revision History

Contract No. – CAM98			
Version No.	**Description**	**Originator(s)**	**Date**
1.0	*Smart Signal* Design Guidance – Official Publication	Nathan Mozeleski Andrea Collins	4/15/2023
2.0	*Smart Signal* Design Guidance – Official Publication V2.0 – Updated references to FDM, Specifications, and Standards. Revised Scoping and Special Design Considerations sections.	Nathan Mozeleski Yusef El-Eses Trent Masih	3/4/2025

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List of Abbreviations

Abbreviation	Meaning
AAM	Active Arterial Management
API	Applicable Programming interface
APL	Approved Product List
ATC	Advanced Transportation Controller
ATIS	Advanced Traffic Management System
ATMS	Advanced Traffic Management System
ATS	Automatic Transfer Switch
ATSPM	Automated Traffic Signal Performance Measures
AVI	Automatic Vehicle Identification
BIU	Bus Interface Units
CAB	Cabinet
Cat-6	Category 6
CAV	Connected and Autonomous Vehicle
CCTV	Closed Circuit Television
CV	Connected Vehicle
DMS	Dynamic Message Sign
DTOE	District Traffic Operations Engineering **OR** Department Traffic Operations Engineering
EOR	Engineer of Record
EPB	Electric Pull Box
EQ	Estimated Quantities
EVP	Emergency Vehicle Pre-emption
FCC	Federal Communications Commission
FDM	Florida Design Manual
FDOT	Florida Department of Transportation
FHWA	Florida highway Administration
FOC	Fiber Optic Cable
FPB	Fiber Pullbox
FSV	Fiber Splice Vault
HFOV	Horizontal Field of View
HPS	High-Pressure Sodium
HUB	Communication Hub
IEEE	Institute of Electrical and Electronics Engineers
IDOT	Indiana Department of Transportation
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
LED	Light-Emitting Diode
LRT	Light Rail Transit
MFES	Managed Field Ethernet Switch
MMU	Malfunction Management Unit
MSP	Modified Special Provision
NEMA	National Electrical Manufacturers Association

Abbreviation	Meaning
NTCIP	National Transportation Communications for ITS Protocol
PoE	Power-over-Ethernet
POP	Pavement-Only Project
PTZ	Pan, Tilt & Zoom
PPC	Proprietary Product Certification
R-ICMS	Integrated Corridor Management System
RPMU	Remote Power Management Unit
RRR	Resurfacing, Restoration, and Rehabilitation
RSA	Roadside Alerts
SDLC	Synchronous Data Link Communications
SFP	Small-Form Pluggable
SIM	Subscriber Identity Module
SOP	Standard Operating Plan
SPAT	Signal Phase and Timing
SPD	Surge Protection Device
TEM	Traffic Engineering Manual
TIM	Traveller Information Message
TSCMA	Traffic Signal Compensation and Maintenance Agreement
TSP	Technical Special Provision **OR** Transit Signal Priority
TMS	Traffic Monitoring Site
UAO	Utility Agency Owners
UDOT	Utah Department of Transportation
UDS	Utility Demarcation Site
UPS	Uninterruptible Power Supply
VDS	Vehicle Detection System
VFOV	Vertical Field of View

Glossary

- **Automated Traffic Signal Performance Measures (ATSPM)**: A suite of performance measuring, data collection, and data analysis tools used to support objectives and performance-based approaches related to traffic signal operations, maintenance, management, and design. ATSPM allows for improved safety, mobility, and operational efficiency of signalized intersections for all users.
- **Detection Channels**: The circuits within the traffic signal cabinet that receive detection inputs, allowing for the traffic signal controller to simultaneously identify the presence of multiple vehicles and pedestrians at the intersection.
- **Detection Inputs**: The signals received from traffic detectors and sensors that actuate the detection channels.
- **Engineer**: The design/consulting firm employee advised to adhere to this design guidance.
- **High-Resolution Data**: Detailed traffic data collected at signalized intersections, which includes data on the position, speed, and movement of vehicles.

Section 1 - Introduction

This document aims to offer technical guidance on implementing the Florida Department of Transportation (FDOT) District Five *Smart Signal* initiative, covering planning, technical design, construction oversight, and project management. It is intended for Engineers of Record (EOR), designers, technical reviewers, project managers, local agencies, and other relevant stakeholders.

DISCLAIMER:

This document is intended to be an informational resource and does not relieve the Engineer or Planner of the responsibility to design a fully functional and implementable system. The following guidance is based upon previous experience in the planning, design, deployment, and project management of Smart Signal systems within the District and has been made available to assist in project efforts; but does not supersede engineering judgement. All involved parties shall be responsible for practicing due diligence for all aspects of the design and is encouraged to coordinate with District personnel to better understand the current conditions and limitations of the available system(s)—including networking configuration constraints, integration status with central systems (e.g., ATMS, SunGuide), known operational issues, maintenance considerations, pace of technology, and more. Furthermore, this document is not intended to be all inclusive. The Engineer shall be responsible for all aspects of the design—including coordination efforts, procedural steps, and processes that are not explicitly defined in this document—based on individual experience and project-specific field conditions.

1.1 References

The Engineer should ensure that the references used are the most current edition or version, including that of any recent revisions or updates.

- *FDOT Approved Products List*, latest version.
- *FDOT Basis of Estimate,* latest version.
- *FDOT Central Office Design of Traffic Signal Detection Technologies, Informational Guide,* Sept. 2022.
- *FDOT District Five Guidelines for Traffic Signal Plan Preparation,* Sept. 2024.
- *FDOT Standard Plans for Road and Bridge Construction*, latest version.
- *FDOT Standard Specifications for Road and Bridge Construction,* latest version.
- *FDOT Traffic Engineering Manual (TEM)*, latest version.
- *FDOT Utility Accommodation Manual (UAM),* latest version.
- *Florida Design Manual (FDM)*, latest version.
- *FHWA Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways,* 2023 Edition.
- *FHWA Traffic Detector Handbook – Third Edition*, Oct. 2006.
- *ITE ATC 5201 – Advanced Transportation Controller Standard, v06A*, Jan. 12, 2018.
- *ITE Traffic Engineering Handbook*, 7th Edition, Jan. 2016.
- *NEMA Standards Publication TS 2-2021, Traffic Controller Assemblies with NTCIP Requirements,* version 03.08 or later.

Section 2 – *Smart Signal* Overview

2.1 Purpose

The primary goal of the *Smart Signal* implementation is to enhance mobility and safety at signalized intersections districtwide by creating a data-rich environment and deploying scalable infrastructure. Additionally, while the initiative will support future Connected and Autonomous Vehicle (CAV) applications, its core focus is on developing standardization for traffic signal equipment and improving real-time data sets for better management and operation of arterial roadways.

The proposed *Smart Signal* architecture will deliver enhanced high-resolution data, encompassing detailed controller and detector information, and can be configured to provide intersection turning movement counts if desired by the District and Local Maintaining agency. This data will be used by the Department and local maintaining agencies to quantify and evaluate Automated Traffic Signal Performance Measures (ATSPM). High-resolution data is defined as information collected and processed by the local Advanced Transportation Controller (ATC) before being converted into signal performance metrics. The ATC can respond in real-time to detection inputs, adjusting signal indications to improve traffic flow and safety.

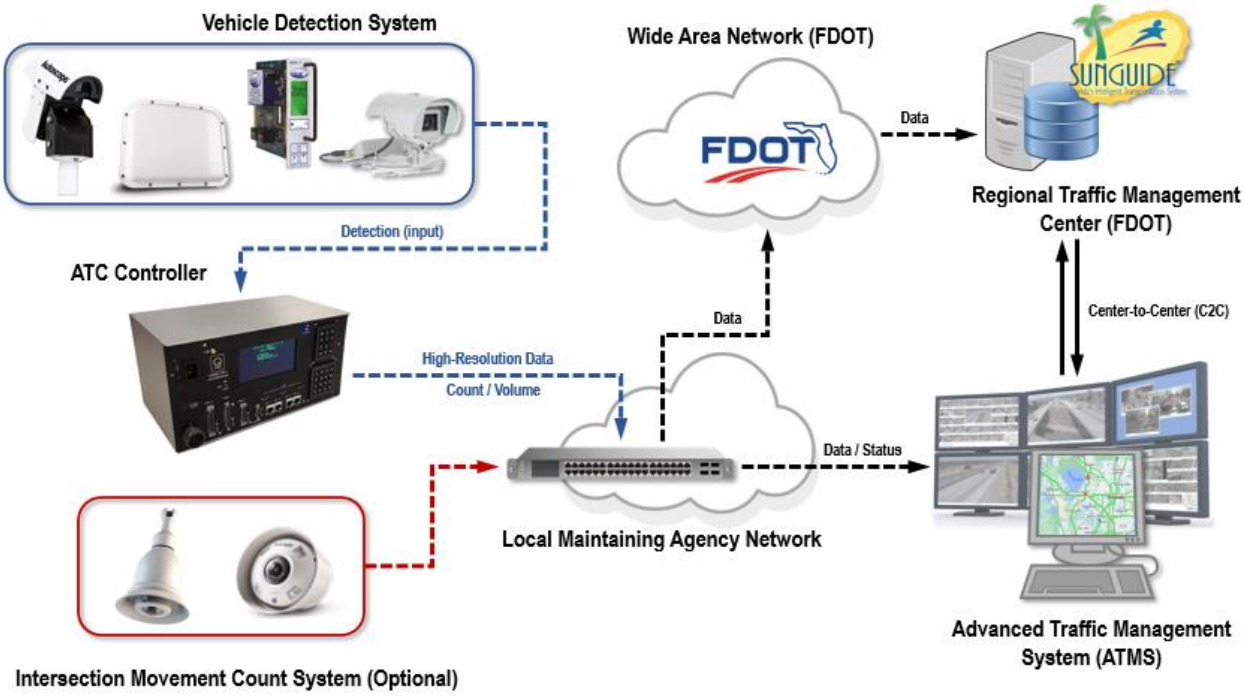


Figure 1: High-level overview of *Smart Signal* architecture and data flows.

The *Smart Signal* standard will ensure the infrastructure at signalized intersections provides a platform capable of accommodating Connected and Autonomous (CAV) equipment for future applications focused on safety and mobility. Future applications may include the dissemination of real-time information to road users including signal state and phase (e.g., Signal Phase and Timing (SPAT)), traffic and roadway conditions (e.g., Traveler Information Messages (TIM), Roadside Alerts (RSA)), weather conditions (e.g. Spot Weather Impact Warning); real-time notifications to

motorists for enhanced situational awareness within the intersection (e.g., Pedestrian in Crosswalk Warning, Red Light Violation Warning, Forward Collision Warning, and Vehicle Turning Right in Front of Transit Vehicle).

The districtwide *Smart Signal* implementation will provide standardization for proposed signal requirements across the Central Florida region focused on functionality. The standardization specifically provides minimum technical requirements for the system(s) but does not dictate specific equipment, products, manufacturers, or systems.

2.2 Benefits

Benefits of the districtwide *Smart Signal* implementation will be realized by a variety of stakeholder and users:

- FDOT and Local Maintaining Agencies – operations, maintenance, planning, project management
- Professional Industry – traffic engineering, design, and planning
- General Public – motorists, bicyclists, pedestrians, transit riders, emergency responders

Example benefits for the deployment of *Smart Signals* include real-time operational improvements to motorists along arterial roadways, including reduction of average travel times, reduction of "lost time" or average delay per vehicle, improvement of travel time reliability, and more. The continuous data will feed into existing Department maintained systems to enhance the operational capabilities, such as the Active Arterial Management (AAM) program. Additional benefits from the system include improved maintenance responsiveness by providing a system for quicker recognition of issues and reduced recurring costs for traffic volume and turning movement count data collection efforts.

ATSPM provide real-time quantifiable performance at signalized intersections and the progression of traffic along a corridor. The real-time data collected will provide maintaining agencies with the status of current delays, volumes, speeds, and travel times that can be utilized to optimize mobility, manage traffic signal timing, reduce congestion, and improve safety for all roadway users. Because data is being collected continuously, maintaining agencies will be able to efficiently identify problems down to individual detection zones. **Figure 2** is a culmination of all possible metrics available within ATSPM. The data needed for traffic studies and optimization models is already being collected with ATSPM, saving costs from previously necessary signal timing data collection means and methods.

Across the nation, multiple agencies are turning to the implementation of ATSPM to improve the operations and function of their arterial network. The following illustrates two examples of successful ATSPM deployments installed by Indiana Department of Transportation (INDOT) and Utah Department of Transportation (UDOT). INDOT implemented a pilot system across eight (8) intersections, running real-time automatic data downloads integrated into a server residing at the Traffic Management Center (TMC) with front-end viewing capabilities of the performance measures, allowing INDOT to improve traffic performance. Following the success of the pilot deployment, INDOT elected to scale the system for increased benefits. UDOT initially invested heavily on communications infrastructure, allowing for quick future expansion to over 1,000 intersections with a performance measures system to process high-resolution data and optimize traffic signal operations in real-time. UDOT also developed a live public-facing performance measures website to actively display the current and historical operations at each signalized intersection.

For on-system projects, it is mandatory to adhere to this guidance document to streamline the design and permitting processes and ensure the incorporation of all *Smart Signal* elements. For off-system projects, while it is not obligatory, the Engineer is encouraged to apply the general principles of this document to the greatest extent possible while remaining within the confines of the approved project scope. Discussions between the Engineer and the local maintaining agency are recommended to highlight the benefits of *Smart Signal* implementations.

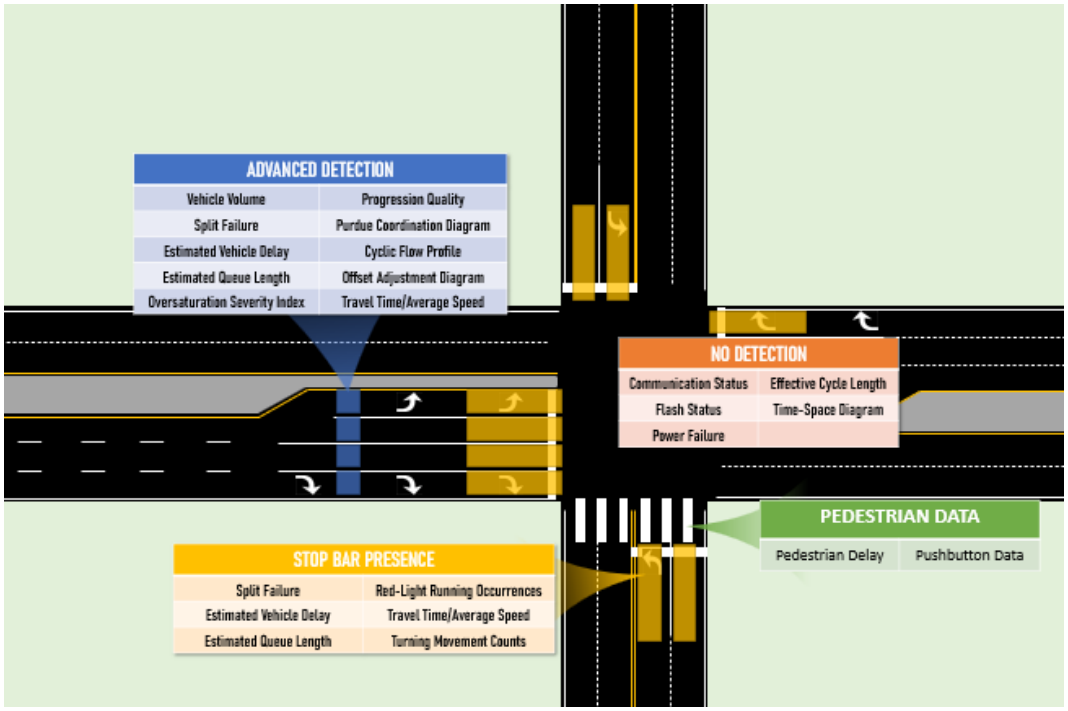


Figure 2: Sample metrics available within ATSPM based on the granularity of detection

Section 3 – Project Workflow

3.1 Roles and Responsibilities

The lifecycle of a *Smart Signal* project will incorporate five (5) primary roles, each with a unique set of contributions and responsibilities:

1. Engineer of Record (EOR)
2. Department Project Manager
3. Local Maintaining Agencies
4. Third-Party Stakeholders
5. District Traffic Operation Engineer

The **EOR** will be responsible for ownership of all engineering and design related decisions on the project. All efforts related to the analysis, review of existing conditions, identification and mitigation of potential risks, design considerations, development of technical submittal documents, and coordination will be the responsibility of the EOR. The EOR is also responsible for ensuring the proposed signal equipment are compatible with all FDOT and local maintaining agencies standards and requirements and will be operational successfully. This individual may be an employee of the Department or a representative of a private, third-party consulting firm.

The **Department Project Manager** will be responsible for the oversight and management level decisions on the project. Activities including scope, budget, and schedule management, document control, coordination with interested third-parties, technical review of submittal documents, and general oversight of the design process will be the responsibility of the Department Project Manager. Acting on behalf and with the best interests of the Department, this individual may be either a direct employee of the state or a designated third-party representative.

Local Maintaining Agencies will be responsible for representing the interests of the public municipality, providing the necessary requirements and preferences to be incorporated within the project. Through continuous coordination efforts, the local maintaining agency will be responsible for providing technical input, applicable standards, and requirements for the project to meet, performing technical reviews of submittal documents, identifying specific product and/or technology preferences (e.g., Proprietary Product Certifications), and more. The local maintaining agency will be the entity responsible for the maintenance of signal equipment as identified in the executed Traffic Signal Compensation and Maintenance Agreement (TSCMA).

Third-Party Stakeholders represent a wide range of public and private entities that may have joint interest in the project, including municipalities (e.g., cities, counties), private developers, utility agency owners (UAO), product vendors, business owners, and more. Stakeholders shall share any concerns or issues and provide their inputs to the Department Project Manager and the EOR.

The **District Traffic Operations Engineering (DTOE)** will be responsible for providing final approval of key documents required throughout the lifecycle of the project, including but not limited to Proprietary Product Certifications (PPC) and ITS Certification Memorandum. Additionally, the DTOE will be an available resource and subject-matter expert to provide input on important decisions that may impact the safety and well-being of the general public.

3.2 Project Progression

Each *Smart Signal* project will be required to complete similar activities in the development of technical designs and contract documents (e.g., plans, specifications). **Figure 3** depicts a high-level flowchart of the *Smart Signal* design process, including critical milestone activities and roles.

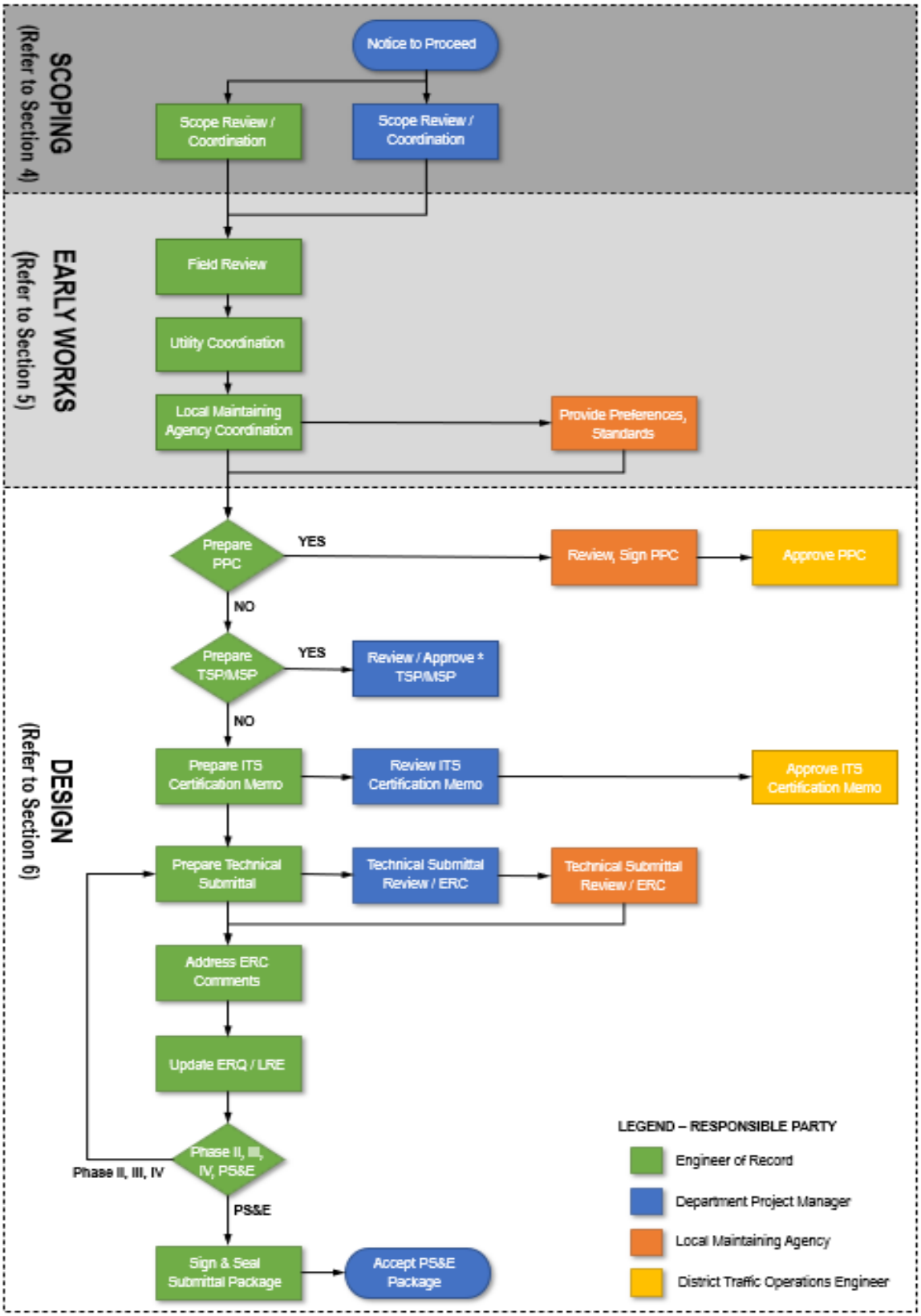


Figure 3: *Smart Signal* Design Process Flowchart

Section 4 – Scoping

4.1 *Smart Signal* Features

The implementation of the *Smart Signal* standard will be required for all projects that impact the existing signal controller cabinet assembly or signal detection equipment for two or more legs of the intersection under any of the following project types:

- New Construction
- Reconstruction
- Widening
- Resurfacing, Restoration, and Rehabilitation (RRR)
- Traffic Operations – with three (3) signalized intersections or more
- Pushbutton

It is the EOR's responsibility to evaluate and justify the extent of *Smart Signal* implementation for projects through coordination with both the local maintaining agency and FDOT.

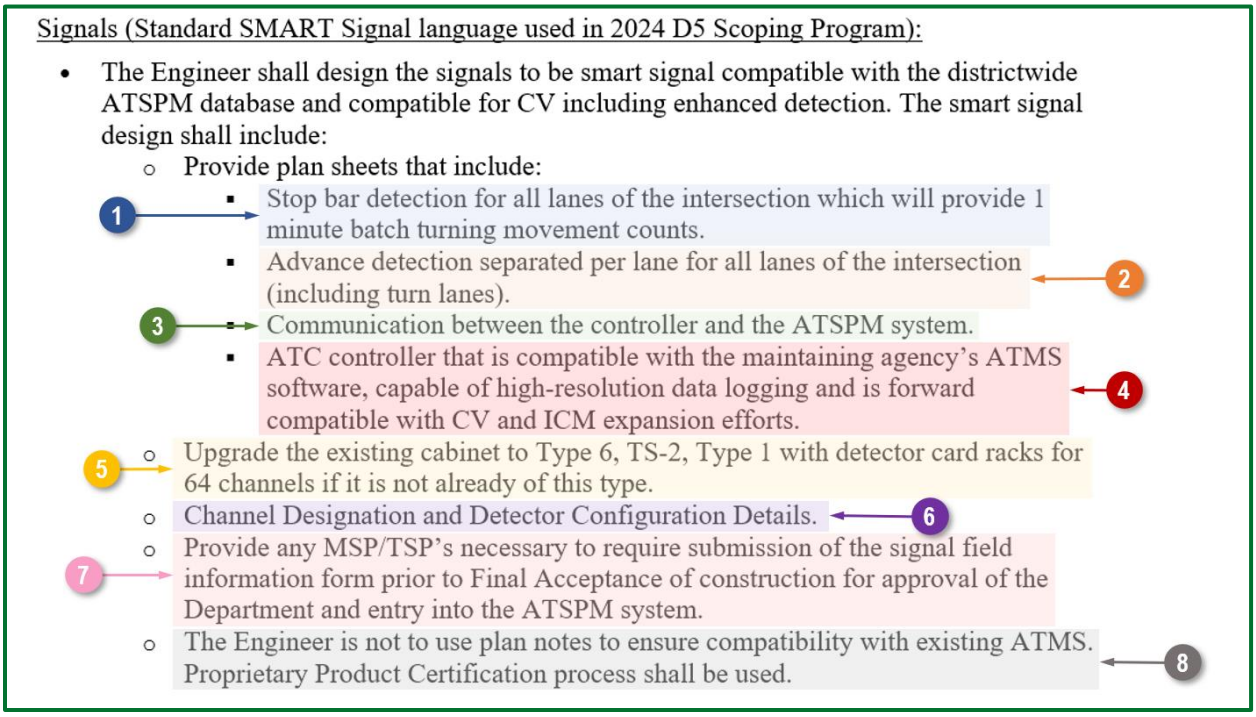


Figure 4: Example scoping language for *Smart Signals* typical project

The EOR shall design the new signal to be *Smart Signal* compatible with the districtwide ATSPM database and future compatibility for Connected and Autonomous Vehicle (CAV), including enhanced detection. There are eight (8) primary elements to be incorporated into the design of *Smart Signals*, as appropriate. The following identifies the minimum technical requirements for a *Smart Signal* project.

1. Project shall include lane-specific detection zones for all approaches.
2. Project shall include lane-specific advanced detection zones for all approaches, all lanes, including through, left, right, and dual movement lanes.
3. Project shall include field network equipment capable of establishing a reliable, continuous communication link between the signalized intersection and the central network to reach external applications, such as ATSPM.
4. Project shall include traffic signal controller units compliant with the Advanced Transportation Controller (ATC) standard and capable of high-resolution data logging and future expansion for applications including CAV.
5. Project shall include NEMA TS-2, Type 1 controller cabinet assemblies, minimum Size 6 or better and wired for sixty-four (64) detection channels.
6. Project shall include detailed detector channel assignment providing unique channels for each detection zone.
7. Project shall include the development of necessary Technical Special Provisions (TSP) and/or Modified Special Provisions (MSP) required, including testing, integration, and as-built data collection efforts.
8. Project shall include the development and approval of necessary Proprietary Product Certifications (PPC) for local maintaining agency preferences.

The EOR is responsible for thoroughly coordinating any necessary clarifications or changes with the Department Project Manager and local maintaining agency before beginning design-related activities. Failure to ensure that both the Engineer and the Department fully understand the scope and agree upon the objectives of the project may result in costly schedule delays or errors and omissions later in the project lifecycle.

4.2 *Smart Signal* "Ready" Projects

Within District Five, most projects with signalized intersections will include the complete implementation of the *Smart Signals* requirements; however, there are a few exceptions in which specific intersections will only be required to provide the minimal defined requirements. These limited-scope projects are referred to as *Smart Signal "Ready"* and will be constructed such that new infrastructure is capable of accommodating equipment for a full buildout in the future.

Candidates for a *Smart Signal "Ready"* deployment include limited-scope or private development permit projects, including the construction of a new or widening of an existing signalized intersection leg for a residential development or business entrance. The intent of *Smart Signal "Ready"* projects is to ensure that the magnitude of the requested signalization scope is proportional to the overall project scope and budget. *Smart Signal "Ready"* projects will also help reduce unnecessary rework by ensuring the proposed signalization infrastructure is capable of simple modifications to provide the complete *Smart Signal* functionality at a later date.

The Department Project Manager will be responsible for identifying whether or not the project includes any signalized intersections that are only required to be upgraded according to the *Smart Signal "Ready"* minimum techical requirements.

Refer to **Figure 5** for more information on the minimum technical requirements for *Smart Signal* versus *Smart Signal "Ready"* improvements.

Smart Signal Project (New Construction, 3R, Widening, Traffic Ops)	Requirement	*Smart Signal* "Ready" Project (Private Development, minimum limited-scope) [5]
YES	ATC Controller	YES
YES	NEMA Type 6 Cabinet Assembly w/ 64 input channels	Conditional [7]
YES	Stop Bar Detection (all lanes, all approaches)	Conditional [1]
YES	Advanced Detection (all lanes, all approaches)	*Optional* [8]
YES [6]	Queue Detection (left turn lanes)	Conditional [6]
YES	Managed Field Ethernet Switch	YES
YES	Remote Power Management Unit	YES
Conditional [4]	Uninterruptible Power Supply	Conditional [4]
YES	Fiber Optic Communications, Infrastructure [2]	*Optional*
YES [3]	Alternative Communications (wireless, cellular)	YES [3]

[1] If the local agency or project preference for stop bar detection is in-pavement loops, the project must install loops for all lanes, all approaches impacted by the project.
[2] Minimum fiber optic communications infrastructure includes dedicated conduits, fiber optic pull box or splice vault at the cabinet base, fiber optic patch panel, splice enclosure, trunkline and drop fiber optic cables.
[3] If fiber optic communications are installed at an intersection, this requirement is null; alternative communications shall only be permitted if fiber optics communications are not feasible and approved by the Department.
[4] If the local agency preference requires UPS, install a complete assembly with battery backup system for each signalized intersection.
[5] The project is required to restore, replace, and/or upgrade all existing signalization components impacted as part of the project to the relevant Smart Signal standards.
[6] Provide queue detection where applicable based on operational needs of the intersection, traffic analysis, or historical.
[7] Existing NEMA Type 5 assembly shall be acceptable if existing assembly can accommodate additional equipment and detection inputs.
[8] Advanced detection is not optional for corridors with posted speed limits of 40+ MPH.

All projects are anticipated to meet the Smart Signal standards, unless otherwise approved by the Department.

Figure 5: *Smart Signal* vs. *Smart Signal* "Ready" project requirements

The minimum technical requirements for improvements at *Smart Signal "Ready"* intersections include the installation of the following:

- Advanced Transportation Controller (ATC)
- NEMA TS-2, Type 1 standard controller cabinet assembly, minimum Size 6 with 64 detection channels; existing NEMA Type 5 assembly shall be acceptable if existing assembly can accommodate additional equipment and detection inputs
- Managed Field Ethernet Switch (MFES)
- Remote Power Management Unit (RPMU)
- Network communications
- Detection technologies

Each *Smart Signal "Ready"* project shall be assessed to determine if any of the conditional requirements are applicable and need to be included within the proposed work. Conditional requirements include the following:

- **Presence (Stop Bar) Detection** – include stop bar detection for all lanes and all approaches impacted by the project if the technology preference of the local maintaining agency is in-pavement loops
- **Queue Detection –** include vehicle detection systems capable of providing advanced queue detection for left and/or right turn lanes where an operational need is identified within the intersection, or requested by the local maintaining agency
- **Uninterruptible Power Supply –** include an uninterruptible power supply (UPS) with battery backup system for each signalized intersection if requested by the local maintaining agency

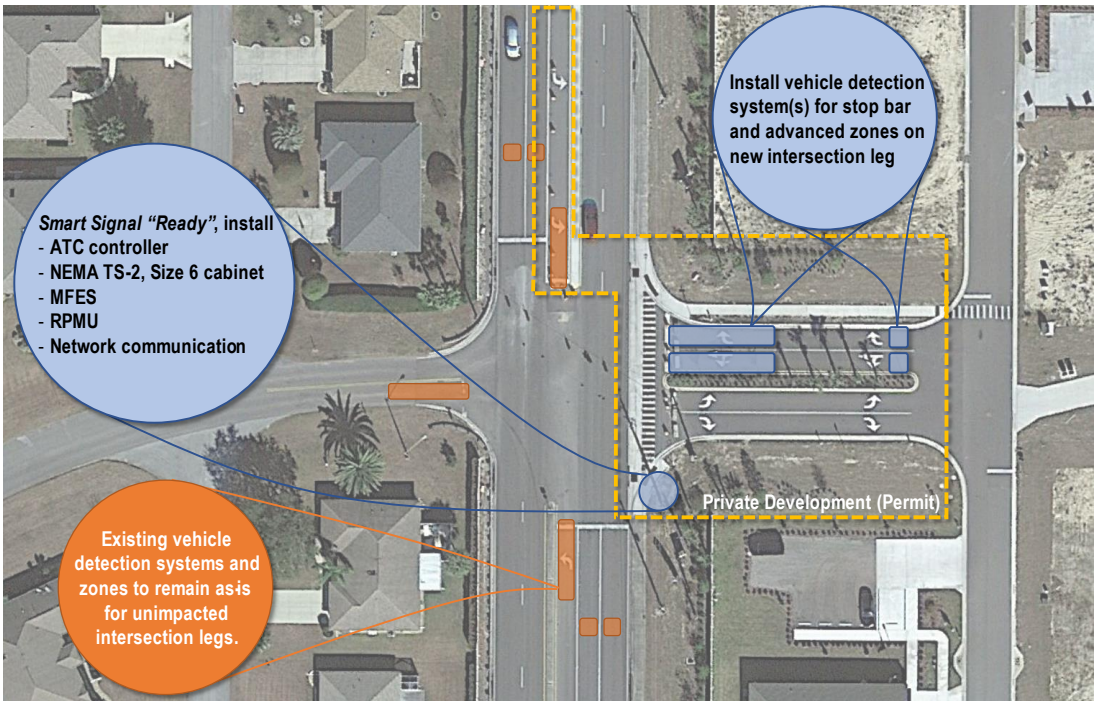


Figure 6: Example *Smart Signal* "Ready" improvements for permit project of a private development entrance.

In some cases, District Five may elect to forgo the implementation and requirements of *Smart Signal* standards for projects with minimal impacts to signalized intersections (such as pavement-only projects (POP), pedestrian detection improvements, and similar minimal scope efforts). The reasons may be a result of limited funding or the accelerated need for completed construction; however, all final decisions for intersections on state-maintained roadways shall obtain concurrence from District Five. Intersections encompassed within the project limits of a POP, where the signal detection and operations are impacted (i.e., in-pavement loops), the EOR shall coordinate with District Five to determine the appropriate disposition for re-establishing the detection to ensure the preferences of the maintaining agency and/or District Five are satisfied. District Five may elect to implement a more cost-effective solution to re-establish intersection detection where agreeable with the maintaining agency.

Section 5 – Early Works

The *Smart Signal* development process begins with field reviews, preliminary analysis, coordination, and engineering activities required before detailed technical design. These efforts are collectively known as "early works".

5.1 Field Review

The first project development activity for each project is conducting the on-site field review. This step provides the EOR an in-depth understanding of the existing conditions and potential design constraints of the project. Furthermore, the data collected from the field will aid the EOR to identify high-level design requirements and determine potential impacts between existing infrastructure (e.g., utilities) and proposed design elements. The EOR shall not rely on the limited available information from desktop surveys or the accuracy of as-builts drawings, as often conditions in the field are evolving. Field reviews shall be conducted for all existing and proposed intersections within the project limits.

Prior to beginning each field review, the EOR is responsible for coordinating with the appropriate local maintaining agencies a minimum of five (5) days in advance. The EOR shall clearly identify the purpose of the field visit, project locations, anticipated dates and times, and request information concerning access to traffic signal controller cabinets to identify existing security features (e.g., standard Type 2 cabinet key, padlocks, electronic locking mechanisms). Additionally, the EOR is encouraged to reach out to the local maintaining agency upon arriving at the site prior to accessing any controller cabinets.

The EOR will be responsible for coordination with the local maintaining agency to identify current equipment requirements and proprietary preferences to identify legacy equipment and/or gaps in existing hardware to be replaced as part of the project.

During the field review, the EOR shall be responsible for determining the following, at minimum:

- Potential utility conflicts, either overhead or underground
- Existing utility service points and/or potential new utility service point location(s)
- Potential clear zone, lateral offset issues or violations for existing infrastructure
- Existing signalization and ITS field equipment and associated infrastructure, including, but not limited to vehicle and pedestrian detection systems, cabinets, pull boxes, conduit, cabling, signal heads, overhead signing, poles, and foundations
- Existing infrastructure that is either damaged, non-functional, or unutilized (*the EOR shall be responsible for reporting damaged equipment and/or identified concerns to the local maintaining agency immediately)*

The field review shall also serve as opportunity for the EOR to observe real-time traffic conditions (e.g., heavy pedestrian movements, queuing turn lanes, red light violations) to identify potential operational improvements or needs to be addressed by the project.

Based off of field review findings, the EOR shall determine necessary improvements needed to meet the District's *Smart Signal* standard and communicate any identified deviations from the approved scope with the FDOT Project Manager. In order to meet project requirements, it may be necessary to upgrade existing signalization equipment and ITS field devices due to either the condition or age of the equipment, as noted during the field review.

5.1.1 Existing Equipment Inventory

Below is a sample inventory checklist that can be used during the field review. It is recommended the EOR take photos of all existing equipment reviewed in the field.

Table 1: Existing Signalization Equipment Inventory Checklist

Signal Structure *(complete for each structure)*	
Type	❑ Mast arm, single ❑ Mast arm, dual ❑ Span wire, single point attachment (e.g., diagonal) ❑ Span wire, multi-point attachment (e.g., box, drop box, "H") ❑ Truss ❑ Pedestal
Material	❑ Steel ❑ Concrete ❑ Aluminum
Location / Corner	
Condition	❑ Good ❑ Fair ❑ Poor
	Damage identified:
Luminaires	❑ Yes ❑ No
	❑ High-pressure sodium (HPS) fixture ❑ LED fixture
Controller Cabinet Assembly	
Standard	❑ NEMA TS-1 (*"A", "B", "C", "D" connectors*) ❑ NEMA TS-2, Type 1 (*"A" connector, SDLC*) ❑ NEMA TS-2, Type 2 (*"A", "B", "C", "D" connectors, SDLC*) ❑ 170 / 2070 (*Caltrans*) ❑ Hybrid
Size	❑ Size 4 *(NEMA)* – 24" W x 46" H x 16" D ❑ Size 5 *(NEMA)* – 30" W x 48" H x 16" D ❑ Size 6 *(NEMA)* – 44" W x 52" H x 24" D ❑ Size 7 *(NEMA)* – 44" W x 72" H x 24" D ❑ Type 332 *(Caltrans)* ❑ Type 334 (*Caltrans*) ❑ Other
APL No.	
Manufacturer	
Date of Manufacture	
Installation	❑ Base mount ❑ Pole mount
Base Dimensions	
Location / Corner	
Main Circuit Breaker (A)	
Additional Circuit Breakers	
Conduit Sweep *(complete for each)*	
Conduit Size	
Utilization (Conduits entering cabinet)	
Destination	

Controller Unit		
Body Type	❑ NEMA TS-1 (*"A", "B", "C", "D" connectors*) ❑ NEMA TS-2, Type 1 (*"A" connector, SDLC*) ❑ NEMA TS-2, Type 2 (*"A", "B", "C", "D" connectors, SDLC*) ❑ 170 / 2070 (*Caltrans*) ❑ Hybrid	
Manufacturer	❑ Econolite ❑ Intelight / Q-Free ❑ Naztec / Trafficware / Cubic ❑ Siemens / Yunex ❑ Other	
Model		
Firmware Version (Can be obtained via the 'Software' menu on the controller display)		
Additional Modules (Can be obtained via the 'Software' menu on the controller display)	❑ SynchroGreen Traffic Adaptive ❑ Light Rail Transit (LRT) ❑ Transit Signal Priority (TSP) ❑ Connected Vehicle (CV) ❑ Other	
Vehicle Detection System(s) *(complete per active system)*		
Type	❑ Loops ❑ Standard video ❑ Omni-directional video (fisheye) ❑ Microwave radar ❑ Video/microwave hybrid ❑ In-ground wireless magnetometers ❑ Other	
Manufacturer		
Model		
In-Cabinet Equipment		
Auxiliary Signalization Equipment		
Emergency Vehicle Preemption (EVP)	❑ Yes	❑ No
	Manufacturer	
	Model	
Transit Signal Priority (TSP)	❑ Yes	❑ No
	Manufacturer	

	Model	
Adaptive Signal Control	❑ Yes	❑ No
	Manufacturer	
	Model	
Accessible Pedestrian Signal (APS)	❑ Yes	❑ No
	Manufacturer	
	Model	
Uninterruptible Power Supply (UPS)	❑ Yes	❑ No
	Manufacturer	
	Model	
	Install Date (battery)	
Remote Power Management Unit (RPMU)	❑ Yes	❑ No
	Manufacturer	
	Model	
	No. Available Plugs	
Utility Power Service		
Service Provider (UAO)		
Service Voltage		
Location / Corner		
Service Pole No.		
Installation	❑ Overhead ❑ Underground	
Communications		
Network Connection	❑ Yes	❑ No
Fiber Optics	❑ Yes	❑ No
	Type	❑ Single-Mode ❑ Multi-Mode ❑ Hybrid
	Fiber Count	
	Patch Panel Count	(capacity) | (terminated)
	Patch Panel Manufacturer	
	Patch Panel Model	
	Connection(s)	
Wireless Radio	❑ Yes	❑ No
	Manufacturer	
	Model	
	No. of Radios	
	Signal Destination(s)	
Cellular Modem	❑ Yes	❑ No
	Manufacturer	
	Model	
Managed Field Ethernet Switch (MFES)	❑ Yes	❑ No
	Manufacturer	
	Model	

	No. of Copper Ports (RJ45)	(total)	(available)
	Copper Port Assignment		
	No. of Fiber Ports (SFP)	(total)	(available)
	Fiber Port Assignment		
Intelligent Transportation Systems (ITS) Field Devices			
CCTV Camera	❑ Yes	❑ No	
	Manufacturer		
	Model		
	Type	❑ Fixed ❑ Pan-tilt-zoom, dome ❑ Pan-tilt-zoom, external positioner	
	Location / Structure		
	Wiring Architecture	❑ Analog ❑ Digital ❑ Power-over-Ethernet	
	In-Cabinet Equipment		
Bluetooth Reader	❑ Yes	❑ No	
	Manufacturer		
	Model		
	Location / Structure		
	In-Cabinet Equipment		
Connected Vehicle Roadside Unit (RSU)	❑ Yes	❑ No	
	Manufacturer		
	Model		
	Location / Structure		
	In-Cabinet Equipment		

5.2 Utility Coordination

Following the field review, the EOR is to start coordination with utility owners within the project limits. Utility coordination is required to determine adjustments to existing utility lines so there are no conflicts with the proposed construction. For all utility installation and adjustment requirements within FDOT right-of-way, refer to the *FDOT Utility Accommodation Manual (UAM)*.

It is recommended that the EOR contact Sunshine 811 to obtain an updated list of all utility providers in the area. Utility coordination may be conducted via the Engineer's preferred form of contact; however, it is imperative that all utility lines, either overhead or underground, be verified against the proposed work to be done. Plans shall be sent to utility owners for mark-ups. If utilities cannot be avoided and require relocation(s), provide a utility conflict matrix as depicted in **Appendix B**.

Vertical clearances to all overhead lines shall be checked to determine the required clearances of the proposed signalization and/or ITS infrastructure. Transmission lines cannot be relocated.

After the necessary field reviews have been conducted, the EOR is to coordinate with the utility agency owner (UAO) regarding the need for new utility service points if the existing service points are inadequate.

Utility coordination efforts shall be used to identify existing communications infrastructure, as well as locate potential connection points for network connectivity.

