UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-335/85-31 and 50-389/85-31

Licensee: Florida Power and Light Company
9250 West Flagler Street
Miami, FL 33102

Docket Nos.: 50-335 and 50-389 License Nos.: DPR-67 and NPF-16

Facility Name: St. Lucie 1 and 2

Inspection Conducted: December 2-6, 1985

Inspectors: K W VanDyne for 1/6/86
J. B. Macdonald Date Signed

K W VanDyne 1/6/86
K. W. VanDyne Date Signed

Approved by: Frank Jape 1/6/86
F. Jape, Chief, Test Program Section Date Signed
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This routine, announced inspection entailed 34 inspector-hours at the site during normal duty hours, in the areas of operational safety verification, followup of previously identified items and followup of IE Bulletin 84-03.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

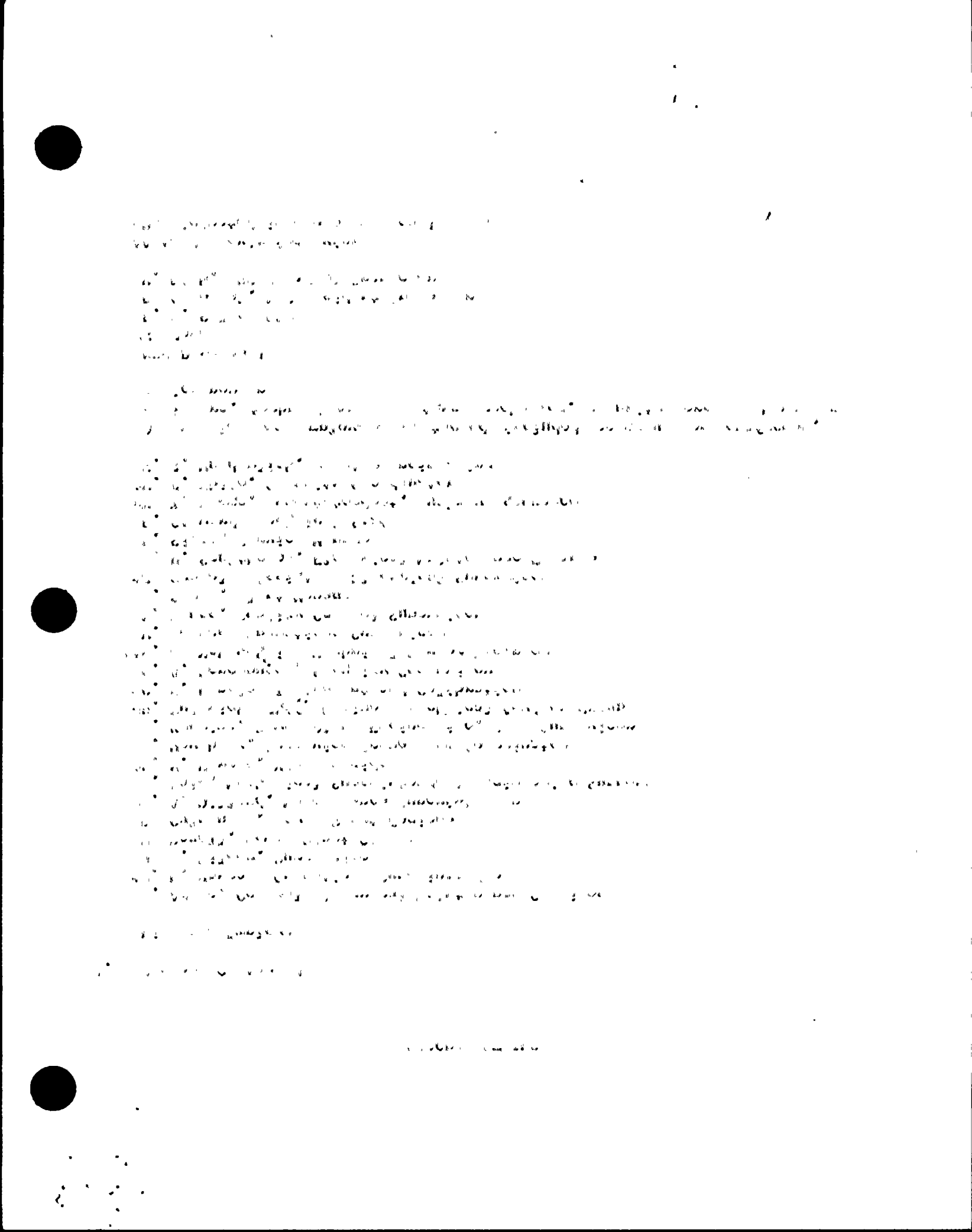
Licensee Employees

R. Adams, General Electrical Maintenance Services
#*J. H. Barrow, Operations Superintendent
*J. O. Bilder, Purchasing
*N. Bozell, Power Plant Stores
D. Culpepper, Power Plant Engineer
*T. A. Dillard, Maintenance Superintendent
S. Hale, Mechanical Superintendent Engineering Support
*K. N. Harris, Vice President
P. Heychock, Inservice Inspection Coordinator
#*J. Krumins, Power Plant Engineering, Site Supervisor
#R. Kulavich, Shift Engineer Technical Advisor Group
*C. F. Leppla, Instrument and Calibration
*G. A. Longhouser, Security Supervisor
#*L. L. McLaughlin, Technical Senior Engineer
#W. Pearce, Operations Supervisor
N. Rouse, Quality Control Supervisor
D. Sager, Plant Manager
*J. Scarola, Assistant Electrical Supervisor
#*B. R. Sculthorpe, Electrical Maintenance Engineer
*R. Sipos, Service Manager
D. Steward, Technical Staff
*N. T. Weems, Superintendent, Quality Assurance
*W. G. White, Security Coordinator
*E. J. Wunderlich, Reactor Engineering

Other licensee employees contacted included construction craftsmen, engineers, technicians, operators, mechanics, security force members, and office personnel.

NRC Personnel
#F. Jape
#D. E. Sells, NRR
R. Crlenjak, NRC Resident Inspector
H. Bibb, NRC Resident Inspector

*Attended exit interview
#Participated in conference call



2. Exit Interview

The inspection scope and findings were summarized on December 6, 1985, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

4. Unresolved Items

