Chapter 7

Traffic and ITS Design

The following are changes, additions or deletions to the January 2013, Topic #625-000-007, Plans Preparation Manual (PPM), for use on Turnpike projects only.

7.1 General

Add the following paragraphs

Florida's Turnpike Enterprise has developed Traffic Plans Guide Drawings to establish guidelines for traffic design and traffic engineering plan development. The Guide Drawings attempt to improve the quality of plans, provide system consistency, reduce plan development time and reduce plan review time. The Guide Drawings represent the compilation of engineering manuals, best practices and effective design experience on Florida's Turnpike. The Guide Drawings show layouts and details of an example condition.

It is the responsibility of the Design Engineer of Record using these Guide Drawings to exercise proper engineering judgment and prepare a safe and effective design that fits the specific conditions of a project. The inappropriate use of and adherence to these Guide Drawings does not exempt the engineer from the professional responsibility of developing an appropriate design. Design engineers and consultants are encouraged to become familiar with the information contained in the Guide Drawings and to discuss specific design details with Florida's Turnpike design staff.

The Guide Drawings are available as dgn and pdf versions on the Florida's Turnpike Enterprise Production Design website at the following URL:

http://design.floridasturnpike.com/prod_design/traffic/trafficguidedrawings.html

7.1.2.2 Median Traffic Railings

Modify paragraph 1

Add Do Not Stop (TPK-7) to the list of permanent signs critical to safety.

7.2 Signing

7.2.1 Design Criteria

Add the following to paragraph 1

The placement of signs shall prevent subjecting motorists to too much information, not interfere with other traffic control devices, not impair the visibility of other signs and not violate minimum spacing distances listed in Table 2, Minimum Spacing Distances for Signs in Florida

Administrative Code 14-51.014. The designer shall consider that Table 2 provides the minimum spacing requirements and the design should maximize the sign spreading concept in MUTCD 2E.10 when possible. In addition, the minimum sign spacing from Dynamic Message Signs (DMS) should be 1000 feet.

The designer shall consider the physical placement of sign supports as well as the visibility of the sign panel. The placement of sign supports shall not occur in the bottom of ditches. Clearing and grubbing should be included if the visibility of the sign panel is blocked. Refer to the Traffic Plans Guide Drawings for guidance.

The design for sign location shall consider the cross section as to the placement of the sign structure foundation outside the clear zone. Signs located behind guardrail shall be located a minimum of four feet setback from the face of guardrail. This applies to the foundations on overhead signs and for the sign panel for ground mounted signs.

Add the following paragraphs

All advance guide signs should use the physical gore as the point of reference for distance messages. The only time this should not be done is if the physical gore and theoretical gore are separated by more than 500 feet.

Destination guide signs on ramps shall include destinations that repeat advance guide sign and supplemental guide sign information and provides route guidance to the driver.

Follow MUTCD Table 2C-5 and Figure 2C-3 for Advisory Speed Warning Signing at all Turnpike exit ramps.

For all post-interchange distance signs on the Turnpike, the maximum letter height used shall be 10” E or 10” EM.

For size of signs, lettering and plaques, Florida’s Turnpike facilities shall follow the Freeway Classification in MUTCD Tables 2B-1, 2C-2, 2E-4 and 2E-5. The minimum sizes for regulatory and warning signs facing traffic on exit or entrance ramps to/from Turnpike facilities shall be as shown in the referenced MUTCD Tables corresponding to the Freeway column. Regulatory signs for Do Not Enter (R5-1) and Wrong Way (R5-1a) which face side street traffic shall also use the Freeway classification in the referenced MUTCD Tables.

Add the following section

7.2.10 Overhead Sign Installations

Mount advance guide signs and exit direction signs on overhead structures when the number of travel lanes in one direction is three or more. Supplemental guide signs shall remain ground mounted under sections of three or more travel lanes.

