U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-322/85-21

Docket No. 50-322

License No. NPF-19

Licensee: Long Island Lighting Company

175 East Old Country Road

Hicksville, New York 11801

Facility Name: Shoreham Nuclear Power Station

Inspection At: Shoreham, New York

Inspection Conducted: April 9 - May 10, 1985

Prepared by: for H B Kister 8-12-85
E. M. Kelly, Project Engineer date

Reviewed by: for H B Kister 8-12-85
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Approved by: Harry B. Kister 8/12/85
Harry B. Kister, Chief, Projects Branch No. 1 date
Division of Reactor Projects

Summary:

A special inspection by a region-based project engineer (35 hours) of allegations related to the design, inspection and testing of the Shoreham Nuclear Power Station was conducted.

One set of allegaticns were made by a former LILCo Operational Quality Assurance (QDA) inspector, Mr. George Henry, who initially presented eight technical concerns in a January 17, 1985 newspaper article published in the Suffolk Times. Those concerns were the subject of an NRC inspection documented in Report 50-3221/85-10) conducted on January 28-30, 1985. Mr. Henry was interviewed by NRC Region I personnel on February 19 and 27, 1985, to gain further information on his original allegations. Two new concerns (defective emergency sirens and concrete grout repairs) were raised during those interviews. The results of this inspection reaffirmed the preliminary conclusions reached as a result of NRC Inspection 85-10; that, while some of

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the allegations are accurate descriptions of situations or conditions which did occur, no engineering problems or construction defects exist which have not been properly identified and dispositioned by LILCo.

The new concern for emergency siren gear boxes and motor contacts (detail 4.1 of this report) was substantiated, but also found to be previously identified and under correction by LILCo. Valve disc 2208 (detail 5.2) was successfully liquid penetrant-tested, conclusively reaffirming the engineering disposition reached by LILCo in September 1982 that its minor surface defects were not a probable source of crack propagation, and that therefore the disc is a qualified spare part (currently not installed). No unacceptable fuel rod defects (detail 5.1) were identified, although a fretting problem (at corner rod-spacer contact locations) was found to be investigated by LILCo, at its own initiative, in August 1983. The problem, separate from Mr. Henry's alleged "scratches" which he had stated to have observed, was conservatively addressed and properly evaluated by LILCo, and the results of their re-inspections were consistent with similar findings at other nuclear facilities. The "catch basin", alleged to be committed to for an offsite de-contamination trailer, was found (details 5.4) to be most probably confused with a portable, inflatable tank which was unsuccessfully used (and later removed) in 1983 in an attempt to collect water from shower drains. No LILCo commitment or NRC requirement for that tank has ever existed, and as noted in Inspection Report 85-10 precautionary statement have been added to appropriate procedures to minimize the use of water at the decontamination trailer. The emergency drill held on July 7, 1982 (detail 5.5) was found to be a limited exercise of Technical Support Center capabilities, and was the first of its kind to use a pre-planned scenario. There have been more than 100 such training/exercise sessions conducted since, and the alleged errors were relatively minor and corrected with no subsequent recurrences. The July 7, 1982 exercise was found to be well-critiqued, using comprehensive written forms, by the licensee's observers.

Finally, LPL Technical Services contractors utilized as QC inspectors in the licensee's the Operational Quality Assurance (OQA) section were found to be properly certified (in accordance with OQA procedure and ANSI standard N45.2.6). Their involvement in Shoreham quality activities was found (detail 5.6) to be limited, in both scope (preoperational test activities and related repair/rework) and time (essentially a 7-month peak period). From October 1982-April 1983. There were only a total of 12 LPI personnel certified to work in OQA; five of these were referred to by Mr. Henry during the February 1985 NRC interview as being prematurely dismissed by LILCo for being "too strict in enforcing standards". Former LPL employers, LILCo supervisors, and co-workers were interviewed during this inspection - none of those five individuals were available for contact - and no apparent evidence was found which could corroborate Mr. Henry's allegations. These five LPL individuals were appropriately characterized as professional job-shoppers at Shoreham whose employment was short-lived. Their work principally involved maintenance, repair/rework, and observation of preoperational flushing and

housekeeping in a relatively compressed time frame. The details of each of these individuals' termination with LILCo were discussed with their former supervisors and co-workers - no questionable circumstances were found to be involved.

The second set of allegations made by Mr. Ron Stanchfield, initially in a January 25, 1985 newspaper article and later clarified during a February 4, 1985 interview with NRC Region I personnel, were found to be insignificant and unsubstantiated. Courter & Co. training and indoctrination of potential QA/QC personnel was appropriate and in accord with procedures and applicable ANSI standards. It should be noted that Mr. Stanchfield's tenure as an employee of LILCo subcontractors at Shoreham was brief; further, he was never certified as a QC inspector, nor did he ever perform a QC inspection.

## DETAILS

1. Principals Contacted

W. Renz, Offsite Emergency Preparedness Supervisor
L. Britt, Manager, Licensing Division
D. Crocker, Onsite Emergency Preparedness Coordinator
R. Grumseich, Supervisor, Nuclear Licensing
J. Kelly, Quality Assurance Division Manager
A. Muller, Quality Control Division Manager
J. Reilly, Operations Manager (GE)
W. Steiger, Plant Manager
W. Schiffmacher, Manager - Electric System Operations
E. Staudte, QCD Inspector
P. Scannell, Electrical Engineering Division Manager
B. Gelfond, QA Manager, Courter and Co.
J. Arcuri, Manager, Courter and Co.
C. Thurber, Professor of Geophysics, State Univ. at Stonybrook

2. Background

This inspection addresses allegations made by former LILCo quality control inspector George W. Henry. Eight technical concerns raised by Mr. Henry were originally presented in a newspaper article written by Karl Grossman and published in the Suffolk Times on January 21, 1985. An inspection of the allegations was made during January 28-31, 1985, and preliminary findings were documented in Inspection Report No. 50-322/85-10 issued on February 19, 1985. The allegations were further discussed in interviews with the alleger on February 19 and 27, 1985. Two new allegations were presented during those interviews; defective emergency sirens and improper concrete repairs. Mr. Henry was a QC inspector assigned to LILCo's Operational Quality Assurance (OQA) Section from July 1981 until August 15, 1983. He was certified as a Level II mechanical/electrical inspector in accordance with ANSI Standard N45.2.6 on July 27, 1982. Mr. Henry met the minimum requirements for a Level II inspector (science degree and six months related inspection experience) at that time of his certification.

