

October 15, 2008

**Cynthia Snow White
Project Manager
Florida Industrial Electric
1050 Miller Drive
Altamonte Springs, FL 32701**

**Mr. Alan Autry
Construction Services Manager
District 1
P.O. Box 1249
Bartow, Florida 33831**

**Re: FIN 419811-1-2-01;
SR 31 (Arcadia Rd) and SR 78 (Bayshore Rd)
DRB Recommendation For – *Special Design Mast Arm: Drilled Shaft Issues***

Dear Mr. Autry and Ms. White,

Florida Department of Transportation (Department) and Florida Industrial Electric (FEI) requested a hearing concerning the referenced issues.

Summaries of the Department's and FEI's positions, as well as rebuttals were forwarded to the Disputes Review Board (DRB), and a hearing was held on October 7, 2008.

ISSUE:

1. Is the contractor entitled to additional costs for the repair of the drilled shaft as well as additional contract time?

Contractor's Position

On February 20, 2007, Florida Industrial Electric, Inc. (FIE) executed a contract with the Florida Department of Transportation (FDOT) to improve the signalization, signing, and pavement markings at the intersection of SR 31 (Arcadia Rd) and SR 78 (Bayshore Rd). A portion of this contract included the installation of a Mast Arm (special design). This new mast arm required a drilled shaft to be constructed. All of the dimensions for the drilled shaft were provided by the FDOT in the Contract Documents.

On October 23, 2007, FIE installed the drilled shaft. At the end of the installation, it was apparent that there was an issue with the shaft because the anchor bolts were skewed. FIE began an investigation to determine the cause of the skewed anchor bolts. At the same time, FIE retained an Engineer to design a repair procedure. It was during the design of the repair procedure that FIE determined that the skewed bolts were a result of the FDOT design. It is the contention of FIE that the diameter of the drilled shaft was not sufficient in size to accommodate the Reinforced Steel 'Cage', CSL Test Tubes, and Anchor

Bolts in accordance with the Contract Documents.

FIE has requested additional compensation and contract time from the FDOT for unforeseen work associated with the installation/repair of the referenced drill shaft. This request is based on erroneous drill shaft design supplied by the FDOT. After numerous attempts to resolve the issue, FDOT continues to deny responsibility for the drilled shaft repairs. FIE requests that the Regional Dispute Review Board rule on entitlement to costs and time associated with the repairs to the drilled shaft.

In the pages that follow, you will find drawings, correspondence, and pictures that FIE believes to prove that the design provided by FDOT was erroneous. A copy of this package has been submitted to the FDOT as required and three copies of this package have been forwarded to you for disbursement to the appropriate RDRB Members.

Below you will find a timeline of correspondence & events associated with the original installation and the repair of the drilled shaft:

- 10/23/07 Initial install of the drilled shaft
- 10/31/07 Retain an Engineer to design a repair procedure
- 11/5/07 FDOT letter rejecting FIE repair procedure (Attachment A)
- 11/6/07 FIE letter objecting to repair procedure denial & placing FDOT on notice of FIE's intent to seek compensation for associated costs (Attachment B)
- 11/6/07 FDOT email stating that FDOT is reviewing the design and that they will review the Repair Plan (Attachment C)
- 11/6/07 FIE's Repair Plan (Attachment D)
- 11/9/07 FIE/FDOT email discussing the repair procedure (Attachment E)
- 11/9/07 FDOT email with comments on the repair plan and denying that there was a design error (Attachment F)
- 11/16/07 FIE letter submitting a revised repair procedure and placing FDOT on notice for possible time extension requests (Attachment G)
- 11/29/07 FDOT email approving repair procedure (Attachment H)
- 12/18/07 FIE email to notify FDOT of drill shaft conflicts (Attachment I)
- 12/19/07 FIE letter notifying FDOT that there is a conflict with the three CSL tubes (Attachment J)
- 12/20/07 Email from the Engineer retained by FIE to design the repair procedure stating his

observations from the field, including a conflict between the #9 rebar and the CSL tubes (Attachment K)

- 12/20/07 FDOT email chain that includes FDOT acknowledgement of a conflict and direction to “... *cut all five of the CSL tubes below the anchor bolts and proceed with installation...*” (Attachment L)
- 12/26/07 FDOT letter denying responsibility for design error (Attachment M)
- 12/27/08 FIE letter objecting to denial of request with detailed explanations and responses (Attachment N)

With reference to Drill Shaft Installation, the Contract Documents include the following:

- Special Provision 455-14.2 (Reinforcing Steel) – “... *Ensure that reinforcing steel is in accordance with the sizes, spacing, dimensions, and the details shown in the plans.*”
- Special Provision 455-16.1 (Cage Construction and Placement) – “*Completely assemble and place as a unit the cage of reinforcing steel, consisting of longitudinal bars, ties, and cage stiffener bars, immediately after the Engineer inspects and accepts the shaft excavation and immediately prior to placing concrete... The Engineer will give final approval of the cage construction and placement subject to satisfactory performance in the field.*”
- Special Provision 455-16.3 (Support, Alignment, and Tolerance) – “*Tie and support the reinforcing steel in the shaft so that the reinforcing steel will remain within allowable tolerances as specified in 455-8 and section 415.*”
- Special Provision 415-5.1 (Bar Spacing – General) – “*Except as otherwise specified herein, ensure that each bar is within 1 inch of the plan position.*”
- Special Provision 455-16.4 (Cross-Hole Sonic Logging (CSL) Tubes) – “*Install CSL access tubes full length in all drilled shafts from the tip of the shaft to a point high enough to allow cross-hole-sonic-logging testing, but not less than 30 inches above the top of the drilled shaft, ground surface or water surface, whichever is higher. Equally space tubes around circumference of drilled shaft. Securely tie access tubes too the inside of the reinforcing cage and align tubes to be parallel to the vertical axis of the center of the cage. Access must be Schedule 40 steel with a minimum inside diameter of 1.5 inches...* “*Provide the following number and configuration of cross-hole sonic logging access tubes in each drilled shaft based on the diameter of the shaft.*” A chart included with this provision indicates that a shaft greater than 48” in diameter requires 1 tube per 12 inches of shaft diameter.
- Plan Sheet T-9 (Mast Arm Tabulation Sheet), Note #1 reads, “*Work with Index 17745*”

- Plan Sheet T-9 (Mast Arm Tabulation Sheet) – The chart at the bottom of the page indicates the dimensions for the drill shaft as follows:
 - The drill shaft diameter (DB) is 4.5 feet (or 54 inches).
 - The Anchor Bolt diameter (BC) is 2 inches, this does not account for the diameter of the bolt head and nuts.
 - The longitudinal reinforcing steel size (RA) is #9 (or 1 1/8” in diameter).
 - The plans require 23 longitudinal sections of reinforcing steel to be equally spaced around the circumference of the cage.
- FDOT Design Standard 17745, sheet 2 of 5, section A-A (2006 edition) – Depicts that the drill shaft rebar cage must have 6 inches of concrete coverage. (Attachment P)
- FDOT Design Standard 17745, sheet 2 of 5, Foundation Plan (2006 edition) – The note reads, “*Note: 6” min. cover on all shaft enforcement*”.