Overhead sign installations shall meet the vertical clearance requirements of TPPPH Section 2.10, Table 2.10.2.

Add the following section

7.2.11 Sign Background Sheeting

Background sheeting shall be ASTM D 4956 – 09 Type-XI retroreflective sheeting material for new signs on all projects. The design should specify the use of ASTM D 4956 – 09 Type-XI. The Type XI sheeting will allow the Turnpike to reduce power consumption on externally lit signs by using lower wattage light and increasing the retroreflectivity of the sign.

Do not increase text spacing for white text on colored background panels for overhead signs that use the minimum letter sizes specified in MUTCD Table 2E-3.

Add the following section

7.2.12 Toll Route Markers

The Florida's Turnpike mainline shall use the Turnpike Route Marker sign panel shown in the latest Guide Drawings. The panel sizes shall meet the following standards:

1. To identify the Turnpike from a cross road or for trailblazing – 30" x 36"
2. For all guide sign uses along a freeway and for Post Interchange signs – 40" x 48"
3. For "special" applications – 50" x 60"

For all other Turnpike operated facilities the Toll Route Marker shall be used as shown in the Traffic Engineering Manual, Section 2.23. The size of this panel shall meet the standards in the TEM with the following exception:

1. For identification along the mainline (i.e., Post Interchange Sign) – 36" x 48"

The width of the attached cardinal direction sign, directional arrow auxiliary sign, or other auxiliary sign shall match the width of the parent route marker sign.

On the Turnpike Mainline, use the Toll Auxiliary Sign (M4-15) in combination with the Turnpike route marker. On numbered routes, such as Toll Route 869, use the Toll Route Shield (FTP-79-06, FTP-80-06, or FTP-81-06) without the additional Toll Auxiliary Sign.

Add the following section

7.2.13 Truck Lane Restrictions

The design engineer shall include truck lane restriction signs on corridors that have three or more lanes in each direction of travel. The restriction prohibits heavy trucks from traveling in the left lane. This measure is implemented to improve safety and mobility by increasing passing opportunities and reducing negative interactions between slow-moving trucks and other vehicles. Sample panel designs for the restriction are included in the Guide Drawings. The design engineer should implement the signs similar to a post-interchange sign so that drivers entering the system are informed at each entry point. If installation of the truck lane restriction sign is not possible

on the mainline due to sign clutter, the truck lane restriction sign can be implemented on the entrance ramp after the toll plaza to maintain proper sign spacing.

7.3 Lighting

Add the following references

Federal Aviation Regulation, Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace, USDOT/FAA. This regulation sets the requirements to follow on projects near airports.

Federal Aviation Administration Advisory Circular AC 70/7460-1, Obstruction Marking and Lighting, FAA. This advisory circular defines the requirements to follow to identify objects that require special lighting near airports.

Federal Aviation Administration Advisory Circular AC 150/5345-43, Specification for Obstruction Lighting Equipment, FAA. This advisory circular contains the FAA specification for obstruction lighting equipment.

Manual on Uniform Traffic Studies (January 2000) Chapter 15 Highway Lighting Justification Procedure, FDOT.

Recommended Practice for Roadway Lighting IES RP-8-00 (R2005), *ANSI/IESNA.*

American National Standard Practice for Tunnel Lighting IES RP-22-11, *ANSI/IESNA.*

7.3.1 Design Criteria

Add the following paragraphs

Lighting pole layout and design shall employ practices, where possible, to reduce the risk of light poles in high crash and high risk locations. Some of these design considerations are, but not limited to: lane drop and intersection locations, sections of roadway where the paved shoulder narrows, and curve/vehicle departure directions. These design considerations shall be documented in the Lighting Design Analysis Report (LDAR).

Conventional lighting should be used for all Florida Turnpike roads unless high mast lighting is proven to be the better and more cost efficient alternative. Lighting designers shall consult with the Turnpike Electrical Engineer before proposing new high mast light poles.

