REGULATORY DOCKET FILE COPY

W/ltr 10-14-75 to D F Knuth

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT - UNIT #1
FINAL REPORT
TOWER CRANE COUNTERWEIGHT DROP
TO
REACTOR AUXILIARY BUILDING ROOF DECK

RETURN TO REGULATORY CENTRAL FILES
ROOM 016

TABLE OF CONTENTS

I. SUMMARY

A. Synopsis of the Incident

On January 14, 1975 at approximately 2:00 P.M., a crane counterweight dropped an estimated 80 feet to the concrete roof deck of the reactor auxiliary building control room. The counterweight came to rest on the roof deck in an upright position causing considerable damage to the counterweight, cracking of the concrete roof deck, spalling of concrete in the immediate vicinity of the impact area, and spalling of concrete on the underside of the roof deck around embedments and along the concrete block wall separating the control room from the classroom.

There were no injuries to personnel.

B. Results of Analysis

Soniscope survey was utilized to determine the extent of damage to the roof slab. The soniscope survey was conducted by Erlin, Hime and Associates of Northbrook, Illinois for Pittsburgh Testing Laboratory of Pittsburgh, Penn., and revealed a damaged area of approximately 14' x 12' (See Attachment No. 1 - "Soniscope Studies of an Impacted Roof Slab, Reactor Auxiliary Building, St. Lucie Unit No. 1"). A further evaluation was made by Pittsburgh Testing Laboratory and forwarded along with a recommended repair procedure (See Attachment No. 2 - "Preliminary Report of Investigation of Floor Slab Integrity"). Concrete cores were taken of the slab in an effort to visually inspect the magnitude of interior damage in accordance with CP-81 (See Attachment No. 3 - Construction Procedure for "Repair of Reactor Auxiliary Building Roof Deck").

C. Synopsis of Corrective Action

The capability to meet the original design criteria of the reactor auxiliary building was re-established following a series of epoxy intrusion grouting operations. The grouting operations were conducted by the Ben Starling Corporation of Stone Mountain, Georgia in accordance with Ebasco Construction Procedure CP-81. Final evaluation of the roof repair epoxy intrusion grouting operation was made by Pittsburgh Testing Laboratory. (See Attachment No. 8 - "Final Report of Testing and Inspection of Floor Slab Integrity"). The evaluation stated that the repair operation had been successful in restoring the structural integrity of the slab.

II DESCRIPTION OF THE DEFICIENCY

A. Tower Crane Counterweight Drop

A Potain (or Manitowoc-Potain) static tower crane model 982 was being disassembled at approximately 2:00 P.M. on January 14, 1975, when a counterweight of approximately 5100 pounds free fell to the roof deck of the reactor auxiliary building. The crane had been erected in an area bounded by the turbine building to the west, the reactor auxiliary building to the south, the reactor containment building to the northeast, and the main steam trestle to the north. The crane had been erected for use during construction of these structures.

The elevation of the top of the mast was +304 feet above sea level, the boom (or jib) elevation was approximately +272 feet above sea level, and the elevation of the roof deck is +82 feet above sea level. The free distance between the boom and the roof deck was approximately 190 feet, with the counterweight secured to the underside of the boom. Observers of the counterweight lowering operation

reported that the counterweight had been lowered over halfway from the boom to the roof deck, while others reported that the counterweight had been lowered past the spring line of the reactor containment building, but not quite halfway between the spring line of the containment and the roof deck. Thus, the counterweight was approximately 80 feet above the roof deck when free fall began. (See Attachment No. 4 - Sketch FS 8770 246). The counterweight size was 6'6" high, 4'11" long, and 1'2" thick and weighed approximately 5100 pounds (See photographs Nos. 1 & 2 contained in the Interim Report dated January 31, 1975). The crane was equipped with an auxiliary winch for raising and lowering counterweights and was inspected prior to lowering of the counterweight. As part of the inspection the cable had been run completely off the drum and inspected for deterioration and the counterweight had been lifted and lowered back into position before releasing from the boom to assure proper operation of the brakes. All inspections were performed by experienced crane operators and the inspections revealed no malfunctions.

After inspection, the pins, which held the counterweight in position, were pulled and the counterweight lowering operation began. When the weight was approximately halfway down, the weight began to free fall. The operator reported that he was watching the weight from the cabin of the crane and that when free fall began, he applied the brakes to stop the weight from falling, but nothing happened. After the weight came to rest, the operator observed that the cable continued to run off the drum, and that after all the cable had run off, the drum continued to turn. The brake had little or no effect on stopping the rotation of the drum.

The auxiliary drum is manually placed into position by rotating a worm gear which meshes the gears on the drum with the drive pinion. A lock is provided to hold the drum and gears in position for the main drum (trolley travel), but the auxiliary drum on the Potain tower crane does not have a safety lock. A study of the gear box, drum, drum worm gear, and drive pinion was made. The failure of the auxiliary drum to control the lowering of the counterweight was attributed to drum disengagement from the drive pinion allowing the drum to "free wheel". The disengagement occurred due to the absence of a safety lock which would have prevented the drum worm gear from "backing out" of the mesh position.

B. Reactor Auxiliary Building

The reactor auxiliary building is a reinforced concrete structure with cast in-place concrete exterior walls. The interior floor construction is of beam and girder construction supported by reinforced concrete columns. All interior shielding walls are either solid concrete block of reinforced construction, or reinforced concrete.

The reactor auxiliary building is a seismic Class I structure and houses the waste treatment facilities, engineered safety features, switchgear, laboratories, offices, and control room. It further provides protection for the cable and piping penetration areas of the containment building. The building exterior walls, floors and interior partitions are designed to provide plant personnel with the necessary biological radiation shielding, and to protect the equipment inside from the effects of adverse environmental conditions including tornado and hurricane winds, temperatures, missiles and flooding.

The reactor auxiliary building is designed in accordance with the "ACI Standard Building Code Requirements for Reinforced Concrete", ACI 318-63 Part IVB, Ultimate Strength Design.

The reactor auxiliary building roof deck is a 24 inch thick reinforced concrete slab supported on all four extremities by 24 inch thick reinforced concrete walls, and an intermediate 4 foot thick girder supported at 27 foot intervals by 3 foot square reinforced concrete columns. At the point of impact, an 8 inch thick concrete block wall had been erected to separate the control room from the classroom.

C. Status of Construction

The project was 88% complete at the time of the incident. All major civil work relating to the reactor auxiliary building, reactor building and the turbine building was complete (these structures surround the tower crane). Below the roof deck of the reactor auxiliary building, the interior walls for the classroom, offices, etc., had been completed. In the control room adjacent to and north of the classroom, major equipment including the RTGB board, engineered safeguard logic cabinets, sequence of events cabinet, digital electro-hydraulic control cabinet, reactor protective systems cabinets and the radiation and weather monitoring panels had been installed, with work continuing on electrical connections. The north-south wall at column line RAJ separating the control and classrooms from the HVAC equipment room was complete.

D. Extent of Damage

An immediate investigation was conducted to determine the extent of damage. The counterweight damage amounted to spalled concrete over most of the lower one-third surface. The counterweight was expendable and was removed from the area with no repairs.

The upper surface of the reactor auxiliary building concrete roof sustained moderate surface cracking extending out approximately 2' to 4' from the impact area (see photographs No 3 & 4 contained in the Interim Report dated January 31, 1975, and Attachment No. 1). There was some slight spalling of concrete in the immediate area of impact and moderate cracking of concrete extending through the slab.

On the underside of the reactor auxiliary building roof deck, surface cracking of the concrete was evident (see Attachment No. 1).

The 8 inch concrete block wall separating the control room from the classroom suffered spalling along the top of the wall directly under the point of impact, and cracking extending radially downward under the area of impact (see photograph No. 5 contained in the Interim Report dated January 31, 1975). Sonic testing was utilized to determine the extent of damage to the roof slab. Evaluation of the sonic tests revealed an area within a fourteen foot by fourteen foot boundary which contained cracked or damaged concrete (see Attachments Nos. 1 & 2).

III. CORRECTIVE ACTION

A. Tower Crane Disassembly

The remaining counterweights were removed from the Potain tower crane with a Manitowoc 4100 crawler tower crane. The Potain tower crane boom was removed with a Manitowoc 4100 crawler tower crane

and a Manitowoc 4100 crawler crane.

B. Temporary Protection

Temporary protection for the roof deck was accomplished by sealing the impact area with a waterproofing plastic membrane.

During the week of April 21, 1975 a 16' x 16' wood frame waterproof enclosure was erected to ensure that the repair area would be protected from weather and water (see Attachment Photograph 9-1)

C. Roof Deck Repair

The epoxy intrusion grouting repair of the reactor auxiliary building roof at elevation +82.0 was performed by the Ben Starling Corp., of Stone Mountain , Georgia. The work was begun on June 6, 1975, and was carried out in accordance with the attached Ebasco Construction Procedure CP-81. Two 4" cores were taken from the repair area in an effort to establish initial slab conditions (see Attachment Photograph 9-2). The cores verified the soniscope readings since it was possible to take only fragmented samples, which revealed extensive cracking and damage in the unsound (impact) area.

On June 8, 1975, the epoxy intrusion pressure grouting operation began. The material was pressure injected with a hand pump through one-way alemite grease type fittings into ¼" holes drilled into the roof slab from the top and bottom of the slab to a depth of from 2" to 16" (see Attachment Photographs Nos. 9-3, 9-4, 9-5, 9-6, & 9-7).

The chemical epoxy grouts used during the injection operation were Sikadur Hi-Mod and Sikadur Hi-Mod L.V., both of which are 2 component moisture insensitive 100% solid epoxy-resins (see Attachments No. 6 - "Sikadur Hi-Mod LV" - and No. 7 - "Sikadur Hi-Mod").

A total of eighteen (18) gallons of material was pressure injected into the slab during the first injection operation. During the injection of the top side of the slab, material penetrated through to the bottom side of the slab in a semicircular area which had the center of impact as an origin and extended northerly with about nine (9) foot radius. Penetration of the material was evidenced by visual observation of seepage through cracks, vented fittings, anchor bolts, and around the edges of some embeds. The epoxy was also forced through eleven (11) vented fittings on the top side of the slab. This evidence indicated that penetration through the slab had been obtained. Test cubes of the epoxy material were taken and compressive strength tests were conducted by Pittsburgh Testing Laboratory at the St. Lucie site (see Attachment No. 5 - "Test Core/Test Cube Results").

On June 24, 1975, J. F. Artuso of Pittsburgh Testing Laboratory sonic tested the repair area. He concluded that there still existed areas that gave unsound readings (see Attachment No. 8 - "Final Report of Testing and Inspection of Floor Slab Integrity"). He recommended drilling four - four (4) inch diameter cores in and around the unsound area for the full depth of the slab to provide further information. (See Attachment No. 8 - Interior Attachment III). Based on sonic readings and core evaluations, Mr. Artuso recommended that further epoxy grouting be performed to fill cracks not grouted during the initial injection. Soniscope readings were taken again on July 22, 1975, to establish a new base line prior to further epoxy injection (see Attachment No. 8).

During the week of August 4. 1975, the roof slab was again pressure injected with epoxy by the Ben Starling Corporation. The injection process was coordinated with sonic testing in accordance with CP-81. A total of five gallons of additional material was pressure injected. An area approximately six (6) feet by four (4) feet around the impact point still failed to provide sound readings, even after extensive injection. It was hypothesized that unsound readings were the result of massive surface fragmentation caused by the direct impact of the counter-weight. To prove the hypothesis, test spots were prepared by removing the top two (2) to four (4) inches of concrete (see Attachment Photograph Nos. 9-8 & 9-9). Seven (7) test spots were prepared and tested inside the "unreadable" area with the result that sound readings were received at six of the seven locations. The poor reading at the seventh test spot was attributed to interference due to the close proximity to steel embeds. These results were acceptable to the testing consultant and Ebasco personnel.

The area was then prepared for the finish topping with the removal of all unacceptable materials and a general cleaning. The concrete that had been removed in the impact area, including the cores, was replaced with a topping consisting of 3½ parts sand (maximum mixed with 1 part Sikadur Hi-Mod. The topping was placed in three (3) inch lifts with a minimum of 1½ hour set time between lifts and was completed on August 21, 1975 (see Attachment Photographs 9-10 & 9-11).

Upon completion of the topping, sonic tests were conducted to

verify bond between the topping and the original concrete. Due to either damping or a diffraction of sound waves by the epoxy topping, readings were unobtainable. Therefore, two cores were taken to substantiate bond. The examination of the cores indicated sound bond with a high degree of epoxy penetration into the random cracking pattern beneath the epoxy topping (see Attachment Photographs 9-12 & 9-13). A core break was performed for one of the two final cores, verifying that the structural integrity of the slab had been restored (see Attachment No. 5).

D. Testing Methods

All repair operations were conducted in accordance with the requirements of ASTM C-109, ACI - 503, and ASTM D-695.

IV. ANALYSIS OF SAFETY IMPLICATIONS

A. The Potain (or Manitowoc-Potain) static tower crane model 982 was completely disassembled. A study of the gear box, drum worm gear, drive pinion, and drum was conducted. It was concluded that the failure of the auxiliary drum to adequately control the lowering of the counterweight was due to drum disengagement from the drive pinion, allowing the free rotation of the drum. The crane manufacturer was notified of the deficiency in an effort to prevent reoccurrence of this event at any other location.

B. Synopsis of Deficiencies

During the taking of cores for verification of soniscope readings taken June 23-24, 1975, a total of seven (7) reinforcing steel bars were wholly or partially severed. An engineering deviation report (No. 214) was initiated and transmitted to the Ebasco, New York Office for an engineering evaluation. (See Attachment #11).

A response was received in the form of a memorandum dated August 27, 1975, from M. Weber/J. Fotheringham to J. M. Fisher in which it is stated that the roof slab can withstand the design loading with stresses within the allowable limits, provided the soundness of the concrete slab is satisfactory. (See Attachment #12). A signed copy of the final engineering evaluation for deviation report No. 214 will be transmitted to Quality Assurance for incorporation into the permanent plant filing records.

C. Conclusion

The reactor auxiliary building roof repair began January 14, 1975, and ended September 5, 1975. Damage to the roof consisted of surface fragmentation and laminar cracking. Epoxy intrusion pressure injection grouting techniques were used to fill and bond all cracks except those directly under the impact point for a depth from 2"-4". For repair and filling of the surface area and core holes, an epoxy-aggregate mixture was used. Soniscope studies were conducted before, during, and after repair operations to evaluate the adequacy of the repair. Cores were secured to visually observe and, where possible, verify soniscope evaluations. Based on the extensive tests, examinations, evaluations, and visual observations, it is concluded that there was a high degree of epoxy penetration and consolidation, that all crack and joint bonds are sound, that the structural integrity of the concrete slab is equal to or greater than the time prior to the impact, and that the restoration of the reactor auxiliary building roof deck at elevation +82.0 has been successfully completed.

ATTACHMENT NO. 1

J. Wills

FORM 95-MA

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

MIAMI, FLORIDA 33142

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

MA 8209
Lab #7680
1-24-75

SONISCOPE STUDIES OF AN IMPACTED ROOF SLAB REACTOR AUXILLARY BUILDING, ST. LUCIE UNIT #1

CLIENT: Ebasco Services, Inc.
P.O. Box 1117
Jensen Beach, Fl 33457

PROJECT: Florida Power & Light Company, St. Lucie Unit #1

Gentlemen:

SUMMARY AND DISCUSSION:

Damage to the slab by the counterweight impact, based upon the soniscope survey, is within a 12'x14' area. The damage was manifested as cracking interpreted to be relatively severe within about a 6 foot zone around the impact area, and for a distance of about 10 feet to the north and north-eastern area of the impact.

Cracks were tight, randomly oriented on the top slab surface, and confined to the area within and immediately adjacent to the impact. Those cracks are directly due to the impact.

On the underside of the slab, cracks were tight and extensively developed. To the south of the impact area, the cracks were directional; to the north they were both directional and random. The directional cracks were most prominent. A few of the cracks were distinctly due to drying shrinkage around embedded electrical boxes. The directional cracks are interpreted to be the result of drying shrinkage, possibly enhanced by deflections caused by the impact. The random cracks are the result of the impact and are secondary to the directional cracks.

A core-filled masonry wall was located essentially directly below the point of main impact force. The top of the wall spalled due to the impact. The damage to the roof slab thus would appear to have been minimized because of the support provided by the wall.

Crack repair techniques utilizing pressure epoxy grouts have been successful for refurbishing cracked concrete. As a means of evaluating the efficacy of the repairs, which should provide continuity to the slab, a soniscope survey should be made after the repairs have been completed.

During repairs of the masonry wall, attention should be given to the detection of cracks, which can be observed as block surfaces are exposed.

FORM 95-MA

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

MIAMI, FLORIDA 33142

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

MA 8209
Lab #7680

INTRODUCTION:

Reported herein are the results of soniscope (pulse velocity) studies of concrete of the roof slab (elevation 82 feet) of the Auxillary Building of Unit 1, St. Lucie Plant, of the Florida Power & Light Company. The studies were prompted by the impact of a concrete crane counterweight which caused an overloading of a portion of the nominal 24-inch thick slab. In addition to the soniscope studies, a sketch of the cracks in the vicinity of the impact area was made. The studies were requested by John Fisher, of Ebasco Services as a means of evaluating the extent of damage to the roof.