Unresolved Items were not identified during this inspection.

5. Operational Safety Verification - Degraded Reactor Coolant Pump Anti-Reverse Rotation Device (71707)

a. Background

The Anti-Reverse Rotation Device (ARRD) on each Allis-Chalmers Reactor Coolant Pump (RCP) motor consists of a stationary ratchet element bolted to the motor frame, and a rotating element keyed to the motor shaft with thirty-six anti-rotational pins and pin retainers. At speeds of less than 100 rpm in the forward direction the pins contact the stationary element and ride up the ramps. At approximately 100 rpm the ramps push the pins into the retainers in the rotating element where centrifugal force will hold them until the RCP speed slows to below 100 rpm. As the RCP coasts down the pins fall and ride along the ramps. When the RCP stops, the pins contact the vertical backstops preventing reverse-rotation. The pins are 1½ inches in diameter and about 5 inches long. They are chromium-molybdenum with a molybdenum sulphide (Fearlon) tip to reduce wear on the stationary element. Refer to figure 1.

During repair of a Unit 2 RCP in September 1985, several of the pins were found to be lodged in the pin retainers. Further investigation revealed that many pins in the other Unit 2 RCP's were lodged in their retainers and many of the pins that fell freely had broken Fearlon tips or other surface defects. The edges of the pins, which lodged in the retainers, had mushroomed out due to metal to metal contact with the stationary element such that they could no longer fall by gravity. The Unit 1 ARRD's were inspected during the present refueling outage and similarly damaged pins were discovered. A summary of the pin damage is shown in Table 1.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

b. Modification and Replacement of Anti-Rotation Pins

All the Unit 2 pins were removed and were replaced with new pins. The outside diameter of the Fearlon tip end had been machined to a new steeper angle of approximately eighteen degrees as illustrated in Figure 2. The modification reduces the outside diameter at the point of anticipated metal to metal contact, reducing the mushrooming effect of the pin edge. The modification was approved by a Seimens-Allis engineer and was documented on Attachment 2 of the modification procedure; PC/M No. 127-285.