Table 2: Utility Coordination Checklist

First Steps	
Contact Sunshine 811	Provide: ❑ Project Description ❑ Project Limits
Contact Local Utility Providers	Provide: ❑ Project Description ❑ Project Limits ❑ Plan Sheets to be Marked-up (i.e., RGBs)
Follow-up	
Complete Utility Conflict Matrix	❑ Utility Agency Owner ❑ Contact Personnel (email, phone number) ❑ Utility Location (station, offset, top elevation) ❑ Utility Type / Size ❑ Material ❑ Description of Conflict ❑ Action ("To Remain", "To Be Removed", "To Be Relocated")
Submit Utility Adjustment Letter to Utility Agency Owner(s)	❑ Request "No Facilities Form" with UAO letterhead ***OR*** ❑ Request "No Conflict Form" with UAO letterhead
Prepare Utility Adjustment Sheet(s) ***per FDM Section 923***	

5.3 Local Maintaining Agency Coordination

The EOR shall be responsible for the design of a functional system that meets the District's *Smart Signal* standard while simultaneously adhering to the preferences and requirements of the local maintaining agency. The EOR shall coordinate with the local maintaining agency at the early stages of the project to determine specific needs at the project

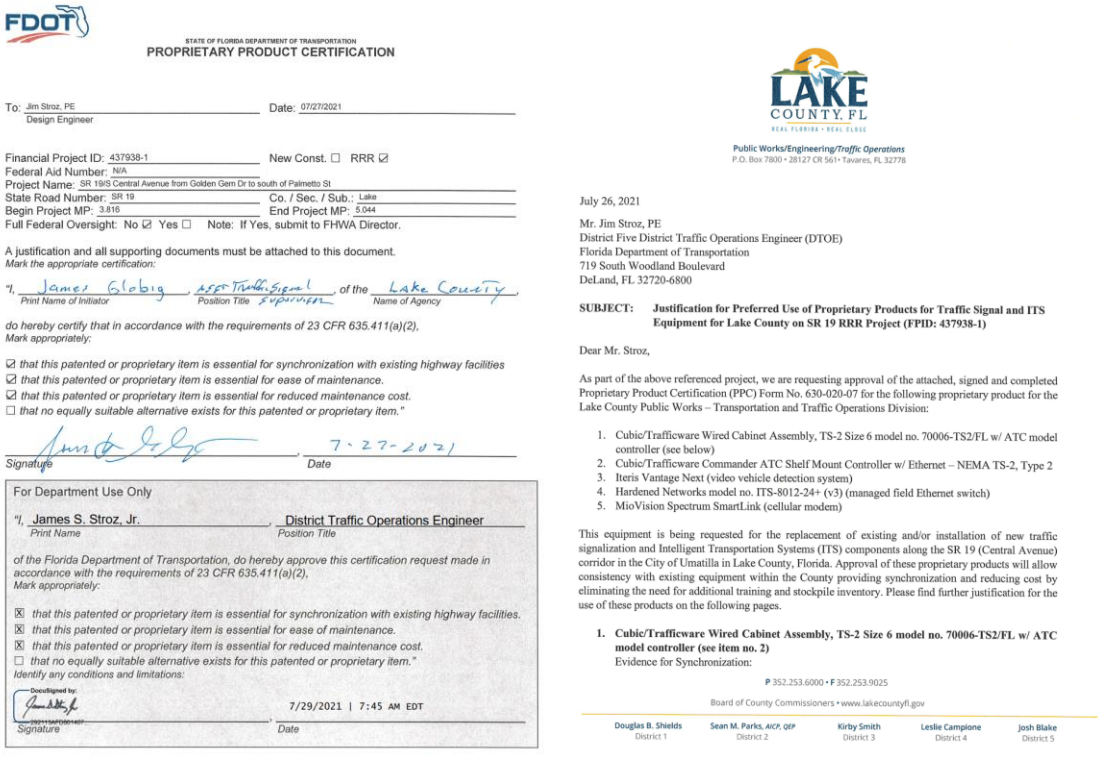
location(s), identify changes or modifications to current design standards, define necessary proprietary products, and more.

Where the local maintaining agency identifies specific technology preferences to be included in the project, the EOR will be responsible for preparing Proprietary Product Certifications (PPC) to be signed off by both a representative of the local maintaining agency and the Department Traffic Operations Engineer (DTOE). Each PPC shall be comprised of two (2) parts: the *Proprietary Products Approval Request Letter* submitted on behalf of and signed by the local maintaining agency and the PPC Form signed by the DTOE. Within each of these documents, identify the specific products being requested—including manufacturer and model number—as well as the justification (e.g., synchronization with existing deployed systems, familiarity and ease of maintenance, reduced maintenance cost, no suitable alternative). The executed document shall be provided to the FDOT Project Manager for retention with project records.

Local maintaining agencies within District Five include:

- Brevard County
- City of Melbourne
- City of Palm Bay
- City of Titusville
- City of Palm Coast
- Lake County
- Marion County
- City of Ocala
- Orange County
- City of Orlando
- City of Maitland
- City of Winter Park
- Osceola County
- City of Kissimmee
- Seminole County
- Sumter County
- Volusia County
- City of Daytona Beach
- City of Ocoee

Refer to **Appendix A** for an example listing of local maintaining agency preferences for signalization equipment. Note that the list provided isn't comprehensive and the Engineer should coordinate as appropriate with the local agencies to ensure the latest preferences are captured for each agency.



STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
PROPRIETARY PRODUCT CERTIFICATION

To: Jim Stroz, PE — Design Engineer
Date: 07/27/2021

Financial Project ID: 437938-1 — New Const. ☐ RRR ☑
Federal Aid Number: N/A
Project Name: SR 19/S Central Avenue from Golden Gem Dr to south of Palmetto St
State Road Number: SR 19 — Co. / Sec. / Sub.: Lake
Begin Project MP: 3.816 — End Project MP: 5.044
Full Federal Oversight: No ☑ Yes ☐ Note: If Yes, submit to FHWA Director.

A justification and all supporting documents must be attached to this document.
Mark the appropriate certification:

"I, James Globig (Print Name of Initiator), ASST Traffic Signal Supervisor (Position Title), of the Lake County (Name of Agency),

do hereby certify that in accordance with the requirements of 23 CFR 635.411(a)(2), Mark appropriately:

☑ *that this patented or proprietary item is essential for synchronization with existing highway facilities*
☑ *that this patented or proprietary item is essential for ease of maintenance.*
☑ *that this patented or proprietary item is essential for reduced maintenance cost.*
☐ *that no equally suitable alternative exists for this patented or proprietary item."*

Signature — 7-27-2021 (Date)

For Department Use Only

"I, James S. Stroz, Jr. (Print Name), District Traffic Operations Engineer (Position Title),

of the Florida Department of Transportation, do hereby approve this certification request made in accordance with the requirements of 23 CFR 635.411(a)(2), Mark appropriately:

☒ *that this patented or proprietary item is essential for synchronization with existing highway facilities.*
☒ *that this patented or proprietary item is essential for ease of maintenance.*
☒ *that this patented or proprietary item is essential for reduced maintenance cost.*
☐ *that no equally suitable alternative exists for this patented or proprietary item."*
Identify any conditions and limitations:

DocuSigned by: — Signature — 7/29/2021 | 7:45 AM EDT (Date)

LAKE COUNTY, FL
Public Works/Engineering/*Traffic Operations*
P.O. Box 7800 • 28127 CR 561• Tavares, FL 32778

July 26, 2021

Mr. Jim Stroz, PE
District Five District Traffic Operations Engineer (DTOE)
Florida Department of Transportation
719 South Woodland Boulevard
DeLand, FL 32720-6800

SUBJECT: Justification for Preferred Use of Proprietary Products for Traffic Signal and ITS Equipment for Lake County on SR 19 RRR Project (FPID: 437938-1)

Dear Mr. Stroz,

As part of the above referenced project, we are requesting approval of the attached, signed and completed Proprietary Product Certification (PPC) Form No. 630-020-07 for the following proprietary product for the Lake County Public Works – Transportation and Traffic Operations Division:

1. Cubic/Trafficware Wired Cabinet Assembly, TS-2 Size 6 model no. 70006-TS2/FL w/ ATC model controller (see below)
2. Cubic/Trafficware Commander ATC Shelf Mount Controller w/ Ethernet – NEMA TS-2, Type 2
3. Iteris Vantage Next (video vehicle detection system)
4. Hardened Networks model no. ITS-8012-24+ (v3) (managed field Ethernet switch)
5. MioVision Spectrum SmartLink (cellular modem)

This equipment is being requested for the replacement of existing and/or installation of new traffic signalization and Intelligent Transportation Systems (ITS) components along the SR 19 (Central Avenue) corridor in the City of Umatilla in Lake County, Florida. Approval of these proprietary products will allow consistency with existing equipment within the County providing synchronization and reducing cost by eliminating the need for additional training and stockpile inventory. Please find further justification for the use of these products on the following pages.

1. **Cubic/Trafficware Wired Cabinet Assembly, TS-2 Size 6 model no. 70006-TS2/FL w/ ATC model controller (see item no. 2)**
Evidence for Synchronization:

P 352.253.6000 • F 352.253.9025
Board of County Commissioners • www.lakecountyfl.gov

Douglas B. Shields, District 1 — Sean M. Parks, *AICP, QEP*, District 2 — Kirby Smith, District 3 — Leslie Campione, District 4 — Josh Blake, District 5

Figure 7: Example Proprietary Products Certification (PPC) Form (left); Approval Request Letter (right)

In addition to identified proprietary products, the EOR shall coordinate with the appropriate local maintaining agency in advance of the design phase to request all necessary documents including available as-built drawings, signal timing plans (e.g., coordination plans, time of day plans, preemption and priority timings), standard operating plan (SOP), as well as request access to the cabinet assembly for field reviews.

It is important to note that coordination with the local maintaining agency is not a one-time activity. The local maintaining agency is to be considered a valued stakeholder for the project and should be kept abreast of the overall project progress, schedule, and design decisions, and should be included in the technical reviews for phase deliverables (e.g., Phase II).

Section 6 – Standard Design

The information provided within this section shall be considered supplemental information to the design criteria listed within the *FDOT Central Office Design of Traffic Signal Detection Technologies, Informational Guide*.

6.1 Presence (Stop Bar) Detection

Smart Signal implementation will include stop bar detection for all lanes and all approaches within a signalized intersection, including left turn, right turn, and through lanes, as well as any lanes with shared movements (e.g., right/through). Within the *Smart Signal* architecture, stop bar detection will be used in two different functions, based on the operational configuration of the intersection: (1) generate calls to controller to actuate specific phasing, and (2) provide real-time lane-specific data to the ATSPM system. While stop bar detection zones for some lanes may be utilized for both functionalities (e.g., left turns), others may only be used to provide input for high-resolution data logging. In other words, some stop bar detection zones may not be related to signal operations.

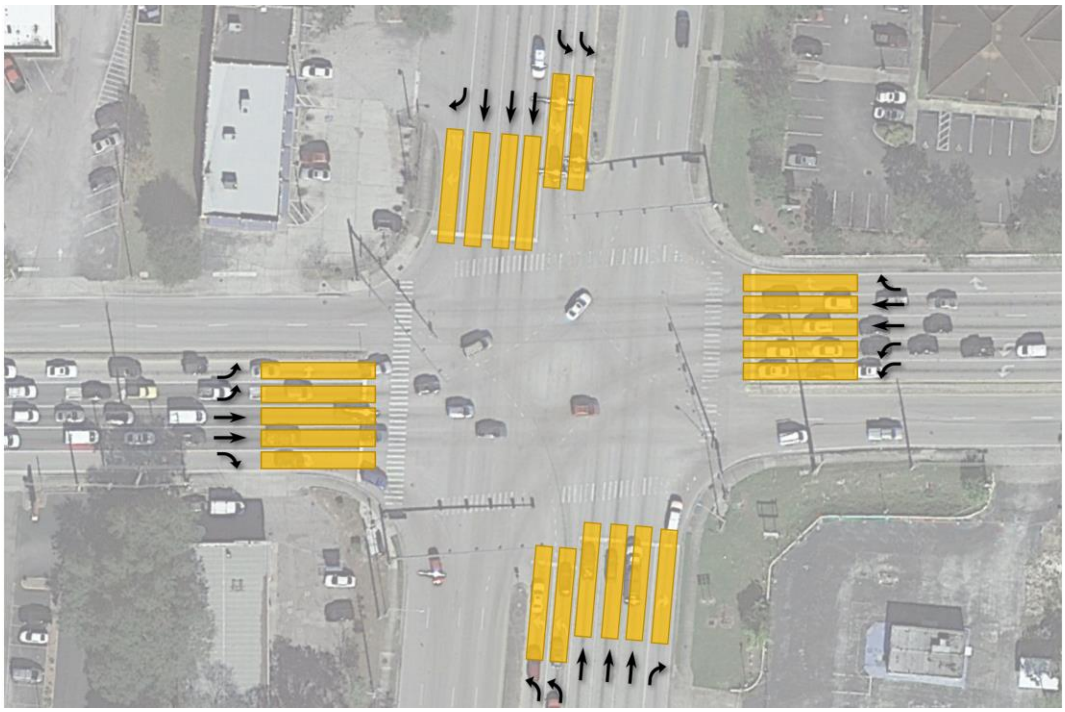


Figure 8: Example *Smart Signal* schema for stop bar detection provided for all lanes, all approaches

Traditionally, stop bar detection zones may only be provided for left turn lanes of both minor and major roadways (Phases 1, 3, 5, and 7), through and right lanes for minor street approaches (Phases 4 and 8), and occasionally right turn lanes for major roadways where specific turn restrictions or overlaps exist. In order to improve the granularity of data and available performance metrics for operations, *Smart Signals* deployments will increase the stop bar detection to include all lanes and all approaches, including through and right turn lanes for the major roadway (Phases 2 and 6).

Within the controller, all stop bar detection zones will be programmed as “presence” operation mode and provided a unique detector channel number. No stop bar detection zones may share detector channels. Each stop bar detection zone shall be reviewed to identify which channels will be programmed to generate calls for specific phases and which zones will be used for data collection only. Regardless of the function, all stop bar detection zones must be programmed into the controller. Coordinate with the local maintaining agency for any operational preferences or requirements.

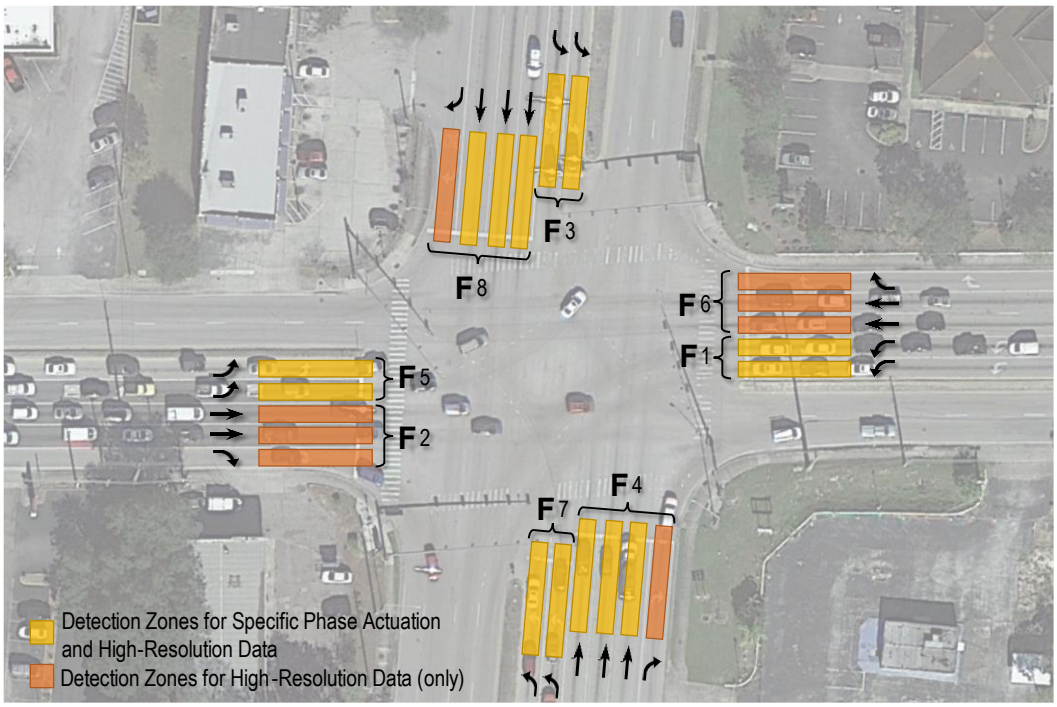


Figure 9: Example of stop bar detection zones and functionality

While the requirements for *Smart Signals* identify the data that is required for stop bar detection at signalized intersections, the standard is not intended to dictate how that information is obtained. Each local maintaining agency will likely have preferences for the specific type of technology to be utilized for stop bar detection–ranging from inductive loops, video (e.g., traditional, omni-directional, thermal), microwave radar, to hybrid technologies. One type of technology shall be utilized to provide stop bar detection for all approaches within an intersection; do not mix and match, unless otherwise approved by the Department. The EOR will be responsible for coordinating specific technology preferences with the local maintaining agency. The EOR shall also identify any site-specific conditions that may negatively impact the performance of the proposed technology at that location. For example, coastal intersections experiencing significant salt spray may experience degraded detection over time when using video detection as the camera lens becomes cloudy; in this situation the appropriate technology may be microwave radar or inductive loops.

Some situations arise where high-resolution data is desired, even if there is not a signal being directly impacted by the vehicular movements (refer to **Figure 10**). This may occur where there is a free-flow through lane, and a left-turn movement that is signalized. In this instance, the detection zone shall be placed where the stop bar *would* be. This provides high-resolution data to the Department, for if the full intersection ever becomes signalized.

Supplementing stop bar detection, upgraded *Smart Signal* intersections must include a system capable of providing accurate turning movement count data for all lanes and all approaches if part of a new construction or widening project. The system shall quantify vehicle movements—including left turn, right turn, and through maneuvers—and provide this information in one-minute batches to the centralized server using network communication accessible through an Applicable Programming Interface (API). The system shall be capable of recording turning movement count data for all lanes, including shared-use lanes (e.g., through-right). While systems capable of determining U-turn movements exist, this is not a requirement of the turning movement count system. Based on the preferences of the local maintaining agency the same system may be utilized to provide both stop bar detection and turning movement count data.

Figure 10: Example of presence detection at a free-flow intersection

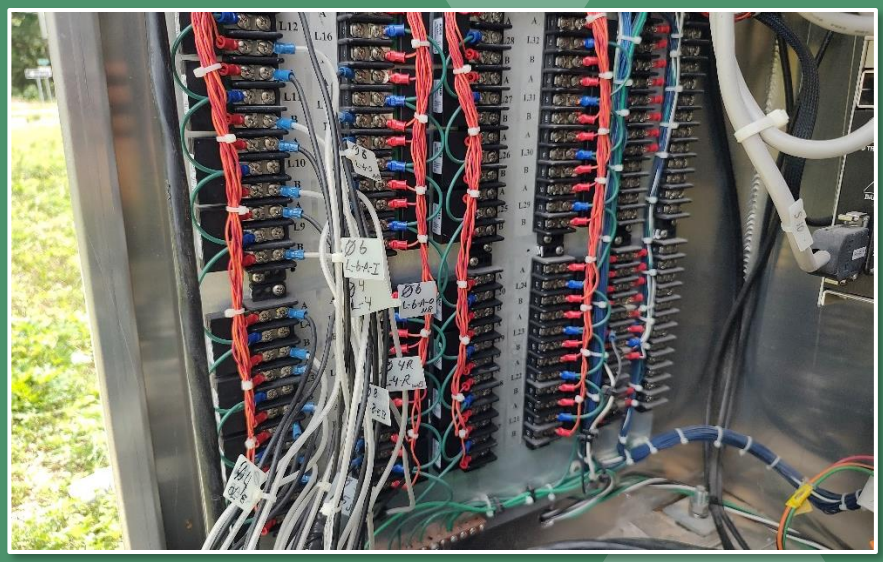
The Engineer is responsible for coordination with the local maintaining agency to identify additional stop bar detection zone needs for intersections within the project limits during the design phase.

6.1.1 Inductive Loops

Provide inductive loop vehicle detection systems for signalized intersections where requested by the local maintaining agency to provide stop bar detection. The following provides generalized design guidance and considerations for the deployment of inductive loops:

- Design inductive loop systems in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232*, *FDOT Standard Plans for Road and Bridge Construction – Index 660-001*, and *FDOT Standard Specifications for Road and Bridge Construction – 600 Series*.
- Coordinate with the local maintaining agency to determine specific preferences for loop assemblies, including type (e.g., Type "A" vs. "F"), standard loop assembly length, and distance of leading edge either in advance of or behind the stop bar. In the event there are no local preferences, 40'-0" Type "F" loop assemblies installed with the leading edge 5'-0" in advance of the stop bar should be considered default.
- Ensure standard 13" X 24" signalization pull boxes are provided on each intersection corner to facilitate splicing between loop lead-in wires and homerun cabling. Pull boxes shall be stamped with "FDOT Traffic Signal" and include only cabling carrying low-voltage signal. Each loop lead-in shall be uniquely spliced to a homerun cabling; do not splice multiple loops to a single homerun cable.
- Ensure underground cabling pathways are provided between loop assemblies and the controller cabinet using conduits dedicated to cabling carrying low-voltage signal.
- Ensure each homerun cable is connected to the termination block of a unique channel within the cabinet assembly detector panel. Homerun cables shall not be terminated to the same channel.
- Ensure the controller cabinet assembly includes sufficient channels to provide a unique channel for each detection zone, including detector racks, Bus Interface Units (BIU), and Synchronous Data Link Communications (SDLC) bus interfaces. Provide enough solid-state, rack mounted detector cards to ensure unique channels for all detection zones.
- Provide solid-state, rack mounted detector cards with time delay for each lane containing a right turn, including shared-use lanes (e.g., through-right).

Type F inductive loops installed forty feet (40') in length with loop lead-in cuts. (**City of Maitland**)



Lead-in cables for Inductive loops terminated to individual channels in the detector panel of the controller cabinet assembly. (**Marion County**)

Standard detector rack with bus interface unit (BIU) and two-channel detector cards installed in controller cabinet assembly. (**Orange County**)

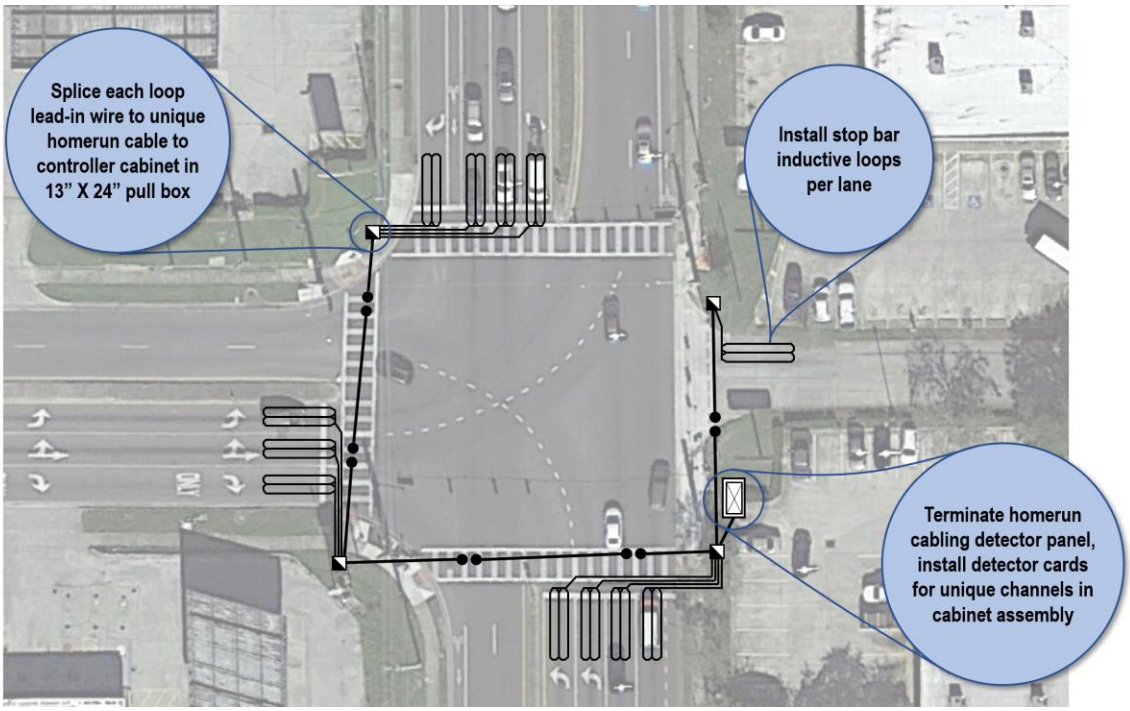


Figure 11: Example deployment of inductive loops for stop bar detection

The following pay items shall be utilized in the design and installation of inductive loop systems for stop bar detection:

- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-11** Pull & Splice Box, Furnish & Install, 13" X 24" Cover Size
- **660-1-1BB** Loop Detector Inductive, Furnish & Install, (Type)
- **660-2-1BB** Loop Assembly, Furnish & Install, (Type)

6.1.2 Video Vehicle Detection Systems

Provide video vehicle detection systems for signalized intersections where requested by the local maintaining agency to provide stop bar detection. The following provides generalized design guidance and considerations for the deployment of standard (e.g., fixed lens) video detection systems:

- Design video vehicle detection systems in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232* and *FDOT Standard Specifications for Road and Bridge Construction – 600 Series*, as well as manufacturer installation guidelines and recommendations.
- Provide the appropriate number of camera sensors necessary to adequately establish detection zones for all lanes of an approach. Generally, the Horizontal Field of View (HFOV) for cameras is limited to a maximum lateral coverage of four (4) lanes within an approach. Signalized intersections with more than four (4) lanes to an approach should include additional cameras necessary to provide all detection zones with one camera dedicated for left turn lanes and the other for through and right turn movement lanes.
- Ensure cameras are positioned in the center of the proposed detection zones for an approach, where feasible. If the camera cannot be centered over the proposed detection zones, verify the field of view will not experience visual occlusions.

Video detection camera installed on cantilevered mounting arm for span wire intersection. (**Orange County**)

Mast arm structure with video detection camera on vertical riser mounting arm. (**City of Orlando**)

Image processing cards for video vehicle detection system installed in detector rack with bus interface unit (BIU) in controller cabinet assembly. (**Osceola County**)

- Typical camera mounting height for stop bar detection is 20'-25' above the pavement.
- For signalized intersections with mast arm structures, provide vertical riser arms to obtain the mounting height necessary for full field of view coverage. Mounting brackets will be rigidly attached to the mast arm. Ensure there is a minimum 1'-0" horizonal clearance from traffic signal heads, retroreflective backplates, overhead sign panels, and other obstructions that may impact the field of view. Do not install cameras closer than 2'-0" to the tip end of the mast arm to avoid significant "bouncing" that may negatively impact video streams.
- For signalized intersections with span wire configurations, determine if mounting assemblies that rigidly attached to the catenary and/or messenger wire are available and provide the necessary field of view coverage. Where mounting directly to the span wire structure is unavailable, mounting cameras to horizontal structures (e.g., luminaires, internally illuminated sign supports, cantilevered mounting brackets) attached to the upright supports may be acceptable. Provide a vertical riser arm to obtain the mounting height necessary and to clear all occlusion areas (e.g., large trucks in nearby lanes).

- Ensure cameras are installed providing a field of view of at least 100' behind stop bar pavement markings and at least 5'-10' in front of the stop bar for each lane to develop detection zones. Note, the intent is not to create a single continuous detection zone including stop bar and advanced detection regions. Individual detection zones with unique channel assignments are required. The Vertical Field of View (VFOV) is directly proportional to the mounting height of camera sensors above the roadway. Generally, each foot above the road surface the camera is mounted provides ten feet of roadway viewing coverage.

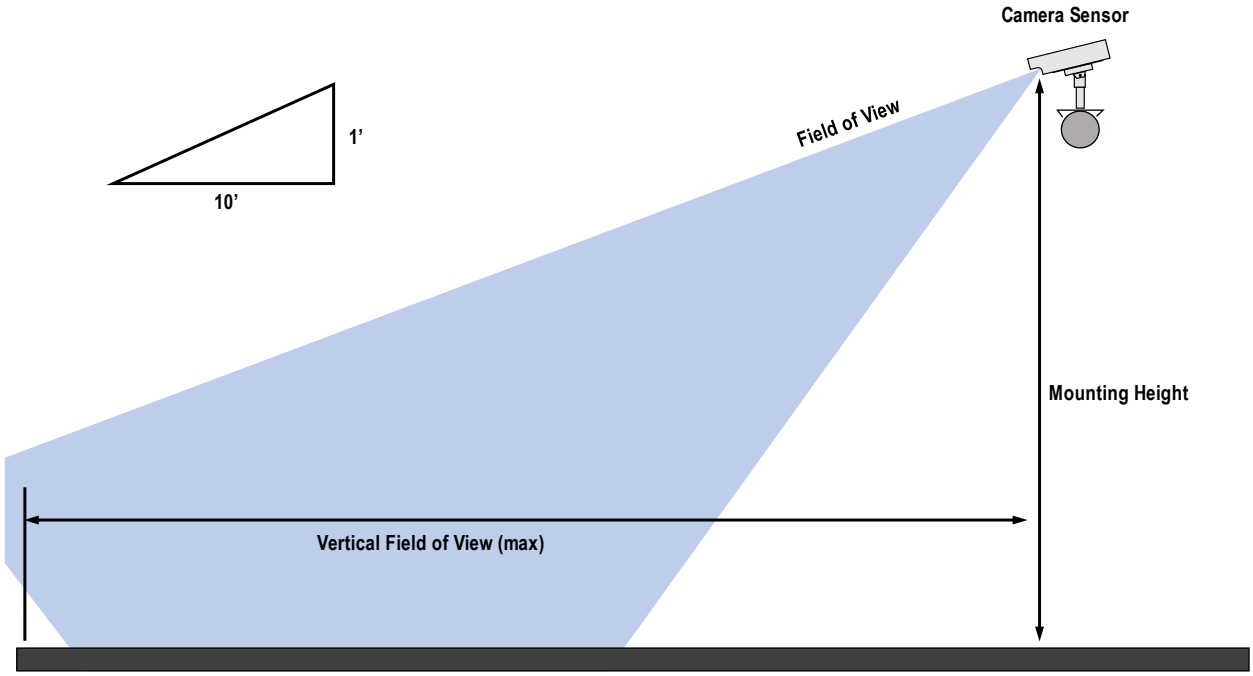
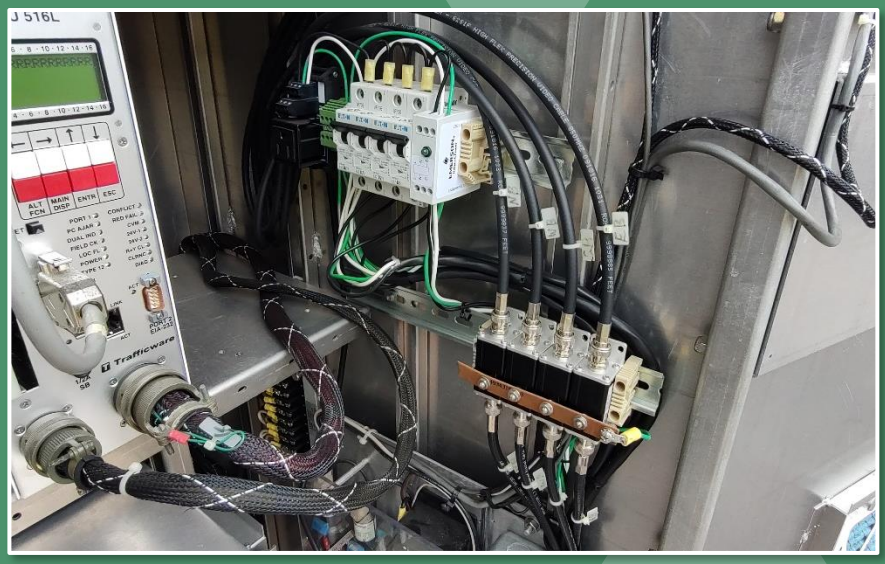


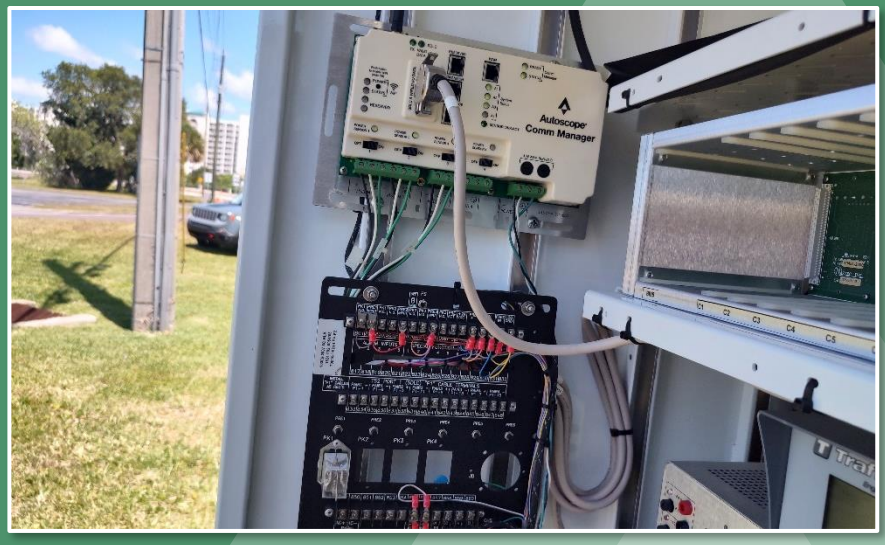
Figure 12: Video vehicle detection system Vertical Field of View (VFOV) proportionate to mounting height

- Ensure standard 13" X 24" signalization pull boxes are provided on each intersection corner where camera sensors are proposed to provide a cabling pathway and house cable slack. Pull boxes shall be stamped with "FDOT Traffic Signal" and include only cabling carrying low-voltage signal.
- Ensure underground cabling pathways are provided between camera assemblies and the controller cabinet using conduits dedicated to cabling carrying low-voltage signal.

Video detection cameras installed directly to the catenary wire of a span wire intersection. (**City of Orlando**)



Typical in-cabinet video detection array including in-line surge protection devices, circuit breakers, and power distribution assembly. (**City of Orlando**)



Proprietary in-cabinet equipment will vary from vendor to vendor providing an interface between the video detection sensors and controller. (**Brevard County**)

- Ensure the proposed camera cabling lengths do not exceed the maximum distances provided for the particular type of cable, including horizontal and vertical distances. If longer cabling lengths are required, provide the necessary media conversion (e.g., fiber optics) to achieve the required distance for communication signals.
    - Category 6 (Cat-6) Ethernet cable runs for Power-over-Ethernet (PoE) cameras shall not exceed 328' (100 m) in length (*IEEE 802.at*). It is recommended to maintain PoE cabling distances below 300' to ensure appropriate signal strength while providing for unforeseen cabling runs and slack (e.g., drip loops).
    - RG-59/U coaxial cabling runs for digital cameras shall not exceed 750' in length

  Verify the proposed cabling length will provide the minimum low-voltage power necessary for the device with consideration for voltage drop over the length. Where necessary, increase the wire gauge.
- Ensure system in-cabinet equipment (e.g., video cards, processing unit) provides sufficient discrete detection channels to accommodate all proposed detection zones. Provide connection between the in-cabinet equipment and the Synchronous Data Link Communications (SDLC) bus within the cabinet assembly for data transfer to the controller.
- Ensure in-line surge protection equipment is provided in the cabinet for each camera.

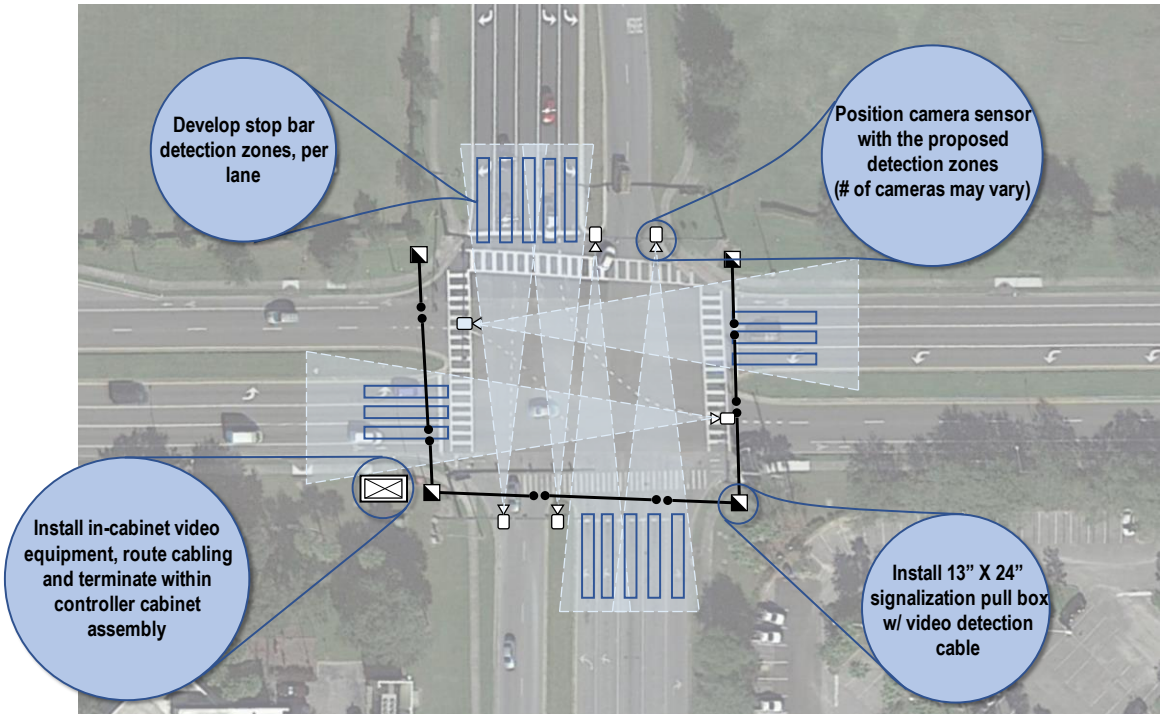


Figure 13: Example video vehicle detection system deployment for stop bar detection

It is recommended the Engineer of Record coordinates with the manufacturer of the video vehicle detection system to review proposed detection zones, sensor installation locations, in-cabinet equipment, and other site-specific considerations for design optimization.

The following pay items shall be utilized in the design and installation of video vehicle detection systems for stop bar detection:

- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-11** Pull & Splice Box, Furnish & Install, 13" X 24" Cover Size
- **660-4-11** Vehicle Detection System – Video, Furnish & Install, Cabinet Equipment
- **660-4-12** Vehicle Detection System – Video, Furnish & Install, Aboveground Equipment

Omni-directional camera sensor installed on cantilevered mounting arm for span wire intersection. (**City of Orlando**)

Candy cane vertical mounting arm for omni-directional camera affixed directly to concrete strain pole for a span wire intersection. (**City of Orlando**)

Mast arm structure with omni-directional camera sensor positioned towards the center of the signalized intersection. (**Seminole County**)

Specialty video vehicle detection systems, such as omni-directional lens cameras, can also provide stop bar detection to the controller. The following provides generalized design guidance and considerations for the deployment of omni-directional video vehicle detection systems:

- Design omni-directional video vehicle detection systems in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232* and *FDOT Standard Specifications for Road and Bridge Construction – 600 Series*, as well as manufacturer installation guidelines and recommendations.
- Provide the appropriate number of camera sensors necessary to adequately establish detection zones for all lanes and all approaches. Generally, the maximum coverage area for omni-directional cameras includes a detection radius of 150' – 200'. Larger intersections may require two (2) cameras to achieve full coverage.
- Ensure omni-directional cameras are installed at a height such that the coverage area completely includes the stop bar for the intended approaches. The detection radius is directly proportional to the mounting height above roadway. Generally, each foot above the road surface the camera is mounted provides seven (7) feet of radial coverage.

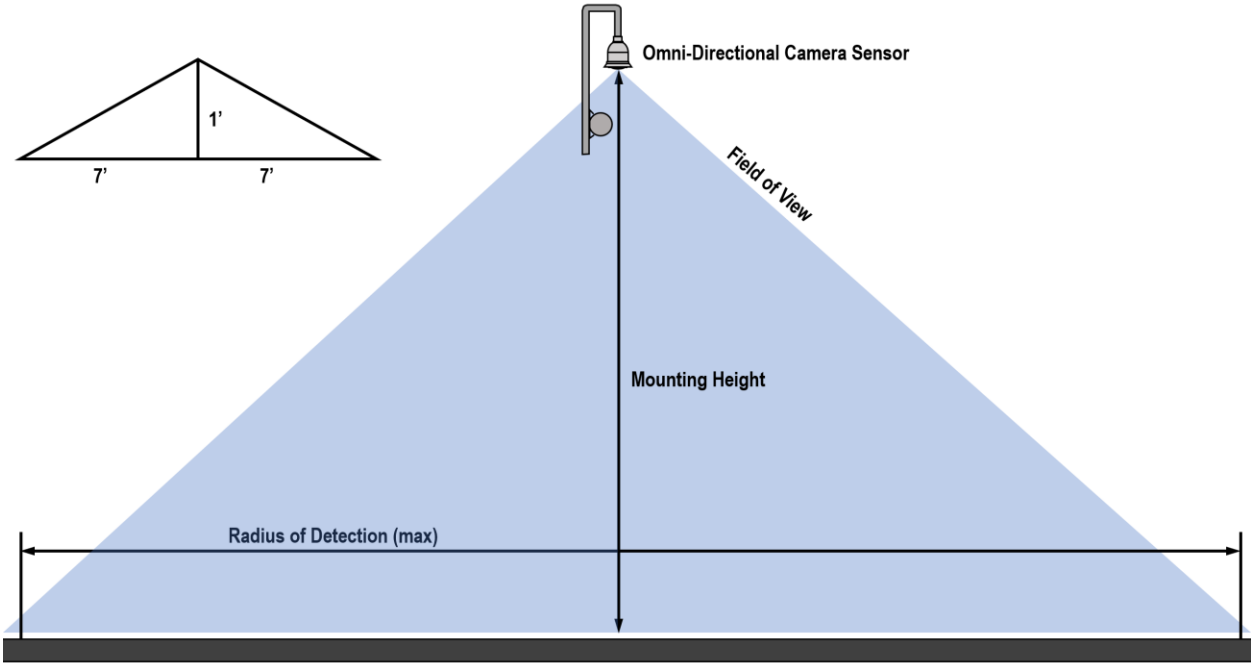
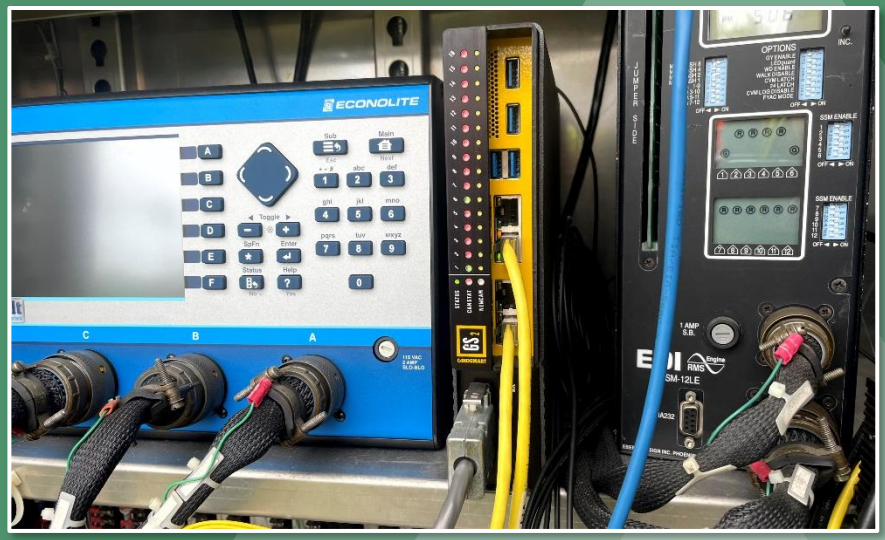


Figure 14: Omni-directional video detection system coverage radius proportionate to mounting height

- Ensure omni-directional cameras are installed ahead of stop bars for all approaches with detection zones and located as close to the center of the intersection as possible.
    - For signalized intersections with mast arm structures, provide vertical riser arms to obtain the mounting height necessary for full field of view coverage. Mounting brackets will be rigidly attached to the mast arm. Ensure there is a minimum 1'-0" horizonal clearance from traffic signal heads, retroreflective backplates, overhead sign panels, and other obstructions that may impact the field of view. Do not install cameras closer than 2'-0" to the tip end of the mast arm to avoid significant "bouncing" that may negatively impact video streams.