The impact area was defined by markings imposed by the counterweight. The markings defined a rectangular area having long sides of 5 feet and short sides of 14 inches. The long axis of the rectangle was oriented northwest-southeast (See Figure 1). The southeast side was impacted initially as was demonstrated by a greater amount of damage within and immediately adjacent to that side. That area was essentially directly over an east-west core-filled masonry block wall that separated the operations room and a classroom. At the top of the wall were incipient spalls that formed due to loading imposed because of the impact and movement of the roof slab. Thus, the wall provided resistance to the deflection of the roof slab, minimizing that deflection and probably also the damage.

STUDY:

Method - The determination of pulse velocity of concrete is a non-destructive testing method that utilized the evaluation of rate of propogation of compressional waves in concrete. The velocity of those waves is calculated from data obtained using a double trace oscilliscope which tracks the travel time of waves generated by gentle impacts imposed by one transducer and received by a second tranducer. The transmission time divided by the path length provides the rate of propogation (velocity) of the transmitted wave, conventionally reported in terms of feet per second.

The soniscope procedure is given in ASTM Designation: C597, "Pulse Velocity Through Concrete".

Among the factors that affect the pulse velocity are:

a) Type of Aggregate
b) Density of paste
c) Moisture Content
d) Discontinuities such as large voids, honeycombing, cracks
e) Embedded metal

The factors of item (d) will cause a reduction of velocity and/or an attenuation of the transmitted signal; item (d) will cause an increase in the velocity. Items (a), (b) and (c) will typically be relatively constant for aged concrete of a given mix design. Deviations from that mix design, concrete deterioration, cold joints, etc. can cause detectable differences of pulse velocity.

For this particular study, cracks and reinforcing steel caused variations of pulse velocity in different areas of the slab. The cracks generally caused sufficient interference to the transmitted waves so that when cracks were present, the waves were damped completely. The steel interferred by (1) bridging cracks and thus permitting the waves to travel across some otherwise impassible gaps, and (2) by significantly increacing the pulse velocity when reinforcing steel paralleled the propogation direction.

The interference by the steel was operative only when the pulse was transmitted through the slab (laterally, or diagonally). There was no significant steel interference when the pulse was transmitted essentially vertically through the slab.

Procedure - A point within the actural impact location was established as the focus for the pulse velocity measurements. The point selected was near the southwestern end of the imprint of the counterweight. Transducer locations were marked off on the top and bottom sides of the slab along east-west, north-south, northeast-southwest, and northwest-southeast radii at 2 feet intervals. A sketch of the layout is shown in Figure 1.

The following pulse velocity measurements were made:

a) At two-feet spacings laterally along the top surface of the slab.
b) At four, six, and eight feet spacings laterally along the top surface of the slab.
c) Vertically through the slab at two-feet intervals.
d) Diagonally through the slab (these measurements provided non-useable data because of the interference caused by reinforcing steel.

Sketches of each type of measurement are shown in Figure 2.

Soniscope Data - The lateral measurements indicated there was continuity within the top surface region of the slab outside of an area about 3 feet to the north, northwest, west, southwest, and south of the impact impression, and about 5 feet to the northeast of the impact impression.

The diagonal measurements provided spurious data because of interference by the reinforcing steel.

FORM 95-MA

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

MIAMI, FLORIDA 33142

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

MA 8209
1-24-75

The vertical measurements indi ted that cracks interferred with the compressional pulse. The area of most extensive damage was for a distance of about 9 feet to the north and northeast of the impact area, and for a distance of about 3 to 4 feet east, west, and south of the impact area. A sketch of the area affected is shown in Figure 3.

Cracking - A survey of cracking perceivable on the top and bottom surfaces of the slab in the vicinity of the impact area was sketched by personnel of Ebasco Services, Inc., and is shown in Figures 4 and 5.

The cracking pattern on the topside of the slab (Figure 4) directly reflects the impact of the counter weight. The cracking pattern on the underside of the slab, to the south of the impact area, has a directional pattern influenced by the reinforcing steel and is interpreted to reflect an initial drying shrinkage, possibly enhanced by the impact load.

The crack pattern north of the impact area (Figure 5) is a mixture of directional cracking and random cracking. The origin of the directional cracks is interpreted to be similar to that of the cracks south of the impact area. Additionally, cracks disposed radially to circular embedded electrical boxes are the result of drying shrinkage. Other cracks are interpreted to be due to the impact.

All cracks were tight and offsets were very slight.

Miscellaneous - The soniscope survey was made on January 16 and January 18, 1975. Participating in the survey were Steve Anderson and Tom Rickards of Pittsburgh Testing Laboratory, Bob Potter and Abe Cochran of Ebasco Services, Ind., and Bernard Erlin, Soniscope and Petrographer Consultant. The soniscope used for the studies was a James Model V Scope.

The sketches of the cracks on the top and bottom of the roof slab were made by Ed Williford of Ebasco Services, Inc.

Soniscope Consultant
Bernard Erlin

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

John W. Harllee

John W. Harllee,
Vice President

mc/cc

FORM 95-MA

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

MIAMI, FLORIDA 33142

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

MA 8209
1-24-75

The vertical measurements indi ted that cracks interferred with the compressional pulse. The area of most extensive damage was for a distance of about 9 feet to the north and northeast of the impact area, and for a distance of about 3 to 4 feet east, west, and south of the impact area. A sketch of the area affected is shown in Figure 3.

Cracking - A survey of cracking perceivable on the top and bottom surfaces of the slab in the vicinity of the impact area was sketched by personnel of Ebasco Services, Inc., and is shown in Figures 4 and 5.

The cracking pattern on the topside of the slab (Figure 4) directly reflects the impact of the counter weight. The cracking pattern on the underside of the slab, to the south of the impact area, has a directional pattern influenced by the reinforcing steel and is interpreted to reflect an initial drying shrinkage, possibly enhanced by the impact load.

The crack pattern north of the impact area (Figure 5) is a mixture of directional cracking and random cracking. The origin of the directional cracks is interpreted to be similar to that of the cracks south of the impact area. Additionally, cracks disposed radially to circular embedded electrical boxes are the result of drying shrinkage. Other cracks are interpreted to be due to the impact.

All cracks were tight and offsets were very slight.

Miscellaneous - The soniscope survey was made on January 16 and January 18, 1975. Participating in the survey were Steve Anderson and Tom Rickards of Pittsburgh Testing Laboratory, Bob Potter and Abe Cochran of Ebasco Services, Ind., and Bernard Erlin, Soniscope and Petrographer Consultant. The soniscope used for the studies was a James Model V Scope.

The sketches of the cracks on the top and bottom of the roof slab were made by Ed Williford of Ebasco Services, Inc.

Soniscope Consultant
Bernard Erlin

Respectfully submitted,

PITTSBURGH TESTING LABORATORY

John W. Harllee

John W. Harllee,
Vice President

mc/cc

MA 8209
Lab #7680
1-24-75

FIGURE 1 - Sketch of the grid used for the soniscope survey. The distance between points is 2 feet.

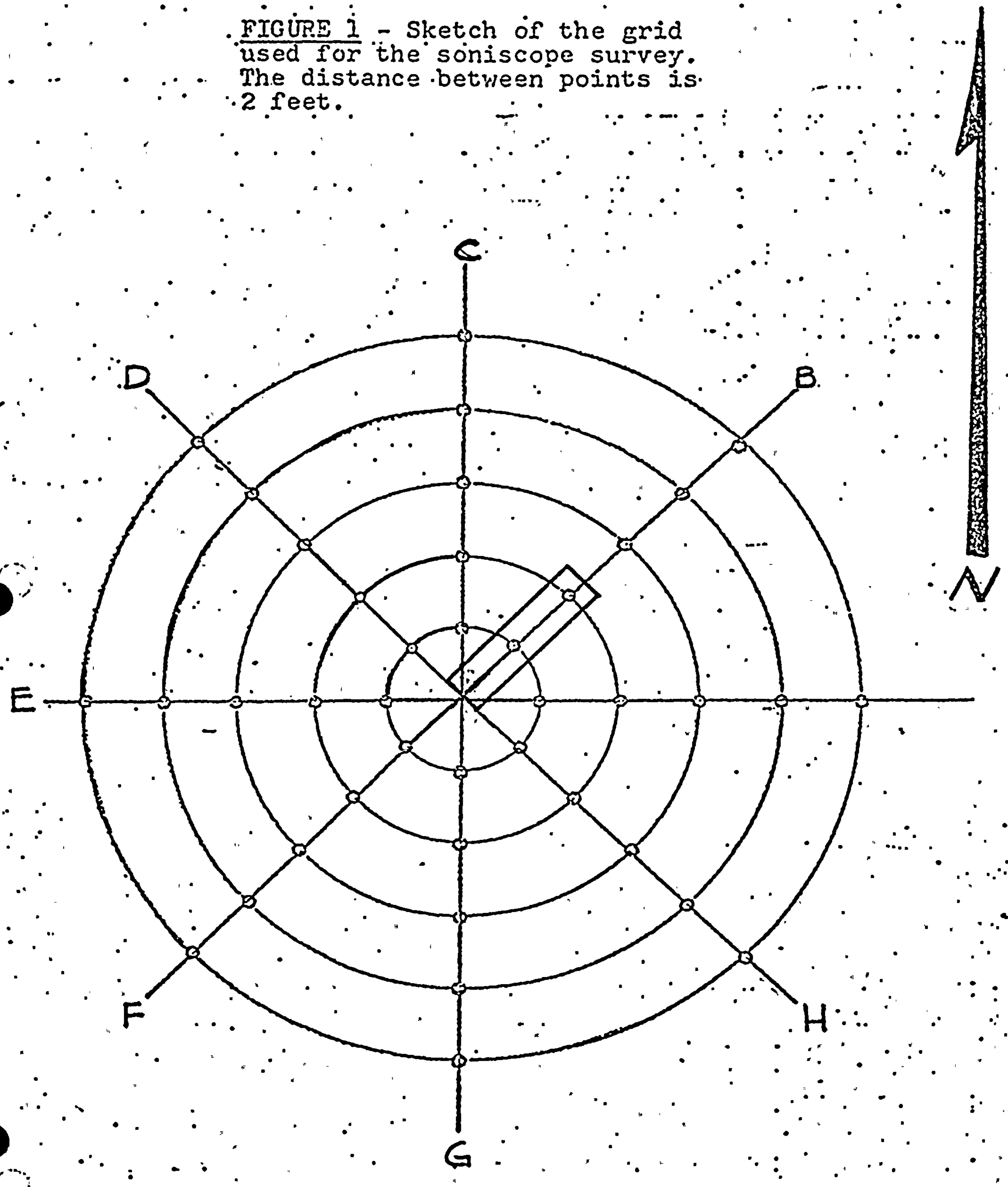
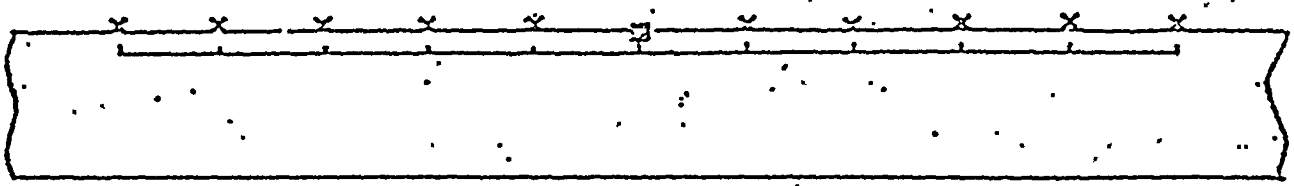
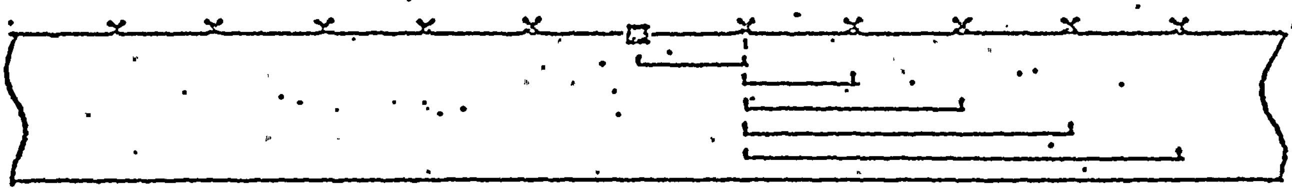


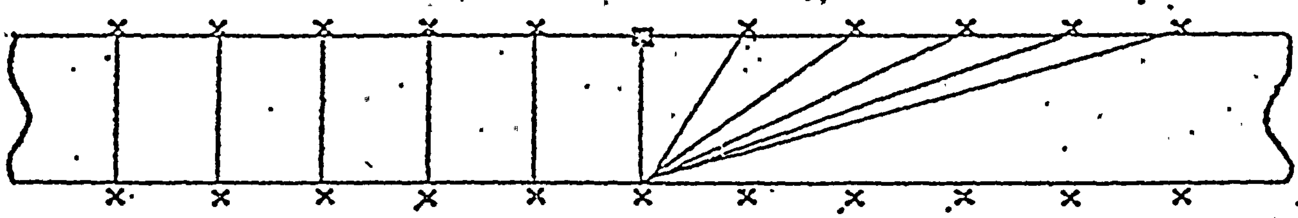
FIGURE 2 - Pulse velocity data was obtained using the path lengths shown.



Lateral top surface measurements at 2-foot intervals



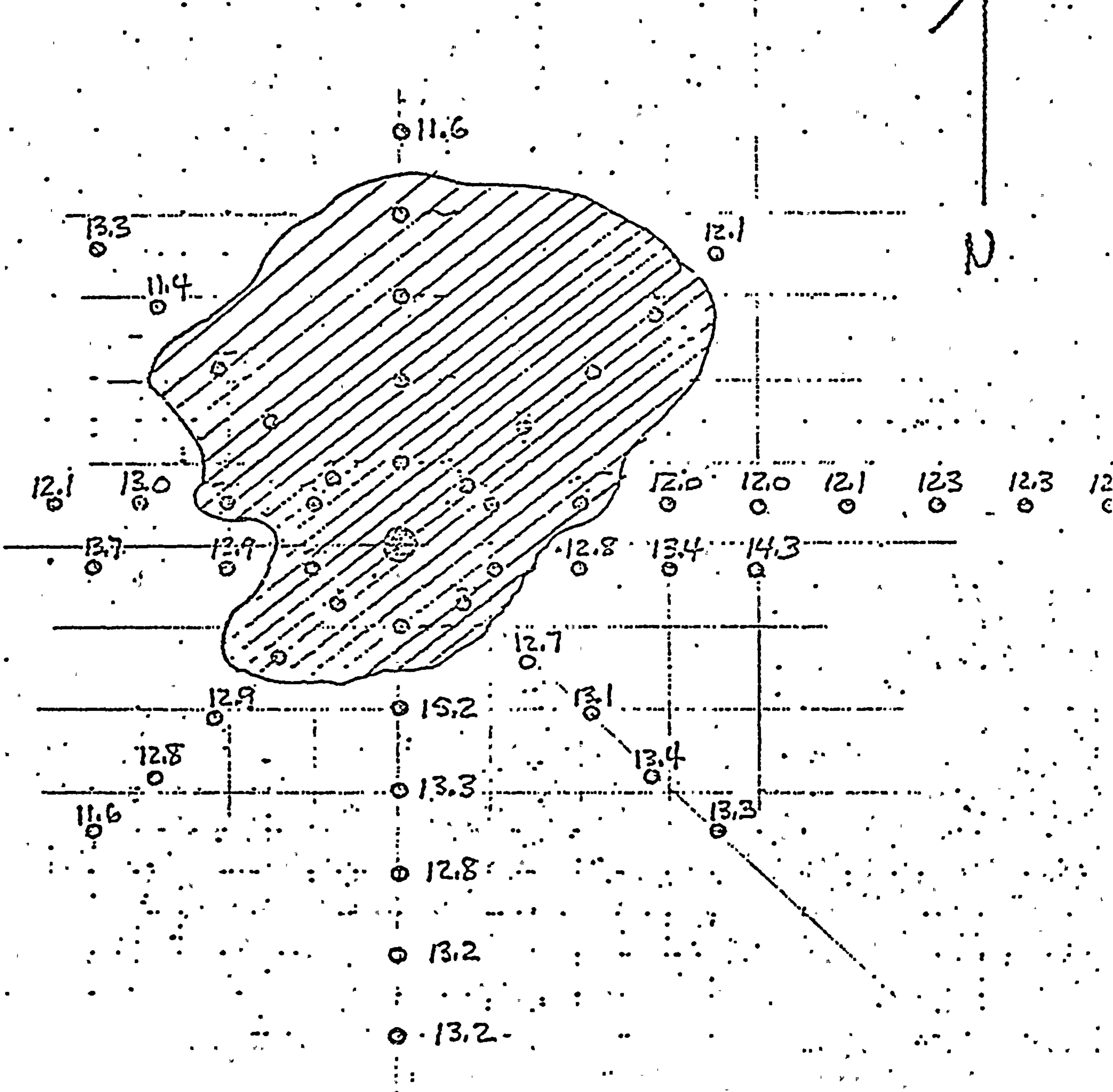
Lateral top surface measurements at 2, 4, 6, etc.-foot intervals