This inspection also addressed allegations made by a former worker at Shoreham, Mr. Ron Stanchfield, originally presented in a January 25, 1985 newspaper article written by Karl Grossman and published in the Riverhead News Review. An interview with Mr. Stanchfield was held on February 4, 1985. Mr. Stanchfield was employed for one month, from January 19 to February 20, 1981, with Courter and Company, a piping contractor at Shoreham. Mr. Stanchfield was a participant in training intended to certify him as a Level II Site Quality Assurance (SQA) Engineer in accordance with ANSI N45.2.6 and Courter QA procedures. Mr. Stanchfield never completed that training and thus was never certified. The scope of his assignment with Courter was to eventually become a document reviewer of piping isometrics and other drawings in support of the site ASME Code N5 program - an

assignment he never performed. Field QC inspection was never intended to be a responsibility of Mr. Stanchfield, nor did he perform any such inspection while employed by Courter and Company. Mr. Stanchfield was employed that same year at Shoreham with an electrical contractor, Comstock and Jackson, on two separate occasions and for a total of about three months (March 23-May 21, and September 22 - November 2, 1981), as an Electrical Designer. His responsibilities involved checking and preparing as-built drawings for field-run electrical conduit. QC inspection of Comstock work was performed by Stone and Webster Field Quality Control (FQC), and Mr. Stanchfield had no involvement in QC inspection.

## 3. Stanchfield Allegations

### 3.1 Inadequate SQA Experience, Training and Examination

Mr. Stanchfield stated that Courter Site Quality Assurance (SQA) personnel being trained to be certified inspectors were: 1) inexperienced; 2) inadequately trained; and, 3) improperly examined. Training classes which were supposed to last an entire day were alleged by Mr. Stanchfield to be shortened to six hours. The training lectures were stated to be boring, lacking "real" instruction and only "fullfilling a requirement", with only a brief question and answer period at the end that was often omitted. The examination was stated by Mr. Stanchfield to be casually conducted and proctored, with reference material (QAP procedures) "at his fingertips" and answers offered to him by certified SQA engineers who were present. Mr. Stanchfield stated that he was led to believe that he was the only one of six or seven candidates to initially pass the examination on the first day - the six or seven were allegedly re-examined and passed the test the next day. Mr. Stanchfield also referred to unspecified SQA personnel who were hired with allegedly falsified resumes.

#### 3.1.1 References

- ANSI Standard N45.2.6 - 1973, Qualifications of inspection, Examination and Testing Personnel.

- Courter QA Procedure 14.1, Qualification and Training of Field QA/QC Personnel (Rev. 1, 5/9/78).

- LILCo Field QA Division Audits of Courter and Co. QA/QC-Training and Personnel Qualifications and Records; FA-702, 758, 831, 861, 921, 955, 1018, 1065, 1111, 1233, 1257, 1327, 1524 and 1700; January 1978-April 1984.

- Courter & Co. Internal Memoranda,
  (Arcuri to Gelfand) dated 2/8/85
  (Gelfand to Arcuri) dated 2/11/85

- Courter and Co. SQA Test Records for R. Stanchfield (Employee No. 2713).

3.1.2 Findings

Mr. Stanchfield was employed for 21 working days with Courter and Company. He was being trained for Level II certification as a drawing reviewer, and was a Courter SQA Engineer. His intended duties would not have involved field inspection, moreover, he never performed either document review or field inspection, while employed at Courter.

Responsible Courter personnel who administered the training program provided the following information. The training program in which Mr. Stanchfield participated was implemented by Courter in accordance with Quality Assurance Procedure (QAP) No. 14.1, and consisted of a series of lectures and presentations, and periodic meetings as the job would progress, to explain and detail specific job requirements. Principal topics included the QA Manual, ASME Code, and various contract specifications. As a candidate for ANSI Level II certification, Mr. Stanchfield was hired based on previous experience in a similar capacity. His training and indoctrination were designed not so much to teach, but to "familiarize an already able practitioner".

LILCo Field Quality Assurance conducted twelve audits of the Courter & Company Training and Personnel Qualification and Records program during the period January 1978 thru April 1984. The results of these audits were reviewed and discussed with the Manager of the LILCo Field QA Field Division responsible for their conduct. The audits were regularly conducted, findings were clearly documented and followed up with appropriate corrective action, and the audits generally found Courter indoctrination and training programs to be satisfactory.

Attendance sheets for training sessions were requested to be filed, along with lecture plans and schedules, and corresponding examination results. The training sessions attended by Mr. Stanchfield were reviewed and discussed with the LILCo FQA Manager. These included the following five sessions:

| Date/Times | Personnel in Attendance | Subject (QA Procedures) |
|---|---|---|
| January 22, 1981 | | |
| (9-10:30AM) | 9 | NQA-1, 2 and 14 |
| (3:30-4:30PM) | 7 | QAP 10.1-10.6 |
| January 23, 1981 | | |
| (8-9:30AM) | 7 | Material Controls |

| | | |
|---|---|---|
| (1:30-4:30PM) | 7 | QAP 10.1-10.6 |
| January 26, 1981 | | |
| (8:00AM-4:30PM) | 6 | NW-100 ASME Welding Procedures |

The results of three separate tests taken (and passed) by Mr. Stanchfield were also reviewed:

| Date | Subject | Questions | Grade |
|---|---|---|---|
| 1/27/81 | Nuclear Welding | 50 | 86 |
| 1/28/81 | QA Procedures | 100 | 82 |
| 1/28/81 | QAP-Section 10 | | |
| | Part 1 | 65 | 83 |
| | Part 2 | 15 | 80 |
| | Part 3 | 20 | 90 |

Mr. Stanchfield also had a certified eye test dated February 3, 1981, as part of his personnel file. An individual who took the same lectures and tests as Mr. Stanchfield was contacted. This individual passed these tests the first time, and was certified as a Level II SQA inspector. He indicated that the lectures were somewhat boring at times, and that the sessions were usually terminated (before scheduled times) when there would be no more material to cover or questions to be asked. The tests were administered in a temporary building (the "Change House"), and no one to his knowledge cheated - no QAPs were opened nor were any answers proffered by SQA engineers.

3.1.3 Conclusion

No cheating was found to be practiced during the testing, and although the lecture sessions were characterized by one individual as somewhat "boring" at times and occasionally not lasting for the full expected period, they fulfilled the licensee's commitments outlined in Courter QA procedures and ANSI Standard N45.2.6 for the qualification of QA/QC personnel.