Larger intersections typically require two (2) omni-directional cameras to provide adequate coverage for all approaches. (**Seminole County**)

Best practice includes the installation of an in-line surge protection device to isolate omni-directional camera from the rest of the controller cabinet assembly. (**Volusia County**)



In-cabinet processing unit used to provide connection between omni-directional cameras and controller using SLDC bus connection.

- For signalized intersections with span wire configurations, cameras shall be mounted directly to the span wire support upright or to horizontal structures (e.g., luminaires, internally illuminated sign supports, cantilevered mounting brackets) attached to the upright supports. Provide a vertical riser arm to obtain the mounting height necessary and to clear all occlusion areas (e.g., large trucks in nearby lanes).

- Ensure standard 13" X 24" signalization pull boxes are provided on each intersection corner where camera sensors are proposed to provide a cabling pathway and house cable slack. Pull boxes shall be stamped with "FDOT Traffic Signal" and include only cabling carrying low-voltage signal.
- Ensure underground cabling pathways are provided between camera assemblies and the controller cabinet using conduits dedicated to cabling carrying low-voltage signal.
- Ensure the proposed camera cabling lengths do not exceed the maximum distances provided for the particular type of cable, including horizontal and vertical distances. If longer cabling lengths are required, provide the necessary media conversion (e.g., fiber optics) to achieve the required distance for communication signals.
  - Cat-6 Ethernet cable runs for PoE cameras shall not exceed 328' (100 m) in length (*IEEE 802.at*). It is recommended to maintain PoE cabling distances below 300' to ensure appropriate signal strength while providing for unforeseen cabling runs and slack (e.g., drip loops).

  Verify the proposed cabling length will provide the minimum low-voltage power necessary for the device with consideration for voltage drop over the length. Where necessary, increase the wire gauge.
- Ensure system in-cabinet equipment (e.g., processing unit) provides sufficient discrete detection channels to accommodate all proposed detection zones if the system is being utilized for stop bar detection. Provide connection between the in-cabinet equipment and the SDLC bus within the cabinet assembly for data transfer to the controller. Provide an Ethernet-based connection (e.g., 10/100) between the in-cabinet equipment and the network communication equipment within the cabinet using a Cat-6 patch cable.
- Ensure in-line surge protection equipment is provided in the cabinet for each camera.

For lane-by-lane channel assignment schema, refer to **Section 6.6** for additional information.

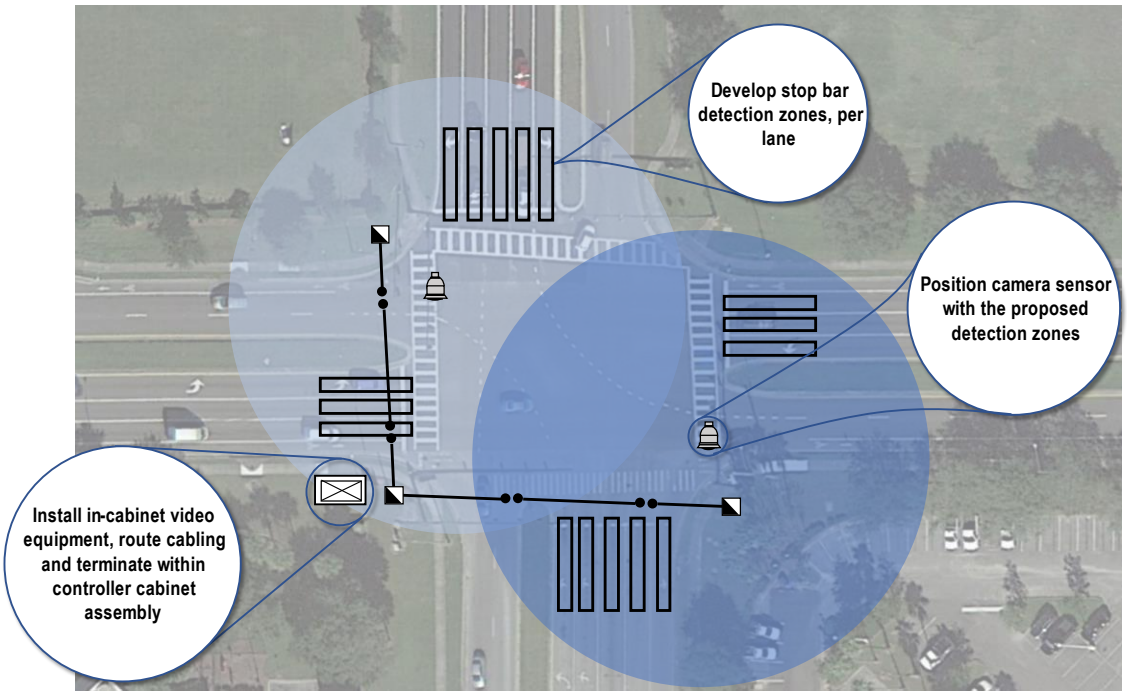


Figure 15: Example deployment of omni-directional cameras for stop bar

Multiple microwave radar sensors installed on mast arm assemblies on the near side of the intersection for stop bar detection. (**Volusia County**)

Span wire intersection with microwave radar sensors installed using mounting assembly attached to the catenary and messenger wires. (**Marion County**)

Multiple microwave radar sensors installed for span wire intersection stop bar detection. (**Lake County**)

It is recommended the Engineer of Record coordinates with the manufacturer of the omni-directional video vehicle detection system to review proposed detection zones, camera installation locations, in-cabinet equipment, and other site-specific considerations for design optimization.

The following pay items shall be utilized in the design and installation of omni-directional video vehicle detection systems for stop bar detection and/or turning movement counts:

- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-11** Pull & Splice Box, Furnish & Install, 13" X 24" Cover Size
- **660-4-11** Vehicle Detection System – Video, Furnish & Install, Cabinet Equipment ***OR***
- **660-9-11** Traffic Detection System – Video, Furnish & Install, Cabinet Equipment
- **660-4-12** Vehicle Detection System – Video, Furnish & Install, Aboveground Equipment ***OR***
- **660-9-12** Traffic Detection System – Video, Furnish & Install, Aboveground Equipment

The following pay items notes shall be included, as necessary:

- **660-4-11 *OR* 660-9-11:** Shall include all work necessary to furnish, install, and configure in-cabinet equipment to provide a completely functional camera system.
- **660-4-12 *OR* 660-9-12:** Shall include all work necessary to furnish and install cameras, mounting arms, brackets, wiring, hardware, and all ancillary components, as well as al data and power cabling required for a complete deployment.

6.1.3 Microwave Vehicle Detection Systems

Provide microwave vehicle detection systems for signalized intersections where requested by the local maintaining agency to provide stop bar detection. The following provides generalized design guidance and considerations for the deployment of microwave radar detection systems:

- Design microwave vehicle detection systems in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232, Section 233,* and *FDOT Standard Specifications for Road and Bridge Construction – 600 Series*, as well as manufacturer installation guidelines and recommendations.
- Provide the appropriate number of radar sensors necessary to adequately establish detection zones for all lanes of an approach. Microwave sensors vary significantly in the parameters for coverage ranges provided for stop bar detection. Refer to manufacturer documentation (e.g., data product sheets, installation guidelines) to determine the exact detection zone—including horizontal spread, vertical angle, minimum distance to object, and maximum detection distance—of each product.
- Ensure sensors are positioned such that the minimum mounting height is provided with clear line of sight and no areas of occlusion. Typical sensor mounting height for stop bar detection is 20' above the pavement. Dependent upon the specific proposed system, sensors may be located on either the near or far side of the intersection from the proposed detection zone(s). Refer to manufacturer documentation for additional information, such as recommended offset of the sensor from the edge of the first lane to be detected.
    - For signalized intersections with mast arm structures, sensors mounting brackets will be rigidly attached to the mast arm. Ensure there is a minimum 1'-0" horizonal clearance from traffic signal heads, retroreflective backplates, overhead sign panels, and other obstructions that may impact the field of view.
    - For signalized intersections with span wire configurations, determine if mounting assemblies that rigidly attached to the catenary and/or messenger wire are available and provide the necessary field of view coverage. Where mounting directly to the span wire structure is unavailable, mount sensors

Example in-cabinet processor with capacity for six (6) unique microwave vehicle detection system sensors with SDLC bus connection. (**Lake County**)

Typical in-cabinet processors for microwave sensors include embedded surge protection devices to eliminate the need for external equipment, verify with each vendor. (**Orange County**)

Two (2) microwave radar sensors installed directly to the concrete strain pole. (**Orange County**)

to horizontal structures (e.g., luminaires, internally illuminated sign supports, cantilevered mounting brackets) attached to the upright supports or directly to the upright support structures.

- Ensure standard 13" X 24" signalization pull boxes are provided on each intersection corner where radar sensors are proposed to provide a cabling pathway and house cable slack. Pull boxes shall be stamped with "FDOT Traffic Signal" and include only cabling carrying low-voltage signal.
- Ensure underground cabling pathways are provided between sensors and the controller cabinet using conduits dedicated to cabling carrying low-voltage signal.
- Ensure the proposed sensor cabling lengths do not exceed the maximum distances provided for the particular type of cable, including horizontal and vertical distances. If longer cabling lengths are required, provide the necessary media conversion (e.g., fiber optics) to achieve the required distance for communication signals.
    - RS-485 serial cable runs for sensors shall not exceed 1400' in length, dependent upon the selected baud rate.

  Verify the proposed cabling length will provide the minimum low-voltage power necessary for the device with consideration for voltage drop over the length. Where necessary, increase the wire gauge.
- Ensure system in-cabinet equipment (e.g., processing unit, detector cards) provides sufficient discrete detection channels to accommodate all proposed detection zones if the system is being utilized for stop bar detection. Provide connection between the in-cabinet equipment and the Synchronous Data Link Communications (SDLC) bus within the cabinet assembly for data transfer to the controller.
- Ensure in-line surge protection equipment is provided in the cabinet for each radar detection device.

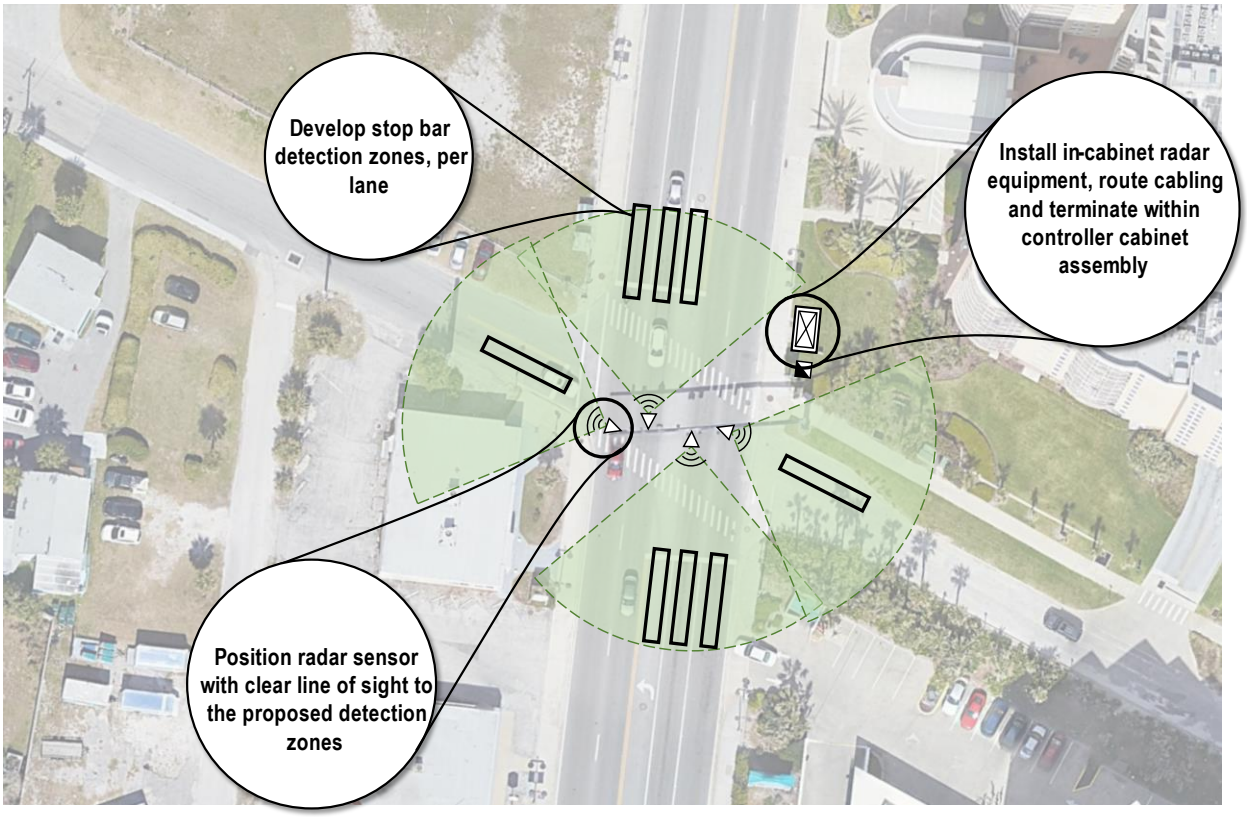
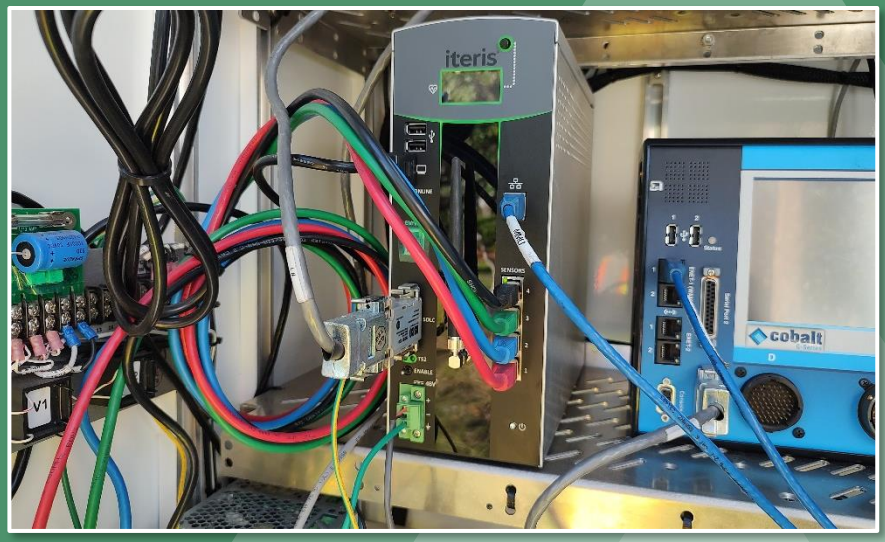


Figure 16: Example microwave radar vehicle detection system for stop bar detection

It is recommended the Engineer of Record coordinates with the manufacturer of the microwave vehicle detection system to review proposed detection zones, sensor installation locations, in-cabinet equipment, and other site-specific considerations for design optimization.

Hybrid video-radar unit installed on cantilevered mounting arm attached to the concrete strain pole at a span wire intersection. (**Lake County**)

Centered over the approach, hybrid video-radar unit installed on mast arm structure. (**Orange County**)



In-cabinet processing unit for hybrid video-radar unit with connection to SDLC bus. (**Osceola County**)

The following pay items shall be utilized in the design and installation of microwave vehicle detection systems for stop bar detection:

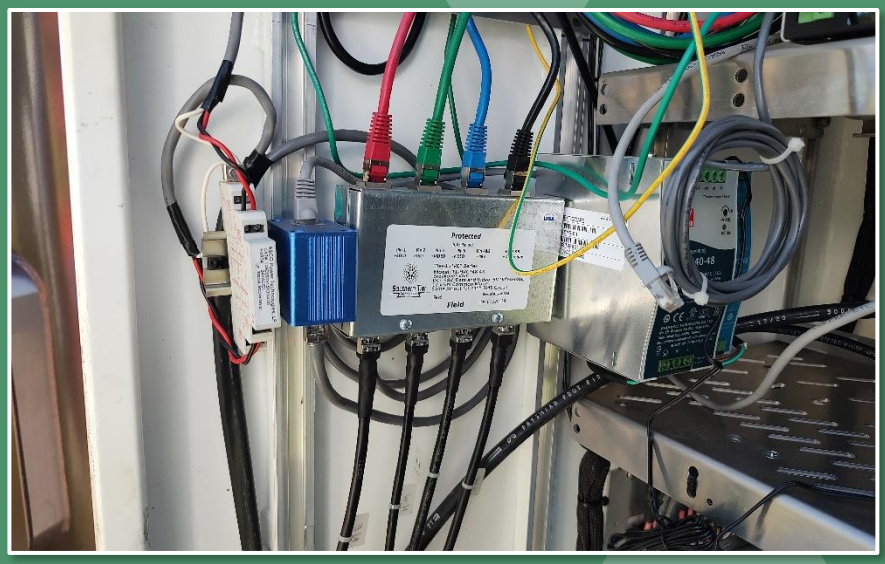
- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-11** Pull & Splice Box, Furnish & Install, 13" X 24" Cover Size
- **660-3-11** Vehicle Detection System – Microwave, Furnish & Install, Cabinet Equipment
- **660-3-12** Vehicle Detection System – Microwave, Furnish & Install, Aboveground Equipment

6.1.4 Hybrid Systems (Video/Radar)

Provide hybrid systems (video/radar) for signalized intersections where requested by the local maintaining agency to provide both stop bar detection and advance detection. The following provides generalized design guidance and considerations for the deployment of hybrid systems (video/radar):

- Design hybrid systems (video/radar) in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232* and *FDOT Standard Specifications for Road and Bridge Construction – 660-3 Series*, as well as manufacturer installation guidelines and recommendations. Ensure coordination with the local agency occurs and appropriate PPCs, MSPs/TSPs, and notes are included with the submittal.
- Ensure hybrid systems (video/radar) are installed ahead of stop bars for all approaches with detection zones and located as close to the center of the intersection as possible.
    - For signalized intersections with mast arm structures, provide vertical riser arms to obtain the mounting height necessary for full field of view coverage. Mounting brackets will be rigidly attached to the mast arm. Ensure there is a minimum 1'-0" horizonal clearance from traffic signal heads, retroreflective backplates, overhead sign panels, and other obstructions that may impact the field of view. Do <u>not</u> install cameras closer than 2'-0" to the tip end of the mast arm to avoid significant "bouncing" that may negatively impact video streams.
    - For signalized intersections with span wire configurations, cameras shall be mounted directly to the span wire support upright or to horizontal structures (e.g., luminaires, internally illuminated sign supports, cantilevered mounting brackets) attached to the upright supports. Provide a vertical riser arm to obtain the mounting height necessary and to clear all occlusion areas (e.g., large trucks in nearby lanes).
- Ensure standard 13" X 24" signalization pull boxes are provided on each intersection corner where hybrid sensors are proposed to provide a cabling pathway and house cable slack. Pull boxes shall be stamped with "FDOT Traffic Signal" and include only cabling carrying low-voltage signal.
- Ensure underground cabling pathways are provided between the hybrid sensor assemblies and the controller cabinet using conduits dedicated to cabling carrying low-voltage signal.
- Ensure the proposed camera cabling lengths do <u>not</u> exceed the maximum distances provided for the particular type of cable, including horizontal and vertical distances. If longer cabling lengths are required, provide the necessary media conversion (e.g., fiber optics) to achieve the required distance for communication signals.
    - Cat-6 Ethernet cable runs for PoE cameras shall <u>not</u> exceed 328' (100 m) in length (*IEEE 802.at*). It is recommended to maintain PoE cabling distances below 300' to ensure appropriate signal strength while providing for unforeseen cabling runs and slack (e.g., drip loops).
- Verify the proposed cabling length will provide the minimum low-voltage power necessary for the device with consideration for voltage drop over the length. Where necessary, increase the wire gauge.

Hybrid radar-video unit installed on mast arm on the far-side of signalized intersection approach. (**Osceola County**)



In-cabinet equipment array for hybrid radar-video unit inclusive of in-line surge protection devices and power distribution. (**Osceola County**).

Hybrid video-radar sensors provide the ability to capture both stop bar and advanced detection zones for a single approach simultaneously. (**City of Orlando**)

- Ensure system in-cabinet equipment (e.g., processing unit) provides sufficient discrete detection channels to accommodate all proposed detection zones if the system is being utilized for stop bar detection. Provide connection between the in-cabinet equipment and the SDLC bus within the cabinet assembly for data transfer to the controller. Provide an Ethernet-based connection (e.g., 10/100) between the in-cabinet equipment and the network communication equipment within the cabinet using a CAT-6 and RJ-45 cable.
- Ensure in-line surge protection equipment is provided in the cabinet for each hybrid system device.

It is recommended the Engineer of Record coordinates with the manufacturer of the microwave vehicle detection system to review proposed detection zones, sensor installation locations, in-cabinet equipment, and other site-specific considerations for design optimization. The following pay items shall be utilized in the design and installation of hybrid systems (Video/Radar) for stop bar and advanced detection:

- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-11** Pull & Splice Box, Furnish & Install, 13" X 24" Cover Size
- **660-4-11** Vehicle Detection System – Video, Furnish & Install, Cabinet Equipment ***OR***
- **660-9-11** Traffic Detection System – Video, Furnish & Install, Cabinet Equipment
- **660-4-12** Vehicle Detection System – Video, Furnish & Install, Aboveground Equipment ***OR***
- **660-9-12** Traffic Detection System – Video, Furnish & Install, Aboveground Equipment

6.2 Advanced Detection

In addition to stop bar detection, *Smart Signal* implementations will include advanced detection zones for all lanes and all approaches of a signalized intersection. Advanced detection zones will be utilized to provide real-time, lane-by-lane data to the various systems for each approach lane. Providing a minimum of two (2) points of detection in each lane (e.g., one stop bar, one advanced) enables enhanced performance metrics for the monitoring and management of current and historical traffic conditions. Beyond providing just data, advanced detection zones may be utilized in the operations of an intersection based on the preferences of the local maintaining agency and the specific needs of a location. In total, there are three (3) categories of advanced detection zones to be provided within *Smart Signal* intersections, each with specific functionality and applications: extended call, queue discharge, and data only.

Note that as a general practice, advanced detection zones can be waived on approaches originating from private business entrance and exits, such as plazas (i.e., Publix) or apartments, where vehicle storage bay lengths are generally small.

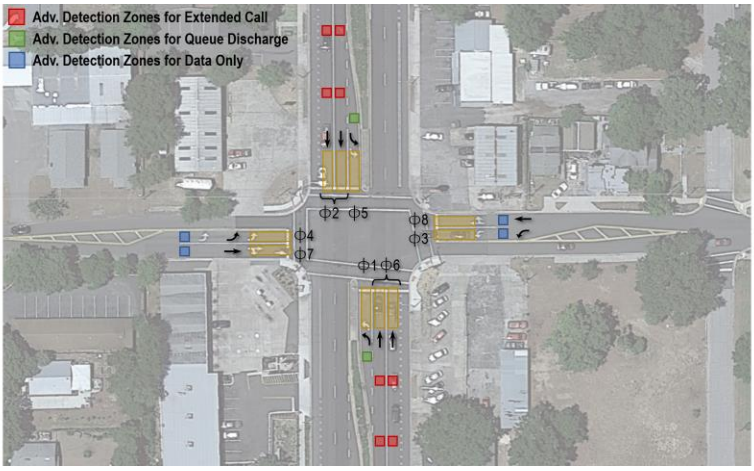


Figure 17: Example intersection with various functionality for advanced detection zones

Extended Call

Extended call utilizes advanced detection zones to generate calls to the controller requesting additional time for the existing green phase. While typically employed for through movements on major roadways, extended call may be implemented for turning movements and through movements on minor streets, where appropriate. This function provides safe phase termination of high-speed intersection approaches to avoid dangerous scenarios for either hard braking or rapid acceleration during the yellow change interval, known as the dilemma zone. Within the cabinet assembly, each advanced detection zone utilized for time extension will be configured for "pulse" operations and programmed to the associated phase in the controller as extension.

Extension calls can be achieved by either single point or multi-point advance detection zones, based on the preferences of the local maintaining agency or the unique needs of the intersection. The objective for time extension is to ensure vehicles approaching the intersection are provided enough time to either reach the next detector or intersection limits safely. The quantity, location, and spacing of advanced detection zones is proportional to the approach speed and may vary dependent upon the preferences of the Local maintaining agency. In the event there are no local preferences, the following guidance shall be utilized for extended time detection placement.

Table 3: Through Lane Dilemma Zone Detection Chart

Posted Speed (MPH)	Distance from Stop Bar to First Zone (D_1)	Distance from Stop Bar to Second Zone (D_2)	Extension (T_1) (seconds) Typical
40	138'	244'	1.9 s
45	166'	298'	2.0 s
50	196'	356'	2.2 s
55	230'	419'	2.4 s
60	265'	488'	2.6 s
65	303'	561'	2.8 s

Refer to the *FHWA Traffic Detector Handbook* for additional design guidance related to the deployment of extended call advanced detection zones.

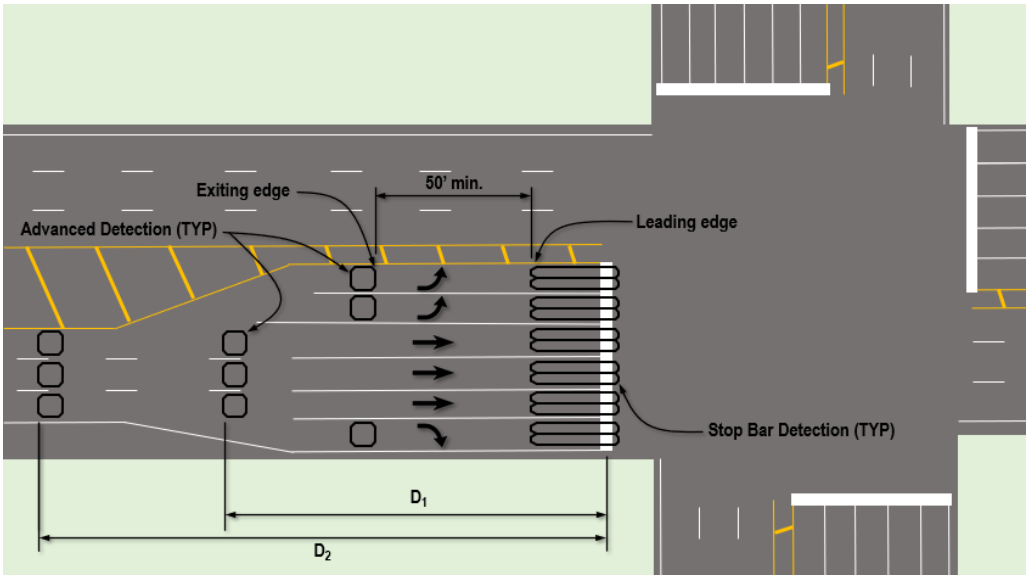


Figure 18: Example loop assemblies in-lane placements and spacing

Turn Lanes Advanced Detection

When placing advanced detection devices for turn lanes, avoid positioning them in the taper area, as this section can cause inaccuracies due to varying vehicle positions and speeds as vehicles enter the turn lane. Instead, place detectors beyond the end of the long storage area to accurately capture vehicles waiting to turn, rather than those still maneuvering into position. Ideally, detectors should be located closer to the end of the turn lane, but not at the very end where vehicles might queue beyond the detector's range

Minor Streets Advanced Detection

For minor streets, advanced detection devices should be placed approximately 50 to 150 feet before the intersection to effectively capture approaching vehicles and allow timely signal adjustments. Detectors should be positioned about 10 to 20 feet before the stop line to avoid errors from vehicles stopping too close. In addition, if turn lanes are present, install detectors within these lanes.

Queue Discharge

Advanced detection may be utilized to provide queue discharge functionality where signalized intersections experience significant queues resulting in spillback volume from one lane to another. Typically located at the end of left or right turn lane storage bays, advance detection zones for queue discharge will be configured as "presence" operation and generate priority detection calls to the controller. The low-priority detection call will initiate the controller transition to the appropriate phase necessary to clear the developed queue.

The application of queue discharge detection shall be implemented at signalized intersections where a history of significant queues exists. Coordinate with the Local maintaining agency to determine appropriate locations for queue discharge.

Data Only

Advanced detection zones are required for all approach lanes within the signalized intersection. Where advanced detection zones are not necessary to modify the operation of the signalized intersection, zones will be programmed into the controller as "pulse" operation and serve only to provide input to the high-resolution data logger.

Unlike extended call or queue discharge applications, data only advanced detection zones are not tied to approach speed, specific locations within the intersection, or minimum spacing requirements. Each zone is required to be installed behind the established stop bar detection zone for that particular lane and provided the minimum spacing necessary to differentiate the two zones.

6.2.1 Inductive Loop

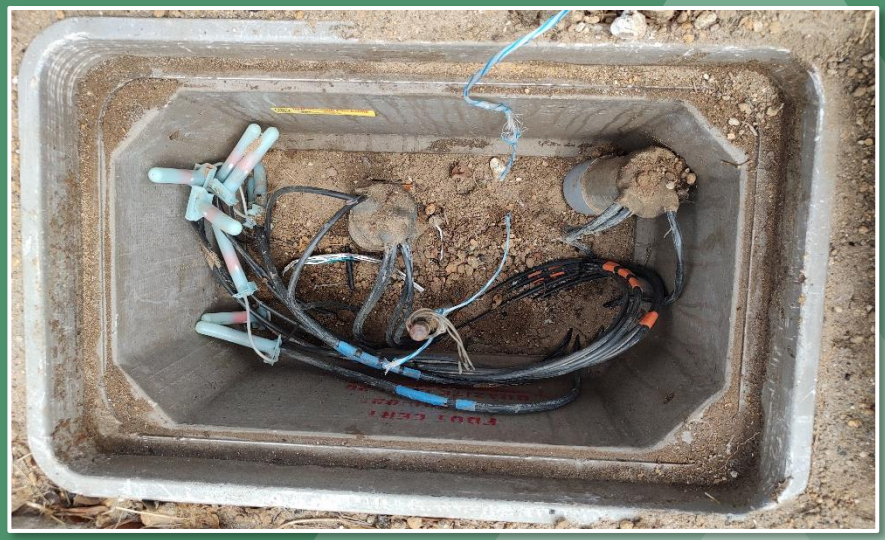
Provide inductive loop vehicle detection systems for signalized intersections where requested by the local maintaining agency to provide advanced detection. The following provides generalized design guidance and considerations for the deployment of inductive loops:

- Design inductive loop systems in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232*, *FDOT Standard Plans for Road and Bridge Construction – Index 660-001*, *FDOT Standard Specifications for Road and Bridge Construction – 600 Series*, and *FHWA Traffic Detector Handbook*.
- Provide 6'-0" X 6'-0" Type "B" loop assemblies for advanced detection in each lane at locations identified for each application below:
    - Extended Call – Coordinate with the local maintaining agency to identify preferences for advanced detection, including single point versus multi-point detection, specific lane placement, and spacing of loop assemblies based on approach speed.

    - Queue Discharge – Install one (1) loop assembly in each lane experiencing significant queues causing spillback into adjacent lanes. Position each loop assembly at the beginning of the storage bay or at the point where queued vehicles impede other lanes. Ensure the entire loop is positioned within the specified lane and will not receive false calls from vehicles entering into other lanes.
    - Data Only – Loops providing only high-resolution data to the controller are not tied to the operation of the intersection and therefore are more flexible in the available placement locations within lanes. Install one (1) loop assembly in each lane of the approach. Ensure a minimum of 50' edge-to-edge spacing is provided between the leading edge of the stop bar loop and the exiting edge of the advanced detection loop. For minor street approaches for small roadways where providing the minimum spacing is not possible, provide a minimum of 25' edge-to-edge spacing between stop bar and advanced detection loops
- Ensure standard 13" X 24" signalization pull boxes are provided adjacent to each set of advanced detection loop assemblies to facilitate splicing between loop lead-in wires and homerun cabling. Pull boxes shall be stamped with "FDOT Traffic Signal" and include only cabling carrying low-voltage signal. Each loop lead-in shall be uniquely spliced to a homerun cabling; do not splice multiple loops to a single homerun cable.
- Ensure underground cabling pathways are provided between loop assemblies and the controller cabinet using conduits dedicated to cabling carrying low-voltage signal.
- Ensure each homerun cable is connected to the termination block of a unique channel within the cabinet assembly detector panel. Homerun cables shall not be terminated to the same channel.
- Ensure the controller cabinet assembly includes sufficient channels to provide a unique channel for each detection zone, including detector racks, BIU, and Synchronous Data Link Communications (SDLC) bus interfaces. Provide enough solid-state, rack mounted detector cards to ensure unique channels for all detection zones.

Type B inductive loops provided for advanced detection in the left turn and through movement lanes. (**Marion County**)

Loop lead-in wires for advanced detection cut in asphalt pavement surface to homerun pull box. (**Marion County**)



Electrical splices for loop lead-in wire and homerun cabling installed in pull box each spliced to an individual circuit. (**City of Orlando**)

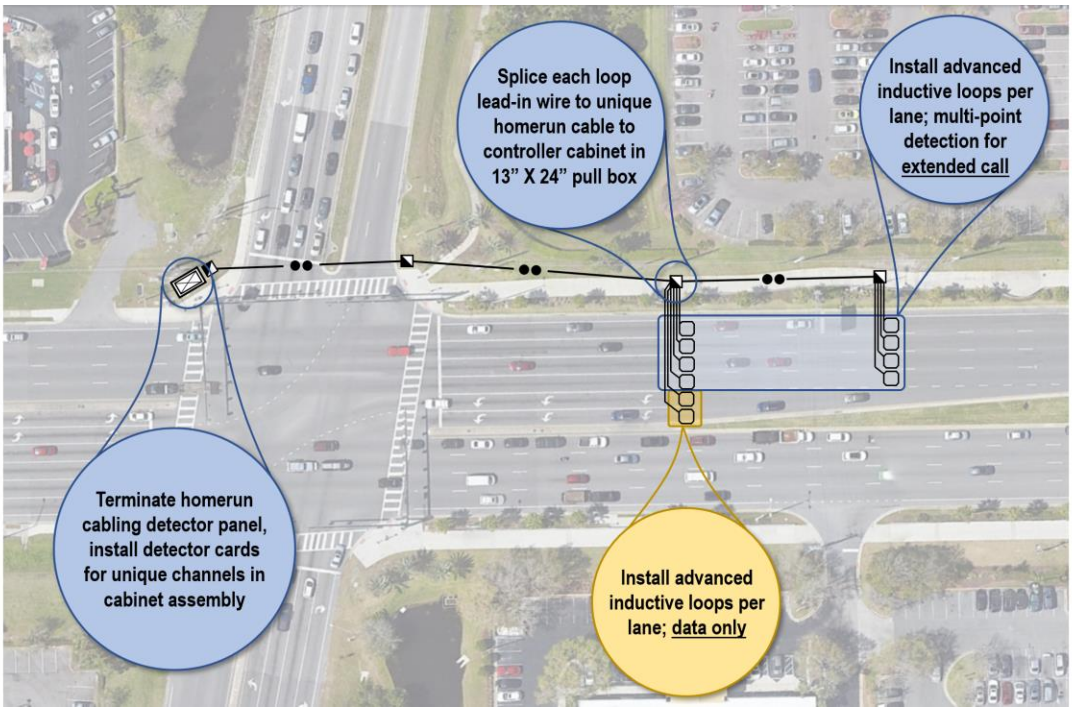


Figure 19: Example deployment of inductive loops for advance detection extended time and data only functions

The following pay items shall be utilized in the design and installation of inductive loop systems for advanced detection:

- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-11** Pull & Splice Box, Furnish & Install, 13" X 24" Cover Size
- **660-1-1BB** Loop Detector Inductor, Furnish & Install, (Type)
- **660-2-102** Loop Assembly, Furnish & Install, Type B

6.2.2 Video Vehicle Detection Systems

Provide video vehicle detection systems for signalized intersections where requested by the local maintaining agency to provide advanced detection. The following provides generalized design guidance and considerations for the deployment of standard (e.g., fixed lens) video detection systems. Note, video vehicle detection systems may provide limited maximum viewing distances not suitable for some advanced detection applications requiring zones further from the intersection (e.g., multi-point detection for extended call). Ensure the proposed video detection system can provide the necessary detection zones without requiring additional infrastructure (e.g., supplement poles).

- Design video vehicle detection systems in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232* and *FDOT Standard Specifications for Road and Bridge Construction – 600 Series*, as well as manufacturer installation guidelines and recommendations.
- Provide the appropriate number of camera sensors necessary to adequately establish detection zones for all lanes of an approach for advanced detection. Generally, the HFOV for cameras is limited to a maximum lateral coverage of four (4) lanes within an approach. Signalized intersections with more than four (4) lanes to an approach shall include additional cameras necessary to provide all detection zones with one camera dedicated for left turn lanes and the other for through and right turn movement lanes.

Vertical riser mounting arm installed to provide greater elevation of video detection camera above the roadway surface for advanced detection zones. (**City of Orlando**)

Video detection camera mounted on luminaire support arm for increased elevation above the road surface in a span wire intersection. (**City of Orlando**)

LCD color monitor installed in controller cabinet assembly displaying active vehicle calls for advanced detection zones. (**Orange County**)

- Ensure cameras are positioned in the center of the proposed detection zones for an approach, where feasible. If the camera cannot be centered over the proposed detection zones, verify the field of view will not experience visual occlusions.
    - For signalized intersections with mast arm structures, provide vertical riser arms to obtain the mounting height necessary for full field of view coverage. Mounting brackets will be rigidly attached to the mast arm. Ensure there is a minimum 1'-0" horizonal clearance from traffic signal heads, retroreflective backplates, overhead sign panels, and other obstructions that may impact the field of view. Do not install cameras closer than 2'-0" to the tip end of the mast arm to avoid significant "bouncing" that may negatively impact video streams.
    - For signalized intersections with span wire configurations, determine if mounting assemblies that rigidly attached to the catenary and/or messenger wire are available and provide the necessary field of view coverage. Where mounting directly to the span wire structure is unavailable, mounting cameras to horizontal structures (e.g., luminaires, internally illuminated sign supports, cantilevered mounting brackets) attached to the upright supports may be acceptable. Provide a vertical riser arm to obtain the mounting height necessary and to clear all occlusion areas (e.g., large trucks in nearby lanes).
- Ensure cameras are installed providing a field of view of providing adequate coverage for each lane to develop advanced detection zones. The VFOV is directly proportional to the mounting height of camera sensors above the roadway. Generally, each foot above the road surface the camera is mounted provides ten feet of roadway viewing coverage.
- Ensure standard 13" X 24" signalization pull boxes are provided on each intersection corner where camera sensors are proposed to provide a cabling pathway and house cable slack. Pull boxes shall be stamped with "FDOT Traffic Signal" and include only cabling carrying low-voltage signal.
- Ensure underground cabling pathways are provided between camera assemblies and the controller cabinet using conduits dedicated to cabling carrying low-voltage signal.
- Ensure the proposed camera cabling lengths do not exceed the maximum distances provided for the particular type of cable, including horizontal and vertical distances. If longer cabling lengths are required, provide the necessary media conversion (e.g., fiber optics) to achieve the required distance for communication signals.
    - Cat-6 Ethernet cable runs for Power-over-Ethernet (PoE) cameras shall not exceed 328' (100 m) in length (*IEEE 802.at*)
    - RG-59/U coaxial cabling runs for digital cameras shall not exceed 750' in length

  Verify the proposed cabling length will provide the minimum low-voltage power necessary for the device with consideration for voltage drop over the length. Where necessary, increase the wire gauge as needed.
- Ensure system in-cabinet equipment (e.g., video cards, processing unit) provides sufficient discrete detection channels to accommodate all proposed detection zones. Provide connection between the in-cabinet equipment and the Synchronous Data Link Communications (SDLC) bus within the cabinet assembly for data transfer to the controller.

It is recommended the Engineer of Record coordinates with the manufacturer of the video vehicle detection system to review proposed detection zones, sensor installation locations, in-cabinet equipment, and other site-specific considerations for design optimization.

The following pay items shall be utilized in the design and installation of video vehicle detection systems for stop bar detection:

- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-11** Pull & Splice Box, Furnish & Install, 13" X 24" Cover Size
- **660-4-11** Vehicle Detection System – Video, Furnish & Install, Cabinet Equipment
- **660-4-12** Vehicle Detection System – Video, Furnish & Install, Aboveground Equipment

6.2.3 Microwave Vehicle Detection Systems

Provide microwave vehicle detection systems for signalized intersections where requested by the Local maintaining agency to provide advanced detection. The following provides generalized design guidance and considerations for the deployment of microwave radar detection systems:

- Design microwave vehicle detection systems in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232, Section 233,* and *FDOT Standard Specifications for Road and Bridge Construction – 600 Series*, as well as manufacturer installation guidelines and recommendations.
- Provide the appropriate number of radar sensors necessary to adequately establish detection zones for all lanes of an approach. Microwave sensors vary significantly in the parameters for coverage ranges provided for advanced detection. Refer to manufacturer documentation (e.g., data product sheets, installation guidelines) to determine the exact detection zone—including horizontal spread, vertical angle, minimum distance to object, and maximum detection distance—of each product.
- Ensure sensors are positioned such that the minimum mounting height is provided with clear line of sight and no areas of occlusion. Dependent upon the specific proposed system, sensors may be located on either the near or far side of the intersection from the proposed detection zone(s). Refer to manufacturer documentation for additional information.
    - For signalized intersections with mast arm structures, sensors mounting brackets will be rigidly attached to the mast arm. Ensure there is a minimum 1'-0" horizonal clearance from traffic signal heads, retroreflective backplates, overhead sign panels, and other obstructions that may impact the field of view.
    - For signalized intersections with span wire configurations, determine if mounting assemblies that rigidly attached to the catenary and/or messenger wire are available and provide the necessary field of view coverage. Where mounting directly to the span wire structure is unavailable, mount sensors to horizontal structures (e.g., luminaires, internally illuminated sign supports, cantilevered mounting brackets) attached to the upright supports or directly to the upright support structures.
- Ensure standard 13" X 24" signalization pull boxes are provided on each intersection corner where radar sensors are proposed to provide a cabling pathway and house cable slack. Pull boxes shall be stamped with "FDOT Traffic Signal" and include only cabling carrying low-voltage signal.
- Ensure underground cabling pathways are provided between sensors and the controller cabinet using conduits dedicated to cabling carrying low-voltage signal.
- Ensure the proposed sensor cabling lengths do not exceed the maximum distances provided for the particular type of cable, including horizontal and vertical distances. If longer cabling lengths are required, provide the necessary media conversion (e.g., fiber optics) to achieve the required distance for communication signals.
    - RS-485 serial cable runs for sensors shall not exceed 1400' in length, dependent upon the selected baud rate.
    - Category 6 (Cat-6) Ethernet cable runs for Power-over-Ethernet (PoE) cameras shall not exceed 328' (100 m) in length (*IEEE 802.at*). It is recommended to maintain PoE cabling distances below

300’ to ensure appropriate signal strength while providing for unforeseen cabling runs and slack (e.g., drip loops).

Verify the proposed cabling length will provide the minimum low-voltage power necessary for the device with consideration for voltage drop over the length. Where necessary, increase the wire gauge as needed.

- Ensure system in-cabinet equipment (e.g., processing unit, detector cards) provides sufficient discrete detection channels to accommodate all proposed detection zones if the system is being utilized for stop bar detection. Provide connection between the in-cabinet equipment and the Synchronous Data Link Communications (SDLC) bus within the cabinet assembly for data transfer to the controller.