FIE utilized the Contract Documents, including the specific dimensions and requirements detailed above, to generate a detailed cadd drawing (to scale) that allows for manipulation of three of the drill shaft components (Anchor Bolts, CSL Tubes, and Rebar Cage) to show possible lay-out scenarios that meet the plan requirements. Please reference FIE Attachment O (Possible Lay-Out Scenarios). By spinning the different layers of the cad tool, it becomes apparent that the drilled shaft, as it is designed in the contract documents, is simply not constructible as designed by FDOT.

Further, FIE feels strongly that the FDOT’s direction to remove the CSL tubes to avoid conflict while constructing the repair procedure is an obvious admittance to responsibility for the design error (refer to Attachment L).

In closing, based on all of the information contained within this package, FIE respectfully requests that the RDRB rule in favor of entitlement for costs (time and money) associated with the required repair to the drilled shaft.

ATTACHMENT INDEX (Included with Contractor’s Position Paper):

- A. FDOT Letter (11/5/07) Drill Shaft Repair Denial
- B. FIE Letter (11/6/07) Objection to Drill Shaft Repair Denial – NOI Costs Incurred
- C. FDOT Email (11/6/07) Submit Repair Plan
- D. FIE Repair Plan (11/6/07) via FIE Retained Structural Engineer

- E. FDOT Email (11/9/07) Plan Review Update
- F. FDOT Email (11/9/07) Plan Review Comments
- G. FIE Letter (11/16/07) Submit revised Repair Plan – NOI Time Extension
- H. FDOT Email (11/29/07) Approval of Repair Plan
- I. FIE Email (12/18/07) Notice of Rebar & CSL Tube Conflicts During Repair
- J. FIE Letter (12/19/07) Confirmation of Conflict With CSL Tubes & Request For Direction From FDOT
- K. FIE Engineer Email (12/20/07) Confirmation of Visual Observations – Conflict With CSL Tubes
- L. Email Chain (12/20/07) FDOT Direction To Remove All CSL Tubes to Avoid Conflict
- M. FDOT Letter (12/26/07) FDOT Denial of Responsibility For Design Error
- N. FIE Letter (12/27/07) FIE Objection to Denial – With Details Documenting Design Error
- O. CADD – Lay Out Scenarios
- P. FDOT Standard Index 17745

Department's Position

CONTRACTOR CLAIM / DISPUTED ISSUE

The Contractor, Florida Industrial Electric, Inc., (FIE, Inc.), has requested a hearing before the Regional Dispute Review Board, (RDRB), to resolve the Contractor's Claim concerning the failure to meet acceptable construction tolerances outlined by the Plans, Standard Specifications and Design Standards Index No.17745 in the construction of the Drilled Shaft foundation for proposed traffic signal mast arm assembly located at the intersection of SR 31 and Bayshore Road, Sta. 273+98, offset 55-feet right of centerline. FIE contends that the design provided by the FDOT was not sufficient and resulted in a drilled shaft foundation that did not provide sufficient room for all of the components required; e.g. rebar, CSL tubes, and anchor bolts, which resulted in skewed anchor bolts. FIE is seeking entitlement for repairs associated with the drilled shaft foundation as it relates to misalignment, tolerances, and rejection of the in-place product.

DEPARTMENT POSITION

The drilled shaft foundation in question was constructed on Monday, October 22 and installed on Tuesday, October 23, 2007. The foundation failed to meet acceptable construction tolerances outlined in Standard Specification 455-20. A review of the Contract documents and field data indicates that inadequate construction procedures and methods, not design errors, resulted in the misalignment of the anchor bolts as well as the issue of inadequate concrete cover for the reinforcing steel within the drilled shaft.

In accordance with the Plan documents, 2004 Standard Specifications 5-3, and Supplemental Specifications 5-1.6, the Contractor is directly responsible when producing an unsatisfactory product to remove and replace or otherwise carry out all construction measures to correct the work at no expense to the Department. As such, we recommend that the Disputes Review Board uphold the cited terms of the Contract and deny entitlement to FIE for this issue.

ENGINEER'S ANALYSIS OF CONTRACTOR'S CLAIM/DISPUTED ISSUE

The Contractor contends that the FDOT should be responsible for any additional costs associated with correcting the deficient drilled shaft foundation. Following rejection of the foundation, FIE hired an engineer to provide a repair procedure. FIE indicated that during design of the repair procedure, it became clear that the FDOT's original design was in error and did not include sufficient space for the components which led to the out of tolerance condition. Specifically, they state, "The inadequate FDOT design resulted in skewed anchor bolts." (Exhibit 6, page 49)

Issue Background

Fact: The plans for this project depict the installation of a new mast arm assembly for signalization improvements at the intersection of SR 31 and Bayshore Road at Station 273+96.00, 55-ft right. This location was field adjusted to Station 273+98.00, 55-ft right during construction to avoid conflict with an existing buried fiber optic conduit and depicted on as-built Plan Sheet T-5. (Exhibit 1, page 9)

Fact: The Special Mast Arm Assemblies Data Table provided on Plan Sheet T-9 depicts the requirements for a 4.5-foot (54-inch) diameter, 30-ft deep, drilled shaft foundation and the required reinforcement. (Exhibit 1, page 10) The pole base connection data depicts requiring eight (8) 2-inch diameter anchor bolts.

Fact: The Plan Notes on Plan Sheet T-9 indicate that the work is to be performed in accordance with Design Standard Index 17745 and that, "the Contractor shall coordinate anchor bolt requirements with the fabricator". Fabricator Plan Sheet 3 of 4 submitted by FIE as part of the shop drawings for the mast arm assembly on 4/25/07 (Exhibit 2, page 19) depicts the eight anchor bolts centered within a 36-inch diameter "Bolt Circle".

Design Standard Index 17745 (Exhibit 1, page 12) requires a minimum of 6-inch cover on shaft

reinforcement. This is consistent with Supplemental Specification 455-20 that states, “ensure that the reinforcing cage is concentric with the shaft within a tolerance of 1-½ inches. Ensure that concrete cover is 6-inches plus or minus 1-½ inches unless shown otherwise in the plans.”

