BY THE U.S. GENERAL ACCOUNTING OFFICE

Report To The Honorable C.W. Bill Young, Sam Gibbons, And Andy Ireland House Of Representatives

Florida's Sunshine Skyway Bridge-- Design And Construction Concerns

The state of Florida is building a new Sunshine Skyway Bridge across Tampa Bay to replace the existing bridge, part of which collapsed after being hit by a ship in May 1980. The new bridge is estimated to cost $230 million of which the Federal Highway Administration is providing $105 million.

This report discusses a number of concerns raised by three Florida Congressmen. They involve design contracting procedures, construction control activities, quality of the concrete, depth of foundation piles, and the new bridge's ability to withstand ship impact.

This report points out how these concerns were resolved.

GAO/RCED-85-32
DECEMBER 14, 1984

Request for copies of GAO reports should be sent to:

U.S. General Accounting Office
Document Handling and Information
Services Facility
P.O. Box 6015
Gaithersburg, Md. 20760

Telephone (202) 275-6241

The first five copies of individual reports are free of charge. Additional copies of bound audit reports are $3.25 each. Additional copies of unbound report (i.e., letter reports) and most other publications are $1.00 each. There will be a 25% discount on all orders for 100 or more copies mailed to a single address. Sales orders must be prepaid on a cash, check, or money order basis. Check should be made out to the "Superintendent of Documents".

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

RESOURCES, COMMUNITY,
AND ECONOMIC DEVELOPMENT
DIVISION

B-216296

The Honorable C.W. Bill Young
House of Representatives

The Honorable Sam Gibbons
House of Representatives

The Honorable Andy Ireland
House of Representatives

This report, prepared at your request, discusses the construction of Florida's Sunshine Skyway Bridge. The report discusses the design contracting process, Federal Highway Administration and Florida Department of Transportation's efforts to ensure the bridge is being built to specifications, and a group of technical concerns about the bridge. The technical concerns include the significance of cracks in the main piers' foundation and the effect of using Florida limestone in the concrete mix for the bridge.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 7 days from the date of the report. At that time, we will send copies to the U.S. Secretary of Transportation; the Administrator, Federal Highway Administration; and other interested parties. We will also make copies available to others upon request.

Ralph V. Carlone for

J. Dexter Peach
Director

GENERAL ACCOUNTING OFFICE
REPORT TO CONGRESSMEN C. W.
BILL YOUNG, SAM GIBBONS,
AND ANDY IRELAND
HOUSE OF REPRESENTATIVES

FLORIDA'S SUNSHINE SKYWAY BRIDGE--DESIGN AND CONSTRUCTION CONCERNS

D I G E S T

The Florida Department of Transportation contracted for design and construction of a new Sunshine Skyway Bridge to replace the existing bridge, part of which collapsed after being hit by a ship in May 1980. The bridge crosses Tampa Bay as part of Interstate 275 and connects St. Petersburg and Bradenton, Florida. Florida estimates the new bridge will cost $230 million. The Federal Highway Administration is funding about $105 million for the bridge's construction. The state of Florida is funding the balance of the construction and all design costs. Construction began in June 1982, and the bridge is to be completed in March 1986.

In November 1983, Congressmen C. W. Bill Young, Sam Gibbons, and Andy Ireland requested GAO to investigate several concerns pertaining to the design and construction of the new bridge. These concerns centered on the contracting procedures for the design, Florida's and Federal Highway's efforts to ensure the bridge was being built to specifications, and specific technical aspects about the design and construction.

DESIGN CONTRACTING CONCERNS

GAO reviewed design contracting concerns stemming from reports of companies having inaccurate accounting procedures and making excessive profits. Although the Federal Highway Administration approved the bridge's design, it was not involved in the design contracting process because no federal funds were used to design the bridge.

Florida followed its consultant engineer contracting procedures except that it did not audit the accounting systems of 10 of the bridge designer's 11 subconsultants prior to awarding the contract. Pre-award audits were not made because Florida's inspector general could not complete them before the desired

award date. Therefore, because of Florida's sense of urgency to get the project started due primarily to heavy traffic and safety implications on the old bridge, Florida decided to proceed with the design and to do post-award audits. (See pp. 6 and 7.)

Post-award audits of two of the largest subconsultant contracts by the Florida inspector general found that the accounting systems of these two design subconsultants did not adequately identify and segregate costs. Because of the inadequate accounting systems, the inspector general initially questioned over $500,000 of the design costs. However, the inspector general did not find any improper costs charged to the contracts and thus no action was taken to recover the questioned costs. (See pp. 7 and 8.)

Audits of seven of the eight smaller subconsultants were limited to reviewing documentation and found the documentation generally acceptable. An audit of the eighth subconsultant questioned about $11,000 in design costs. Because the contract was negotiated for a lump sum, Florida's general counsel decided there was insufficient legal basis to seek an adjustment. Since 1981, Florida's auditing staff has increased to enhance the inspector general's ability to audit consultant contracts. (See p. 8.)

Another Florida inspector general post-award audit reported that a subconsultant realized a $250,000 profit on a $450,000 negotiated lump sum contract (122 percent) to design the trestle portion of the bridge. Florida expected the contractor to realize a profit of 12 percent. The profit exceeded the expected profit because the contract authorized almost 14,000 staff hours, but the contractor only expended about 5,300 staff hours to design the trestle. The Florida Transportation Department's general counsel decided there was insufficient legal basis to seek adjustment because, as a negotiated lump sum contract, the amount was mutually agreed upon. Prior to negotiating with the prime consultant and the subconsultants for an acceptable designcost, Florida prepared an in-house cost estimate for the entire bridge design but did not prepare a detailed cost estimate for designing the trestle. Although Florida's procedures did not require a detailed cost estimate for the trestle design, had Florida prepared one, it would have been in a better position to negotiate a lower contract price. (See pp. 8 and 9.)

EFFORTS TO CONSTRUCT BRIDGE FOUNDATION ACCORDING TO SPECIFICATIONS

GAO reviewed concerns about Florida and Federal Highway efforts to ensure that the bridge is being built to specifications. To ensure the main piers' foundation was built to specifications, Florida used several layers of controls and assurance checks on the quality of materials and the construction activities. The contractor, as required under the contract, tested the quality of materials before they were used in the construction of the bridge foundation. Florida personnel at the construction site monitored the contractor's material testing and inspected construction activities. Two separate Florida laboratory inspection teams independently tested materials, inspected construction, and reviewed the efforts of the personnel at the construction site.

Federal Highway officials visited the construction site, reviewed materials testing results, and inspected construction activity. (See pp. 10 to 12.)

TECHNICAL CONCERNS

GAO was asked to address several technical concerns involving the concrete used for the bridge's main piers' foundation, the depth of foundation piles, and the ability of the new bridge to withstand ship impact.

Concrete

GAO asked engineers from the Army Corps of Engineers, Bureau of Reclamation, and the National Bureau of Standards to assess the technical concerns about Florida limestone being used in the concrete mix, cracks appearing in the main piers' foundation, and concrete pouring delays of the foundation support piles. These agencies reported that the

--concrete, using Florida limestone as the aggregate or rock filler, was a quality concrete (see pp. 14 and 15);

--cracks in the concrete foundation were normal shrinkage cracks and were of no structural significance at this time; however, it was pointed out by the engineers that over the long term, the cracks could allow seawater to come in contact with the steel

reinforcing bars within the concrete and could cause localized rusting of the bars. (see pp. 15 to 17); and

--reported length of time to pour the concrete for the foundation support piles should not be considered a problem for the bridge foundation. (See p. 17.)

The Federal Highway Administration and the state of Florida made the same judgments. Regarding the concrete cracks in the main pier, Florida officials advised that several proposals have been made to solve the problem. Corrective action will be taken after the superstructure is erected. (See pp. 15 to 17.)

