

# Extinguish the Torch Meeting

## Final Summary Report

### **Project: NB Turnpike and Glades Intersection Improvements**

**Financial Project Number: 435615-1/4-52-01**

**Contract No.: E8P90**

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### **Project Scope of Work:**

435615-1-52-01: The Improvements consisted of the widening the northbound Turnpike and adjusting Turnpike Mainline geometry in the northbound direction from Milepost 75.603 to Milepost 76.404 to provide an additional auxiliary lane for Exit 75 (Glades Road) and widening the off ramp to two (2) lanes. The existing ramp bridge over the Lake Worth Drainage District canal was modified to remove the existing single-lane bridge and construct a new two-lane bridge for exiting traffic. Modifications to signing and pavement markings, and lighting was also included.

435615-4-52-01: The Improvements consisted of widening westbound Glades Road, mostly to the inside, to accommodate the addition of an additional right turn lane to the northbound/southbound entry to Florida's Turnpike; and widening of the Turnpike off ramp to Glades Road to include an additional right turn for westbound traffic onto Glades Road. The work also included signing and pavement markings, lighting, and signalization modifications at the Turnpike Entrance and at Corporate Center for the new lane configurations. The existing Turnpike bridge (No. 930416) over Glades Rd was painted.

### **Contract Time**

Original Contract Time:	290 days
Time Extensions for Weather Impacts:	89 days
Time Extensions for Holidays and Special Events:	59 days
Other Time Extensions (Special Events):	2 days
Time Extended by SA:	26 days
<u>Total Time Extensions:</u>	<u>175 days</u>

**Total Allowable Contract Time: 465 days**

Project completed on Day 464 day of 465 Allowable Days.

**Time Analysis:** 9 % over original contract time. (Percentage time does not include Weather, Holidays & Special events.)

**Contract Amount**

- Original Contract Amount: \$8,378,687.61 (Includes original contingency)
- Original Contingency Amount: \$86,879.02
- Overruns/Underruns: \$115,768.51
- 10 Supplemental Agreements totaling: \$645,631.46 (including Hurricane Irma).
- Work Orders totaling: \$324,047.36 (Includes original contingency)
- Final Contract amount: \$9,193,442.77 (Includes Hurricane Irma SA's which totaled \$80,742.32)
- Final money percentage: TBD (Pending distribution of held retainage)

**Added Scope to the project:**

- Irrigation restoration on Glades Road medians
- Iguana deterrent Geogrid reinforced slopes
- Traffic Monitoring Site restoration

**1- Existing Irrigation not addressed in the plans**

***Issue Detail***

Glades Road: The plans called for capping the existing irrigation in Glades Road medians, and did not indicate the presence of irrigation on the North side of Glades Road. The existing grass at these locations was Floratam, which requires irrigation. Representatives of the Boca West Master's Association (BWMA) contacted this office at the beginning of the project to request restoration within the Glades medians and on the North side of Glades Road.

SunPass Building: The irrigation in the SunPass Building property was not indicated in the plans, and was damaged during construction. Also, the existing grass was Floratam, and no provision for replacing the sod with Floratam was made in the contract.

***Resolution***

Glades Road: Irrigation was restored in the Glades medians. The contractor's proposed cost totaled \$46,711.50 which included MOT, and a 10-day time extension was requested. Through negotiations, the contractor allowed the work to occur concurrently during phase 1 and avoid MOT costs were avoided. In addition, the CEI negotiated with BWMA for them to restore the irrigation on the north side of Glades Road, and place the sod within the medians and on the north side of Glades Road, as a tradeoff.

Irrigation cost	\$28,561.50
Sod	<u>-\$8,872.18</u>

**Cost to contract                      \$19,689.32**

Turnpike SunPass Building: A battery operated timer was placed at a cost of \$550 to restore automatic operation of the irrigation system to the back side of the building. Bahia sod was placed for grass restoration since no irrigation was restored in the property along the frontage on Glades and the exit ramp.

**Cost to contract                      \$550.00**

***Lessons Learned / Recommendations***

In areas with an existing Memorandum of Maintenance (i.e. Maintenance Agreement, such as the Glades Roads medians), the Department and the designer need to consider restoration during the design phase and/or coordinate/clarify the scope with the impacted parties to prevent issues during construction. In addition, irrigation plans for the SunPass building were available and the information should have been included in the plans.

## 2- Truss Span Structure Revision During Construction

### Issue Detail

During shop drawing review, the EOR discovered a plan error, resulting in the span size increase of 7.4' which resulted in a 42% weight increase and corresponding material and fabrication increased costs of 48%. This cost was due to the chord thickness increase to 8 5/8" X 5/8", which caused all gussets and the upright thicknesses to increase. With RFI E8P90-0017 submitted on 1-11-17, the EOR was made aware of the increased weight and fabrication costs and of the difficulty in obtaining the new proposed chord size. The contractor submitted a price proposal for \$350,000. The original structure bid price was \$177,000.

### Resolution

Due to the additional cost, other options for chord sizes were requested from the EOR. The fabricator had suggested a 10 3/4" X 3/8" chord size that would not increase the weight significantly and was readily available. On January 25<sup>th</sup>, a meeting was held for clarification on why the size suggested by the contractor could not be considered. Ultimately, a CSI was proposed by the contractor with the suggested chord size. A concept meeting was held and no objections were indicated. However, due to the potential for exposure that may have resulted for design review times, the CSI was rejected by the Construction Office. On May 5<sup>th</sup>, the contractor was directed to construct the Revision 2 design, with compensation for actual costs per Section 4-3.2.1 of the Specifications, since the proposed price was not accepted.