Details of the shaft reinforcing steel are a requirement of the drilled shaft installation plan (per Supplemental Specification 455-15.1.2) and outlined by Supplemental Specification 455-16.

Fact: Supplemental Specification, 455-16.4 required the installation of five (5) Cross-Hole Sonic Logging (CSL) tubes for the proposed drilled shaft. The Supplemental Specification indicates the number of required tubes based on the shaft diameter, tube configuration, spacing, and installation requirements.

- Supplemental Specification 455-16.4 Cross-Hole Sonic Logging (CSL) Tubes states, “Install CSL access tubes full length in all drilled shafts from the tip of shaft to a point high enough above the shaft to allow cross-hole-sonic logging testing, but not less than 30 inches [750 mm] above the top of the drilled shaft, ground surface or water surface, whichever is higher. Equally space tubes around circumference of drilled shaft. ”

Fact: Payment for the Mast Arm drilled shaft foundation is included within Pay Item No.649-440, Mast Arm Assembly, Furnish and Install/High Loading, Special Design. (Exhibit 1, Plan Sheet No.T-2, Page 8)

In summary, requirements for installation of the drilled shaft foundation included:

1. Completely assemble a 42-inch diameter steel reinforcing cage for the drilled shaft that would allow for the required 6-inches of concrete cover (within acceptable tolerances). The requirements for the reinforcing cage consist of 23-#9 longitudinal bars, ties, and cage stiffener bars, as well as 5 CSL tubes.
2. Installation of 6-inch non-corrosive spacers along reinforcing cage in order to ensure concentric spacing for the entire length of the cage prior to lowering into the excavated hole. [42-inch reinforcing cage + 12-inch spacer offset across the shaft diameter = 54-inches]
3. Excavation of a 54-inch diameter, 30-foot deep drilled shaft. Lower reinforcing cage following inspection and acceptance of the shaft excavation.
4. Concrete placement.
5. Installation of anchor bolts centered within the shaft (36-inch diameter bolt circle) per the shop drawings) into the fresh concrete using a template that is secured to the framework to maintain

proper alignment and depth. Framework and forms should remain in place until the concrete has reached sufficient strength to support the reinforcing and anchor bolts.

Fact: FIE submitted a Drilled Shaft Installation Plan to the FDOT on 5/21/07. (Exhibit 3, pages 22-31) This plan depicted construction of a 54-inch drilled shaft foundation including reinforcing cage and 6-inch spacers as detailed by the plans and specifications but did not include details of the required CSL tubes. The Drilled Shaft Installation Plan was accepted by the FDOT on 9/19/07. (Exhibit 3, page 21)

FIE assembled the reinforcing cage per the drilled shaft installation plan without including CSL tubes. While setting up for the drilled shaft installation, it was determined on 10/22/07 that FIE had not installed the CSL tubes into the reinforcing cage per Supplemental Specification 455-16.4; and they were a requirement of the contract. FIE subsequently installed five 2-inch steel CSL tubes.

It is important to note that final approval of drilled shaft installation plans are subject to satisfactory performance, and that acceptance by the Engineer does not relieve the Contractor of the responsibility to perform the work in accordance with the Contract Documents.

Fact: On 10/23/07, FIE excavated a 64-inch shaft instead of the 54-inch shaft indicated in both the plans and drilled shaft installation plan, placed the 42-inch diameter-reinforcing cage with 6-inch spacers into the shaft, poured the concrete, and placed the anchor bolts using their fabricated template. The Drilled Shaft Log for 10/22/07 and 10/23/07 confirms construction of a 64-inch shaft and use of a 64-inch inside diameter casing. (Exhibit 4, pages 32 – 36)

Fact: On 10/24/07 the Department notified FIE that the drilled shaft foundation was unacceptable and requested they submit a written proposal of corrective action. (Exhibit 5, page 37) The following observations of the completed drilled shaft were provided:

- Anchor bolts are not centered in the drilled shaft.

Supplemental Specification 455-20, Construction Tolerances, paragraph (d) states, “Ensure that the reinforcing cage is concentric with the shaft within a tolerance of 1-½ inches.”

- All the anchor bolts do not have adequate concrete cover (min. 6-inches). [Photographs provided within Exhibit 7 depict approximately 3-½ inches of concrete cover]

Supplemental Specification 455-20, Construction Tolerances, paragraph (d) also states, “Ensure that concrete cover is 6-inches plus or minus 1-½ inches unless shown otherwise in the plans.”

- A number of the anchor bolts are excessively out of plumb (1-½ inches over a 8-inch span).



Unsatisfactory drilled shaft



Insufficient concrete cover

- The anchor bolt diameter center-to-center ranges from 32-inches to 34-inches.

The approved shop drawing (Sheet 3 of 4) depicts the center-to-center diameter (bolt circle) for the anchor bolts to be 36-inches. The shop drawing note depicted from the fabricator indicates, "Anchor bolts must be set in accordance with this drawing. Alignment of foundation in relation to roadway is the responsibility of the field contractor. Foundation must be set so arm and signals are facing traffic flow."

- Anchor bolts appear to be at a calculated height that is excessive for the installation of Finish Caps/Nut Covers.

Fact: On 10/25/07 and 10/26/07, electronic correspondence from FIE, Inc. to Department personnel indicated the drilled shaft template may have shifted after the shaft was set. (Exhibit 5, page 38) Within the 10/26/07 electronic correspondence, FIE proposed two initial repair methods to correct the misalignment of anchor bolts and reinforcing steel. (Exhibit 5, page 40)

FIE later alleged that the unacceptable drilled shaft was the result of a design error. FIE indicated that the FDOT design of the drilled shaft did not allow adequate clearances within the reinforcement cage to set the anchor bolts. (Exhibit 6, pages 42 and 43)

Fact: On 11/9/07, Quan–Yang Yao, P.E., FDOT Senior Structures Design Engineer, performed a review of the original design and construction plans for the subject project, as well as the drilled shaft repair proposal prepared by FIE’s Specialty Engineer. He found no design error in the construction plans. (Exhibit 6, page 46)

Based on the Contract Documents, the diameter for the reinforcement cage of a 54-inch drilled shaft should have been between 42-inches and 45-inches (given the 1 ½ inch tolerance for concrete coverage). This diameter range would have allowed between 36 ¾ inches and 39 ¾ inches within which to place the 36-inch diameter anchor bolt circle. Given the allowable reinforcing bar tolerances and clearances, this available space within the reinforcement cage was sufficient to prevent skewed anchor bolts and provide the necessary concrete cover.