Unexpected soil sample led to placing piles deeper

Concerns raised about the composition of a soil sample of the Tampa Bay seabed led Florida to place 27 foundation piles deeper into the seabed than planned, a decision supported by the Federal Highway Administration. Placing the piles deeper increased the support capability of the piles, according to Federal Highway officials and Florida's geotechnical (soil) consultant. (See pp. 17 to 19.)

Sunshine Skyway trestle redesigned

The design specifications for the trestle required it to be capable of withstanding a force equal to a one-million pound ship impact. The initial trestle design was approved by Florida and the Federal Highway Administration in March and June 1982, respectively. Doubts raised about the initial trestle design led Florida to request another design engineering firm to review the trestle design in October 1982. As a result of this firm's review, the original trestle designer revised the design with minor changes and expected little cost increases.

The revised design, however, still did not meet the ship impact specification. As a result, Florida had the other design engineering firm redesign the trestle. The new trestle design was approved in July 1983 as meeting the specification. The construction cost of the new design plus construction delay increased the Skyway's cost by $15 million. The state of Florida will bear the entire cost increase. (See pp. 19 and 20.)

FEDERAL AND STATE AGENCY COMMENTS

Both the U.S. and the Florida Department of Transportation commented on GAO's report. Florida's Department of Transportation said that the vast majority of GAO's report tends to support Florida's conclusion and actions while offering some clarification of specific items. The U.S. Department of Transportation provided some clarification on the design and construction technique used and said that the Federal Highway Administration supported Florida's decision to implement a solution to cracks in the main piers' foundation after the superstructure is erected and would review the solution at that time. Changes have been made to the report as appropriate.

Contents

Page

ILLUSTRATIONS

ABBREVIATIONS

GAO	General Accounting Office
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
NBS	National Bureau of Standards

CHAPTER 1

INTRODUCTION

On May 9, 1980, the freighter, Summit Venture, struck the southbound span of the Sunshine Skyway Bridge, which crosses Tampa Bay and connects St. Petersburg and Bradenton, Florida. Approximately 1,300 feet of the bridge fell into Florida's Tampa Bay. Thirty-five people died as a result of the accident.

The Florida Department of Transportation (FDOT) subsequently held public meetings to consider options for repairing or replacing the bridge. Among the options considered were rebuilding the existing bridge, replacing the bridge with a tunnel, or building a new bridge with higher vertical clearances and wider horizontal clearances to better facilitate ship traffic. On January 31, 1981, the Governor of Florida announced the decision to build a new Sunshine Skyway Bridge. In February 1981, FDOT advertised for the design of a new bridge. FDOT awarded the design contract in July 1981 and, in January 1982, FDOT awarded a construction contract to the low bidder for the bridge foundation, the first part of the bridge to be built. Contracts for constructing the other portions of the bridge were not awarded until October 1982.

The new Sunshine Skyway Bridge project will cost an estimated $230 million, including the cost of clearing accident residue from the bay and removing portions of the existing bridge. The new bridge will be a part of Interstate 275. The Federal Highway Administration (FHWA) is providing about $105 million for the new bridge and the state of Florida the balance. FHWA's share consists of $18 million in emergency relief funds and about $87 million of Interstate funds that, prior to the accident, were planned to be used to repair and upgrade the existing Skyway Bridge. Although FHWA approved the bridge design, no federal funds were used to design the bridge. The state of Florida will be the bridge owner and FDOT the project administrator.

The Skyway Bridge was designed by Figg and Muller Engineering, Incorporated, under a $5 million contract. Construction is divided into three major components--the main piers' foundation, built by Hardaway Constructors, Inc., and Michael Construction Company under a $7 million contract; the concrete main span and high level approach, being built by Paschen, Incorporated, under a $71 million contract; and the low level approach, called the trestle, being built by Ballenger Corporation under a $50 million contract. To protect the bridge piers from ship impact, concrete islands will be built around each pier by Misener Marine, Inc., under a $4 million contract. Additional contracting will be done in the future to remove the existing bridge, to construct additional protective structures, to install a bridge signalling system, and to pay for additional consultant services. These contracts will account for the remaining $90.5 million of the bridge's estimated $230 million cost.

FDOT performed the construction engineering and inspection functions for the main pier foundation contract. However, due to personnel limitations, FDOT contracted with SKYCEI, a consortium of four engineering firms, to perform the construction engineering and inspection services for the main span, high level approach, and trestle construction under a $7 million contract. Figg and Muller, the bridge's designer, has been retained to provide design consulting services during construction under their amended design contract totalling about $7.5 million as of August 1984.

The construction of the two main piers' foundation began in June 1982 and is now complete. Construction is underway on the main span, high level approach, and trestle. Construction had not started on the pier protection as of August 1984. The bridge is scheduled to be completed in March 1986.

The Skyway Bridge is being built with a design and construction technique that uses concrete segments held together by steel tendons stretched between them. The segments are precast and then transported to the construction site. The main span segments will also be supported by cables strung between the center median of the bridge and the tops of the main piers. Figure 1 on the following page shows an illustration of the bridge.

The concrete segmental center span will be 1,200 feet long, reportedly a record length for a bridge of this type. The entire bridge will be 4.1 miles long and will provide four lanes of roadway. The horizontal ship channel clearance is 1,000 feet and the vertical clearance 175 feet.

The roadway on the low level trestle approach will be 26 feet above Tampa Bay and the trestles encompass about 2.5 miles of the 4.1-mile-long structure. The high level approach and main span make up the rest of the bridge.

FHWA'S ROLE

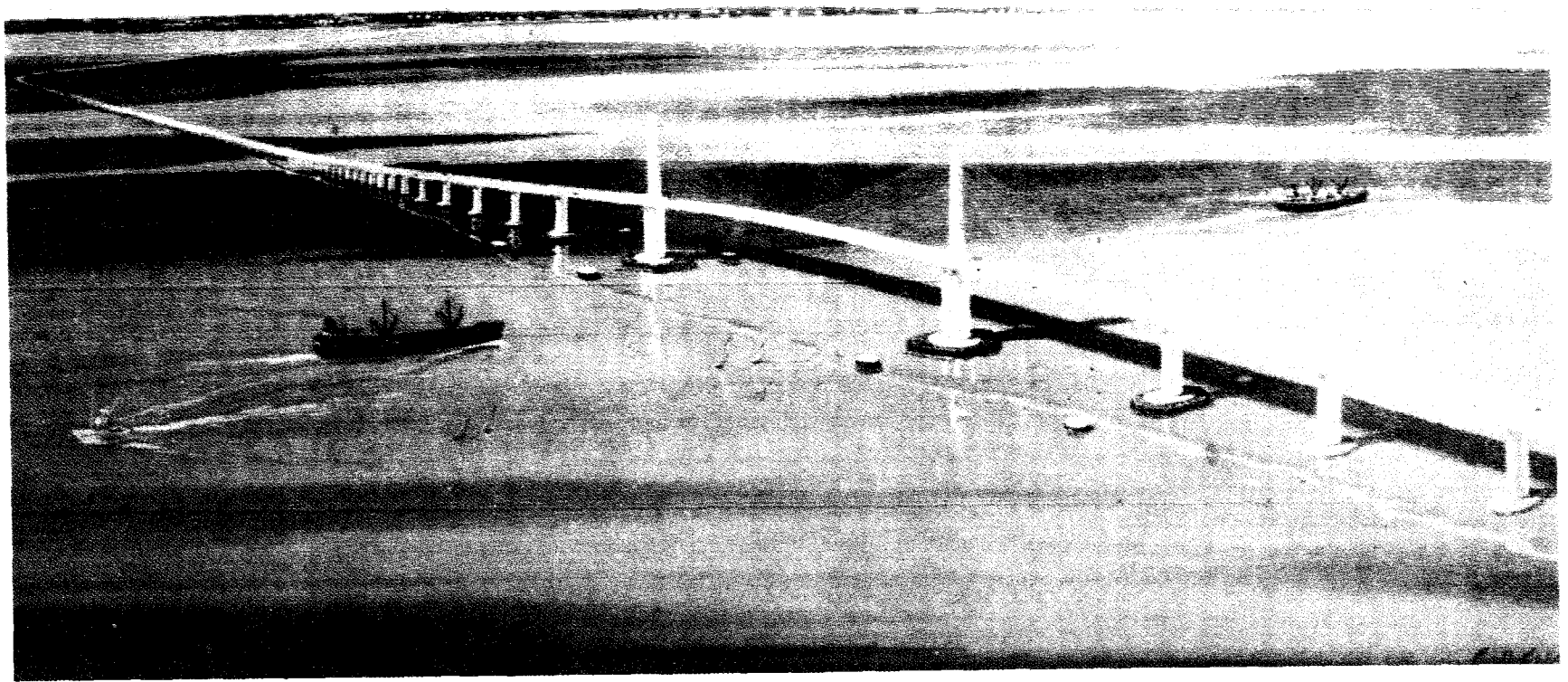
When federal funds are used in a project, states must follow applicable federal policies and standards for contracting and construction. FHWA must evaluate states' procedures for compliance with federal regulations and monitor states' performance. However, for the Skyway project, FDOT elected to use state funds to design the bridge. With no federal funds involved in the design of the bridge, FHWA did not participate in the contracting process and did not approve the design contract. FHWA did approve the actual design of the bridge and the construction contracts. FHWA was monitoring FDOT's performance during construction by visiting the construction site and reviewing materials testing and construction activities.