The Unit 1 damaged pins were removed and replaced by the modified new pins. Due to the limited availability of pins, the undamaged pins in Unit 1 were removed and machined to the new angle of taper and returned to service in a configuration such that new pins would be placed adjacent to the older pins.

Florida Power and Light (FPL) engineers have been evaluating the pin failures. A sample of eleven pins were tested for hardness, chemistry and tensile strength.

The sample groups and test results are summarized in Table 2.

Additional material and design specification testing is planned as more information becomes available.

c. Summary of Conference Call to Discuss Reportability of ARRD Problem

On December 5, 1985, a conference call was established between the representatives of Region II, NRR and FPL noted in Paragraph 1. FPL stated that the plant staff had evaluated the pin failure and determined the failures were not reportable under 10 CFR 50.72, 10 CFR 50.73 or 10 CFR 21, as FSAR Chapter 5.5.5.? states that only one pin is required to keep the pump from rotating in the reverse direction and that limit was never reached. The NRC representatives concurred with the FPL position and requested that a special report be submitted on the pin failures. FPL agreed to the request for a special report. The report will be forwarded in two parts. Part one, to be submitted by January 15, 1986, will include initial information available about the sequence of events leading to the failure of the pins and corrective actions taken or planned for the failures. Part two, to be submitted sixty days after the next Unit 2 refueling outage is completed, will include an evaluation of the corrective actions taken. Of particular concern to the inspectors was the surveillance period for the pins. The only surveillance required is established by the Allis-Chalmers Technical Manual, which states that the pins must be inspected for wear and replaced, if necessary, after forty hours of low speed operation (0 to 75 rpm). The inspectors believe this surveillance period is inadequate because the pins at St. Lucie reached a high level of

degradation in less than ten hours of low speed operation. Therefore, part two of the special report will also include a new meaningful surveillance period based on the data gathered from testing and corrective actions initiated since the degraded pins were discovered.

The submittal of the special report will be identified as Inspector Followup Item, 335, 389/85-31-01, Submittal of two part special report on ARRD degradation including revised surveillance period.