The contractor's submitted costs totaled \$373,311.41 after the construction was completed; however, a settlement for \$355,000 was reached.

**Additional cost to contract: \$178,000**

### Lessons Learned / Recommendations

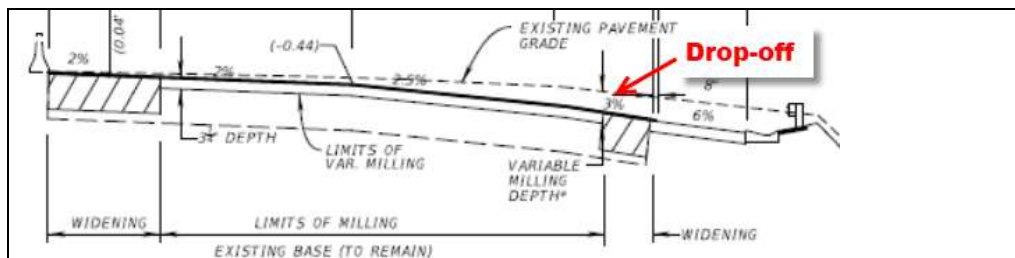
For cases such as this, where the cost increase appears extraordinary, it may be advisable to have the design team review/consider all options to prevent the cost impact the Department.

## 3- Milling & Resurfacing: Drop-offs created by Cross-Slope Corrections and Potential with hitting base

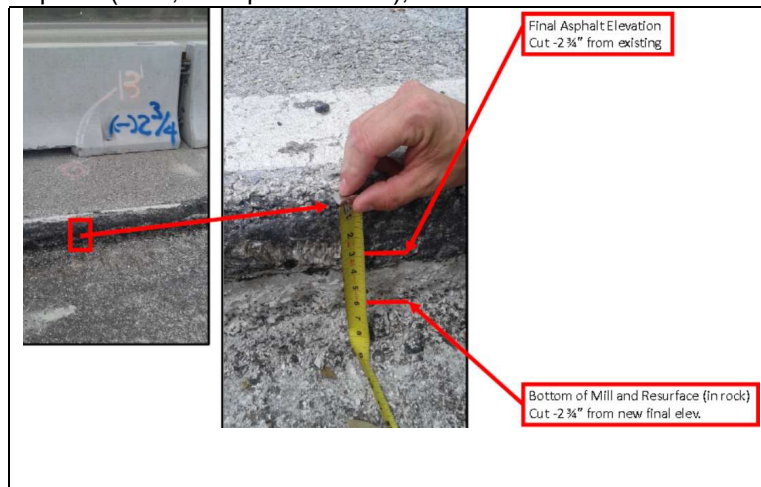
### Issue Detail

The improvements called for widening on the outside (Phase 1) and inside (Phase 2) of the Turnpike with cross-slope correction and with 1/2" additional milling to gain wall reveal.

The plans did not indicate which phase to complete the Milling & Resurfacing, and called for outside widening first, and then the inside widening, and there was a concern with drop-offs created and the potential for holding water during the M & R operations.



In addition, due to the deep mill (3 1/4", 2 3/4" plus 3/4" FC5), there was a concern about hitting existing base.



### Resolution

Additional pre-pave meetings (workshops) were held early, and supplemental information was provided by the EOR (stations, offsets, elevations). From this information, it was clear that there would be a significant drop-off at the outside widening that would need to be addressed to allow the Phase 2 traffic shift. A sacrificial asphalt wedge was placed on the outside widening to address the drop off.

Fortunately, the contractor did not submit an NOI, since there was an understanding that the turnpike would assist with extended lane closures during the M & R due to the drop-off between lanes; however, after numerous discussions, no extended lane closures were granted due to heavy traffic; and the contractor addressed the issue by breaking up the project into 600' to 700' sections, and milled and resurfaced across all lanes within each section to prevent a drop-off condition. This resulted in lower production rate (ave 237 TN) and a lower ride number (from all the extra joints).

Additionally, due to the concern with hitting base, that became evident after the pavement was sawcut and removed, the Turnpike Materials office performed pavement coring to verify existing asphalt thickness. Due to the thin asphalt, the EOR modified the cross-slope of R-3 from 2.5% to 2% to address the issue. This adjusted cross-slope resulted in re-paving required on the outside auxiliary lane and the outside shoulder along the mainline between Stations 472+88 to 491+00, that had already been widened and paved during Phase 1B.

**The cost to contract for slope modification: \$41,872.00**

**\$31,871.78 (asphalt quantity overrun) and \$10,000 for additional milling (under negotiation)**

### Lessons Learned / Recommendations

The plans should consider an approach to minimize the potential for drop-offs for milling and resurfacing projects involving cross-slope correction, and especially for projects with extra milling to gain wall reveal. The approach needs to be clearly addressed in the plans, along with additional MOT asphalt that may be required. Also, a depiction of the special detour should be included, so it is understood what MOT asphalt has been considered for payment as special detour. Whenever a deep mill is proposed, it is also important to verify the locations of the cores used in the pavement design and check the existing asphalt thickness.

**Comment: projects should be designed with Milling and Resurfacing (with cross-slope corrections) completed first, then widening. This is a reoccurring issue.**

#### 4- Performance Turf Limits

##### **Issue Detail**

The designer did not include performance turf for areas within the project that should have been included, and the performance turf in these areas and had to be negotiated to close out the project. For example, the LWDD Permit area required 4010 SY of sod for restoration.