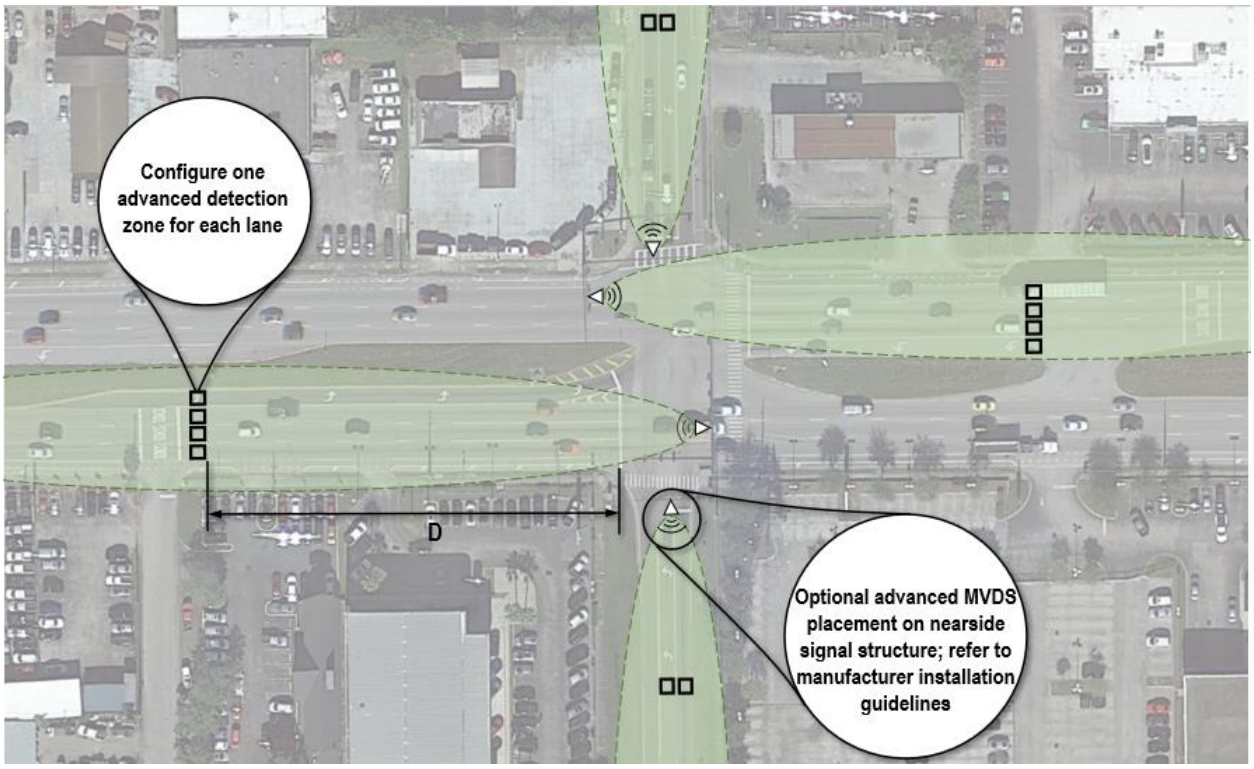


Figure 20: Example microwave radar vehicle detection system for advanced detection zones

It is recommended the Engineer of Record coordinates with the manufacturer of the microwave vehicle detection system to review proposed detection zones, sensor installation locations, in-cabinet equipment, and other site-specific considerations for design optimization.

The following pay items shall be utilized in the design and installation of microwave vehicle detection systems for advanced detection:

- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-11** Pull & Splice Box, Furnish & Install, 13” X 24” Cover Size
- **660-3-11** Vehicle Detection System – Microwave, Furnish & Install, Cabinet Equipment
- **660-3-12** Vehicle Detection System – Microwave, Furnish & Install, Aboveground Equipment

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6.3 Network Communications

Each signalized intersection shall provide means for communication between the signalization equipment in the field and the appropriate network, whether the local maintaining agency or Department. Multiple technologies can be used to establish network communications—including fiber optic cabling, point-to-point wireless radios, and cellular modems—each providing a unique set of benefits and limitations.

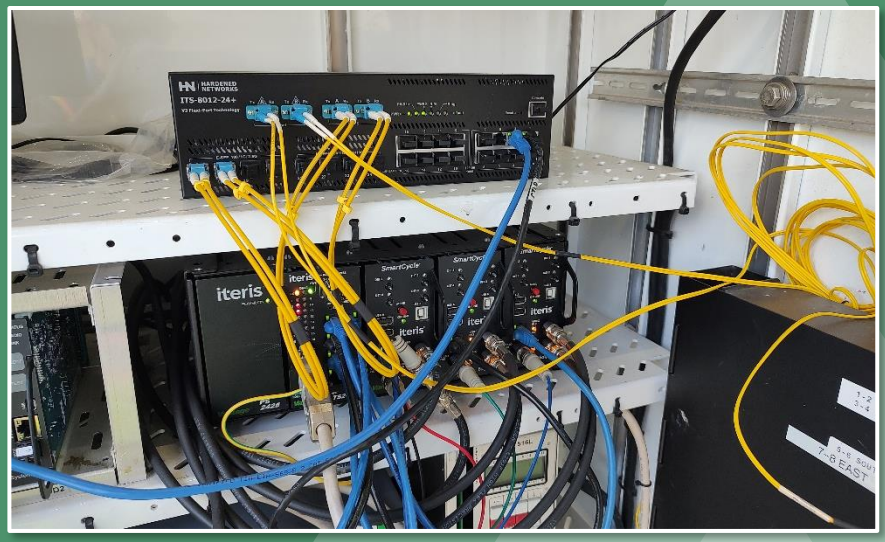
Table 4: Pros and Cons for Available Network Communication Technologies

Fiber Optics	
Pros	*Cons*
• Low cost for maintenance; no recurring licensing or monthly subscription costs • High reliability and quality of connection • Greater bandwidth and capacity for network traffic • Capable of long-distance connections • Enhanced security • Resistant to interference, noise • Scalable to handle future growth	• Higher capital costs for initial installation • Higher likelihood for physical damage (e.g., unintended cable breaks) • Requires skilled technicians for fiber optic connection installation (e.g., splicing, terminations)
Point-to-Point Wireless Radios	
Pros	*Cons*
• Low costs for initial deployment, less infrastructure • Average cost for maintenance; no recurring licensing or monthly subscription costs • Requires limited to no underground infrastructure, less susceptible to unforeseen damage • Flexible network architecture options (e.g., P2P, P2MP; licensed vs. unlicensed) • Ability to traverse long distances, difficult terrain (e.g., bodies of water)	• Limited reliability, variable quality of connection • Limited bandwidth and capacity for network traffic • Higher security risk • Susceptible to environmental degradation (e.g., interference, noise) • Requires clear line of sight between radios (e.g., vegetation, tall structures) • Requires skill technicians for configuration, troubleshooting, and maintenance
Cellular Modem	
Pros	*Cons*
• Low costs for initial deployment, less infrastructure • Low costs for maintenance activities • Requires no underground infrastructure, less susceptible to unforeseen damage • No specialized skillset necessary for maintenance	• Requires monthly subscription cost • Quality of connection, reliability based on third-party cellular provider's network strength • Limited bandwidth and capacity for network traffic • Higher security risk

The EOR shall be responsible for determining the appropriate means of communication for each signalized intersection based on coordination with the Department, local maintaining agency preferences, existing conditions, and pertinent project constraints.

Each model of managed field Ethernet switch (MFES) includes a variety of ports for fiber optic medium (e.g., SFP) and copper (e.g., RJ-45). (**Seminole County**)

Managed field Ethernet switch and power supply installed on DIN rail rigidly affixed to the front of a shelf within the controller cabinet assembly. (**Osceola County**)



Managed field Ethernet switch with optical bypass capabilities provides redundancy in the case of power outage requiring additional fiber optic jumper connections. (**Lake County**)

The EOR shall be responsible for determining the appropriate means of communication for each signalized intersection based on coordination with the Department, local maintaining agency preferences, existing conditions, and pertinent project constraints.

Each signalized intersection shall be provided with a MFES installed within the traffic signal controller cabinet regardless of the selected communication means. The EOR shall coordinate with the local maintaining agency to identify the specific technical requirements of the switch or if there are any existing proprietary product requirements of the local maintaining agency for synchronization with the existing deployments. Ensure each switch provides the minimum number of 10/100 copper Ethernet ports (RJ-45) and 100/1000 small-form pluggable (SFP) fiber optic ports necessary to accommodate the field devices and network connections proposed with a minimum of two (2) spare copper ports (RJ-45) for future use. The EOR shall coordinate with the local maintaining agency to identify if any specific port schema exists (e.g., Port No. 1 remains open for maintenance).

The following pay items shall be utilized in the design and installation of managed field Ethernet switches:

- **684-1-1** Managed Field Ethernet Switch, Furnish & Install

Based on the specific needs of the project, the EOR may be required to include pay item notes with specifics information related to the MFES per local maintaining agency preferences.

Two-section lid fiber optic splice vault (30” X 60”) with concrete apron. (**Marion County**)

Warning label for fiber optic cable within the vicinity adhered to the outside of the controller cabinet assembly. (**Lake County**)

Fiber optic patch panel installed in controller cabinet assembly with two (2) fully terminated twelve-count connector panels. (**City of Orlando**)

6.3.1 Fiber Optics

Where applicable, provide fiber optic cabling and associated hardware at and in between signalized intersections to provide network communications between the field equipment and the appropriate central network. The following provides generalized design guidance and considerations for the deployment of fiber optic communications:

- Design fiber optic cabling in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 233* and *FDOT Standard Specifications for Road and Bridge Construction – 633 Series*, as well as manufacturer installation guidelines and recommendations.
- The EOR is responsible for performing link loss calculations to ensure the proposed design does not exceed the allowable maximum loss. Minimize splice connections and termination, when feasible.

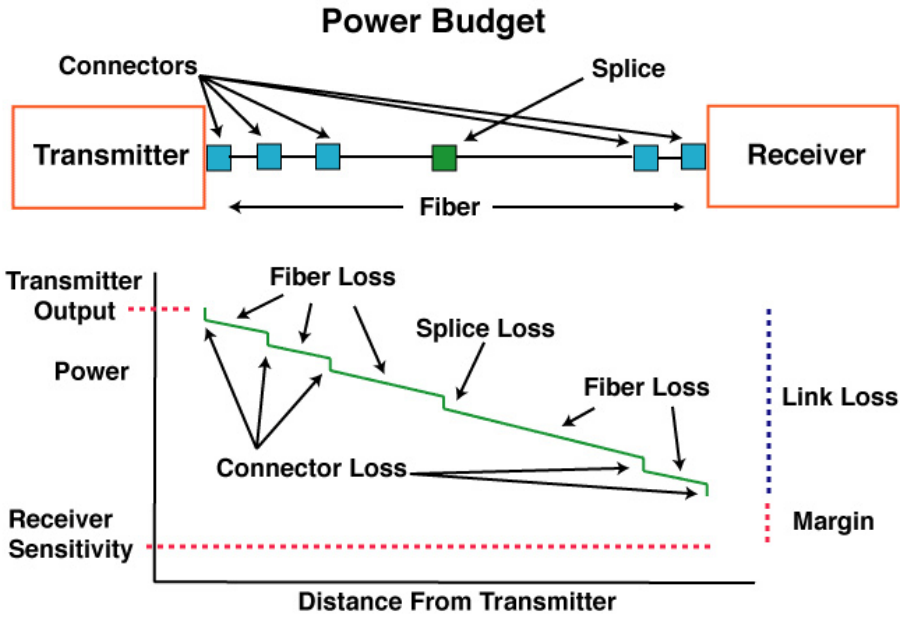


Figure 21: Fiber optic link power budget

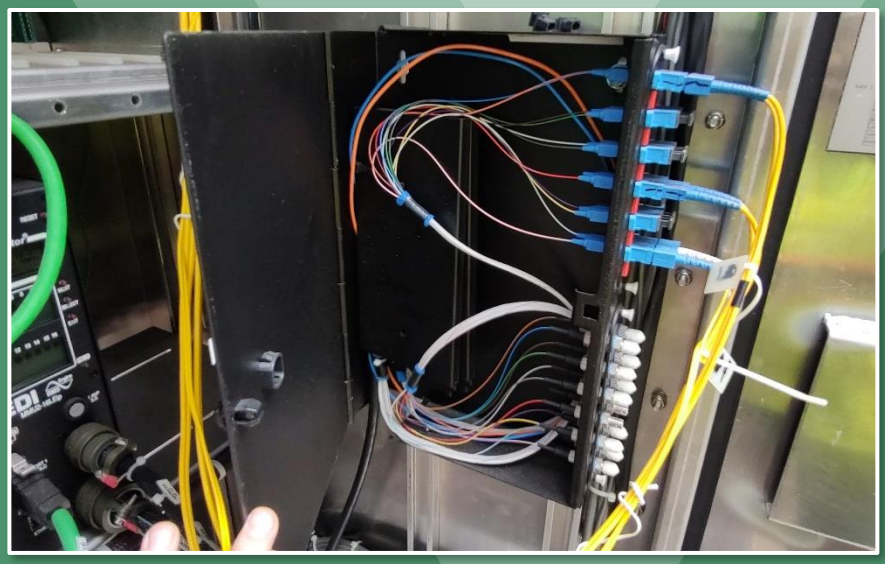
- Provide fiber optic cabling with dedicated infrastructure—including underground conduit, vertical risers, sweeps, pull boxes, junction boxes, and splice vaults. Do not collocate fiber optic cables with any wiring or cables carrying low or high voltage.
- Provide 12-count (minimum) fiber optic drop cables for connection between the backbone and traffic signal controller cabinet at each signalized intersection. Provide a 48-count (minimum) fiber optic drop cable to all communication hubs. Provide a 96-count (minimum) fiber optic cable for all backbone communications, unless otherwise directed. The EOR is responsible for coordination with the local maintaining agency to identify specific preferences on fiber optic cabling counts.
- Ensure conduit runs for fiber optic cabling are straight or provided with sweeping arcs, where appropriate. Conduit runs shall ensure cabling does not exceed the minimum bending radius parameters as defined by *ANSI/TIA/EIA-568 B.3*. The standard states, "[…] cable must support a bend radius of ten (10) times its diameter under no load (on the reel), and twenty (20) times the outside diameter when subject to the cable's rated load limit."

Typical round fiber optic splice vault (36” diameter) installed at the base of the controller cabinet assembly. (**City of Orlando**)

Interior of round fiber optic splice vault with conduit sweeps, cabling slack, and underground splice enclosure. (**Orange County**)

Example aerial fiber optic line with snowshoe cable storage fixture and overhead splice enclosure. (**City of Orlando**)

- Provide fiber optic splice enclosures wherever fusion splice connections are proposed to protect against exposure from the surrounding environment. Ensure splice enclosures provide cable ports necessary to accommodate a minimum of four (4) fiber optic cables simultaneously.
- Within fiber optic splice enclosures, provide one (1) splice tray for each buffer tube within the backbone cable where fibers are to be spliced. *For example, if the 96-count fiber optic backbone is spliced to four (4) fibers of a drop cable, provide a total of one (1) splice tray; if the 144-count fiber optic backbone is butt-spliced to a separate 144-count fiber optic backbone, provide a total of twelve (12) splice trays*.
- For underground fiber optic cabling installations, ensure the following:
    - Provide a minimum of two (2) two-inch conduit sweeps for fiber optic communications within the traffic signal controller cabinet foundation.
    - Provide a minimum of two (2) two-inch conduits for all fiber optic cabling runs—one for fiber and one for tone wire (future).
    - Provide fiber optic pull boxes (24" X 36") at the base of each traffic signal controller cabinet unless a fiber optic splice vault is located on the same corner within 100' of the cabinet.
    - Provide fiber optic splice vaults (30" X 60" or 36" round) at all signalized intersections with fiber optic communications.
    - Provide underground splice enclosures installed within splice vaults attached to the interior wall.
- For aerial fiber optic cabling installations, ensure the following:
    - Coordinate with utility agency owners (UAO) to identify potential shared-use poles and attachment heights for aerial fiber optic cabling. The EOR is responsible for obtaining all necessary attachment permits from the UAO.
    - Provide vertical risers attached to shared-use utility pole for fiber optic cabling transitions from underground to aerial attachments. Ensure underground-to-aboveground conduit transitions are installed a minimum of 6" below grade.
    - Provide aerial fiber optic cables with messenger wires for all overhead spans between poles for structural support. Messenger wire shall be removed for all cabling segments installed underground.
    - Provide overhead cable storage brackets—or "snowshoes"—with associated mounting hardware where cabling slack is necessary. Install "snowshoes" spaced every ¼ mile (1,320') to ½ mile (2,640') with 200' of cabling slack.
    - Provide aerial fiber optic splice enclosures affixed to overhead messenger wires with mounting hardware and stainless-steel banding. Install splice enclosures where fiber optical cables transition from aboveground to underground (e.g., fiber optic drops).
- Provide fiber optic connection hardware within the traffic signal controller cabinets to facilitate network communications. In-cabinet equipment necessary for a complete installation includes:
    - Fiber optic patch panel.
    - Fiber optic connector panel – minimum one (1) connector panel for each buffer tube terminated.
    - Fiber optic buffer fan-out kit – minimum one (1) kit for each buffer tube terminated.
    - Fiber optic jumper cables, duplex or singlex – provide a minimum number of jumpers between the patch panel and switch for each active and redundant circuit within a signalized intersection.
- Provide a field-terminated patch panel in lieu of a pre-terminated patch panel when flexibility and on-site customization is needed, especially for varying complex setups during installation.
- Terminate the fiber optic drop cable fully within the traffic signal controller cabinet providing termination connections within the patch panel for each fiber. Ensure the patch panel and connector panels are sized to accommodate terminations for the entire drop cable.
- Provide specialized fiber optic connections to enable optical bypass where requested by the Local maintaining agency. Optical bypass switches shall be provided specific circuits for redundant pathways.
- The EOR is responsible for coordination with the local maintaining agency to determine the specific needs and design considerations of the fiber optic communication system, including:
    - Fiber optic circuitry (e.g., active circuits, redundant circuits, spare)



Interior of fiber optic patch panel installed to the controller cabinet wall with 24-count fiber optic drop terminated into connector panels. (**Orange County**)

Shelf-mounted fiber optic patch panel with twelve-count connector panel. (**City of Orlando**)

Connections between the fiber optic patch panel and the managed field Ethernet switch is developed using fiber optic jumpers; yellow for single-mode, orange for multi-mode. (**Lake County**)

- Unidirectional or bi-directional data transfer
- Network architecture (e.g., bus, ring)
- Splicing schema (e.g., buffer tube, fiber pairing)

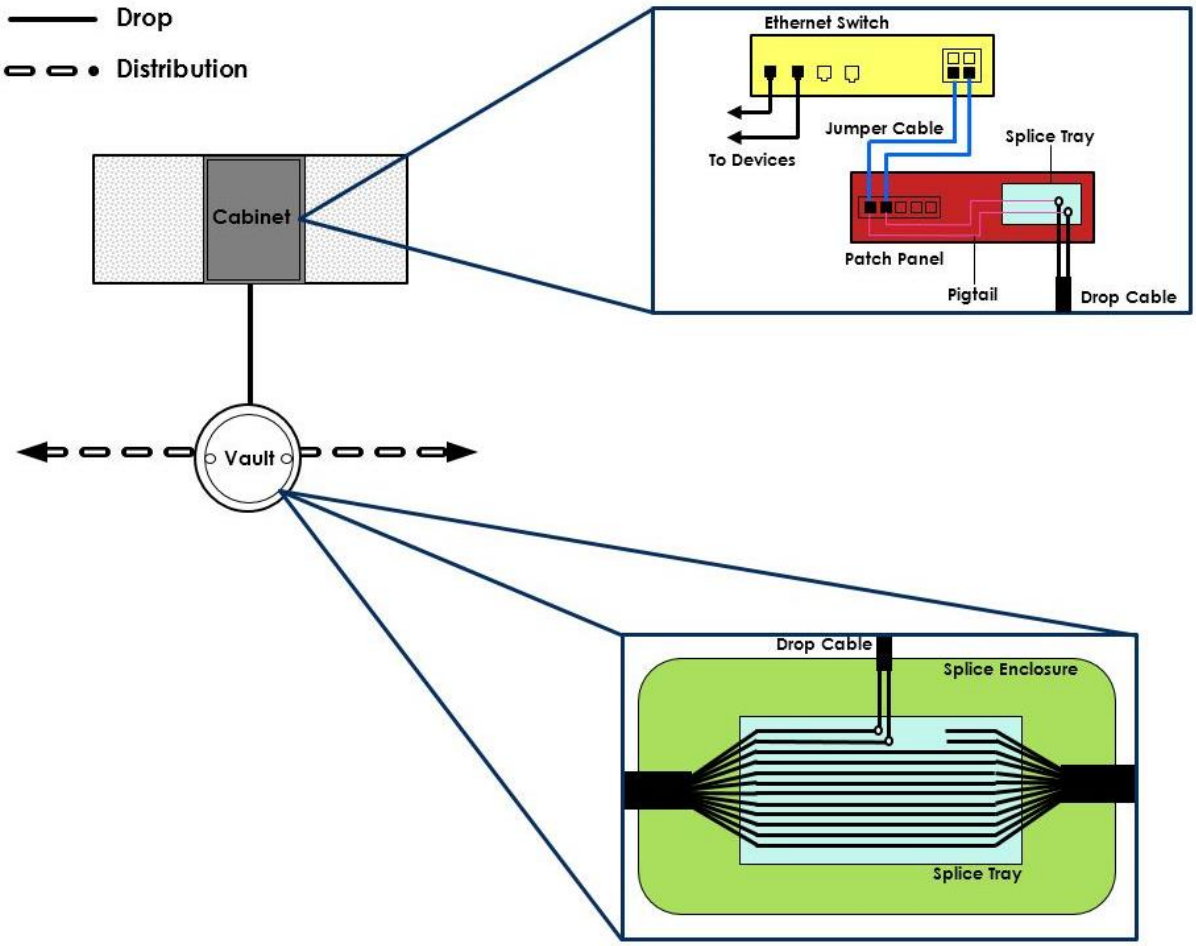


Figure 22: Example of type underground fiber optic connection hardware and in-cabinet equipment

The following pay items shall be utilized in the design and installation of fiber optic communications:

- **630-2-1B** Conduit, Furnish & Install, (Installation Method)
- **633-1-1BC** Fiber Optic Cable, Furnish & Install, (Location) (Count)
- **633-2-31** Fiber Optic Connection, Install, Splice
- **633-2-32** Fiber Optic Connection, Install, Termination
- **633-3-11** Fiber Optic Connection Hardware, Furnish & Install, Splice Enclosure
- **633-3-12** Fiber Optic Connection Hardware, Furnish & Install, Splice Tray
- **633-3-14** Fiber Optic Connection Hardware, Furnish & Install, Buffer Fan Out Kit
- **633-3-16** Fiber Optic Connection Hardware, Furnish & Install, Patch Panel – Field Terminated
- **633-3-17** Fiber Optic Connection Hardware, Furnish & Install, Connector Panel
- **633-6** Fiber Optic Cable Locator[1]

[1] To be used when there is existing buried fiber optic cable within project limits. Locator is not needed for projects without existing fiber optic cable.

Multiple point-to-point wireless radios installed to vertical riser mounting arm creating connection between signalized intersections. (**Marion County**)

Dish-style point-to-point wireless radio installed on mast arm structure. (**City of Orlando**)

Point-to-point wireless radio install directly to concrete strain pole in a span wire intersection to develop clean lines of sight between intersections. (**City of Orlando**)

- **635-2-12** Pull & Splice Box, Furnish & Install, 24" X 36" Cover Size
- **635-2-13** Pull & Splice Box, Furnish & Install, 30" X 60" or 36" Round Cover Size

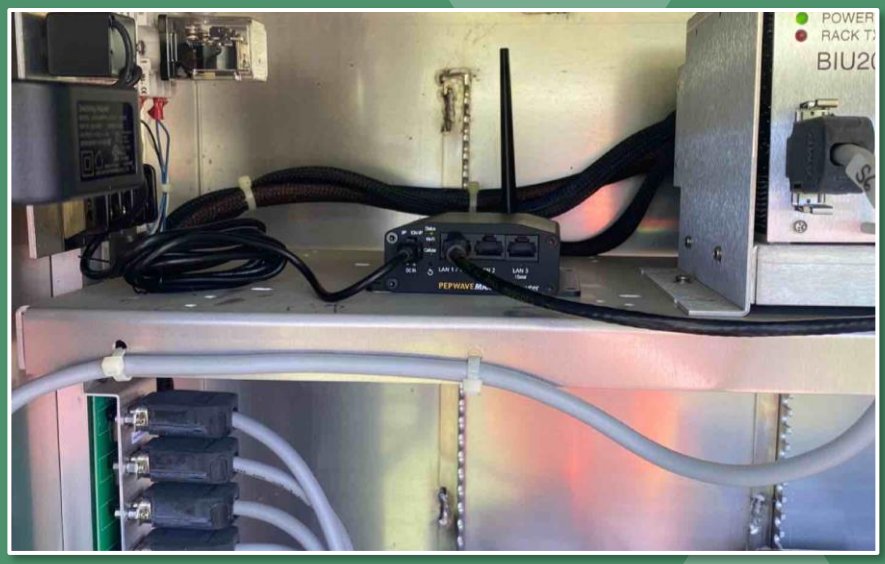
6.3.2 Point-to-Point Wireless Radio

Where applicable, provide point-to-point wireless radios and associated hardware at signalized intersections to provide network communications between the field equipment and the appropriate central network. The following provides generalized design guidance and considerations for the deployment of wireless radios:

- Design wireless access point deployment in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 233*, as well as manufacturer installation guidelines and recommendations.
- Establish wireless links using client subscriber units (i.e., point-to-point) and access points (i.e., point-to-multi-point) radios, as appropriate. Client subscriber units create a dual-direction communication link between two (2) points. Access points are capable of creating dual-direction communication links with multiple client units simultaneously.
- Ensure reliable network communication is provided for a minimum of one (1) location within the project. The EOR shall be responsible for developing a network architecture capable of routing traffic between the signalized intersections and the appropriate central network. Where feasible, the network architecture shall include redundant pathways for communication in the event of wireless link failure.
- Ensure clear line of sight is provided between radio units. Verify the wireless link is free of obstructions from trees and vegetation, overhead signs, bridge structures, changes in elevation, horizontal curves, and other elements that may degrade connection signal. If a clear line of sight is unavailable, ensure the proposed wireless radio units are capable of delivering the high-performance signal transmission in partial obstruction conditions.
- The EOR shall be responsible for coordination with the local maintaining agency to determine specific requirements of the proposed wireless system, including radios operating within the licensed versus unlicensed spectrum. Licensed radios require registration with the Federal Communications Commission (FCC) prior to operation, which would be the responsibility of the EOR.
- Determine the minimum bandwidth throughput necessary for each proposed wireless link (e.g., 100 Mbps) based on the existing and proposed field devices. Ensure a minimum of 20% capacity is provided in the calculation of the worst-case scenario.
- The EOR shall be responsible for identifying wireless radios that meet the minimum technical requirements necessary to establish a reliable wireless link, including:
    - Signal-to-Noise Ratio (dB)
    - Bit Error Rate
    - Bandwidth Throughput (Mbps)
    - Latency (sec)
    - Link Availability

  Ensure all technical requirements of the wireless system are defined in a Technical Special Provision (TSP) or Modified Special Provision (e.g., *Section 684*).
- In-cabinet equipment for wireless radio installations shall include Power-over-Ethernet (PoE) injectors, power supplies, and surge protection devices (SPD).
- Provide physical connection between each wireless radio units and the managed field Ethernet switch to route data to the appropriate central network. Provide Cat-6 Ethernet cable runs for PoE that do not exceed 328' (100 m) in length (*IEEE 802.at*)
- Do not collocate PoE with power cables either within the same conduit or pull boxes.

Shelf-mounted cellular modem acting as router to provide network connection between the controller and local maintaining agency network. (**Lake County**)



Cellular modem with embedded antenna; however, external antennas may be installed to the exterior of controller cabinet assemblies to boost signal strength, where needed. (**Marion County**)

Cellular modems provide routing capabilities to act as network communication devices at locations where switches are not present and multiple network-enabled devices are required; maximum of three (3) RJ-45 ports. (**Brevard County**)

- Provide mounting hardware necessary to rigidly affix the wireless radio units to the signal support structures, including vertical risers and mounting brackets. The EOR shall be responsible for determining the appropriate mounting height for radio units to establish a clear line of sight.

The following pay items shall be utilized in the design and installation of wireless radio systems:

- **633-8-11** Multi-Conductor Cable, Furnish & Install, CAT 6
- **684-6-1B** Wireless Communication Device, Furnish & Install, (Type)

6.3.3 Cellular Modem

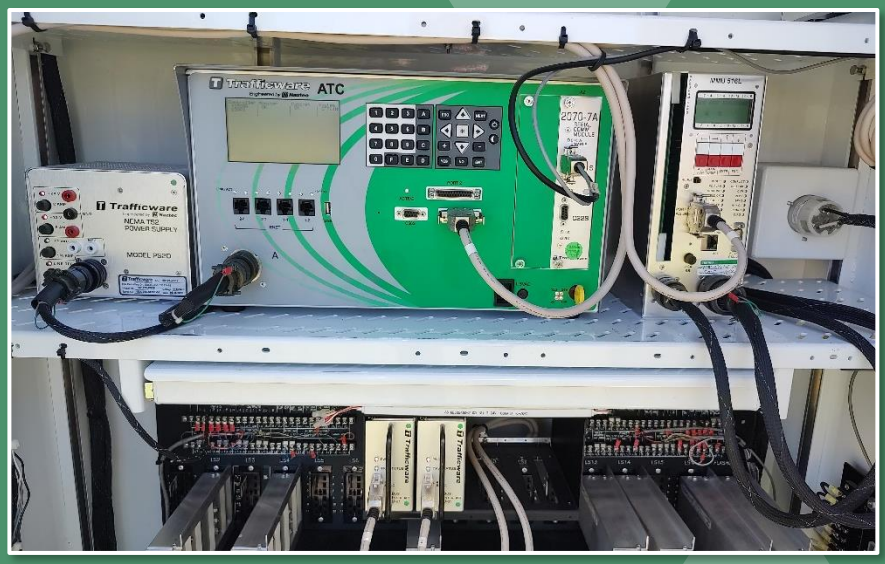
Typically, cellular modems serve as a temporary solution for reliable communication until a permanent fiber or radio connection can be set up. Both District and Local agencies consider cellular modems as a last resort. Engineers should plan for a permanent communication solution to connect back to the network. When unavoidable, provide a broadband cellular modem and antenna at signalized intersections to provide network communications between the field equipment and the appropriate central network. The following provides generalized design guidance and considerations for the deployment of cellular modems:

- Design cellular modem deployment in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 233*, as well as manufacturer installation guidelines and recommendations.
- Ensure cellular modems are compatible with the District's cellular network carrier and provides a removable subscriber identity module (SIM) card. Each cellular modem shall be equipped with redundant SIM card slots for multiple carriers in the event of a cellular provider failure or loss of signal.
- Verify available cellular signal strength within the signalized intersection using a smartphone registered on the same cellular network as the District's cellular provider. Ensure the area provides reliable signal strength with an appropriate cellular communication generation (e.g., 3G, 4G, 4G LTE, 5G), as approved by the District. If minimum speeds are unavailable, the EOR shall coordinate with the Department for a design exception or alternative options.
- The EOR shall determine if an external antenna is required to achieve minimum communication speeds. External antennas shall be installed on the outer face of controller cabinets with field drilled holes carrying coaxial cabling to the cellular modem. Ensure all field drilled holes are watertight and prevent water intrusion into the cabinet.
- Ensure the proposed location for the antenna possess strong cellular signal strength and avoid locations within close proximity to buildings or other structures that may impede signal.
- The EOR shall be responsible for coordination with District Specifications Office is to submit a MSP or TSP, as needed. A TSP would require use of *Section 684* defining the minimum technical requirements of the cellular modem.

The following pay items shall be utilized in the design and installation of cellular modems:

- **684-90-102** Network Device, Cellular Modem

Trafficware *(now Cubic ITS)* 980-ATC unit, NEMA TS-2, Type 1 model. (**Seminole County**)



Trafficware (*now Cubic ITS*) ATC unit, NEMA TS-2, Type 1 model. (**Brevard County**)

Trafficware (*now Cubic ITS*) COMMANDER ATC unit, NEMA TS-2, Type 1 model; shown in bench testing phase.

6.4 Controller

Each intersection upgraded to the *Smart Signal* standards will require a signal controller unit compatible with the *Institute of Transportation Engineers (ITE) ATC 5201 – Advanced Transportation Controller (ATC) Standard, v06A*. The deployment of ATC-standard controllers will ensure that each signalized intersection provides the ability to perform high-resolution data logging the firmware native to the controller unit. The data logger within the controller records intersection parameters—including inputs (e.g., detection calls) and outputs (e.g., phasing, timing)—at a resolution of ten (10) times a second. This data is transmitted across the network to be utilized by the centralized ATSPM system, providing real-time insight into the operations of signalized intersections for improved monitoring, maintenance, and management.

The EOR shall be responsible for coordination with the local maintaining agency to identify preferences for controllers—including manufacturer, model, body style type (e.g., TS-2 Type 1 or Type 2), compatible firmware version, additional software modules, and more. The EOR shall verify the proposed controller is compatible with the associated cabinet assembly for the signalized intersection. Where existing controller cabinet assemblies are to remain, the proposed ATC type shall match the existing connection type (e.g., Type 1 – SDLC interface; Type 2 – "A", "B", "C", "D" MS-type connectors).

Cubic Intelligent Transportation Systems (*formerly Trafficware*)

980-ATC (Trafficware)

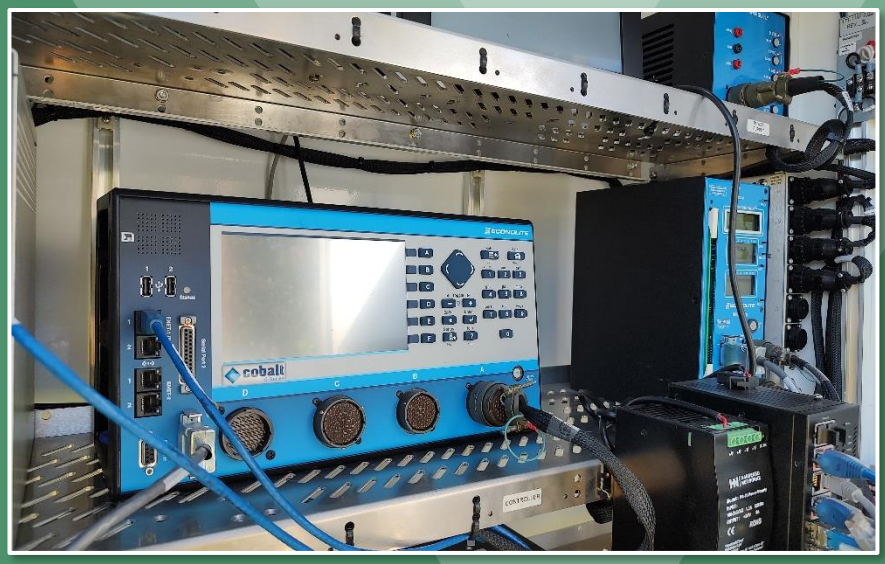
Minimum Firmware - v76.10, or newer
Available Software Module Add-Ons:

- SynchroGreen Traffic Adaptive
- Light Rail Transit (LRT)
- Transit Signal Priority (TSP)

COMMANDER™ ATC

Minimum Firmware – all versions
Available Software Module Add-Ons:

- SynchroGreen Traffic Adaptive
- Light Rail Transit (LRT)
- Transit Signal Priority (TSP)
- Connected Vehicle (CV)



Econolite Cobalt ATC unit, TS-2, Type 2 model, operated as Type 1 ("A" connector only). (**Osceola County**)

Q-Free (*formerly Intelight*) XN-2 ATC unit, TS-2, Type 2 model, operated as Type 1 ("A" connector only). (**Lake County**)

Siemens (*now Yunex Traffic*) m60 ATC unit, TS-2 Type 2 model, operated as Type 1 ('A" connector only). (**Marion County**)

Econolite Control Products

Cobalt®

Minimum Firmware – all versions
Available Software Module Add-Ons:

- Centracs® Adaptive
- Intersection Monitor
- Connected Vehicle Co-Processor

Q-Free (*formerly Intelight*)

X3-ATC (Intelight)

Minimum Firmware – all versions
Available Software Module Add-Ons:

- MAXTIME Adaptive
- MAXTIME Ramp Meter
- MAXTIME Intersection Control
- MAXTIME Connected Vehicle

XN-2

Minimum Firmware – all versions
Available Software Module Add-Ons:

- MAXTIME Adaptive
- MAXTIME Ramp Meter
- MAXTIME Intersection Control
- MAXTIME Connected Vehicle

Yunex Traffic (*formerly Siemens ITS*)

m60 ATC (Siemens)

Minimum Firmware – all versions
Available Software Module Add-Ons:

- *To Be Determined*

NEMA Type 6 controller cabinet assembly with stand-alone UPS cabinet on shared concrete base (foundation) with generator security anchor. (**Lake County**)

"Piggyback" UPS cabinet attached to the exterior side wall of the NEMA Type 6 controller cabinet assembly; some agencies may elect to wrap cabinet exteriors to match local aesthetic requirements. (**Osceola County**)

NEMA Type 6 controller cabinet assembly with matte black powder-coat finish and additional rear door. (**Seminole County**)

The following pay items shall be utilized for the design and installation of ATC units. Note, locations where existing controller cabinet assemblies are to be removed, the pay item number for cabinet removal accounts for all in-cabinet equipment, including the traffic signal controller; do not provide a separate pay item number for controller removal. Similarly, complete controller cabinet assemblies include controller units, therefore at location where complete assemblies are to be installed there is no need to provide a separate pay item number for controller units:

- **671-2-11** Traffic Controller Without Cabinet, Furnish & Install in Existing Cabinet, NEMA
- **671-2-50** Traffic Controller, Relocate – Without Cabinet
- **671-2-60** Traffic Controller, Remove – Cabinet to Remain

6.5 Cabinet Assembly

Unless otherwise determined by the Department and Local Agency, *Smart Signal* improvements will include new controller cabinet assemblies adhering to the National Electrical Manufacturer's Association (NEMA) TS-2 standard with minimum Size 6 dimensions and sixty-four (64) detection channels. Each project shall assess the existing cabinet assembly to determine whether or not the cabinet will require either replacement or modification. Complete assemblies shall include a completely wired cabinet, in-cabinet equipment (e.g., power supplies, malfunction management unit (MMU), load bay with switches, detector panel, detector racks with BIUs, Synchronous Data Link Communications (SDLC) bus, power panel), concrete foundation, conduit sweeps, and all other elements for a complete installation.

Each controller cabinet assembly shall meet the requirements of the TS-2 specifications and the minimum dimensions for Size 6 cabinets (44" width by 52" height by 24" depth), as defined in the NEMA Standards Publication TS 2-2021. Based on the preferences of the local maintaining agency, cabinets may be increased to Size 7 where requested. Size 6 cabinet assemblies shall include a minimum of two (2) full size shelves for installation of in-cabinet equipment. Existing Size 5 cabinet assemblies can accommodate new proposed signal intersection infrastructure, it can be reused with the written approval of the District and Local Agency.

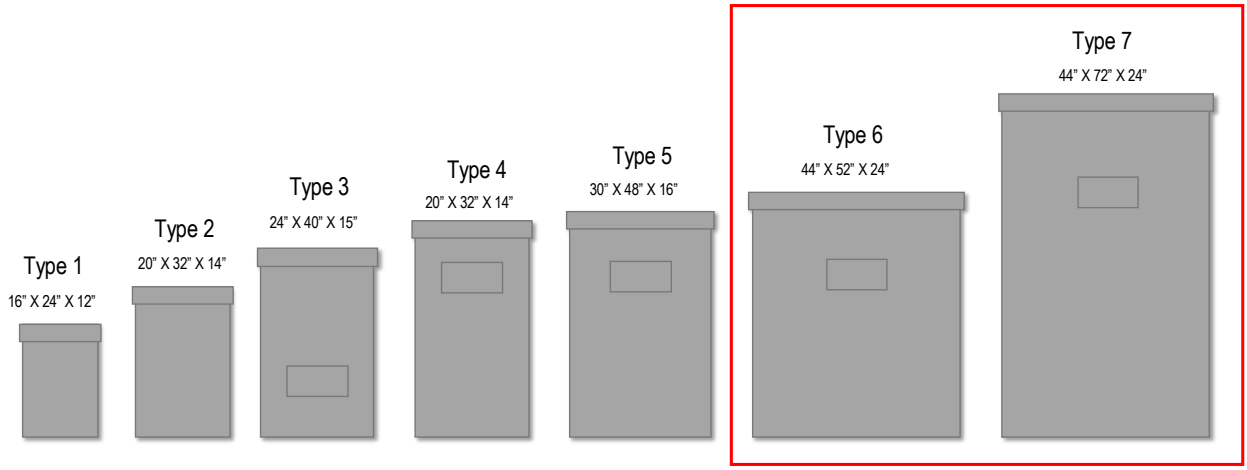
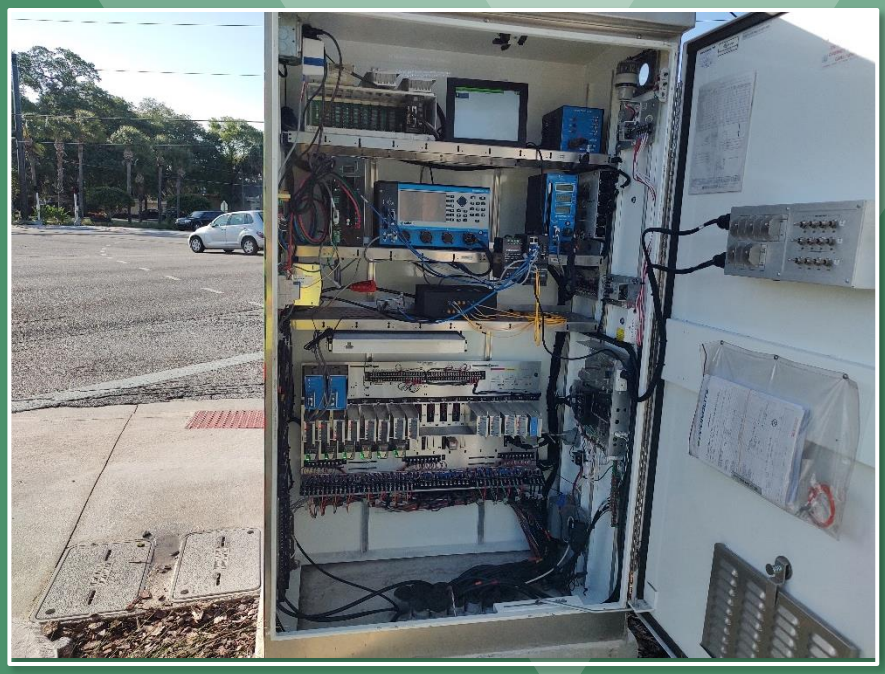
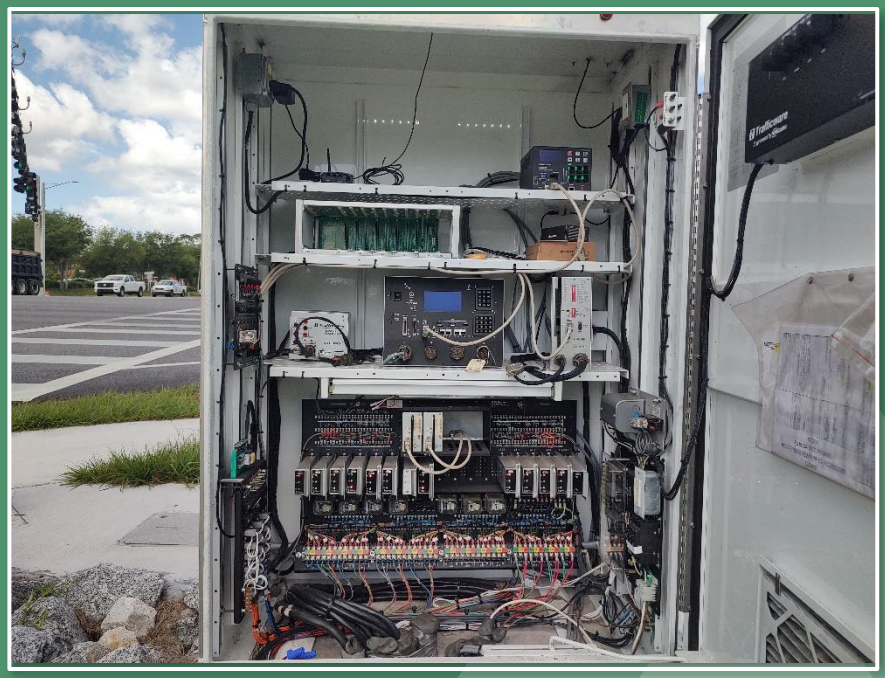


Figure 23: NEMA controller cabinet assembly sizing comparison

Each cabinet assembly shall be outfitted to accommodate a minimum of sixty-four (64) detection channels, including detector panel assembly with sixty-four (64) channel terminal connections, SDLC bus interfaces to accommodate a minimum of four (4) BIUs, and physical shelf space to install four (4) ten-position, sixteen-channel detector racks. The actual number of detector racks or in-cabinet equipment attached to the SDLC bus interface included for each signalized intersections may vary based on site-specific conditions and the selected detection technology, but all cabinet assemblies shall be capable of providing the minimum number of detection channels.