The training sessions were intended to familiarize Courter personnel with appropriate QA/QC field procedures and ASME Code requirements, for their eventual certification as inspectors in accordance with the ANSI standard. Level II personnel are required by that standard to have previous experience and training in the performance of required inspections of "power plant, nuclear plant, heavy industrial, or other similar equipment or facilities". That level of capability was inferred from education and experience which demonstrated that the person could competently perform a particular task. Certification at Shoreham was supported by indoctrination of Courter personnel

with the technical objectives of their job. The training sessions attended by the alleger met those objectives.

The examinations taken by the alleger demonstrated a knowledge of necessary Code requirements and Courter procedures. The same examinations were also taken by an individual interviewed during this inspection; that individual passed the first time, and observed no cheating or profferring of exam answers. The examinations fulfilled a learning objective, which was not to memorize the Code or QAPs but rather, to know where they were and how to refer to them. An open book exam, (while never practiced) was at one time considered to be implemented by Courter, and would have been an appropriate training measure. Courter QA/QC personnel were expected to consult the QAPs in the field and, when a question arose, were to find and refer to that procedure (rather than invoke them from memory). If an individual would fail an exam, he or she would have been retrained and examined again.

The alleger could not provide any names of individuals who had been hired and certified by LILCo as Courter SQA personnel, and who allegedly had falsified resumes Discussions with Courter management did not identify any instances of certified personnel who were known to have falsified their resumes and no evidence of falsified resumes was found during the course of this inspection.

In summary, certification to ANSI Level I and II of Shoreham Q&C personnel with previous education and technical experience was appropriately conducted in accord with Courter QA procedures. Indoctrination did consist, in part, of a walk-through of procedures and the qualifying tests were one step in that process. On-the-job training and, later on, performance monitoring of QC personnel, were a continuance of that program. The alleger however never reached that stage, since he worked less than one month and never performed QA/QC inspection work for Courter.

3.2 Earthquake Tremors Felt in Reactor Building

Mr. Stanchfield allegedly felt a..."strong quivering and a sudden jerk, like something had fallen" while at grade elevation in the Reactor Building on October 21, 1981. A LILCo press release the next day described an earthquake with an "epicenter in the middle of Long Island" whose tremors were felt on site, but stressed to be not felt in the reactor building. Mr. Stanchfield characterized the LILCo press release to be "a lie", in that allegedly it was generally agreed that most people on site had felt the tremors. Further, Mr. Stanchfield alleged that following the earthquake, he noticed a " sizeable flood of water (i.e. more than a garden hose) pouring down a westerly construction staircase". While Mr. Stanchfield could not

firmly associate a connection between the cause of the alleged flood and the earthquake, he decided to resign after reading the press release and "weighing all the other things that were going on at Shoreham". Upon handing in his written resignation, Mr. Stauchfield stated that soon after, "I was fired".

3.2.1. References

- LILCo Press Release dated October 21, 1981
- Newsday Article by Dallas Gatewood dated 10/22/81
- Shoreham System Description 1020.655; Seismic Monitoring

3.2.2 Findings

An earthquake measuring 3.5 on the Richter scale occurred at 12:49 pm on Wednesday, October 21, 1981, which was centered in Long Island Sound about 10 miles northwest of Greensport, L.I., (due south of Madison, Connecticut). Measurable tremors lasted for three minutes on a seismograph at the State University at Stony Brook, and were strong enough to be reportedly felt for about five seconds. The quake affected eastern Long Island and parts of Connecticut, the strongest effects being felt in Suffolk County, Long Island. Similar to an earthquake recorded in 1937 at Glen Cove, the quake was reported to be the strongest on Long Island in a hundred years. The peak magnitude of October 21, 1981 was well below that at which significant damage can occur (5-6 Richter), and was approximately 900 times below the intensity of the earthquake which the Shoreham plant is designed to withstand (5.5 Richter). No major damage or injuries were reportedly associated with the October 1981 earthquake.

The LILCo press release was issued on the same day as the quake, and stated that:

> None of the tremor from today's quake was felt in the reactor building at Shoreham. Moreover, workers located in temporary buildings on site reported feeling the tremor.

A number of individuals were asked during this inspection if they were in the the reactor building at the time of the quake and remembered feeling it. No one who was in the Reactor Building at the time of the earthquake could be located to corroborate the alleger's experience. .

The Shoreham Station is designed to withstand an earthquake of Richter scale 5.5 magnitude, equivalent to a maximum potential ground acceleration of 0.2 g. This is well above (by approximately three orders of magnitude) the measured readings experienced in October 1981. A seismic monitoring system has since been installed to monitor and record such events. The

system utilizes tri-axial, time-history accelerometers positioned for three locations: 1) Reactor Building floor mat elevation 8-ft; 2) primary containment wall elevation 60-ft.; and, 3) a free-field reading.

The system monitors and records seismic input motion and subsequent plant behavior. The system is triggered or actuated upon ground acceleration above 0.01g, and would've most-likely recorded the motions associated with the October 1981 tremor. An alarm is activated in the main control room at ground acceleration at or above 0.1g. No data recorded from the October 1981 earthquake were available, since the monitoring system was not yet required operable at Shoreham. The system was officially required to be put into operation on December 7, 1984, when a low power operating license was issued.

During the interview with Mr. Stanchfield he stated that the flood of water that he said he observed was actually the day after the earthquake. The alleged "flood" of water down a Reactor Building staircase could not be corroborated. At the time of the earthquake, the plant was 80% or more completed in construction, and there was considerable activity in the areas of system turnover (from UNICO construction to LILCo Startup staff) and initial preoperational testing. Both of these milestones involved extensive system flushing for cleanliness and test requirements, and as such necessitated extensive demineralized water usage. No instances of "sizeable" water leakage or piping ruptures could be identified as having occurred in October 1981.

3.2.3 Conclusion

Shoreham is approximately 20 miles from the estimated epicenter of the October 1981 earthquake. The quake measured 3.5 on the Richter scale (equivalent to a Modified Mercali IV classification) and it's tremors were capable of being felt on site but incapable of causing (and in fact did not cause) any major damage.

Whether or not the tremors were felt inside of the Reactor Building is academic. Although none of the individuals contacted during this inspection could corroborate the alleged description of the earthquake, and the LILCo press release issued on the same day did state that none of the tremor was felt in the Reactor Building, its conceivable that it could've been felt, especially at higher elevations. However, the time (shortly after noon time) and duration (five seconds) coupled with the massive construction characteristics of the Reactor Building make it equally likely that only a few individuals would've felt the tremors inside the building. Given the slight nature of the quake, and the level of seismic design inherent in

Shoreham's Reactor Building, its improbable that any damage could've been incurred. No evidence of any recorded damage at Shoreham could be found. Further, considering the state of activity at Shoreham in the Fall of 1981, especially since the alleged water flooding was observed on the following day, the source (if any) of the water on the steps would've been most likely due to system piping flushes.