The preferred conventional lighting fixture is the Mongoose for style consistency throughout.

High mast lighting at interchanges may be used provided that the surrounding area is not an urban residential area. Lighting designers shall investigate future development plans of the area and obtain approval from the Turnpike Electrical Engineer and Project Manager before considering high mast lighting.

High mast lighting shall not be located in the following locations and shall meet horizontal clearance requirements specified in PPM, Vol. 1 Chapter 2:

a. Steep Embankments
b. Steep Slopes in Slope Pavement
c. Adjacent to Slope Embankment Cut-Outs
d. With Buried Pole Bases
e. In areas not accessible to a crane for aerial basket work.

Underdeck lighting shall be mounted to pier caps. If pendant hung fixtures are required to meet criteria, special attention should be given to locate fixtures over shoulders, gore areas, other separations from traffic. If pendant hung fixtures are required over live traffic lanes, the fixture locations shall be coordinated with the Turnpike Electrical Engineer and Turnpike Maintenance. All pendant hung fixtures shall have a redundant method of support.

Where there is continuous roadway lighting, roadways under bridges structures shall be lighted to the same level (or criteria) of the adjacent roadway. If the adjacent roadway is not lighted, lighting under bridges structures is still required where there is frequent nighttime pedestrian traffic; or where unusual or critical roadway geometry occurs adjacent to or under the bridge structure. Daytime lighting is required when the bridge structure limits natural sunlight penetration and limits a driver's visibility under the structure. Other factors to consider in evaluating the need for daytime lighting are specific roadway geometry and conditions, including pedestrian and vehicular activity. These requirements include not only Turnpike facilities, but any roadway crossing under a Turnpike facility.

Projects with conventional lighting along the roadside shall be designed for an average initial illumination as indicated in Table 7.3.1. Projects with high mast lighting shall be designed for an average initial illumination as indicated in Table 7.3.2 Rest areas and Service Plazas shall be designed for an average initial illumination as indicated in Table 7.3.5. This includes the ramps to and from the Service Plazas.

If the adjoining mainline roads are not illuminated, then the lighting design shall include mainline transition lighting to allow a driver a reasonable reduction in lighting levels from a lighted roadway to an unlit road. The mainline transition lighting shall extend beyond the project lighting limits by approximately four-to six- pole spacing. The mainline transition illumination levels shall be 1.0 foot candles average initial intensity (horizontal foot candles) with the same uniformity ratios specified in Table 7.3.1.

If the length of the mainline between any two lighted areas (roadway sections, interchanges, service plazas, and/ or tolls plaza) is 0.5 mile or less, then that section of the mainline shall be lighted regardless of what the Lighting Justification Report indicates.

All widening and resurfacing projects shall be reviewed for compliance with current lighting criteria. All deficiencies within the project scope shall be addressed and corrected. Deficiencies outside the project scope shall be brought to the attention of the Turnpike Project Manager and Electrical Engineer.

Projects with highway speed tolling gantries are not required to have roadside lighting unless dictated by another section of the TPPPH and/or a Lighting Justification Report. Where roadside lighting exists, the roadway lighting shall remain and shall be reviewed for compliance with current lighting criteria. All deficiencies within the project scope shall be addressed and corrected. Deficiencies outside the project scope shall be brought to the attention of the Turnpike Project Manager and Electrical Engineer.

Where new poles and luminaries are being proposed for the majority of a project, all poles and luminaries shall be new.