Contributing factors to the skewed anchor bolts and unacceptable concrete coverage appear to have been:

1. FIE did not coordinate placement and tying of the CSL tubes with the anchor bolt requirements during assembly of the reinforcement cage. Had they planned for placement of CSL tubes within their installation planning process, they may have adjusted the longitudinal reinforcement bars in order to maximize the available space for the anchor bolts. It is not critical for the CSL tubes to be placed exactly equal distance apart.
2. FIE excavated a 64-inch shaft instead of the 54-inch shaft without adjusting the size of the spacers and without advanced approval. Based on the increased diameter of the shaft (and casing), FIE should have utilized an alternate spacer or an appropriate extension for the

proposed 6-inch spacers. Use of 6-inch spacers may have contributed to FIE's inability to maintain the vertical alignment of the reinforcement cage.

3. Installation of 6-inch spacers by FIE combined with the shifting of the template used prior to setting of the concrete resulted in a shift of the entire reinforcement cage as well as the anchor bolt circle.

SUMMARY

The unsatisfactory drilled shaft constructed by FIE was not the result of a design error but the result of improper construction methods. Sufficient space was available within the reinforcement cage to place the CSL tubes and anchor bolts. The out of tolerance condition of the completed drilled shaft was due to a combination of factors that were the responsibility of the Contractor including over excavation of the planned 54-inch shaft coupled with the use of 6-inch spacers, last minute placement of CSL tubes, and the movement (slip) of the Contractor's template prior to the concrete reaching sufficient strength to support the reinforcing and anchor bolts. These factors resulted in the drilled shaft failing to meet the construction tolerances of Supplemental Specification 455-20.

Per Supplemental Specification 5-1.6, Corrections for Construction Errors, and Standard Specification 5-3, Conformity of Work with Contract Documents, it is the Contractor's responsibility when producing an unsatisfactory product to remove and replace or otherwise carry out all construction measures to correct the work at no expense to the Department. As such, we recommend that the Disputes Review Board uphold the cited terms of the Contract and deny entitlement to FIE for this issue.

GOVERNING SPECIFICATIONS

A complete specifications package is bound separately and provided for reference. Below are applicable excerpts.

SUPPLEMENTAL SPECIFICATIONS

5-1.6 Corrections for Construction Errors: For work that the Contractor constructs incorrectly or does not meet the requirements of the Contract Documents, the Contractor has the prerogative to submit an acceptance proposal to the Engineer for review and disposition. The acceptance proposal shall describe the error or defect and either describe remedial action for its correction or propose a method for its acceptance. In either case, the acceptance proposal shall address structural integrity, aesthetics, maintainability, and the effect on Contract Time. The Department will judge any such proposal for its effect on these criteria and also for its effect on Contract Administration.

Carry out all approved corrective construction measures at no expense to the Department.

Notwithstanding any disposition of the compensation aspects of the defective work, the Engineer's

decision on the technical merits of a proposal is final.

- *The completed drilled shaft did not meet acceptable construction tolerances of Supplemental Specification 455-20. The Engineer reasonably determined that the unacceptable work was the result of improper construction methods and not due to a design error. As such, any expense associated with the corrective construction measures taken by FIE is the responsibility of the Contractor.*

5-10.2 Inspection for Acceptance: If any or all of the Work is found to be unsatisfactory, the Engineer will detail the remedial work required to achieve acceptance. Immediately perform such remedial work. Subsequent inspections will be made on the remedial work until the Engineer accepts all Work.

- *The Department inspected the drilled shaft upon completion of the work, notified FIE that it was unacceptable, and outlined the remedial work required to achieve acceptance.*

415-5.7.2 (Reinforcing Steel) Tolerances and Clearance: (a) Column Verticals: Place column verticals within ½ inch of their plan position. (b) Column Hoops: Place every hoop within 1 inch of the plan position for the specific hoops, with no accumulation of such tolerance caused by the spacing between any two hoops.

455-16.4 Cross-Hole Sonic Logging (CSL) Tubes: Install CSL access tubes full length in all drilled shafts from the tip of shaft to a point high enough above the shaft to allow cross-hole sonic logging testing but not less than 30 inches [750 mm] above the top of the drilled shaft, ground surface or water surface, whichever is higher. Equally space tubes around circumference of drilled shaft. Securely tie access tubes to the inside of the reinforcing cage and align tubes to be parallel to the vertical axis of the center of the cage.

- *As indicated above, the installation of CSL tubes is required for ALL drilled shafts. CSL tube placement should have been a consideration of the Contractor when coordinating anchor bolt placement requirements.*

455-15.1.2 Drilled Shaft Installation Plan: At the preconstruction conference submit a drilled shaft installation plan for review by the Engineer. Final approval will be subject to satisfactory performance.

Acceptance by the Engineer does not relieve the Contractor of the responsibility to perform the work in accordance with the Contract Documents.

- *The Installation Plan is for the Contractor to explain the approach to the work, Construction Methods and Equipment, and allow the Engineer an opportunity to comment of the equipment and procedures chosen before field operations begin. The Engineer's acceptance is not a guarantee that the chosen methods and equipment are capable of obtaining the required results. This responsibility lies with the Contractor. Neither the plans, design standards, nor specifications provide the Contractor with the option of eliminating the*

installation of CSL tubes. Although the Department accepted the Contractor's submitted Drilled Shaft Installation Plan that did not outline the use of the CSL tubes, such acceptance does not relieve the Contractor of the responsibility to perform the work in accordance with the Contract Documents (namely Supplemental Specification 455-16.4 and 455-20).

455-20 Construction Tolerances: Meet the following construction tolerances for drilled shafts:

- (d) Ensure that the reinforcing cage is concentric with the shaft within a tolerance of 1-1/2 inches [40 mm]. Ensure that concrete cover is 6 inches \pm 1-1/2 inches [150 \pm 40 mm] unless shown otherwise in the plans.
- ***The reinforcement cage and anchor bolt circle was not concentric with the shaft and had less than 4-1/2 inches of concrete cover. The diameter of the anchor bolts was also not the required 36-inches, and they were out of plumb to the point that the anchor plate would not have fit over them even if they were at the required 36-inch diameter.***

STANDARD SPECIFICATIONS

5-3 Conformity of Work with Contract Documents: Perform all work and furnish all materials in reasonably close conformity with the lines, grades, cross sections, dimensions, and material requirements, including tolerances, as specified in the Contract Documents.

In the event that the Engineer finds that the Contractor has used material or produced a finished product that is not in reasonably close conformity with the Contract Documents, and that the Contractor has produced an inferior or unsatisfactory product, the Contractor shall remove and replace or otherwise correct the work or materials at no expense to the Department.