The alleger was employed as an electrical designer with the Shoreham electrical subcontractor, Comstock and Jackson, at the time of the earthquake. He was terminated on November 2, 1981 - two weeks after the earthquake. No evidence of any plant construction or test problems, either identified by the alleger or associated with the earthquake, was found during this inspection.

## 3.3 Cable Tray As-Built Location

Discrepancies between the locations depicted on drawings and actual field conditions were alleged to be found by Mr. Stanchfield for electrical cable tray conduit and supports. These alleged conditions were found sometime in the period September-October 1981, during the alleger's tenure as a "designer" with the Shoreham electrical subcontractor, Comstock and Jackson. The problems were alleged to have been brought to the attention of a supervisor who discouraged or rejected Mr. Stanchfield's findings. The alleged discrepancies were stated to be located outside of the Reactor Building, in the Turbine Building, at ceiling elevation. No instances were specified, other than generally stated as-built discrepancies. These allegedly exist for such differences, from "a small to a great (i.e. in feet) degree", between designer drawing and actual physical locations.

### 3.3.1 Findings

Mr. Stanchfield was employed for a total of three months with Comstock and Jackson as an electrical designer, responsible for the development of as-built drawings for field-run, small branches of electrical conduit and raceway. Comstock did not have a QC staff and Mr. Stanchfield was not a participant in any quality assurance activity during his employment. The work of documenting as-built tray location was a construction task, and was subject to later verification by Stone & Webster QA/QC surveillance.

Mr. Stanchfield's employment with Comstock occurred on two separate occasions. The second occasion, during which his alleged problems occurred lasted 40 calendar days from September 22 to November 2, 1981.

3.3.2 Conclusion

Transcripts of the February 4, 1985, NRC Region I interview with Mr. Stanchfield indicate a personality conflict between himself and his immediate supervisor at Comstock during his last five weeks at Shoreham. The short time and nature of his duties were such that no significant configuration control problems (if they existed) could've possibly been involved. Further, any such potential problems would not have gone undetected since later QC verification and as-built programs were devoted to electrical cable tray, including significant attention as part of the ASLB hearings (see NRC Inspection Report 83-18 published 2/6/83). This allegation is therefore considered to be unsubstantiated, and warrants no further inspection.

4. Henry Allegations-New

Two additional allegations were made by Mr. Henry during the February 19 and 27, 1985 interviews conducted by NRC Region I representatives. These were not described in the January 17, 1985 newspaper article, nor were they evaluated by the NRC as part of Inspection 50-322/85-10.

4.1 Emergency Siren Design Deficiencies

Mr. Henry stated that technicians who had installed the emergency sirens in Suffolk County used to alert an evacuation situation were allegedly concerned that the amperage contact for the motors were underrated by twice their capacity. Also alleged was a problem with the coupling of the motor (rated at 3500 rpm) and a reduction gear (rated at 1700 rpm). Mr. Henry's stated concerns were that the gear box would allegedly "rip itself loose", and that the motor contacts would "burn away".

4.1.1 References

-- March 7 and 25, 1985 Letters to LILCo from Alerting Communicators of America (P. Enstrom to J. Minto).

-- April 8, 1985 Letter to Alerting Communicators of America from Regal-Beloit Corporation (D. Spitzenberger to P. Enstrom).

-- ACA Penetrator-10 Rotating Directional Siren; Installation, Operation, Maintenance and Parts Manual; Procedure EOM-70028.

-- February 21, 1985 LILCo Letter (SNRC-1151) to NRC (J. Leonard to H. Denton); Prompt Notification System Design Report.

4.1.2 Findings

The Shoreham Prompt Notification System (PNS) is designed to provide alerting signal and instructional message to Suffolk County areas within the 10-mile plume exposure emergency planning zone. One means, other than the emergency broadcasting network to notify the public is via the siren-generated signals from 89 fixed sirens geographically located to provide 100% population coverage. The sirens are manufactured by the Alerting Communicators of America (ACA); 77 of these are 125 decibel (dB) "Penetrator-10" rotating sirens, and 12 are 115dB "Banshee" omni-directional sirens. The sirens produce a primary single tone warning of 440 hertz, and are radio-controlled and activated from three locations. The mounting heights are 60-70 feet above ground.

Testing and maintenance for the sirens is described in Appendix M to the Design Report, and is regularly conducted in accordance with Maintenance Procedure EOM-70028. Silent tests every two weeks, quarterly "growl" tests, semi-annual inspections, and annual preventive maintenance are conducted for all sirens, in addition to an annual system-wide test in conjunction, when possible, with the annual emergency preparedness exercise. The quarterly "growl" test consists of a short (less than 3 seconds) activation or "bump" of the motor. The sirens were installed in May-June 1982, and the first (and only) system-wide operating test was performed on May 25, 1983 (2 sirens failed). The regular maintenance test program was begun following that test, and has been continued to-date, although no future annual exercise has been scheduled.

The Penetrator-10 siren is driven by a 15 horsepower motor made by the Baldor Electric Company and rated at 3450 rpm. The motor also drives a gear-reducer which rotates the entire siren/motor/reducer assembly at approximately 3 rpm for 360-degree directional coverage. The motor draws 53 Amps continuous running current. The "lock-rotor" or surge current associated with starting the motor and overcoming the inertia of a siren assembly is 5 to 6 times that amount or approximately 250 Amps.

The gear-reducer is a Flexaline Model BM 1133-60 with a 60 to 1 speed ratio. This reduces the motor's speed to 3450/60 or 57.5 rpm to drive a 10-tooth sprocket which is in mesh with a 60-inch #35 chain with 180 links. This results in a 3.2 rpm frame rotation. The manufacturer of the gear reducer, Grove Gear Division of Regal-Beloit Corp., tested this assembly and certified it for 18.9 foot-pounds output torque in accordance with accepted conservative practice. This rating ensures that the ACA Penetrator siren can be started and maintained operable. ACA tests of their siren indicate that 9 to 11 foot-pounds of

breaking torque and 5 foot-pounds of continuous torque are actually required. The nameplate data on the Flexaline 1133-60 indicate a nominal "1750 rpm input"; however, certification from the manufacturer in the form of letters to LILCo dated March 7 and April 8, 1985 indicate that the gearbox is properly sized for its application on ACA Penetrator 10 sirens.