Table 7.3.1 Conventional Lighting – Roadways

Replace the following table

ROADWAY CLASSIFICATIONS	ILLUMINATION LEVEL AVERAGE INITIAL (H.F.C)	UNIFORMITY RATIOS		VEILING LUMINANCE RATIO
		AVG/MIN	MAX/MIN	Lv (max)/Lavg
INTERSTATE, EXPRESSWAY, FREEWAY, MAJOR ARTERIALS & HIGHWAY SPEED TOLLING GANTRIES	1.7	4:1 or Less	10:1 or Less	0.3:1 or Less
ALL OTHER ROADWAYS	1.0	4:1 or Less	10:1 or Less	0.3:1 or Less
***PEDESTRIAN WAYS AND BICYCLE LANES**	2.5	4:1 or Less	10:1 or Less	0.3:1 or Less

Note: These average illumination values should be considered standard, but should be increased if necessary to maintain an acceptable uniformity ratio. The maximum illumination level average initial horizontal foot-candle value shall be 2.25 FC for Interstate, Expressway, Freeway, Major Arterials, and Highway Speed Tolling Gantries. The maximum illumination level average initial horizontal foot-candle values shall be one and one-half values for All Other Roadways, Pedestrian Ways, and Bicycle Lanes.

* This assumes a separate facility. Facilities adjacent to a vehicular roadway should use the levels for that roadway.

Table 7.3.2 Highmast Lighting – Roadways

Replace the following table

ROADWAY CLASSIFICATIONS	ILLUMINATION LEVEL AVERAGE INITIAL (H.F.C)	UNIFORMITY RATIOS	
		AVG/MIN	MAX/MIN
INTERSTATE, EXPRESSWAY, FREEWAY, MAJOR ARTERIALS & HIGHWAY SPEED TOLLING GANTRIES	1.0	3:1 or Less	10:1 or Less
ALL OTHER ROADWAYS	1.0	3:1 or Less	10:1 or Less

Note: These average illumination values should be considered standard, but should be increased if necessary to maintain an acceptable uniformity ratio. The maximum illumination level average initial horizontal foot- candle values shall be one and one-half values for Interstate, Expressway, Freeway, Major Arterials, Highway Speed Tolling Gantries, and All Other Roadways.

Table 7.3.3 Sign Lighting

Replace the following table

AMBIENT LUMINANCE*	ILLUMINATION LEVEL AVERAGE INITIAL (H.F.C)	UNIFORMITY RATIOS
		MAX/MIN
LOW	5.0 to 10.0	6:1
MEDIUM	10.0 to 20.0	6:1
HIGH	20.0 to 40.0	6:1

* Ambient luminance classifications are defined in Section 10.3 of the AASHTO Roadway Lighting Design Guide (2005). Refer to the Traffic Plans Guide Drawings for information on sign panel sheeting used on Turnpike projects.

Table 7.3.5 Rest Area and Service Plaza Lighting

Replace the following table

AREA ILLUMINATED	ILLUMINATION LEVEL AVERAGE INITIAL (H.F.C)	UNIFORMITY RATIOS	
		AVG/MIN	MAX/MIN
ENTRANCE AND EXIT	1.7	4:1 or Less	10:1 or Less
INTERIOR ROADWAYS	1.5	4:1 or Less	10:1 or Less
PARKING AREAS	1.5	4:1 or Less	10:1 or Less

Note: These average illumination values should be considered standard, but should be increased if necessary to maintain an acceptable uniformity ratio. The maximum illumination level average initial horizontal foot-candle values shall be one and one-half values.

Add the following section

7.3.1.1 Box Girder Maintenance Lighting and Power

No welding or burning of the structure will be allowed. All fasteners shall be approved mechanical devices. The electrical work associated with the box girders involves working in confined space areas. All precautions and rules according to "confined spaces" of the Code of Federal Regulations, 29 CFR 1910.146 shall apply. Emergency lighting shall be provided within each box girder per NFPA 101.

The minimum conductor size shall be No. 10 AWG. A green insulated conductor shall be installed in each conduit run. The minimum conduit size shall be 1 inch. All interior conduits within a box girder shall be PVC Schedule 80.

The six-hour timers shall control the lighting contactors. Timers shall be provided at each hatch entrance and mid span.

The light fixtures shall be connected to separate branch circuit breakers from the receptacle branch circuit breakers.