*Construction of the gravity wall could not be completed without using the LWDD R/W.*

##### **Resolution**

For the LWDD right of way area, the CEI negotiated with the contractor to pay only for materials (\$1.98 per SY or \$7,940.00), since LWDD allowed excess material to remain within the LWDD R/W, a benefit to the contractor. Other areas requiring restoration were negotiated, in a similar manner. **Total additional costs related to performance turf totaled \$15,000.**

##### **Lessons Learned / Recommendations**

The designer should consider how areas are to be accessed for construction, and include additional areas within the performance turf quantity as well, not just the area identified as clearing and grubbing. Maybe a contingent amount can also be included in the quantity.

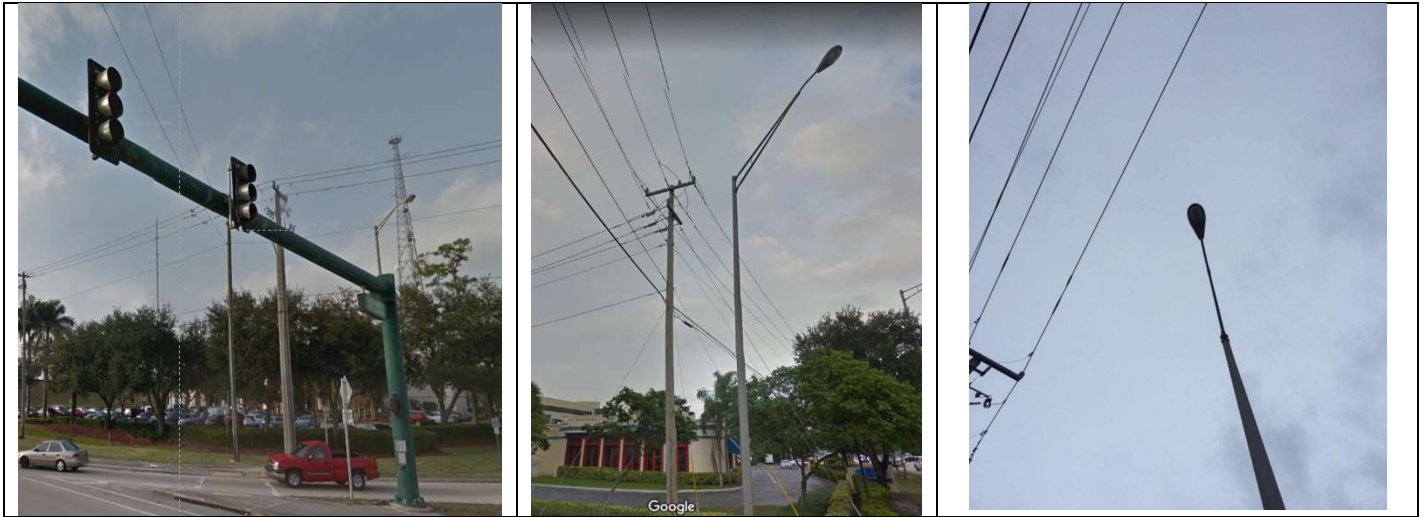
**Comment: Performance Turf limits (sod) is a re-occurring issue on projects.**

#### 5- Overhead Electric Conflicts

##### **Issue Detail**

There were conflicts with overhead electric that had to be addressed during construction. The installation of the Mast Arm B on the NW corner of Turnpike entrance and Glades and the removal of the existing signal arm, and the removal

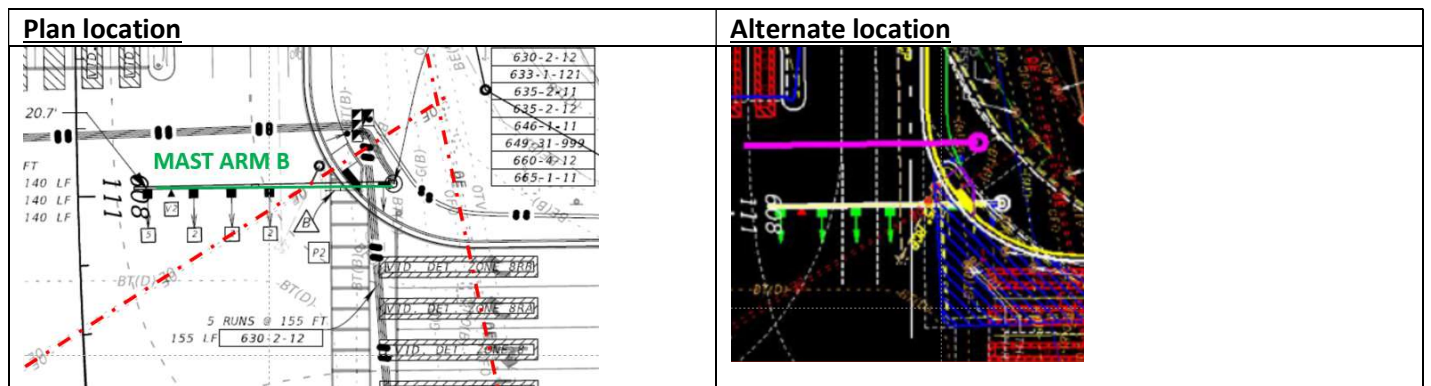
of 2 existing light poles on the NE and NW corners. The UWS did not include de-energizing (per the EOR, the 10' OSHA clearance was met). However, the contractor indicated the OSHA clearance could not be met, and this was confirmed in the field.



**Resolution**

The proposed location of the mast arm was modified to minimize the OE conflict with the line running along Glades. In addition, an arrangement was made with FPL to de-energize the overhead electric running across the intersection, as this OE was only for the signal. One de-energizing was accomplished by FPL concurrently with a pole hold that was part of the UWS. In addition, FPL agreed to provide a 2-hour outage of the single-phase OE running parallel to Glades to allow for the removal of the 2 light poles approximately 5' from the OE.