Vertical measurements through the slab at 2-foot intervals

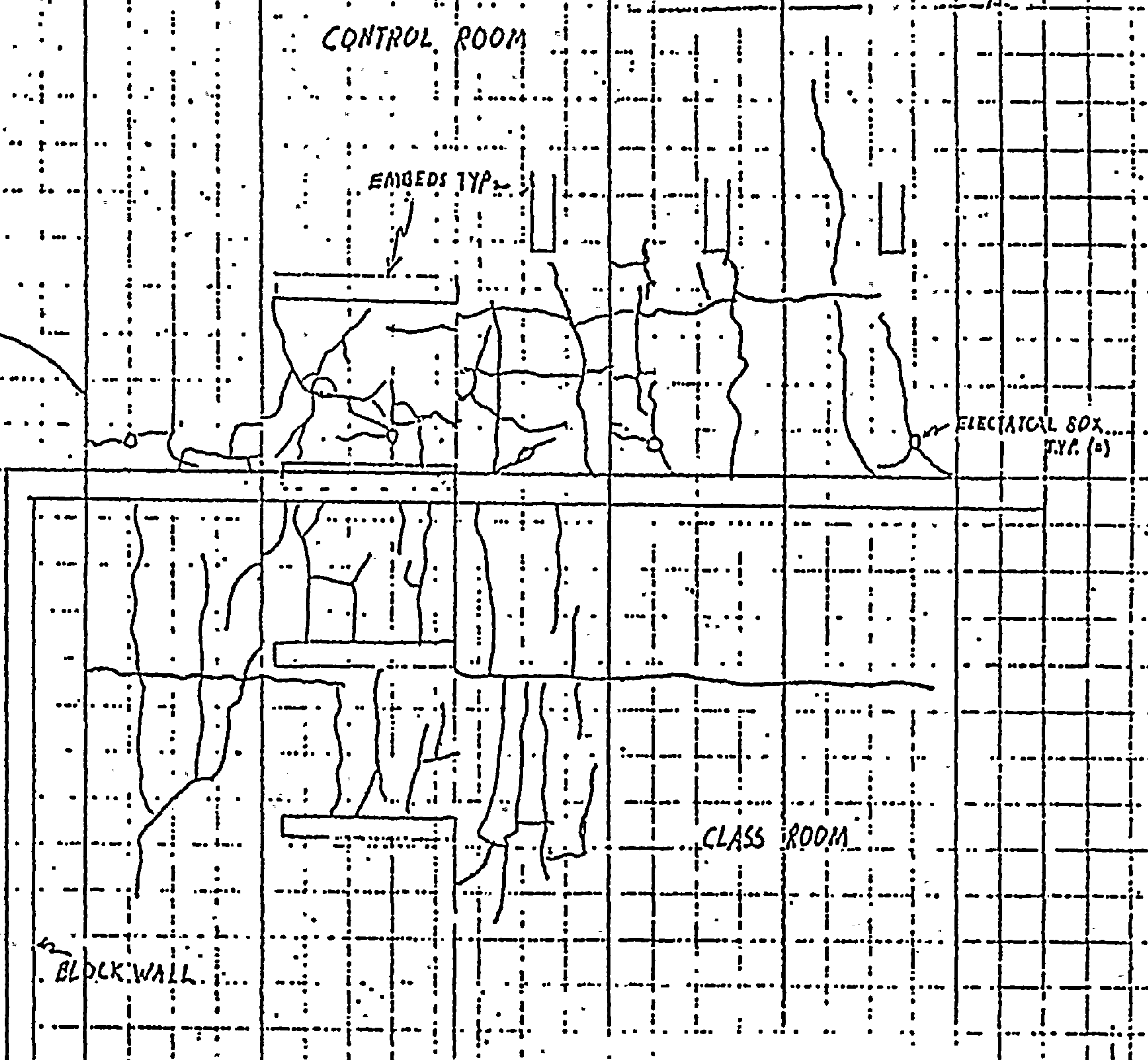
Diagonal measurements through the slab at increments of 2-feet

FIGURE 3.- The results of the soniscope survey are shown. Within the lined area, transmittance was nil. The numbers are the pulse velocity (feet per second X10^{2}), vertically through the slab, at the indicated locations. The distance between points along each line of traverse is 2 feet.



MA 8209
Lab #7680
1-24-75

FIGURE 5 - Sketch of cracks on the bottom slab surface in the vicinity of the impact



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT
1974 - 890,000 KW INSTALLATION UNIT
CRACK SKETCH - UNDERSIDE OF RAB EL 82' ROOF SLAB

EBASCO SERVICES INCORPORATED

SCALE 1/4" = 1'	APPROVED	DATE ... 75
DR E.V.		

MA 8209
Lab #7680
1-24-75

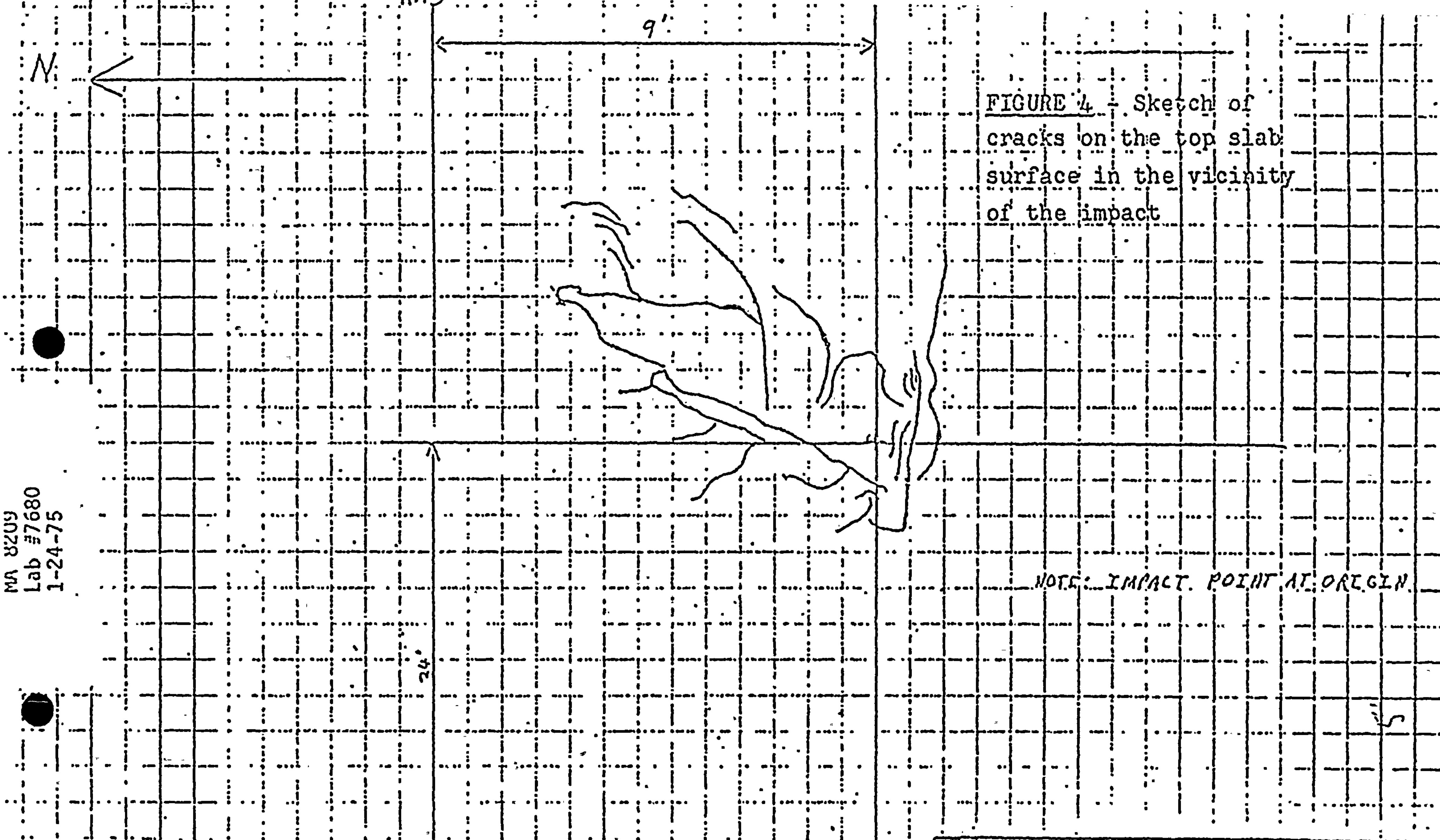


FIGURE 4 - Sketch of cracks on the top slab surface in the vicinity of the impact

FLORIDA POWER & LIGHT COMPANY ST. LUCIE PLANT 1974 - 890,000 KW INSTALLATION UNIT		
CRACK SKETCH - TOP OF RAB EL. 92' ROOF SLAB		
EBASCO SERVICES INCORPORATED		
SCALE 1/4" = 5"	APPROVED	DATE 1/17/75
DR EW		770-404
CK		

ATTACHMENT No. 2

FORM 407 REV.-PC

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881
850 POPLAR STREET, PITTSBURGH, PA. 15220

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

AREA CODE 412 TELEPHONE 922-4000

PLEASE REPLY TO:
P. O. BOX 1645
PITTSBURGH, PA. 15230

LABORATORY No. 752369

ORDER No. MA-8209

CLIENT'S No.

REPORT

February 7, 1975

PRELIMINARY REPORT OF INVESTIGATION

OF

FLOOR SLAB INTEGRITY

FOR

EBASCO SERVICES, INC.
P.O. Box 1117
JENSEN BEACH, FLORIDA 33457

ATTN: Mr. John Fisher

PROJECT : Florida Power & Light Company St. Lucie Unit #1

INVESTIGATION REQUESTED : Investigate Structural Integrity of Reactor Auxiliary Building Roof Slab

Determine extent of damage caused by the impact load and recommend a repair procedure that would restore original structural integrity.

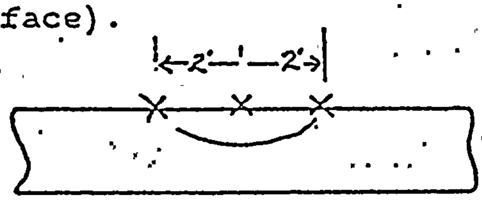
AREA AFFECTED : Roof Slab of Reactor Auxiliary Building defined by Ebasco. The point of impact was 9 feet from line RA3 and 24 feet from line RAL at elevation 82.

CIRCUMSTANCES OF : Counterweight of Tower Crane dropped on the area defined above and left an imprint of 14" x 5". This area and some surrounding area was waterproofed by an application of bituminous coating. Cracking resulted in the top and bottom surfaces of the slab. Complete differentiation between prior shrinkage cracks and impact cracks could not be made.

PRELIMINARY TESTING : Pittsburgh Testing Laboratory employed Erlin, Hime and Associates of Northbrook, Illinois to use a sonic technique to determine internal condition of the affected roof slab. The method is described in the James Electronics brochure and utilizes the method in ASTM C-597 to determine integrity by determination of pulse velocities. This initial testing using a James Model V Scope was performed on January 16 & 18, 1975 by Bernard Erlin of Erlin, Hime Assoc. assisted by Tom Richards of Pittsburgh Testing Laboratory, Bob Potter and Abe Cochran of Ebasco Services. A masonry concrete block wall was located beneath the impact area and served as a restraint to the impact and as an absorption media for the impact load. This support was transmitted through a mortar joint at the top of the wall at the junction of wall and slab.

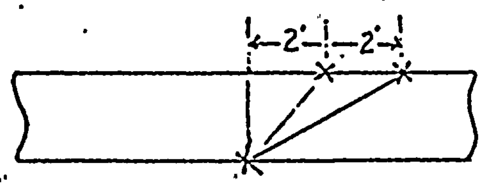
Method 1

Pulse velocity measurements were made horizontally at 2 ft. centers in the area; (both transducers on top surface).



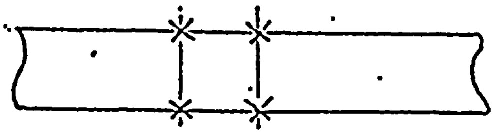
Method 2

Diagonally measurements (transducers on opposite sides of the floor slab in an offset plane).



PRELIMINARY TESTING cont. : Method 3

Vertically through the slab (transducers on opposite side in direct vertical plane positions.



Method 1 provides only surface condition by measurements of shear wave propagation. (This affected area was within confines of the area determined by Method 3).

Method 2 proved ineffective because of shrinkage crack interference.

Method 3 proved most reliable because acceptable pulse velocities could be established on sound concrete near the affected areas. Therefore, the affected area could be defined. The affected area is thus the area where proper pulse velocities could not be determined because of distressed concrete interference. This area is shown as a cross-sectional area on the attached sketch.

Values of 12.0 (thousand feet per second) or higher is generally considered sound concrete. (More definite strength determinations are made by correlation of velocity to known strengths). For the purpose of this study definite strength determinations are not necessary because of the correlation criteria used in this evaluation.

EVALUATION : The test results appear consistant with the most severely cracked areas of the slab. Compression of the concrete on the top surface is revealed by an imprint of the counter weight face and slight surface spalling.

Slight cracking of the top surface was apparently caused by tension of the surface as it rebounded.

EVALUATION cont. : Possibly some cracking and the slight spalling may have been caused by localized compression failure. Greater cracking occured on the bottom side which was subjected to greater tensile stresses. All of the cracks are relatively narrow. Deflection was minimal because of the restraint by the masonry wall. Damage was minimized by the restraint and stress absorption of the concrete masonry wall. The impact stresses distributed throughout the wall in the impact area and caused only slight spalling at the top of the wall. There was no evidence of distress to other parts of the building.

The narrow crack widths and absence of significant spalling also justifies the assumption of limited damage to the slab.

The structural performance of the entire slab should not differ significantly after the repair as compared to the slab prior to the damage due to the localized condition relative to the entire monolithic slab.

RECOMMENDATIONS: The recommended repair is to reinforce the slab in the affected area by re-establishing the original integrity by epoxy intrusion grouting. This technique of intrusion of high penetration epoxy grout has been successfully utilized and is an established method (Reference ACI-503 "Guide for use of Epoxy Compounds with Concrete").

The repair procedure should include the following conditions:

1. Conformance to ACI-503 as applicable to the section to be grouted.

2. Remove the top 1½" concrete of the affected top surface, and any concrete penetrated by the bituminous coating. The area should be approximately 14 foot square as located on the attached pulse velocity sketch.

RECOMMENDATIONS: cont.

3. Determine comparative pulse velocities on the affected area after removal of the top surface and before intrusion of the epoxy.

An area of about 4 ft.x 4ft. located in an unaffected part of the slab (across the monolithic beam) should be prepared similarly to Step 2. This area will be used for comparative purposes.

4. Proceed with the epoxy intrusion in accordance with a procedure established by an experienced epoxy grout specialist. Test specimens should be taken from the epoxy after mixing during grouting to establish hardened properties.

5. After consolidation by the epoxy grout, determine pulse velocities in the affected and surrounding area, and the calibration area. These will be used to evaluate structural integrity restoration.

6. Additional proof tests should consist of securing and evaluating cores from the slab before and after grouting. An evaluation of the core would indicate condition of the existing concrete, epoxy penetration and physical strengths. The cores should be nominal 2" diameter and drilled vertically about 12 to 15" depths from the top surface. Two cores should be taken from the affected area (one at the impact imprint area and the other approximately 3 feet radial point from the first one). Duplicate cores near these locations should be taken after the intrusion (within 6" of the first 2 comparative cores).