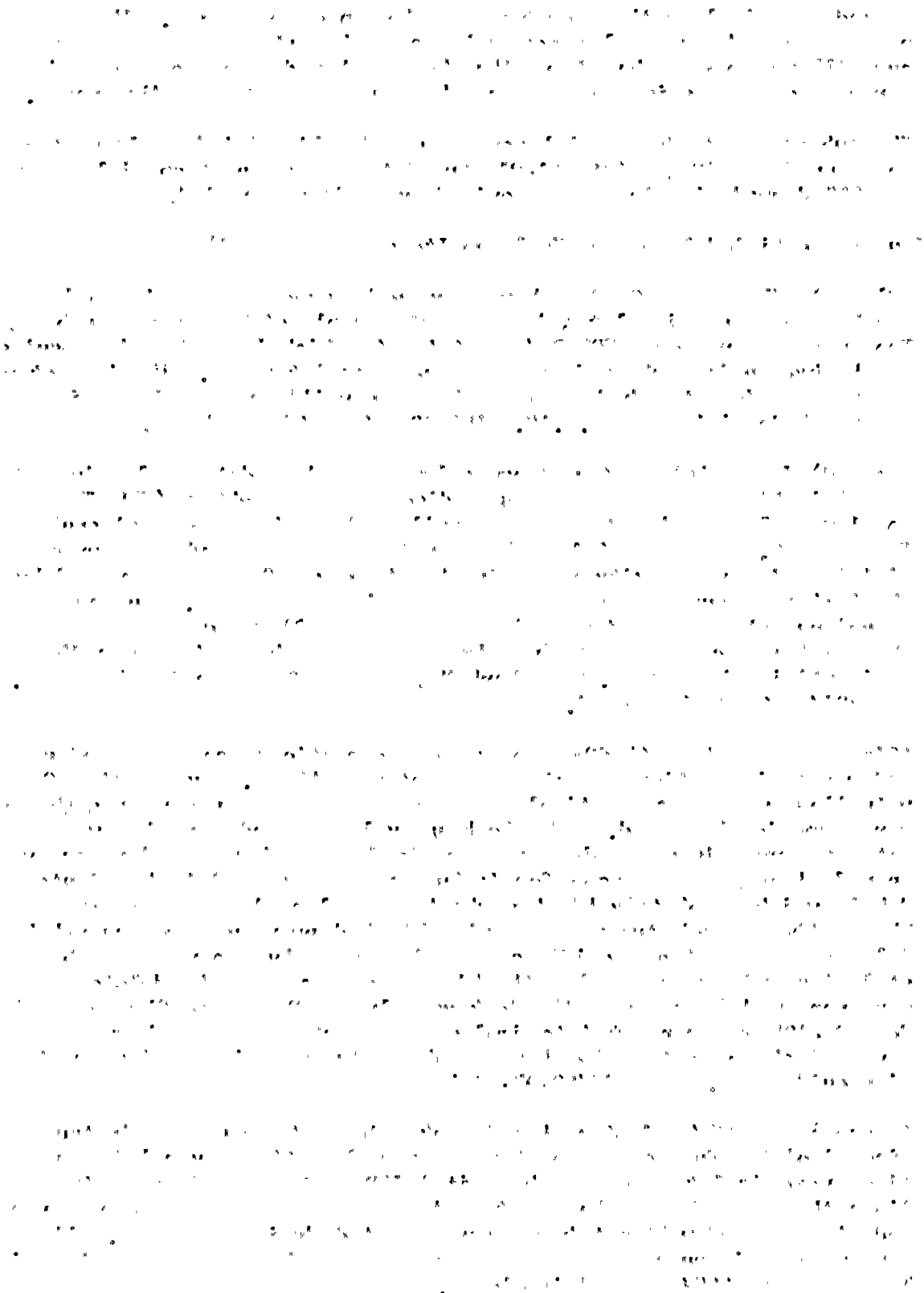
6. Previously Identified Inspector Followup Items (IFI) (92701)

a. (Closed) IFI 335/83-07-01: Verify visual inspection of hydraulic snubbers and functional testing of a 10% sample of hydraulic snubbers. The inspector reviewed FPL PO# 93359-59800B which indicated the results of the hydraulic snubber inspection functional testing. The inspector determined that the hydraulic snubber surveillance complies with Technical Specification 4.5.10. IFI 335/83-07-01 is closed.

b. (Closed) IFI 335/83-07-02: Review factors and conditions leading to identification of the locked-up, disconnected snubber (FPL Tag No. 159). In an FPL letter dated April 2, 1983 the mechanical snubber, Tag No. 159, Mark No. RC-163-11, elevation 35' - 1," which services RCP1A1 Seal lower cavity vent line had been verified disconnected by the Backfit group to install RCP seal injection piping. During the refueling outage a plant modification, PC/M 69-81 was generated to move the snubber location approximately one foot. The snubber was then re-identified by Tag No. 226, Mark No. RC-246-H3, Elevation 36' - 3". IFI 335/83-07-02 is closed.

