

DISPUTE REVIEW BOARD RECOMMENDATION

May 10, 2000

FAXED May 10, 2000

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RE: State Job No. 47010-35919/56010-3520
W.P.I. No. 31111042\3116849
Contract # 19197
Liberty & Calhoun County
State Road 20 Apalachicola River Bridge

Subject: Issue No. 2 - Repair of Expansion Joints

Dear Sirs:

The Owner, Florida Department of Transportation (Department), and the Contractor, Odebrecht Construction, Incorporated (OFL), requested a hearing to determine **entitlement** of OFL to **additional compensation for emergency repairs, permanent repairs and modifications to four (4) SEJ-S armored expansion joints** constructed in the above referenced project. Should entitlement be established and acknowledged, the DRB was not to decide the quantum of such entitlement at this time as the parties would attempt to negotiate the value of entitlement.

Pertinent issues, correspondence and other information relating to the Department's and the Contractor's positions were forwarded to this Disputes Review Board (DRB) for review and discussion at a hearing that was held on April 25, 2000, at the Department's office in Havana, Florida.

ISSUE:

OFL has filed a claim requesting additional compensation for both the temporary and permanent repairs to four (4) of the SEJ-S armored expansion joints in the new SR 20 Apalachicola River Bridge. OFL claims that the repairs to two (2) of the four (4) expansion joints, specifically the joints at Piers No. 57 and No. 60 were necessitated by the fact that the joints were not designed correctly for their application in this project. The failure of these expansion joints was due to design error on the part of the Department and not faulty manufacturing of the joint material or faulty workmanship in the installation of the armored expansion joints.

In the case of the other two (2) expansion joints at Piers No. 66 and No. 74, OFL claims that the alleged faulty workmanship (*i.e.*, voids under the rails) that caused the Department to order these repairs did not exist. No repairs were needed to correct OFL's installation of the joints.

OFL seeks compensation for all work associated with the temporary and permanent repairs to armored expansion joints at Piers No. 57, No. 60, No. 66 and No. 74.

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The Department maintains that the armored expansion joints failed due to faulty welds of the studs to the angles. They believe that the failure of the welds is indicative that the expansion joint units were not fabricated in accordance with the applicable F.D.O.T. standards and specifications. Therefore, it is their position that all repairs are the responsibility of OFL and their respective Subcontractors and/or Suppliers.

CONTRACTOR'S POSITION:

OFL has maintained from the very beginning of the project that they were not in favor of using the specified SEJ-S armored expansion joint material and, for this reason, had submitted alternate armor joints to the Department. These submittals were rejected, and OFL was required to install the specified expansion joints.

Problems developed in the armored expansion joints at several places in the bridge which were repaired by OFL under a directive from the Department. OFL seeks compensation for this work, and recounts the chronology of events in their letter to Parsons Brinckerhoff dated January 15, 1999:

Regarding your letter #OFL-407, Odebrecht disagrees with some of the descriptions of the contents of your letter. Please find below Odebrecht's description of the contents of the letters and the factual chronology of events:

- *On March 29, 1996, following recommendation from the fabricator who at the time was aware of changes made to these type of joints in other states, Odebrecht sent a fax to Mr. Bob Richey concerning an alternate expansion joint to replace the SEJ-S joint.*
- *Parsons' meeting 019 dated April 11, 1996 acknowledged our submittal of the alternate joint and stated that it is being reviewed by the designer.*
- *Parsons' meeting 020 dated April 18, 1996 informed Odebrecht that the alternate joint was verbally rejected and that a letter would follow.*
- *Parsons' meeting 021 dated April 30, 1996 informed Odebrecht again of the rejection of the alternate joint and that FDOT would be issuing a rejection letter. As of January 15, 1999, no letter of rejection from FDOT has been received by Odebrecht.*
- *September 17, 1998, Odebrecht requests permission to execute an emergency lane closure to perform the necessary repairs to the SEJ-S joint at piers 57 & 60.*
- *September 17, 1998, Parsons approved our request for the lane closure to perform the temporary repairs and also requested an appropriate time in Odebrecht's schedule to investigate the cause of the failure. Parsons stated that they could not respond to Odebrecht's contention that the joints are faulty until this investigation was completed, but that our cost for labor and equipment would be tracked until liability was established.*
- *On September 23, 1998, Odebrecht received a letter from representative, Mr. Ross Anglin, of our supplier Capital City Steel, summarizing our meeting on September 21st, 1998, with FDOT personnel, including co-designers of the bridge, Mr. Henry Bollman, and Mr. Charles Boyd. In this letter he points out similar problems encountered by the Texas DOT. Mr. Bollman indicated that he would contact the Texas DOT as well as bridge engineers in other states for their experiences. Mr. Anglin makes reference to Capital City Steel's offer to substitute the bridge design, as well as FDOT's verbal rejection of the change. He mentioned that subsequently FDOT has included the submitted alternate design in other projects. He also*