This was accomplished through direct coordination with FPL during construction, and was provided by FPL as a courtesy and partnering effort, at **no additional cost to the Department**.



**Lessons Learned / Recommendations**

Clarification needs to be provided on the OSHA requirement and the need for de-energizing for construction and for removals, since rule 1926.1408(d)(1) below seems to indicate that if the existing arm (load) is directly below the OE, the line is to be de-energized. In addition, light pole removals need to be considered to review for conflicts.

**OSHA 1926.1408(d)(1)**

No part of the equipment, load line, or load (including rigging and lifting accessories) is allowed below a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line, except where one of the exceptions in paragraph (d)(2) of this section applies.



Comment: Referenced section not included. (Please see the OSHA attachments (A and B) from the US Department of Labor for additional information, and referenced sections.)

Specialized equipment should be called out in the contract, not just "Low Profile" equipment, as that pertains to the drill rig, which is not the source of the problem.

It was discussed that the Telehandler is not an option per the input of some contractors.

There was much discussion on this as a contractor means and method issue. Pete Nissen, DCE, indicated that construction staff needs to hold our position and not concede if it is a means and method issue.

**6- Iguana Mesh (Geogrid slope reinforcement)**

***Issue Detail***

The maintenance office had placed "iguana mesh" on the slope north of Glades Road. The existence of the geogrid in this location was not indicated in the plans and it was encountered during clearing & grubbing efforts.



***Resolution***

The Geogrid was removed, and per the request of Maintenance was replaced on the slope.

**Cost to the contract: \$ 46,832.50 (Plus \$3,300 for removal)**

### Lessons Learned / Recommendations

With the prevalence of iguanas in South Florida, especially near canals, during design it is important for the design/review team to consider if iguana deterrent/treatments are needed, or if they had been placed prior, as this may impact clearing & grubbing costs, and add costs for replacement.

#### 7- Off-Duty Officers Hours underestimated for Turnpike Widening and Paving and Ramp D-1 bridge construction

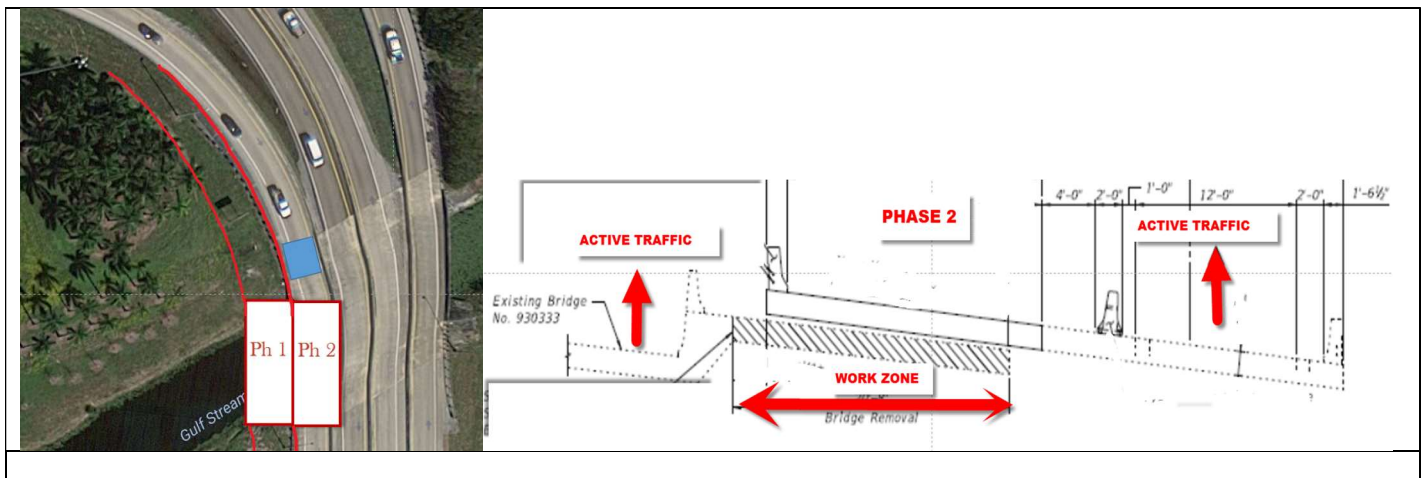
##### Issue Detail

The plans included 284 hours for officers on Glades Road only. No officer hours were included for Turnpike. Officers were required for most of the inside median widening work (Phase 2), and for most Phase 2 Ramp D-1 bridge work.

The lane closure restrictions indicated that a “single lane” closure on the ramp was permitted between 9:00 pm to 6:00 am; however, there was only one lane on the ramp, so each lane closure was a FULL RAMP CLOSURE, requiring detours for each closure and off-duty officers.

As a result, traffic officer hours were significantly overrun.

In addition, Ramp D-1 bridge construction was on the critical path, and the schedule was very tight. Phase 2 construction of the bridge was especially challenging due to limited work space, and since the work for this phase was between live traffic on both sides, required ramp closures. Due to the this the work, the production rate for the work was low, resulting in more ramp closures (and more officers).



12. THE NUMBER OF LANES CLOSED AND THE HOURS LANE CLOSURES ARE PERMITTED ARE AS FOLLOWS:

SR 91 (FLORIDA'S TURNPIKE):  
SINGLE LANE CLOSURES 10:00 PM TO 5:00 AM  
DUAL LANE CLOSURES 11:00 PM TO 5:00 AM

SR 808 (GLADES ROAD) EXIT RAMP:  
SINGLE LANE CLOSURES 9:00 PM TO 6:00 AM

ONLY ONE Lane on Ramp - FULL RAMP CLOSURE



### **Resolution**

Officer hours were overrun, as needed. **Additional cost to the contract: \$58,901.85**

For the Ramp D-1 bridge construction work, the Turnpike allowed a continuous Ramp Full Weekend Closure (10 pm Friday to 5 am Monday) and extended closures on the other weekends to allow the contractor to complete the most time-consuming operations, such as canal excavation and riprap placement with fewer ramp closures and inconvenience to the travelling public.