The service voltage for the box girders shall be 240/480 volts, single-phase, three-wires and then step down to the 120/240 volts through the mini power centers. A main disconnect switch shall be provided immediately adjacent to the hatch door of each girder. The 240/480 volt-feeder shall terminate in a distribution panelboard. The distribution panelboard shall provide 480 volt power to each mini power center.

The number of mini power centers within each box girder shall be determined based on the number of lights and receptacles. The maximum number of lights and receptacles within a mini power center shall be as indicated on Structural Index No. 21240.

Add the following section

7.3.1.2 Photometric Analysis

A point-by-point, computerized photometric analysis shall be performed for all roadway areas being illuminated throughout the project. A 5 foot by 5 foot maximum point spacing shall be used for the point by point photometric analysis on the mainline, and major arterials, ramps and all other roadways. Alternatively, the photometric grid may consist of longitudinal points spaced up to 16 feet apart with two transverse points per lane at each longitudinal point spaced ¼ of the lane width from the edges of the lane. A copy of the results of this analysis shall be included in the LDAR and submitted to the Turnpike Electrical Engineer for review. The photometric analysis shall identify and evaluate each roadway classification and area of illumination, as defined by the section 7.3.1, within the project scope. The analysis shall also

identify distinct area/sections of roadway within the project scope. Some of these distinct areas may include: Mainline, Ramps, and Roadway Directions. Results shall indicate foot-candle values displayed on plan view on 11' x 17' pages with 1/100th accuracy (0.XX foot-candles). Where solid objects, such as bridges, block light fixture contributions, a 3D graphic representation shall be included to ascertain that solids were accounted for. Typical section photometric analysis are not considered a complete or through photometric analysis.

A point-by-point, computerized photometric analysis shall be performed for all signs being illuminated throughout the project. A 1 foot by 1 foot maximum point spacing shall be used for the point by point photometric for the entire area of the sign panel(s). A copy of the results of this analysis shall be included in the LDAR and submitted to the Turnpike Electrical Engineer for review. Results shall indicate foot-candle values displayed on each sign panel with 1/100th accuracy (0.XX) foot-candles).

A photometric analysis is required for projects where the relocation of light poles is included in the scope of work.

Provide an angle convention detail, if any tilting is required, to clearly depict fixture tilt orientation. A detail is required for each type of fixture being used (fixture on pole, sign luminaire, etc.). The detail(s) shall be provided in the LDAR and the plan sheets.

Add the following section

7.3.1.3 Lighting Load Center and Wiring Criteria

The service voltage for the roadway lighting load centers shall be 240/480 volts, single-phase, three-wires.

Roadway lighting load centers shall be coordinated with utility provider prior to Phase III Plan Submittal. Utility transformers shall be sized for connected and spare loads.

FDOT Design Standard Index No. 17504 (Service Point Details) shall be coordinated with the utility provider's requirements for electrical service (or electrical service standards). The electrical service point shall designed to and meet all utility provider's requirements.

The load center location and surrounding area shall have a minimum of 1'-0" between the load center and the designer's high water elevation.

Where a Load Center is being replaced and existing poles, equipment, etc. are being re-fed, all equipment and identification labels shall be replaced to include the new load center designation and circuit.

The voltage for the roadway luminaires shall be 480 volts, single-phase, two-wires.

Roadway lighting circuit conductors shall not be larger than #1 AWG. Circuits requiring conductors larger than #1 AWG shall be coordinated with the Turnpike Electrical Engineer and Turnpike Maintenance.

Where existing conductors within a circuit are being replaced, the size of the new conductors shall not be smaller than the existing conductors.

For light pole to light pole power runs, two different circuits shall be ran where reasonable; alternating the circuits between each luminaire in the run.

The maximum distance between pull boxes in long conduit runs shall be 300 feet.

For multiple (more than 3) branch circuits, provide two conduits from the load center to a pull box adjacent to the load center and split the branch circuit conductors into each conduit such that not all circuits are installed in one conduit.