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concludes that according to his examination the joints had been properly installed. In addition, he states that while he is a Professional Engineer, he is also a representative of Capital City Steel, and has no authority to offer any conclusions the FDOT design.

- *On September 23, 1998, Odebrecht sent a letter to Parsons requesting direction should the second attempt at repairing the joint on September 21, 1998 be unsuccessful and also requested that Parsons continue to track our cost.*
- *On September 23, 1998, Parsons letter OFL-384 acknowledges our second attempt at repairs and the fact that costs were tracked, but would not give direction in the event of a third failure. Parsons also requested use of a manlift to inspect underneath the bridge. Odebrecht supplied the manlift to Parsons to verify the proper clearance for movement of the joint. The conclusion was satisfactory.*
- *On September 29, 1998, Odebrecht sent a letter to Parsons in reference to our concerns with the safety of the traveling public and liability resting solely on Odebrecht until the investigation is completed. Odebrecht also stated that if failure reoccurred, we would recommend closing the lane until direction is received from the Department. In addition, we submitted the previously mentioned letter from our fabricator's representative, Ross Anglin.*
- *On October 12, 1998, Parsons directed Odebrecht to remove the joints at piers 57 & 60, and requested submittal of our proposed removal and replacement procedure prior to the commencement of any operations. No mention was made of a conclusion to the investigation, nor compensation for the replacement.*
- *On October 15, 1998, Odebrecht sent a letter to Parsons agreeing to remove the joints and stated that it would be inconceivable to use the same type of joint after all of the evidence that our fabricator had supplied. In addition, we stated that a replacement procedure would be forthcoming and requested that Parsons review our cost for temporary repairs that were performed.*
- *On October 23, 1998, Odebrecht submitted our replacement procedure and requested an MOT plan from the Department. We also proposed to perform this work on a time and material basis.*
- *On November 9, 1998, Parsons sent a letter to Odebrecht stating, among other items, that FDOT was reviewing our costs incurred for the temporary repairs.*
- *On December 23, 1998, Parsons sent a letter to Odebrecht directing us to perform the additional repairs to the joints at piers 57 & 60, similar to the procedure used in the second attempt. Parsons also stated that voids under the joints must be filled and that an inspector would sound all of the joints. No conclusion of this investigation, nor compensation was mentioned.*
- *On December 23, 1998, Odebrecht sent a letter to Parsons requesting the grade and type of bolt to be used and stated that compensation would have to be agreed upon prior to performing the work, as well as FDOT accepting all responsibility for the joint repairs.*
- *On December 29, 1998, Parsons sent a letter to Odebrecht listing the joints that presented voids underneath the angle. Parsons referenced the standard specifications section 5-9, in which it states that it is the Contractors responsibility to fix any defects discovered, and that the Contractor will make no claims for losses suffered due to repairs of such defect. Parsons also stated that if Odebrecht refused to perform the work, the Department would withhold payment in the amount equal to the cost of repairing the defect.*

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- *On January 5, 1999, Odebrecht sent a letter to Parsons stating that upon inspection by both Parsons and Odebrecht personnel, no voids were found. Odebrecht's position was that since the defect stated in Parsons' letter did not exist, we were entitled to compensation for the costs incurred during the investigation in addition to the previously submitted cost for temporary repairs as stated in the standard specifications section 5-9.1. A breakdown of our costs was enclosed.*
- *On January 7, 1999, Parsons sent a certified letter stating the events, in chronological order, that lead up to this letter of default. This letter was forwarded to our bonding company as well as our main office.*
- *On January 12, 1999, Parsons sent a letter of acknowledgment of proceeding with the repairs and directed Odebrecht to repair 4 joints instead of the 6 previously mentioned. Parsons also indicated that costs for labor, materials, and equipment would be tracked.*

Considering the extensive list of factual events just described, Odebrecht's contention is that these unfortunate circumstances could have been avoided provided the Department had approved our March 29, 1996 submittal for an alternate joint.