Respectfully Submitted,

PITTSBURGH TESTING LABORATORY

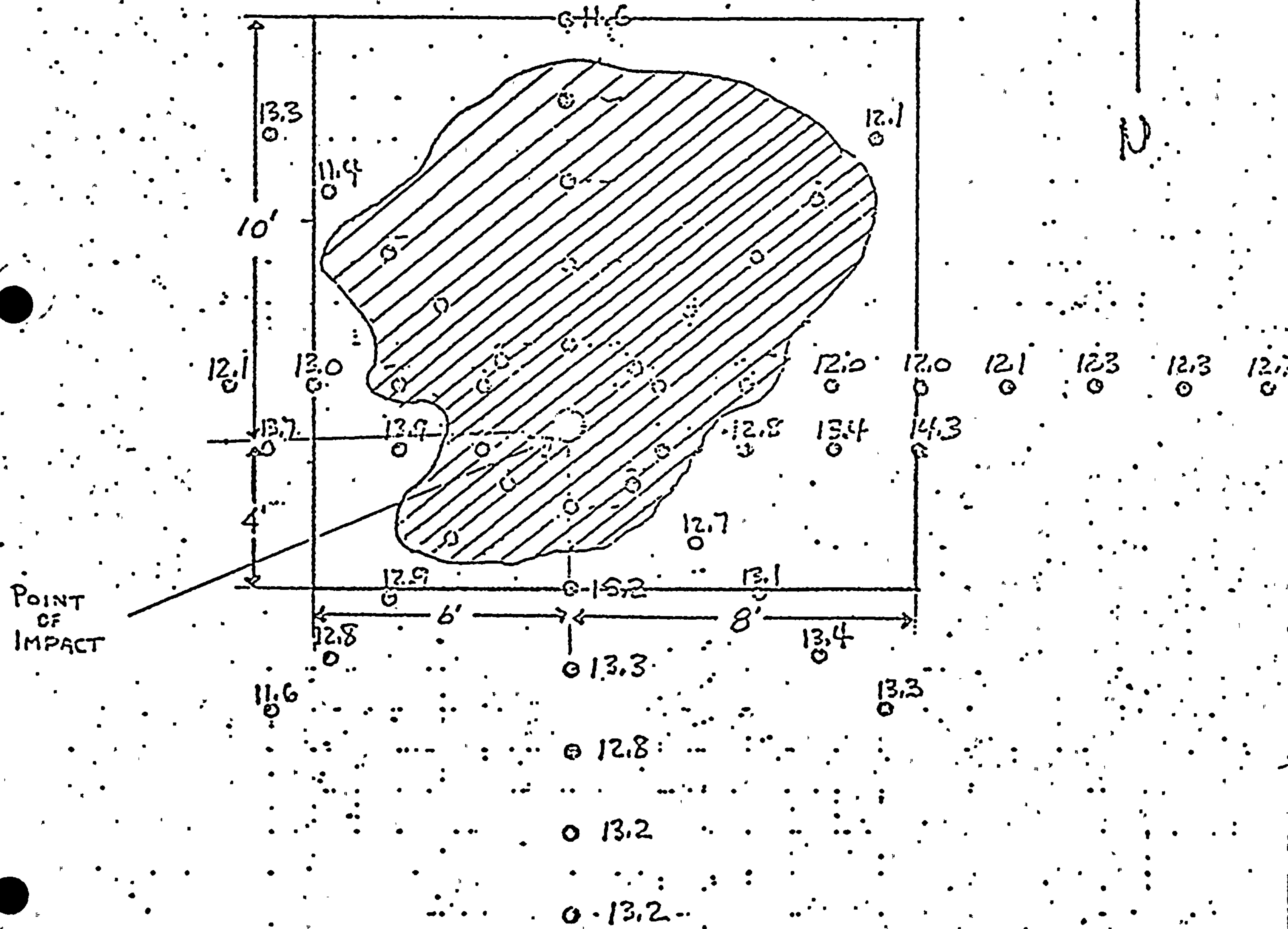
J. F. Artuso

J.F. Artuso, Vice President

JFA/dz Telecopied to John Mills 2-11-75 9:15 a.m.

METHOD 3 - PLUSE VELOCITY RESULTS

The cross-sectioned area is the affected area.



ATTACHMENT NO. 3

EBASCO SERVICES INCORPORATED

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT
890 MWe INSTALLATION

LETTER OF TRANSMITTAL

DATE: August 11, 1975

TO: Distribution

Gentlemen:

We are transmitting attached X under separate cover via ________ the following items:

	Welding Procedure		Flushing Procedures
	Quality Control Site Procedures		Pre-Operational Test Procedures
X	Construction Procedures		
	Quality Compliance Procedures		

This copy is ____ Draft X Final

Copies	Title and/or Doc. #	Date	Rev.	Description
1	CP-81	8-6-75	2	REPAIR OF REACTOR AUXILIARY BUILDING ROOF DECK

EBASCO CONTROLLED DOCUMENTS REFERENCE ONLY

Comments Required By: ____________

Remarks: Revisions as approved on forms QCSP 5.1.3 dated 7/30/75 and 8/8/75 are included.

Signed [signature] 8/11/75
J. M. Fisher, Project Superintendent

These are transmitted as checked below:

CC:	Comment	Info	Perm File
C. B. Amos			X
W. H. Rogers, Jr.			X
R. A. DeLorenzo			X
O. R. Gray			X
A. Bailey			X
H. D. Mantz, Jr.			X
K. N. Harris			X
R. G. Cockrell			X
C. Crowell			X
D. J. Stephens			X
H. S. Floyd/J. Biswurm			X
L. Borchardt			X
A. M. Cutrona			X
Document Control File (Original)			X

Form QCSP 5-1-2

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT - UNIT #1
1974 - 890 MWe INSTALLATION
REVIEW AND APPROVAL RECORD
FOR

CONSTRUCTION PROCEDURE

REPAIR OF REACTOR AUXILIARY BUILDING ROOF DECK

Document No. CP-81

Number of Sheets 4

Revision Number 0

Prepared by Thomas E. Cottrell Civil Engr. 2-24-75
Signature and Title — Date

Reviewed by James R Behres Sr. QC Supvr. 2-25-75
Signature and Title — Date

Approved by [signature] CONSTR SUPT 4-11-75
Signature and Title — Date

Approved by D L Bozalis for O.R. Gray 4-11-75
Project Construction Supervisor (FP&L Co.) — Date

- EBASCO -
CONTROLLED
DOCUMENTS

REFERENCE ONLY

Rev. No.	Description of Revision	Rev. By	App'd By	App'd By FP&L
Rev. 2	General Revision	SL Baird [signature]	[signature]	[signature] 8-11
1	Revise 6.3, Add 6.4.1 thru 6.4.7	[signature]	[signature]	[signature]

CP-81
Rev. 0 Draft 3-4-75
Rev. 0 4-10-75
Rev. 1 6-23-75
Rev. 2 8-6-75

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT - UNIT #1
1975 - 890 MWe INSTALLATION
REPAIR OF REACTOR AUXILIARY BUILDING ROOF DECK

1.0 SCOPE

This procedure describes the steps to be taken to repair the reactor auxiliary building roof elevation 82.0, and to insure the protection of equipment in the control room and the repair area from adverse environmental effects.

2.0 REFERENCES

2.1 ACI-503 Guide for Use of Epoxy Compounds with Concrete.

2.2 QCSP-4 Supply, Delivery and Placement of Concrete.

2.3 Drawing FS 8770-436, Rev. 1 dated February 27, 1975.

- EBASCO -
CONTROLLED
DOCUMENTS
REFERENCE ONLY
DOCUMENT NUMBER

3.0 ATTACHMENTS

None

4.0 PREREQUISITES

4.1 Fabricate a wood frame or metal frame enclosure, approximately 16' x 16', with translucent sides. The exterior walls shall be solid 2' up from the concrete deck with reinforced polyethylene covering the remainder of the wall to the roof. The enclosure shall be made weatherproof, and a waterproof closure shall be installed around the base to prevent deck water from seeping into the repair area.

4.2 Reinforced polyethylene shall be placed over all equipment at elevation 62.0 which will be exposed to any foreign material in the approximate area of the repair. Coverages shall include the control room, classroom, and hall areas, and shall be placed such that observation of the ceiling can be made during repair operations.

4.3 The pressure chemical grouting procedure and materials shall meet with the engineer's approval.

5.0 RESPONSIBILITY

5.1 It shall be the responsibility of the Construction Supervisor to implement the procedure during all working operations with the exception of the chemical grouting.

5.2 It shall be the responsibility of Quality Control to monitor the work being performed to assure conformance to the procedure.

5.3 Pittsburgh Testing Laboratory shall be responsible for evaluation of both the sonic tests and the compressive strength tests performed on the core samples.

5.4 The chemical grouting consultant shall be responsible for the installation of the materails selected for the chemical grouting operation.

6.0 PROCEDURE

6.1 Using a diamond bump grinder, remove the concrete in the repair area as located on Dwg. FS 8770-436, Rev. 1 dated February 27, 1975 to a depth of one (1) inch plus or minus one-half (± 1/2) inch. Care shall be taken not to penetrate any rebar, however, surface scratching of rebar shall not constitute penetration. All blemishes and/or penetrations shall be brought to the attention of the Senior Resident Engineer for disposition.

6.2 Pittsburgh Testing Laboratory/Erlin-Hime Associates shall sonic test the area to establish base line readings. Sonic testing shall be recorded on a field sketch showing locations and readings.

6.3 Within the repair area, and using a reinforcing steel locator (e.g. James C-4952 R- meter), locate all reinforcing steel located in the repair area (top mat only). Locate and core drill four (4) inch diameter vertical samples (minimum one at the impact area and another three (3) feet away from the first one) to a depth of 12 to 15 inches. The cores shall be delivered to Pittsburgh Testing Laboratory for evaluation. R1

6.4 After the evaluation of all tests has been completed, and after review of the chemical grouting consultants procedure and materials, the repair area shall be chemically grouted in accordance with the chemical grouting procedure. The chemical grouting procedure shall consist of the following basics:

6.4.1 All cracks shall be cleaned from the top of the roof slab by using a high pressure, air jet. All debris shall be vaccum removed.

6.4.2 One quarter (¼) inch holes, approximately six (6) inches on center, two (2) to twelve (12) inches deep, shall be drilled in the cracks (other than shrinkage cracks) from the top and bottom of the roof slab. The cracks shall again be flushed with a high pressure air jet, cleaning and opening the cracks to the fullest. All debris shall be vacuum removed.

6.4.3 The surface of all visible cracks shall be sealed with an epoxy gel. One way alemite or zerk type grease fittings shall be set in holes and sealed securely with am epoxy gel.

6.4.4 Using a high pressure pump, injection shall start at the first fitting at the beginning of a crack. The epoxy intrusion grout (Sikadur Hi-Mod L.V. and/or Sikadur Hi-Mod) shall be forced through the one way fitting and into the crack. The remaining one way fittings shall be vented by placing a wire in the valve to keep them opened. This will allow air and water to escape and will act as relief valves. The pressure injection shall proceed from fitting to fitting. R1

6.4.5 The intention shall be to inject the grout through the slab by pressure injection of each fitting.

6.4.6 After injection of the top of the slab has been completed, paragraphs 6.4.1 thru 6.4.4 shall be repeated for the bottom of the roof slab.

6.4.7 After injection is completed, all epoxy sealing gel and all fittings shall be removed. Removal of sealing gel may be accomplished by scarifying.

6.5 After the repair area chemical grouting operation has been completed and accepted by Ebasco and by the chemical grouting consultant, Pittsburgh Testing Laboratory/Erlin-Hime Associates shall sonic test the repair area. The results shall be compared to the base line readings established in paragraph 6.2.

6.6 Repeat paragraph 6.3 except that the vertical samples shall be taken within 6" of the first two comparative cores.

6.7 Away from the repair area, but on the elevation +82.0 roof, repeat paragraph 6.3 at a location designated by the Senior Resident Engineer.

6.8 If sonic testing indicates, after initial epoxy intrusion grouting, that there still exists an area(s) that is unacceptable, further epoxy intrusion grouting shall be performed in accordance with paragraph 6.9 until the area is acceptable. Upon complete acceptance of the area by sonic testing, proceed to paragraph 6.10. R2

6.9 The additional epoxy intrusion grouting shall consist of the following basics:

6.9.1 One quarter (¼) inch holes, two (2) to sixteen (16) inches deep, shall be drilled where necessary to penetrate the cracks in the roof slab (from top and bottom). The holes shall be flushed with a high pressure air jet to clean and open the cracks.

6.9.2 One way alemite or zerk type grease fittings shall be set in the holes and sealed securely with epoxy gel.

6.9.3 Using a high pressure pump, the epoxy intrusion grout (Sikadur Hi-Mod L. V. and/or Sikadur Hi-Mod) shall be forced through the one way fitting and into the slab. The remaining one way fittings shall be vented by placing a wire in the valve to keep them opened. R2

6.9.4 The intention shall be to inject the grout through the slab by pressure injection of each fitting.

6.9.5 After the injection is completed, all epoxy sealing gel and all fittings shall be removed. Removal of sealing gel may be accomplished by scarifying.

6.9.6 After the unacceptable area has been injected, it shall again be sonic tested by Pittsburgh Testing Laboratory. If unacceptable areas still exist, institute further repairs in accordance with paragraphs 6.8 and/or 6.9.7 as required until acceptable readings are obtained for the entire repair area. Proceed to paragraph 6.10 upon complete acceptance.

6.9.7 If the fractured area in the area of the impact is not consolidated by epoxy grouting, the fractured area shall be removed by chipping to sound concrete. Care shall be taken not to penetrate any rebar, however, surface scratching of rebar shall not constitute penetration. Sonic tests shall be performed by Pittsburgh Testing Laboratory on the unremoved concrete to verify concrete soundness. Repeat paragraph 6.8.

6.10 After all tests have been made, and after evaluation of all tests has been completed, Pittsburgh Testing Laboratory shall submit a complete analysis stating whether the repair has or has not been successful and whether or not the repaired area now meets original design requirements.

6.11 After final acceptance, remove all unapproved material from the repair area. The concrete removed by the diamond bump grinder, chipping or coring shall be replaced to the original roof elevation with either concrete bonded to the repair surface with a bonding compound in accordance with QCSP-4 or a Sika-sand mixture composed of 3½ parts sand (maximum) to 1 part Sika epoxy. R2

6.12 After final acceptance, remove the temporary enclosure from the roof slab and the polyethylene coverings from the elevation 62.0 areas.

7.0 INSPECTION

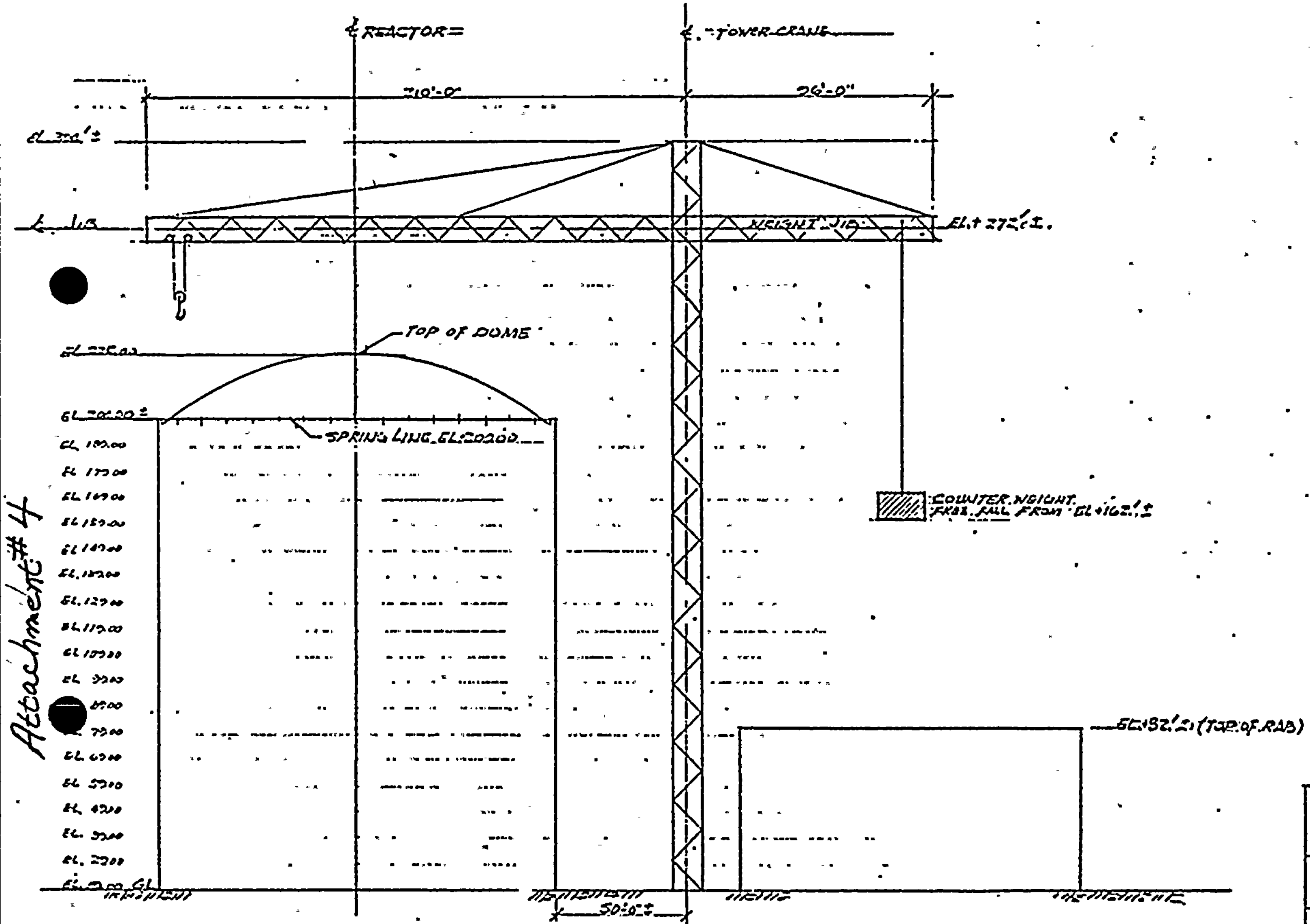
7.1 Quality Control shall inspect the following items:

7.1.1 Repair and core sampling areas.

7.1.2 Coring of all samples. Core Drill Release shall be on file.

7.1.3 Concrete placement per QCSP-4.

Attachment # 4



FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT
1974 - 890,000 KW INSTALLATION UNIT 1

"SKETCH" OF ITEMS AND BUILDINGS INVOLVED IN COUNTER WEIGHT DROP.

EBASCO SERVICES INCORPORATED

SCALE N.T.S.	APPROVED	DATE 2-3-75
DR [illegible]	[signature]	FS-8770-
CK [signature]		246

ATTACHMENT #5

TEST CORE / TEST CUBE RESULTS

TEST STANDARDS: ASTM C-109, ASTM D-695

TESTS PERFORMED BY: PITTSBURGH TESTING LABORATORY (ST. LUCIE SITE)

PERIOD: June 12 – September 5, 1975.