Interior of NEMA Type 6 controller cabinet assembly with hybrid video-radar vehicle detection system. (**Osceola County**)



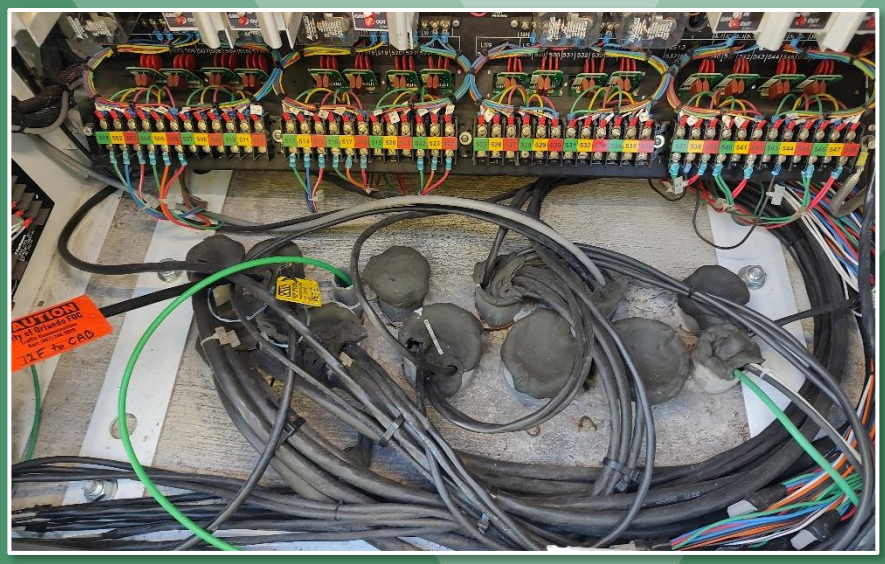
Interior of NEMA Type 6 controller cabinet assembly with microwave radar vehicle detection system. (**Lake County**)

The EOR shall be responsible for coordination with the local maintaining agency to identify specific technology preferences, including manufacturer and model of cabinet assemblies and/or in-cabinet hardware for synchronization with existing deployments. Coordination with the local maintaining agency shall also determine technical specifications for cabinet assemblies, including:

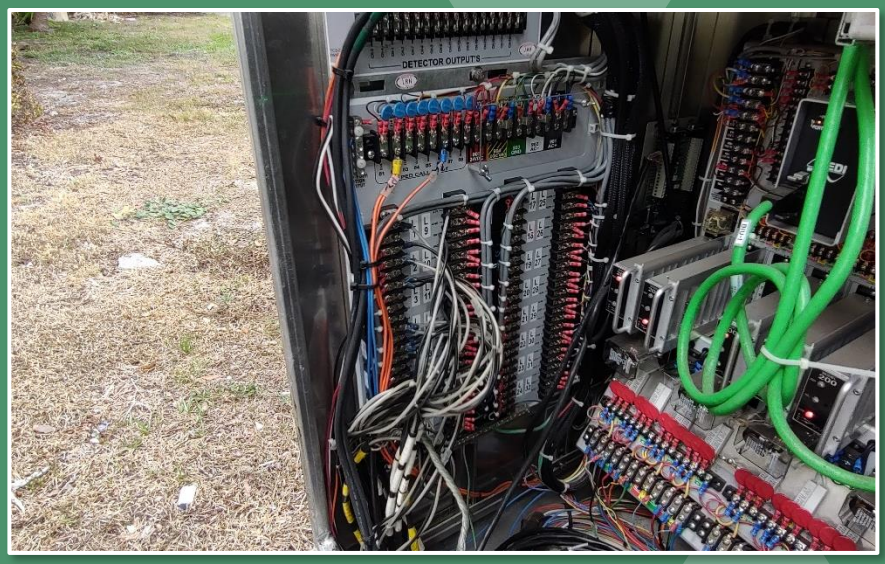
- Single door versus dual door cabinets (e.g., front and rear)
- Cabinet door locking mechanisms and minimum number of keys (e.g., standard Corbin Type 2, electronic key)
- Wiring configuration for either NEMA TS-2 Type 1 or TS-2 Type 2 standard (e.g., "A", "B", "C", "D" MS-type connectors)
- Requirements for ancillary and emergency power, including uninterruptible power supply (UPS) line interactive or double-conversion, automatic transfer switch (ATS), external generator connection, stand-alone versus "piggyback" battery backup cabinets
- Aesthetics requirements for powder coating or specialty color finishes
- Minimum number and allocation of conduit sweeps
- Internal wiring and connection labeling

For existing signalized intersections, determine if the existing controller cabinet assembly meets the current *Smart Signal* requirements and can either be re-utilized or modified. Verify existing wiring configuration, cabinet dimensions, minimum number of detection channels, anchor bolt pattern, quantity and size of conduit sweeps, and state of all in-cabinet equipment. Where existing cabinet assemblies do not meet the applicable standards, provide new assemblies complete with concrete bases, cabinets, conduit sweeps, and service slabs. The following provides generalized design guidance and considerations for the deployment of controller cabinet assemblies:

- Design controller cabinet assemblies in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232*, *FDOT Standard Plans for Road and Bridge Construction – Index 676-010*, and *FDOT Standard Specifications for Road and Bridge Construction – 600 Series*.
- For new controller cabinet assemblies, provide a minimum of twelve (12) conduit sweeps between pull boxes at the foot of the cabinet base with the following allocation. Refer to **Section 6.7** for additional information on conduit utilization:
    - One (1) electrical service wire (high voltage)
    - One (1) grounding
    - Two (2) ITS field devices (low voltage)
    - Two (2) fiber optic communications
    - Three (3) signalization detection systems – input (low voltage)
    - Three (3) signalization traffic control systems – output (high voltage)
    - One (1) UPS electrical service wire (high voltage) (*optional*)

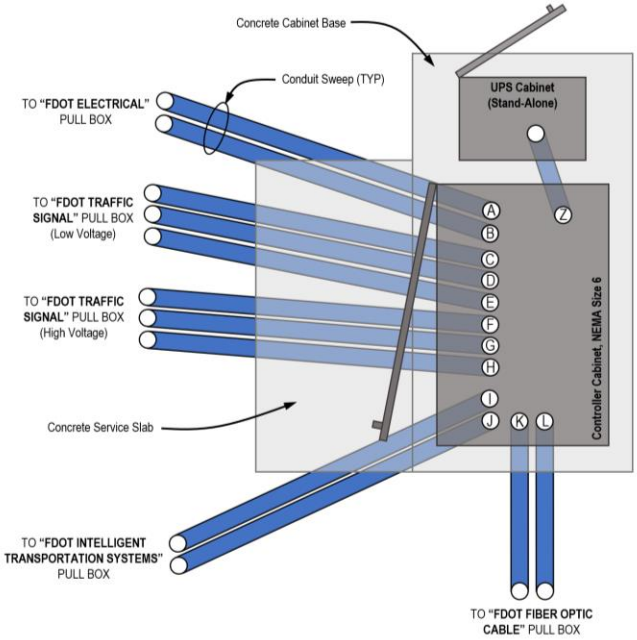


Provide a minimum of thirteen (13) conduit sweeps sized appropriately to facilitate all future cabling needs. (**Lake County**)



Example detector panel installed on the interior wall of the controller cabinet assembly; provide cabinet assemblies with the ability to support a minimum of sixty-four (64) discrete detection channels. (**Orange County**)

Interior of “piggyback” cabinet housing uninterruptible power supply (UPS) head unit and battery array. (**City of Orlando**)



ID	MIN. SIZE	CONDUIT UTILIZATION
A	2"	ELECRICAL SERVICE WIRE (HIGH-VOLTAGE)
B	1"	GROUND WIRE
C	2"	DETECTION SIGNAL (LOW-VOLTAGE)
D	2"	DETECTION SIGNAL (LOW-VOLTAGE)
E	2"	DETECTION SIGNAL (LOW-SIGNAL) / SPARE
F	2"	SIGNAL (HIGH-VOLTAGE)
G	2"	SIGNAL (HIGH-VOLTAGE) / SPARE
H	2"	INTERNALLY ILLUMINATED SIGN (HIGH-VOLTAGE)
I	2"	ITS DEVICE (LOW VOLTAGE)
J	2"	ITS DEVICE (LOW VOLTAGE) / SPARE
K	2"	FIBER OPTIC COMMUNICATIONS
L	2"	FIBER OPTIC COMMUNICATIONS / SPARE
Z	2"	UPS ELECTRICAL SERVICE WIRE (HIGH-VOLTAGE)

Figure 24: Minimum conduit sweeps and allocation for new controller cabinet assembly

- Provide service slabs for all doors of the controller cabinet assembly, including front and rear doors where applicable. Dimensions for service slabs shall be 44" (L) by 30" (W) by 3" (D). Where cabinet bases are installed immediately adjacent to existing or proposed sidewalks, service slabs may be omitted with approval by the Department.
- Ensure controller cabinet assemblies are installed such that the cabinet doors can fully open without obstruction (e.g., walls, vegetation, utility poles). Position cabinets such that maintenance personnel can access the cabinet within the right-of-way and personnel can observe the intersection with doors opened away from traffic.

The following pay items shall be utilized in the design and installation of controller cabinet assemblies. Note, locations where existing controller cabinet assemblies are to be removed, the pay item number for cabinet removal accounts for all in-cabinet equipment, including the traffic signal controller, UPS, networking equipment, and more. Do not provide a separate pay item number for item-specific removals. Additionally, complete controller cabinet assemblies include controller units as part of the pay item number, therefore at location where complete assemblies are to be installed there is no need to provide a separate pay item number for controller units.

- **670-5-11C** Traffic Controller Assembly, Furnish & Install, NEMA, One or Two Preemption
- **670-5-500** Traffic Controller Assembly, Relocate Controller with Cabinet
- **670-5-600** Traffic Controller Assembly, Remove Controller with Cabinet
- **676-1-1BB** Traffic Signal Controller Cabinet, Furnish & Install w/out Controller, (Description, Function)
- **676-1-500** Traffic Signal Controller Cabinet, Adjust/Modify
- **685-1-1B** Uninterruptible Power Supply, Furnish & Install, (Type)

6.6 Detector Channel Assignment

To provide the granularity of data from the signalized intersections to the various systems ingesting this information, the *Smart Signal* standards requires each intersection to develop a site-specific detector channel assignment. The detector channel assignments will ensure that the appropriate infrastructure is installed, configured, and integrated in a manner to guarantee unique detection channels for each zone.

The EOR shall be responsible for coordination with the local maintaining agency to identify specific requirements for detection channel assignments. If the agency does not have specific requirements, the default schema for the District shall be implemented. The EOR shall coordinate with the Department for the standard detector chart sheet to be utilized. The EOR is to ensure two or more different detection types are not combined in the same BIU for new cabinet assemblies. Existing assemblies may have mixed detection means if approved by the District and local agency.

The default schema shall increase detector channel assignments incrementally by one (1) starting with the inside lane and working to the outside; and working from the stop bar to the advanced detection zones for each approach. When all of the zones for a single approach are counted, the schema rotates counterclockwise and begins the pattern again. The pattern shall begin with *Channel 01* as the innermost lane (i.e., nearest to the centerline) for the mainline approach with Movement 2 (through). For intersections with left turn lanes, *Channel 01* will be the inside lane of Movement 5 (left). For one-way roadway or T-intersections without a Movement 2, the schema shall begin on the mainline approach with Movement 6 (through) and repeat the same pattern.

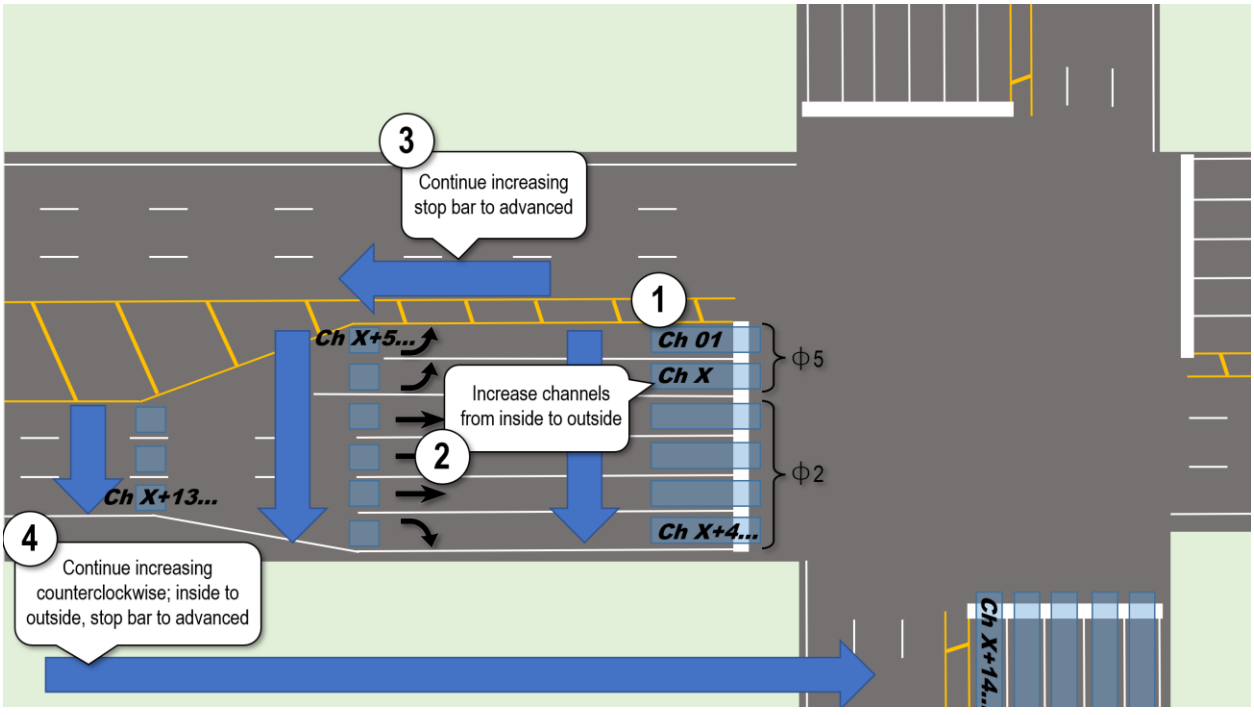


Figure 25: Default detector configuration schema channel assignments

Provide concrete aprons around all pull boxes collocating multiple boxes where feasible. Ensure boxes are separated per function (e.g., low-voltage signal versus high-voltage signal).

Example electrical transformer serving as the utility service point where the UAO will tap power for the signalized intersection.

Prestressed concrete Type P-II 12' pedestal poles are to be installed for all electrical power service equipment (e.g., meter, disconnect); avoid installing power service equipment on strain poles or cabinet exteriors.

6.7 General Infrastructure

The following provides generalized design guidance and considerations to build the necessary infrastructure for a complete *Smart Signal* system:

- Design in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 233*, *FDOT Standard Specifications for Road and Bridge Construction – 630 Series, FDOT Standard Specifications for Road and Bridge Construction – 635 Series,* and *FDOT Standard Specifications for Road and Bridge Construction – 639 Series*.
- This document is not intended to be all inclusive and will not provide design guidance for signalization or pushbutton infrastructure.
    - Design signalization infrastructure in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 232, FDOT Standard Specifications for Road and Bridge Construction – 632 Series, FDOT Standard Specifications for Road and Bridge Construction – 634 Series, FDOT Standard Specifications for Road and Bridge Construction – 646 Series,* and *FDOT Standard Specifications for Road and Bridge Construction – 649 Series.*
    - All pedestrian features added or modified should be designed "Accessible Pedestrian Signal Ready" to permit future upgrades without reconstructing curb ramps or relocating pedestrian poles to meet spacing requirements.
- For electrical service runs between the utility service point and the signalized intersection equipment, ensure electrical pull boxes are spaced no greater than 600 feet apart.
- Unless otherwise specified by the maintaining agency, ensure conduit sizing as follows:
    - 3" conduit for signal
    - 2" conduit for detection (loop lead-in, video detection, etc.) and other low voltage equipment
    - 2" conduit for street lighting
    - 3" conduit for communication
    - 1" conduit for grounding
    - 3" spare conduit for signal
    - 3" spare conduit for communications
- Coordinate with the utility provider to ensure a power source is available and adequate for the proposed signal work. Perform electrical power draw calculations to ensure the minimum amperage is available and communicated with the Utility Agency Owner (UAO). Provide a minimum of twenty-five percent (25%) additional capacity for future loads. Ensure the calculations factor in the power draw loads for maintenance needs (e.g., vacuum, drill).
- Electrical service meter and service disconnect shall be located on a prestressed concrete Type P-II pedestal (12') located on the same intersection corner and adjacent to the controller cabinet, where feasible. Provide a dedicated electrical pull box at the baes of the Type P-II pole with rigid-galvanized steel conduits for all aboveground-underground transitions affixed to the pole. Where the utility service point and meter are not able to be located on the same intersection corner, or greater than 250' from the controller cabinet, provide an additional branch disconnect at the controller cabinet for ease of maintenance.
- Ensure voltage drop calculations are performed for all electrical service conductor runs and the plans provide the appropriate wire sizing in American Wire Gauge (AWG). Voltage drop shall not exceed 3.0%, unless otherwise approved by the Department.
- Grounding and lightning protection shall be designed in accordance with the applicable provisions of *FDOT Design Manual (FDM) – Section 233.3.8 and FDOT Standard Specifications for Road and Bridge Construction – 620 Series.*

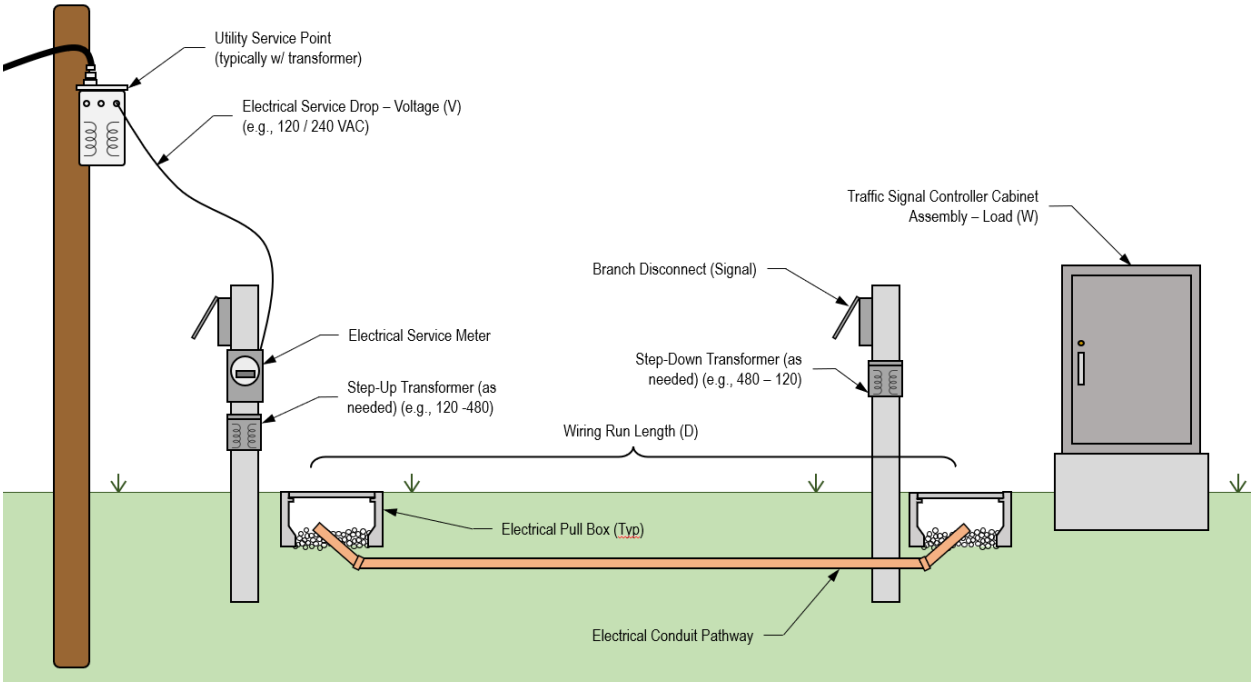


Figure 26: Typical Power Service Design

The following pay items shall be utilized in the design and installation of any general infrastructure:

- **630-2-AB** Conduit, Furnish & Install, (Installation Method)
- **635-2-1B** Pull & Splice Box, F&I, (Nominal Cover Dimensions)
- **635-3-1B** Junction Box, Furnish & Install, (Type)
- **639-1-1BC** Electrical Power Service, F&I, (Type of Service), (Meter Base)
- **639-2-1** Electrical Service Wire, Furnish & Install
- **639-3-1B** Electrical Service Disconnect, F&I, (Type Mount)[1]
- **639-6-1BC** Electrical Power Service - Transformer, F&I, (Size), (Phase and Windings)
- **641-2-12** Prestressed Concrete Pole, F&I, Type P-II Service Pole

[1] The electrical service disconnect should be within 300 feet of the cabinet and located on the same side of the roadway as the cabinet.

Section 7 – Special Design Considerations

7.1 Red Extend

The concept of "Red Extend" is a safety countermeasure at signalized intersections designed to reduce the risk of crashes caused by vehicles running red lights by providing additional protection if and when a potential violating vehicle is detected. The operations of the signalized intersection are modified to extend (hold) the all-red clearance interval when a potential violating vehicle approaching the intersection is detected, potentially running the red light. The extended all-red clearance provides the violating vehicle time to clear the intersection before the next phase enters the subsequent green-light interval. The duration of the all-red extension will vary based on the speed and where in the intersection approach the potential violating vehicle is detected during the all-red clearance interval.

The implementation of the "Red Extend" safety countermeasure shall be considered for projects with documented safety concerns resulting from red-lighting running issues, projects that impact existing signal controller cabinet assemblies with either radar or hybrid (radar/video) vehicle detection systems, and projects installing new video or radar vehicle detection systems for the following project types:

- New Construction
- Reconstruction
- Widening
- Resurfacing, Restoration, and Rehabilitation (RRR)
- Traffic Operations – with three (3) signalized intersections or more
- Pushbutton

It is the EOR's responsibility to coordinate with District Five to determine the exact locations where the "Red Extend" strategy shall be implemented within a project. Ensure the vehicle detection system is capable of providing the detection input for vehicles traveling at speeds that prompt the controller's programmed red extension timings.

The logic programmed into each make and model of controller may differ. Below are example parameters to consider for controller configurations:

- The controller's parameter for red extension shall be enabled.
- The necessary red extension timings shall be programmed into the controller settings and confirmed operational.
- When the red extension detection zones trigger an event, the all-red clearance interval shall be capable of extending to the maximum red interval or until the no events are triggered by the red extension detection zones.

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Section 8 – Technical Submittal

Develop *Smart Signal* plan submittals in accordance with *FDM Section 901*. Below is additional guidance for The Department project specific *Smart Signal* Plans – Detail Sheets and the typical sequence of plans production, as well as the typical deliverables associated with a project including *Smart Signal* deployment.

Table 5: Phase Submittal Deliverables

Summary of Phase Submittals				
Provide *Smart Signal* Plans – Detail Sheets listed as applicable				
DELIVERABLE(S):		**Phase II**	**Phase III**	**Phase IV**
1	***Smart Signal* Plans**			
	Key Sheet	P	C	F
	Signature Sheet (if required)	P	C	F
	General Notes with Pay Item Notes	P	C	F
	Project Layout	P	C	F
	Pedestrian Pole Information	P	C	F
	Controller Timings	P	C	F
	Emergency Vehicle Preemption (EVP) Phasing and Timing	P	C	F
	Detection Channel Assignment Detail	P	C	F
	Interconnect / Communication Plan	P	C	F
	Splicing Diagrams	P	C	F
	Guide Sign Worksheet	P	C	F
	Mast Arm / Strain Pole Details	P	C	F
	Miscellaneous Structure Plans		P	F
	Mounting Details*	P	C	F
	Cabinet Installation Detail	P	C	F
	Managed Field Ethernet Switch Detail	P	C	F
	Wiring Diagrams	P	C	F
	Maintenance of Communication Plan (MOC)		P	F
	Temporary Traffic Control Plan		P	F
	Utility Location Summary		P	F
	Report of Core Borings		P	F
2	**Estimated Quantities (EQ) Report**		P	F
3	**Calculations (e.g., Power Draw, Conduit Fill)**		P	F
4	**Modified Special Provisions (MSP) / Technical Special Provisions (TSP)**	P	C	F
5	**Proprietary Product Certification (PPC)**	P	C	F
6	**ITS Certification Memo**	P	C	F

* Examples of typical Vehicle Detection Mounting Details include but are not limited to mounting details for the following types of devices: video detection, microwave radar, Bluetooth, and turning movement count system (if applicable).

Status Key:
P – Preliminary
C – Complete but subject to change
F – Final

8.5 Plans Production

Ensure all *Smart Signal* Plans are developed to meet the requirements set forth in the latest version of *FDOT Standard Plans, FDOT Standard Specifications for Road and Bridge Construction,* and the District Five *ITS Design Review Checklist* located on https://cflsmartroads.com/. The following provides general guidance for the development of plan sheets and details.

Key Sheet – Develop Key Sheet in accordance with *FDM Section 910.2 and 941.2*. Engineer shall make the determination if this project requires the Key Sheet to be developed as a lead or component plan set and adjust accordingly.

General Notes – Develop General Notes sheet in accordance with *FDM Section 914 and 941.3.* Engineer shall ensure the provided notes are sufficient to cover all aspects of the project and shall include District Five specific signalization notes. Additionally, the General Notes sheet shall include a pictorial legend defining any atypical symbology utilized within the plan sheets and all necessary pay item notes. Pay item notes are required for proposed work that requires specific direction to the Contractor outside of the direction given within the Standard Plans and Specifications, as well as all adjust/modify pay item numbers. Pay item notes are not used to cover for proprietary products since all products will require the use of a MSP.

Pay item notes shall include, but is not limited to:

- Identifying appropriate EVP/TSP plans, modules, and all work necessary to convert existing databases, time of day plans, signal timing and phasing information for ATC units
- Detailing necessary materials and work specific to the local maintaining agency

Refer to **Section 6** for sample pay item notes specific to various design elements.

Project Layout – Develop Project Layout sheet. The Engineer shall select the appropriate common scale (e.g., 1" = 2000') for the Project Layout sheet necessary to depict all project information in a clean, easy-to-read format. At a minimum, project Layout sheets shall include the following:

- Begin Project Limits (w/ stationing)
- End project Limits (w/ stationing)
- North Arrow
- Scale
- County Line (as applicable)
- Street Names for Major intersections and Interchanges
- Plan sheet Numbering
- Signal ID No. and Device Type and ID No. (existing and proposed) (w/ stationing)
- Match Lines (as required)

If the project does not include baseline or centerline stationing, provide the appropriate latitude/longitude information for project limits and device locations.

Plan Sheets – Develop *Smart Signal* Plan Sheets in accordance with *FDM Section 941.4*. Plan Sheets shall be developed at either 1" = 20' or 1" = 40' scale.

Smart Signal specific requirements for Plan Sheets are as follows. Plan Sheets shall include the Global Intersection ID in the bottom right-hand corner from NOEMI Data Integration View. Ensure Plan Sheets clearly depict the existing and proposed signalization infrastructure including, but not limited to, field devices, structures, cabinets, conduits, pull

boxes, and electrical equipment. The Plan Sheets shall also include topographical information (e.g., survey, aerial photography) necessary to properly identify existing conditions and site constraints, such as right-of-way lines, underground and overhead utilities, roadway and drainage infrastructure, landscaping signalization equipment, sign structures, and more. Provide textual callouts with sufficient information for the Contractor to understand the proposed work, including brief descriptions of work (e.g., activity, size, type) and pay item numbers with the associated quantities and units. Conduit callouts shall include total number of runs and proposed utilization (e.g., low-voltage signal, high-voltage signal, fiber optics, power). Provide textual callouts with sufficient information for the Contractor to understand any removal work to be done and pay item numbers with the associated quantities and units. Ensure all *Smart Signal* devices and structures – including existing and proposed – are properly identified with the corresponding ID number(s), as well as stationing and offset from the baseline/centerline. If the project does not include a baseline or centerline, provide latitude and longitude information for each device. Callouts shall clearly identify the unique components of the *Smart Signal* system. If area within the plan sheet is heavily congested or require additional clarity, provide an inset with a higher level of detail and an increased scale (e.g., 1" = 10').

Detection Channel Assignment Detail – Ensure detection zones are called out on the Plan Sheets to indicate the locations of stop bar detection zones, advanced detection zones, and turning movement count detection zones. The Detection Channel Assignment Detail shall clearly match detection zones as called out in the plans to specific, unique channels and connections for the controller cabinet assembly. Ensure the Contractor is provided information for how the data is to be collected.

Additional Detail Sheets – Develop additional details as required to provide project-specific requirements and construction details. These may include, but are not limited to:

- Rectangular Rapid Flashing Beacon (RRFB) Sign Assembly Design (as applicable to Signalization Package)
- Splicing Diagrams
- Wiring Diagrams
- Managed Field Ethernet Switch Detail
- Mounting Details (i.e., Turning Movement Count Camera, Video Detection, Radar Detection, Wireless Radio)
- Power Service Details
- Mast Arm Tabulation
- Internally Illuminated Street Name Signs Worksheet
- Mast Arm Assemblies Data Table
- Foundation Details
- Report of Core Borings
- Utility Verification Sheet

8.6 Estimated Quantities (EQ) Report

Develop Estimated Quantities (EQ) Report in accordance with *FDM Section 902.*

8.7 Calculations

During early works efforts (e.g., field review(s)), the Engineer should take note of existing conduit paths within the project limits. As-builts may provide information such as the size of the conduit installed, but it is important to note how many cables run within those existing conduits and the diameters of each cable. The total cross-sectional area occupied by the existing plus proposed cables shall not exceed 40% of the inner diameter of the conduit. This is applied to existing and proposed conduit.

During design, the Engineer should complete power draw calculations to determine the sufficient power source required. Power draw is a limiting factor of design as there is only so much demand a transformer can serve - eventually a ceiling will be reached. Every device installed will require a different amount of power, so having appropriate cut sheets and data for the specific devices which are to be installed will provide more accurate numbers. Keep in mind, the distance from power source to device will also impact your power required.

8.8 Modified Special Provisions / Technical Special Provisions

Modified Special Provisions (MSP) shall be required when an implemented Specification does not adequately address the specific needs of the project. The required MSP will be a revision of the implemented Specification and will require approval from both the District and State Specifications Office. **Appendix E** includes a link to the State Specification Office's guidance website.

Technical Special Provisions (TSP) shall be required when an implemented Division II or Division III specification is not applicable to the type of work and there is not an applicable section of the *FDOT Standard Specifications for Road and Bridge Construction* to cover the proposed type of work. Each TSP will require approval from the District Specifications Office.

8.9 Proprietary Product Certification (PPC)

Based on the distinct needs of the District and local agency preferences, there are a number of items in which a specific product or manufacturer is required to be used through Proprietary Products Certifications (PPC) to accommodate either synchronization with existing systems, unique functionality, or logistics. Each PPC must be submitted to the District for review and approval by the District Design Engineer (DDE) or designee utilizing the established request letter and PPC form templates. PPC forms must include an attestation statement for why a product is essential to the project and/or why no equally suitable alternative exists. **Appendix C** includes sample PPC letters that have been approved by FDOT. All proprietary products require and MSP to be submitted to the District specifications office.

Refer to **Appendix A** for Local maintaining agency Equipment Preferences, as there may be signalization equipment preferred by local agencies which are not listed in the FDOT Approved Product List (APL). If a product is not listed on the APL, contact the Product Evaluation office at product.evaluation@dot.state.fl.us for BABA compliance review.

8.10 ITS Certification Memo

Following completion of early works efforts (e.g., fields reviews, utility coordination, local agency coordination), it is the responsibility of the EOR to submit an ITS Certification Memo, identifying all personnel and agencies within the project limits that were contacted and identifying all existing communications and ITS field devices. The ITS Certification Memo acts as official record and provides plan of action to maintain, replace, or remove identified equipment.

Refer to **Appendix F** for a sample ITS Certification Memo.