EXHIBITS

Exhibit 1- Signalization Plan Sheets, Design Standard Index No.17745	8 - 15
Exhibit 2- Drilled Shaft Shop Drawings	16 - 20
Exhibit 3- Drilled Shaft Installation Plan	21 - 31
Exhibit 4- Drilled Shaft Log	32 - 36
Exhibit 5- Drilled Shaft Rejection	37 - 40
Exhibit 6- Related Correspondence	41 - 49
Exhibit 7- Project Photographs	50 - 61
Exhibit 8- Complete Specifications Package for FPID 419811-1-52-01	Separate
As-Built Signalization Plans Package for FPID 419811-1-52-01	Separate

The Contractor's rebuttal to the Department's Position Paper is as follows:

Page 2, paragraph 2, of the FDOT Position Paper refers to Note #3 on Plan Sheet 9:

- This note reads as follows, *“Contractor shall coordinate anchor bolt requirements with fabricator.”*
 - FIE concurs with this note and refers the board to the following notes included with the manufacturer produced shop drawings (see FDOT Position Paper pages 18 & 19)
 - Page 18 – Note 2: *“Designed in accordance with project plan sheets”*
 - Page 18 – Note 5: *“Anchor bolt analyzed for steel strength only. The anchor bolt embedment length shown on this drawing shall be verified by the foundation engineer”*
 - Because the plans refer the Contractor to Standard Index 17745, then the foundation engineer is FDOT.
 - Page 19 – Base Data Chart: Indicates eight 2” x 49” anchor bolts
 - The anchor bolt data included in the shop drawings indicates the FIE did coordinate the anchor bolt requirements with the manufacturer. It is FIE's contention that coordination of the anchor bolts with the mast arm fabricator is to ensure the anchor bolts are coordinated with mast arm only and does not apply to assurance that the anchor bolts will fit within the foundation that is designed by FDOT.
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Page 2, paragraph 3, of the FDOT Position Paper refers to Supplemental Specification 455-15.1.2 & 455-16:

- Refer to FIE's Drill Shaft Plan (page 25 of FDOT's Position paper, Note #7) which reads s follows, *“After cleaning and acceptance of the excavation, the reinforcing cage, as detailed in the project plans, will be lowered into the hole...”*
 - FIE did include details of the shat reinforcing steel as required.
-

Page 3, paragraph's 1 through 3 discuss the CSL Tube Requirements:

- FIE acknowledges that our initial Drill Shaft Plan did not include the required CSL Tubes.
- FIE acknowledges that our initial construction of the cage did not include the CSL Tubes.
- FIE acknowledges that, upon FDOT pointing out the CSL Tube requirement, FIE obtained and installed the CSL Tubes per the contract requirements.
- Once the CSL Tubes were installed within the cage, FIE installed the cage within the hole.

- It is important to note that Supplemental Provision 455-16.1 states that. "... The engineer will give final approval of the cage construction and placement subject to satisfactory performance in the field."
 - FIE maintains that although we may have had to 'scramble' on the eve of the drill shaft installation to ensure compliance with the CSL Tube requirement, this issue has no bearing on the outcome of the Drill Shaft Issue.
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Page 3, paragraph 4 discusses the drill shaft diameter and spacers:

- FIE acknowledges that the plans indicate a 54" shaft diameter.
- FIE acknowledges that a 64" diameter shaft was installed.
- Sheet T-11 of the contract plans (see page 8 of this rebuttal), indicate varying soil conditions and that the water table could be encountered within the first 5 to 6 feet of the shaft. Based on this information, FIE elected to utilize temporary casing during the installation of the shaft to avoid possible caving of the shaft wall. This was performed at no cost to the FDOT.
- Please refer to Supplemental Specification 455-15.2 (temporary casing construction method) and 455-15.7 (casings).
- FIE interpretation of the 2 specifications referenced above is that temporary casing is allowed as long as there is no cost to the FDOT and if the Engineer approves. Since the specification does not require written approval from the engineer, FIE contends that Engineer approval for the temporary casing and subsequent over excavation (diameter) is given under Supplemental Specification 455-16.1, "*The engineer will give final approval of the cage construction and placement subject to satisfactory performance in the field.*"

Several references through out the FDOT Position Paper are made about the inadequate concrete coverage and the alignment of the anchor bolts. FIE responds as follows:

- FIE concurs that the anchor bolts were not installed properly during the installation of the original drill shaft, but it is of contention that this was caused by FDOT design error.
- FIE contends that the cage position was maintained during the concrete installation and that the 6" concrete coverage was maintained around the rebar cage.
- The FDOT picture shown on page 3 of their Position Paper depicts that the 6" concrete coverage was not maintained. FIE concurs that the coverage was not maintained on the anchor bolts, because of the inability to properly fit the anchor bolts within the cage.
- Please refer to the picture attached to this rebuttal (page 5). The picture was taken during the repair procedure and clearly depicts that the coverage was not maintained around the anchor bolts due to the skewing.
- During the final phase of the drill shaft installation, the anchor bolts are installed. It was during the installation of the anchor bolts that it became apparent that there was an alignment issue. Our field staff made numerous attempts to properly align the anchor bolts, but all of the attempts failed. As the concrete began to 'set', our field staff made a 'last-ditch' effort to install

the anchor bolts as close to the required position as possible. Unfortunately, this attempt also failed and resulted in anchor bolts that were severely skewed and a shaft that was subsequently rejected by FDOT.

Page 4, paragraph 1 of the FDOT Position Paper quotes a statement made by the FIE Project manager, which reads as follows:

- “... *the drill shaft template may have shifted after the shaft was set...*”, FIE acknowledges this statement, but points out that it was made prior to FIE’s discovery of the design error.
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Page 4, comment 1 of the FDOT Position Paper:

- Comment # 1 reads as follows: “*FIE did not coordinate the placement and tying of the CSL tubes with the anchor bolt requirements during assembly of the reinforcing cage. Had they planned for the placement of the CSL tubes within the installation planning process, they may have adjusted the longitudinal reinforcement bars in order to maximize the available space for the anchor bolts. It is not critical for the CSL tubes to be placed exactly equal distance apart.*”
 - Supplemental Provision 455-16.4 states, “... *Equally space tubes around the circumference of drilled shaft...*” – If equal spacing is not critical, perhaps the FDOT should provide for a tolerance within their Contract Documents.
 - FDOT contends that proper planning for the installation of the CSL tubes would have prevented the failure of the drill shaft. Please refer to attachment L of FIE’s Position Statement, in which FDOT directs FIE to “... *cut all of the CSL tubes below the anchor bolts and proceed with an installation that would allow for the design angle to be constructed.*” If proper planning for the CSL tubes would have remedied the alignment issue, then they would not have had to be removed to avoid conflict during the repair procedure.
-

Standard Index 17745 / Supplemental Specification 455-16.4:

- The 2006 FDOT Design Standard #17743 and #17745 that are applicable to this project were last revised on July 1, 2005.
- The Supplemental Specifications (dated July 2006) applicable to this project are a revision to the 2004 edition of the FDOT Standard Specifications.
- On January 1, 2008, the FDOT Standard Index #17743 was revised. The revision includes significant changes to the drilled shaft reinforcing steel requirements. Please refer to page 6 and 7 of this rebuttal to compare the old and new Index #17743. FDOT has increased the longitudinal rebar diameter but decreased the # of longitudinal bars required. FIE believe this revision was likely made to accommodate the CSL tubes that were added via the July 2006 Supplemental Specification update.