### **Lessons Learned / Recommendations**

Other construction options should be considered for these types of situation, such as a diversion, which would allow traffic to be maintained during the bridge construction, and reduce the need for full ramp closures (and off duty-officers).

Also, more contract time should have been provided for the bridgework. Fortunately, due to time extensions granted during the NOI settlement for other issues, and with the weekend closures granted, even though the bridge work time extended to mid-November, the bridge work did not delay the project.

## **8- Work over Water Impacting Public Safety (Temporary Formwork Shops)**

### **Issue Detail**

LWDD cautioned the CEI repeatedly about the public use of the canal by boaters for fishing and recreation. While the canal is not considered “navigable” by Coast Guard definition, boaters were known to use the canal, and were observed by CEI staff. Per the contractor, the contract did not require signed and sealed shop drawings, and submitted an NOI. There was no documentation, Permit language, ordinance or State Statute that could be located that stipulated that the public could not use the canal.

### **Resolution**

The contractor was directed to submit signed and sealed shop drawings for the temporary formwork, due to the impact to public safety. Warning signs were also placed along the canal approaches, due to hazards in the water created by pile templates.

### **Lessons Learned / Recommendations**

When construction involves work over water, designers should consider measures to prevent public access during construction, even if a canal is not considered navigable, or open to public use. **Should address public access.**

**Cost to the contract: \$16,000**

## **9- S-508 Drainage Structure Contractor initiated change**

### **Issue Detail**

The proposed location of S-508 was not included as an MOT phase. All roadway work involved the WB side of Glades only, and the original location of the structure would have impacted EB traffic and would have involved extra costs to the contract for MOT. The contractor initiated a change in the location, and the EOR assisted with this change; however, the change was more complicated than it appeared, and due to the delay with getting the final design location (34 days after NOI submitted), the Department was exposed for a delay claim.



### **Resolution**

Structure location was moved, but an NOI was issued due to the delay in the EOR response, and the Department settled a delay claim with the contractor for \$100,000 (for project wide delays).

### **Lessons Learned / Recommendations**

In this case, the claim for additional work may have been the best solution, but in any case, a prompt response is critical. Also, even if a change is initiated by the contractor, the change needs to be treated with the same amount of responsiveness. A timely response is critical to preventing delay claims.

**Cost to the contract: \$100,000**

## **10- Turnpike Drainage Structures Elevation Errors**

### **Issue Detail**

The shoulder gutter inlets on the Turnpike were discovered to be too high, due to a design error, and an NOI was submitted on 4-12-17 due to potential delay impacts. The EOR provided an intermediate MOT phase (Phase 1C) to minimize the impact and allow the contractor to continue working towards the traffic switch for the Phase 2 Ramp D-1 bridge construction, while the design details/approvals were finalized. The contractor submitted an RFI on 4-7-17, interim MOT phase 1C was provided on 5-11-17, and direction on the structures correction was provided by the EOR on 5-23-17. The contractor had installed additional measures for erosion control and protection in the area impacted by the delay, and had moved forces to the ramp roadway work; however, a documented 100-yr storm hit (10" rain event) and caused significant damage to the work area, due to no fault of the contractor.

### **Resolution**

The Department compensated the contractor for the storm damage, since this damage was not due to the fault of the contractor, but was an act of God. The intermediate MOT phase minimized the issue; however, the design error and response time extended the time for the work to be completed and caused the unfinished work to be exposed and vulnerable during the rainy season.

**Cost to the contract: \$62,000**

### **Lessons Learned / Recommendations**

Any impact to the contractor's work causes exposure to the department. This was a steep slope and very vulnerable to erosion damage, a timely response may have prevented the contractor from shifting forces away from the work area, and may have minimized the potential for storm damage.

## **11- Adaptive Control Signal Coordination**

### **Issue Detail**

The signal plans called for Adaptive Control equipment on the two intersections within the project limits (TPK/Glades and Corporate/Glades), and the signals were designed with the understanding that Palm Beach County would have implemented Adaptive Control on the TPK at Glades intersection and the next signal west of the Turnpike (Boca Rio) prior to the project; however, PB County did not complete the work as planned, and Adaptive Control was not in place, and only partial equipment was provided in the contract for the Turnpike at Glades intersection. Installing only partial components would not allow the signals to be properly coordinated and controlled, and Boca Rio was key to the system coordination but was not part of the project and was outside the project limits

### **Resolution**

Palm Beach County provided let a project to install the Adaptive Control System at all three intersections, and Adaptive Control components procured for this project were provided to Palm Beach County using the funds available in the pay items for this work.

No additional cost to the contract resulted; however, this required significant time to coordinate and resolve during construction.

### **Lessons Learned / Recommendations**

In situations where work is to be completed by another agency prior to the beginning of the project, verification should be made by the designer to verify (prior to letting) the work was completed and that no modifications are required due to changes that may have occurred. Another approach could be to assume no work was completed prior, and eliminate unneeded work from the contract after construction begins.