LAB No.	DATE CAST	DESCRIPTION	DATE TEST	AGE (DAYS)	COMPRESSIVE STRENGTH (PSI)	AVG. COMP STRENGTH (PSI)
S-125-1	6-12	Sikadur Hi-Mod LV (cast	6-13	1	6470	X
-2		in lab)	6-15	3	6810	X
-3			6-19	7	7320	X
-4			7-10	28	6640	
-5			7-10	28	8670	7690
-6			7-10	28	7750	
S-126-1	6-12	Sikadur Hi-Mod LV (cast	6-13	1	6110	X
-2		at location)	6-15	3	7660	X
-3			7-10	28	8030	6265
-4			7-10	28	4500	
S-129-1	6-12	Sikadur Hi-Mod (cast at	7-10	28	10,080	10,040
-2	6-12	location)	7-10	28	10,000	
S-128-1	6-13	Sikadur Hi-Mod (cast at	6-14	1	8280	X
-2		location)	6-17	3	7670	X
-3			6-20	7	8560	X
-4			7-11	28	7780	
-5			7-11	28	6420	7500
-6			7-11	28	8310	

S-[illegible]-1	8-5	Sikadur Hi-Mod LV (cast	8-6	1	8,750	x
-2	↓	at location)	9-2	28	12,150	8890
-3		↓	9-2	28	5,630	
S-135-1	8-7	Sikadur Hi-Mod LV (cast	8-9	1.5	8,400	x
-2	↓	at location)	9-4	28	11,700	11,280
-3		↓	9-4	28	10,850	
S-136-1	8-20	Sikadur Hi-Mod : Sand	8-21	1	7550	x
-2		(1:2 - by Volume)	8-27	7	8450	x
-3		↓	9-17	28	8850	x
S-[illegible]-1	8-20		8-21	1	8080	x
-2			8-27	7	9350	x
-3			9-17	28	9900	x
S-138-1	8-21		8-22	1	6950	x
-2			8-28	7	8300	x
-3			9-18	28	8650	x
S-139-1	8-21		8-22	1	6800	x
-2			8-28	7	7950	x
-3		↓	9-18	28	7950	x
[illegible]	8-21	Core taken from completed repair area 9-5-75.	9-9-75	4	6890	x

ATTACHMENT No. 6

sika | mtd

SIKA CHEM[illegible] CORPORATION
MATERIALS TECHNOLOGY DEPARTMENT
BOX 297, LYNDHURST, NEW JERSEY 07071
TEL. 201-933-8800 (N.J.); 212-695-2253 (N.Y.)

technical bulletin

SIKASTIX TB: 75/11
Supercedes TB: 75/03

new exclusive damp-cure formulation

SIKASTIX 350

SIKADUR HI-MOD LV*

high-modulus, low-viscosity, moisture-insensitive epoxy adhesive

DESCRIPTION

Sikadur Hi-Mod LV is a 100%-solids, 100%-reactive, 2-component, moisture-insensitive, epoxy-resin system. It is an all-purpose, high-strength, rigid adhesive to be used for crack grouting or as a penetrating sealer.

ADVANTAGES

- *Unique, high-strength adhesive for 'can't-dry' surfaces* - - Patented, exclusive formulation of Hi-Mod LV makes it insensitive to moisture before, during, and after cure. Reduces need for job shut-down due to wet weather.
- *Ideal for high-modulus underwater injection grouting* - - Hi-Mod LV literally pushes water away, provides tenacious, crack-filling bond when pressure-injected even underwater. Also excellent to restore structural integrity of dry and damp materials.

TYPICAL PROPERTIES

Ratio	:	1:1½ (B:A) 1 part by volume Component B to 1½ parts Component A
Color	:	Component A is hazy-straw; B is amber; Mixed color: straw.
Viscosity	:	Similar to light-weight oil.
Shelf life	:	2 years.

	73F
Pot life of neat Sikadur Hi-Mod LV	25 minutes
Tack-free (thin film)	3 hours
Final cure (75% of ultimate strength)	3 days

Ultimate physicial characteristics after cure at 75F and 50% relative humidity

Tensile strength Neat	(14 days)	ASTM D 638	3,000 psi min.
Tensile elongation Neat	(14 days)	ASTM D 638, mod.	5% max.
Compressive strength Neat	(28 days)	ASTM D 695	10,000 psi min.
Compressive modulus Neat	(28 days)		475,000 psi min.

*All values approximate. Will vary depending on temp. and humidity.

PACKAGING

Sikadur Hi-Mod LV is available in 10-gallon and 3-gallon units.

*Patented

SIKA PRODUCTS ARE INTENDED FOR INDUSTRIAL USE ONLY

KEEP AWAY FROM CHILDREN • OBSERVE PRODUCT CAUTION

Every reasonable precaution is taken in the manufacture of our products and compiling of data to assure that they shall comply with Sika's existing standards. Information given is correct to the best of our knowledge and the products, as sold, are satisfactory for the purpose proposed. However, no guaranty of the results, using these products and data, is given because every possible variation in the methods of their use or conditions under which they are applied cannot be anticipated. Sika is not responsible if the material should be used in a manner to infringe any patent held by others.

PRINTED IN U.S.A.

COVERAGE

One gallon of Sikadur Hi-Mod LV covers approximately 125 sq ft when used as a penetrating sealer on a smooth surface.

HOW TO USE

Surface Preparation - - Surface must be clean and sound. Cracks may be dry, damp, or wet. Surface should be dry as a penetrating sealer. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles, and disintegrated materials.

Proportioning/Mixing - - Volumetric ratio of Sikadur Hi-Mod LV is 1:1¼ (B:A). To mix, proportion 1 part B and 1¼ parts A into clean pail. Mix thoroughly for 3 minutes with Sika paddle on slow-speed (400 to 600 rpm) drill until blend is a uniform straw color. Mix only that amount of Hi-Mod LV you can use in 25 minutes at 73F.

Application - - *As a sealer* - - Apply neat mixed material using a rubber squeegee. Allow material to penetrate and squeegee off excess while still liquid. *Crack grouting* - - See technical bulletin on grouting cracks.

Temperature - Not recommended when concrete temperature is below 40F. Pot life will be less at higher temperatures. Store at 73F for best results.

CAUTION

Do not thin Sikadur Hi-Mod LV. Solvents will prevent proper cure. Not designed for use as an adhesive for fresh plastic portland cement mortar or concrete. Use Sikadur Hi-Mod.

Read before opening containers

A Component - For Industrial Use Only! Warning! May Cause Skin Sensitization or other allergic responses. Avoid inhalation of vapor. Use good ventilation particularly if material is heated or sprayed. Prevent all contact with skin or eyes. If contact with skin occurs, wash immediately with soap and water. In case of contact with eyes, flush immediately with water and contact a physician. SPI Classification 4.

B Component - DANGER! CAUSES (SEVERE) BURNS. Contains alkaline amines: strong sensitizer. Do not get in eyes, on skin, on clothing. Avoid breathing vapor. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

FIRST AID: IN CASE OF CONTACT, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician. Wash clothing before reuse. Discard contaminated shoes. MCA.

WEAR PROTECTIVE CLOTHING, GOGGLES, GLOVES, AND/OR BARRIER CREAMS

LYNDHURST, NEW JERSEY 07071
201-933-8801 (NJ) - 212-695-2253 (NY)

This unit contains 1.8 U.S. gal; yields 3 U.S. gal when mixed with Component B

SIKADUR HI-MOD

High-modulus, high-strength, moisture-insensitive epoxy adhesive

ATTACHMENT No. 7

THIS IS A 2-COMPONENT, 1:1½ (B:A) SYSTEM
MIX 1 PART B WITH 1½ PARTS BY VOLUME
COMPONENT A

new exclusive damp-cure formulation

FOR INDUSTRIAL USE ONLY
KEEP AWAY FROM CHILDREN
PROVIDE ADEQUATE VENTILATION

DESCRIPTION

Sikadur Hi-Mod is an all-purpose, structural epoxy adhesive. Insensitive to moisture before, during, and after cure, this 2-component, 100%-solids, 100%-reactive epoxy cures to a tough, high-modulus, high-strength adhesive with tenacious bond to dry, can't-dry, and damp surfaces, and wet surfaces free of standing water.

WHERE TO USE

Use Sikadur Hi-Mod neat to bond fresh, plastic concrete to sound, hard concrete; as a penetrating sealer over concrete; for pressure-injection above and below water. Use neat or mix with Colma Quartzite Aggregate to prepare a high-strength mortar to anchor bolts.

Material is USDA-approved for use in food plants where there is a possibility of incidental food contact.

Typical Characteristics at 75F

Pot life	40 minutes
Tack free (thin film)	4 hours
Initial cure** (1,000 psi minimum)	8 hours
Final cure** (75% ultimate strength)	7 days
Shelf life	2 years
Tensile strength (14 days)	3,200 psi
Compressive modulus** (28 days)	1,250,000 psi
Compressive strength** (24 hours)	6,300 psi
Compressive strength** (28 days)	10,800 psi

*Material temperature at 75F. **As mortar (ASTM C-109 modified).

CAUTION: Read Before Opening Container

For industrial use only! Warning!

May cause skin sensilization or other allergic responses.

Avoid inhalation of vapor. Use good ventilation particularly if material is heated or sprayed. Prevent all contact with skin or eyes. If contact with skin occurs, wash immediately with soap and water. In case of contact with eyes, flush immediately with water and contact a physician. SPI Classification 2

Wear protective clothing, goggles, gloves, and/or barrier creams.

HOW TO USE

SURFACE PREPARATION: Surfaces must be clean, sound, and free of standing water. Remove laitance, grease, curing compounds, other foreign materials. Sandblast steel to white finish.

PROPORTIONING/MIXING: Volumetric ratio is 1:1½ (B:A). To mix, proportion 1 part B and 1½ parts A into clean pail. Mix thoroughly for 3 minutes with Sika paddle on low-speed (400- to 600-rpm) drill. To prepare mortar, slowly add up to 3¼ parts by loose volume of Colma Quartzite Aggregate while continuing to mix.

APPLICATION: Bonding fresh concrete to hardened concrete — Apply neat with brush, roller, broom, or spray.

Anchor bolts — Use Hi-Mod neat or with aggregate. To prepare a mortar, add up to 2½ parts by loose volume CQA.

Grout cracks — Use neat. For injection grouting — Inject neat Hi-Mod through pipe nipples, Zerk or Alemite fittings, or polyethylene 1-way valves. Seal cracks with Sikadur Gel.

LIMITATIONS

Do not apply when surface temperature is below 40F.

CAUTION

Do not dilute Hi-Mod. Use only oven-dry aggregate.

Every reasonable precaution is taken in the manufacture of all products and compiling of data, to assure that they shall comply with Sika's exacting standards. To the best of our knowledge information given is correct and the products as sold are satisfactory for the purpose proposed by Sika. However, no guaranty of results using these products and data is given because every possible variation in the methods of their use or conditions under which they are applied cannot be anticipated. Sika is not responsible if the material should be used in a manner to infringe any patent held by others

Batch Number

SIKA CHEMICAL CORPORATION, Lyndhurst, N.J. 07071

ATTACHMENT NO. 8

9/11/75

FORM 407 REV.

PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

850 POPLAR STREET, PITTSBURGH, PA. 15220

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

AREA CODE 412 TELEPHONE 922-4000

PLEASE REPLY TO:
P. O. BOX 1646
PITTSBURGH, PA. 15230

LABORATORY No. 757593

ORDER No. MA-8209

DATE: August 29, 1975

CLIENT'S No.

REPORT

FINAL REPORT OF TESTING

AND

INSPECTION OF FLOOR SLAB INTEGRITY

FOR

EBASCO SERVICES INC.
P. O. BOX 1117
JENSEN BEACH, FLORIDA 33457

Attention: John Fisher

A. PROJECT

Florida Power & Light Company
Port St. Lucie Unit 1

B. TESTING AND INVESTIGATION

Structural integrity of Reactor Building Roof Slab - (damaged area caused by fall and impact of tower crane counter weight). Point of impact 9 ft. from Line RA3 and 24 ft. from Line RAL at elevation 82.

C. EVALUATION OF DAMAGE AND RECOMMENDED REPAIR

Given in PTL Report No. 752369 dated February 7, 1975.

D. REPAIR PROCEDURE

Ebasco CP-81 Rev. 2.

E. INITIAL REPAIR

Ebasco performed and supervised the repair in accordance with CP-81. Intrusion epoxy pressure grouting was performed. Details and cube specimen compression tests are contained in Ebasco Report.

F. INITIAL SONIC BASE LINE TESTING

Prior to grouting and after surface preparation of the affected area, a preliminary sonic base line test was conducted to delineate area to be pressure grouted. This was performed on May 22-23, 1975. The results of the preliminary base line is given on Attachment I. Also, contained is the typical pulse velocity determined in the unaffected surface prepared area (location area RA3, RAI - RA4, RA5. The average pulse velocity in the unaffected area was 11,700 feet/sec. The development of similar pulse velocities produced an outline of damaged area that required grouting.

G. PRIMARY GROUTING

Pressure grouting of the damaged slab was performed by the B. Starling Company using a sika two component epoxy system. Two inch cubes were taken at intervals during grouting to evaluate the harding qualities and the compressive strength. The calibration of the grouting equipment, details of grouting and cube strength results were witnessed by Ebasco and given in an Ebasco Report.

H. SONIC TESTS OF GROUTED SLAB

Pulse velocity determinations were made after the primary grouting and shown on Attachment II. This was performed on June 23-24, 1975. The test results indicated that complete grout penetration of all cracks was not achieved. It was recommended that in addition to the cores scheduled by CP-81, additional cores be taken at specific locations in order to properly evaluated the extent of additional grouting requirements. The locations of the cores secured are shown in Attachment III.

I. CORE EVALUATION AND ADDITIONAL GROUTING REQUIREMENTS

On June 30, 1975, the cores and coreholes were visually examined. The condition of the slab as indicated by this examination is shown on Attachment III. Based on this evaluation, it was recommended that major cracks near the bottom of the slab were not penetrated with the epoxy grout. Recommendations were made to pressure grout from beneath the slab to achieve better penetration.

PITTSBURGH TESTING LABORATORY
ESTABLISHED 1881
850 POPLAR STREET, PITTSBURGH, PA. 15220
AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.
AREA CODE 412 TELEPHONE 922-4000

FORM 407 REV.-PG

PLEASE REPLY TO:
P. O. BOX 1646
PITTSBURGH, PA. 15230

LABORATORY No. 757593

ORDER No. MA-8209

Date: August 29, 1975

CLIENT'S No.

REPORT

J. POST GROUTING SONICS BASE LINE

It was found desirable to perform additional pulse velocity tests and establish a post grouting sonics base line that provide exact peripheral dimensions of grouted areas. This was performed on July 22-23, 1975 and is shown in Attachment IV. Based on these additional tests, specific area were recommended for grouting. Arrangements were made to have the B. Starling Company perform this grouting utilizing the same type of grouting materials and equipment.

K. GROUTING AND SONIC TESTING

In order to properly trace the effectiveness of the grouting during the grout process, it was necessary to perform the sonic tests concurrently with the grouting process. This was performed August 4 - 8, 1975.

As soon as the planned grout locations were completed, pulse velocity measurements were taken. The results of this series of sonic tests are given in Attachment V. These tests indicated that most of the damaged area was properly repaired and made monolithic with the epoxy grout. However, a localized area was not sufficiently penetrated. Obstructions from an existing duct prevented proper spacing of grout holes. Therefore, recommendations were made to properly penetrate the deficient area with additional grout from the top with grout hole drilling.

L. SONIC TEST RESULTS OF LOCALIZED AREA

Pulse velocity measurements were made of the localized area to determine effectiveness of the third grouting operations. The results of this series of test are given in Attachment VI. (The tests taken and shown were only in the unresolved area). The test results indicated that a concentrated area, slightly larger that the impact imprint of the counter weight, had not been penetrated the last grouting operation. This is shown by outline an Attachment VI. Additional probing and evaluation indicated that the fragmentation of the surface produced laminar type cracks which could not be completely penetrated by the pressure grouting. In order to verify this the top surface (about 2 to 3") were removed at several spots in the localized area. Sonic tests were taken after removal of spot locations and surface preparations. These results are indicated on Attachment VI. The sonic tests indicated monolithic concrete beneath this surface area. Therefore, recommendations were made to remove the surface concrete in the localized area to a depth of sound concrete.

PITTSBURGH TESTING LABORATORY
ESTABLISHED 1881
850 POPLAR STREET, PITTSBURGH, PA. 15220
AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.
AREA CODE 412 TELEPHONE 922-4000

PLEASE REPLY TO:
P. O. BOX 1646
PITTSBURGH, PA. 15230

FORM 407 REV.-PG

LABORATORY No. 757593

ORDER No. MA-8209

CLIENT'S No.