c. (Closed) IFI 335/83-07-03: Review test conditions, cause of failure and corrective action for steam generator snubbers. During the 1985 refueling outage a statistical sampling of two steam generator snubbers were functional tested. The lock up velocity and capacity were satisfactory. However bleed rate tests indicated zero rod velocity upon lock up. The reason for failure was determined to be minute debris which completely blocked the bleed valve allen screw orifice. The snubber manufacturer, ITT Grinnell, had previously recommended deletion of the bleed orifices for similar lockup valves at other utilities and confirmed that the bleed orifices could be deleted as a permanent modification to the lock up valves. Plant modification PC/M No. 180-185 was generated to implement the change. The inspectors reviewed the procedure for design and safety analysis and implementation guidelines. IFI 335/83-07-03 is closed.

d. (Closed) IFI 335/83-16-01: Local leak rate test results of instrument lines isolated during ILRT performed in April 1983. Several instrument lines were isolated during the Unit 1 ILRT. The portions of these lines that were isolated would be subjected to post-accident pressure and therefore should not have been isolated during the test. The penetrations in question were locally tested. The results are shown in Table 3. IFI 335/83-16-01 is closed.



e. (Open) IFI 389/84-33-01: Change of cavity seal ring pressure value in refueling procedure. Review of Refueling Procedure MWO 1-M-0036 has not yet incorporated the change in seal pressure. The licensee has committed to completing the change by January 15, 1986. IFI 389/84-33-01 remains open.

f. (Closed) IFI 389/84-33-02: Cavity seal ring test analysis. The inspectors reviewed the plant modification PC/M 124-284. The cavity seal ring analysis was verified to be complete. IFI 389/84-33-02 is closed.

7. Licensee Action on IE Bulletins (92703)

(Closed - Unit 1) 84-BU-03 Refueling Cavity Water Seal. The inspectors reviewed the FPL response to IEB 84-03, serial No. L-84-349, dated November 27, 1984.

The design of the St. Lucie reactor cavity seal ring provides a double seal against leakage. The primary seal is created by the seal plate forcing the wedge portion of each seal into the annular gaps. The inner seal wedges between the reactor vessel flange and the inner ring plate on the cavity seal ring. The outer seal wedges between the outer ring plate on the cavity seal ring and the embedment ring on the primary shield wall. After the seals have been installed and the seal plate had been fastened in place and torqued, the seals are inflated. The balloon portion of the seals expands against the sides of each annular gap, to provide a secondary seal for each gap. Because of the primary seal, loss of air to the seal will not result in water leakage around the seal nor contribute to failure of the sealing system.

FPL has analyzed the potential for gross seal failure as occurred at the Haddam Neck Plant on August 21, 1984, and has concluded that gross seal failure is not a credible event at St. Lucie. Testing was performed to determine the equivalent hydrostatic head required to force the seal through a mock-up reactor cavity. The results of the tests for the design configuration indicated that a hydrostatic head equivalent to 274 feet was required (assuming the worst case tolerance, i.e., largest gap, determined by as-built drawings) to cause the seal to fail. Considering the actual hydrostatic head is 26 feet, the seal has a factor of safety greater than 10 for design case. Further testing was performed with silicone lubricants and with the seals deflated (single failure/worst case); a hydrostatic head equivalent to 102 feet was required for seal failure. Even with this worst case/single failure condition, the factor of safety is approximately 4.

FPL concluded, based on the results of the testing, gross failure is not a consideration at the St. Lucie Plant. IEB 84-03 is closed.

TABLE 1

ANTI-REVERSE ROTATION DEVICE PIN DAMAGE

UNIT 1

RCP 1A1

Fourteen pins were lodged in the pin retainers

Many of the remaining pins had damaged Fearlon tips and edges that were beginning to mushroom outward

RCP 1A2

No pins were lodged in the pin retainers

Numerous pins had damaged Fearlon tips and edges that were beginning to mushroom outward

RCP 1B1

Nine pins were lodged in the pin retainers

Almost all remaining pins had broken off Fearlon tips and had edges that mushroomed outward

RCP 1B2

No pins were lodged in the pin retainers

All Fearlon tips and pin edges were in excellent condition

UNIT 2*

RCP 2A1

Thirty-two pins lodged in the pin retainers

RCP 2A2

Twenty-three pins were lodged in the pin retainers

RCP 2B1

Thirty pins were lodged in the pin retainers

TABLE 1

RCP 2B2

No pins were lodged in the pin retainers

* No information was retained on the condition of the pins that fell freely on Unit 2

TABLE 2

ANTI-ROTATION PIN TESTING

GROUP A: Four (4) new pins removed from a spare Siemens-Allis Reactor Cooling Pump Motor.