**Below items added based on discussion at the Extinguish the Torch meeting:**

## **12- Right of Way**

### **Issue Detail**

Limited R/W was available for construction on the northside of Glades Road, with the completed construction right at the property line at the eastern driveway of the Starbucks Plaza. The property owner contacted the Department at the start of construction with questions regarding the property line. In addition, towards the end of the project, the property owner conducted a property survey and claiming that portions of the completed handrail and traffic signal features were encroaching within the adjacent property right-of-way. In addition, with the limited space construction operations were very tight, and no temporary easement information was provided to the construction staff to facilitate this work



**West side of the driveway**

**East side of the driveway**

**Resolution**

A response to the property owner regarding the R/W concern was provided by the Turnpike Right-of-Way office at the beginning of construction. During construction, the CEI staff met with the property manager on-site multiple times to discuss upcoming work and existing irrigation, since the irrigation was within the FDOT R/W and would be impacted during construction. Meetings were also held by the CEI with the property manager to discuss the concern with completed work and R/W encroachment. Additional survey completed by the CEI surveyor confirmed all construction was completed within the R/W per the plans. The Turnpike R/W Office also completed a review and additional survey, and found no encroachment or error in the survey. The property owner ultimately submitted a demand letter after project final acceptance, and the Turnpike Right-of-Way Office is handling responses, as required.

**Lessons Learned / Recommendations**

It is suggested that when R/W is very constrained and proposed construction features are within 5 feet of private property, the designer contact (and meet with, as needed) property owner's and review the proposed work so potential R/W issues can be vetted and cleared prior to construction beginning. In addition, temporary easements should be acquired and transmitted to the construction office to facilitate construction work, and to protect the Department from claims. This approach would also help to maintain positive Public relations.

**13- RFI's**

**Issue Detail**

While the RFI system was used by the contractor, some design items/issues were handled through e-mail, and due to untimely responses, resulted in claims against the Department. For example, the request to modify the location of S-508 (RFM) discussed in item 9 above, was not handled through the RFI system.

**Resolution**

The location of S-508 was ultimately completed, and the pending Notice of Intent to claim (NOI #9) was settled with the contractor. See item 9 above for details.

**Lessons Learned / Recommendations**

It is strongly recommended to use the RFI tracking system. For all RFI's, RFM's and RFC's. Th ProjectSolve system helps to document and track the issues and helps to assign priority for the EOR.



- **Part Number:** 1926
- **Part Title:** Safety and Health Regulations for Construction
- **Subpart:** CC
- **Subpart Title:** Cranes & Derricks in Construction
- **Standard Number:** 1926.1408
- **Title:** Power line safety (up to 350 kV)--equipment operations.
- **GPO Source:** e-CFR

**1926.1408(a)**

*Hazard assessments and precautions inside the work zone.* Before beginning equipment operations, the employer must:

**1926.1408(a)(1)**

*Identify the work zone by either:*

**1926.1408(a)(1)(i)**

Demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) and prohibiting the operator from operating the equipment past those boundaries, or

**1926.1408(a)(1)(ii)**

Defining the work zone as the area 360 degrees around the equipment, up to the equipment's maximum working radius.

**1926.1408(a)(2)**

Determine if any part of the equipment, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone, could get closer than 20 feet to a power line. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3) of this section, as follows:

**1926.1408(a)(2)(i)**

*Option (1)--Deenergize and ground.* Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.

**1926.1408(a)(2)(ii)**

*Option (2)--20 foot clearance.* Ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures specified in paragraph (b) of this section.

**1926.1408(a)(2)(iii)**

*Option (3)--Table A clearance.*

**1926.1408(a)(2)(iii)(A)**

Determine the line's voltage and the minimum approach distance permitted under Table A (*see* § 1926.1408).

**1926.1408(a)(2)(iii)(B)**

Determine if any part of the equipment, load line or load (including rigging and lifting accessories), while operating up to the equipment's maximum working radius in the work zone, could get closer than the minimum approach distance of the power line permitted under Table A (*see* § 1926.1408). If so, then the employer must follow the requirements in paragraph (b) of this section to ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum approach distance.

**1926.1408(b)**

*Preventing encroachment/electrocution.* Where encroachment precautions are required under Option (2) or Option (3) of this section, all of the following requirements must be met:

**1926.1408(b)(1)**

Conduct a planning meeting with the operator and the other workers who will be in the area of the equipment or load to review the location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution.

**1926.1408(b)(2)**

If tag lines are used, they must be non-conductive.

**1926.1408(b)(3)**

Erect and maintain an elevated warning line, barricade, or line of signs, in view of the operator, equipped with flags or similar high-visibility markings, at 20 feet from the power line (if using Option (2) of this section) or at the minimum approach distance under Table A (*see* § 1926.1408) (if using Option (3) of this section). If the operator is unable to see the elevated warning line, a dedicated spotter must be used as described in § 1926.1408(b)(4)(ii) in addition to implementing one of the measures described in § § 1926.1408(b)(4)(i), (iii), (iv) and (v).

**1926.1408(b)(4)**

Implement at least one of the following measures:

**1926.1408(b)(4)(i)**

A proximity alarm set to give the operator sufficient warning to prevent encroachment.

**1926.1408(b)(4)(ii)**

A dedicated spotter who is in continuous contact with the operator. Where this measure is selected, the dedicated spotter must:

**1926.1408(b)(4)(ii)(A)**

Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A clearly visible line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

**1926.1408(b)(4)(ii)(B)**

Be positioned to effectively gauge the clearance distance.

**1926.1408(b)(4)(ii)(C)**

Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

**1926.1408(b)(4)(ii)(D)**

Give timely information to the operator so that the required clearance distance can be maintained.

**1926.1408(b)(4)(iii)**

A device that automatically warns the operator when to stop movement, such as a range control warning device. Such a device must be set to give the operator sufficient warning to prevent encroachment.

**1926.1408(b)(4)(iv)**

A device that automatically limits range of movement, set to prevent encroachment.