REPORT

DATE: August 29, 1975

M. SONIC TESTS OF LOCALIZED AREA AFTER SURFACE REMOVAL

After this surface had been removed, seven areas were selected for sonic tests. The sonic test results are indicated on Attachment VII. The points were closely spaced in the localized area and therefore enabled much greater test coverages or frequencies than normally performed for sonic tests and examinations. Satisfactory pulse velocities were achieved at four of the seven locations. Although this indicated general structural integrity of this small area, a retest program was recommended. The seven areas were ground to permit transducer locations slightly off of the single points. Often surface conditions or minor localized discontinuties in the concrete prevent sonic transmission. It is then advisable to shift the transducers slightly to adequately check the concrete integrity. Adequately pulse velocities were achieved at six of the seven locations. These retests are shown on Attachment VII.

An evaluation of the seventh point indicated that an electrical embeddment interfered with the proper sonic testing at this point. Based on these results the structural integrity of the damaged slab was restored by the epoxy grouting. It was recommended that the surface removed in the localized area be replaced with an epoxy-aggregate concrete to restore it to the original monolithic slab thickness. Sonic tests were recommended after restoration to verify the bond of the concrete resurfacing.

N. SONIC TESTS OF RESTORED SURFACE

After restoration, sonic tests were performed to verify adequacy of the bond between the epoxy-aggregate surface and the original concrete. Due to either dampening or a diffraction of sound waves by the epoxy topping, transmission was not received. Therefore, two cores were secured from the repaired surface to check the bonding qualities of the topping to the base slab. The cores penetrated into the base slab about 8 inches in total length to include about one half length of topping and one half length of base slab. The cores were snapped out of the hole. The break occurred in the base slab and was a diagonal shear type. This indicated higher strength of the bonded joint. An examination of the cores indicated sound bond and high degree of epoxy penetration and consolidation in the random cracks caused by the impact.

FORM 407 REV.-PG

PITTSBURGH TESTING LABORATORY
ESTABLISHED 1881
850 POPLAR STREET, PITTSBURGH, PA. 15220

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL.

AREA CODE 412 TELEPHONE 922-4000

PLEASE REPLY TO:
P. O. BOX 1646
PITTSBURGH, PA. 15230

LABORATORY No. 757593

ORDER No. MA-8209

CLIENT'S No.

REPORT

DATE: August 29, 1975

O. CONCLUSION

Based on the tests and visual examinations described herein, we believe that the structural integrity has been restored in the slab which was damaged by the impact.

JFA/dz

cc: 3 - Client
Attn: J. Fisher
1 - Client
Attn: F. Jones

Respectfully submitted,

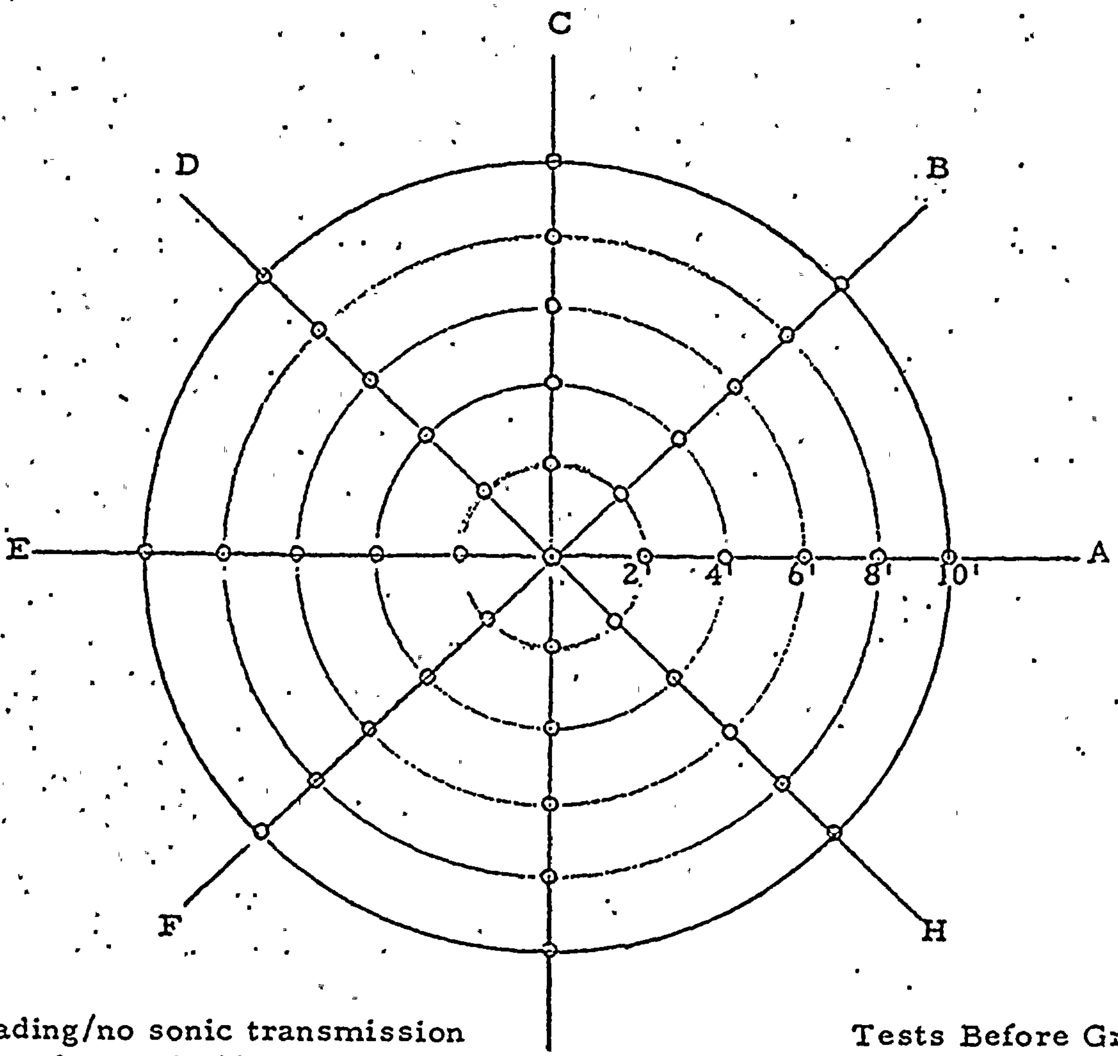
PITTSBURGH TESTING LABORATORY

J. F. Artuso

J.F. Artuso
Vice President

ATTACHMENT I

Identification of the grid used for the sonic tests. (The distance between points on radial lines is 2 feet). (0 is point of impact)



LEGEND
NR - No reading/no sonic transmission
I - Structural or embeddment interference
— - Reading not required

Tests Before Grout
Sonic - May 23, 1975

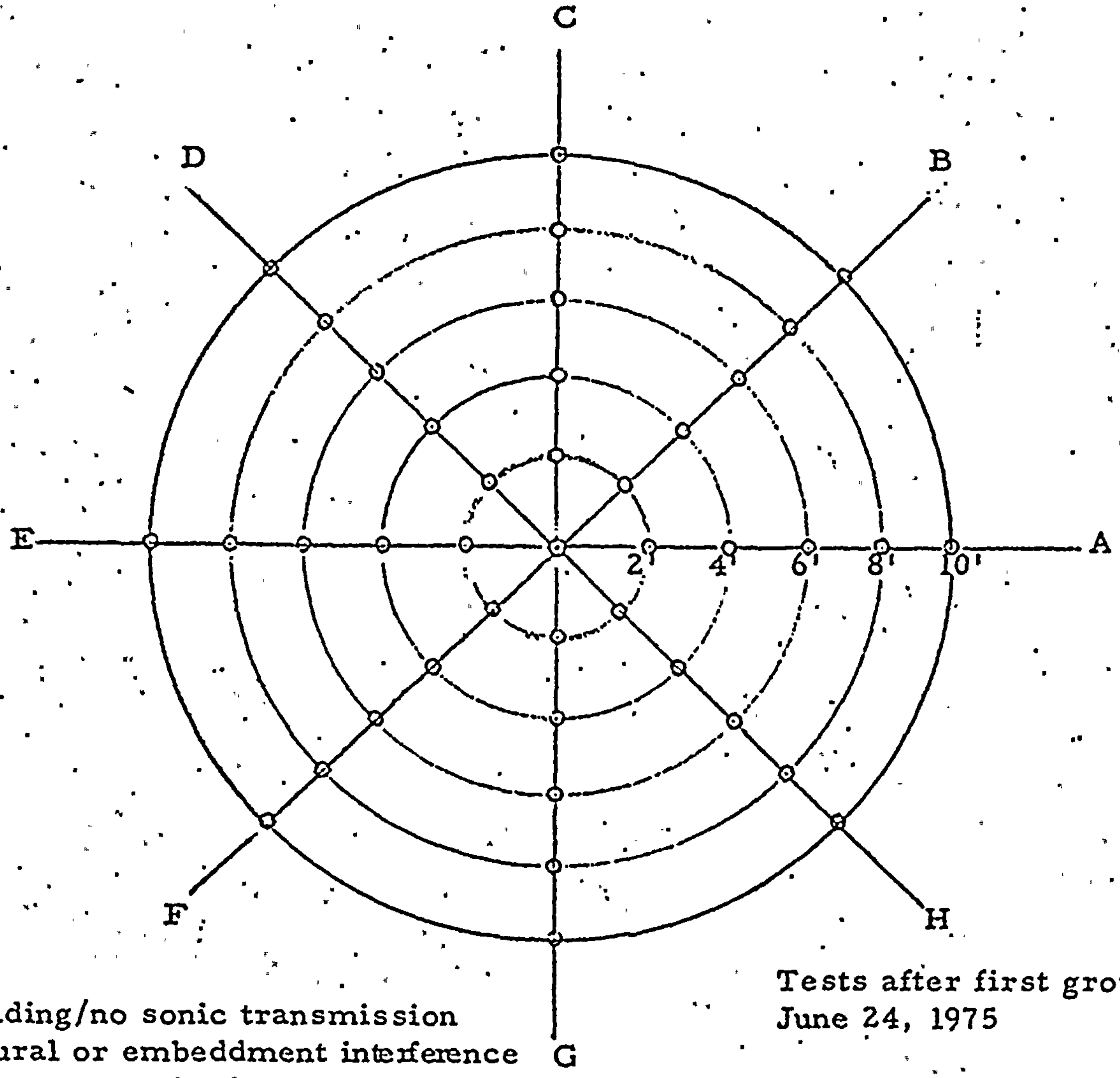
SONIC DATA (Units in 1000 feet per second)

LOCATIONS

Distance Ft.	A	B	C	D	E	F	G	H
2	NR	NR	NR	NR	NR	NR	NR	NR
4	NR	NR	NR	NR	3.2	3.6	9.5	6.6
6		NR	NR	NR	I	12.6	I	9.9
8	NR	NR	NR	NR	10.7	—	3.9	I
10	I	NR	I	I	—	—	I	—

ATTACHMENT II

Identification of the grid used for the sonic tests. (The distance between points on radial lines is 2 feet). (0 is point of impact)



LEGEND
NR - No reading/no sonic transmission
I - Structural or embeddment interference
— - Reading not required

Tests after first grouting
June 24, 1975

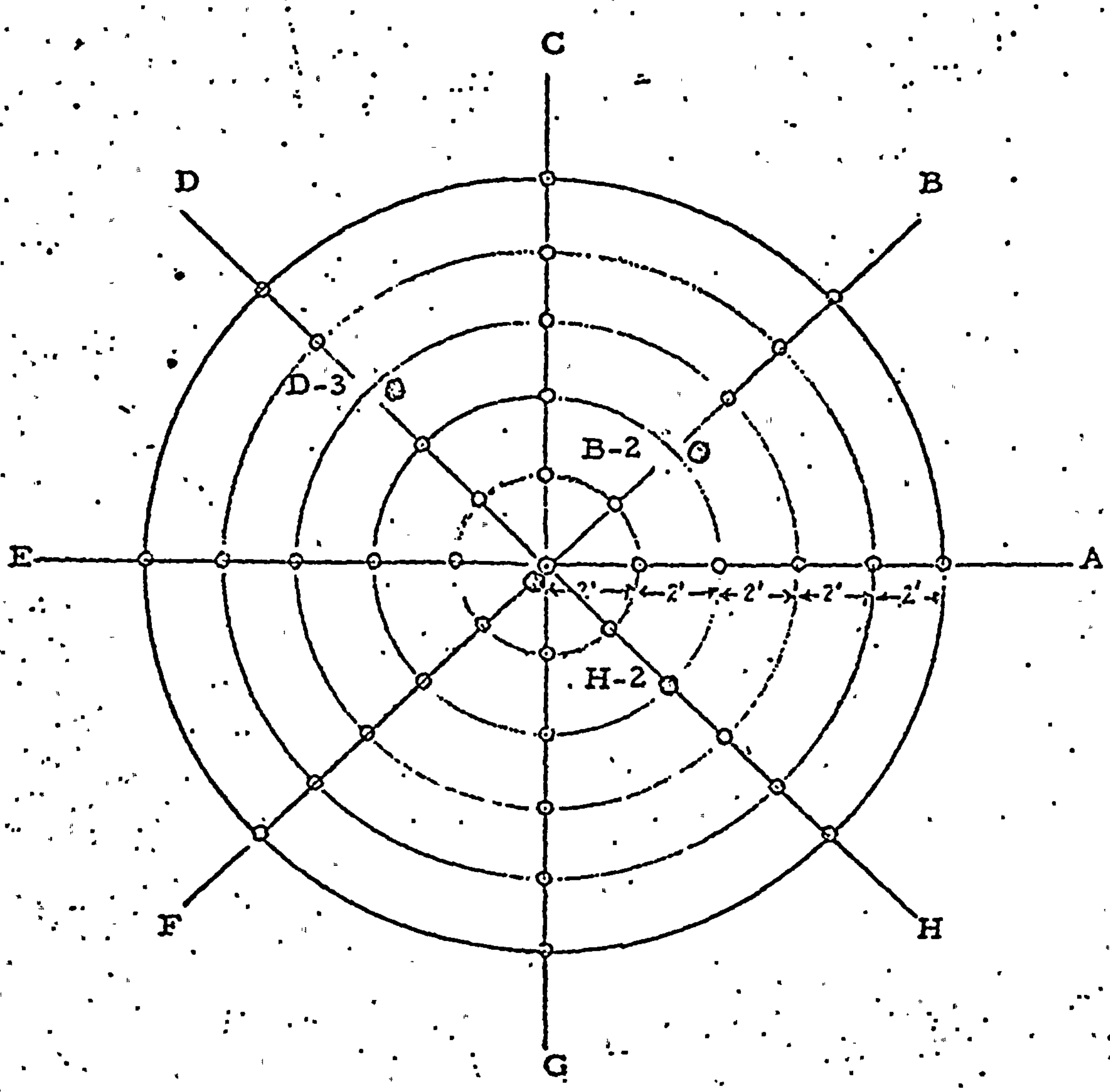
SONIC DATA (Units in 1000 feet per second)

LOCATIONS

Distance Ft.	A	B	C	D	E	F	G	H
2	NR	NR	NR	NR	NR	4.5	NR	NR
4	4.6	NR	NR	NR	NR	4.2	12.8	13.1
5	NR	NR	NR	7.8	NR	12.6	—	12.9
8	NR	NR	NR	4.5	9.1	—	—	—
10	I		I	I	—	—	I	—

Sonics Survey
Grid Locations
(Radial distances between points - 2')