GROUP B: Two (2) damaged pins removed from Reactor Cooling Pump Motor #2-A2.

GROUP C: Five (5) new replacement pins out of PSL storeroom.

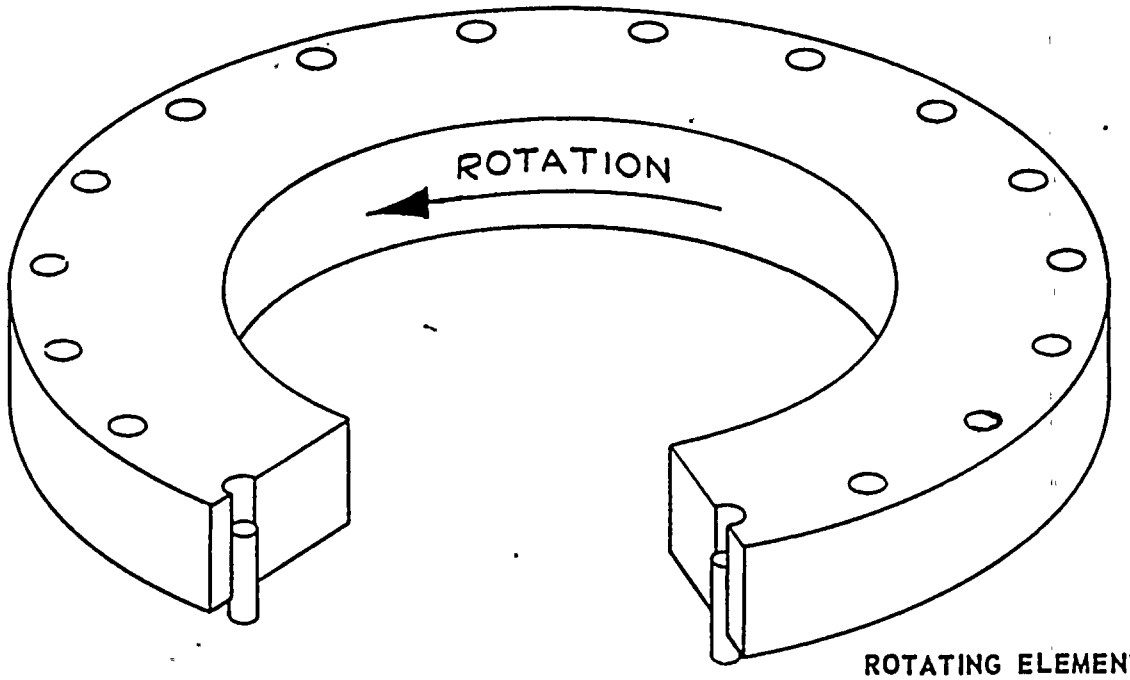
GROUP	HARDNESS EQUOTIP D	HARDNESS ROCKWELL	TENSILE KSI	% Cr.	% Mo.
AI	584	32.0	132	1.08	0.21
AII	599	34.0	138	1.03	0.19
AIII	585	32.0	132	1.03	0.17
AIV	584	32.0	132	1.16	0.13
BI	565	29.0	120	1.05	0.13
BII	571	30.0	124	0.94	0.15
CI	539	25.0	108	0.98	0.15
CII	556	27.5	116	0.94	0.20
CIII	556	27.5	116	0.90	0.15
CIV	530	23.5	104	0.96	0.18
CV	564	29.0	120	0.88	0.17