During routine maintenance and test by LILCo Overhead Lines personnel in October-November 1984, four sirens were found to have contacts that were pitted. The licensee surmised that this problem was due to the momentary "bump" of the motor during regular growl testing, which prematurely interrupts the start current across the motor contacts. The pitting is expected to be eliminated by replacement with larger NEMA size 3 contacts which have a greater continuous full load current rating of 90 Amps, and therefore a larger capacity for surge currents on the order of 500 Amps.

The original (still installed) contacts are NEMA size 2, manufactured by Siemens-Allis (catalog No. AN21P) and nominally rated for 45 continuous amps and a maximum 7½ HP. While the motor/sirens experience an infrequent short-duty cycle (4 starts, total of 4 minutes operation annually), the existing NEMA 2 contacts are considered to be slightly undersized and this is exhibited by the observed pitting. A siren randomly selected and inspected during the course of this inspection also was found to have pitted contacts (see Figuure 1 at end of report).

The pitting is in large part due to the practice of "bumping" the motor, and the subsequent opening of the contacts while the larger surge current is still present. Newer NEMA size 3 contacts manufactured by Furnas (Cat. No. 14 HP108745U) with larger current-carrying capacity have been ordered and are planned to be installed within the next year in conjunction with new ground line indication. The practice of "bumping" a motor is being re-evaluated and will most probably be discontinued. No failures have been experienced with these sirens because of contact problems. Further pitting would not result in a siren failure to sound; rather, the contact would fuse and fail closed, "freezing" the motor on until a 3-minute timer would shut off the siren.

4.1.3 Conclusion

The Flexaline gear-reducer is properly sized for application to the ACA Penetrator 10 siren. The nameplate data on the gear box indicate an input rating of 1750 rpm; however, this is only nominal, and the combination of 60 to 1 reducer and sprocket/chain result in transmitting the 3450 rpm motor speed into a 3.2 rpm frame rotation. The gear-reducer is capable of supplying

the required output torque to start and maintain siren operation, with considerable (70-100%) design margin. No gear box failures have been experienced to-date, nor would it be expected to "tear itself loose".

The existing motor contacts are apparently slightly undersized, and most are expected to have already experienced some pitting due to momentarily "bumping" the motor to test electrical continuity (without actually subjecting nearby populations to siren sounding). The pitting was substantiated during examination of a siren as part of this inspection, as well as from the four failures observed in October-November 1984. The licensee identified this problem, and has proposed a solution of discontinuing motor "bumping" and eventual replacement of all motor contacts with larger size contacts. The observed problem would not have prevented siren operation at any time, and would have been eventually detected by the licensee's regular maintenance and test program. The contacts were only slightly under-rated, and not by "twice their capacity", as alleged. The larger contacts should be installed prior to the as-yet unscheduled full-scale emergency exercise.

4.2 Inadequate Concrete Grouting

Mr. Henry stated that honeycombs occurred in "cementing" that was being "replaced or repaired" which were "just as bad as the cement that was being cracked out". The defects were alleged to be "merely trowelled over with a veneer layer of concrete", and allegedly "laughed off as...though they disappeared". A specific instance alleged to exist was an area in the steam tunnel at a large foundation, "like a footing for a pipe support". The information was allegedly provided to Mr. Henry by Stone & Webster QC construction inspectors during the beginning of 1982. Another alleged instance involved grouting being performed on the HPCI pedestal in the Reactor Building. The epoxy grout being used was questioned by Mr. Henry as to its proper mixing and constituency, although he was not involved in the construction activity or QC inspection of the work. Mr. Henry stated that the source of these admitted "rumors" regarding concrete grouting was a Stone & Webster QC inspector named "Allan".

4.2.1 References

-- Shoreham Drawing Nos. M-10410 and 11-7; Main Steam Piping Plans, Reactor and Turbine Buildings

-- QC Inspection Reports for HPCI;
Pump Foundation Grouting (3/22/76)
Turbine Foundation Grouting (3/23/76)

-- Shoreham Drawing No. M-10923-8; Reactor Building Equipment Foundation Details, Elevation 8'-0".

4.2.2 Findings

The HPCI pump and turbine pedestals were poured, equipment installed, and skids grouted in the period March 1975-March 1976. The poured concrete pedestals were 22-32 inches thick, and 7 feet wide by 28 feet long. Following the cure of the foundation, the turbine and pump skids were landed and mounted, and a 1½-inch layer of grout was poured. The grout was an approved mixture, and grouting was observed by QC inspection with test conditions documented. That grout is for cosmetic purposes, and also serves to keep moisture from under the equipment skids and acts as a vibration dampener.

The HPCI skids and pedestals were inspected for later grouting (after March 1976) which would've been conducted under the Repair/Rework system because of spalled concrete caused by the heat of welding associated with support base plate work. Two spots were observed where spalled concrete had been grout-repaired. Surface conditions were observed to be smoothly finished, with no irregularities or crevices and no obvious defects or evidence of honeycombs.

The entire length of main steam piping, from the MSIVs to the Turbine stop valves, was walked-down and examined by the NRC inspector inside of the steam tunnel (See Figure 2 at end of report). Approximately 50 pipe supports were evaluated; 40 incorporating embed plates. Roughly half of these were observed to have evidence of grouted concrete at the periphery of the embed plate which was indicative of previously spalled concrete. The following supports were further examined, along with associated documentation (in the form of QC non-conformances or N&Ds) for grout repair:

| Support Number | N&D | Date |
|---|---|---|
| PRR-101 thru 104 | 4903 | 6/1/82 |
| PRR-121 & 122 | 4903 | 6/1/82 |
| PSSP-807/809 | 1780 | 5/25/78 |
| PSST-160 | 2016 | 3/21/82 |

None of these supports were found to be inappropriately dispositioned or repaired. No uncorrected spalled concrete was observed on these or any other supports that employ embedded baseplates within the steam tunnel. All findings were based on visual examinations.

4.2.3 Conclusion

No QC inspector named "Allan" was known to be employed by S&W as a QC inspector. Evidence of areas where spalled concrete had been grout-repaired was found on the HPCI pedestal, and at selected support baseplate inside the steam tunnel. These repairs were QC inspected and properly documented. Visual inspection found these areas to be smoothly finished, with no obvious disconuities or uncorrected/unrepaired conditions. No further inspection is warranted (i.e. destructive examination or concrete/support removal) based upon these findings. The grout repairs are principally a cosmetic repair, with some significance for proper bearing, vibration dampening and moisture barrier.

