Lessons Learned Memorandum

Date Updated 6 March 2018

To Tracie Rose, P.E., Construction Project Manager
Brian Scales; FTE QAR Manager
Robert Laurence- PSSP

From Mark A. Cook, P.E., Senior Project Engineer

Subject Lessons Learned on SR-589 Veterans Expressway Sections1-3 Express Lanes, Contract E8P07, FIN 435609-1-52-01
SR-589 from MP 2.911 to 10.398 (N. of Memorial Road. to N. of Gunn Highway)

Reference Materials:

1. Contract Plans
2. Contract TSPs
3. 2016 Specifications
4. 2016 Standard Index

Project Lessons Learned:

1. **Date-Time:** November 2016 to May 2017
   Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
   Fin #: 435609-1-52-01
   Key Words: Ledstar DMS
   Spec. Sections: 5-1.4.3, 700-4
   Discipline: Electrical Engineering

   Issue: Ledstar Corporation took over twice the duration stated in the construction CPM to manufacture and deliver the 14 DMS devices that the contract plans required. The original duration in the CPM was 80 days for manufacture and delivery of the DMS signs but the actual duration was over 7 months (ordered December 2016 and arrived in June 2017, about 210 days). The prime contractor HSD indicated that Ledstar told them they were put in the queue and they had other customers in the USA and Canada ahead of our contractor. The contractor had a signed contract with Ledstar and approved shop drawings and it was too late to switch to Daktronics made DMS.

   Resolution or Benefit: Ledstar may have provided a lower initial price to HSD but later it appeared that using Ledstar cost the contractor critical time on his schedule and made the DMS the critical path over all the rest of the other activities.

   Lesson Learned: Ledstar may be a cheaper bid option but a contractor should be aware the wait times to get the product may be longer, affecting the critical path.

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2. **Date-Time:** September - November 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: Ledstar DMS
Spec. Section: 700-4
Discipline: Electrical Engineering.

Issue: Ledstar Power Block in 3-Line Walk in DMS. The power block size may need to be increased to allow easier installation of #1/0 gauge power service wires and ground wire. The contractor complained the #1/0 wire could not be installed and tried to install #6 wire but the CEI caught this and enforced #1/0 wire. The contractor had to get Ledstar's technician to come to the project from Canada and help HSD staff wire in all the DMS. While this is not a problem for FTE, it illustrated the unfamiliarity of the product to the Florida ITS contractor industry. Also, the FTE TMC had a learning curve trying to use the software for the Ledstar product.

Resolution or Benefit: Ledstar components and wiring compatibility should be checked by EORs to ensure they are not designing thinking only of Daktronics compatibility.

Lesson Learned: EORs should not get comfortable designing DMS based solely on the system characteristics of Daktronics and now that Ledstar is being used throughout Florida they need to check designs are more universal in nature and compatible for any system. FTE TMC is also going through a learning curve on how to use the Ledstar software in Sunguide and Sunwatch.

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3. **Date-Time:** July-September 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: Ledstar DMS
Spec. Section: 700-4

Discipline: Electrical Engineering.

Issue: Ledstar Batteries are much larger, apparently, than Daktronics. This is not an issue of itself for the UPS; however, EOR's need to check their designs to ensure the Ledstar battery sizes will fit in enclosures that the EORs had assumed Daktronics batteries would be placed. Example of this was the existing local HUB 4.1 NB where an existing DMS was in place and FTE EOR added a second one-line DMS. The Ledstar batteries for the one-line DMS were too large to go into the 334 cabinet and HSD had to add on a second 336 cabinet to hold the batteries. FTE denied responsibility to pay for this as this was considered HSD's decision to use Ledstar and forgo using other cabinets provided in the plans. This also is an example of the contractor getting a lower price

initially from Ledstar then finding out there were associated extra costs that came from using the Ledstar product.

Resolution or Benefit: Ledstar components and wiring compatibility should be checked by EORs to ensure they are not designing thinking only of Daktronics compatibility.