FDOT TSM&O

Transportation Systems Management & Operations

District Five

Smart Signal

Appendices

Appendix A: Local Maintaining Agency Preferences

Maintaining Agency	Controller	Cabinet Assembly	Malfunction Management Unit (MMU)	Power Supply	Uninterruptible Power Supply (UPS)	Loop Detector Cards	Video Vehicle Detection System	Microwave Vehicle Detection System	Wireless Access Point	Preemption / Priority System	CCTV Camera	Intersection Movement Count (IMC) Platform	Bluetooth Travel Time Reader	Managed Field Ethernet Switch	Vehicular Signal Head	Pedestrian Signal Head	Pedestrian Detector (Standard)	Accessible Pedestrian System	RPMU	Other Miscellaneous Information	Last Updated
Brevard County	Cubic* - Commander ATC, TS-2 Type1 APL No. 671-016-014	Cubic* - Wired Cabinet Assembly 70006-TS2/FL, Size 6 w/ 64 Channels APL No. 676-023-004	Trafficware - MMU2-16LEIP-TW APL No. 678-016-010	Cubic* - Nema TS2 Shelf Mount PS2D APL No. 678-017-005	Alpha - FXM 1100 APL No. 685-002-009 With Generator Plug and 240XTC Batteries	Cubic* - 2 Channel LCD Detector APL No. 660-008-012	Miovision - SmartCore DCM + SmartView 360 Camera APL No. 660-015-047	Wavetronix - SmartSensor Matrix APL No. 660-018-004 Wavetronix - Advance Detection System APL No. 660-026-002	Ubiquiti - airMAX NanoBeam 5AC Gen 2 (NBE-5AC-Gen2)	GTT Opticom - 3101 GPS Radio Kit APL No. 663-001-005	Bosch - AUTODOME IP Starlight VG5-ITS1080P-30X6 APL No. 682-001-008 Bosch - AUTODOME 7100i ITS SERIES VG6-ITS2-40X1D APL No. 682-002-026	MioVision - SmartSense - 2 Camera detection plus APL No. 660-015-041	Iteris** - BlueTOAD Spectra APL No. 660-027-007	Ruckus/CommScope ICX7150-C12P Ruckus/CommScope ICX8200-24P	All black polycarbonate heads with Dialect LED modules	GE Lighting Solutions - Countdown Pedestrian Signal, 16 inch module APL No. 653-022-018	Polara - BullDog III Series Vandal Resistant ADA Push Button (Model: BDSP-014-B) APL No. 665003-011	Polara - iNS3 Pushbutton Station, iPHCU3S Ped Head Control Unit APL No. 665-004-011	Digital Loggers - Web Power Switch Pro-8 Circuit APL No. 685-004-002	Load Center: Square D - QO Load Center, Traffic Signal Power Service Disconnect (Breaker Box) ASCO 400 Series (S50A120V1P) Lightning Arrestor Illuminated Street Name Signs: Southern Manufacturing Clean Profile LED Illuminated Street Name Signs APL No. 700-015-023 School Flasher Assembly: Temple Solar Cabinet and Time Clock, Solar School Zone Flasher, and Pelco Ped Pole Assembly FCU 500-071 School Beacon Timer Switch and Cellular Modem APL No. 678-008-023b TF4001F-FL-DC Solar Flashing School Beacon - Yellow LED (single beacon) APL No. 700-026-018a	January 2025
City of Melbourne	Cubic* - Commander ATC w/ Scout 85.2 or Higher, TS-2 Type 1 APL No. 671-016-014	Cubic* - Wired Cabinet Assembly 70006-TS-2/FL with Double Door, Size 6 w/ 64 Channels APL No. 676-023-004	Cubic* - MMU2 - 16LEip APL No. 678-016-010	Cubic* - Nema TS2 Shelf Mount PS2D APL No. 678-017-005	Alpha - Novus 1100 Stand Alone w/ Cabinet Enclosure	Cubic* - 2 Channel LCD Detector APL No. 660-008-012			Ubiquiti Powerbeam AC 5ghz High-Performance Air Max Bridge w/ 420 mm Dish	3M Opticom - GPS TS-2 Rack Mounted APL No. 663-001-006	Bosch - AUTODOME IP Starlight APL No. 682-001-008	Cubic - Gridsmart GS2 Processing Unit w/ 2 Bell Cameras, 1 lic. Count Module APL No. 660-015-036	Iteris** - Blue TOAD Spectra APL No. 660-027-007	ITS Express - 8042 Plus Bypass APL No. 684-002-028	Polycarbonate	Polycarbonate	Cambell APL No. 665-003-012	Polara Navigator		Mast Arm 8 phase SOP 10 w/ 4-Section FYA's, Luminaires will be LED Cobra Head, Overhead Signs will be TCS - thin edge rigid mount LED.	January 2025
City of Palm Bay	Econolite - Cobalt C series, TS1/TS2, 8MB Data key, ABCD connectors, (with EOS) APL No. 671-017-010-a	Econolite - TS2-1 PNG FDOT65 P65 BM 16 Horiz Cab In-white/out Bare 1 rack	Eberle - MMU2-16LEip APL No. 678-016-008	Eberle - EDI PS250 APL No. 678-017-007	Alpha - Novus 1100 Stand Alone w/ Cabinet Enclosure		Two Camera Miovision System C/O Smart-Core-Dcm Miovision Core Detection And Hardware Smartsense-Detection Miovision Smartsense Detection License - Lifetime Of Hardware Smartview-360 360' Camera Smartmount-Tcs-1 1-1/2" Miovision Camera Mnt W/ 300 Ft Cat5E Outdoor Cable 1 Smartmount-Tcs-2 1-1/2" Miovision Camera Mnt W/ 1000 Ft Cat5E Outdoor Cable 1 Smartextender-Tcs-1 1-1/2" Miovision Camera Repeater Extension And Enclosure W/Mounting **Needed For 300'+ Cable Runs 1 Smartsense-Int-2G-Connectivity Smartsense Monitoring Trafficlink Intersection Data- 1 Year With 2 Gig Apl 660-015-041		Ubiquiti Powerbeam AC 5ghz High-Performance Air Max Bridge w/ 420 mm Dish	GTT Opticom - GPS TS-2 Rack Mounted APL No. 663-001-006	Bosch - AUTODOME IP Starlight APL No. 682-001-008	Use same Miovision system as video detection	Iteris** - Blue TOAD Spectra APL No. 660-027-007	ITS Express - 8042 Plus Bypass APL No. 684-002-02	Polycarbonate	Polycarbonate	Polara - Bulldog APL No. 665-003-011	Polara Navigator		Mast Arm 8 phase SOP 10 w/ 4-Section FYA's, Luminaires will be LED Cobra Head, Overhead Signs will be TCS - thin edge rigid mount LED	January 2025
City of Titusville	Cubic* 980 ATC TS-2 Type 1 APL No. 671-016-008 Commander ATC Traffic Controller NEMA TS2 Type 2 APL No. 671-017-014	Cubic* - Wired Cabinet Assembly 70006-TS-2/FL with Double Door, Size 6 w/ 64 Channels APL No. 676-023-004	Cubic* MMU-516L-E APL No. 678-016-007	Cubic* - Nema TS2 Shelf Mount PS2D APL No. 678-017-005			Cubic*** - Gridsmart APL No. 660-015-036										Polara - Bulldog APL No. 665-003-011				January 2025
Flagler County / City of Palm Coast	Cubic ITS, Inc Commander NEMA TS2 Type 2 APL No. 671-017-014	Cubic ITS, Inc Trafficware 70006-TS2/FL Size 6 APL No. 676-023-004	Eberle Design, Inc. MMU2-16LEip APL No. 678-016-008	Eberle Design, Inc. PS250 APL No. 678-017-007	APC Smart-UPS 1300W APL No. 685-002-018	Cubic ITS, Inc. Model 722L 2 Channel TS2 Type C APL No. 660-017-009	Iteris NEXT			GTT Opticom 764 GPS & IR Phase Selector APL No. 663-001-006	Bosch IP Starlight 7000i VG5-ITS1080P-30X6 APL No. 682-002-019			ITS Express ITS-8042 APL No. 684-002-028		Mobotrex 16x18 Pedestrian Signal Housing APL No. 653-024-002	Polara BDL3-B Pushbutton APL No. 665-003-011			RRFB: Carmanah R920-E APL No. 654-001-014	January 2025
Lake County	Intelight - TS2-1 QFREE Controller XN-1 or XN-2, Ethernet Enabled. Include a generator switch box panel APL No. 671-016-015	Temple TF5116TFL02- NEMA TS-2 ELS1008FLG2 Double door cabinet, 67" H, Front & back doors, TS2-1, OR TCS model #D684426B2D2PGSD-P CAB (ZLAKECOUNTY), NEMA Type 6 Stretch,frnt/rear door,pec,white inside. TO INCLUDE A GENERATOR SWITCH BOX PANEL OR . 70006-TS2/FL Type 6 with rear door TS2-1 APL No. 676-023-004	Any on APL	Any on APL	Any on APL		Iteris - Vantage Vector APL No. 660-015-031	Iteris - RADIUS-CCU-SM APL No. 660-018-009 Wavetronix - Radar Detection Matrix and Advanced APL No. 660-018-004 APL No. 660-026-002	PEPLink FirstNet		ITS Express-Advance Imager Series Model AIS-8300 APL No. 682-002-025			ITS Express-Layer 3 MFES Model ITS-8004-16 -V3	Any on APL	Any on APL	Any on APL	Any on APL			Februrary 2025
Marion County	Yunex**** - Eagle m60 ATC LITE w/ SEPAC 5.3 firmware APL No. 671-017-012	MoboTrex/Eagle NEMA TS2 -Type 1 (Model ELS1008 Size Stretch P) w/ Cyberlock (Part CL-TC1) and separate Alpha UPS side-mount cabinet (Model SE48-1616) APL No. 676-023-006	Eberle - MMU2-16LEip APL No. 678-016-008		An Alpha Technologies FXM HP 1100 Uninterrupted Power Supply (UPS) with an Alpha Technologies SE48-1616 BBS enclosure and four (4) Alpha-Cell 100 XTV 12-volt batteries compatible with the City's existing UPS/BBS software. APL No. 685-002-020		Iteris - Vantage Next Detection System Major: Vantage Vector camera/radar APL No. 660-015-031 Minor: Vantage Next camera APL No. 660-015-045	Wavetronix - SmartSensor Radar Detection System APL No. 660-018-004	Simrex DataMover WB-G58AC Radio Pepwave MAX-BR1-ENT FirstNet Ready Cellular Router with Peplink Mobility 22G External Antenna (if fiber/radios not present on corridor)		Siqura PTZ PD910 (or most current FDOT approved Siqura model) w/ Siqura PM08 mounting bracket APL No. 682-002-015	Iteris - Vantage Next w/Vector APL No. 660-015-045	Iteris** - Vantage Velocity APL No. 660-027-002	Ruckus, Layer 3 ICX8200-24 without PoE Cellular Modem - RocketLinx Layer 2 Managed Field Ethernet Switch (Model ES8510-XTE)	Aluminum top w/ polycarbonate bottom & reflectorized backplates 4-section heads w/ FYA					RPMU - Digital Loggers Ethernet Power Controller 7 Signal Heads - Aluminum Aluminum top with polycarbonate bottom and retroreflective backplates 4-section heads with FYA for left turn lanes Street Name Signs - Internally Illuminated LED Signs attached to the signal pole Street Lighting - American Electric Lighting Autobahn LED Roadway (Model ATBL G MVOLT RX 20 NR) •Performance package G (30,000 lumens) •Multi-volt (120-277V) •20kV/10KA surge protection •No photocontrol receptacle (NR) LED lights no higher than 40 feet above ground level Signal Configuration - Box Span-Wire	January 2025
City of Ocala	Cubic* - Commander ATC TS-2 Type 1 APL No. 671-016-014	Cubic* - Wired 7006-TS2/FLPP Type 6 -64 channels (City Standard on file with Cubic) APL No. 676-023-004	Cubic* MMU-516L-E APL No. 678-016-007	Cubic* - Nema TS2 Shelf Mount PS2D APL No. 678-017-005	An Alpha Technologies FXM HP 1100 Uninterrupted Power Supply (UPS) with an Alpha Technologies SE48-1616 BBS enclosure and four (4) Alpha-Cell 100 XTV 12-volt batteries compatible with the City's existing UPS/BBS software. APL No. 685-002-020	Cubic* - 2 Channel LCD Detector	Iteris - Vantage Next Detection System Major: Vantage Vector camera/radar APL No. 660-015-031 Minor: Vantage Next camera APL No. 660-015-045				AXIS brand with the latest FDOT APL Model APL No. 682-002-023		Iteris** - BlueTOAD DSRC & CV2X BT System compatible with the City's existing Travel Time Reader Software	Alcatel OS 6465 Series, FL APL No. 684-002-040	Dialight XLF of XOD series with tinted lenses or later.	Dialight "walking person" and "hand" icons.	Polara - BDL3 APL No. 665-003-011			Mast arms preferred, box span if not possible. Tapco - RRFB-XL Enhanced Crosswalk System, 110VAC, not wireless APL No. 654-001-009 Internally Illuminated LED Street Signs: TCS - Britelite TCSSIGNBL series and shall be free-swinging double-sided APL No. 700-015-024	January 2025
Orange County	Intelight - NEMA TS2 Type 2 XN-2 APL No. 671-017-015	TCS - MPXX TS2-T1 Series APL No. 676-023-007	Eberle - MMU2-16LEip APL No. 678-016-008	Eberle - EDI PS250 APL No. 678-017-007	Alpha - FXM 1100 APL No. 685-002-009	EDI – Detector 2 Channel Auto Rack Mount APL No. 660-008-025	Iteris NEXT Vector (4) for Mast Arms Intersections APL No. 660-015-045 Smart Micro – TRUGRD Stream for Span intersections APL No. 660-018-010	Smart Micro – TRUGRD Stream APL No. 660-018-010	Miovision Smartlink APL No. 660-027-009	GTT Opticom APL No. 663-001-005	AXIS Q6315-LE APL No. 682-002-021		Iteris** - BlueTOAD Spectra APL No. 660-027-007	ITS Express - ITS 8012-24 V3+ APL No. 684-002-028			Polara - BDL3 – B button APL No. 665-003-011	Campbell Company – Guardian APL No. 665-004-010		BOS: Southern MFG Co APL No. 700-012-010 RRFB: Tapco APL No. 654-001-009 Cabinet Locks: Cyberlocks Illuminated Street Name Signs: TCS Britelite 700-015-024	January 2025
City of Apopka	Intelight - NEMA TS2 Type 2 XN-2 APL No. 671-017-015	TCS - MPXX TS2-T1 Series APL No. 676-023-007	Eberle - MMU2-16LEip APL No. 678-016-008	Eberle - EDI PS250 APL No. 678-017-007	Alpha - FXM 1100 APL No. 685-002-009	EDI – Detector 2 Channel Auto Rack Mount APL No. 660-008-025	Iteris NEXT Vector (4) for Mast Arms Intersections APL No. 660-015-045 Smart Micro – TRUGRD Stream for Span intersections APL No. 660-018-010	Smart Micro – TRUGRD Stream APL No. 660-018-010	Miovision Smartlink APL No. 660-027-009	GTT Opticom APL No. 663-001-005	AXIS Q6315-LE APL No. 682-002-021		Iteris** - BlueTOAD Spectra APL No. 660-027-007	ITS Express - ITS 8012-24 V3+ APL No. 684-002-028			Polara - BDL3 – B button APL No. 665-003-011	Campbell Company – Guardian APL No. 665-004-010		BOS: Southern MFG Co APL No. 700-012-010 RRFB: Tapco APL No. 654-001-009 Cabinet Locks: Cyberlocks Illuminated Street Name Signs: TCS Britelite 700-015-024	January 2025
City of Orlando	Trafficware - 980 ATC NEMA TS2-2 APL No. 671-017-014	Trafficware - Wired Cabinet Assembly TS-2 Size 6 APL No. 676-023-004	Eberle - MMU2-16LEip Unit Type 16 APL No. 678-016-008	Cubic* - Nema TS2 Shelf Mount PS2D APL No. 678-017-005	We would like to standardize to selected manufacturer used for UPS expansion project FDOT LAP FM #447388-1-38-01 Alpha Technologies – FXM HP 650,1100,2000 Series APL No. 685-002-020		Iteris - If video detection is specified in plans Vantage Vector APL # 660-015-031	Wavetronix - Dilemma Zone Protection System-SS-200V and SS-200E (SmartSensor Advance) APL No. 660-026-002 Wavetronix - Vehicle Detector, Microwave SS225-SS225 SmartSensor Matrix APL No. 660-018-004 Wavetronix - Traffic Data Detection, Smartsensor-SmartSensor HD APL No. 660-020-004		GTT Opticom - 764 GPS & (IR Phase Selector if specified in plans) APL No. 663-001-006	Advanced Imager Series - AIS-8300 APL No. 682-002-025	Not used by City of Orlando - FDOT D5 usage only - GRIDSMART Technologies, Vehicle Detector - Video, GS Series APL No. 660-015-036		ITS Express - 8012-24 v3 APL No. 684-002-028				Pelco APL No. 665-004-009		(Lighting Per OUC) Streetworks discrete LED USSL-PA2B-740-U-T3-BK-10K-PR7 BIU: Trafficware Group, Bus Interface Unit, (TS2), BIU-700-TW APL No. 678-018-005 Load Switch: Power Distribution & Control, Load Switch, SSS-86-3 APL No. 678-004-009 Load Switch (Flasher): Power Distribution and Control, Flasher Type 3, SSF-86-3 APL No. 678-007-007 Flasher Transfer Relay: Flash Transfer Relay (Struthers-Dunn, LLC) APL No. 678-005-009	January 2025
City of Maitland	Yunex**** - Eagle m60 TS2-2 APL No. 671-017-012 Intelight - Q-Free TS2-2 APL No. 671-017-015	Temple TS-2 Size 6 APL No. 676-023-006	Eberle - MMU2-16LEip APL No. 678-016-008	EDI 5AMP APL No. 678-017-007	TechPower - Developments UPS System, DBL MX 1000-U36 APL No. 685-020-012	EDI - LMD224 APL No. 660-009-013	Iteris Vantage Next APL No. 660-015-045	Wavetronix APL No. 660-018-006		GTT Opticom - 764 GPS & (IR Phase Selector if specified in plans) APL No. 663-001-006				ITS Express ITS-8012-24-V3-K APL No. 684-002-028				Polara - ICCU52 APL No. 665-004-007			January 2025
City of Winter Park	Intelight - NEMA TS2 Type 2 XN-2 APL No. 671-017-015	TCS - MPXX TS2-T1 Series APL No. 676-023-007	Eberle - MMU2-16LEip APL No. 678-016-008	Eberle - EDI PS250 APL No. 678-017-007	Alpha - FXM 1100 APL No. 685-002-009	EDI – Detector 2 Channel Auto Rack Mount APL No. 660-008-025	Iteris NEXT Vector (4) for Mast Arms Intersections APL No. 660-015-045 Smart Micro – TRUGRD Stream for Span intersections APL No. 660-018-010	Smart Micro – TRUGRD Stream APL No. 660-018-010	Miovision Smartlink APL No. 660-027-009	GTT Opticom APL No. 663-001-005	AXIS Q6315-LE APL No. 682-002-021		Iteris** - BlueTOAD Spectra APL No. 660-027-007	ITS Express - ITS 8012-24 V3+ APL No. 684-002-028			Polara - BDL3 – B button APL No. 665-003-011	Campbell Company – Guardian APL No. 665-004-010		Winter Park Preferences align with Orange County Preferences	January 2025
Osceola County	Econolite - Cobalt 2100 APL No. 671-017-010	Econolite - R77 APL No. 676-023-001	Eberle - MMU2-16LEip APL No. 678-016-008	Eberle - EDI PS250 APL No. 678-017-007	Alpha - FXM1100 APL No. 685-002-020	EDI - LM622T APL No. 660-017-008	Iteris Vantage Next APL No. 660-015-045		Miovision - SmartLink APL No. 660-027-009	GTT Opticom - 764 GPS & IR APL No. 663-001-006	Bosch Autodome Starlight 7000i VG5-ITS 1080P-30x6 APL No. 682-001-008	Iteris - Vantage Next w/Vector APL No. 660-015-045	Iteris** - BlueToad, Spectra RSU APL No. 681-001-001	ITS Express - ITS-8042-V3-K - DIN rail. APL No. 684-002-028	Mobotrex	Mobotrex	Polara - BDL3-B APL No. 665-003-011	Polara - iNS APS Pedestrian System APL No. 665-004-012			January 2025
City of Kissimmee	Econolite - Cobalt 2100 APL No. 671-017-010	Econolite - R77 APL No. 676-023-001	Eberle - MMU2-16LEip APL No. 678-016-008	Eberle - EDI PS250 APL No. 678-017-007	Alpha - FXM1100 APL No. 685-002-020	EDI - LM622T APL No. 660-017-008	Iteris Vantage Next APL No. 660-015-045		Miovision - SmartLink APL No. 660-027-009	GTT Opticom - 764 GPS & IR APL No. 663-001-006	Bosch Autodome Starlight 7000i VG5-ITS 1080P-30x6 APL No. 682-001-008	Iteris - Vantage Next w/Vector APL No. 660-015-045	Iteris** - BlueToad, Spectra RSU APL No. 681-001-001	ITS Express - ITS-8042-V3-K - DIN rail. APL No. 684-002-028	Mobotrex	Mobotrex	Polara - BDL3-B APL No. 665-003-011	Polara - iNS APS Pedestrian System APL No. 665-004-012		City of Kissimmee's preferences align with Osceola County's preferences.	January 2025
Seminole County	Cubic - Commander ATC, TS-2 Type 1 APL No. 671-016-014	Cubic - Cabinet Assembly 70006-TS2\FLPP32-E2-WCD9110600 or FLPP64 APL No. 676-023-004	Eberle - MMU2-16LEip APL No. 678-016-008	Eberle Design PS250 678-017-007	APC - 1300w UPS W/12FT CABLE AND BYPASS SWITCH (8005-0123-APC-1300-BYP12) APL No. 685-002-018-a FXM-HP 1100 Series (with 4 – 100 Ah or larger batteries) APL No. 685-002-020	Eberle Design Oracle 2E 660-017-007	NA-MIO-CTM-DCM-V1- 2 Camera detection plus APL No. 660-015-047			GTT Opticom - 764 GPS with 3100 receiver and IR APL No. 663-001-006	Bosch - ITS Autodome Series VG5-ITS1080P-30X kit APL No. 682-002-019	NA-MIO-CTM-DCM-V1- 2 Camera detection plus APL No. 660-015-047	Iteris** - Blue TOAD Spectra APL No. 660-027-007 Iteris** - BlueTOAD Spectera RSU IPL No. 681-001-001	ITS Express ITS-8012-24 V3 Plus w/2-sfp-1000lx10 gig optics APL No. 684-002-028		Dialight APL No. 653-022-014	Polara - BDL3 APL No. 665-003-011	APS, Guardian APL No. 665-004-010		Mast Arm Lighting: GE - Evolve APL No. 715-005-017	January 2025
Sumter County	Yunex**** - Eagle m60 TS2-2 APL No. 671-017-012 Intelight - X3 APL No. 671-017-012	Temple - TS2 Type 1 / Size Type 6 w/ 64 channels of vehicle detection APL No.676-023-006 TCS - TS2 Type 1 / Size Type 6 w/ 64 channels of vehicle detection APL No.676-023-008	EDI MMU2-16LEip or EDI 16MMU-LE (Eberle Design) APL No. 678-016-008 The conflict monitor shall be networkable	EDI 5AMP APL No. 678-017-007	Alpha - FXM1100 - The UPS should be networkable APL No. 685-002-020	EDI - LMD224 APL No. 660-009-013	Iteris Next APL No. 660-015-045	Wavetronix APL No. 660-018-006		GTT Opticom - 764 GPS & IR APL No. 663-001-006				Siemens RS900G w/ 8 copper ports and dual 1000BASE-X SFP APL No. 684-002-028	Traffic Signal heads will be aluminum and black in color. Mounting Hardware: Astro-Bracket with 120 inch steel braided cables and a 48 inch tube.	Countdown Type		Polara - iCCU S2 APL No. 665-004-007		Cisco IR1101-K9 – Cisco Industrial Integrated Services Router 1101 – Router – Desktop Cisco SIR1101UK9-172 – Cisco IOS XE Universal License (v. 17.2) Cisco SL-IR1101-NE – Cisco Network Essentials License Cisco P-LTE-MNA – Cisco Wireless Cellular Modem – 4G LTE Advanced Cisco ANT-4G-OMNI-OUT-N – Cisco Outdoor Omnidirectional Antenna for 2G/3G Cellular – Antenna Cisco CON-SNT-IR101K9K – Cisco Smart Net Total Care – Extended Service Agreement Cisco PWR-IE50W-AC – Cisco Expansion Power Module – Power Supply Cisco CAB-L400-20-TNC-N – Cisco LMR-400 Antenna Cable – 6m Cisco LTE-ADPT-SM-TF – Cisco Antenna Adapter	January 2025
Volusia County	Econolite Cobalt 2100 APL No. 671-017-010	Econolite - TS2 Size 7 Cab APL No. 676-045-001			TechPower - Developments DBL MX 1000-U36 APL No. 685-002-012		Econolite Vision APL No. 660-015-037 Iteris NEXT-CCU APL No. 660-015-044 Iteris NEXT-CCU-SM2-TS2 or -SM4-TS2 APL No. 660-15-045 Iteris NEXT-CCU-SM APL No. 660-015-046 Vantage APEX APL No. 660-015-053	Wavetronix LLC - SmartSensor Matrix APL No. 660-018-004 Wavetronix LLC -SmartSensor Advance APL No. 660-026-002 Iteris Radius-CCU-SM APL No. 660-018-009		GTT Opticom - 764 GPS & IR Phase Selector APL No. 663-001-006	Bosch - ITS Autodome Series VG5-ITS1080P-30X6 APL No. 682-002-019 Bosch - 8000I Series APL No. 682-005-001 ITS Express - AIS-8300 APL Number: 682-002-025		Iteris** - Vantage Velocity APL No. 660-027-002	ITS Express - ITS-80 Series V3 APL No. 684-002-028			(1) Polara - iN2 APL No. 665-004-008 (2) Polara - iDS2 Pushbutton APL No. 665-004-013	Polara Enterprises LLC - iNS2 Pushbutton Station, ICCU-S2 APL Number: 665-004-012 Polara Enterprises LLC - iDS2 Pushbutton Station, iCCU-S2 Central Control Unit APL Number: 665-004-013		RRFB: Carmanah Technologies - SC315-G APL No. 654-001-013 RRFB: Carmanah Technologies R920-F APL No. 654-001-012 RRFB: TAPCO RRFB-XL2 APL No. 654-001-009	January 2025
City of Daytona Beach	Cubic* - Commander ATC TS-2 Type 1 - Version 76.xxx APL No. 671-016-014	Cubic - Size 6 Cabinet NEMA TS2-1 APL No. 676-023-004	Cubic* MMU-516L-E APL No. 678-016-007		Alpha - FXM1100 With Communication Module APL No. 685-002-020		Iteris Vantage Vector Hybrid Detection System Iteris Vantage Next Iteris Vantage Radius APL No. 660-015-031 APL No. 660-015-045	Wavetronix - Matrix Sensor Stop Bar Detection Wavetronix Advance Sensor Click 650 (Cabinet Interface) APL No. 660-018-004 APL No. 660-026-002			Bosch NDP-7512-Z30 Bosch Autodome Pipe Mount VG4-A-9543			Lantronix (Transition Networks) - Model SIS1040-384-LRT APL No. 684-002-038			Campbell - Mount Screws at 9 and 3 APL No. 665-003-012	Polara Engineering			January 2025

Notes:
* Cubic, formerly Trafficware
** Iteris, formerly Trafficcast
*** Cubic, formerly GridSmart
**** Yunex, formerly Siemens

Appendix B: Utility Coordination

Project:	STATE PROJ. NO.	SHEET NO.
		X of Y

Utility Agency:
Contact Person:

STATION	OFFSET (m)	UTILITY TYPE/SIZE	MATERIAL	DESCRIPTION OF CONFLICT	TO REMAIN	TO BE REMOVED OFFSITE	TO BE ADJUSTED	TO BE RETIRED IN PLACE	TO BE RELOCATED	INCLUDED IN FDOT PROJECT	PRIOR TO FDOT PROJECT	CONCURRENT WITH FDOT PROJECT	REMARKS AND COMMENTS

* ALL CONFLICTS IDENTIFIED ARE PRELIMINARY. ADDITIONAL CONFLICTS MAY BE IDENTIFED.

* THE CONFLICTS IDENTIFIED IN THIS MATRIX BY THE F.D.O.T. DO NOT RELIEVE THE UTILITYCOMPANY/OWNER FROM THE RESPONSIBILITY TO IDENTIFY ALL CONFLICTS WITH THEIR FACILITIES.

*FAILURE BY THE OWNER TO IDENTIFY A CONFLICT MAY RESULT IN A CLAIM BROUGHT AGAINST THE UTILITY AGENCY BY THE FDOT.

*STATION/OFFSET REFERENCED FROM CENTERLINE OF CONSTRUCTION UNLESS OTHERWISE SPECIFIED.

UAO LETTERHEAD

Re:

I hereby certify that (**UAO NAME**) **HAS** existing facilities located within the above project limits and have determined that no relocation will be necessary. I have based this information off a field review and Atkins preliminary construction plans dated **(February 27, 2007)**. I have attached a set of marked plans with existing facilities to remain shown in green.

OR
(Please delete which paragraph is not applicable)

I hereby certify that **(UAO NAME) DOES NOT HAVE** any facilities located within the above project limits, as per the Atkins preliminary construction plans dated **(February 27, 2007)**.

_____ _____
SIGNED DATE

_____
PRINT NAME

_____
TITLE

Appendix C: Proprietary Product Certification (PPC)

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

PROPRIETARY PRODUCT CERTIFICATION

To: _____ Date: _____
Design Engineer

Financial Project ID: _____ New Const. ☐ RRR ☐
Federal Aid Number: _____
Project Name: _____
State Road Number: _____ Co. / Sec. / Sub.: _____
Begin Project MP: _____ End Project MP: _____
Full Federal Oversight: No ☐ Yes ☐ Note: If Yes, submit to FHWA Director.

A justification and all supporting documents must be attached to this document.
Mark the appropriate certification:

"I, _____, _____, of the _____,
Print Name of Initiator *Position Title* *Name of Agency*

do hereby certify that in accordance with the requirements of 23 CFR 635.411(a)(2),
Mark appropriately:

☐ *that this patented or proprietary item is essential for synchronization with existing highway facilities*
☐ *that this patented or proprietary item is essential for ease of maintenance.*
☐ *that this patented or proprietary item is essential for reduced maintenance cost.*
☐ *that no equally suitable alternative exists for this patented or proprietary item."*

_____, _____
Signature *Date*

For Department Use Only

"I, _____, _____
Print Name *Position Title*

of the Florida Department of Transportation, do hereby approve this certification request made in accordance with the requirements of 23 CFR 635.411(a)(2),
Mark appropriately:

☐ *that this patented or proprietary item is essential for synchronization with existing highway facilities.*
☐ *that this patented or proprietary item is essential for ease of maintenance.*
☐ *that this patented or proprietary item is essential for reduced maintenance cost.*
☐ *that no equally suitable alternative exists for this patented or proprietary item."*
Identify any conditions and limitations:

_____, _____
Signature *Date*

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

PROPRIETARY PRODUCT CERTIFICATION

To: **Jim Stroz, PE (District Five, DTOE)** Date: **January 13, 2025**
Design Engineer

Financial Project ID: **456268-1-93-01** New Const. ☐ RRR ☒
Federal Aid Number:
Project Name: **ITB - Vehicle Detection System (Lake County)**
State Road Number: **Varies** Co. / Sec. / Sub.: **Varies**
Begin Project MP: **Varies** End Project MP: **Varies**
Full Federal Oversight: No ☐ Yes ☐ Note: If Yes, submit to FHWA Director.

A justification and all supporting documents must be attached to this document.
Mark the appropriate certification:

"I, **Nathan Mozeleski, PE** *(Print Name of Initiator),* **Engineer of Record** *(Position Title), of the* **AtkinsRealis** *(Name of Agency),*

do hereby certify that in accordance with the requirements of 23 CFR 635.411(a)(2),
Mark appropriately:

☒ *that this patented or proprietary item is essential for synchronization with existing highway facilities*
☒ *that this patented or proprietary item is essential for ease of maintenance.*
☒ *that this patented or proprietary item is essential for reduced maintenance cost.*
☐ *that no equally suitable alternative exists for this patented or proprietary item."*

Signature, **January 13, 2025** *Date*

For Department Use Only

"I, James S. Stroz *(Print Name),* District Traffic Ops Engineer *(Position Title)*

of the Florida Department of Transportation, do hereby approve this certification request made in accordance with the requirements of 23 CFR 635.411(a)(2),
Mark appropriately:

☒ *that this patented or proprietary item is essential for synchronization with existing highway facilities.*
☒ *that this patented or proprietary item is essential for ease of maintenance.*
☒ *that this patented or proprietary item is essential for reduced maintenance cost.*
☐ *that no equally suitable alternative exists for this patented or proprietary item."*

Identify any conditions and limitations:

DocuSigned by:
292113AED861407...
Signature, 01/13/2025 | 11:50 AM EST *Date*

Lake County
Public Works – Engineering Division
323 North Sinclair Avenue
Tavares, Florida 32778
Phone: (352) 253-6000
Fax: (352) 253-6026

January 9, 2025

Mr. Jim Stroz, PE
District Five – District TSM&O Engineer
Florida Department of Transportation
719 South Woodland Boulevard
DeLand, FL 32720-6800

SUBJECT: Justification for Preferred Use of Proprietary Products for Traffic Signal Equipment for Lake County TSM&O Improvements Project (FPID: 456268-1)

Dear Mr. Stroz,

As part of the above referenced project, we are requesting approval of the attached, signed and completed Proprietary Product Certification (PPC) Form No. 630-020-07 for the following proprietary product for the Lake County Public Works – Transportation and Traffic Operations Division:

1. Iteris VantageRadius (video-radar vehicle detection system w/ live-stream video)
2. Iteris VantageRadiusPlus (video-radar vehicle detection system w/ live-stream video)
3. Iteris VantageRadius CCU (in-cabinet processor unit)

This equipment is being requested for the replacement of existing and/or installation of new traffic signalization components along the US 441 (SR 500) corridor in Lake County, Florida. Approval of these proprietary products will allow consistency with existing equipment within the County providing synchronization and reducing cost by eliminating the need for additional training and stockpile inventory. Please find further justification for the use of these products on the following pages.

1. **Iteris VantageRadius Vehicle Detection System**
   Evidence for Synchronization:
   a. Function: The Iteris VantageRadius video and radar vehicle detection system is consistent with the existing detection system used throughout the County. The system includes a multi-sensor technology using video and radar, cabinet processor, cabling, and mounting hardware. The County has been utilizing the Iteris video vehicle detection system for over 10 years with minimal issues. The Iteris VantageRadius video vehicle detection system is simultaneously capable of providing detection calls to the controller through SDLC connections and real-time video streams to the County over the network.
   b. Logistics: County staff is familiar with the equipment, software, and hardware for the Iteris VantageRadius video vehicle detection system allowing them to quickly diagnose, remove, install, program, or troubleshoot issues in the field reducing impacts to the traveling public.

In addition, the County stocks and maintains spare Iteris parts, including in-cabinet equipment (e.g., processor) and video imaging sensors, in order to quickly replace any damaged or failing equipment. The County has been utilizing Iteris video vehicle detection systems for over 10 years and has in-depth knowledge of the Iteris equipment, hardware, and software and requires no additional training resources. Using the Iteris Vantage Next video vehicle detection system provides the most efficient use of the County's limited staff and resources while maintaining desirable levels of service for the traveling public.

In conclusion, Lake County is requesting that the proprietary products listed in this document be furnished for this project. If you have any questions, please feel free to contact me directly at (352) 742-1766, or via e-mail at jglobig@lakecountyfl.gov.

Sincerely,

James Globig | Assistant Traffic Operations Supervisor
Lake County Traffic Operations
James Globig 1/13/2025

Appendix D: Technical Special Provision (TSP)

Appendix D has been removed.

Refer to the Pre-Spec Meeting to Letting (fdot.gov) website for guidance.

Appendix E: Modified Special Provision (MSP)

Appendix E has been removed.

Refer to the Pre-Spec Meeting to Letting (fdot.gov) website for guidance.

Appendix F: ITS Certification Memo

CONSULTANT LETTERHEAD

DATE: _____

TO: **FDOT Project Manager**

FROM: _____, Engineer of Record

COPY TO: District Construction Scheduling Specialist
Intelligent Transportation System (ITS) Manager

SUBJECT: Verification of Communication and/or ITS Cables
Financial Project ID: _____
Federal ID Number: _____
County: _____
SR. No.: _____
Project Limits: _____

Verification of Communication Cables, Wireless Communication, and ITS Devices:

I certify that I coordinated with the following personnel/agency to develop a plan of action to handle communication cables, wireless communication, or ITS devices as part of the project.

1.

2.

3.

Action Plan:

_____ No communication cables, wireless communication, or ITS devices were identified within the limits of the projects.

_____ Communication cables, wireless communication, or ITS devices were identified within the limits of the project. They will be handled as follows:

1.

2.

3.

Submitted by:

_____
Signature, Engineer of Record

_____
Print Name of Engineer of Record

_____
Print Name of Consultant Firm

Concurred by:

_____
District Traffic Operations Engineer

FLORIDA DEPARTMENT OF TRANSPORTATION

RON DESANTIS
GOVERNOR

KEVIN THIBAULT
SECRETARY

INTELLIGENT TRANSPORTATION SYSTEMS (ITS) CERTIFICIATION

Date: February 28, 2022

To: Heidi Trivett (Project Manager, TSM&O District Five)

From: Nathan Mozeleski, PE (Atkins North America, Inc.), Engineer of Record

Subject: Marion County ITS Network Communications Upgrade (FPID 436361-1)

I certify that I coordinated with the following personnel and/or agency to identify existing communications and/or ITS field devices, as well as develop a plan of action to maintain, replace, or remove each facility as appropriate within the project limits.

1. **Florida Department of Transportation – District Five**, Patrick White, (321) 257-7243, July 1, 2021
2. **Marion County Traffic Operations**, Don Watson, PhD, (352) 671-8686, July 1, 2021
3. **City of Ocala – Ocala Fiber Network (OFN)**, Billy Weakland, (352) 401-6912, November 4, 2021

The following communications and/or field devices were identified within the limits of the project and will be handled as detailed below:

1. **Florida Department of Transportation – District Five.** Existing fiber optic communications cables installed along US 301 / US 441 and I-75 will remain in place. Existing field devices within the project limits include Connected Vehicle (CV) roadside units (RSU), CCTV cameras, managed field Ethernet switches (MFES), and remote power management unit (RPMU) will remain in place. *No impacts to the existing ITS facilities are anticipated as part of the project.*
2. **Marion County Traffic Operations.** Existing fiber optic communications cables installed sporadically along CR 484, SR 200, and SR 464 will remain in place and be reutilized within minor modifications included as part of the project. Existing field devices within the project limits include traffic signal controllers, CCTV cameras, Bluetooth travel time readers, video vehicle detection systems, uninterruptible power supplies (UPS), arterial dynamic message signs (ADMS), managed field Ethernet switches (MFES), and wireless communications devices. The design will include the removal of

existing and installation of new switches, wireless radios, and uninterruptible power supplies, whilst all other existing field equipment is to remain in place,

3. **City of Ocala – Ocala Fiber Network (OFN).** Existing fiber optic communications cables installed along CR 484, SR 35 (Baseline Rd), SR 464 (Maricamp Rd), SR 200, and SE 25th Ave will remain in place. *No impacts to the existing ITS facilities are anticipated as part of the project.*

Submitted by:

Nathan J Mozeleski 2022.03.01 15:00:58-05'00'

Nathan Mozeleski, PE

Atkins North America, Inc.

Concurred by:

_____

Jim Stroz, PE

District Traffic Operations Engineer

Appendix G: Sample Plans

1 AS	653-1-11
1 AS	653-1-60
1 EA	665-1-60
1 EA	700-3-101
1 EA	700-3-601

10 LF	630-2-11
1 EA	646-1-11
1 AS	653-1-11
1 EA	665-1-11

PED. PEDESTAL-2, STA. 58+70, 65'LT

EXISTING PED. PEDESTAL-1 TO REMAIN, REMOVE TWO-WAY PED. HEAD, REMOVE PHASE-2 PED. DETECTOR AND SIGN PANEL

EXIST. MAST ARM POLE-1 & OVERHEAD STREET NAME SIGNS TO REMAIN INSTALL VIDEO DETEC. CAMERAS VC1, VC2 & IMC CAMETRA. USE EXISTING CONDUIT FROM CABINET TO POLE

2 EA	660-4-12
1 EA	660-9-12

REPLACE EXIST. SIGNAL CABINET

(4X10) 40 LF	630-2-11	663-1-122	1 EA
380 LF	632-7-2	670-5-111	1 AS
1 EA*	635-2-13	670-5-600	1 AS
1 EA	660-4-11	684-1-1	1 EA
1 EA	660-9-11	685-2-1	1 EA
1 EA	663-1-121	695-8-11	1 EA

*635-2-13 IS FOR FUTURE USE

EXIST. POWER PEDESTAL, DISCONNECT AND METER TO REMAIN

APPARENT R/W LINE

APPARENT R/W LINE

PEDESTRIAN SIGNAL HEAD DETAILS

P2 P4 P8

PED. SIGNAL COUNT-DOWN 1-SECT., 1-WAY

(A) SR 19

(B) Guerrant St

(C) Cassady St

EXISTING OVERHEAD STREET NAME SIGNS TO REMAIN

RELOCATE PED. PEDESTAL-3 TO STA. 59+16, 60.75'LT, REMOVE TWO-WAY PED. HEAD, REMOVE PHASE-4 PED. DETECTOR AND SIGN PANEL

630-2-11	5 LF
646-1-40	1 EA
653-1-11	1 AS
653-1-60	1 AS
665-1-60	1 EA
700-3-101	1 EA
700-3-601	1 EA

PED. PEDESTAL-4, STA. 59+24, 50.5'LT

630-2-11	30 LF
646-1-11	1 EA
653-1-11	1 AS
665-1-11	1 EA

PEDESTRIAN SIGN DETAIL

OR

R10-3i 9"X15" 8 EA

(D) LEFT TURN YIELD ON FLASHING YELLOW ARROW

(FUTURE PANELS) FTP-85-13 3'0"X2'6" (2 EA)

0 10 40 Feet

2 RUNS @ 105 LF 1- VIDEO, 1-SPARE

105 LF 630-2-12

℄ SURVEY SR 19

635-2-11 3 EA

2 RUNS @ 75 LF 1- VIDEO, 1-SPARE

630-2-12 75 LF

EXISTING PED. PEDESTAL-6 TO REMAIN

700-3-101	2 EA
700-3-601	2 EA

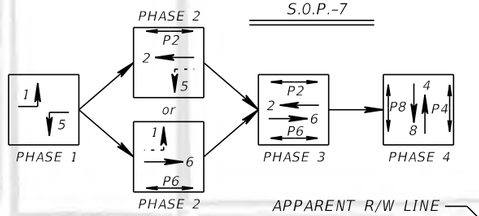
EXIST. MAST ARM POLE-2 & OVERHEAD STREET NAME SIGNS TO REMAIN. INSTALL VIDEO DETECTION CAMERAS VC3 & VC4

660-4-12 2 EA

EXISTING PED. PEDESTAL-5 TO REMAIN

700-3-101	2 EA
700-3-601	2 EA

S.O.P.-7



LEGEND:

IMC CAMERA (INTERSECTION MOVEMENT COUNTS)

VVDS (PRESENCE, ADVANCE, QUEUE)

CONTROLLER TIMINGS

TIMING FUNCTION									
MOVEMENT NUMBER		1	2	3	4	5	6	7	8
TIMING FUNCTION	MINIMUM GREEN	7	15		7	7	15		7
	EXTENSION	3.0	3.5		3.0	3.0	3.5		3.0
	MAXIMUM GREEN 1	15	45		20	15	45		20
	MAXIMUM GREEN 2	25	60		30	25	60		30
	YELLOW CLEARANCE	4	4		3.4	4	4		3.4
	ALL RED	3.3	2.0		3.3	2.7	2.0		3.3
	PEDESTRIAN WALK		7		7		7		7
	PED. CLEARANCE		10		26		12		26
	RECALL		MIN				MIN		

NOTES:

1. THE MAJOR STREET IS SR 19 (N. CENTRAL AVE). THE MINOR STREET IS GUERRANT ST/CASSADY ST.
2. THE POSTED SPEED LIMIT WITHIN THE INTERSECTION LIMITS ALONG SR 19 IS 35 MPH.
3. REPLACE ALL R10-3i PANELS. THE ARROWS ON SIGN R10-3i SHALL POINT IN THE DIRECTION OF THE CROSSING. THE SIGN PANELS SHALL BE PLACED DIRECTLY ABOVE THE INTENDED PUSH BUTTON.
4. ALL TIMINGS ARE PRELIMINARY AND MAY REQUIRE FIELD ADJUSTMENT AS DIRECTED BY THE MAINTAINING AGENCY.
5. MAINTAINING AGENCY TO DETERMINE THE OPERATION OF 4-SECTION SIGNAL HEADS FOR THE TIME OF DAY.
6. EXISTING LOOPS SHALL BE ABANDONED AND REMOVE ALL ABANDONED PULL BOXES.
7. EXISTING CONCRETE BASE SHALL BE USED FOR THE PROPOSED CABINET, WHERE NOT POSSIBLE, PRECAST BASE SLAB SHALL BE INSTALLED.

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

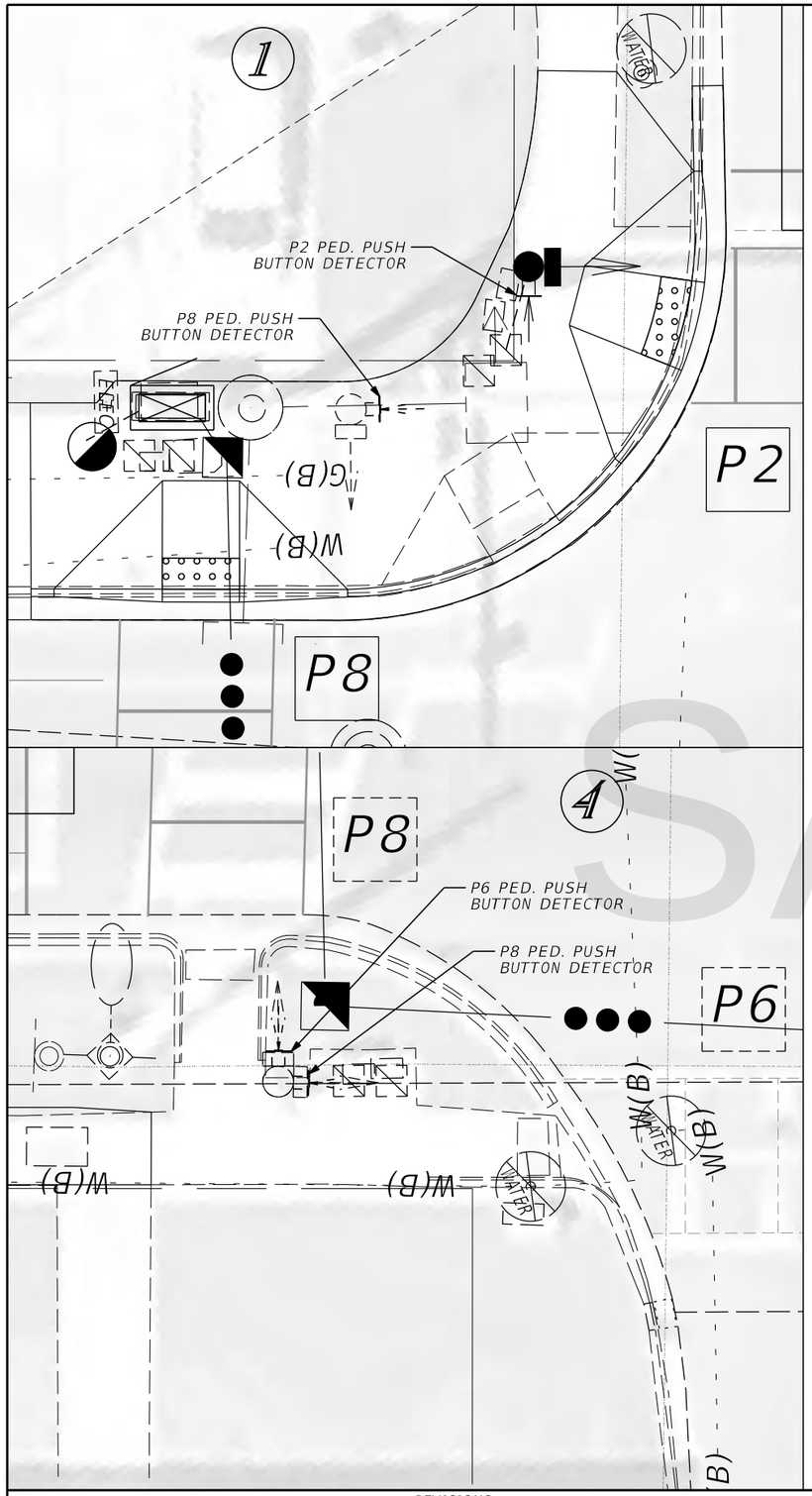
DISTRICT FIVE - DESIGN
Ayman A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

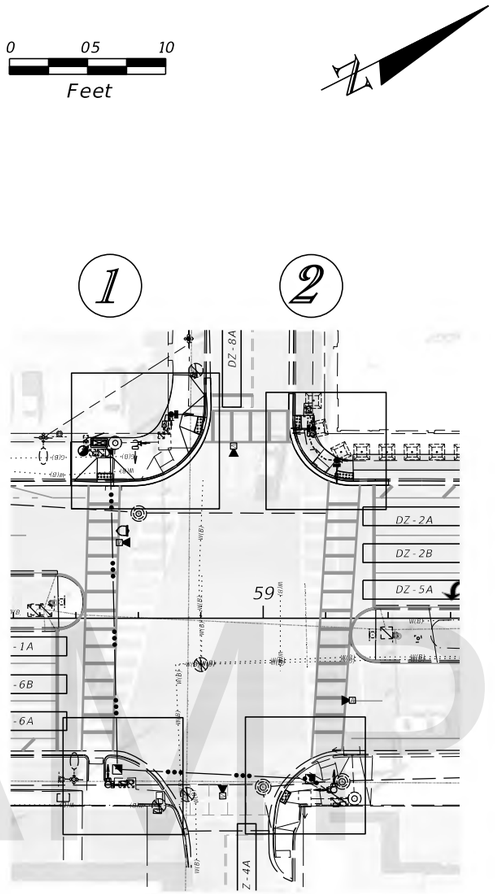
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 19	LAKE	437938-1-52-01

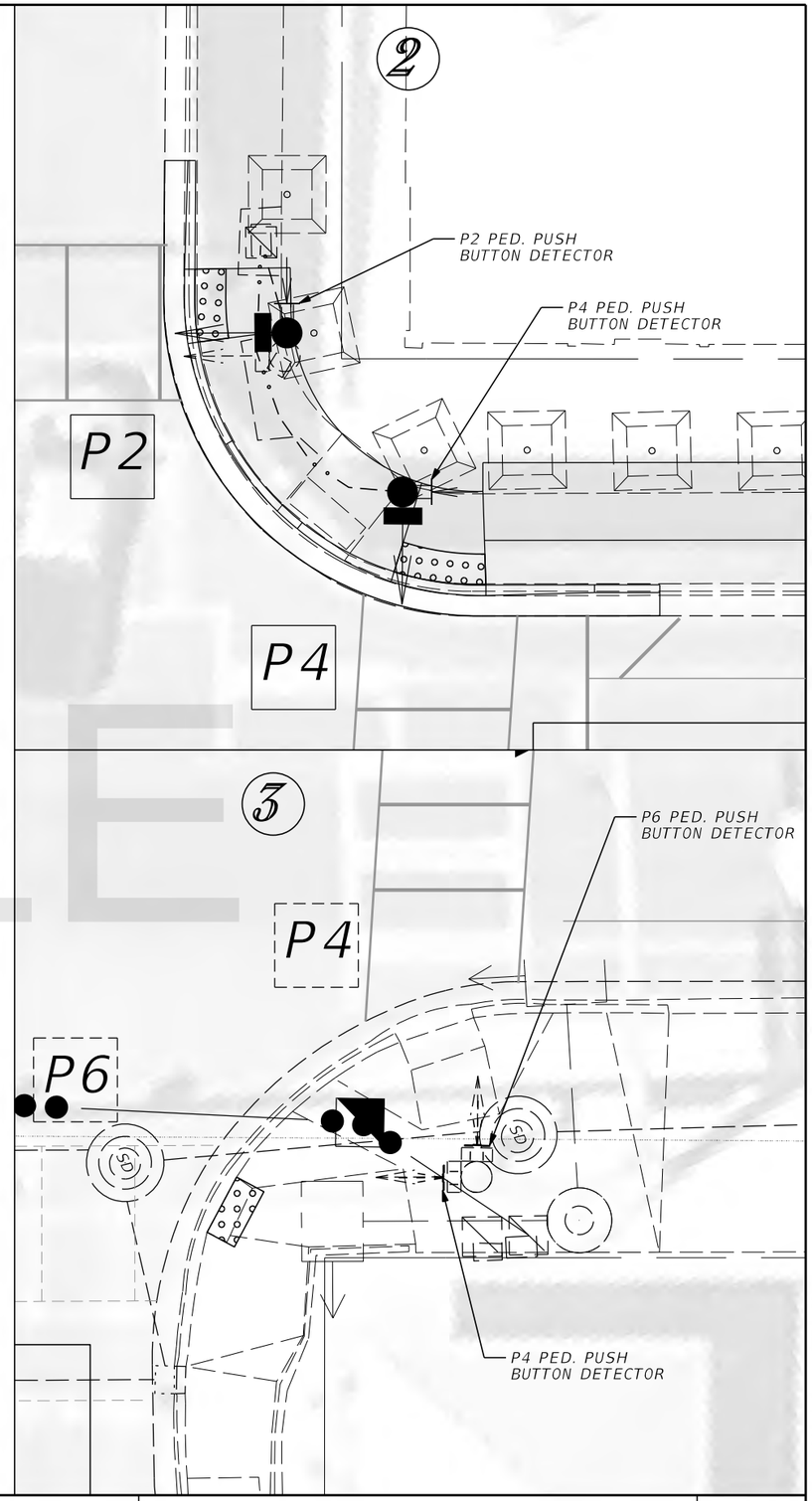
SIGNALIZATION PLAN

SHEET NO.





SR 19 @ CASSADY ST / GUERRANT ST



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN
Aymon A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 19	LAKE	437938-1-52-01

SIGNAL SPECIAL DETAIL

SHEET NO.