TABLE 3

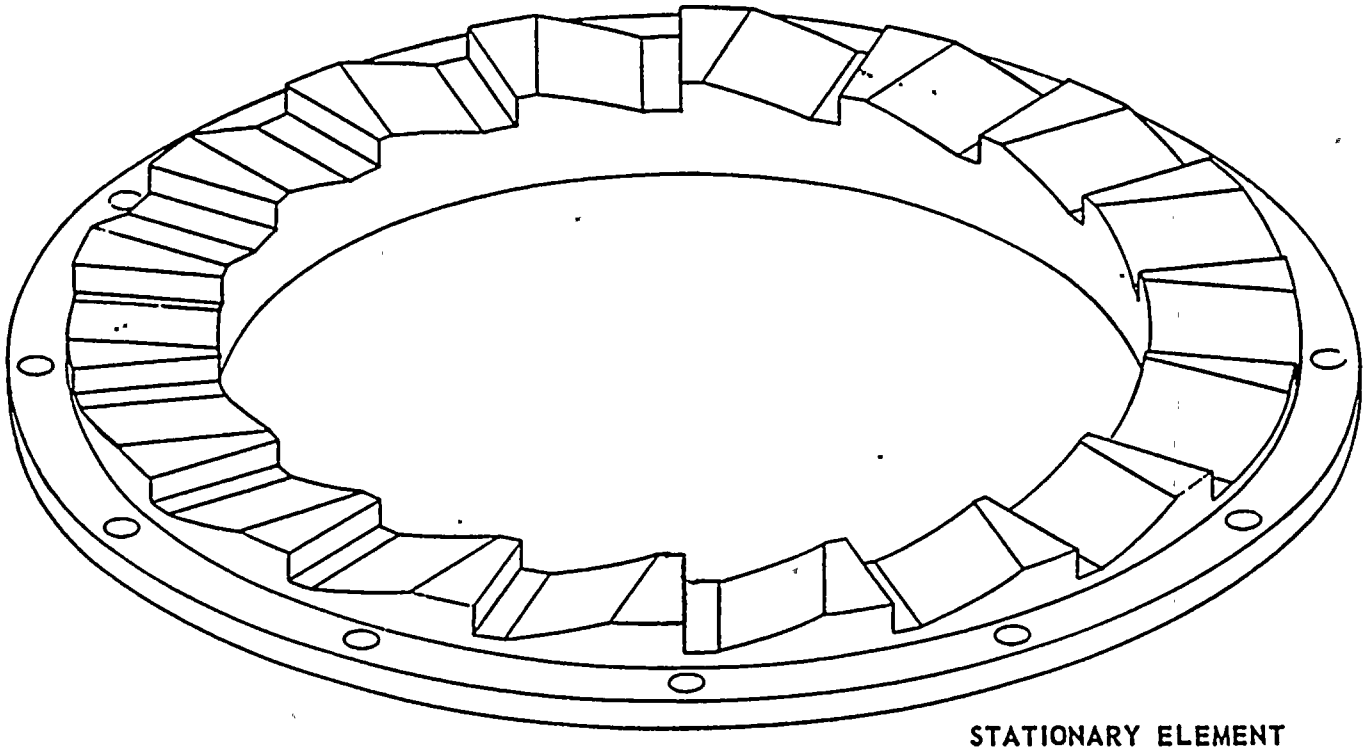
LLRT RESULTS OF CONTAINMENT INSTRUMENTATION PENETRATIONS

Penetration	LEAKAGE RATE (SCM)
45A	4.6
45B	0.0
45C	4.6
53A	2.3
53B	4.6
53C	0.0

Total Leakage = 16.1 sccm = 1.77 x 10-5 La