5. Henry Allegations-Follow-up

Follow-up of allegations which were originally addressed in NRC Inspection Report No. 50-322/85-10 is contained in the paragraphs which follow.

5.1 Fuel Rod Defects

Interviews were conducted with two other QC inspectors (other than those contacted as part of Inspection 85-10) involved with new fuel receipt inspections in August 1982. No new instances, other than LDR-1588 regarding fretting (in excess of .003 inches) on a single rod at two spots, were identified. The re-inspection of 53 fuel bundles was conducted on August 18-20, 1983, in accordance with approved procedure TP58.703.01 to inspect for corner rod fretting which may have occurred during transportation of the fuel to Shoreham. Each bundle sampled was de-channelled, and a special tool was used to raise two of the four corner rods (A8 and H8) above the seven spacer dimple locations where the fretting was suspected to occur. A scratch depth gauge was used which had a minimum sensitivity of detection of 0.0005 inches in depth. Scratches of depths less than 0.003 inches were considered by GE to be unreportable and therefore acceptable surface defects. Of the 53 bundles reinspected in August 1983, 16 rods were recorded as having scratches less than the reportable criterion, and on order of 0.001 inches deep. These were not, however, considered to represent any material or structural problems.

The cladding on the Shoreham Fuel rods is nominally 0.032 inches thick; the GE criterion for an acceptable surface defect was about 10% of the clad thickness. Fuel assemblies contain 8x8 arrays with 62 fuel rods. Considering the 14 spots of interest on each of the 53 sample bundles re-inspected, application of the statistical methodology of MIL Standard-105D with an acceptable quality level (AQL) of 0.25% defects dictated a sample size of 50 assembles. The

findings - 2 rejectable instances out of 743 locations of interest - were within the AQL.

Fretting of the corner rod in fuel bundle assemblies has been observed at a number of facilities and is believed to have occurred during shipping of the bundles in a horizontal position. Based on our review this issue received satisfactory disposition by LILCo. This issue does not appear to be the condition alleged by Mr. Henry, but the condition alleged by Mr. Henry could not be corroborated.

5.2 Velan Check Valve

Valve disc serial number 2208 was liquid penetrant (LP)-tested on March 11, 1985 in the presence of an NRC inspector (See Figures 3 and 4 at end of report). LP was performed at the two locations of interest, with no relevant indications found. Attached is a copy of a LILCo LP Examination Report, including a sketch of the valve disc. The subject disc is a 24-inch diameter carbon steel base material with a stellite seating surface overlay.

The acceptable LP re-affirmed previous engineering evaluations by both Velan and LILCo of the two minor groundouts located just inside (and off) of the raised stellite seating surface. The original Velan inspection traveller was dispositioned accepted 'as-is' on August 4, 1982. The two grind outs were originally measured as: (1) 0.155 inches deep, 0.450 inches round; and (2) 0.150 inches deep, 0.400 inches wide and 1.75 inches long (see Figure 5 at end of report).

Acceptable LP testing confirmed no surface indications of cracks, following the hard facing repair of this testable check valve flapper by GE in July 1982. The alleger's rejection of the repaired disc on August 24, 1982 (LDR-0781) was presumably based principally on ASME Code Subsection NB-2539.3, "Blending of Repaired Areas", which requires uniform blending of the repaired surface into the surrounding surface. This criterion was satisfied, although the two minor grindouts did exist. Stellite welding and repair is considered to be a difficult and tedious materials process, and is in part a reason for the existence of the surface defects.

The alleger's rejectable disposition sat, unchanged, for over eight months, even though Stone & Webster site engineering accepted the valve as-is, with LILCo Startup concurrence, in September 1982. Finally, in response to a Startup memorandum on April 13, 1983, and in an attempt to clear this issue from the Master Punch List (a consideration for fuel load), OQA personnel other than the alleger dispositioned LDR-0781 as accepted, and closed the issue on April 26, 1983.

It can be concluded from the results of the LP testing that no crack exist, associated with the two minor ground-outs on disc 2208, which would propagate and result in valve failure. The disc is currently not installed, but is a qualified spare part for the 24-inch air-operated check valves in the LPCI system which form part of the critical high-low pressure interface between reactor coolant and ECCS systems. The valve disc sat, unnecessarily, on the MPL for eight months until OQA dispositioned the grindouts, as acceptable On April 26, 1983. This conclusion was re-affirmed nearly two years later, during conduct of this inspection.

5.3 HPCI MOV-049 Stroke Time

An acceptable stroke time for this valve of 18.7 second for in service testing, and 36 seconds for containment isolation, was previously justified as documented in Inspection Report 85-10 (detail 3.5).

Mr. Henry expressed a general comment that systems were preoperationally tested with existing known and/or uncorrected deficiencies which allegedly "invalidate the test". The HPCI preoperational test is an example of a system being appropriately accepted by plant staff, even though all test deficiencies were not closed out. HPCI was initially tested as a system in May-June 1982, with a total of 24 test exceptions opened (two of which involved MOV-049). The system, after extensive rework, was again preoperationally tested during February-April 1983. The system was returned to normal on April 5, 1983 with a total of nine test exceptions invoked. One significant example of an exception to a test performance criterion involved the development of full design flow of 4350 gpm. Only 3900 gpm could be developed since Auxiliary Boiler steam at 100 psig was used (in lieu of reactor steam) as a HPCI turbine motive force. Full flow testing will be verified during the Power Ascention Program as part of Startup Test STP-15, and the test discrepancy appropriately resolved at that time.

Therefore, preoperational approval of the HPCI system prior to resolution of an acceptable stroke time for MOV-049, did not represent either an "invalidated" test or a "write-off" of the system, as alleged. Rather, it represented the appropriate and reasonable conduct of an extensive preoperational test program which will be carried on through the power ascention startup test phase of Shoreham as a prerequisite to eventual full power commercial operation.

5.4 Vehicle Decontamination Area

Further research of informal records and correspondence associated with the Wildwood Substation-Decontamination Trailer indicate that the trailer arrived at Shoreham on April 22, 1983 and was scheduled to be

completed by June 1, 1983. An internal memorandum (Bob Teetz to Stan Penkos), dated April 22, 1983 and addressed to LILCo Substation Maintenance-Hicksville, delineated the day-to-day contact as Mr. Bob Mandell of Stone & Webster. The memorandum also delineated an attached list of 11 items to be completed by LILCo Riverhead Sub-maintenance personnel. Item number 6 described the original intention to provide a plastic inflatable "pillow" tank of 5000 gallon capacity to collect trailer drains. The tank was installed, tested (unsuccessfully), and subsequently removed sometime in the summer of 1983. The item read as follows:

> Install existing precut PVC drain pipe and make connection to pillow tank to be located adjacent to south side of trailer. (Advise if pump will be required to utilize the tank. If so, please specify and install as needed). 5000 gallon tank.