- FIE believes that we were simply caught in the timeframe when FDOT did not have proper coordination between the Standard Index (rebar) and the Specifications (CSL Tubes).

The Department's rebuttal to the Contractor's Position Paper is as follows:

Central to the Department's Position is the fact that the FDOT foundation design, when constructed per Standard Design Index 17745 and the allowable construction tolerances, provided sufficient space to accommodate the reinforcing steel cage, CSL tubes and anchor bolts. FIE however, failed to adequately coordinate placement of the drilled shaft components with the anchor bolt spacing requirements during their shop drawing approval process. Coordination of component placement requirements prior to placing the reinforcing cage into the excavated shaft and pouring concrete would have revealed the precision required to avoid a conflict. Other construction factors that contributed to the problem was FIE's over excavation of the planned 54-inch shaft coupled with the use of 6-inch spacers, and the movement (slip) of the Contractor's template prior to the concrete reaching sufficient strength to support the reinforcing and anchor bolts. None of these factors are design related. The combination of these factors resulted in the drilled shaft failing to meet the construction tolerances of Supplemental Specification 455-20.

FIE fails to support their position of entitlement for additional costs associated with the drilled shaft repair costs or that an FDOT design error caused the misalignment of anchor bolts, inadequate concrete cover and unacceptable bolt circle diameter. Instead the body of data presented reveals improper construction methods and a lack of coordination and planning on the part of the Contractor were the cause for the unacceptable finished product.

Accordingly, we recommend that the Disputes Review Board uphold Contract Supplemental Specification 5-1.6, Corrections for Construction Errors, and Standard Specification 5-3, Conformity of Work with Contract Documents, which stipulate that it is the Contractor's responsibility when producing an unsatisfactory product to remove and replace or otherwise carry out all construction measures to correct the work at no expense to the Department and deny entitlement to FIE for this issue.

The following comments are specifically offered in response to FIE's Position Paper provided September 26, 2008.

The second paragraph on Page 1 of FIE's Position Paper states, "At the end of the installation, it was apparent that there was an issue with the shaft because the anchor bolts were skewed."

- This statement seems to under state the magnitude of the problems with the installed shaft since the "skewed anchor bolts" were just one of many issues rendering the shaft unsatisfactory. As depicted on Page 3 of the Department's Position Paper, the drilled shaft foundation was unacceptable because:
 1. The anchor bolts were not centered in the drilled shaft per Supplemental Specification 455-20;
 2. Anchor bolts did not have the minimum concrete cover per Supplemental Specification 455-20;
 3. A number of the anchor bolts were observed to be excessively out of plumb (skewed); and

4. The anchor bolt diameter center-to-center was not the required 36-inches making it unusable for mounting the mast arm assembly base plate in accordance with the approved shop drawings.

Also within the second paragraph on Page 1, FIE's Position Paper states, "It was during the design of the repair procedure that FIE determined that the skewed bolts were the result of the FDOT design. It is the contention of FIE that the diameter of the drilled shaft was not sufficient in size to accommodate the reinforced steel 'cage', CSL test tubes, and anchor bolts in accordance with the Contract Documents."

- The Department takes exception to these statements, as they are not accurate. In fact, it is apparent from all information available during the repair procedure development that the only conclusion that could be proven was that the problems associated with the unsatisfactory drilled shaft were the result of insufficient space within the reinforcing cage that was constructed by FIE and not the result of the FDOT design.
- Coordination for the placement of anchor bolt requirements is the responsibility of the Contractor. FIE did not coordinate placement and tying of the CSL tubes or with the anchor bolt requirements during assembly of the reinforcement cage. Had they planned for placement of CSL tubes within their installation planning process, they may have adjusted the longitudinal reinforcement bars in accordance with the allowable tolerances of Supplemental Specification 415-5.1 and 415-5.7.2 in order to maximize the available space for the anchor bolts. The diameter of the drilled shaft would have been sufficient in size to accommodate the steel reinforcement cage, CSL tubes and anchor bolts had it been constructed in accordance with the Contract tolerances.
- The Plan Notes on Plan Sheet T-9 indicate that the work is to be performed in accordance with Standard Index 17745 and that, "the Contractor shall coordinate anchor bolt requirements with the fabricator". As such, it is the Contractor's responsibility to plan for the installation of the anchor bolts in order to meet the required construction tolerances. **FIE's submitted shop drawings contain the following Contractor Certification:**

"I hereby certify that the (equipment)(material)(article) shown and marked in this submittal is that proposed to be incorporated into Contract Number 419811-1-52-01, is in compliance with Contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval. Certified by Everton Jackson, Date 4/25/07."

FDOT approval was predicated on FIE's certification that the anchor bolts could be placed within the 54-inch drilled shaft foundation, meeting the requirements of Standard Index 17745, Plan Sheet T-9 and Supplemental Specification 455-16.4. Means and methods for actually installing the components in the allocated spaces and in compliance with the Contract Documents is the responsibility of the Contractor. Correction of unacceptable, out of tolerance work is to be performed by the Contractor at no expense to the Department per Supplemental Specification 5-1.6 and Standard Specification 5-3.

- As stated previously, FIE fails to address the causes for the lack of minimum concrete cover for the anchor bolts or the less than 36-inch bolt circle diameter. These unsatisfactory conditions appear to be the result of the contractor over excavating the designed 54-inch shaft to 64-inches; not providing an appropriate extension for the 6-inch spacers; and the fact that FIE's template shifted during construction.

On Page 4 of the FIE Position Paper it states that they utilized the contract documents, "including dimensions and requirements detailed above [referring to Specifications and Design Standards]" to generate a to-scale CADD drawing showing possible lay-out scenarios for components of the drilled shaft within plan requirements with reference to Attachment O (Possible Lay-Out Scenarios). FIE further states, "By spinning the different layers of the CADD tool, it becomes apparent that the drilled shaft, as it is designed in the contract documents, is simply not constructible as designed by FDOT."