Four months have passed since our first repair to the expansion joints on this project. On several instances Parsons indicated that the causes for the failure would be investigated. The project is approaching final inspection and Odebrecht has yet to receive any communication regarding the results or even progress of FDOT's investigation. Considering the slow progress of this investigation, we began searching for more information on this type of expansion joints. We discovered that FDOT Maintenance Department has had to repair these exact type of joints on several other projects, including the bridge situated less than a mile west of this project. These expansion joint failures are not isolated to one contractor, one supplier, or one project. Therefore, it is a known fact to the Department that these type of expansion joints are failing in several other projects in Florida. Taking this into account, we hereby request that the history of repairing these type of joints be provided to us for our information as soon as possible.

Moreover, during the course of this investigation, Parsons and FDOT have concentrated their efforts in pointing the finger at the contractor and the supplier with unsubstantiated allegations. Originally, Parsons and FDOT attempted to condemn the contractor for the failure of the joints by making unfounded allegations that the joints would be failing because of voids under the angle. Odebrecht was threatened to have payment withheld in the amount equal to the cost of repairing the defect. Field inspections by Parsons and Odebrecht proved false the theory of voids being present. Currently, FDOT and Parsons are attempting to direct the liability towards the fabricator without presenting any factual evidence. The fact is that the fabricator has performed all work according to FDOT plans, specifications, and approved shopdrawings. The fabricator has also supplied all required certifications. FDOT and Parsons have failed to perform an impartial investigation on these joints by deliberately and blatantly disregarding all the factual evidence presented up until this time.

Furthermore, you stated in your letter #OFL-407 that Odebrecht would not begin to repair the joints until we had a time commitment as to when we would be paid for the work. We disagree with that statement. We actually stated that we would not begin to repair until we had a time commitment as to when FDOT would reach a resolution on this issue. We would not be able to bear another undefined period of fruitless investigation with this project coming to an end. Nevertheless, as you have acknowledged in your letter #OFL-410, we have initiated the repairs to the failed expansion joints. We reiterate that we do not consider this work to be a part of our contractual obligations for this project and we will certainly be requesting full compensation for this work.

Odebrecht has undoubtedly been unfairly treated by the Department in this district. Odebrecht is a world renowned company that has focused on quality work and client

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satisfaction for over fifty years. Some of our other projects in Florida have recently received rewards from FDOT for quality and craftsmanship. It would be ludicrous to believe that Odebrecht would undermine its reputation and its relationship with FDOT refusing to repair a joint that has been known to be problem prone. The notice of default we have received is evidence of the overzealous and inadequate treatment we have received along this project. We have been bullied by this notice of default into fixing a problem that is not due to faulty construction methods, craftsmanship, or materials as we have supported with facts in this letter. Therefore, we reserve our rights to pursue further compensation for financial and moral damages caused by this improper treatment at a later date. (Emphasis added)

A further review of OFL's position is centered around the failure of the specified SEJ-S armored expansion joints at Piers No. 57 and No. 60 which took place soon after traffic was on the bridge. The Department directed OFL to make temporary repairs to these specific joints which also failed once they were again subjected to traffic on the bridge. As directed by the Department in their letter to OFL dated December 23, 1998, these expansion joints were later repaired by drilling and epoxying in 5/8" dia. X 9" long round-headed bolts through the joint angle into the concrete deck with the exception being the use of 5/8" dia. versus 1/2" dia. bolts.

Since other joints were suspect, the Department examined all expansion joints in the bridge and directed OFL to make the same repairs to four (4) other expansion joints (which was later changed to two (2) other expansion joints). These were at Piers No. 66 and No. 74, which were repaired by OFL as directed.