Discussion with R. Mandell of S&W indicated that there were difficulties in establishing the tank as operable, even with a drain pump, since the shower heads could not provide enough water to properly inflate the tank. The pillow tank is most probably the alleged "fiberglass catch basin". The tank was intended to collect drains from the two showers installed inside of the trailer (note that the showers incorporate fiberglass bottoms). No commitment was ever made to the NRC, nor is there any regulatory requirement, regarding this inflatable tank. Appropriate procedural changes have been incorporated for use of the trailer to minimize and control/contain any liquids generated.

5.5 Emergency Drill Plane Plotting

The July 7, 1982 drill (number 11) was the first to activate the TSC; Mr. Henry participated as a "Communicator" in the TSC, involving relaying phone information. A number of detailed "Drill Observer Critique Reports", prepared by each observer, were reviewed. Each report contained about 30 questions, to be circled either satisfactory or unsatisfactory, as well as allowance for detailed comments. One observer's comments (R. Rossin) did mention that no announcement in the TSC of wind shift was made during the drill - an ommission slated to be "crucial to the Dispatcher". These critique sheets were found to pose the proper questions to, and allow for detailed comments from, drill observers. A summary of the drill is attached with this report.

5.6 LPL QC Inspectors

Detail 3.8 of NRC Inspection Report 50-322/85-10 described the preliminary findings associated with Mr. Henry's allegation that contract QC personnel provided to LILCo OQA from LPL Technical

Services were dismissed because of being "too strict on standards". That inspection confirmed later statements made by Mr. Henry during the February 27, 1985 NRC interview that there occurred a turnover of about a dozen (LPL) inspectors in a 12-month period. Inspection Report 85-10 verified the certification of 12 LPL contractors as OQA inspectors during the period April 1982-April 1984. Also, the maximum number of LPL/OQA personnel on-site and employed at any one time during that period was six, and their average residence time was approximately two months. Their principal assignments were involved with peripheral preoperational testing activities, such as: material/warehouse receipt, repair/rework, and maintenance inspections. At no time were these contractors involved in construction inspections, and at all times their work was subject to evaluation and approval by senior LILCo supervision. Therefore, these individuals were accurately characterized as "professional job shoppers...of brief or short-lived" tenure at Shoreham, as alleged by Mr. Henry.

During the February 27, 1985 interview of Mr. Henry by NRC Region I personnel, further information and more detailed allegations were made. Specifically, five former LPL contractors were named as examples of individuals allegedly dismissed for being strict on standards. Mr. Henry alleged that these individuals were dismissed or resigned anticipating dismissal from LILCo OQA.

Discussions were held during this inspection with the following personnel:

A. Muller - Supervisor of OQA Section in 1982-83
T. Rose - Former QA/QC Engineer in OQA
J. Curliss - LPL Regional Manager
D. Pietronski - QC Inspector, OQA
R. Purcell - LILCo Startup Manager in 1983

No evidence of dismissal of any LPL contractors for the alleged reason was found. Regarding the five LPL contractors named by Mr. Henry in the February 27, 1985 interview, their personnel files were reviewed and concluded to be in order, in accordance with OQA Procedure (QAP) S-02.3 and with proper certification and training documentation present. This group of five individuals worked in OQA during the period September 1982-April 1983, with an average residence time of 4-5 months each. Review of the time cards for three of these five verified typical responsibilities as repair/rework and material receipt inspectors, and maintenance observation. The primary OQA involvement with actual preoperational testing was a Cleanliness Area Verification Report, to assure cleanliness requirements of Startup Instruction No. 5 were maintained. Participation in quality activities during employment at Shoreham must be therefore concluded as minimal. In discussions

with the LPL Regional Manager he indicated that he was not aware of any LPL contractors being dismissed by LILCo because they were too strict in enforcing standards.

Inspection of personnel files for LPL contract employees did not reveal anyone performing work for which they were not certified.

The results of this followup inspection, including discussions with the principals noted above, do not change the preliminary conclusion of inspection 85-10; no further inspection of this area is warranted.

## 6.0 Exit Interviews

The findings of this inspection were discussed with LILCo representatives during exit interviews on April 12 and May 10, 1985. No written material was provided to licensee representatives during the course of this inspection, and material lpresented (including pictures and documents) was determined to not contain proprietary information which would require witholding in accordance with 10 CFR Part 2.790.

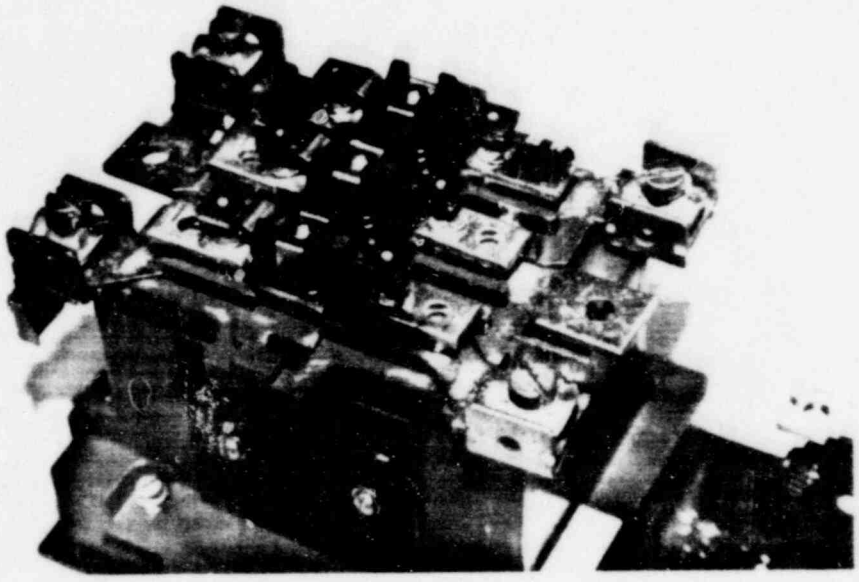

Figure 1: Emergency siren contacts that have experienced pitting.