ROTATING ELEMENT



STATIONARY ELEMENT

FIGURE 1

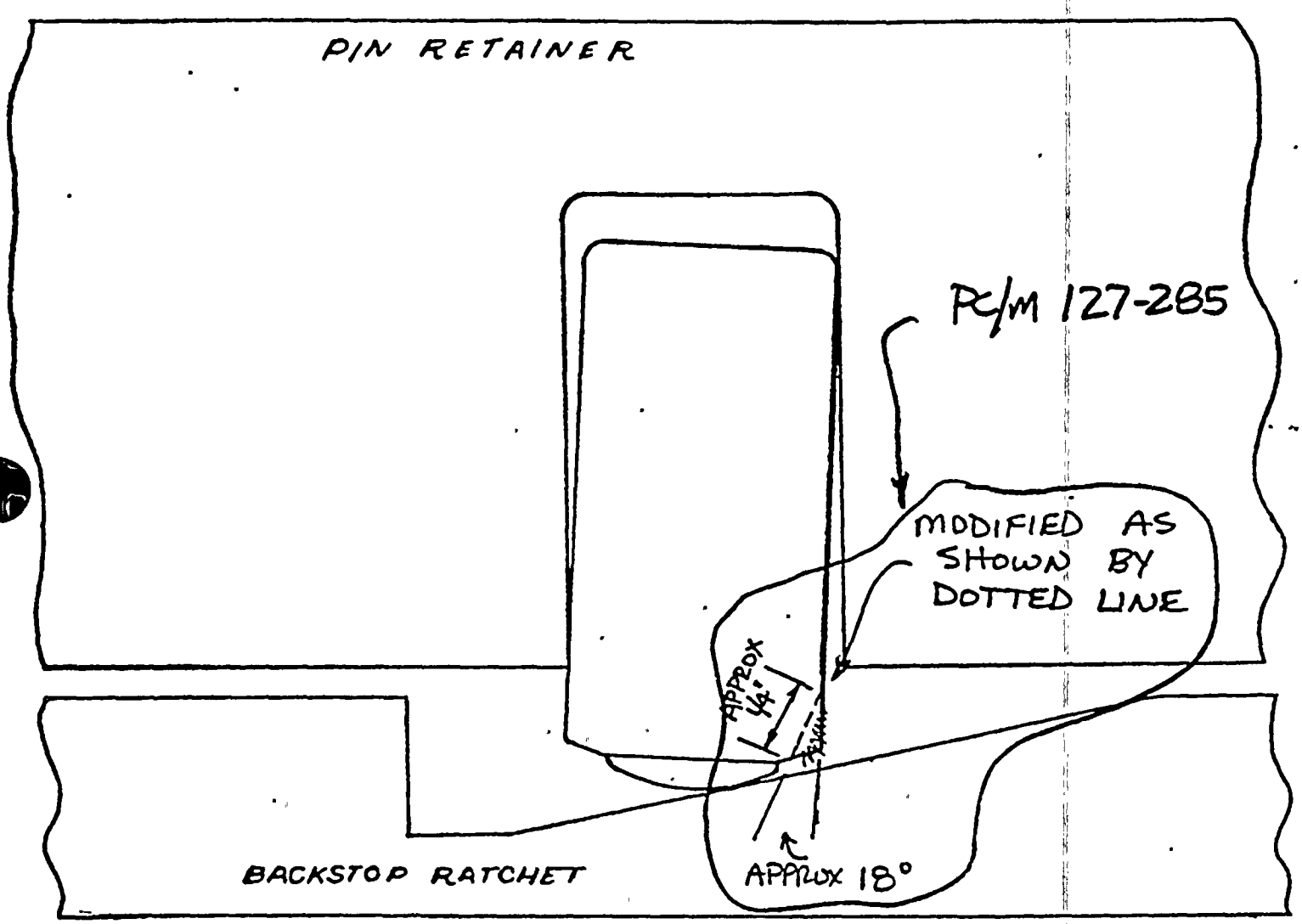

PIN RETAINER
PC/M 127-285
MODIFIED AS SHOWN BY DOTTED LINE
APPROX 1/4"
APPROX 18°
BACKSTOP RATCHET

FIGURE 2