APPROXIMATE CORE LOCATIONS



Concrete Core Analysis

O - Origin.
H - 2
B - 2
D - 3

Nominal Depth of Slab - 22 inches

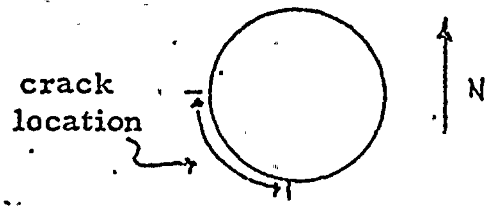
ATTACHMENT III

CORE ID — **DESCRIPTION OF CORE**

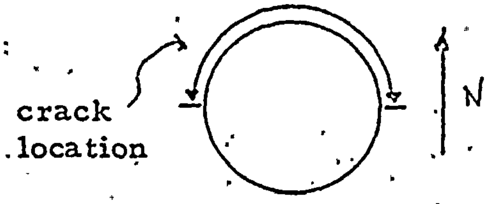
O - Origin

1. Circumferential crack at twelve inches (12") from top. No epoxy penetration evident.

2. Crack at three inches (3") from top, fragmented crack from south to west quadrant. No epoxy evident.

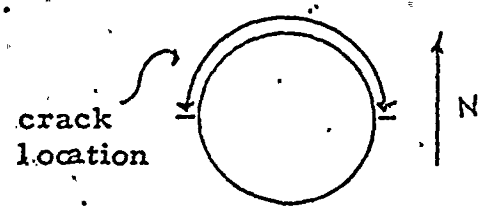


3. Crack at six inches (6") from top, located in northern sector. Fine hair line crack, no width. No epoxy evident.



H - 2

1. Crack at seventeen inches (17") deep, no penetration of epoxy evident, located in northern sector.



B - 2

1. Crack at six inches (6") below top, epoxy penetration 100%.

2. Crack at lower rebar layer, twenty inches (20") below top of slab, circumferential crack with no epoxy penetration.

3. Crack at twenty-one inches (21") below top of slab, one inch (1") below rebar, no epoxy penetration evident.

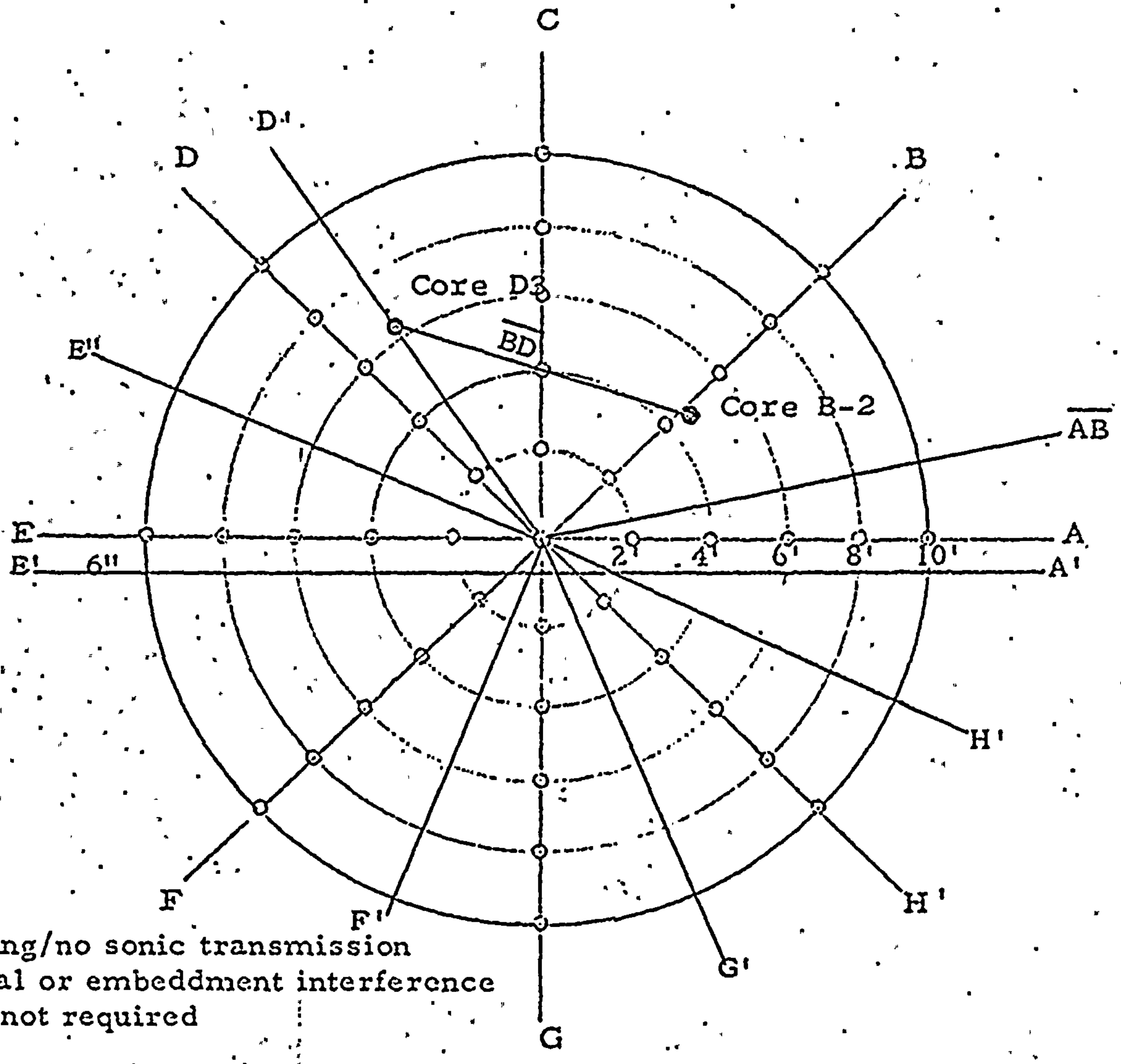
D-3

1. Sound hole, 100% penetration in crack twenty inches (20") from top, sonic reading 150 on both sides of hole.

ATTACHMENT IV

SONICS - Post-grouting base line July 2[illegible]-23, 1975

Identification of the grid used for the sonic tests. (The distance between points on radial lines is 2 feet). (0 is point of impact)



LEGEND
NR - No reading/no sonic transmission
I - Structural or embeddment interference
_ - Reading not required

SONIC DATA (Units in 1000 feet per second)

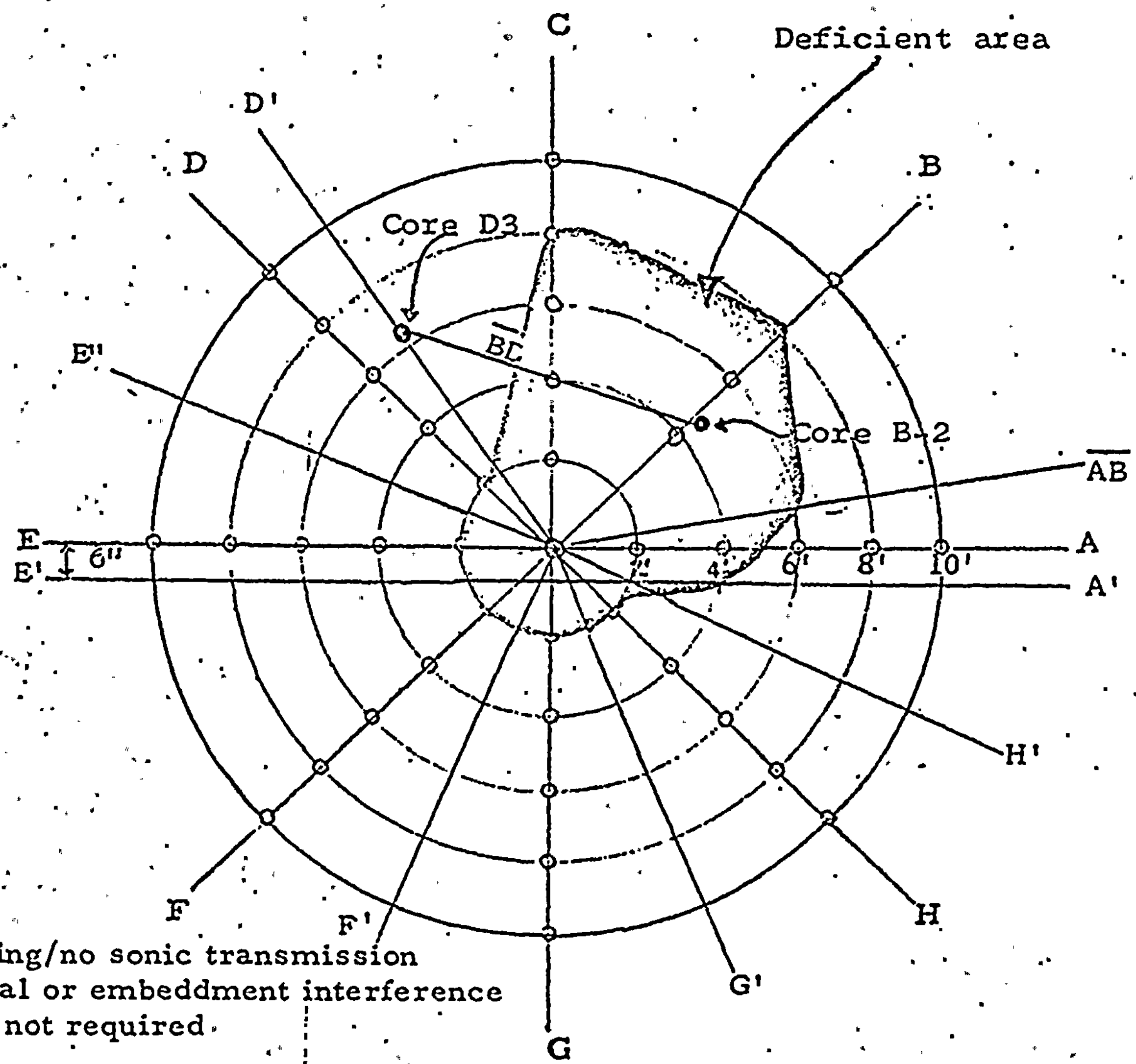
LOCATIONS

Distance Ft.	A'	$\overline{AB}$	B	C	D	D'	E'	E"	F	F'	G	G'	H	H'	$\overline{BD}$
2	NR	NR	NR	NR	197	–	NR	NR	NR	NR	NR	NR @ 3'	6.5	NR 3.5'	NR
4	5.0	NR.	NR	NR	NR	–	11.0	NR	NR	NR	9.6	12.6 @ 4.5'	6.5	12.2 @ 4.5'	NR
6	12.9	12.9	356	NR	NR	12.4 @ 6.5'	12.2 (1'SO)	NR	12.3	12.6 @ 5.5'	12.8	–	13.2	–	–
8	12.9	–	210	11.8	12.5	12.3	–	NR	–	–	–	–	–	–	–
10	–	–	12.6 @ 9'	–	–	–	12.2 @ 9.5'	NR	–	–	–	–	–	–	–

ATTACHMENT V

SONICS - Tests after second grouting August 4-6, 1975

Identification of the grid used for the sonic tests. (The distance between points on radial lines is 2 feet). (0 is point of impact)



LEGEND
NR - No reading/no sonic transmission
I - Structural or embeddment interference
_ - Reading not required

SONIC DATA (Units in 1000 feet per second)

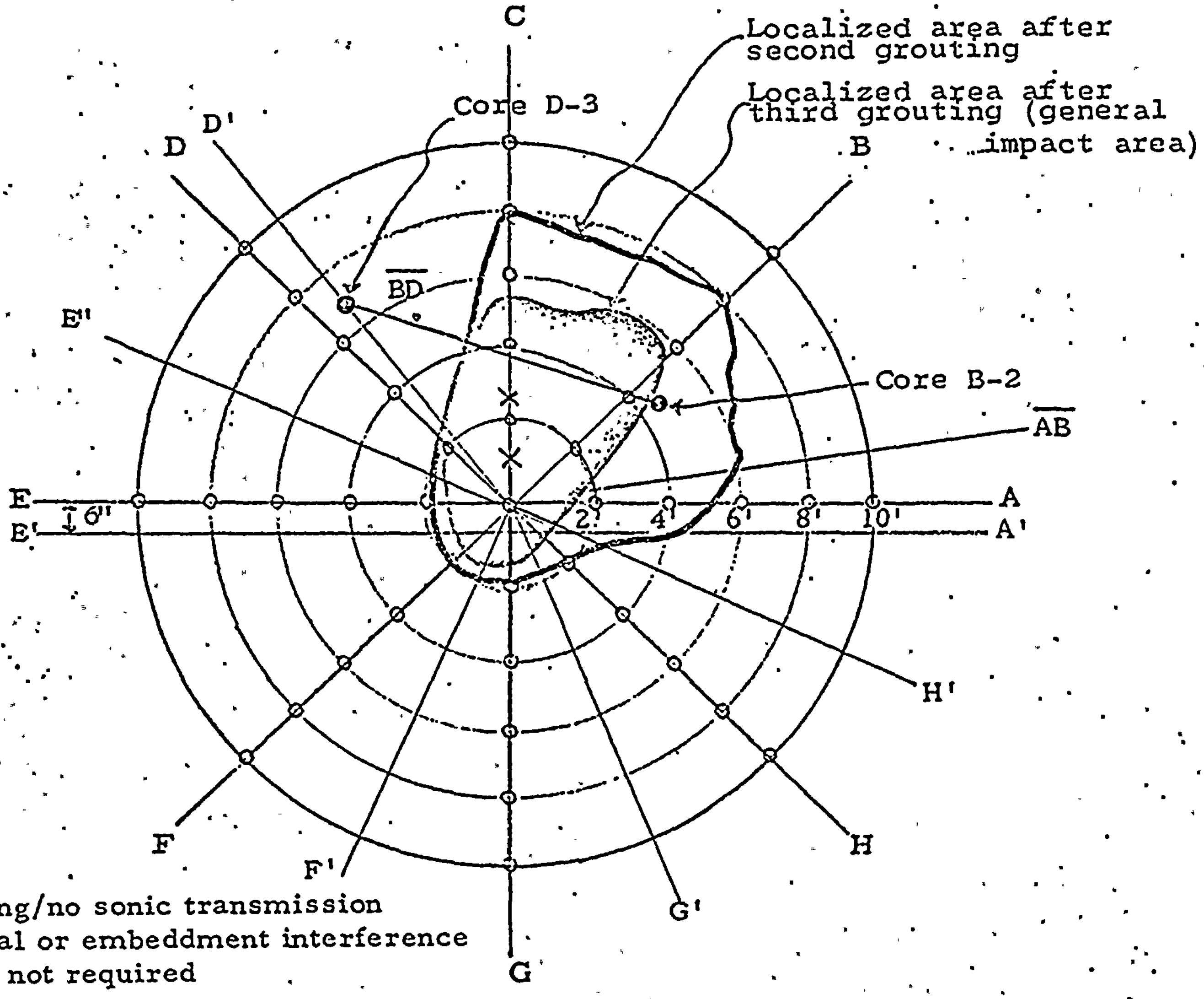
LOCATIONS

Distance Ft.	A'	$\overline{AB}$	B	C	D	D'	E'	E''	F	F'	G	G'	H	H'	$\overline{BD}$
2	12.4 @ .5'SO	NR	5.8	5.2	11.8	11.5	12.4	I	12.3	I	13.2	I	11.1	I	NR
4	12.9 @ .3'SO	11.6 @ .3'NO	2.3	NR	I	11.6	12.6	11.0 @ 4.8'	12.6	13.1 @ 3'	12.5	13.1 @ 4.2'	12.9	12.2 @ 4.5'	5.4
6	12.9	12.9	7.3	4.8	I	12.4 @ 6.5'	I	12.7	12.6	12.6	12.6	-	12.9	-	-
8	12.9	12.7	12.2	12.1	12.5	12.3	12.2 @ 9.5'	-	-	-	-	-	-	-	-
10	-	-	12.6 @ 9'	-	-	-	-	-	-	-	-	-	-	-	-

ATTACHMENT VI

Sonics - Test after third grouting August 6-8, 1975
(Localized Shaded Area Tested)

Identification of the grid used for the sonic tests. (The distance between points on radial lines is 2 feet). (0 is point of impact)



LEGEND
NR - No reading/no sonic transmission
I - Structural or embeddment interference
_ - Reading not required

SONIC DATA (Units of 1000 feet per second)

LOCATIONS

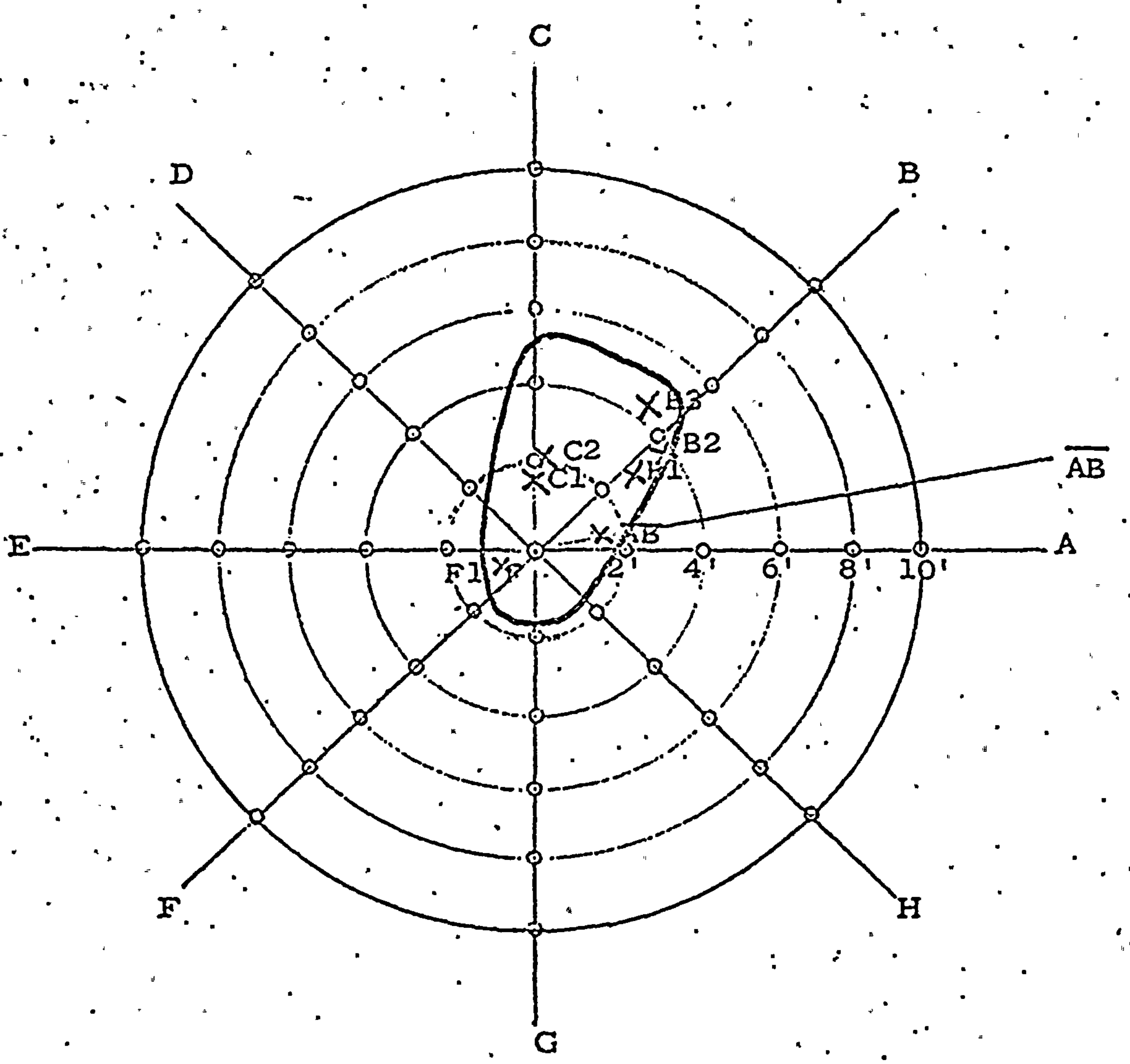
Distance Ft.	A'	AB	B	C	D	E	F	G	H	BD
2	12.4	11.4 @ 1.5'	5.9	5.4	-	-	-	-	-	11.8
4	-	11.6	3.4 @ 3.3'	7.6	-	-	-	-	-	11.4 @ 5'
6	-	-	11.8 @ 5.1'	12.2@ 5' 11.8@6.5'	-	-	-	-	-	-
8	-	-	12.4@7' 150@8'	12.4	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-