OFL maintains that the specified SEJ-S armored expansion joints at Piers No. 57 and No. 60 failed because they were not correctly designed for this project's application. This position is supported by a letter from their supplier, Capitol City Steel, dated September 23, 1998, referencing problems encountered with this type of expansion joint in similar applications.

Additionally, OFL has provided a copy of an internal memo from the Texas Department of Transportation dated February 12, 1998, showing that the Texas Department of Transportation has discontinued the use of the SEJ-S Armor Joints due to "stud anchor weld failure". OFL has always maintained that the method of failure in the armor joints at Piers No. 57 and No. 60 was failure of the welds between the studs and the armor angle as was indicated in the Texas Department of Transportation's memo.

OFL's position on the joints at Piers No. 57 and No. 60 is that since **these joints are unique in that they separate the continuous three (3) span steel section of the deck from the adjoining bulb tee spans, and since they are the only joints specified to have a 4" opening**, they are not correctly designed. Heavy traffic on these two (2) joints under the aforementioned conditions caused the welds to break and the joints to fail. OFL seeks compensation in regards to the temporary and permanent repairs to the armored expansion joints at Piers No. 57 and No. 60 because they feel the failure of the expansion joints at these piers is solely attributable to the design of the stud to angle welds not being of sufficient cross section and strength for heavy traffic loading.

The armored expansion joints at Piers No. 66 and No. 74 were also suspect, as were the joints in Piers No. 1 and No. 21, due to what the Department thought to be "voids under the expansion rail" (See Parson's letter of December 29, 1998). OFL was directed to make repairs to these joints, which was later mutually agreed to be only the armored joints at Piers No. 66 and No. 74.

OFL seeks compensation in regards to the permanent repairs to the armored expansion joints at Piers No. 66 and No. 74 since the work was directed by the Department based on the

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Department's belief that voids existed under the rails. This was later proven to be incorrect when, during the repairs, no voids were detected - a fact later acknowledged by the Department. OFL's letter of January 5, 1999 states:

In response to your letter OFL-405, Odebrecht along with Parsons simultaneously inspected the alleged voids under the expansion joint listed in your letter and found no evidence to support your statement.

P.B.'s. letter of January 7, 1999, to OFL second page, 5th bullet point states:

- *On December 30, 1998, an agreement was reached between your superintendent and this office that only four (4) joints needed to be repaired. We also held a meeting in the field to investigate the probable cause of the joint failures. It was thought that there were voids under the expansion joint rail, but after investigating it appeared that there were not voids under the rail. It appeared that the weld that attaches the nelson studs to the rail had failed.*

DEPARTMENT'S POSITION:

The Department stated that the proposed alternate expansion joint was not approved because OFL never provided the necessary engineering calculations. The Department's position deals primarily with the problems surrounding the SEJ-S armored expansion joints at Piers No. 57 and No. 60. Its position contained in the submission to the DRB is as follows:

During the project after traffic had been shifted onto the new bridge, it was discovered that sections of the expansion joints at piers 57 and 60 had separated from the concrete deck and were creating a safety problem for the vehicles crossing the bridge. OFL mobilized quickly and a temporary solution was devised which consisted of drilling into the concrete deck through the existing vent holes in the joint angle and epoxying a steel bar in the hole and welding it to the joint angle. After a few days this repair broke and a more permanent solution was discussed. It was decided that a hole would be drilled through the joint angle and into the concrete deck, and then a steel bolt with a round head would be epoxyed into the hole. This method of repair appeared to work well at solving the problem.

It was believed that the reason the joint had failed was that there were voids under the joint angle so that the angle was not securely attached to the deck. This opinion was derived by viewing the joints from under the deck and from on top of the deck by removing the joints' neoprene seal. Upon inspection of the joint at pier 57 it was clear that there was a void under the joint angle. You could also clearly see that the shear stud had broken away from the angle at the welded connection, and not the stud itself being sheared off. You could also see concrete debris on top of the pier column. It appeared that this debris was from the angle continuously impacting the deck and pulverizing the concrete. PB proceeded to sound all of the joints on the new bridge to see if any other joints had voids. They provided a list of six joints to OFL that needed to be repaired. This list was later reduced to four joints. OFL disputed the contention that there were voids under the joint angles, so they proceeded to drill under the angle at one of the joints specified to see if a void was present. After they drilled under the angle it was apparent that a void was not present. However, the sounding of the joint did indicate that the angle was not securely attached to the deck.