OBJECTIVES, SCOPE, AND METHODOLOGY

On November 17, 1983, Congressmen C. W. Bill Young, Andy Ireland, and Sam Gibbons requested that we investigate the

Figure 1

New Sunshine Skyway Bridge



Courtesy of Figg and Muller Engineering, Inc.

construction of the new Sunshine Skyway Bridge, citing specific concerns about the design and construction of the new bridge.

On the same day, the Congressmen also requested the House Committee on Public Works and Transportation, Subcommittee on Investigations and Oversight, to investigate the construction of the bridge. We have coordinated our audit efforts with the Subcommittee.

In subsequent discussions with Congressman Young and his office, the contact for our investigation, we agreed to cover a number of concerns which can be grouped into three areas: design contracting concerns, construction control concerns, and technical concerns. The design contracting concerns stemmed from reports of companies making excessive profits, having inaccurate accounting procedures, and falsifying reports. Construction control refers to the efforts of FHWA and FDOT to ensure that the bridge is being built to specifications. The technical concerns were based on reports of Florida limestone being used in the concrete mix, cracks appearing in the main piers' foundation, delays in pouring the concrete piles that support the main piers, placing piles deeper into the seabed than planned, and the trestle being redesigned.

We also addressed the concern about a newspaper article reporting that a former Florida Secretary of Transportation suspected that "cronyism" existed within FDOT. As agreed with Congressman Young, the cronyism allegation is being reported in a separate letter.

We conducted our review from January to June 1984. To address whether FHWA and FDOT handled the contracting process according to their procedures, we held discussions with FHWA and FDOT management and contracting officials, FDOT inspector general officials, a state of Florida auditor general official, and representatives of Figg and Muller, the prime consultant, and Schmertmann and Crapps Incorporated, a subconsultant. We obtained and analyzed FDOT procedures for design contracting and reviewed FDOT inspector general and Florida auditor general audit reports of the consultants' and of FDOT's contracting procedures. We focused on those audit reports that resulted in the congressional concerns of excessive profits, inaccurate accounting procedures, and falsifying reports. We did not assess all of the audit reports related to the design of the bridge.

To respond to the objective of assessing FHWA and FDOT efforts to ensure that the bridge is being built to specifications, we held discussions with FHWA and FDOT management officials, the bridge project manager, program manager, and construction inspectors at the bridge construction site. We also held discussions with onsite representatives of Figg and Muller, and SKYCEI, the consultants performing construction engineering and inspection services for the trestle, the high level approach, and the main span construction. At the bridge construction site we reviewed detailed inspection and construction documents for the

completed foundation contract and scanned these records for the ongoing contracts. We visited FDOT's Gainesville, Florida, laboratory and discussed the laboratory functions of testing materials and checking the performance of FDOT's onsite inspectors. We limited our assessment of FHWA and FDOT efforts to the main piers' foundation because it was the only portion of the bridge completed at the time of our review. We did, however, describe how FHWA and FDOT are monitoring the main span, high level approach, and trestle construction, which were just beginning at the time of our review.

To address the group of specific technical concerns, including the use of limestone in the concrete mix, time taken to pour concrete, and cracks in the concrete main piers, we held discussions with FHWA and FDOT officials; representatives of Figg and Muller, the designer; Schmertmann and Crapps, the geotechnical (soil) subconsultant; two individual subconsultants who recommended against using Florida limestone; and a private citizen who had expressed specific concerns about the construction of the foundation. We obtained studies, construction records, and test results about the specific technical concerns; and we also visited the Skyway construction site and observed the cracks in the foundation.

Because of the engineering judgment and technical nature of the concerns involved, we enlisted the assistance of engineers from the Army Corps of Engineers, the Bureau of Reclamation, and the National Bureau of Standards, each with expertise in mass concrete pours, aggregates, and concrete mixes. These officials reviewed an array of technical information, visited the bridge construction site, and held discussions with FDOT officials. They responded to our questions and opinions on the engineering reasonableness of FDOT decisions and actions. Their input is incorporated into the report where applicable. We did not make any independent engineering judgments.

We met with members of the St. Petersburg Chamber of Commerce and officials of the Pinellas County Metropolitan Planning Organization to discuss the Skyway Bridge. We also reviewed public media reports of Skyway concerns.

We also obtained comments from the U.S. Department of Transportation and FDOT on this report. Their comments are contained in appendixes I and II, respectively. FDOT said that the vast majority of the report tends to support Florida's conclusion and actions while offering some clarification of specific items in the report. Our response to these items is contained in appendix II. The U.S. Department of Transportation provided some clarification on the design and construction technique used and said that FHWA will review FDOT's proposed solution for dealing with the cracks in the main piers' foundation. Changes have been made to the report as appropriate.

We performed the review in accordance with generally accepted government auditing standards.

CHAPTER 2

DESIGN CONTRACTING CONCERNS

FDOT generally followed its consultant engineering procedures in awarding the design contract for the new Skyway Bridge except that it did not audit the accounting systems used by 10 of the 11 bridge design subconsultants prior to contract award. FDOT requested the FDOT inspector general to perform the pre-award audits, but the inspector general could not guarantee completion of the awards prior to the desired contract award date. Florida's Secretary of Transportation said that there was a sense of urgency within FDOT to get the project started because of the heavy traffic and safety implications on the old bridge and rather than delay the award of the design contract, FDOT decided to perform audits after the contract was awarded.

FDOT inspector general post-award audits of two of the largest subconsultant contracts disclosed accounting system problems involving cost accumulation and documentation supporting salaries on one subconsultant, and support and documentation for unit prices on another subconsultant. However, the inspector general did not find any indications of improper charges and no action was taken to recover the costs questioned in the two audit reports. Another FDOT inspector general post-award audit of the subconsultant designing the trestle disclosed that actual labor time expended amounted to only about 40 percent of the hours authorized by the contract. A separate in-house cost estimate for the trestle design might have shown fewer hours were required and that a lower price could have been negotiated for the trestle design. Since the 1981 contracting for the Sunshine Skyway design, the number of FDOT auditors was increased to enhance the inspector general's ability to audit consultant contracts.

Regarding falsified reports, a post-award audit by the Florida auditor general led to charges that invoices were falsified by a subconsultant.