Lesson Learned: If FTE wants Daktronics they need to ask for it by name (sole source).

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4. **Date-Time:** July 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: Ledstar DMS
Spec. Section: 700-4
Discipline: Electrical Engineering.

Issue: Ledstar Embedded DMS Power Converter. The Ledstar embedded Toll Amount DMS require a power converter that needs to be housed in a 334 cabinet on the column of the truss, not in the truss itself.

Resolution or Benefit: Ledstar components and wiring compatibility should be checked by EORs to ensure they are not designing thinking only of Daktronics compatibility

Lesson Learned: EORs should design DMS based solely on the system characteristics of Daktronics now that Ledstar is being used throughout Florida. They need to check that designs are more universal in nature and compatible for any system.

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5. **Date-Time: August** 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: MVDS Testing
Spec. Section: 660-2 and 660-2.3.1.3
Discipline: Electrical Engineering.

Issue: MVDS tests were misunderstood by the FTE Engineers reviewing the shop drawings and they need to re-read the specifications and understand that there are provisions in the specification for the MVDS product to meet to be put on the APL (660-2) and there are separate field test provisions with human observation for samples and ground truth data (660-2.3.1.3) that have lesser time frames (5 minutes vs. 15 minutes) for field tests for volume and speed.

Resolution or Benefit: FTE is going to be using Bluetooth AVI for the travel time system on the Suncoast 2 project. EORs need to check the specifications to ensure they are reviewing for field test procedures and not product approval to get on the APL.

Lesson Learned: TMC/FTE needs to decide how to test the MVDS and TTS on Suncoast Parkway 2 without any traffic on the project if it must be tested prior to opening or do they want to test it after opening when there will be traffic.

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6. **Date-Time:** December 8-9 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: Final striping and pavement markings; Merge at end of Express Lanes
Spec. Section: 102

Discipline: Civil Engineering.

Issue: MOT merge at the northbound north end of the express lanes from Station 1450 to 1510, the merge came off FC-5 and onto structural asphalt moving traffic over to the right into lane 2 back onto the FC-5. The motorist experiences bumps, especially for motorcycles. To prohibit motorists from using the closed express lane associated with the Section 5 implementation, and to encourage motorists to merge before the pavement transition, barrels were erected and an arrow board was installed south of the actual merge point. FTE also discussed using PCMS messages to say the express lanes were opened in advance of the entry points.

Resolution or Benefit: The resolution is that MOT design should keep traffic in merges on the same pavement level. The plans should indicate if PCMS messages are desired.

Lesson Learned: Merge points should not have to go through pavement changes from FC-5 to structural asphalt back to FC-5. PCMS should be shown as advance notification for the opening of the express lanes.

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7. **Date-Time:** September – December 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: MOT plan for implementing Express Lanes; Barrels in closed Express Lanes
Spec. Section: 102
Discipline: Civil Engineering

Issue: Questions came from the contractor about when the barrels in the closed express lane were to be removed; FTE did not believe the MOT barrels were necessary after the delineators had been installed. When the delineators were installed the contractor did not want to remove the barrels saying that they offered

protection to the delineators. The contractor said that FTE's decision to remove barrels out of the closed express lane made the delineators more vulnerable to being hit.

Resolution or Benefit: MOT actions for express lanes need to be refined and better clarified on future contracts such as notes to say the barrels to be removed when delineators are installed.

Lesson Learned: Plans should indicate barrels to be removed after delineators are installed; barrels are only needed to block the entry points for the closed express lanes.

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8. **Date-Time:** September – December 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: Express Lanes Signs; Tarps for sign covers; uncovered.
Spec. Section: 700, 102
Discipline: Civil Engineering

Issue: Hurricane Irma in September 2017 taught us that putting tarps over the new express lanes signs was a bad idea and we learned that the public was not concerned or misled when the signs were left uncovered for the months leading up to the opening of the Express Lanes in December 2017. If the Department wants to cover signs that are not in use, another method should be considered as an option. The uncovered signs did not appear to distract the drivers. Barrels and delineators kept the public out of the express lanes until we were ready to open.