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

SIGNAL ID	BIU NO.	CARD NO.	CHANNEL NO.	DETECTOR ID	DETECTOR	DIRECTION	MOVEMENT TYPE	APP. SPEED MPH	PROTECTED PHASE	PERMISSIVE PHASE	OVERLAP	DELAY SEC.	CAMERA ID	DETECTOR SYSTEM	ZONE SIZE	DISTANCE TO STOP BAR	DETECTOR TYPE	LANE TYPE	LANE NO.
			1	XXXXX01	DZ-1A	NB	L	35	1			5	V3	VIDEO	45'X8'	0	PD	V	*
		1	2	XXXXX02	DZ-1B	NB	L	35	1				V3	VIDEO	10'X8'	130	AD, QD	V	*
			3	XXXXX03	DZ-2A	SB	TR	35	2	5		5	V1	VIDEO	45'X8'	0	PD	V	*
		2	4	XXXXX04	DZ-2B	SB	T	35	2	5			V1	VIDEO	45'X8'	0	PD	V	*
			5	XXXXX05	DZ-2C	SB	TR	35	2	5			V1	VIDEO	10'X8'	130	AD	V	*
		3	6	XXXXX06	DZ-2D	SB	T	35	2	5			V1	VIDEO	10'X8'	130	AD	V	*
			7	XXXXX07	DZ-4A	WB	LTR	25	4			5	V2	VIDEO	45'X8'	0	PD	V	*
	1	4	8	XXXXX08	DZ-4B	WB	LTR	25	4				V2	VIDEO	10'X8'	100	AD	V	*
			9	XXXXX09	DZ-5A	SB	L	35	5			5	V1	VIDEO	45'X8'	0	PD	V	*
		5	10	XXXXX10	DZ-5B	SB	L	35	5				V1	VIDEO	10'X8'	130	AD, QD	V	*
			11	XXXXX11	DZ-6A	NB	TR	35	6	1		5	V3	VIDEO	45'X8'	0	PD	V	*
		6	12	XXXXX12	DZ-6B	NB	T	35	6	1			V3	VIDEO	45'X8'	0	PD	V	*
			13	XXXXX13	DZ-6C	NB	TR	35	6	1			V3	VIDEO	10'X8'	130	AD	V	*
		7	14	XXXXX14	DZ-6D	NB	T	35	6	1			V3	VIDEO	10'X8'	130	AD	V	*
			15	XXXXX15	DZ-8A	EB	LTR	25	8			5	V4	VIDEO	45'X8'	0	PD	V	*
		8	16	XXXXX16	DZ-8B	EB	LTR	25	8				V4	VIDEO	10'X8'	100	AD	V	*
			17	XXXXX17	SPARE														
		9	18	XXXXX18	SPARE														
			19	XXXXX19	SPARE														
		10	20	XXXXX20	SPARE														
			21	XXXXX21	SPARE														
		11	22	XXXXX22	SPARE														
			23	XXXXX23	SPARE														
XXXXX	2	12	24	XXXXX24	SPARE														
			25	XXXXX25	SPARE														
		13	26	XXXXX26	SPARE														
			27	XXXXX27	SPARE														
		14	28	XXXXX28	SPARE														
			29	XXXXX29	SPARE														
		15	30	XXXXX30	SPARE														
			31	XXXXX31	SPARE														
		16	32	XXXXX32	SPARE														
			33	XXXXX33	SPARE														
		17	34	XXXXX34	SPARE														
			35	XXXXX35	SPARE														
		18	36	XXXXX36	SPARE														
			37	XXXXX37	SPARE														
		19	38	XXXXX38	SPARE														
			39	XXXXX39	SPARE														
	3	20	40	XXXXX40	SPARE														
			41	XXXXX41	SPARE														
		21	42	XXXXX42	SPARE														
			43	XXXXX43	SPARE														
		22	44	XXXXX44	SPARE														
			45	XXXXX45	SPARE														
		23	46	XXXXX46	SPARE														
			47	XXXXX47	SPARE														
		24	48	XXXXX48	SPARE														

LEGEND:
PD - PRESENCE DETECTION
AD - ADVANCE DETECTION
V - VEHICLE, B - BIKE
LTR - LEFT-THRU-RIGHT
QD - QUEUE DETECTION
L - LEFT, T - THRU, R - RIGHT
TL - LEFT-THRU, TR - THRU-RIGHT

* CONFIRM THE LANE NUMBER VALUES WITH LAKE COUNTY ENGINEERING DEPT DURING CONSTRUCTION.

SR 19 AT CASSADY ST / GUERRANT ST

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN
Ayman A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 19	LAKE	437938-1-52-01

DETECTOR CHART (1)

SHEET NO.

PEDESTRIAN SIGNAL HEAD DETAILS

P2 P4 P8

PED. SIGNAL COUNT-DOWN 1-SECT., 1-WAY

653-1-11 5 AS

PEDESTRIAN SIGN DETAIL

START CROSSING Watch For Vehicles | DON'T START Finish Crossing If Started | TIME REMAINING To Finish Crossing | DON'T CROSS | PUSH BUTTON TO CROSS | STREET NAME

OR

START CROSSING Watch For Vehicles | DON'T START Finish Crossing If Started | TIME REMAINING To Finish Crossing | DON'T CROSS | PUSH BUTTON TO CROSS | STREET NAME

R10-3i 9"X15" 8 EA

R SY FY G — 1 5

4-SECT., 1-WAY W/ BACK-PLATES 2 AS

650-1-16

R Y G — 2 6 4 8

3-SECT., 1-WAY W/ BACK-PLATES 8 AS

650-1-14

S.O.P.-7

PHASE 1 | PHASE 2 (or) | PHASE 3 | PHASE 4

REPLCAE EXISTING PULL BOXES, INTERCEPT EXIST. CONDUIT

2 EA 635-2-11

EXISTING PED. PEDESTAL-6 TO REMAIN

1 EA 700-3-101

1 EA 700-3-601

REMOVAL ITEMS

632-7-6	1 PI
639-1-610	1 AS
639-2-6	180 LF
641-2-70	2 EA
670-5-600	1 EA

PED. PEDESTAL-4 STA. 75+34, 37'LT
PED. PEDESTAL-5 STA. 75+62, 72'LT

2 RUNS (SIGNAL) @ 45 LF 630-2-11
2 EA 646-1-11
2 EA 665-1-11

6 RUNS @ 105 LF
2-SIGNAL,2-VIDEO,2-SPARE

105 LF 630-2-12

MAST ARM POLE-3, ELEV. 96.15'+0.5', STA. 75+22, 38'LT

4 RUNS @ 30 LF 630-2-11
1 EA 649-21-3
1 EA 660-4-12

3 RUNS @ 55 LF 2-SIGNAL

630-2-11 55 LF

MAST ARM POLE-4, ELEV. 96.87+0.5', STA. 76+23, 50'LT

630-2-11	4 RUNS @ 30 LF
635-3-12	1 EA
649-21-10	1 EA
660-4-12	2 EA
660-9-12	1 EA
684-5-1	1 EA

630-2-11 2 RUNS (SIGNAL) @ 10 LF
646-1-11 1 EA
665-1-11 1 EA

PED. PEDESTAL-7 STA. 76+56, 37'LT

630-2-12 70 LF
6 RUNS @ 70 LF
2-SIGNAL,2-VIDEO, 2-SPARE

14 EA 635-2-11

NOTES:

1. THE MAJOR STREET IS SR 19 (N. CENTRAL AVE). THE MINOR STREET IS W.OCALA ST/BULLDOG LN.
2. THE POSTED SPEED LIMIT WITHIN THE INTERSECTION LIMITS ALONG SR 19 IS 35 MPH.
3. REPLACE ALL R10-3i PANELS. THE ARROWS ON SIGN R10-3i SHALL POINT IN THE DIRECTION OF THE CROSSING. THE SIGN PANELS SHALL BE PLACED DIRECTLY ABOVE THE INTENDED PUSH BUTTON.
4. EXISTING TIMINGS TO REMAIN UNLESS NOTED IN THE PLANS. TIMINGS ARE PRELIMINARY AND MAY REQUIRE FIELD ADJUSTMENT AS DIRECTED BY THE MAINTAINING AGENCY.
5. MAINTAINING AGENCY TO DETERMINE THE OPERATION OF 4-SECTION SIGNAL HEADS FOR THE TIME OF DAY.
6. EXISTING LOOPS SHALL BE ABANDONED.
7. REMOVE ALL ABANDONED PULL BOXES.

0 10 40 Feet

W OCALA ST (35 MPH)

APPARENT R/W LINE

UMATILLA BLVD (NOT PART OF SIGNALIZED INTERSECTION)

(35 MPH) SR 19

℄ SURVEY SR 19

SR 19 (35 MPH)

SCHOOL SCHOOL

135' FROM STOP BAR (TYP.)

DZ-1A DZ-1B DZ-2A DZ-2B DZ-4A DZ-4B DZ-5A DZ-5B DZ-6A DZ-6B DZ-6C DZ-6D DZ-8A DZ-8B

ELEV. 96.33 | ELEV. 96.83 | ELEV. 96.22

1 EA 646-1-60 GAS LINE

POLE-5, ELEV. 97.35'+0.5', STA. 76+57, 35'RT

630-2-11	4 RUNS @ 10 LF
649-21-3	1 EA
660-4-12	1 EA

PED. PEDESTAL-8 STA. 76+52, 34'RT

630-2-11 2 RUNS (SIGNAL) @ 10 LF
646-1-11 1 EA
665-1-11 1 EA

RELOCATE PED. PEDESTAL-1 TO STA. 76+37, 36'RT

630-2-11 2 RUNS (SIGNAL) @ 10 LF
646-1-40 1 EA
700-3-101 1 EA
700-3-601 1 EA

630-2-11 (1-POWER) 90 LF
639-2-1 130 LF

POWER SOURCE- EXISTING UTILITY POLE W/ TRANSFORMER

APPARENT R/W LINE

HATFIELD DR

PROPOSED CABINET (8X10)

80 LF	630-2-11
1 PI	632-7-1
1 EA*	635-2-13
1 EA	660-4-11
1 EA	660-9-11
1 EA	663-1-121
1 EA	663-1-122
1 AS	670-5-111
1 EA	684-1-1
1 EA	684-5-1
1 EA	685-2-1
1 EA	695-8-11

*635-2-13 IS FOR FUTURE USE

PROPOSED POWER PEDESTAL

15 LF	630-2-11
1 AS	639-1-122
30 LF	639-2-1
1 EA	641-2-12

RELOCATE PED. PEDESTAL-2 TO STA. 75+62, 47.5'RT

2 RUNS (SIGNAL) @ 10 LF 630-2-11
1 EA 646-1-40
1 EA 700-3-101
1 EA 700-3-601

PED. PEDESTAL-3 STA. 75+50, 50'RT

2 RUNS (SIGNAL) @ 15 LF 630-2-11
1 EA 646-1-11
1 EA 665-1-11

6 RUNS @ 110 LF
2-SIGNAL,2-VIDEO,2-SPARE

110 LF 630-2-12

D — LEFT TURN YIELD ON FLASHING YELLOW ARROW

(FUTURE PANELS) FTP-85-13 3'0"X2'6" (2 EA)

S — YIELD TO

(BLANK-OUT SIGN) R1-5 (MOD) 3'0"X3'0" (4 EA)

700-11-391 1 AS

P — FRONT: Bulldog Ln ← Ocala St / Bulldog Ln → Ocala St; BACK — 7.5'X2.0' 1 EA

Q — FRONT: Bulldog Ln → Ocala St / Bulldog Ln ← Ocala St; BACK — 7.5'X2.0' 1 EA

R — SR 19 — 6.0'X2.0' 1 EA

FREE SWINGING, DOUBLE SIDED, LED ILLUMINATED OVERHEAD SNS

700-5-21 1 EA
700-5-22 2 EA

LEGEND:

IMC CAMERA (INTERSECTION MOVEMENT COUNTS)

VVDS (PRESENCE, ADVANCE, QUEUE)

CONTROLLER TIMINGS

TIMING FUNCTION	MOVEMENT NUMBER	1	2	3	4	5	6	7	8
	MINIMUM GREEN								
	EXTENSION		3.5				3.5		
	MAXIMUM GREEN 1								
	MAXIMUM GREEN 2								
	YELLOW CLEARANCE	4	4		3.4	4	4		4
	ALL RED	3.8	2.4		3.5	2.6	2.3		2.5
	PEDESTRIAN WALK		7		7		7		7
	PED. CLEARANCE		12		16		16		22
	RECALL		MIN				MIN		

TIMING FUNCTION

SAMPLE

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN

Aymon A. Mohomed, P.E., P.T.O.E. No.: 61777

719 South Woodland Blvd. DeLand, Florida 32720

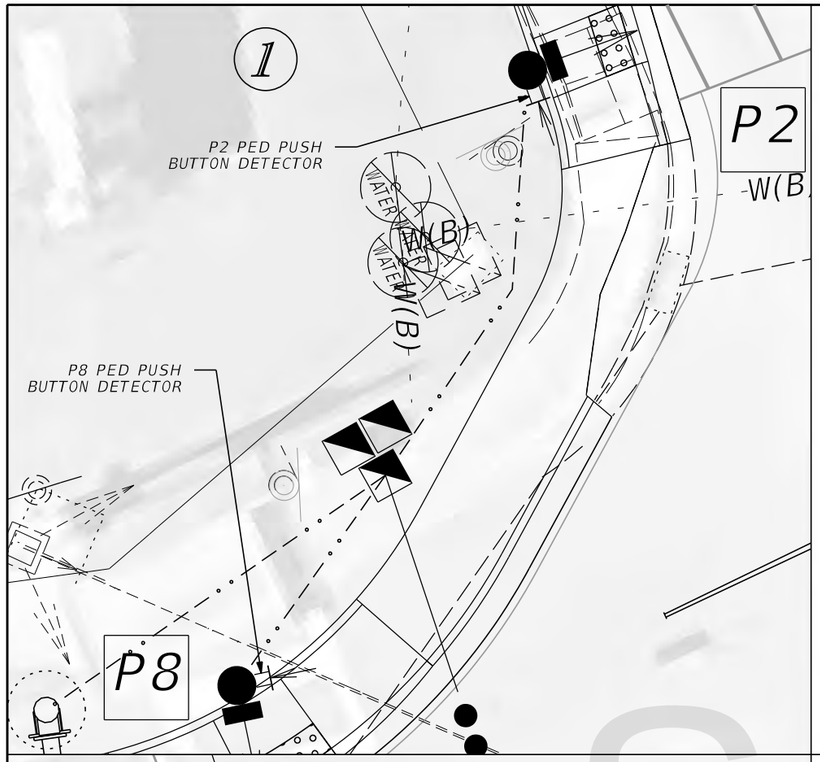
STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

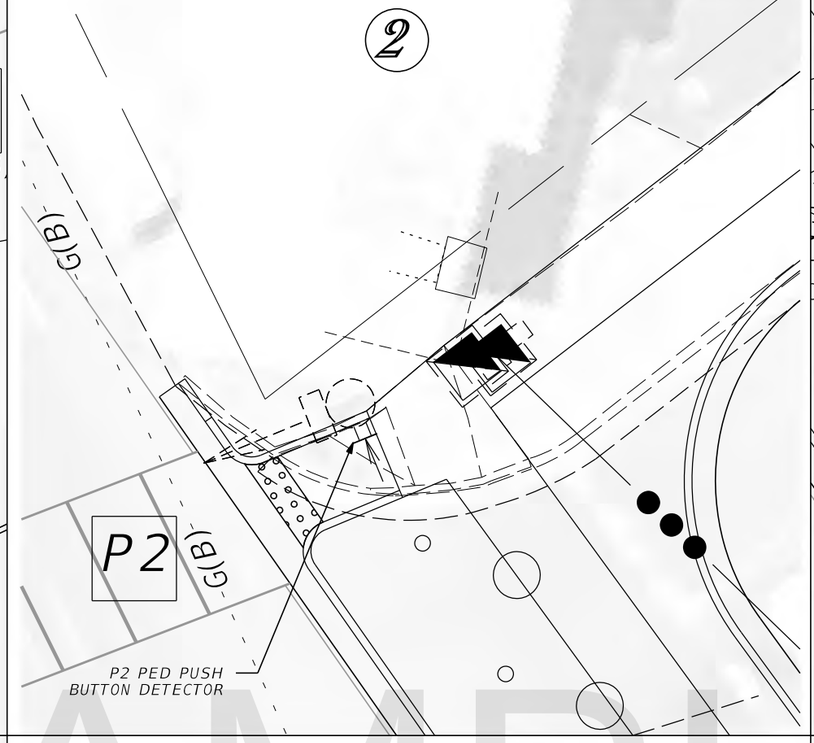
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 19	LAKE	437938-1-52-01

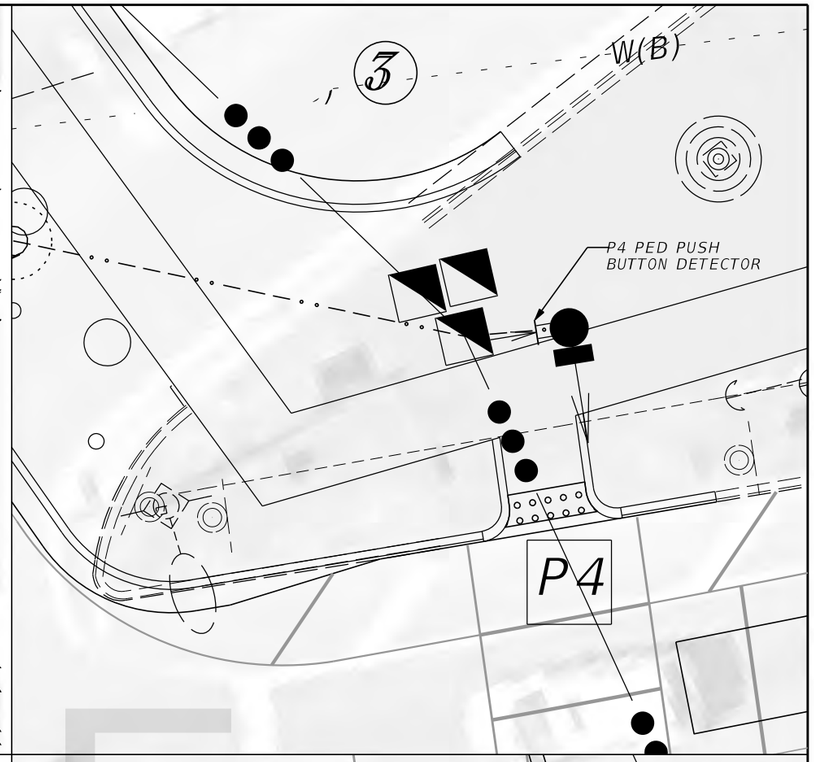
SIGNALIZATION PLAN

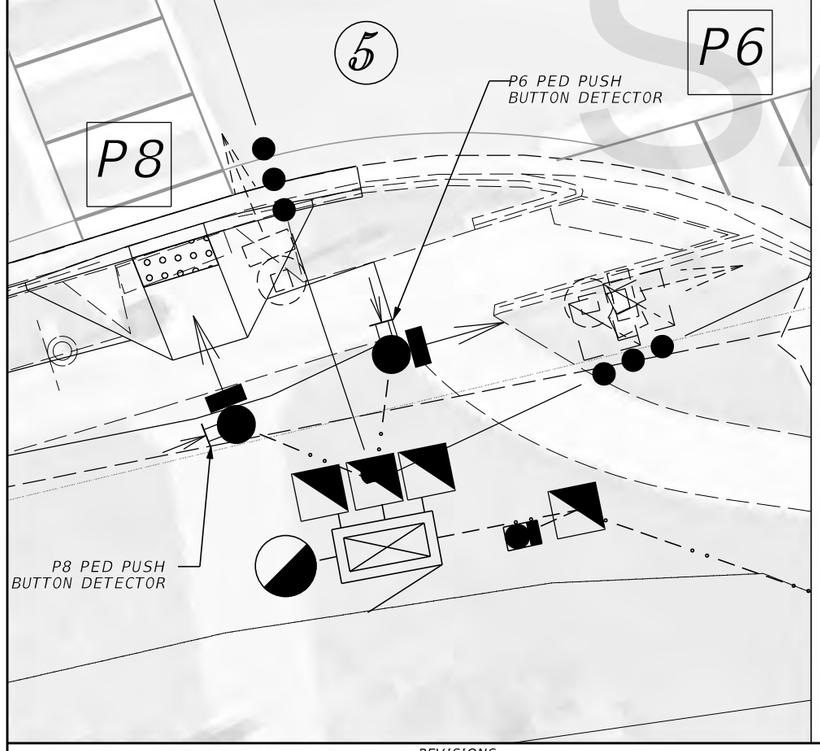
SHEET NO.

KNHNTSV 7/27/2021 3:28:31 PM Default C:\projects\4379381520l\signals\PLANSG02 - mastarm.dgn



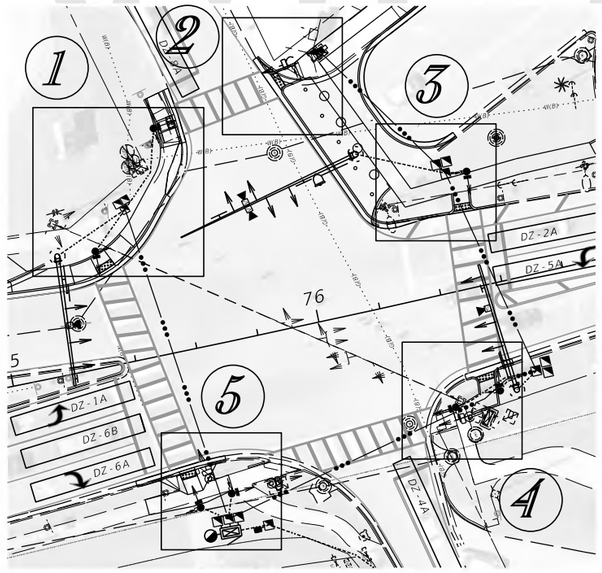


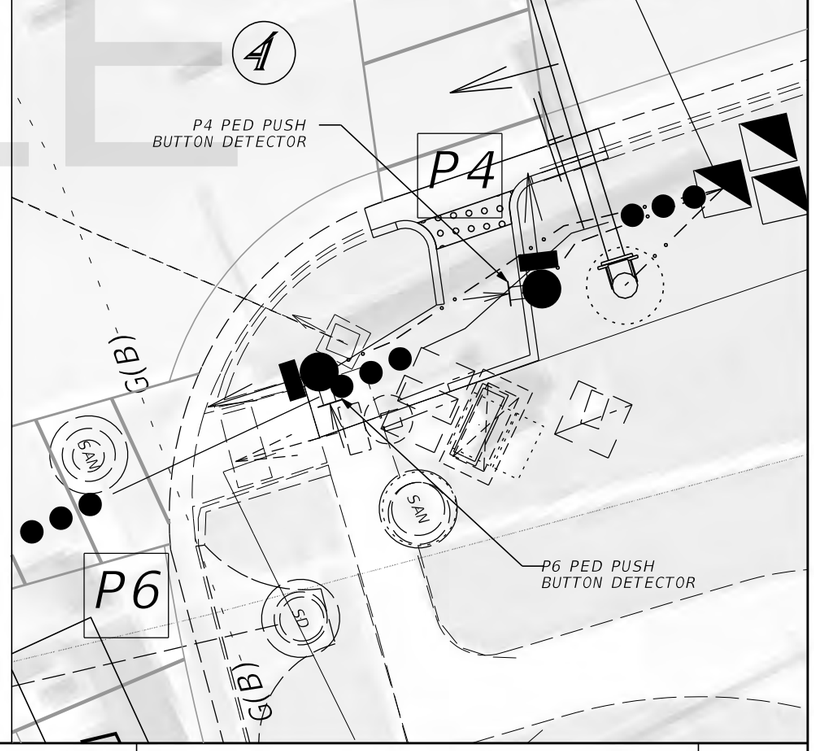




0 05 10
Feet

SR 19 AT W.OCALA ST / BULLDOG LN





REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN

Aymon A. Mohamed, P.E., P.T.O.E.
No.: 61777

719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 19	LAKE	437938-1-52-01

SIGNAL SPECIAL DETAIL

SHEET NO.

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

SIGNAL ID	BIU NO.	CARD NO.	CHANNEL NO.	DETECTOR ID	DETECTOR	DIRECTION	MOVEMENT TYPE	APP. SPEED MPH	PROTECTED PHASE	PERMISSIVE PHASE	OVERLAP	DELAY SEC.	CAMERA ID	DETECTOR SYSTEM	ZONE SIZE	DISTANCE TO STOP BAR	DETECTOR TYPE	LANE TYPE	LANE NO.
			1	XXXXX01	DZ-1A	NB	L	35	1			5	V3	VIDEO	45'X8'	0	PD	V	*
		1	2	XXXXX02	DZ-1B	NB	L	35	1				V3	VIDEO	10'X8'	130	AD	V	*
			3	XXXXX03	DZ-2A	SB	TR	35	2	5		5	V1	VIDEO	45'X8'	0	PD	V	*
		2	4	XXXXX04	DZ-2B	SB	TR	35	2	5			V1	VIDEO	10'X8'	130	AD	V	*
			5	XXXXX05	DZ-4A	WB	LTR	25	4			5	V2	VIDEO	45'X8'	0	PD	V	*
		3	6	XXXXX06	DZ-4B	WB	LTR	25	4				V2	VIDEO	10'X8'	100	AD	V	*
			7	XXXXX07	DZ-5A	SB	L	35	5			5	V1	VIDEO	45'X8'	0	PD	V	*
	1	4	8	XXXXX08	DZ-5B	SB	L	35	5				V1	VIDEO	10'X8'	130	AD	V	*
			9	XXXXX09	DZ-6A	NB	R	35	6	1		5	V3	VIDEO	45'X8'	0	PD	V	*
		5	10	XXXXX10	DZ-6B	NB	T	35	6	1			V3	VIDEO	45'X8'	0	PD	V	*
			11	XXXXX11	DZ-6C	NB	R	35	6	1			V3	VIDEO	10'X8'	130	AD	V	*
		6	12	XXXXX12	DZ-6D	NB	T	35	6	1			V3	VIDEO	10'X8'	130	AD	V	*
			13	XXXXX13	DZ-8A	EB	LTR	35	8			5	V4	VIDEO	45'X8'	0	PD	V	*
		7	14	XXXXX14	DZ-8B	EB	LTR	35	8				V4	VIDEO	10'X8'	100	AD	V	*
			15	XXXXX15	SPARE														
		8	16	XXXXX16	SPARE														
			17	XXXXX17	SPARE														
		9	18	XXXXX18	SPARE														
			19	XXXXX19	SPARE														
		10	20	XXXXX20	SPARE														
			21	XXXXX21	SPARE														
		11	22	XXXXX22	SPARE														
			23	XXXXX23	SPARE														
XXXXX	2	12	24	XXXXX24	SPARE														
			25	XXXXX25	SPARE														
		13	26	XXXXX26	SPARE														
			27	XXXXX27	SPARE														
		14	28	XXXXX28	SPARE														
			29	XXXXX29	SPARE														
		15	30	XXXXX30	SPARE														
			31	XXXXX31	SPARE														
		16	32	XXXXX32	SPARE														
			33	XXXXX33	SPARE														
		17	34	XXXXX34	SPARE														
			35	XXXXX35	SPARE														
		18	36	XXXXX36	SPARE														
			37	XXXXX37	SPARE														
		19	38	XXXXX38	SPARE														
			39	XXXXX39	SPARE														
	3	20	40	XXXXX40	SPARE														
			41	XXXXX41	SPARE														
		21	42	XXXXX42	SPARE														
			43	XXXXX43	SPARE														
		22	44	XXXXX44	SPARE														
			45	XXXXX45	SPARE														
		23	46	XXXXX46	SPARE														
			47	XXXXX47	SPARE														
		24	48	XXXXX48	SPARE														

LEGEND:
PD - PRESENCE DETECTION
AD - ADVANCE DETECTION
V - VEHICLE, B - BIKE
LTR - LEFT-THRU-RIGHT

QD - QUEUE DETECTION
L - LEFT, T - THRU, R - RIGHT
TL - LEFT-THRU, TR - THRU-RIGHT

* CONFIRM THE LANE NUMBER VALUES WITH LAKE COUNTY ENGINEERING DEPT DURING CONSTRUCTION.

SR 19 AT W.OCALA ST / BULLDOG LN

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN
Ayman A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 19	LAKE	437938-1-52-01

DETECTOR CHART (2)

SHEET NO.

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

NOTES:
1. SIGNAL MAINTAINING AGENCY IS THE CITY OF DAYTONA BEACH.
2. MAJOR STREET IS SR A1A (ATLANTIC AVE) SPEED LIMIT IS 30 MPH.
3. MINOR STREET IS WILLIAMS AVE (SPEED LIMIT 30 MPH).
4. ALL PROPOSED TRAFFIC SIGNALS TO INCLUDE FLEXIBLE RETROREFLECTIVE BACKPLATES.
5. COVER HOLES LEFT BEHIND IN STRAIN POLES AFTER REMOVING EXISTING PED SIGNALS AND PED DETECTORS. COST TO COVER THE HOLES TO BE INCLUDED IN THE RESPECTIVE REMOVAL PAY ITEM.
6. CONTROLLER TIMINGS ADJUSTMENTS WILL BE DICTATED BY THE DEPARTMENT OF TRANSPORTATION AND MAY BE IMPLEMENTED BY THE MAINTAINING AGENCY ENGINEER PER THE TSMCA.
7. NOTIFY OWNER FOR THE REMOVAL OF IRRIGATION.

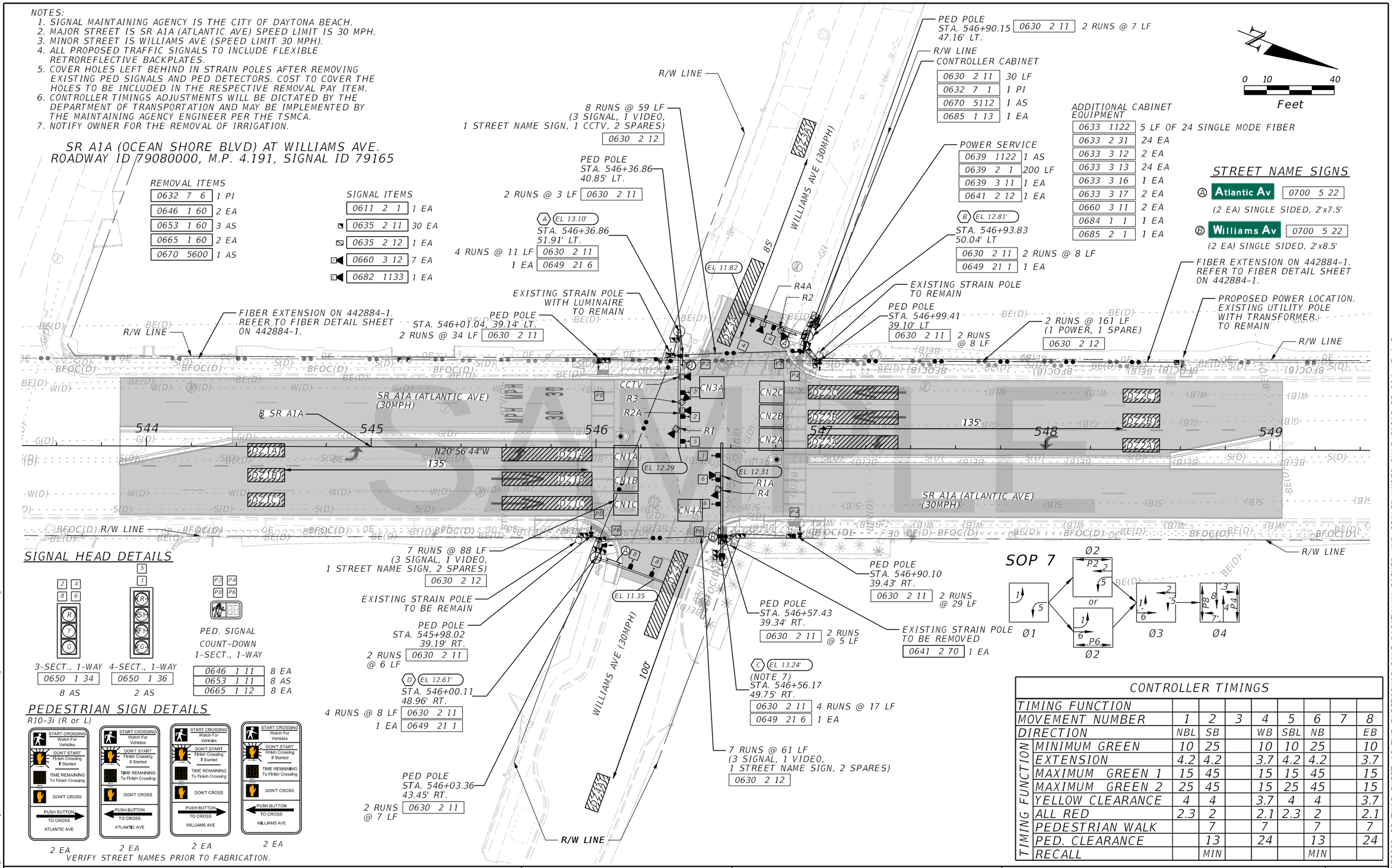
SR A1A (OCEAN SHORE BLVD) AT WILLIAMS AVE.
ROADWAY ID 79080000, M.P. 4.191, SIGNAL ID 79165

REMOVAL ITEMS

0632 7 6	1 PI
0646 1 60	2 EA
0653 1 60	3 AS
0665 1 60	2 EA
0670 5600	1 AS

SIGNAL ITEMS

0611 2 1	1 EA
0635 2 11	30 EA
0635 2 12	1 EA
0660 3 12	7 EA
0682 1133	1 EA



SIGNAL HEAD DETAILS

3-SECT., 1-WAY 0650 1 34 — 8 AS
4-SECT., 1-WAY 0650 1 36 — 2 AS

PED. SIGNAL COUNT-DOWN 1-SECT., 1-WAY

0646 1 11	8 EA
0653 1 11	8 AS
0665 1 12	8 EA

PEDESTRIAN SIGN DETAILS

R10-3i (R or L)

2 EA 2 EA 2 EA 2 EA

VERIFY STREET NAMES PRIOR TO FABRICATION.

SOP 7

CONTROLLER TIMINGS

TIMING FUNCTION								
MOVEMENT NUMBER	1	2	3	4	5	6	7	8
DIRECTION	NBL	SB		WB	SBL	NB		EB
TIMING FUNCTION: MINIMUM GREEN	10	25		10	10	25		10
EXTENSION	4.2	4.2		3.7	4.2	4.2		3.7
MAXIMUM GREEN 1	15	45		15	15	45		15
MAXIMUM GREEN 2	25	45		15	25	45		15
YELLOW CLEARANCE	4	4		3.7	4	4		3.7
ALL RED	2.3	2		2.1	2.3	2		2.1
PEDESTRIAN WALK		7		7		7		7
PED. CLEARANCE		13		24		13		24
RECALL		MIN				MIN		

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
EREZ DAYAN, P.E.
LICENSE NUMBER: 62144
AVANT ENGINEERING GROUP, LLC
2699 LEE ROAD, SUITE 401
WINTER PARK, FL 32789

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

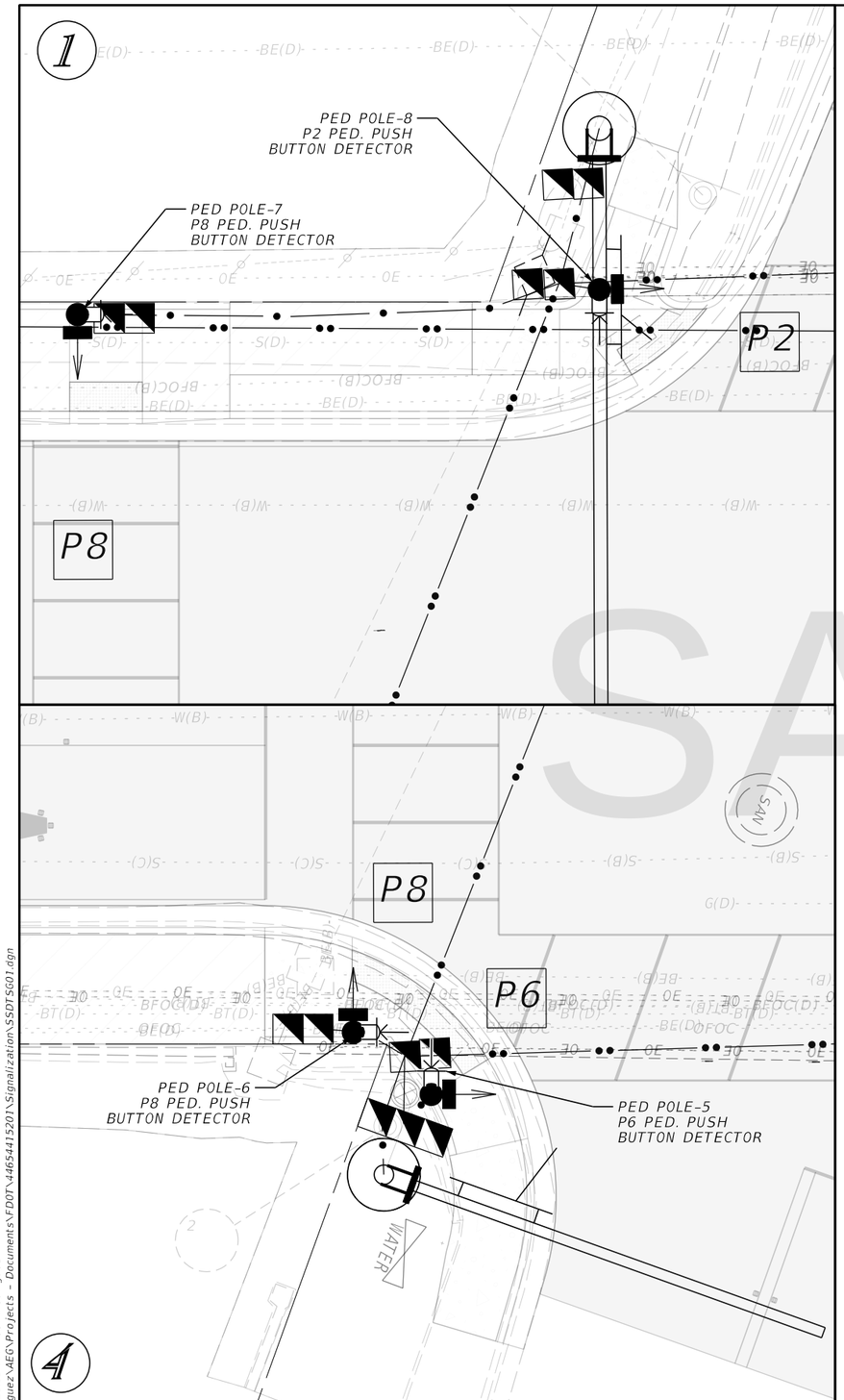
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR A1A	VOLUSIA	446544-1-52-01

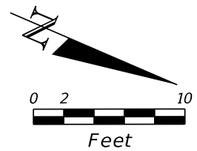
SIGNALIZATION PLAN (WILLIAMS AV)

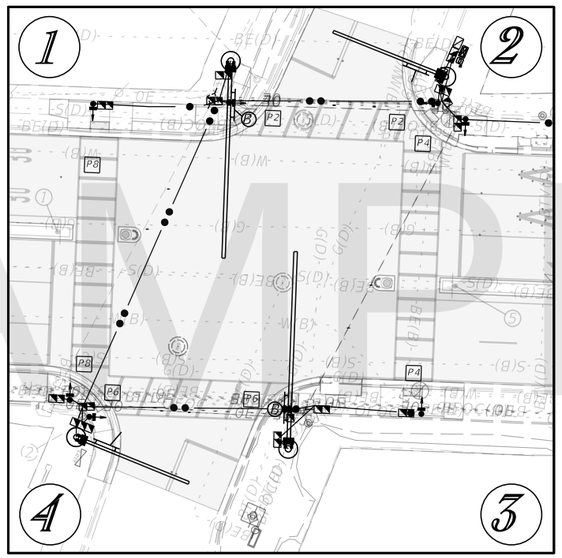
SHEET NO.