The pull box required at each sign structure for sign lighting power (FDOT Design Standard Index No. 17505) shall be installed adjacent to the sign structure. Per the FDOT Design Standard Index No. 17505, a dedicated pull box and ground rod is required for sign structure lighting protection.

Add the following section

7.3.1.4 Temporary Lighting Criteria

The design of temporary lighting shall meet the criteria shown in section 7.3.1. If this criteria cannot be met based on various factors of construction, the Design Engineer of Record shall submit a safe and effective design, using proper engineering judgment to the Turnpike Project Manager and Turnpike Electrical Engineer for review and approval.

7.3.2 Pole Design Criteria

7.3.2.1 General

Add the following paragraphs

It is desirable not to locate any light poles on highway bridges. Spacing shall be adjusted, if possible, to keep light poles off bridge structures including the approach slabs. If light poles are required on bridges, their location shall be closely coordinated with the Bridge Structural Designer. Bridge-mounted poles shall be provided with vibration dampers inside the pole and with vibration pads at the base (this requirement applies for all bridges and fly-over ramps even if they are not over open bodies of water or on causeway sections). Bridge-mounted poles shall have pull box as specified in FDOT Standard Index No. 21210.

Nominal mounting heights for conventional poles shall be 40 and 50 feet as specified in FDOT Standard Index No. 17515. Nominal mounting heights for highmast poles shall be between 80 and 120 feet as specified in FDOT Standard Index No. 17502. In cases where lower or higher

mounting heights are required to meet minimum lighting design criteria, the designer shall contact the Turnpike Electrical Engineer for approval and coordination. Technical special provisions and details shall be provided in those cases where special designs are required. Technical special provisions shall be signed and sealed by a Professional Engineer, licensed in the State of Florida. Vibration dampers and pads shall be provided for all shoulder-mounted poles with pole-top mounted luminaires having mounting heights over 40 feet. All conventional light poles shall be provided with breakaway transformer-type bases except when mounted on bridge traffic railing barriers or on barrier walls. Conventional light poles in parking lots shall not be provided with frangible bases.

Conventional light poles shall be aluminum and shall not be painted. High mast light poles shall be galvanized steel only.

Add the following section

7.3.2.4 Temporary Lighting on Temporary Barriers

Designers should be aware that several historical details for connection of temporary light poles to temporary barriers exist, but are no longer considered acceptable for use on current projects. The connection details should be investigated for projects in design and also for review of shop drawings of projects in construction.

The design of temporary light poles attached to temporary barriers shall conform to the following:

1. Poles shall only be connected to bolted-down or stacked-down Type K temporary barriers.
2. The pole shall be connected to the barrier with a V-shaped bracket that provides two points of connection to the back of the barrier.
3. The pole setback from the barrier shall meet the requirements of PPM 7.1.2.
4. The V-shaped bracket shall not protrude above the top of the barrier.
5. The pole and V-shaped bracket shall be located at the longitudinal center of the barrier segment.
6. Connections to the barrier shall not damage the barrier reinforcing steel.
7. The electrical connections shall be of the “quick-disconnect” type.
8. The pole, bracket and connections shall be designed by a structural engineer to PPM Chapter 29 and FDOT Structures Manual Volume 9 requirements.
9. The lighting and electrical shall be designed by an electrical engineer.

If temporary lighting attachment to temporary barriers is to be designed by the Contractor, then these requirements should be provided in a plan note, which shall also require a shop drawing submittal.

7.3.3 Foundation Criteria

Add the following paragraphs

A concrete slab is not required in those instances when the poles are located behind sidewalks. The pull box shall be located flush with the sidewalk in front of the light pole, and is paid for as "roadside".

A combination pole and pull box concrete slab is not required where the grade is 1:2 or greater and protected by guardrail.

All foundations shall be coordinated with current and future grading to ensure that no foundations are below grade. In addition, foundations shall not be located in ditch bottoms or other locations where water and debris may accumulate.