Resolution or Benefit: FTE should consider if it is really needed to put tarps over Express Lanes signs. The tarps fly off and become a nuisance or hazard. An alternate method for covering signs should be considered.

Lesson Learned: FTE should reconsider the small yellow angular temporary overlays on top of the express lane signs with a message that says express lane closed, or under construction. Do not waste time and money covering signs if there is no good reason to do it.

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9. **Date-Time:** October – December 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: Load Centers, Roadway Lighting
Spec. Section: 715
Discipline: Electrical Engineering.

Issue: The load centers at Gunn Highway, Ehrlich Road, and Sugarwood plaza were not updated in the Design/Build job for Veterans Expressway Section 4 due to the lack of requirement in the RFP. The existing lighting load centers did not have disconnect switches at the power meters adjacent to the TECO power poles supplying the power. When the work was done per the plans to replace the existing load center cabinets with new cabinets, the TECO power had to be turned off. TECO would not turn back on the power until new disconnect switches were provided to be current NEC and electrical standards. Disconnect switches had to be added at three load centers adding to the project time and cost.

Resolution or Benefit: Load center disconnect switches were added to bring the load centers at Gunn, Ehrlich and Sugarwood up to date.

Lesson Learned: Design EORs should be looking at the existing load centers to see if they have disconnect switches between the meter and the load center panel, especially where the existing system has been in place for a long time. Existing load centers should be updated to current code and design.

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10. **Date-Time: September – December** 2017
Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: Delineators, 24” Delineators and 36” Delineators
Spec. Section: Developmental Specification 993
Discipline: Civil Engineering.

Issue: In the developmental specification for delineators, there is no language specifically detailing the contractor’s responsibility to replace damaged delineators. On this project, 24” delineators were added to the project after letting. The specification did not clearly address the expectation to replace delineators based on the amount of damage and what constitutes a functional delineator. Further, internally, what is the expectation from maintenance on turning over the project to them with delineators that had been damaged. The contractor argued that FTE added work to the contract that extended the time on the project, and he had more exposure beyond his expectation at bid time. This led to a claim that the delineator specification did not state they were responsible to replace the missing and mangled delineators after they were initially installed. On this project, 22 delineators were replaced that were considered damaged by the CEI (rips, tears, and holes). Several other delineators were replaced due to product failure (weld failure between base and post and epoxy failure).

Resolution or Benefit: Delineator specifications should be better written to indicate how long the contractor should anticipate he is the responsible party to replace all the mangled and missing delineators up to final acceptance and he should be responsible for a time period after final acceptance for product failures where the base stays but the post is hit and flies off.

Lesson Learned: Since contract management personnel has no way of determining the amount of hits a delineator has experienced, the Developmental Specification should be modified to include language in a more measurable /objective manner and/or include language for Contractor responsibility to maintain from these types of damage until final acceptance. Also, there should be a warranty specification for after final acceptance regarding product failures.

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11. **Date-Time: September – December** 2017

Project: SR-589 Veterans Expressway Sections 1-3 Express Lanes MP 2.911 to MP 10.298
Fin #: 435609-1-52-01
Key Words: Delineators do not drain, 24" Delineators and 36" Delineators
Spec. Section: Developmental specification 993
Discipline: Civil Engineering.

Issue: The Pexco City Post glue-down delineators do not drain and their design with caps in the tops – these caps often come off at the first hit or two. The delineators gather rain water over time and they do not drain well, if at all. In the spring and summer months in Florida's rainy season, the delineators hold water and become heavier objects when hit by cars that may cause more damage.

Resolution or Benefit: Delineator specifications should be written to indicate the delineators need to drain and the caps should stay on or be deleted from the product. FDOT/FTE should look at better draining delineators.

Lesson Learned: Delineator specifications need to include language on drainage. Also, there should be a warranty specification for after job acceptance regarding product failures that includes drainage and caps.

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