Although FHWA approved the bridge's design, it was not involved in the design contracting because no federal funds were used for the design phase.

PRE-AWARD AUDITS WERE NOT MADE

FDOT followed its consultant engineering contracting procedures in effect at the time the Skyway design contract was awarded except that FDOT did not audit the accounting systems used by the bridge designer's subconsultants prior to contract

awards.[1] FDOT procedures required that prior to awarding a contract, an audit, no more than 12 months old, be on file to establish that the firm's accounting system can identify, segregate, and accumulate costs by job. If a current audit is not on file, a special audit of the firm's accounting system must be performed prior to award. Because current audits were not on file for 10 of the 11 subconsultants, FDOT requested the FDOT inspector general to perform pre-award audits. However, the inspector general could not guarantee completion of the audits prior to the desired contract award date because of limited staff and ongoing work. According to Florida's Secretary of Transportation, there was a sense of urgency within FDOT to get the project started because of the heavy traffic and safety implications on the old bridge, and rather than delay the award of the design contracts, FDOT decided not to perform pre-award audits and to perform audits after the contract was awarded.

Subsequently, the FDOT inspector general made post-award audits of the accounting systems of the two subconsultants with the largest contract amounts, representing almost three-fifths of the subconsultant fees. The inspector general questioned about $575,000 of the costs claimed by the two subconsultants because the firms' accounting systems did not adequately identify and segregate project costs. According to the inspector general, pre-award audits might have identified the accounting systems' inabilities to identify and segregate project costs. FDOT inspector general officials said that FDOT was not seeking recoupment of these costs because there were no indications of improper charges, and the contract cost had been mutually agreed upon. The inspector general findings for the two subconsultants are as follows.

--Schmertmann and Crapps conducted geotechnical (soil) investigations and made recommendations for the bridge foundations. An audit report on Schmertmann and Crapps questioned $118,994 of the $312,874 subcontract cost. The questioned costs included differences between salaries billed and salaries actually paid and subconsultant billings which could not be verified by supporting documentation such as time sheets and vouchers. The report stated that the subconsultant's accounting system, a cash basis system, could not accumulate costs by contract or by job.

--Williams and Associates provided equipment and conducted tests in support of the geotechnical investigation. The audit report on Williams and Associates questioned $456,656 of the $935,222 subcontract cost. The questioned costs resulted from a lack of cost data to verify unit

[1]A single contract existed between FDOT and Figg and Muller Engineering, the bridge's designer. Within the contract, the subconsultants were specified as was the work each was to perform and the fee or dollar limits for the work. Figg and Muller were responsible for the subconsultants, received payments from FDOT, and paid the subconsultants.

prices for segments of work. The subconsultant used his judgment in developing prices for such work as an hourly rate for the use of a drilling rig and the charge for each type of tests performed. The report stated that the subconsultant's accounting system, a departmental system, could not accumulate costs by contract or by unit of work.

According to FDOT inspector general officials, Schmertmann and Crapps has modified its accounting system since the audit, and the inspector general has reaudited and approved the new accounting system. The officials said that they did not know if Williams and Associates had modified its accounting system.

The other eight subconsultants represented about 15 percent of the total subconsultant fees. FDOT did limited audits of seven of these eight subconsultants, which consisted of reviewing the documentation supporting invoices but not reviewing these subconsultants' accounting systems. The documentation was found to be generally acceptable. FDOT did review the accounting system of the eighth subconsultant and questioned $11,000 of the $123,250 contract. The questioned costs resulted from an average hourly rate less than that proposed. The inspector general recommended that FDOT seek a price adjustment. FDOT's general counsel decided there was insufficient legal basis to seek an adjustment as the contract was for a negotiated lump sum amount and therefore did not pursue the matter. Unlike the problems concerning the accounting systems of the two subconsultants discussed earlier, a pre-award audit would not have revealed these problems.

In 1982, the Florida legislature authorized three additional auditor positions for the inspector general and encouraged FDOT to increase its efforts for auditing consultant contracts. According to FDOT officials, the additional positions strengthen their auditing capabilities and enhance their ability to respond promptly to management's needs for quality audits of consultant contracts.

TRESTLE DESIGN COSTS

As required by its consultant engineer contracting procedures, FDOT made an overall in-house cost estimate for the design of the bridge. However, a specific estimate was not made for the trestle. Also, at the time of the Skyway design, FDOT did not require the firms competing for the design contract to submit an estimate of their design costs. FDOT selected the designer based on FDOT's evaluation of the technical proposals and then began cost negotiations. If FDOT had made a detailed in-house estimate for the trestle design, FDOT might have negotiated a lower contract price.

For example, an FDOT inspector general audit of the Mid-South Engineering Company's subcontract to design the trestle showed that only 5,335 staff hours were expended compared with the 13,689 staff hours authorized by the contract. The contract amount of $453,235 was paid by FDOT through Figg and Muller, the prime consultant, to Mid-South. The actual costs incurred by the

subconsultant was only $203,759, however. The audit report showed the company received a $249,476, or 122-percent, profit as opposed to the 12 percent profit that Florida expected Mid-South to realize. The auditors recommended that FDOT seek a price adjustment on the contract.

The FDOT general counsel decided there was insufficient legal basis to seek adjustment on the Mid-South subcontract because it was a negotiated lump sum compensation contract. It was their opinion that the contract represented a meeting of the minds at the time of the contract, and FDOT had approved the trestle design as the contract product.

In 1983, FDOT modified its consultant contracting procedures to require firms to submit price proposals before consultant selection. According to the Florida Deputy Secretary of Transportation, the revised procedures assist FDOT's negotiating efforts because FDOT can compare its and the competing firm's estimates for the same work, and the estimates can be used as a data base for future contract negotiations.

FALSIFIED REPORTS

The only evidence of falsified reports involved a Mid-South subcontract for survey work to establish locations for the new Skyway Bridge. The state of Florida's auditor general, as part of a statutory audit of FDOT's financial statements and selected areas of management, conducted an audit of Mid-South. The audit indicated that Mid-South charged FDOT for direct labor, overhead, and per diem for employees who did not actually work on the project and for unallowable boat rentals and radio purchases. The information developed during the audit was given to the state attorney and, subsequently, three Mid-South employees and one former employee were charged with grand theft and fabricating physical evidence. One confessed, and three were acquitted.

The Florida auditor general and state attorney made information from their investigation available to FDOT. FDOT determined that Mid-South had been overpaid $53,396, which has been recouped.

CHAPTER 3

EFFORTS TO CONSTRUCT BRIDGE FOUNDATION ACCORDING TO SPECIFICATIONS

To ensure that the Skyway's main piers' foundation was constructed to specifications, FDOT used several layers of controls and assurance checks on the quality of materials and construction activities, and FHWA monitored FDOT's efforts. Although records and reports showed that construction materials were tested for quality and construction activities were inspected, neither FDOT's nor FHWA's system readily showed how a deficiency noted during construction inspection was resolved.

FDOT does not have a single system of established procedures to control all construction projects. Instead, a control system is tailored to each specific project. FDOT uses the project's contract specifications, general construction standards, and engineering experience to monitor the construction of a project. To ensure that a project is constructed to specifications, FDOT tests the quality of materials to verify that the materials meet specifications and inspects the construction activities for conformance to specifications and general construction standards.

FDOT is responsible for seeing that the bridge is constructed in accordance with plans and specifications, and FHWA has responsibility for overseeing FDOT's efforts. For the Skyway Bridge, FDOT controls included independent checks on the quality of materials and the inspection of construction activities. FHWA monitored FDOT's efforts by visiting the construction site and reviewing materials testing and construction activities.