It is clear to the Department that the welds were faulty because where the shear studs could be seen, it was clear that the weld between the shear stud and the top of the joint angle had failed. The contractor is required to certify that all of the materials incorporated into or fabricated for the project meet current FDOT standards. Since the weld failed, it is FDOT's position that the joints were not fabricated according to FDOT standards and that responsibility resides with the contractor's fabricator. (Emphasis added)

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The Department maintains that, since the cause of the armored joints failure was the failure of weld between the shear stud and the top of the joint angle, the welds were faulty. It is, therefore, the Department's position that the SEJ-S armored expansion joints were not fabricated according to the Department's standards and that the responsibility for the cost of the temporary and permanent repairs resides with OFL and their respective Subcontractors and/or Suppliers.

In the Department's summary of April 18, 2000, stating their position on the three (3) issues pending before the DRB, they do not cite a specific position on the repairs to the SEJ-S armored expansion joints at Piers No. 66 and No. 74. The Department does state that repairs were required at these joints due to the presence of voids under the angle. They go on to say "after they drilled under the angle it was apparent that a void was not present. However, the sounding of the joint did indicate that the angle was not securely attached to the deck." Since the Department does not state conclusively or prove that the shear stud welds to the angles failed at the expansion joints at Piers No. 66 and No. 74, it is not clear what their position is on these two (2) expansion joint repairs.

DRB FINDINGS:

During the review of the information, it was felt that the repairs to the expansion joints at Piers No. 57 and No. 60 should be dealt with as one issue, and the repairs to the expansion joints at Piers No. 66 and No. 74 would be dealt with as a separate issue.

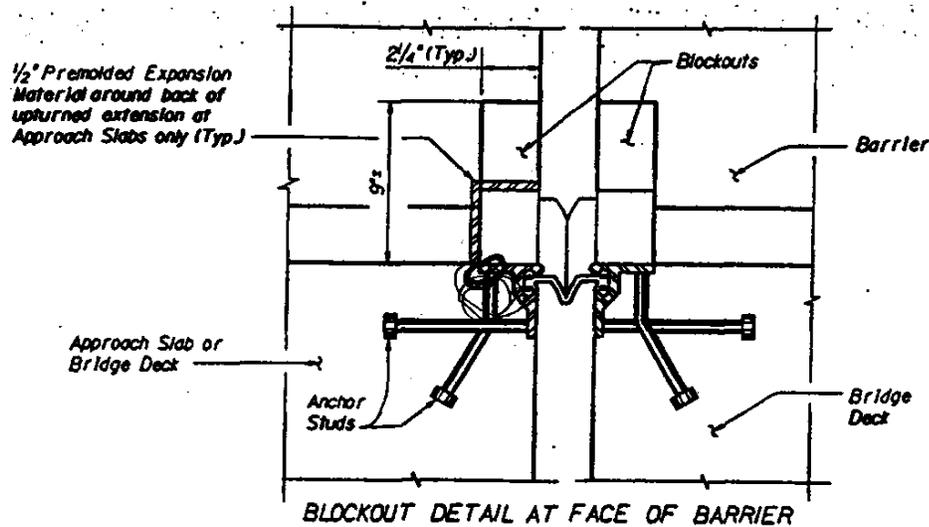
The expansion joints at Piers No. 66 and No. 74 were believed to be faulty by the Department due to the joints exhibiting a hollow sound when tapped by a rod. This, the department felt, indicated voids in the concrete under the angle which could ultimately cause the expansion joint angle to fail and come loose. Based on this assumption, the Department directed OFL to make repairs to the expansion joints at Piers No. 66 and No. 74 using the method employed at expansion joints No. 57 and No. 60.

Upon making the repairs to these joints, it was acknowledged by both parties that there were no evident voids under the rails, nor did the Department conclusively prove or demonstrate that there had been a failure of the anchor stud welds. The voids referenced in the Department's position could not be determined to be caused by voids left during placement and consolidation of the concrete deck, since the destructive forces of the impact of traffic had crushed the concrete.