**1926.1408(b)(4)(v)**

An insulating link/device, as defined in § 1926.1401, installed at a point between the end of the load line (or below) and the load.

**1926.1408(b)(5)**

The requirements of paragraph (b)(4) of this section do not apply to work covered by subpart V of this part.

**1926.1408(c)**

*Voltage information.* Where Option (3) of this section is used, the utility owner/operator of the power lines must provide the requested voltage information within two working days of the employer's request.

**1926.1408(d)**

*Operations below power lines.*

**1926.1408(d)(1)**

No part of the equipment, load line, or load (including rigging and lifting accessories) is allowed below a power line unless the employer has confirmed that the utility owner/operator has deenergized and (at the worksite) visibly grounded the power line, except where one of the exceptions in paragraph (d)(2) of this section applies.

**1926.1408(d)(2)**

*Exceptions.* Paragraph (d)(1) of this section is inapplicable where the employer demonstrates that one of the following applies:

**1926.1408(d)(2)(i)**

The work is covered by subpart V of this part.

**1926.1408(d)(2)(ii)**

For equipment with non-extensible booms: The uppermost part of the equipment, with the boom at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this section minimum clearance distance below the plane of the power line.

**1926.1408(d)(2)(iii)**

For equipment with articulating or extensible booms: The uppermost part of the equipment, with the boom in the fully extended position, at true vertical, would be more than 20 feet below the plane of the power line or more than the Table A of this section minimum clearance distance below the plane of the power line.

**1926.1408(d)(2)(iv)**

The employer demonstrates that compliance with paragraph (d)(1) of this section is infeasible and meets the requirements of § 1926.1410.

**1926.1408(e)**

*Power lines presumed energized.* The employer must assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

**1926.1408(f)**

When working near transmitter/communication towers where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter must be deenergized or the following precautions must be taken:

**1926.1408(f)(1)**

The equipment must be provided with an electrical ground.

**1926.1408(f)(2)**

If tag lines are used, they must be non-conductive.

**1926.1408(g)**

*Training.*

**1926.1408(g)(1)**

The employer must train each operator and crew member assigned to work with the equipment on all of the following:

**1926.1408(g)(1)(i)**

The procedures to be followed in the event of electrical contact with a power line. Such training must include:

**1926.1408(g)(1)(i)(A)**

Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.

**1926.1408(g)(1)(i)(B)**

The importance to the operator's safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.

**1926.1408(g)(1)(i)(C)**

The safest means of evacuating from equipment that may be energized.

**1926.1408(g)(1)(i)(D)**

The danger of the potentially energized zone around the equipment (step potential).

**1926.1408(g)(1)(i)(E)**

The need for crew in the area to avoid approaching or touching the equipment and the load.

**1926.1408(g)(1)(i)(F)**

Safe clearance distance from power lines.

**1926.1408(g)(1)(ii)**

Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been and continues to be deenergized and visibly grounded at the worksite.

**1926.1408(g)(1)(iii)**

Power lines are presumed to be uninsulated unless the utility owner/operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.

**1926.1408(g)(1)(iv)**

The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.

**1926.1408(g)(1)(v)**

The procedures to be followed to properly ground equipment and the limitations of grounding.

**1926.1408(g)(2)**

Employees working as dedicated spotters must be trained to enable them to effectively perform their task, including training on the applicable requirements of this section.

**1926.1408(g)(3)**

Training under this section must be administered in accordance with § 1926.1430(g).

**1926.1408(h)**

Devices originally designed by the manufacturer for use as: A safety device (*see* § 1926.1415), operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must meet the manufacturer's procedures for use and conditions of use.

TABLE A—MINIMUM CLEARANCE DISTANCES

Voltage (nominal, kV, alternating current)	Minimum clearance distance (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

**Note:** The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.

[75 FR 48142, August 9, 2010]

Next Standard (1926.1409)

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- **Part Number:** 1926
- **Part Title:** Safety and Health Regulations for Construction
- **Subpart:** CC
- **Subpart Title:** Cranes & Derricks in Construction
- **Standard Number:** 1926.1410
- **Title:** Power line safety (all voltages)--equipment operations closer than the Table A zone.
- **GPO Source:** e-CFR

Equipment operations in which any part of the equipment, load line, or load (including rigging and lifting accessories) is closer than the minimum approach distance under Table A of § 1926.1408 to an energized power line is prohibited, except where the employer demonstrates that all of the following requirements are met:

**1926.1410(a)**

The employer determines that it is infeasible to do the work without breaching the minimum approach distance under Table A of § 1926.1408.

**1926.1410(b)**

The employer determines that, after consultation with the utility owner/operator, it is infeasible to deenergize and ground the power line or relocate the power line.

**1926.1410(c)**

*Minimum clearance distance.*

**1926.1410(c)(1)**

The power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution determines the minimum clearance distance that must be maintained to prevent electrical contact in light of the on-site conditions. The factors that must be considered in making this determination include, but are not limited to: Conditions affecting atmospheric conductivity; time necessary to bring the equipment, load line, and load (including rigging and lifting accessories) to a complete stop; wind conditions; degree of sway in the power line; lighting conditions, and other conditions affecting the ability to prevent electrical contact.

**1926.1410(c)(2)**

Paragraph (c)(1) of this section does not apply to work covered by Subpart V of this part; instead, for such work, the minimum approach distances established by the employer under § 1926.960(c)(1)(i) apply.

**1926.1410(d)**

A planning meeting with the employer and utility owner/operator (or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution) is held to determine the procedures that will be followed to prevent electrical contact and electrocution. At a minimum these procedures must include:

**1926.1410(d)(1)**

If the power line is equipped with a device that automatically reenergizes the circuit in the event of a power line contact, before the work begins, the automatic redosing feature of the circuit interrupting device must be made inoperative if the design of the device permits.