- The Department takes exception to these statements, as they are not accurate.
- The spinning CADD drawing provided within Attachment O **does not take into account the allowable tolerances of Supplemental Specification 415-5.7.2** which allows placement of column verticals (longitudinal reinforcement bars) within 1/2-inch of their plan position. The spinning CADD Drawing provided by FIE only depicts that there could be conflicts in the placement of the anchor bolts if a Contractor were to construct the reinforcement cage without consideration for allowable tolerances.
- **The drilled shaft foundation was constructible as provided within the plans and contract documents. The Department has provided a to-scale CADD drawing example that simply depicts one of many methods for configuring the reinforcement cage within the allowable tolerances of the contract documents (Rebuttal Exhibit R-1).** There are several other acceptable configurations that could have been utilized depending on the chosen placement position of the anchor bolts between the Contractor and their fabricator. Had the Contractor considered the spacing requirements of all components of the drilled shaft (steel reinforcement bars, CSL tubes and anchor bolts) during the planning process, they could have adjusted the components within the allowable tolerances accordingly to provide sufficient space to place the anchor bolts without conflict.

The following paragraph on Page 4 of the FIE Position Paper also states, "Further, FIE feels strongly that FDOT's direction to remove the CSL tubes to avoid conflict while constructing the repair procedure is an obvious admittance to responsibility for the design error (refer to Attachment L, pages 26-27)."

- The Department takes exception to these statements, as they are not accurate.
- Allowing FIE to cut off the previously placed CSL tubes during the repair **was not an admission of responsibility** for a design error. Rather, **it was confirmation of the fact that the CSL tubes were originally placed in conflict with the anchor bolts by FIE.** Simply stated it is an acknowledgement that they must now be removed to avoid considerable additional costs associated with making changes to the proposed mast arm. The following review of FIE's Attachments is offered as additional evidence for the Department's acknowledgement:

- Page 23 depicts an e-mail from Everton Jackson (FIE) to the Department dated 12/18/07 that describes conflicts encountered at the rebar cage once the top 5.5-feet of the drilled shaft concrete was removed. Mr. Jackson indicates that conflicts were discovered between the #9 rebar and the anchor bolts as well as 1 or 2 of the CSL tubes.
- Page 25 depicts an e-mail from Charles Shatterly (FIE's Engineer) to Everton Jackson (FIE) dated 12/20/07 in which Mr. Shatterly describes his field inspection observations made on 12/18/07. Within it he states,

“3. The only problem observed was with the CSL tubes **which, as before,** interferes with the exact placement of the anchor bolts **because the tubes were placed inside the ring of #9 rebars.**”

- It stands to reason that since the #9 rebar and CSL tubes were originally tied into the reinforcing cage in conflict with the anchor bolt locations without utilization of the allowable tolerances before being set into concrete, these conflicts would remain. As can be seen within Department Rebuttal Exhibit R-1, tying the CSL tubes to the #5 round tie-bars allowed sufficient space for placing anchor bolts. Mr. Shatterly's 12/20/07 observations confirm the Department's assertion that the original CSL tube placement was the cause for the conflict. Placement inside the ring of #9 rebars needlessly reduced the room available for placing the anchor bolts and not an alleged design error. The Department reaffirms this position within the letter dated 12/19/07 (FIE Exhibit Page 28) re-stating their 3 main points:
 1. Improper construction methods were the cause of the anchor bolt alignment issue.
 2. The Contractor was responsible for coordinating anchor bolt requirements with the fabricator.
 3. The major detriment to the anchor bolt placement was the improper placement of the CSL tubes, which unfortunately was not well planned out.

DEPARTMENT SUMMARY

As stated within our Position Paper, the unsatisfactory drilled shaft originally constructed by FIE resulted from improper construction methods and a lack of adequate planning by the Contractor and was not the result of a design error.

The plans depicted use of a Standard Design Index that provided sufficient space within the steel-reinforcing cage to place CSL tubes and the anchor bolts within the contract allowed tolerances. This Standard Design Index has been used successfully on numerous projects throughout the State. The out of tolerance condition of the originally completed drilled shaft was due to a combination of factors that were the responsibility of the Contractor. Most notably the last minute placement of CSL tubes inside the ring of #9 rebar but also due to over excavation of the planned 54-inch shaft coupled with the use of 6-inch spacers, and the movement (slip) of the Contractor's template prior to the concrete reaching sufficient strength to support the reinforcing and anchor bolts. The Department's conclusion that

improper construction methods were the cause of the anchor bolt alignment issues is supported by the observations made by the Contractor's Engineer. The combination of these factors resulted in the drilled shaft failing to meet the construction tolerances of Supplemental Specification 455-20.

Per Supplemental Specification 5-1.6, Corrections for Construction Errors, and Standard Specification 5-3, Conformity of Work with Contract Documents, it is the Contractor's responsibility when producing an unsatisfactory product to remove and replace or otherwise carry out all construction measures to correct the work at no expense to the Department. As such, we recommend that the Disputes Review Board uphold the cited terms of the Contract and deny entitlement to FIE for this issue.

Exhibit R-1	To-Scale CADD Drawing depicting No Design Error	5
Exhibit R-2	Additional Correspondence	6 - 13

Submitted Post-Hearing Responses to Board Requested Clarification From Department Concerning Specifications Relating to CSL Tube Field Installation to Rebar Cage:

Department's Response to CSL Tube Clarification:

On page 4 of the FIE rebuttal (top of page), FIE takes exception to the Department statement that, "FIE did not coordinate the placement and tying of the CSL tubes with the anchor bolt requirements during assembly of the reinforcing cage." [First Bullet, page 4] FIE stated within the hearing regarding this issue (and within their rebuttal paper) that by FDOT allowing the CSL tubes to be cut off during the repair was an admission of responsibility for a design error. We took exception to the later statement.

In response, we (the FODT) made the following comments during the hearing:

1 - Exhibit R-1 depicts one of many possible configurations of a 42-inch reinforcing cage that provides sufficient space for the required anchor bolts and hex nuts taking into account the allowable tolerances. The diagram depicts CSL tubes secured to the column hoops and demonstrates no design error.

2 - We stepped through the correspondence provided by FIE and their structural engineer (depicted on pages 3 and 4 of the FOOT Rebuttal Paper) and called attention to their own observation from the e-mail dated 12/20/07 on page 25 of the FEI Position Paper which FIE's hired structural engineer Mr. Shutterly stated that, "The only problem observed was with the CSL tubes which, as before, interferes with the exact placement of the anchor bolts because the tubes were placed inside the ring of # 9 rebars."

3 - I then made the following statement, "*Supplemental Specification 455-16.4 requires tube placement around the circumference of the cage, as we have depicted within Exhibit R-1 of the (FDOT) Rebuttal, so that it can be secured at*

every column hoop and thereby prevented from misalignment during lifting or concrete placement. Otherwise, it could rotate about the circumference of the #9 vertical rebar."