All light pole steel base plates shall be 2” above grade.

7.3.5 Lighting Project Coordination

Replace the last paragraph with the following

Per PPM, Vol. 1, 2.10.4 and PPM, Vol. 1, 13.5.1, all projects shall be reviewed and coordinated with the FDOT Aviation Office to determine if notification and/or permitting are required to the Federal Aviation Administration (FAA), Florida Department of Transportation (FDOT), and any local jurisdictions.

The Turnpike Project Manager and Turnpike Electrical Engineer shall be provided copies of all notifications and permits for review. If none are required, written notification shall be given to that effect.

The airport manager of any possibly affected airport and/or heliport shall be contacted and provided project scope, drawings, etc. and be met with to fully coordinate the airspace aspects of the project.

Add the following paragraph

Turnpike ITS and Tolls – When the locations of light poles are established, they should be checked with the ITS layout and the Toll Equipment layout for any conflicts with the light poles, the light pole pull boxes, and the roadway lighting circuits.

7.3.6 Voltage Drop Criteria

Replace with the following paragraph

When determining conductor sizes for lighting branch circuits, the maximum allowable voltage drop shall be 6 percent. It shall include a combination of both feeder and branch circuit runs from the power company service point to the last luminaire within a circuit.

Add the following section

7.3.6.1 Pole Cable Distribution System

The pole cable distribution system shall be installed in the pull box adjacent to each light pole. A pole cable distribution system that is installed inside the pole base may only be used when specific project conditions deem its installation inside the pull box impractical, and only after obtaining the approval of the Turnpike Electrical Engineer. All components of the pole cable distribution system shall be listed by a Nationally Recognized Testing Laboratory.

7.4.1 Design Criteria

Add the following paragraph

The Designer shall make every reasonable effort to incorporate the design preferences of the local maintaining agency. These preferences may include but are not limited to pole types, detector loop strategies, conduit routing, specific equipment, signal timing methods, etc. It is the responsibility of the design consultant to meet with the maintaining agency to ascertain their preferences and obtain all other pertinent information. The findings of the design consultant shall be reported to the Turnpike's project manager before proceeding with design.

7.4.2 Certification and Specialty Items

Replace the last paragraph with the following

The design of traffic signals compatible with local signal systems may require the use of materials for which there are no Department approved Standard Specifications or Supplemental Specifications. In those cases, the design consultant will be required to develop project specific Technical Special Provisions (TSPs) for inclusion in the contract document. The design consultant is encouraged to get samples of similar TSPs from the local and maintaining agency. The Turnpike Traffic Operations and plans review staff are available to assist or guide this endeavor. All traffic control products for signals shall be on the Qualified Products List (QPL) as maintained by the FDOT Specification Department.

7.4.13 Traffic Signal Project Coordination

Add the following as paragraphs 7, 8 & 9

In general, the Turnpike will actively work with the local and local maintaining agencies for coordination of design and maintenance issues.

Signal Systems - At the request of the local or the local maintaining agency any signals designed by the Turnpike will include features and equipment typically used for their signals and signal systems. This will include time base, closed loop, UTCS or other technologies. The communications medium shall match that already in place.

Legal Authorization and Maintenance Agreements - The Turnpike must secure legal authorization and execute a maintenance agreement with the local maintaining agency. This will be accomplished through the assistance of the local Traffic Engineer. It is in the Turnpike's interest to make an effort to cooperate with the local and maintaining agency to expedite this process.

7.5.1 Design Criteria

Add the following paragraph

All pull boxes and splice boxes shall be H-20 or HS-20 load rated.

7.5.4.1 Dynamic Message Sign (DMS)

Add the following paragraph

When general purpose mainline DMS are proposed, a travel time sensor compatible with the existing system shall be installed at the site.