FHWA MONITORED FDOT'S EFFORTS

FHWA delegates the responsibility for the construction of federal-aid projects to state highway departments (23 CFR 635.105). However, according to the Federal Aid Highway Manual (Vol. 6, Ch. 4, Sec. 2, Subsec. 8), FHWA policy is to make sufficient reviews or inspections to assure that the project is completed in accordance with approved plans and specifications. In addition, FHWA evaluates the performance, adequacy, and effectiveness of the state's control of the quality of work and encourages state highway departments to develop and implement a quality assurance program.

FHWA, in order to meet its responsibility for construction oversight for the Skyway Bridge's main piers' foundation contract, made 21 visits beginning April 21, 1982, and ending with a final inspection December 14, 1983. FHWA's inspectors prepared a report of each visit which included statements concerning the quality of work, the progress of the work, a description of the scope of the visit with a summary of the work being performed, and the findings or deficiencies of the inspection. In its final inspection, FHWA accepted the work done under the contract which indicated its satisfaction with the construction.

FDOT'S SYSTEM FOR CONSTRUCTION CONTROL

To ensure that materials and construction activities under the main piers' foundation contract met specifications, the contractor tested the quality of materials and performed the construction activities, FDOT onsite personnel monitored the contractor's activities, and two other groups of FDOT laboratory personnel independently assessed both FDOT and contractor efforts. The construction records indicated that the materials were sampled and tested and important construction activities inspected. The construction controls for the main span, high level approach, and trestle work differed in that an engineering consulting firm was being used to monitor the contractors' activities and FDOT onsite personnel were monitoring the consulting firm's efforts. Work was just beginning on the main span, high level approach, and trestle at the time of our review.

Construction controls for the main piers' foundation

FDOT employed four levels of control for the construction of the main piers' foundation.

--The first level of quality control involved the contractor, who was required to develop and implement a quality control program which entailed procedures for mixing and testing concrete, obtaining assurances from suppliers that materials they are supplying meet contract specifications, and testing materials by the contractor. The contractor's quality control plan was approved by FDOT as conforming to FDOT's materials' sampling and testing manual.

--The second level of control, quality assurance, involved FDOT personnel at the construction site. They performed onsite testing of materials as well as oversight inspection of the contractor's compliance with the quality control plan. FDOT monitored the contractor's work and certified that the construction was performed correctly and acceptable for payment.

--The third level of control, independent assurance, was performed on a monthly basis by inspectors from FDOT's laboratory. The inspectors acted as a check on the efforts of the FDOT onsite inspectors and the contractor. The inspectors also performed independent tests of material quality.

--The fourth level of control was inspection-in-depth which was performed by a separate team of inspectors from FDOT's laboratory. They visited the project to thoroughly analyze materials testing and construction inspection to determine whether the first three levels of control were satisfactory.

Discussions with FDOT officials and review of construction records indicated that materials were tested and construction activities were inspected for the main piers' foundation. The contractor, FDOT onsite personnel, and the FDOT laboratory teams sampled and tested materials such as the ingredients of the concrete mix, the strength of the concrete, and the epoxy coating of the steel reinforcing bars to verify that the materials met the contract specifications. FDOT personnel also monitored the contractor's reports of material testing. FHWA visits included reviewing the contractor's and FDOT's reports of material testing which provided a separate check on the control of materials.

The construction records for the main piers' foundation showed that the FDOT personnel were inspecting activities such as drilling the shafts, installing steel reinforcing bars, and pouring the concrete to verify that these activities were performed in accordance with contract specifications and construction standards.

Construction controls system for the main span, high level approach, and trestle

FDOT used an independent engineering consultant firm, SKYCEI, to perform direct quality assurance for the main span and high level approach contract and the trestle contract. SKYCEI is an association of four engineering firms--Parsons, Brinckerhoff, Quade and Douglas, Inc.; H.W. Lochner, Inc.; DRC Consultants, Inc.; and Kisinger, Campo and Associates.

FDOT decided a consulting engineering firm was needed for these contracts because the construction was complex and was to be done at multiple construction locations at the same time, thus requiring a large number of inspectors. FDOT officials said they did not have the necessary number of experienced inspectors available. SKYCEI inspects the contractor's construction work and certifies that the work was performed correctly and was acceptable for payment. SKYCEI prepares the daily construction activity documents. FDOT onsite personnel monitor SKYCEI efforts. The FDOT laboratory personnel are performing the independent materials testing and inspection-in-depth functions similar to the main piers' foundation contract and FHWA is monitoring FDOT's efforts.

FDOT also has the bridge designer personnel onsite to review drawings made by the contractor. The designer assesses the impact of any changes made during construction relative to its design integrity.

FDOT AND FHWA CANNOT READILY DOCUMENT CONSTRUCTION DEFICIENCY CORRECTIONS

Although inspection records contained many construction deficiencies, neither FDOT's nor FHWA's systems provided for readily identifying resolutions to the deficiencies. We selected six deficiencies noted in February 1983 and requested FDOT to provide

information on the correction of the deficiencies. FDOT had difficulty in providing documentation reflecting corrective action for four of the deficiencies. FDOT's responses came from various sources, such as a general correspondence file, another inspector's diary, or by an inspector recalling an incident. The FDOT project engineer acknowledged that this was a weakness in their system. Florida's Deputy Secretary of Transportation said that they had met with SKYCEI and the contractors in June 1984 and reinforced the importance of making timely decisions to resolve construction deficiencies and documenting the resolutions.

FHWA did not have a procedure for following up deficiencies found during its inspections. FHWA inspection reports include a remarks section to note deficiencies. The reports are then sent to FDOT for resolution. FDOT's response may be either verbal, in which case there is no record, or written where it becomes a part of the general correspondence file which contains a wide array of subject matter. FHWA officials, while acknowledging the system does not readily document resolutions, maintain that they monitor the resolutions personally and know what deficiencies have been or have not been resolved.

CHAPTER 4

TECHNICAL CONCERNS

At our request, engineers from the Army Corps of Engineers, National Bureau of Standards, and Bureau of Reclamation reviewed technical concerns about Florida limestone being used in the concrete mix, cracks in the main piers' foundation, and delays in pouring concrete for the foundation support piles. The agencies concluded that

--the concrete, using Florida limestone, was a quality concrete,

--the foundation cracks were to be expected and posed no structural significance at this time, and

--the reported length of time to pour the concrete foundation piles was not a problem to the bridge's foundation.

Two other technical concerns dealt with the depth of the main piers' foundation piles and the trestle design. FDOT considered its decisions to place the foundation piles deeper into the seabed and to redesign the trestle as conservative decisions to ensure the safety of the bridge. The redesigned trestle added $15 million to the cost and will be funded by Florida; no additional federal costs will be incurred.

FLORIDA LIMESTONE USED IN THE CONCRETE MIX

In November 1981, FDOT decided to allow Florida limestone to be used as the aggregate in the concrete mix for the Skyway Bridge even though consultants had recommended against it. Aggregate is the rock filler that is mixed with cement, water, and other materials to produce concrete.

FDOT contracted with four consultants to identify materials and procedures that would produce a durable and quality concrete for the bridge. The consultants made a number of recommendations, adopted by FDOT, which would reduce the heat that builds up in massive concrete pours and increase the concrete's ability to keep saltwater from penetrating the concrete. For example, FDOT adopted the consultants' recommendation to use crushed ice, rather than water, in mixing the concrete to reduce the heat buildup and the potential for cracking. Also, FDOT agreed to the recommended size of aggregate and the use of fly ash, an ingredient that increases the density of concrete and its ability to keep out salt water. The consultants also recommended that Florida limestone not be used as the aggregate in the concrete mix because it had technical characteristics such as being porous and having varying composition which could affect the strength and uniform quality of the concrete. The consultants recommended using aggregate from specified sources in Alabama and Georgia. However, FDOT did not adopt the consultants' recommendation to not

use Florida limestone because FDOT had experience using Florida limestone, and FDOT officials believed that a durable and quality concrete could be produced using the Florida limestone.