**1926.1410(d)(2)**

A dedicated spotter who is in continuous contact with the operator. The dedicated spotter must:

**1926.1410(d)(2)(i)**



Be equipped with a visual aid to assist in identifying the minimum clearance distance. Examples of a visual aid include, but are not limited to: A line painted on the ground; a clearly visible line of stanchions; a set of clearly visible line-of-sight landmarks (such as a fence post behind the dedicated spotter and a building corner ahead of the dedicated spotter).

**1926.1410(d)(2)(ii)**

Be positioned to effectively gauge the clearance distance.

**1926.1410(d)(2)(iii)**

Where necessary, use equipment that enables the dedicated spotter to communicate directly with the operator.

**1926.1410(d)(2)(iv)**

Give timely information to the operator so that the required clearance distance can be maintained.

**1926.1410(d)(3)**

An elevated warning line, or barricade (not attached to the crane), in view of the operator (either directly or through video equipment), equipped with flags or similar high-visibility markings, to prevent electrical contact. However, this provision does not apply to work covered by subpart V of this part.

**1926.1410(d)(4)**

*Insulating link/device.*

**1926.1410(d)(4)(i)**

An insulating link/device installed at a point between the end of the load line (or below) and the load.

**1926.1410(d)(4)(ii)**

Paragraph (d)(4)(i) of this section does not apply to work covered by Subpart V of this part.

**1926.1410(d)(4)(iii)**

[Removed and Reserved]

**1926.1410(d)(4)(iv)**

Until November 8, 2011, the following procedure may be substituted for the requirement in paragraph (d)(4)(i) of this section: All employees, excluding equipment operators located on the equipment, who may come in contact with the equipment, the load line, or the load must be insulated or guarded from the equipment, the load line, and the load. Insulating gloves rated for the voltage involved are adequate insulation for the purposes of this paragraph.

**1926.1410(d)(4)(v)**

Until November 8, 2013, the following procedure may be substituted for the requirement in (d)(4)(i) of this section:

**1926.1410(d)(4)(v)(A)**

The employer must use a link/device manufactured on or before November 8, 2011, that meets the definition of an insulating link/device, except that it has not been approved by a Nationally Recognized Testing Laboratory, and that is maintained and used in accordance with manufacturer requirements and recommendations, and is installed at a point between the end of the load line (or below) and the load; and

**1926.1410(d)(4)(v)(B)**

All employees, excluding equipment operators located on the equipment, who may come in contact with the equipment, the load line, or the load must be insulated or guarded from the equipment, the load line, and the load through an additional means other than the device described in paragraph (d)(4)(v)(A) of this section. Insulating gloves rated for the voltage involved are adequate additional means of protection for the purposes of this paragraph.

**1926.1410(d)(5)**

Nonconductive rigging if the rigging may be within the Table A of § 1926.1408 distance during the operation.

**1926.1410(d)(6)**

If the equipment is equipped with a device that automatically limits range of movement, it must be used and set to prevent any part of the equipment, load line, or load (including rigging and lifting accessories) from breaching the minimum approach distance established under paragraph (c) of this section.

**1926.1410(d)(7)**

If a tag line is used, it must be of the nonconductive type.

**1926.1410(d)(8)**

Barricades forming a perimeter at least 10 feet away from the equipment to prevent unauthorized personnel from entering the work area. In areas where obstacles prevent the barricade from being at least 10 feet away, the barricade must be as far from the equipment as feasible.

**1926.1410(d)(9)**

Workers other than the operator must be prohibited from touching the load line above the insulating link/device and crane. Operators remotely operating the equipment from the ground must use either wireless controls that isolate the operator from the equipment or insulating mats that insulate the operator from the ground.

**1926.1410(d)(10)**

Only personnel essential to the operation are permitted to be in the area of the crane and load.

**1926.1410(d)(11)**

The equipment must be properly grounded.

**1926.1410(d)(12)**

Insulating line hose or cover-up must be installed by the utility owner/operator except where such devices are unavailable for the line voltages involved.

**1926.1410(e)**

The procedures developed to comply with paragraph (d) of this section are documented and immediately available on-site.

**1926.1410(f)**

The equipment user and utility owner/operator (or registered professional engineer) meet with the equipment operator and the other workers who will be in the area of the equipment or load to review the procedures that will be implemented to prevent breaching the minimum approach distance established in paragraph (c) of this section and prevent electrocution.

**1926.1410(g)**

The procedures developed to comply with paragraph (d) of this section are implemented.

**1926.1410(h)**

The utility owner/operator (or registered professional engineer) and all employers of employees involved in the work must identify one person who will direct the implementation of the procedures. The person identified in accordance with this paragraph must direct the implementation of the procedures and must have the authority to stop work at any time to ensure safety.

**1926.1410(i)**

[Reserved.]

**1926.1410(j)**

If a problem occurs implementing the procedures being used to comply with paragraph (d) of this section, or indicating that those procedures are inadequate to prevent electrocution, the employer must safely stop operations and either develop new procedures to comply with paragraph (d) of this section or have the utility owner/operator deenergize and visibly ground or relocate the power line before resuming work.

**1926.1410(k)**

Devices originally designed by the manufacturer for use as a safety device (*see* § 1926.1415), operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, must comply with the manufacturer's procedures for use and conditions of use.

**1926.1410(l)**

[Reserved.]

**1926.1410(m)**

The employer must train each operator and crew member assigned to work with the equipment in accordance with § 1926.1408(g).

[75 FR 48144, August 9, 2010; 79 FR 20743, July 10, 2014]

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