7.5.8.2 ITS Pole and Lowering Device

Replace the first paragraph with the following

CCTV cameras shall be installed on ITS poles without lowering devices unless there are issues with maintenance and access to the camera, or other circumstances requiring a lowering device. The ITS pole for CCTV camera shall be designed as a square type pole mounted at approximately 45 feet.

Add the following paragraph

When prestressed concrete poles are specified for ITS Poles, the Design Consultant should provide design and details based on the proposed attachments. Symmetrically placed prestressing should be considered where applicable.

7.6.1 Guidance on Use of Various Pavement Marking Materials

Add the following paragraphs

Florida's Turnpike lets separate contracts for thermoplastic applications. Include the preformed thermoplastic exit number message in the thermoplastic plan set.

On resurfacing projects, the main Signing and Pavement Marking plan set must include the replacement of RPM's on bridge decks, but exclude painted pavement markings. The separate thermoplastic plan should include refreshing the thermoplastic pavement markings on bridge decks unless specified by Turnpike design staff to exclude.

Add the following section

7.8 Electrical Systems Design and Analysis

The design of all electrical systems (Lighting, Traffic Signals, ITS) shall comply with Florida Administrative Code (FAC) 61G15-33, Responsibility Rules of Professional Engineers Concerning the Design of Electrical Systems. These responsibilities are applicable for all new projects and any major modifications or renovations. In addition, the following analyses are also required. These designs and analyses shall be prepared, reviewed, and signed and sealed by a Professional Engineer with a licensed in the State of Florida. The Professional Engineer shall be competent in electrical engineering through training and/or experience.

7.8.1 Voltage Drop

Voltage drop calculations shall be submitted for any circuits, feeders, services, etc. Voltage drop shall be limited to the percentages shown in the TPPPH and/or TPPPH Guide Drawings. If no criteria exist within the TPPPH and/or TPPPH Guide Drawings, the standards set forth in the FDOT PPM, FDOT Design Standards, and FDOT Standard Specifications for Road and Bridge Construction shall be used. If no Turnpike or FDOT criteria exist, the consultant shall use the guidelines set forth in the National Electric Code (NEC).

7.8.2 Load Analysis

A complete load analysis shall be submitted. This analysis shall include, but is not limited to: calculation of individual circuits, major distribution equipment, and service points. All calculations shall verify all interrupting ratings and conductor sizing.

For any major modifications or renovations, calculations shall consist of providing the existing load (prior to modification), the load being removed, the load being added, and new total load. All existing loads shall be field verified by metering or calculated based on existing conditions.

New service points and major distribution equipment shall be provided with a minimum of 20-percent spare capacity.

7.8.3 Arc Flash Hazard Analysis

Provide an Arc Flash Hazard Analysis for new electrical distribution equipment (panelboards, transformers, load centers, disconnects, etc.), per the latest version of the Standard for Electrical Safety in the Workplace, NFPA 70E. An arc flash hazard analysis shall determine the Arc Flash Protection Boundary and the personal protective equipment that people within the Arc Flash Boundary shall use. The arc flash hazard analysis shall be updated when a major modification or renovation takes place. Field install Arc Flash and Shock Warning labels on each piece of new electrical distribution equipment. The labels will indicate the flash hazard boundary, the flash hazard at 18 inches, the PPE level requirements, and the approach restrictions.

7.8.4 Short Circuit Analysis and Device Coordination

A short circuit analysis shall determine maximum fault current on each piece of new electrical distribution equipment and proper fault current interrupting capacity. Provide documentation from the utility provider on the maximum available fault current at the utility transformer. This value shall be used in the short circuit analysis. The short circuit analysis shall be updated when a major modification or renovation takes place.

Electrical distribution equipment shall be designed as fully rated and selectively coordinated systems. The protective features of the electrical distribution system shall automatically and selectively isolate a faulted or overloaded circuit from the remainder of the electrical system.

Only the closest protective device to the fault shall operate to isolate the fault without affecting other parts of the system.