FDOT decided to allow the use of the best Florida limestone. For the main piers' foundation contract, FDOT specified that three Florida limestone sources and six sources from Alabama and Georgia were permissible for the concrete aggregate. The low bid contractor chose to use Florida limestone.

FDOT officials maintained that the decision to allow Florida limestone as the aggregate was a sound engineering judgment. FDOT officials said that, consistently, tests of the concrete used in the main piers' foundation showed greater strength than the specifications required. The FHWA Division Administrator supported FDOT's decision to use Florida limestone.

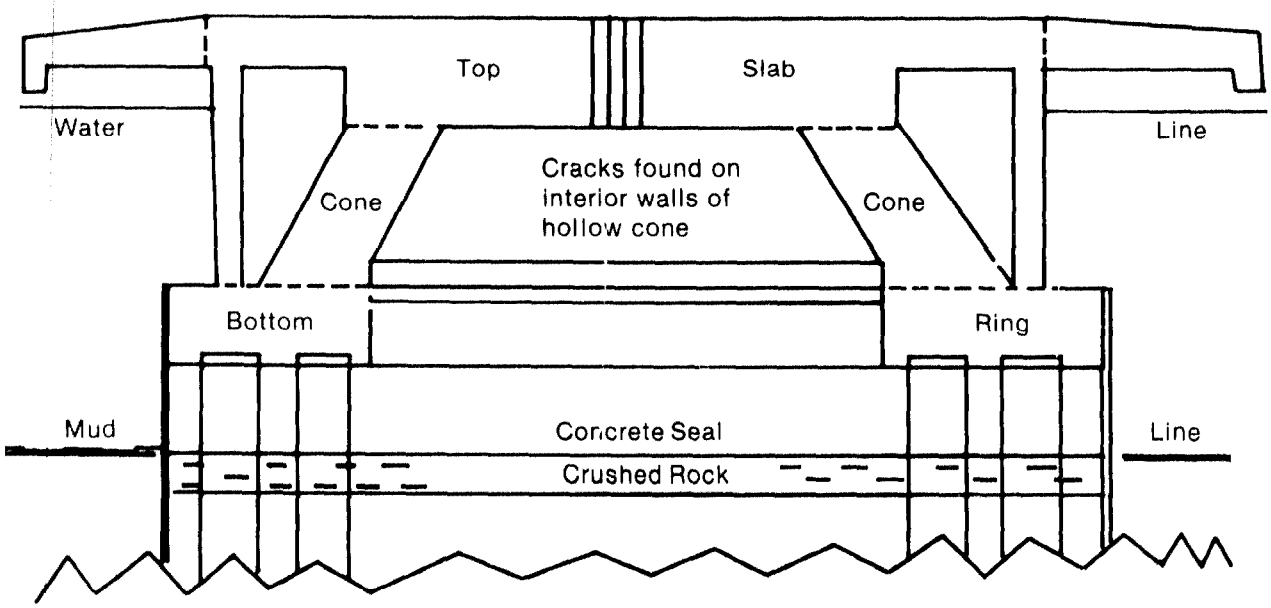
The federal engineers from the Corps of Engineers, Bureau of Reclamation, and National Bureau of Standards (NBS) agreed that FDOT's procedures and concrete mix, including the use of Florida limestone, should produce a quality and durable concrete. Also, the Corps has used Florida limestone in many projects constructed within the state of Florida.

CRACKS IN THE MAIN PIERS

In June 1983, FDOT officials detected hairline cracks inside the hollow concrete cones of the main piers. The walls of the cones are about 8 feet thick and the interior areas of the two main support piers have about 22 hairline cracks ranging in width from .002 inches to .010 inches and in length from about 8 feet to over 15 feet. Some cracks were leaking water as of May 1984.

Figure 2

Cross Section of the Main Piers' Foundation Concrete Cones



FDOT and FHWA inspected the cracks and said that they were shrinkage cracks. Shrinkage cracks in mass concrete, such as the main piers, occur because of stresses resulting from heat generated by the chemical reaction of cement and water, and the subsequent differential in coolings--the outside cools faster than the inside. At FDOT's request, the designer, Figg and Muller, and a consultant, Parsons, Brinckerhoff, Quade, and Douglas, inspected the cracks and concluded that they were shrinkage cracks, considered normal in large concrete pours, and would not impair the structural adequacy of the foundation. Also, FDOT sampled water from the leaking cracks, and the tests indicated that there was no rusting of the steel reinforcement bars within the concrete.

The engineers from the Corps, Bureau, and NBS agreed that shrinkage cracks can be expected in mass concrete and, at present, the cracks do not affect the structural integrity of the main piers. NBS pointed out that some of the cracks that were leaking water contained brown deposit. NBS suggested chemically analyzing the brown material alone and comparing the results with known deposits of rust to determine whether the brown material is rust. NBS also suggested that the efflorescence, or powdery deposits around the cracks, be cleaned so that any new deposits can be monitored. FDOT officials said that they had analyzed the brown deposits shortly after the cracks were identified and results showed the deposits to be largely carbonate of calcium and magnesium rather than steel rust. Also, FDOT continues to test the water leaking from the cracks, and the test results have not shown indications that rusting has occurred. The officials said that they will clean the efflorescence from the cracks so that any new deposits can be identified.

NBS reported that the long-term importance of the cracks is that they could allow seawater to come in contact with the steel reinforcing bars within the concrete and cause localized rusting of the bars. Although the reinforcing bars were epoxy-coated to deter rust, according to the Bureau and NBS, it is probable that there are breaks in the coating of some bars which occurred when the concrete was poured around the reinforcing bars. FDOT officials said that they were considering a number of possible ways of addressing the cracks. However, they do not plan to implement a solution until after the bridge deck is placed on the piers. FHWA officials said that they will analyze FDOT's repair method after FDOT decides how to address the cracks. One solution proposed by an FDOT consultant was to seal the inside cracks to a depth of one and one-quarter inches. After repairing the cracks, FDOT plans to fill the hollow cones with fresh water to offset the pressure from the seawater outside the cones.

At our request, the federal engineers commented on the proposal to seal the inside cracks. They said that surface sealing of the cracks on the inside to a depth of one and one-quarter inches would not eliminate the possibility of corrosion of the steel reinforcing bars. NBS suggested investigating the feasibility of sealing the cracks for their entire depth and that careful consideration be given to the repair method to be used. FDOT

officials said that they would consider the federal engineers' comments and they were open to further suggestions.

DELAYS IN POURING CONCRETE FOR THE PIER FOUNDATION PILES

FDOT specified that the concrete pour for each of the 88 piles[1] supporting the main piers was to be completed within 2 hours. During the pours, the limit was exceeded 18 times but only 2 piles exceeded 3 hours and none exceeded 4 hours in pour time.

The pouring time specification was intended to prevent the occurrence of a cold joint. A cold joint would result if one section of poured concrete hardened and then additional concrete was poured on top of the hardened concrete. This could result in a structure of less strength than that from a continuous pour.

FDOT contended that the pours exceeding 2 hours were not causes for concern because laboratory tests showed that the concrete mix used did not harden for 28 hours. FDOT also took a core sample of the concrete pile that took nearly 4 hours to pour and tests showed the strength exceeded the required strength and was comparable in strength to those piles poured within the 2-hour limit. FHWA concurred with FDOT that the concrete pours exceeding 2 hours were not problems.

The Corps, Bureau, and NBS also concluded that the concrete pours exceeding the 2-hour limit were not problems. NBS estimated that it was unlikely the concrete used had an initial hardening time as high as 28 hours but also estimated that the initial concrete hardening time was in excess of 6 hours and that there was no significance to the 18 pours exceeding the 2-hour limit.