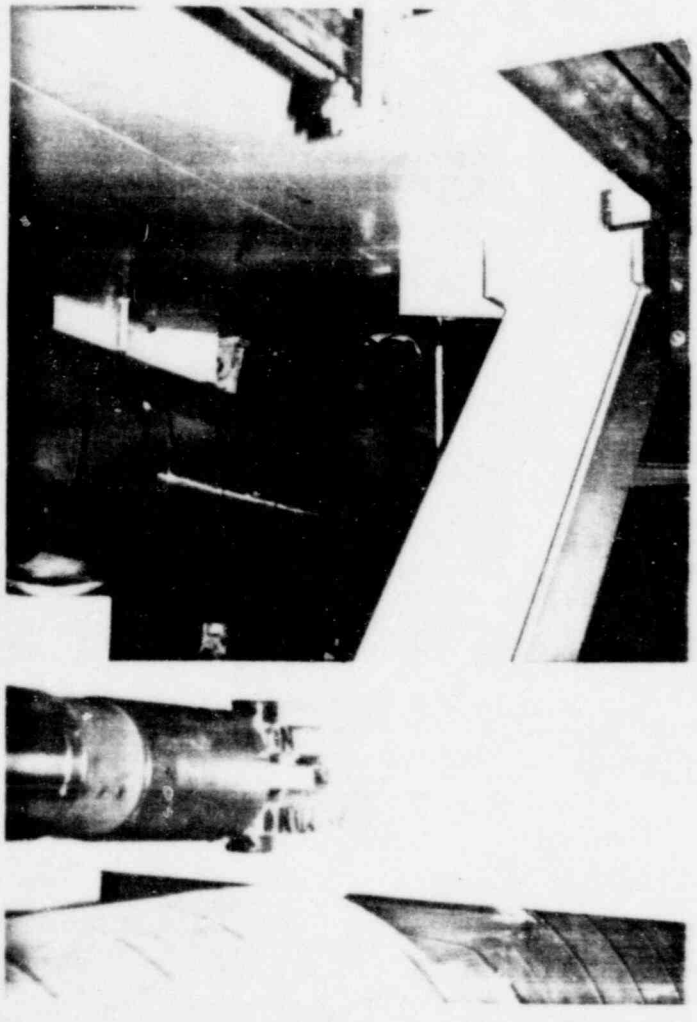

Figure 2: NRC inspector examining concrete/grouting in main steam line tunnel.

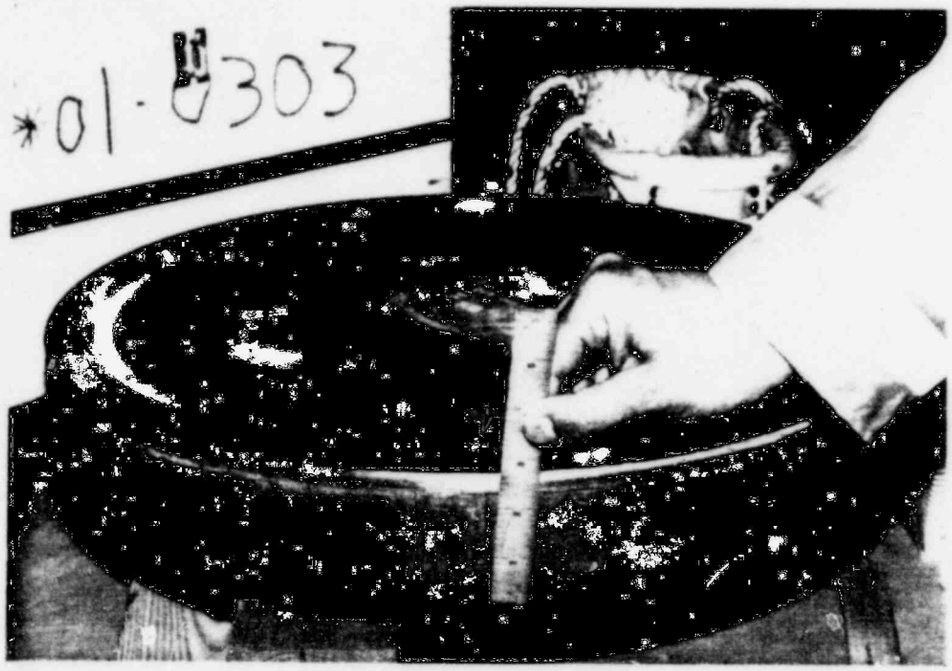


Figure 3: Low pressure coolant injection 24 inch diameter check valve disc (serial number 2208).


Figure 4: NRC inspector examining valve disc just prior to liquid penetrant examination.

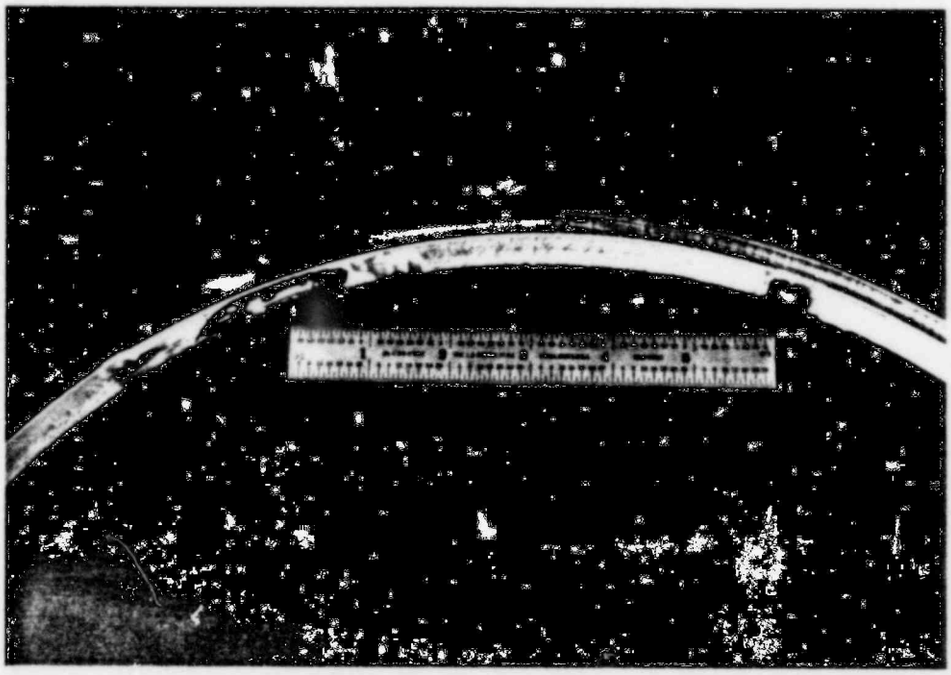

Figure 5: Grind outs in low pressure coolant injection system check valve disc.