X-Spot Locations, Spot locations after removal of additional 2" (nominal
C @ 9"=12.9   C@ 35"=11.9

ATTACHMENT VII

Sonics - Test after surface removal of impact area

Identification of the grid used for the sonic tests. (The distance between points on radial lines is 2 feet). (0 is point of impact)



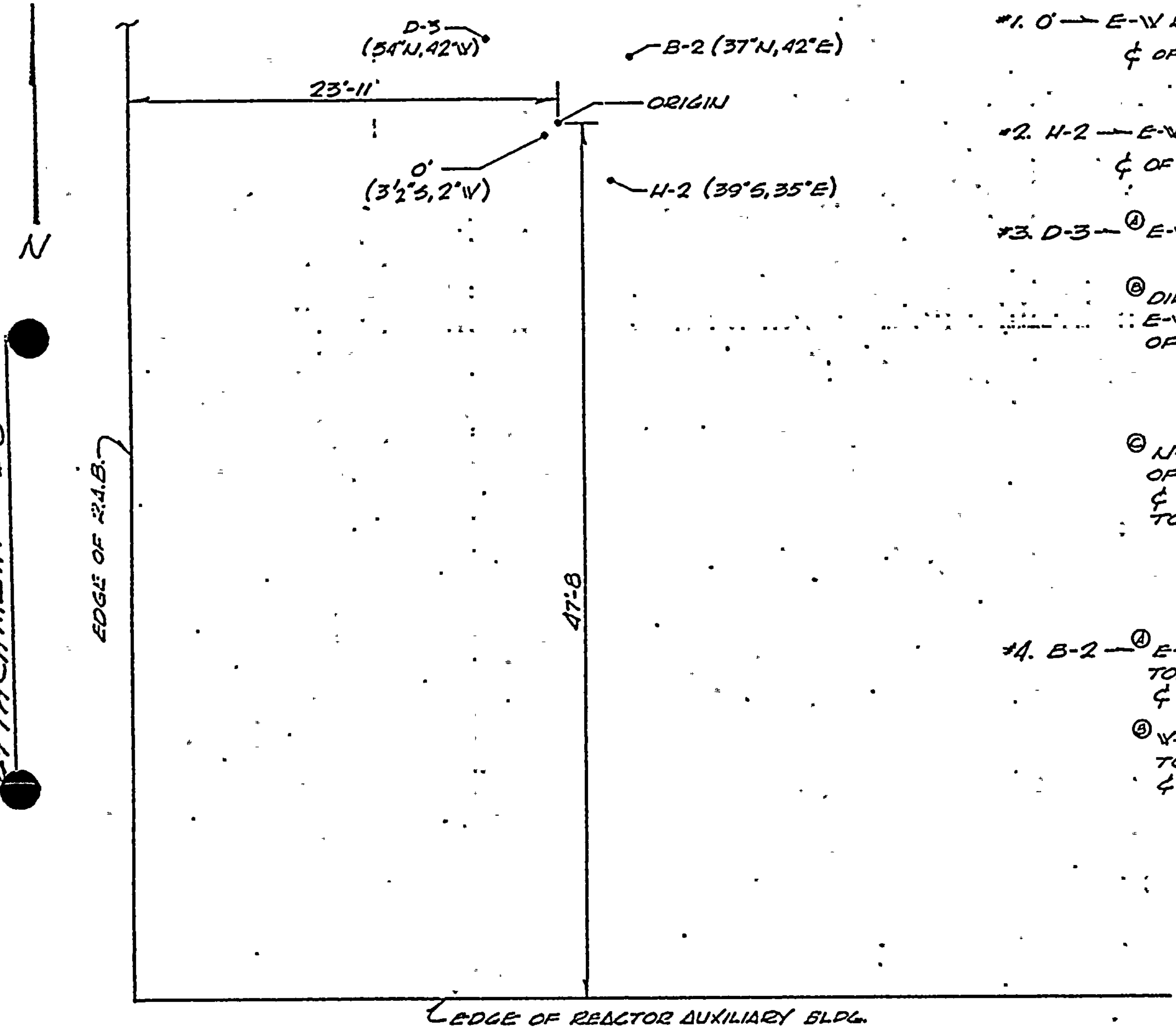
NOTE: 20" Nominal Depth

TABLE

Location - Sonic Value (1000 feet per second)

B1 - 10.1	C1 - 10.5
B2 - 11.7	C2 - 12.2
B3 - NR	E1 - 11.3
C1 - 10.5	F1 - 11.3

ATTACHMENT #10



LOCATION OF 4"φ CORES

REBAR DAMAGE

\#1. 0' — E-W REBAR, 20" BELOW TOP - FULL CUT -
℄ OF BAR 3½"S, 2"W

\#2. H-2 — E-W REBAR, 20" BELOW TOP - FULL CUT -
℄ OF BAR 39"S, 35"E

\#3. D-3 — (A) E-W REBAR, TOP MAT 2½" BELOW TOP OF SLAB - FULL CUT -

(B) DIRECTLY SOUTH OF ABOVE BAR ANOTHER E-W BAR SLICED BY CORE TO A MAX. WIDTH OF ⅞"

(C) N-S BAR, BOTTOM MAT, 19" BELOW TOP OF SLAB
℄ OF BAR 54"N, 42"W, SLICED BY CORE TO A MAX. WIDTH OF ⅞"

\#4. B-2 — (A) E-W BAR, BOTTOM MAT, FULL CUT, 20" BELOW TOP OF SLAB,
℄ OF BAR 37"N, 40"E

(B) N-S BAR, BOTTOM MAT, FULL CUT, 19" BELOW TOP OF SLAB
℄ OF BAR 37"N, 42"E

FLORIDA POWER & LIGHT COMPANY ST. LUCIE PLANT 1975 - 890,000 KW INSTALLATION UNIT 1		
REBAR DAMAGE BY CORE DRILLING RAB ROOF		
EBASCO SERVICES INCORPORATED		
SCALE: 1"=60'	APPROVED	DATE 7-23-75
DR S. LORRAINE		FS-8770-783
CK SLZ		SH 1 OF 1

FORM 8009 CO-11

ATTACHMENT #11

EBASCO SERVICES INCORPORATED

MATERIALS ENGINEERING AND QUALITY COMPLIANCE DEVIATION REPORT

REPORT NO. 214

E.O. NO.

Distribution:
- White • Ebasco Quality Compliance Records
- Yellow • Vendor, Manufacturer or Contractor
- Pink • Ebasco Quality Compliance Rep.

CLIENT OR PROJECT: FLORIDA POWER & LIGHT - ST. LUCIE PLANT UNIT #1

DRAWING NO./SPEC NO.: DRW. #FS 8770-436 REV. 1 Dated Feb. 27, 1975 & CP-81 REV. 1, DATED 6/23/75

VENDOR, MANUFACTURER OR CONTRACTOR: EBASCO SERVICES INC.

P.O. NO.:

DESCRIPTION OF COMPONENT, PART OR SYSTEM: REPAIR OF REACTOR AUXILIARY BUILDING ROOF DECK

The deviation described below does not meet the requirements of the Purchase Order in the manner indicated. You are requested to dispose of this deviation by:

a) Making repairs and reinspecting, OR
b) Replacing with a conforming component, part or system, OR
c) Obtaining an engineering deviation disposition from Ebasco Services Incorporated.

The Ebasco Quality Compliance Representative is to be notified when you have completed disposition.

1. DESCRIPTION *(Items Involved, Specification, Code or Standard to Which Items Do Not Comply, Submit Sketch If Applicable)*

An in process audit conducted by Site Quality Assurance as of this date involving the repair of the Reactor Auxiliary Building Roof Deck has revealed the following deficiencies.

1) Rebar have been damaged and cut - See attached Document #1

2) Failure of the epoxy intrusion to fully seal all cracks. - See Attached Document #2

3) Erractic readings during sonic testing - See attached Document #3.

EBASCO QUALITY COMPLIANCE REPRESENTATIVE: [signature] DATE: 7/14/75

2. RECOMMENDED DISPOSITION BY VENDOR, MANUFACTURER OR CONTRACTOR *(Submit Sketch If Applicable)*

Engineering to evaluate and advise.

VENDOR, MANUFACTURER OR CONTRACTOR QUALITY CONTROL: [signature] DATE: 7/14/75

. EVALUATION OF DISPOSITION

EBASCO ENGINEERING/CONSTRUCTION DATE

Rebar

#2

E-W BAR - 20" below top - full cut

℄ of bar 39" S, 35" E

Orogin

E-W BAR - 20" below top - full cut

℄ of bar 3½" S, 2" W.

B-3

E-W BAR - TOP MAT 2½" below top of slab

54" N, 44" W - ℄ of BAR - Full Cut

Also directly south of this bar, another E-W BAR (Splice?)

sliced by core to a max of 7/8"

N-S BAR - Bot. MAT 19" below top of slab

℄ of bar 54" N, 42" W

sliced by core to a max of 7/8"

B-2

E-W BAR - Bot. MAT - Full Cut - 20" below top of slab

℄ of bar 37" N, 42" E (E-W BAR)

N-S BAR - Bot. MAT. - Full Cut - 19" below top of slab

℄ of bar 37" N, 42" E (N-S BAR)

Core Sample Box

24" L, 10" H, 10" W

ATTACHMENT #2 #2

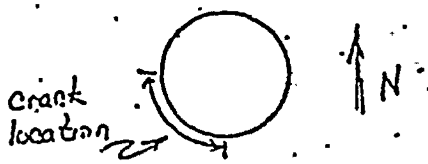
After Epoxy

FLORIDA POWER & LIGHT COMPANY
ST. LUCIE PLANT - UNIT #1
1975 - 890 MWe INSTALLATION
CONCRETE CORE ANALYSIS

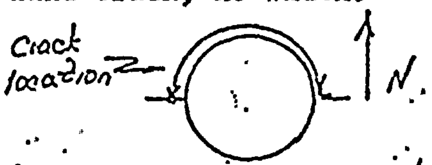
ORIGIN

1. Circumferential crack at twelve inches (12") from top. No epoxy penetration evident.

2. Crack at three inches (3") from top, fragmented crack from south to west quadrant. No epoxy evident.

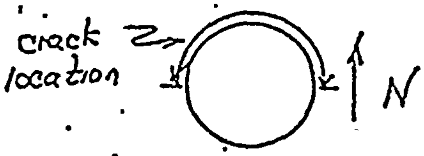


3. Crack at six inches (6") from top, located in northern sector. Fine hair line crack, no width.



H-2 EW BAR - 20" below Top - Fullout - : 4 of bar 39'5, 35" E

1. Crack at seventeen inches (17") deep, no penetration of epoxy evident, located in northern sector.



B-2

1. Crack at six inches (6") below top, epoxy penetration 100%.

2. Crack at lower rebar layer, twenty inches (20") below top of slab, circumferential crack with no epoxy penetration.

3. Crack at twenty-one inches (21") below top of slab, one inch (1") below rebar, no epoxy penetration evident.

D-3

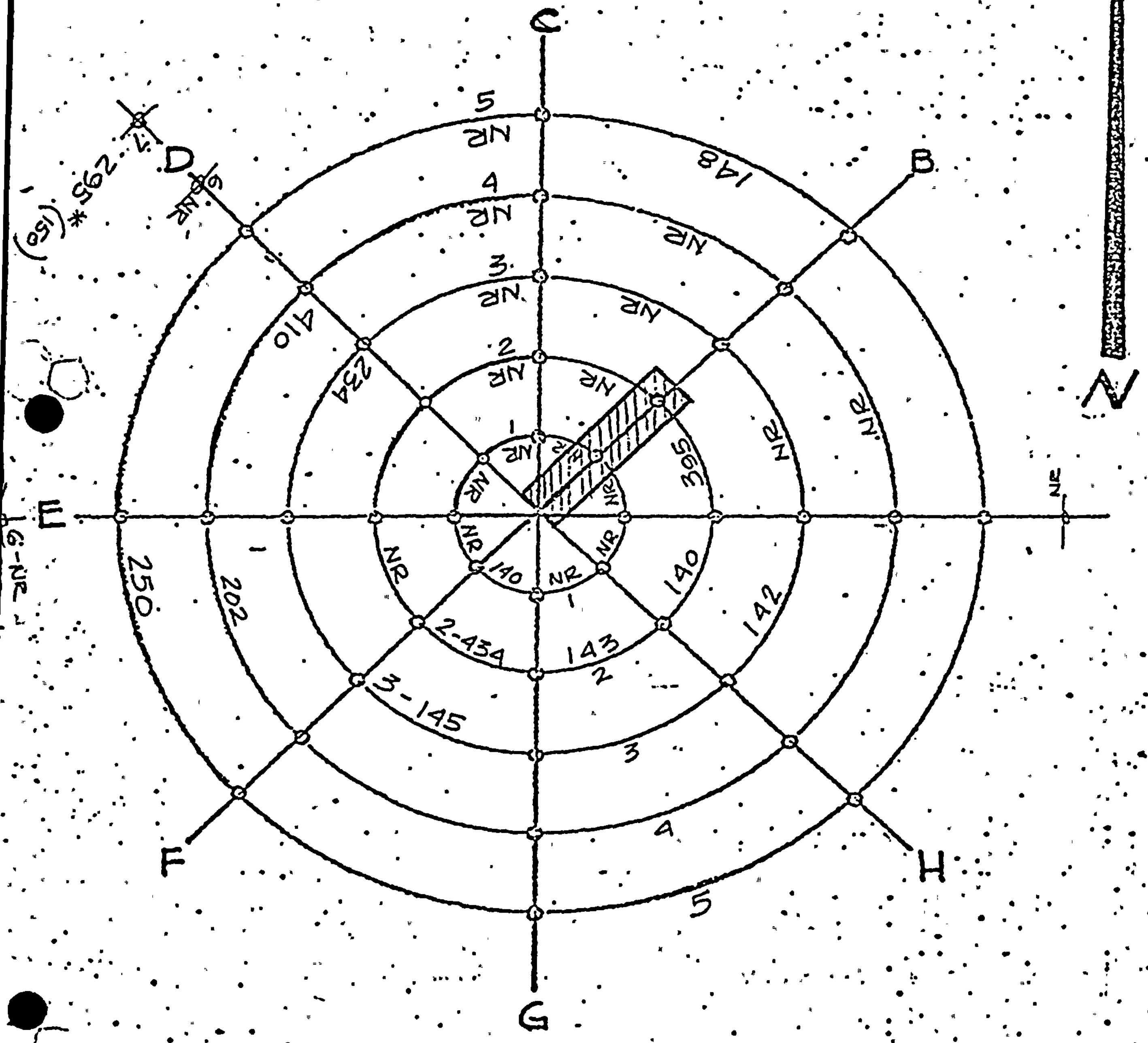
1. Sound hole, 100% penetration in crack twenty inches (20") from top, sonic reading 150 on both sides of hole.

ATTACHMENT #3

FA 8209
Lab #7680
1-24-75

#3

FIGURE 1 - Sketch of the grid used for the soniscope survey. The distance between points is 2 feet.



* PROPERLY ALIGNED READING 295 = 150

ATTACHMENT # 12

August 27, 1975

To: J M Fisher

From: M Weber/J Fotheringham

Subject: ST. LUCIE UNIT NO. 1
RAB ROOF
CUT RE-BARS

Evaluation of the cut re-bars as shown in document No. 1 attached to deviation Report 214 is as follows: Calculations indicate that the roof slab can withstand the design loading with stresses within the allowable limits; provided the soundness of the concrete slab, as determined by field, is satisfactory.

No additional reinforcing should be cut for any reason.

cc: D Fiore

RECEIVED
SEP 2 -
EBASCO SERVICES

	Date	By
Proj. Supt.	9/2	
Con. Supt. (Day)	9/4	JR
Con. Supt. (Nyt)		
Asst. Supt. S&P		
Res. Eng.	9/3	
C. Eng. - Off.		
C. Eng. - Field		
Q. C. Supv.		
Cost Eng.		
Const. Acct.		
Const. Det.		
S Joist 4		
File		

cc: R Torres
A Cutrona
OK