* Supplemental Specification 455-16.4 is located on page 186 of Exhibit 8, Specifications Package and includes the following statements:

Sentences 2 & 3: "Equally space tubes around circumference of the drilled shaft. Securely tie access tubes to the inside of the reinforcing cage and align tubes to be parallel to the vertical axis of the center of the cage."

Sentence 8: "Stiffen the cage sufficiently to prevent damage or misalignment of access tubes during the lifting and installation of the cage."

The point made during the questioning was that tying the CSL tube to the # 9 rebar, instead of the # 5 column hoop as depicted within FDOT Exhibit R-1, could allow the CSL tubes to rotate around the # 9 rebar and not be secured from misalignment. Again calling attention to the 12/20/07 e-mail from Charles Shatterly to FIE (mentioned above in item 2), we also re-emphasized that FIE's placement of the CSL tube inside the ring of #9 rebar as they did, needlessly reduced the room available for placing the anchor bolts. To the best of my recollection, this was also the time when I referred to the pictures on page 52 of the Department Position Paper and page 5 of FIE's rebuttal and called attention to the location of one of the CSL tubes located inside the ring of #9 rebar.

These statements and references to the FIE e-mails and Supplemental Specifications were examples of the FDOT 3 main points that were: the issues were the result of improper construction methods; lack of contractor coordination between the mast arm fabricator for anchor bolt placement and (out-sourced) cage constructor (which was a contractor responsibility); and the major detriment to the anchor bolt placement was improper placement of the hastily installed CSL tubes. These points are as depicted on page 4 of the FDOT Rebuttal Paper.

And then in response to Contractor's response below:

My e-mail does not contain anything that was not discussed at the hearing or contained within our submittals. It is not a continuation of the rebuttal process.

My understanding from the hearing was that the Board wanted clarification of the statements made related to 455-16.4. In my attempt to do so I placed within quotations any comment I directly made at the hearing as well as anything directly from the Specifications or an Exhibit.

During the hearing we made every effort to be brief and not duplicate comments already provided to the Board in our written submittals and focus on answering questions. Since this was an important point, I merely summarized the context of the conversations and referenced material leading to our point related to placement of the CSL tube within the reinforcing cage on this project and the Specification for the purpose of clarity..

I have no problem with the Board disregarding anything within my e-mail that they consider to be "new material" and simply utilize the content of the written documents previously provided, cited terms of the contract, and information gathered at the hearing in determining their recommendation on this matter.

I apologize for any misunderstanding on my part.

Contractors Response to CSL Tube Clarification:

It was my understanding that the only issue that was to be discussed via email subsequent to the hearing was whether or not the specifications contained direction to tie the CSL Tubes to the #5 rebar in lieu of the #9 rebar. From reading the email below, it seems apparent that the FDOT was unable to locate such wording within their specifications.

Below I have 'cut & pasted' the portion of the FDOT's email that addresses the wording of the specification with regards to tying the CSL Tubes to the cage. FIE asks that the board disregard the remainder of the FDOT's email because FIE did not agree to allow further debate of the issue via email. FDOT & FIE were both provided with ample time to provide rebuttals during the hearing and we take exception to the FDOT continuing the rebuttal process. Thank You in advance for your cooperation with this matter.

* Supplemental Specification 455-16.4 is located on page 186 of Exhibit 8, Specifications Package and includes the following statements:

Sentences 2 & 3: "Equally space tubes around circumference of the drilled shaft. Securely tie access tubes to the inside of the reinforcing cage and align tubes to be parallel to the vertical axis of the center of the cage."

Sentence 8: "Stiffen the cage sufficiently to prevent damage or misalignment of access tubes during the lifting and installation of the cage."

NOTE: The above position and rebuttal statements are summarized from the points established from the numerous documents provided to the Board. In arriving at its decision, the Board gave due and proper consideration to all documents provided prior to the hearing, all documents provided at the hearing, all relevant documents provided after the hearing and all testimony provided during the hearing.

Regional 1 DRB Findings

1. Is the contractor entitled to additional costs for the repair of the drilled shaft as well as additional contract time?

*The Board finds the Contractor **IS ENTITLED** to additional costs for the repair of the drilled shaft as well as additional contract time.*

The Board cites the following supportive facts:

1. The contractor, is well-experienced in the construction of drilled shafts foundations.
2. The additional requirement for Cross-Hole Sonic Logging (CSL) tubes in drilled shafts is a relatively new concept in this field for both Engineers and Contractors, and this was the first constructed by the contractor.
3. It was demonstrated that the re-bar cage, anchor bolts, and the CSL tubes could only be constructed by judicious utilization of the allowable "tolerances" and by violating the "five equal spaces" specified for the placing of the CSL tubes.
4. In the final repair, which required removal and replacement of the top five and a half foot section of the drilled shaft (the shaft was thirty feet deep), the CSL tubes were "cut-off" (with the approval of the EOR) and removed from this top section of repaired shaft.
5. The contractor was made aware of the "Special" nature of this drilled shaft foundation, but was not made aware that **tolerances** would have to be used to accommodate the spacings shown, **anchor bolts would have to be aligned "flat"**, and that the "equal spacing" requirement for the CSL tubes would have to be violated as well. **This is contrary to standard practice in the construction industry is to lay out the work as precise as possible to the dimensions given on the plans. If the layout is slightly off in checking of the same, the tolerances are then considered to see if the final work would be acceptable, or ruled out of tolerance."**
6. It was stated by the Contractor and admitted by the FDOT that the reinforcing steel cage and the CSL tubes were installed in the shaft correctly and to the tolerances called out in the specifications. The main problem with the originally poured shaft was the placement of the anchor bolts which would not fit in their planned location due to there not being room for the reinforcing steel, CSL tubes and anchor bolts in their **designed** locations without the use of allowable tolerances.
7. The Department accepted the shaft exempting the five and a half feet that had to be removed and replaced to accommodate the revised positioning of the anchor bolts and steel rebar cage and without the CSL tubes.
8. The Contractor failed to include the CSL tubes in its shop drawing submittal and the Department failed to deny the shop drawing submittal and thereby request the Contractor to resubmit with the CSL

tubes included. These events may have illuminated the unworkable re-bar cage, CSL tubes, and anchor bolt geometry prior to construction.

*Finally, on all matters above, the Board reminds the parties that as entitlement has now been determined, **the parties should timely, within 60 calendar days, negotiate monetary changes.***

Respectfully Submitted,

Region 1 Disputes Review Board

George Seel, DRB Member
Robert Lindquist, DRB Member
James T. Guyer, DRB Chairman

SIGNED FOR AND WITH THE CONCURRENCE OF ALL MEMBERS:



DRB Chairman
James T. Guyer