FDOT'S DECISION TO PLACE THE PILES DEEPER

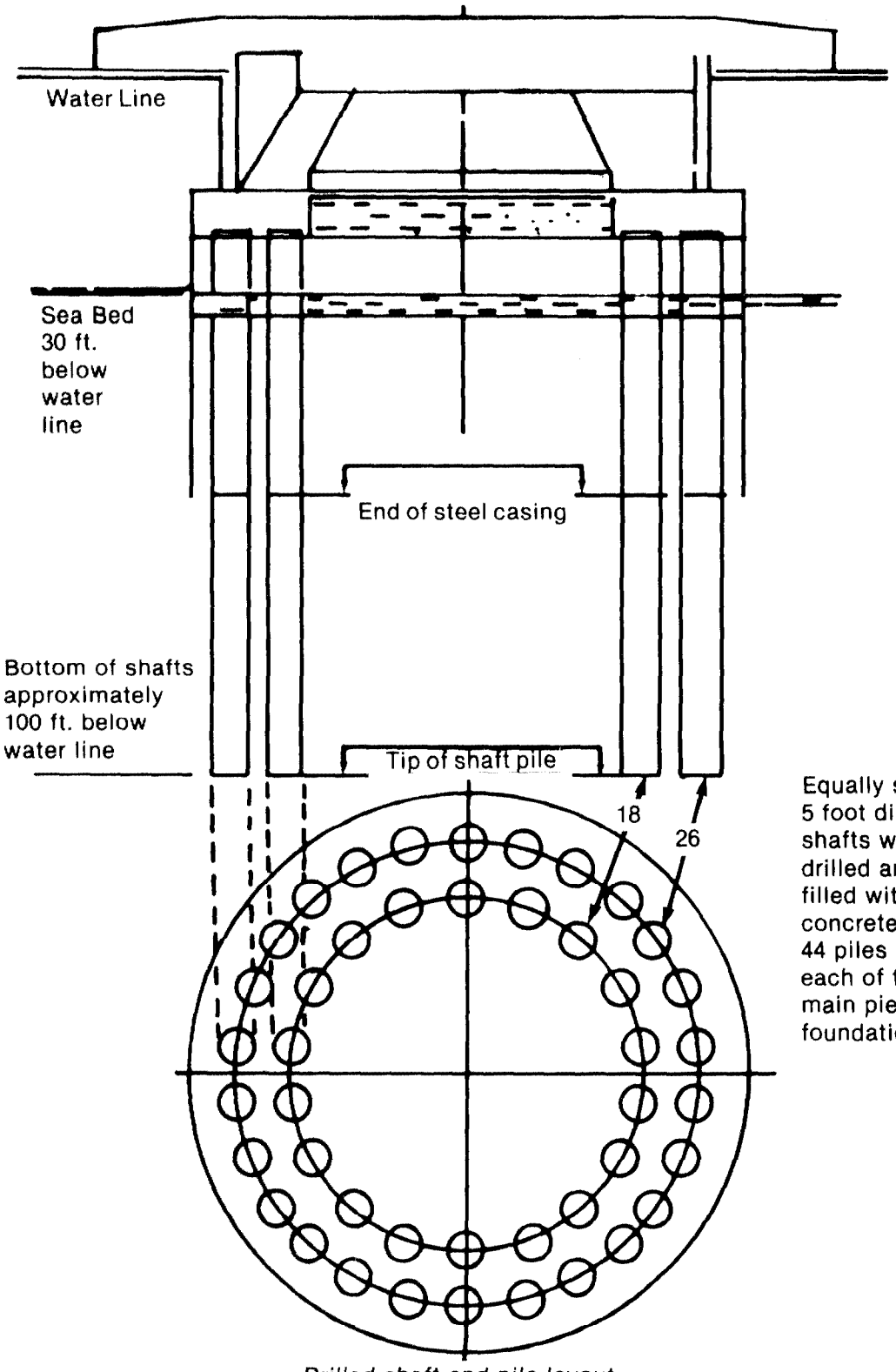
During construction of the south main pier, the contractor had difficulty obtaining core borings from the bottom of the shafts. The shafts were drilled to specified depths in the seabed, core borings taken, and then the concrete piles were poured into the shafts. (See fig. 3 on p. 18 showing the foundation shafts.) The core borings were used to determine the composition of the soil at the tip of the shafts and verify prior geotechnical work. The contractor was unsuccessful in obtaining core borings from the first two shafts of the south main pier. FDOT officials directed the contractor to modify the core boring equipment. The

---

[1]The piles are major structural concrete components, 5 feet in diameter and averaging about 100 feet in length. The piles provide the support for the main piers which support the main span of the bridge. See figure 3 on p. 18 for the layout of the piles for each main pier.

Figure 3

Main Piers' Foundation Shaft



Drilled shaft and pile layout

shaft drilling and concrete pouring continued while the equipment was being modified. On the 15th shaft, the contractor, with modified equipment, obtained a boring that indicated the subsoil was not as expected. However, the boring had been infiltrated with water and broken up when removed from the core boring equipment. FDOT requested the assistance of its geotechnical consultant who observed two more drillings and then recommended drilling the remaining 27 shafts 6 to 7 feet deeper than originally planned. FDOT adopted the recommendation as a conservative measure based on safety.

Core samples were taken on the remaining 27 shafts which confirmed the geotechnical survey results. According to the consultant, drilling the shafts deeper, which places the piles deeper, actually increased the safety factor of the piers. FHWA regional officials agreed and explained that much of the piles' support capability comes from the side friction of the shaft walls adhering to the concrete pile. Placing the piles deeper exposed more of the concrete pile surface to the shaft walls, thus obtaining greater side friction. FHWA concurred with FDOT's decision and has approved the main support piers as meeting construction standards.

FDOT'S DECISION TO REDESIGN THE TRESTLE

FDOT required two designs for the trestle to encourage cost competition among construction contractors. Figg and Muller designed one type of trestle, and Mid-South, a subconsultant of Figg and Muller, designed another. A specification for the trestle was that it should be designed to withstand a ship impact of one-million pounds. FDOT approved Mid-South's design in March 1982, and FHWA approved it in June 1982. In August 1982, Figg and Muller wrote FDOT to question the ship impact resistance of Mid-South's design. FDOT's chief of structures decided the Mid-South design met the specification, and FHWA accepted the decision.

On October 13, 1982, FDOT opened the bids for the trestle construction and the low bidder selected the Mid-South design. The next day, FDOT hired an engineering consulting firm, Parsons Brinckerhoff Construction Services, Inc., to review the Mid-South design and advise whether it met specifications. According to the Florida Secretary of Transportation, the decision to review the design was a conservative measure based on the earlier doubts raised about the design by Figg and Muller.

In a November 17, 1982, letter to FDOT, Parsons Brinckerhoff concluded the design met specifications except for ship impact resistance and the resistance could be strengthened by rearranging some components of the foundation structure and by relatively minor revisions to the connections between the deck units and the piers. The letter stated the revisions would not constitute a significant change in the scope of the construction work and could be implemented during construction. The Florida Secretary of Transportation said that FDOT awarded the trestle construction contract on December 22, 1982, because of the Parsons Brinckerhoff letter.

Between December 1982 and July 1983, Mid-South revised the trestle design to incorporate Parsons Brinckerhoff suggestions, but Parsons Brinckerhoff determined the revised design did not meet the ship impact specification. At FDOT's request, Parsons Brinckerhoff redesigned the trestle, which FDOT and FHWA then approved. The major changes involved the use of seven piles, rather than six, in each pier foundation and additional reinforcing steel. Ballenger, the construction contractor, had been given notice to proceed with construction by FDOT in February 1983 but was delayed until July 1983 when the design modifications were resolved. On December 29, 1983, Ballenger and FDOT agreed to increase the construction contract by about $15 million--$11 million for increased materials and construction costs and $4 million for delay charges. The delay charges represented full settlement of any and all claims such as labor escalation, equipment rental increases, interest expense, and remobilization damages.