Short of there being an obvious defect in the manufacture of the expansion joint angles or a defect in the installation, it was determined that these repairs would fall under Section 5 – 9.1 of the Florida Department of Transportation's standard specifications covering, "Unforeseeable Work".

The expansion joints at Piers No. 57 and No. 60 apparently failed in a manner similar to the mode of the failure experienced and discussed by the Texas D.O.T. in their memo of February 12, 1998, that being that the welds between the anchor studs and the armor angle failed.

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There is considerable correspondence concerning the presence of voids under the armor angle, but in the information presented to the DRB there is nothing to substantiate that voids, if present, contributed to the failure of the anchor stud welds. The mode of failure is still in question since no evidence has been submitted to show if the welds failed in tension or in shear. However, the supporting evidence indicates that the SEJ-S type of armored expansion angle has been prone to failure of the anchor studs weld when subjected to heavy traffic loads. The solution reached by the Texas D.O.T. was to go to larger studs at a closer spacing to generate more weld area per lineal foot of armor angle.

The situation at Piers No. 57 and No.60 was probably further aggravated in the expansion angles due to those two (2) spans having a four (4) inch opening allowing more wheel load into the angle and more potential movement in the angle. The expansion joints at Piers No. 57 and No. 60 were unique in three (3) areas. One, they were the only joints specified to have a four (4) inch opening. Two, they were the only joints that joined a continuous three (3) span steel superstructure unit. Three, they were the only joints that conclusively failed.

It is understood by this DRB that this logic is somewhat subjective. However, **no evidence has been submitted to show why the joints failed.** Even the Department, in their notes on sheet B-138 of the record drawings, prepared by the engineer, indicates that the reason for failure is "unknown":

NOTE:

DUE TO UNKNOWN REASONS, THE EXPANSION JOINTS AT PIERS 57 AND 60 BECAME LOOSE. THE CONTRACTOR SECURED THESE JOINTS WITH ADDITIONAL 9" X 1/2" BOLTS - ON 12" CENTERS TO SECURE THE PLATES AS DEPICTED IN THIS LETTER.

The Department has directed OFL to make repairs to these two (2) joints that are not consistent with the original design whereby the tension in the anchor stud is now into the full cross sectional area of the dome of a 5/8" dia. bolt (the Department requested 1/2" dia. OFL used 5/8"

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dia.) and the shear is through the total cross section area of the bolt and not just the weld as was the case in the original design of the expansion joint unit.

This method of repair is consistent with the items discussed in Capital City Steel's letter of September 23, 1998, whereby, the solution reached by other agencies, specifically the Texas D.O.T., was to provide more cross sectional area of weld, or steel as in the repair procedure, to enable this type of expansion joint to withstand heavy traffic loading.

The specific joints that failed at Piers No. 57 and No. 60 were unique in the amount of opening (4") and that they joined two (2) different types of superstructure design and construction.

The repairs directed by the Department did not require the demolition of a portion of the deck and replacement with the same type of SEJ-S armored expansion joint, but were a modification of the joint material that allowed the stud anchors, which were now bolts, to take the load directly into the bolt with no welded connections.

In summary, there is no evidence to show why the joints failed - only that they failed in the welds of the anchor studs to the armor angle which is consistent to the mode of failure experienced by the Texas D.O.T.

DRB RECOMMENDATION:

The Board, therefore, finds that OFL has entitlement for additional compensation from the Department for the temporary and permanent repairs to expansion joints at Piers No. 57, No. 60, No. 66, and No. 74 of the aforementioned bridge.

This Board sincerely appreciates the patience and cooperation of all parties and the information presented for its review in making this recommendation.

Please remember that a response to the DRB and the other party of your acceptance or rejection of this recommendation is required within 15 days. Failure to respond constitutes an acceptance of this recommendation by both parties.

I certify that I have participated in all of the meetings of this DRB regarding issue No. 2 and concur with the findings and recommendations.

Respectfully Submitted

Disputes Review Board

John H. Duke, Sr.; DRB Chairman
Richard C. Kermode; DRB Member
Leelan G. Wilkinson, Jr.; DRB Member

SIGNED FOR AND WITH THE CONCURRENCE OF ALL MEMBERS:



John H. Duke, Sr., DRB Chairman