12/6/2023 5:57:37 PM NoemiRodriguez
C:\Users\NoemiRodriguez\AEG\Projects - Documents\FDOT\4465441520\Signalization\PLANS01.dgn

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

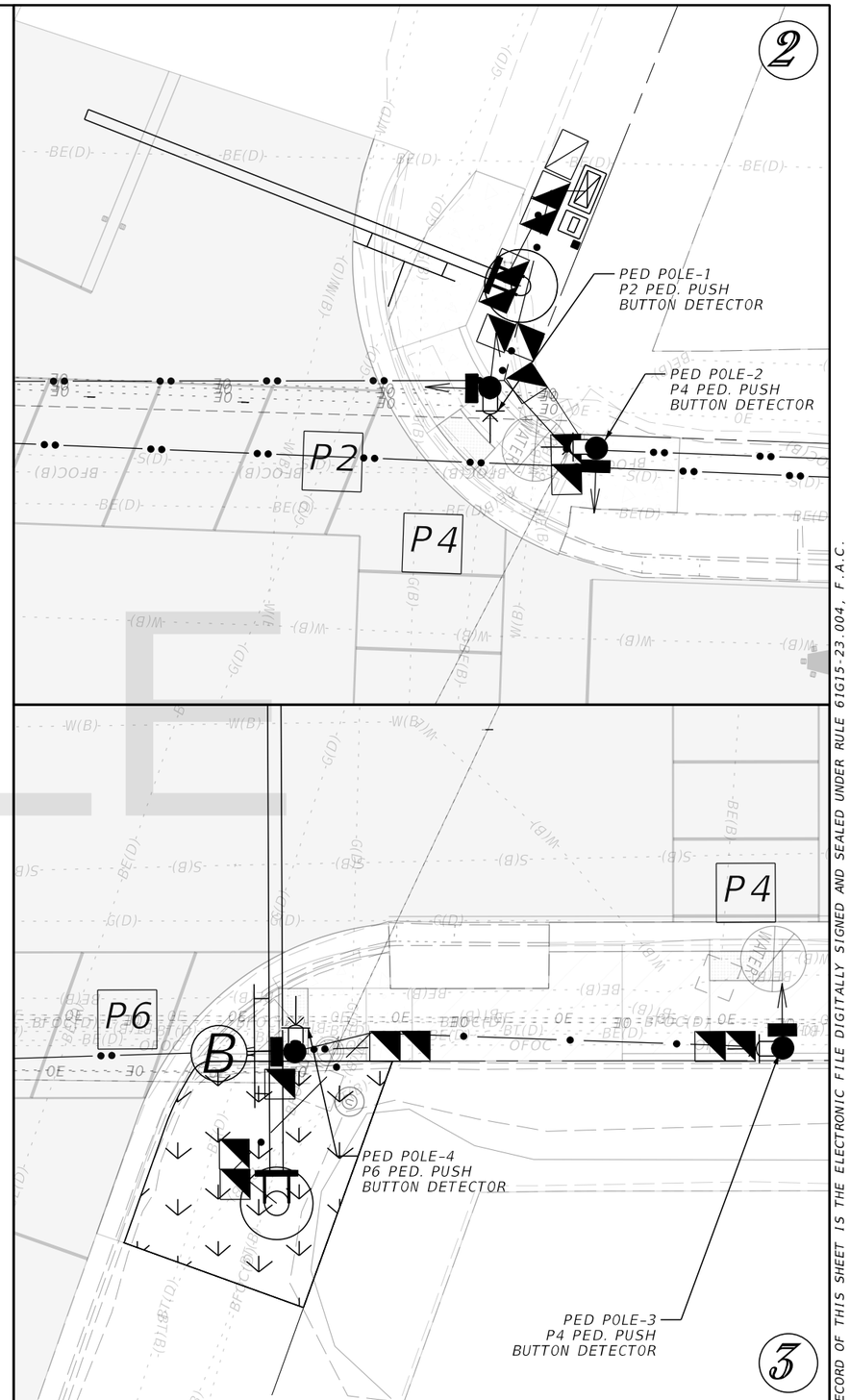






N.T.S

WILLIAMS AV/ SR A1A



PEDESTRIAN DETECTOR LEGEND

LOCATION OF PEDESTRIAN DETECTOR

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			PEDESTRIAN BUTTON DETAIL (WILLIAMS AV)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	EREZ DAYAN, P.E. LICENSE NUMBER: 62144 AVANT ENGINEERING GROUP, LLC 2699 LEE ROAD, SUITE 401 WINTER PARK, FL 32789	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR A1A	VOLUSIA	446544-1-52-01		

12/6/2023 10:20:09 AM NoemiRodriguez
C:\Users\NoemiRodriguez\AEG\Projects - Documents\FDOT\446544152O1\Signalization\SSDTSG01.dgn

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

SIGNAL ID	BIU NO.	CARD NO.	CHANNEL NO.	DETECTOR ID	DETECTOR	DIRECTION	MOVEMENT TYPE	MPH	DELAY TIME	CAMERA ID	DETECTOR SYSTEM	DISTANCE TO STOP BAR	DETECTOR TYPE	LANE TYPE	LANE NUMBER
79165	1	1	1	7916501	DZ-1A	NB	L	30	5	R1	RADAR	5' PAST STOP BAR	PD	V	*
			2	7916502	DZ-1B	NB	T	30		R1	RADAR	5' PAST STOP BAR	PD	V	*
		2	3	7916503	DZ-1C	NB	T & R	30		R1	RADAR	5' PAST STOP BAR	PD	V	*
			4	7916504	DZ-1A1	NB	L	30	5	R1A	RADAR	END OF LTL	QD	V	*
		3	5	7916505	DZ-1B1	NB	T	30		R1A	RADAR	135'	AD	V	*
			6	7916506	DZ-1C1	NB	T & R	30		R1A	RADAR	135'	AD	V	*
		4	7	7916507	CN-1A	NB	L	30		R1	RADAR	0**	CD	V	*
			8	7916508	CN-1B	NB	T	30		R1	RADAR	0**	CD	V	*
		5	9	7916509	CN-1C	NB	T & R	30		R1	RADAR	0**	CD	V	*
			10	7916510	DZ-2A	SB	L	30	5	R2	RADAR	5' PAST STOP BAR	PD	V	*
		6	11	7916511	DZ-2B	SB	T	30		R2	RADAR	5' PAST STOP BAR	PD	V	*
			12	7916512	DZ-2C	SB	T & R	30		R2	RADAR	5' PAST STOP BAR	PD	V	*
		7	13	7916513	DZ-2A1	SB	L	30	5	R2A	RADAR	END OF LTL	QD	V	*
			14	7916514	DZ-2B1	SB	T	30		R2A	RADAR	135'	AD	V	*
		8	15	7916515	DZ-2C1	SB	T & R	30		R2A	RADAR	135'	AD	V	*
			16	7916516	CN-2A	SB	L	30		R2	RADAR	0**	CD	V	*
	2	9	17	7916517	CN-2B	SB	T	30		R2	RADAR	0**	CD	V	*
			18	7916518	CN-2C	SB	T & R	30		R2	RADAR	0**	CD	V	*
		10	19	7916519	DZ-3A	EB	L,T,R	30	5	R3	RADAR	5' PAST STOP BAR	PD	V	*
			20	7916520	DZ-3A1	EB	L,T,R	30	5	R3	RADAR	85'	ADv	V	*
		11	21	7916521	CN-3A	EB	L,T,R	30		R3	RADAR	0**	CD	V	*
			22	7916522	DZ-4A	WB	L,T,R	30	5	R4	RADAR	5' PAST STOP BAR	PD	V	*
		12	23	7916523	DZ-4A1	WB	L,T,R	30	5	R4A	RADAR	100'	AD	V	*
			24	7916524	CN-4A	WB	L,T,R	30		R4	RADAR	0**	CD	V	*
		13	25	7916525	SPARE										
			26	7916526	SPARE										
		14	27	7916527	SPARE										
			28	7916528	SPARE										
		15	29	7916529	SPARE										
			30	7916530	SPARE										
		16	31	7916531	SPARE										
			32	7916532	SPARE										
	3	17	33	7916533	SPARE										
			34	7916534	SPARE										
		18	35	7916535	SPARE										
			36	7916536	SPARE										
		19	37	7916537	SPARE										
			38	7916538	SPARE										
		20	39	7916539	SPARE										
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		21	41	7916541	SPARE										
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		24	47	7916547	SPARE										
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	4	25	49	7916549	SPARE										
			50	7916550	SPARE										
		26	51	7916551	SPARE										
			52	7916552	SPARE										
		27	53	7916553	SPARE										
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		28	55	7916555	SPARE										
			56	7916556	SPARE										
		29	57	7916557	SPARE										
			58	7916558	SPARE										
		30	59	7916559	SPARE										
			60	7916560	SPARE										
		31	61	7916561	SPARE										
			62	7916562	SPARE										
		32	63	7916563	SPARE										
			64	7916564	SPARE										

** ADVANCED DETECTION LANE BY LANE PENDING MANUFACTURERS INPUT

LTL= LEFT TURN LANE PD = PRESENCE DETECTION AD=ADVANCED DETECTION ADv= ADVANCED DETECTION(FOR VOLUMES AND DATA - ANOTHER DETECTION ZONE TO BE PROGRAM WITH PRESENCE DETECTION DEVICE) QD= QUEUE DETECTION AT END OF LTL

CD=COUNTING DETECTION (MOVEMENT COUNTS) 0** = COUNTING ZONES PRIOR TO STOP BAR, COORDINATED WITH MANUFACTURER DURING CONSTRUCTION

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			DETECTOR CHART (WILLIAMS AV)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
				EREZ DAYAN, P.E. LICENSE NUMBER: 62144 AVANT ENGINEERING GROUP, LLC 2699 LEE ROAD, SUITE 401 WINTER PARK, FL 32789	SR A1A	VOLUSIA	446544-1-52-01		

630-2-11	90 LF (9 X10 LF)
632-7-1	1 PI
633-1-121	20+50 LF (SLACK) 12 SM DROP
633-2-31	4 EA
633-3-12	1 EA
633-3-16	1 EA
635-2-13	1 EA
660-1-109	8 EA
660-1-110	4 EA
660-4-11	1 EA
660-6-121	1 EA
660-6-122	1 EA
660-9-11	1 EA
663-1-400	1 EA (COMPLETE SYSTEM)
670-5-111	1 AS
684-1-1	1 EA
685-1-13	1 EA
685-2-1	1 EA

NOTES:

1. *THE MAJOR STREET IS JOHN YOUNG PKWY. THE MINOR STREET IS "THE OAKS BLVD".*
2. *THE POSTED SPEED LIMIT WITHIN THE INTERSECTION LIMITS ALONG JOHN YOUNG PKWY IS 45 MPH.*
3. *THE ARROWS ON SIGN R10-3i SHALL POINT IN THE DIRECTION OF THE CROSSING. THE SIGN PANELS SHALL BE PLACED DIRECTLY ABOVE THE INTENDED PUSH BUTTON.*
4. *EXISTING TIMINGS TO REMAIN UNLESS NOTED IN THE PLANS.*
5. *EXISTING DIAGONAL SPAN WIRE (CATINARY AND MESSENGER) CONCRETE STRAIN POLE SYSTEM TO REMAIN.*
6. *EXISTING REDLIGHT RUNNING BLUE LIGHT SYSTEM ON SPAN WIRE TO REMAIN.*
7. *CONTRACTOR TO USE EXISTING PULL BOXES AND CONDUITS WHERE POSSIBLE TO RUN LOOP LEAD-INS TO THE EXISTING CABINET.*
8. *ALL EXISTING AND PROPOSED SIGNAL HEADS ARE WITHOUT BACK PLATES.*
9. *CONTRACTOR TO USE BURIED CONDUITS TO RUN CABLE TO ABOVE GROUND DEVICES WITH OUT ADDING ADDITIONAL LOAD TO THE DIAGONAL SPAN SYSTEM WHERE POSSIBLE.*
10. *TWO QUEUE DETECTORS AT STA. 372+65 SHALL BE CONNECTED TO PLEASANT HILL RD SIGNAL CABINET. SOUTHBOUND THROUGH SIGNAL PHASE-6 AT THE OAKS INTERSECTION SHALL DWELL WHEN THE QUEUE DETECTOR IS ACTIVATED. SIMULTANEOUSLY SOUTHBOUND LEFT SIGNAL PHASE-1 AT PLEASANT HILL RD INTERSECTION SHALL BECOME ACTIVE USING SIGNAL COORDINATION.*
11. *PROGRAMING AND TIMING COORDINATION OF THE QUEUE DETECTOR SHALL BE COMPLETED OUTSIDE THIS PROJECT SCOPE.*
12. *FIBER OPTIC DROP CABLE SHALL BE PLACED IN THE SAME ACCESS PORT WITH NEW GROMMET. ALL CONNECTORS SHALL BE "ST".*

3-SECT., 1-WAY, 4 AS — EXIST. TO REMAIN

3-SECT., 1-WAY, 1 AS — 650-1-60

3-SECT., 2-WAY, 1 AS — 650-1-60

3-SECT., 2-WAY, 1 AS — 650-1-60

3-SECT., 2-WAY, 1 AS — 650-1-15

3-SECT., 1-WAY, 2 AS — 650-1-14

3-SECT., 1-WAY, 1 AS — 650-1-14

4-SECT., 1-WAY, 2 AS — 650-1-36

PROPOSED POWER PEDESTAL

10 LF	630-2-11
1 EA	635-2-11
1 AS	639-1-122
50 LF	639-2-1
1 EA	641-2-12

8 RUNS @ 90 LF
2-SIGNAL, 2-VIDEO, 1-POWER, 1-FIBER, 1-LOOP, 1-SPARE

95 LF	630-2-12
95 LF (12 SM DROP)	633-1-121
95 LF	639-2-1

EXIST. CONCRETE STRAIN POLE-2 TO REMAIN

2 RUNS @ 20 LF	630-2-11 / 660-6-12	2 EA
2 RUNS @ 35 LF	630-2-14 / 660-9-12	1 EA
1 EA (15' ARM ONLY)	715-5-31	

EXIST. OSCEOLA COUNTY ATMS PULL BOX, SPLICE ENCLOSURE & SPLICE TRAY TO REMAIN, REMOVE EXIST. DROP AND INSTALL NEW 12 SM DROP TO PROPOSED CABINET

35 LF	630-2-11
(12 SM DROP) 35 LF	633-1-121
(50+50 SLACK) (12 SM DROP) 100 LF	633-1-121
4 EA	633-2-31
1 EA	633-3-51

110 LF	630-2-11
1 EA	635-2-11
150 LF	639-2-1

1-LOOP, 630-2-12, 85 LF

1-LOOP, 630-2-11, 280 LF

1-LOOP, 630-2-11, 380 LF

EXIST. OSCEOLA COUNTY ATMS 72 SM FIBER TO REMAIN

POWER SOURCE EXIST. UTILITY POLE WITH TRANSFORMER

EXIST. OSCEOLA COUNTY ATMS PULL BOX W/ SLACK TO REMAIN

PROPOSED SIGNAL CABINET (ID- 22066)

SHOPPING DRIVEWAY (STOP CONTROLLED)

PED. POLE-1
PED. POLE-2
PED. POLE-3
PED. POLE-4
PED. POLE-5
PED. POLE-6
PED. POLE-7
PED. POLE-8

ICM1 V1 V2
ICM2 V3 V4

DZ6A, DZ6B, DZ6C, DZ6D, DZ6E, DZ1A, DZ5A, DZ2D, DZ2C, DZ2B, DZ2A, DZ8A, DZ8B

L1E, L1F, L1B, L2K, L2J, L2I, L2H, L2G, L2F, L2E, L5B, L6F, L6G, L6H, L6I, L6J, L6K, L6L, L6M, L6N, L1C

150' FROM STOP BAR (TYP)

330' FROM STOP BAR (TYP)

100' FROM STOP BAR

SOUTHBOUND SR 600/500 (JOHN YOUNG PARKWAY) (45 MPH)

NORTHBOUND SR 600/500 (JOHN YOUNG PARKWAY) (45 MPH)

THE OAKS BLVD (25 MPH)

2 AS 660-2-102 — QUEUE DETEC. LOOP CONNECTED TO PLEASANT HILL RD CABINET

21 AS 660-2-102

345 LF 630-2-11

23 EA 635-2-11

7 RUNS @ 180 LF
2-SIGNAL, 2-VIDEO, 1-LOOP, 2-SPARE
630-2-12 180 LF

4 RUNS @ 145 LF
1-SIGNAL, 1-LOOP, 2-SPARE
145 LF 630-2-12

630-2-11 105 LF

EXIST. CONCRETE STRAIN POLE-1 TO REMAIN

630-2-11	2 RUNS @ 15 LF
630-2-14	2 RUNS @ 35 LF
660-4-12	2 EA
660-9-12	1 EA
682-1-143	1 EA
715-5-31	1 EA (15' ARM ONLY)

REMOVAL ITEMS:

632-7-6	1 PI
633-1-620	125 LF DROP
639-1-620	1 AS
639-2-6	150 LF
641-2-60	1 EA
670-5-600	1 AS

A — US 17 - 92 — 2 EA

B — The Oaks Blvd — 2 EA

EXIST. OVERHEAD SNS TO REMAIN

0 5 20 Feet

LEGEND:

- IMC CAMERA (INTERSECTION MOVEMENT COUNTS)
- TRAFFIC DATA VVDS (PRESENCE)
- CCTV CAMERA
- BLUETOOTH DETECTOR (TRAVEL TIME)

CONTROLLER TIMINGS

TIMING FUNCTION								
MOVEMENT NUMBER	1	2		P4	5	6		8
MINIMUM GREEN								
EXTENSION								
MAXIMUM GREEN 1								
MAXIMUM GREEN 2								
YELLOW CLEARANCE	3.4	4.8			3.4	4.8		3.4
ALL RED	2.9	2.0			3.3	2.0		2.0
PEDESTRIAN WALK		7		7		7		7
PED. CLEARANCE		31		40		16		37
RECALL								

PED. POLE-1 STA. 373+37, 52'LT
PED. POLE-2 STA. 372+94, 42'LT
PED. POLE-3 STA. 372+95, 113'RT
PED. POLE-4 STA. 373+12, 117'RT
PED. POLE-5 STA. 374+18, 109'RT
PED. POLE-6 STA. 374+56, 101'RT
PED. POLE-7 STA. 374+45, 45'LT
PED. POLE-8 STA. 374+10, 53'LT

630-2-11	2 RUNS (SIGNAL) @ 190 LF
646-1-11	8 EA
653-1-11	8 AS
665-1-11	8 EA

PEDESTRIAN SIGNAL HEAD DETAILS — P2 P4 P6 P8

PED. SIGNAL COUNT-DOWN 1-SECT., 1-WAY, 8 AS

PEDESTRIAN SIGN DETAIL — OR

R10-3i 9"X15" 8 EA

SOP-SPECIAL

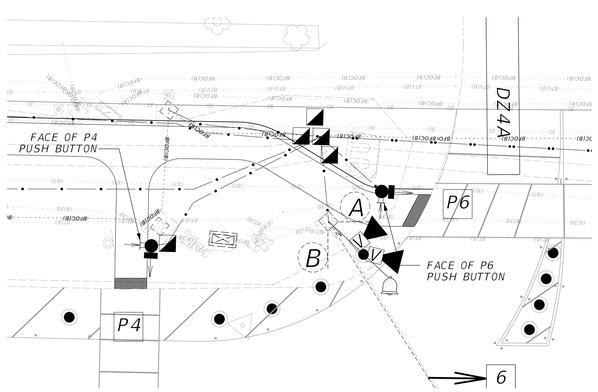
PHASE 1 — PHASE 2 — or — PHASE 2 — PHASE 3 — PHASE 4 — PHASE 5

ALL SIGNALS HEADS ARE 3-SECTION 1-WAY UNLESS NOTED.
ALL EXISTING SIGNAL HEADS TO REMAIN UNLESS NOTED.

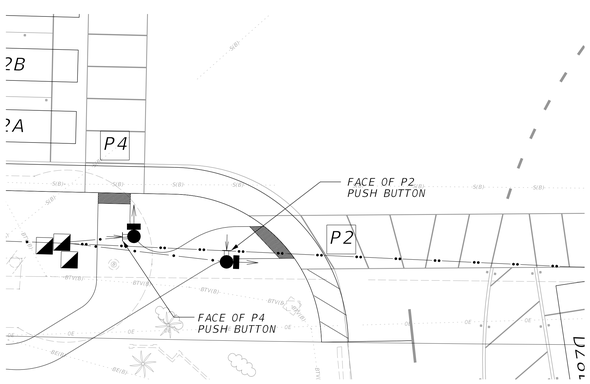
EXISTING CONCRETE STRAIN POLE-2 (NW CORNER)

PROPOSED 4-SEC 1-WAY (75.49')
REPLACE 3-SEC 2-WAY WITH 3-SEC 1-WAY (73.04')
PROP. 3-SEC 1-WAY (29.28')
EXISTING CONCRETE STRAIN POLE-1 (SE CORNER)
REPLACE 3-SEC 1-WAY WITH 4-SEC 1-WAY (90.20')
REPLACE 3-SEC 2-WAY (104.26')
PROP. 3-SEC 1-WAY (148.37')

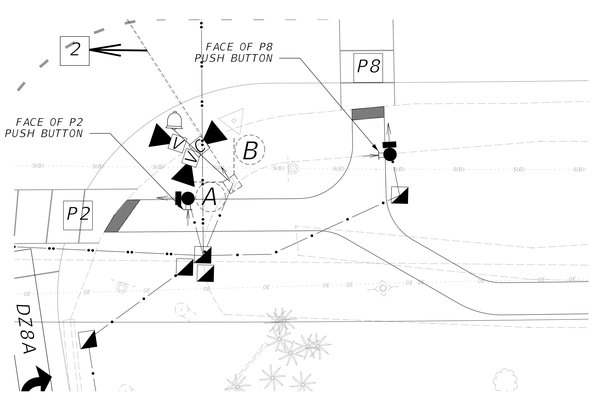
NW CORNER



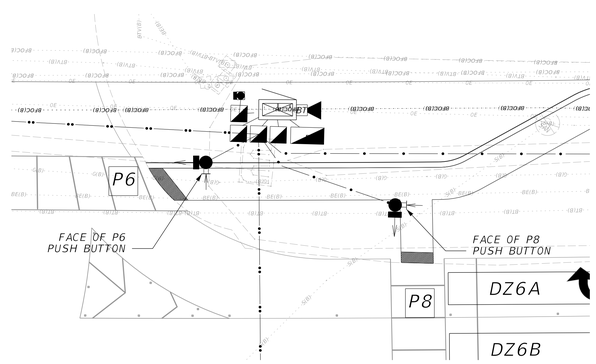
SW CORNER



SE CORNER



NE CORNER



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DISTRICT FIVE - DESIGN
Aaron A. Whitehall, P.E. No. 63777
719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
500/600	OSCEOLA	445201-1-52-01

SIGNALIZATION PLAN SHEET

SHEET NO.

SIGNAL ID	BIU NO.	CARD NO.	CHANNEL NO.	DETECTOR ID	DETECTOR	DIRECTION	MOVEMENT TYPE	APP. SPEED MPH	PROTECTED PHASE	OVERLAP	DELAY SEC.	CAMERA ID	DETECTOR SYSTEM	LOOP TYPE	DISTANCE TO STOP BAR	DETECTOR TYPE	LANE TYPE	LANE NO.
			1	2206601	DZ-1A	WB	L	45	1	8	5	V2	VIDEO		0	PD	V	*
		1	2	2206602	L-1B	WB	L	45	1	8			LOOP	B	150	AD	V	*
			3	2206603	L-1C	WB	L	45	1	8	5		LOOP	B	END OF LANE	QD	V	*
		2	4	2206604	DZ-2A	EB	R	45	2		5	V3	VIDEO		0	PD	V	*
			5	2206605	DZ-2B	EB	T	45	2			V3	VIDEO		0	PD	V	*
		3	6	2206606	DZ-2C	EB	T	45	2			V3	VIDEO		0	PD	V	*
			7	2206607	DZ-2D	EB	T	45	2			V3	VIDEO		0	PD	V	*
	1	4	8	2206608	L-2E	EB	R	45	2				LOOP	B	150	AD	V	*
			9	2206609	L-2F	EB	T	45	2				LOOP	B	150	AD	V	*
		5	10	2206610	L-2G	EB	T	45	2				LOOP	B	150	AD	V	*
			11	2206611	L-2H	EB	T	45	2				LOOP	B	150	AD	V	*
		6	12	2206612	L-2I	EB	T	45	2				LOOP	B	330	AD	V	*
			13	2206613	L-2J	EB	T	45	2				LOOP	B	330	AD	V	*
		7	14	2206614	L-2K	EB	T	45	2				LOOP	B	330	AD	V	*
			15	2206615	DZ-4A	SB	R	25	Stop controlled			V1	VIDEO		0	LBLC	V	*
		8	16	2206616	DZ-5A	EB	L	45	5		5	V3	VIDEO		0	PD	V	*
			17	2206617	L-5B	EB	L	45	5		5		LOOP	B	END OF LANE	QD	V	*
		9	18	2206618	DZ-6A	WB	R	45	6		5	V2	VIDEO		0	PD	V	*
			19	2206619	DZ-6B	WB	T	45	6			V2	VIDEO		0	PD	V	*
		10	20	2206620	DZ-6C	WB	T	45	6			V2	VIDEO		0	PD	V	*
			21	2206621	DZ-6D	WB	T	45	6			V2	VIDEO		0	PD	V	*
		11	22	2206622	DZ-6E	WB	T	45	6			V2	VIDEO		0	PD	V	*
			23	2206623	L-6F	WB	R	45	6				LOOP	B	150	AD	V	*
	2	12	24	2206624	L-6G	WB	T	45	6				LOOP	B	150	AD	V	*
			25	2206625	L-6H	WB	T	45	6				LOOP	B	150	AD	V	*
		13	26	2206626	L-6I	WB	T	45	6				LOOP	B	150	AD	V	*
			27	2206627	L-6J	WB	T	45	6				LOOP	B	150	AD	V	*
		14	28	2206628	L-6K	WB	T	45	6				LOOP	B	330	AD	V	*
			29	2206629	L-6L	WB	T	45	6				LOOP	B	330	AD	V	*
		15	30	2206630	L-6M	WB	T	45	6				LOOP	B	330	AD	V	*
			31	2206631	L-6N	WB	T	45	6				LOOP	B	330	AD	V	*
22066		16	32	2206632	DZ-8A	NB	R	25	8	1	5	V4	VIDEO		0	PD	V	*
			33	2206633	DZ-8B	NB	R	25	8	1		V4	VIDEO		0	PD	V	*
		17	34	2206634	L-8C	NB	R	25	8				LOOP	B	100	AD	V	*
			35	2206635	L-8D	NB	R	25	8				LOOP	B	100	AD	V	*
		18	36	2206636	SPARE													
			37	2206637	SPARE													
		19	38	2206638	SPARE													
			39	2206639	SPARE													
	3	20	40	2206640	SPARE													
			41	2206641	SPARE													
		21	42	2206642	SPARE													
			43	2206643	SPARE													
		22	44	2206644	SPARE													
			45	2206645	SPARE													
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		18	36	2206652	SPARE													
			37	2206653	SPARE													
		19	38	2206654	SPARE													
			39	2206655	SPARE													
	4	20	40	2206656	SPARE													
			41	2206657	SPARE													
		21	42	2206658	SPARE													
			43	2206659	SPARE													
		22	44	2206660	SPARE													
			45	2206661	SPARE													
		23	46	2206662	SPARE													
			47	2206663	SPARE													
		24	48	2206664	SPARE													

LEGEND:
PD - PRESENCE DETECTION
AD - ADVANCE DETECTION
V - VEHICLE, B - BIKE
QD - QUEUE DETECTION
L - LEFT, T - THRU, R - RIGHT
TL - THRU-LEFT, TR - THRU-RIGHT

* CONFIRM THE LANE NUMBER VALUES WITH OSCEOLA COUNTY ENGINEERING DEPT DURING CONSTRUCTION.

US 17/92 (JYP) AT THE OAKS BLVD

REVISIONS

DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN
Aymon A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
500/600	OSCEOLA	445210-1-52-01

DETECTOR CHART (2)
US 17/92 (JYP) AT THE OAKS BLVD

SHEET NO.

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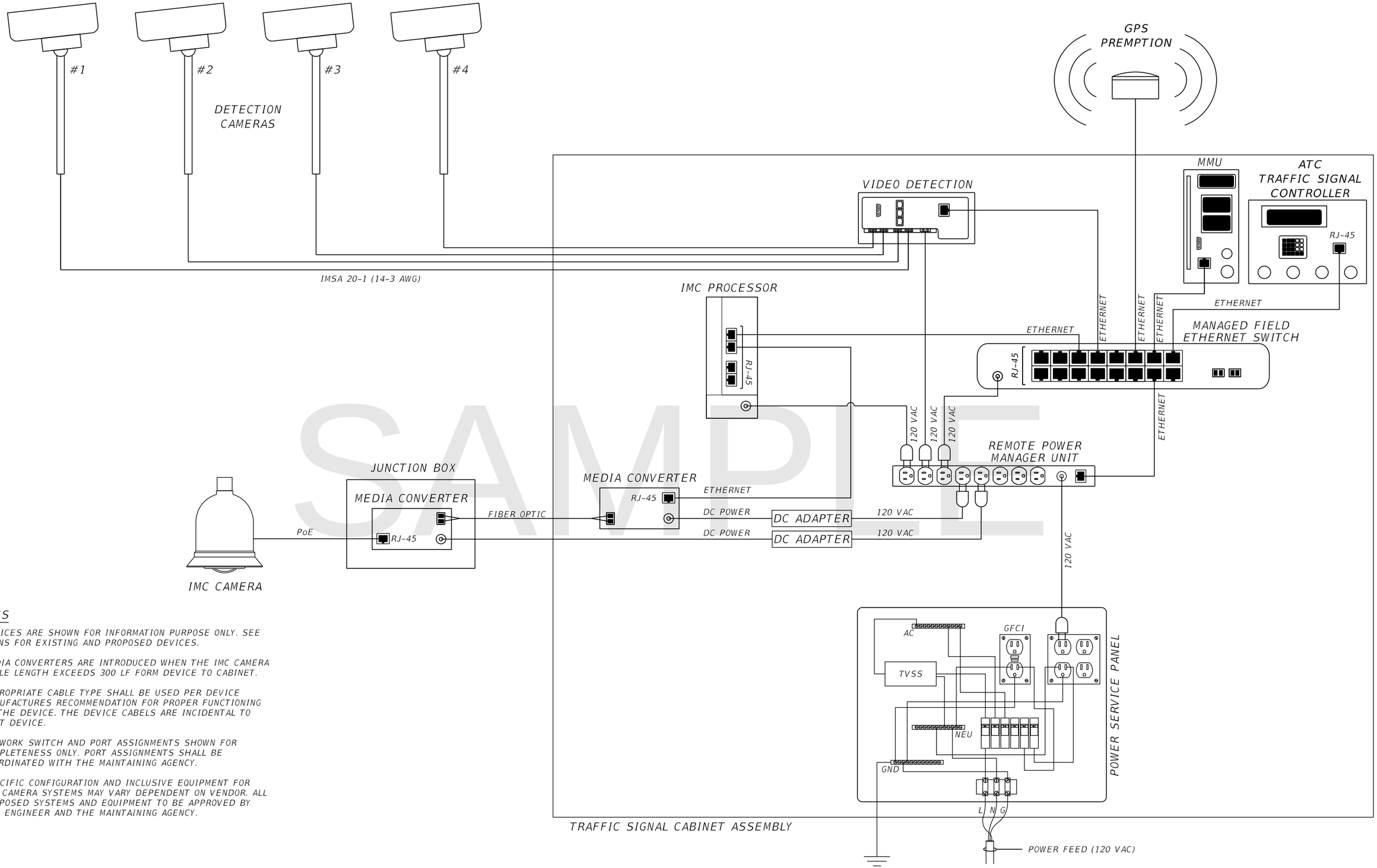

NOTES

1. DEVICES ARE SHOWN FOR INFORMATION PURPOSE ONLY. SEE PLANS FOR EXISTING AND PROPOSED DEVICES.
2. MEDIA CONVERTERS ARE INTRODUCED WHEN THE IMC CAMERA CABLE LENGTH EXCEEDS 300 LF FORM DEVICE TO CABINET.
3. APPROPRIATE CABLE TYPE SHALL BE USED PER DEVICE MANUFACTURES RECOMMENDATION FOR PROPER FUNCTIONING OF THE DEVICE. THE DEVICE CABELS ARE INCIDENTAL TO THAT DEVICE.
4. NETWORK SWITCH AND PORT ASSIGNMENTS SHOWN FOR COMPLETENESS ONLY. PORT ASSIGNMENTS SHALL BE COORDINATED WITH THE MAINTAINING AGENCY.
5. SPECIFIC CONFIGURATION AND INCLUSIVE EQUIPMENT FOR IMC CAMERA SYSTEMS MAY VARY DEPENDENT ON VENDOR. ALL PROPOSED SYSTEMS AND EQUIPMENT TO BE APPROVED BY THE ENGINEER AND THE MAINTAINING AGENCY.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN
Aymon A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 19	LAKE	437938-1-52-01

WIRING DIAGRAM

SHEET NO.

#1
#2
#3
#4
DETECTION CAMERAS
BLUETOOTH
GPS PREMPTION
VIDEO DETECTION
IMSA 20-1 (14-3 AWG)
MMU
ATC TRAFFIC SIGNAL CONTROLLER
RJ-45
ETHERNET
IMC PROCESSOR
ETHERNET
MANAGED FIELD ETHERNET SWITCH
RJ-45
IMC CAMERA
PoE SPD
PoE
PoE SPD
PoE
RJ-45
120 VAC
120 VAC
120 VAC
REMOTE POWER MANAGER UNIT
JUNCTION BOX (SEE NOTE 2)
MEDIA CONVERTER
MEDIA CONVERTER (SEE NOTE 2)
RJ-45
ETHERNET
FIBER OPTIC
DC POWER
DC ADAPTER
120 VAC
PoE
RJ-45
DC POWER
DC ADAPTER
120 VAC
DC POWER
POWER SUPPLY
120 VAC
120 VAC
FIBER JUMPERS
IMC CAMERA
CCTV CAMERA
CCTV CABLE
ETHERNET SPD
VDC SPD
AC
GFCI
TVSS
NEU
GND
L N G
POWER SERVICE PANEL
PATCH PANEL
UPS (EXTERAL CABINET)
TRAFFIC SIGNAL CABINET ASSEMBLY
POWER FEED (120 VAC)
FIBER OPTIC DROP

SAMPLE

NOTES

1. DEVICES ARE SHOWN FOR INFORMATION PURPOSE ONLY. SEE PLANS FOR EXISTING AND PROPOSED DEVICES.
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3. APPROPRIATE CABLE TYPE SHALL BE USED PER DEVICE MANUFACTURES RECOMMENDATION FOR PROPER FUNCTIONING OF THE DEVICE. THE DEVICE CABELS ARE INCIDENTAL TO THAT DEVICE.
4. NETWORK SWITCH AND PORT ASSIGNMENTS SHOWN FOR COMPLETENESS ONLY. PORT ASSIGNMENTS SHALL BE COORDINATED WITH THE MAINTAINING AGENCY.
5. SPECIFIC CONFIGURATION AND INCLUSIVE EQUIPMENT FOR IMC CAMERA SYSTEMS MAY VARY DEPENDENT ON VENDOR. ALL PROPOSED SYSTEMS AND EQUIPMENT TO BE APPROVED BY THE ENGINEER AND THE MAINTAINING AGENCY.

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REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN
Aymon A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

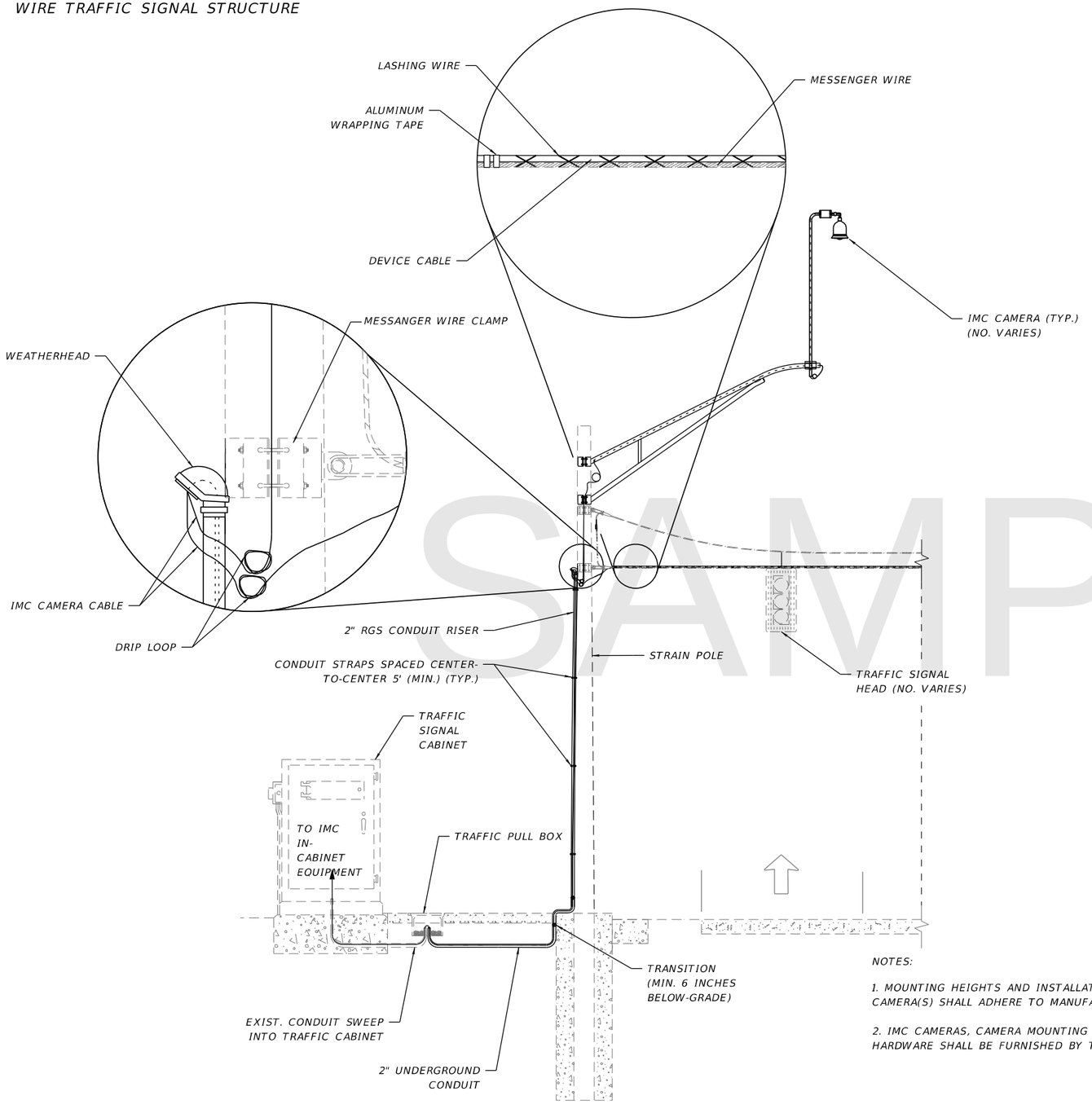
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
500/600	OSCEOLA	445210-1-52-01

WIRING DIADRAM

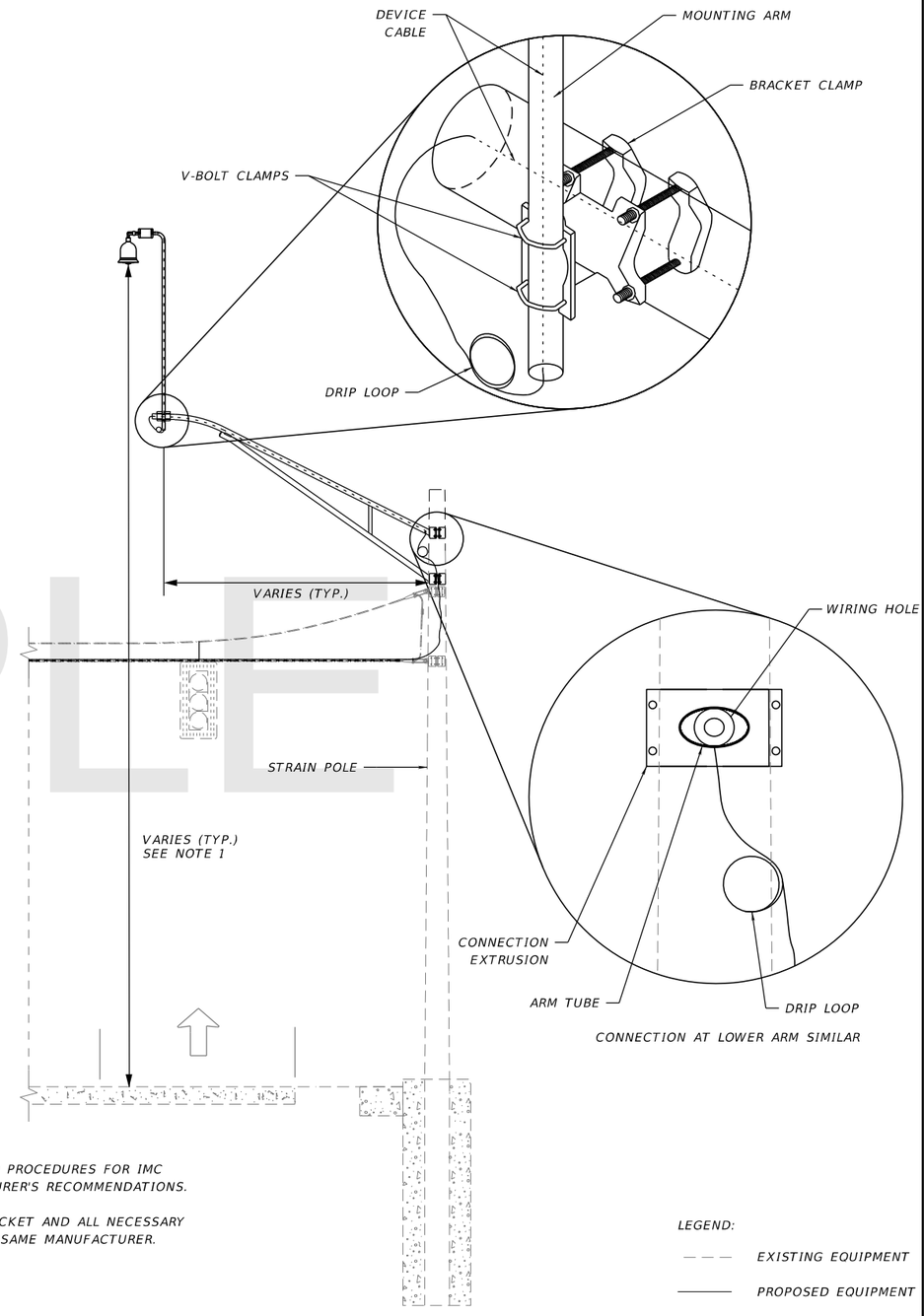
SHEET NO.

IMC CAMERA(S) MOUNTED ON EXISTING SPAN WIRE TRAFFIC SIGNAL STRUCTURE



IMC CAMERA MOUNTING BRACKET CABLE MOUNT DETAIL

N.T.S



NOTES:

1. MOUNTING HEIGHTS AND INSTALLATION PROCEDURES FOR IMC CAMERA(S) SHALL ADHERE TO MANUFACTURER'S RECOMMENDATIONS.

2. IMC CAMERAS, CAMERA MOUNTING BRACKET AND ALL NECESSARY HARDWARE SHALL BE FURNISHED BY THE SAME MANUFACTURER.

LEGEND:

- – – – EXISTING EQUIPMENT
- ——— PROPOSED EQUIPMENT

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN
Ayman A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
500/600	OSCEOLA	445210-1-52-01

DEVICE MOUNTING DETAIL

SHEET NO.

7/30/2021 11:59:51 AM kWHNTSV
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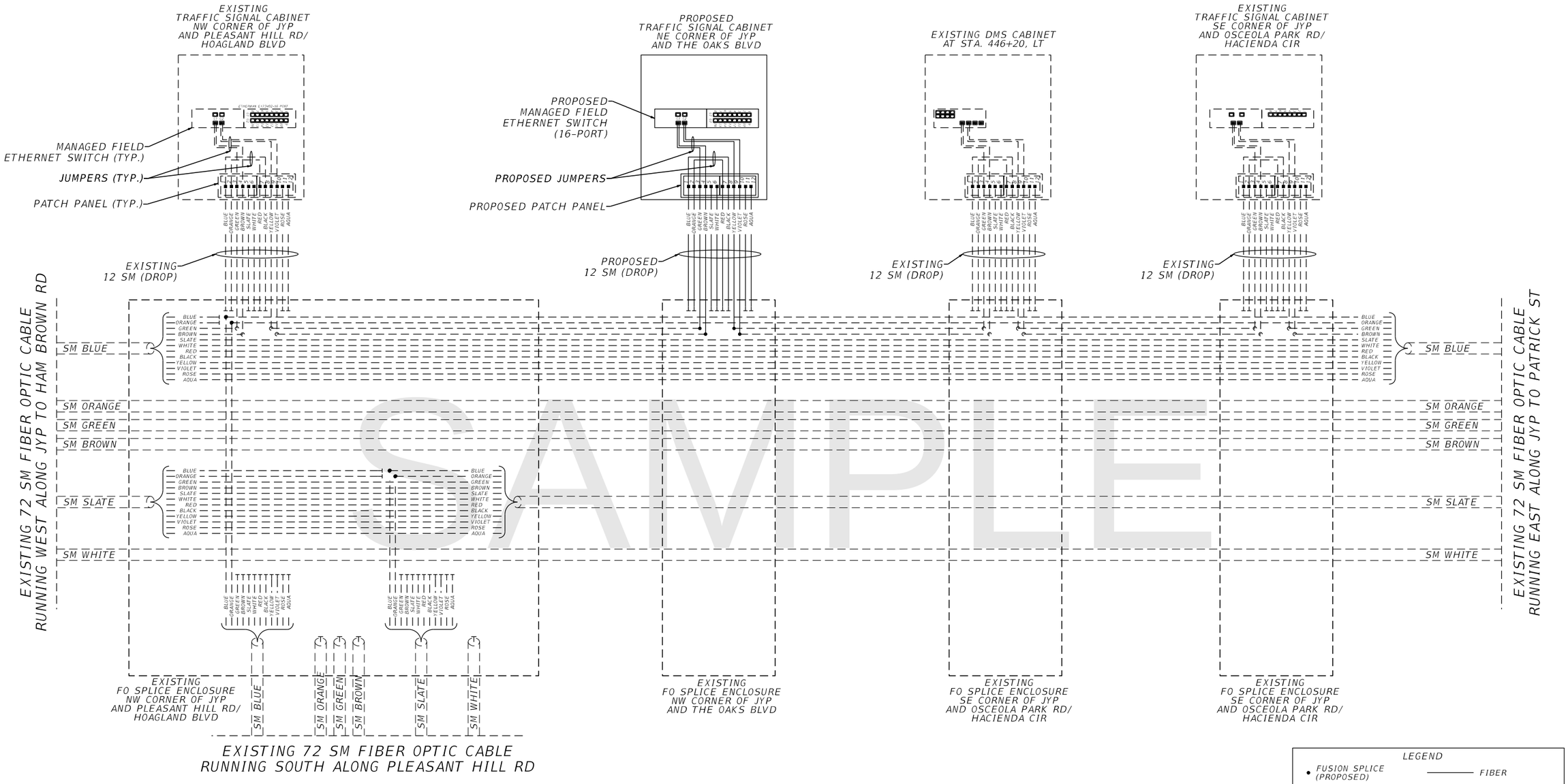

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DISTRICT FIVE - DESIGN
Aymon A. Mohamed, P.E., P.T.O.E.
No.: 61777
719 South Woodland Blvd.
DeLand, Florida 32720

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
500/600	OSCEOLA	445210-1-52-01

SPLICING DIAGRAM

SHEET NO.

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