FDOT officials acknowledged that they lack documentation showing the extent of the review of the original trestle design and whether specific calculations determine that the design did or did not meet ship impact specifications. FDOT and FHWA officials said that reviewing a design for ship impact implications involves a complex series of engineering assumptions and judgments. In June 1984, Florida's Deputy Secretary of Transportation said that there were still differing opinions among FDOT engineers about the adequacy of the original design, and the former chief of structures said that, in his opinion, the original trestle design was adequate. Also, an FHWA headquarters official said that he believed the original design met ship impact requirements, while a division official believed otherwise. FDOT and FHWA officials acknowledged that their review efforts were mostly focused on the high level approach and main span designs, not the trestle design.

Florida's Secretary of Transportation said that the minor construction changes expected from the revised design evolved to a $15-million increase which was much more than originally anticipated. FDOT and FHWA consider the redesign to be a conservative decision based on safety. The state of Florida will fund the additional costs. FDOT and FHWA officials are confident the new trestle design meets the ship impact specifications.

APPENDIX I

U.S. Department of Transportation

Assistant Secretary for Administration

400 Seventh St., S.W.
Washington, D.C. 20590

NOV 14 1984

Mr. J. Dexter Peach
Director, Resources, Community,
and Economic Development Division
U. S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Peach:

This is in response to your letter requesting Department of Transportation (DOT) comments on the General Accounting Office (GAO) draft report, "Florida's Sunshine Skyway Bridge--Design and Construction Concerns," RCED-84-193, dated September 28, 1984.

A summary of GAO findings follows:

The GAO found that Florida used several layers of controls and assurance checks on the quality of materials and the construction activities in constructing the main pier foundations according to specifications. Engineers from the Army Corps of Engineers, Bureau of Reclamation, and the National Bureau of Standards were asked by GAO to assess the quality of the concrete used on the project as well as the significance of the cracks in the main pier foundations. These engineers found the concrete to be a quality concrete and the cracks in the main pier foundations to be normal shrinkage cracks of no structural significance at this time. They also reported that the length of time that was used to cast the concrete for the main pier foundation support piles should be considered a problem for that foundation. The Federal Highway Administration and the State of Florida made the same judgments. The GAO also reported that the State of Florida paid the entire $15 million cost associated with the redesign of the low-level approach trestle section of the structure to withstand ship impact.

The Department of Transportation position with regard to this draft report is reflected below:

o A subsection under Chapter 1, Introduction, contains the statement "A relatively new design and construction

technique..." which should be put into perspective. The segmental concrete design and construction technique being used on the Skyway project was first used in this country in 1973. Since that time, 21 structures have been completed and 6 are currently under construction. In terms of the general concept of segmental concrete bridges in the United States (either precast or cast-in-place), a total of 38 have been built since 1973 with 15 now under construction. At the end of 1983, there were 124 structures either completed or being constructed, designed, or studied. Thus, the technique has had over 20 years of structural service.

[GAO COMMENT: We have revised page 2 of the report to reflect this comment.]

- Chapter 4, Technical Concerns, includes a discussion of cracks in the main piers. The State of Florida has stated that they do not plan to implement a solution to the cracks in the main pier foundations until after the superstructure is erected. The Federal Highway Administration supports this position and will review and analyze the State's proposed solution at that time.

If we can be of further assistance, please let us know.

Sincerely,

Robert L. Fairman

APPENDIX II

Florida Department of Transportation

BOB GRAHAM
GOVERNOR

Haydon Burns Building, 605 Suwannee Street, Tallahassee, Florida 32301-8064, Telephone (904) 488-8541

PAUL N. PAPPAS
SECRETARY

November 8, 1984

Mr. J. Dexter Peach, Director
United States General Accounting Office
Washington, D.C. 20548

Dear Director Peach:

The Florida Department of Transportation has reviewed the draft copy of the GAO Report Florida's "Sunshine Skyway Bridge - Design and Construction Concerns". Since a vast majority of the report tends to support the conclusion and actions of the FDOT, we have limited our comments to the following relatively few areas of your report:

Page 5, Paragraph 4

"The cronyism allegation is being reported in a separate letter."

We do not have any knowledge of a letter at this time. We feel we are not in a position to comment on this matter until we learn more about the specific allegations.

[GAO COMMENT: As noted in the report, we agreed with Congressman Young to report on the cronyism concern in a separate letter as opposed to a report. Consequently, comments were not sought on the letter.]

Page 10, Last Paragraph

The report stated that the subconsultants accounting system, a departmental system, could not accumulate cost by contract or by unit of work.

We are not certain what is meant by "the subconsultant system, a departmental system".

[GAO COMMENT: By a departmental system, FDOT's inspector general was referring to an accounting system that kept costs by functional departments, such as the drilling department and the barge department. However, this accounting system was unable to track costs by contract. The subconsultant in this case was the firm Williams and Associates, a subcontractor to the prime bridge designer.]

FDOT requires any consultant, performing work for the department to maintain certain standards of accounting systems. When a consultant is found to be using a nonconforming system, a certain amount of time is usually granted in order to bring the system into compliance. In the event this is not done, further action is taken, including the possible termination of the contract.

[GAO COMMENT: The above statements describe FDOT's procedures. In the case of the Skyway design subconsultants, however, deficiencies in the accounting systems were not discovered until after a sizable portion of the work was done. As noted in our report, one of the subconsultants--Schmertmann and Crapps--has since revised its accounting system; and at the time of our review, FDOT officials did not know whether the other subconsultant--Williams and Associates--had modified its accounting system, because this subconsultant had not done any work for FDOT since the Skyway design.]

Page 14, Paragraph 1 and Page 18, Paragraph 3

"Neither FDOT's nor FHWA's system readily showed how a deficiency noted during construction inspection was resolved."

Our Bureau of Materials and Research provides a final job certification, which clearly indicates the resolution of any construction deficiencies on a project.

[GAO COMMENT: The Bureau of Materials and Research final job certification for the main piers' foundation, the only contract completed at the time of our review, states that:

"This is to certify that: the results of the tests on acceptance samples indicate that the materials incorporated in the construction work and the construction operation controlled by sampling and testing were in reasonably close conformity with the approved plans and specifications, and such results compare favorably with the results of independent assurance sampling and testing. Exceptions to this certification are documented in the project records."

The final job certification does clearly document the resolution of deficiencies in materials used in the main piers' foundation. However, for construction activities, our review of the certification and the project records did not readily indicate the resolution of deficiencies.]

APPENDIX II

Page 24, Last Paragraph

> Our specifications for this project allowed the determination of set time by in situ sampling. This was subsequently found to be approximately 28 hours. Therefore, we do not consider any pours to have exceeded the specification requirements.

[GAO COMMENT: The contract specification required that the concrete pour for each pile be completed within 2 hours unless the contractor could demonstrate through a trial mix that the concrete took a longer period of time to harden. For the foundation contract, the contractor did not demonstrate that the concrete took more than 2 hours to harden. Therefore, at the time the concrete was poured, the appropriate specification was a 2-hour limitation. However, the Corps, Bureau, and NBS, which assisted us on this matter, all concluded that the concrete pours exceeding the 2-hour limit were not problems.]

The FDOT sincerely appreciates the objective analysis and additional expert input by GAO into these controversial matters. Please advise if you require further input by us.

Sincerely,

Thomas E. Drawdy
Deputy Assistant Secretary
Technical Policy and
Engineering Services

TED/sr

cc: Mr. Paul N. Pappas
Mr. Tom Lewis, Jr.

(342757)

3 0009

AN EQUAL OPPORTUNITY EMPLOYER

UNITED STATES
GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

POSTAGE AND FEES PAID
U. S. GENERAL ACCOUNTING OFFICE

THIRD CLASS

General Electric