PSE&G

Public Service Electric and Gas Company P.O. Box L Hancocks Bridge, New Jersey 08038
Hope Creek Operations

November 13, 1987

Mr. Hal Ornstein
Office of Analysis and Evaluation of Operating Data
United States Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Ornstein,

Enclosed is the report which you requested on the General Electric findings regarding the damaged solenoids from the Hope Creek MSIV which failed to close on February 24, 1987. This event was reported in LER 87-018-00 and LER 87-018-01.

If you need further information regarding this event, please contact me at 609/339-5239.

Respectfully,

Ann Ervin

Ann M. Ervin
LER Coordinator
Technical Department
Hope Creek

AME

Attachment

c W. H. Schell

B/61

RETURN TO FILE J. Gurdero

GENERAL ELECTRIC

NUCLEAR ENERGY BUSINESS OPERATIONS
GENERAL ELECTRIC COMPANY • 175 CURTNER AVENUE • SAN JOSE, CALIFORNIA 95125

Manager - Nuclear Systems Eng - Hope Creek

Noted by M-NSE

MC 395, (408) 925-3580

May 7, 1987
Responds to: N/A

GP-87-032

Mr. R. Drewnowski
c/o Supervisor - Work Center (12-ME)
Public Service Electric & Gas Co.
P.O. Box A
Hancocks Bridge, NJ 08038

Dear Mr. Drewnowski:

SUBJECT: HOPE CREEK PROJECT
Malfunction of Main Steam Isolation Valve
F022A

Earlier this year a problem was experienced with the MSIV F022A. PSE&G forwarded the parts from the solenoids for this valve to General Electric for our investigation.

Enclosed with this letter is our report regarding our findings.

Cause of Failure

The cause of failure appears to have been the accidental inclusion of a foreign material, probably a loose seal, in the solenoid cavity between the plunger and the upper orifice. Consequently the plunger for the solenoid was prevented from completing its magnetic metal to metal flux path. The plunger for the solenoid probably oscillated at full power at 60 to 120 cycles per second, drawing in-rush current and bringing the temperature of the solenoid up to 200°F thereby carbonizing the foreign material lodged between the plunger and its stop. Additional associated damage was caused by this condition within the solenoid. It appears that this was a unique occurrence. The vendor records since 1972 only show one other occurrence of a similar nature in the early 1970's.

Corrective Action

These solenoids were modified at the Hope Creek site. However, the Automatic Valve Corporation is incorporating some corrective actions to assure that shop supplied solenoids will not encounter a similar problem in the future. The quality assurance procedures to monitor and prevent these kinds of problems will be revised at Automatic Valve and submitted to General Electric for our approval. In addition, a functional air test and electrical current test will be added to the valve shop procedure to verify the integrity of the solenoid plunger magnetic circuit.

We recommend that two actions be undertaken by PSE&G:

1. The spanner wrenches provided with the solenoids should be used for assembly or disassembly of the solenoids instead of vice grips. We realize in this instance you probably were not planning on salvaging the solenoid parts so vice grips were used as a matter of expediency.

2. Inner-surfaces of the solenoid have oil residue and carbonized lubricant. We recommend that your air supply be checked for possible oil inclusion.

3. We recommend that you continue to monitor solenoid current on a periodic basis.

We believe that the attached information adequately answers the questions regarding failure of this valve solenoid. If after reading the report you have additional questions, please let me know.

Sincerely,

J. C. Larrew
Project Manager
Hope Creek Project

JCL:ch/attachment

cc: T. Giordano
R. S. Salvesen

HOPE CREEK, MALFUNCTION OF MSIV FO22A

1.0 DISCOVERY OF PROBLEM

In February, 1987, Hope Creek identified a problem with MSIV FO22A at least two days prior to a recent plant shutdown. It was noticed that the ammeter for the solenoid valves on FO22A valve was reading 300 ma (full scale). A local reading was taken and it was found to be 400 ma. The vendor (Automatic Valve Co.) stated that the normal reading should be 210 to 250 ma. At that time the solenoid valves were tested and no problems were identified with the valve other than the high solenoid current.

During plant shutdown the FO22A MSIV failed to close. After plant shutdown the solenoid valves for FO22A were disassembled and a foreign plunger was reported found in the solenoid which had previously malfunctioned (SV #1). The plunger from this solenoid valve was covered with a black deposit. The valve body along with the plungers and solenoids were sent to GE for evaluations to determine why the malfunction happened.

2.0 SUMMARY OF FINDINGS

GE has examined the plungers and solenoids and sent them to the solenoid valve vendor for additional evaluations. Conclusions from these evaluations are as outlined below.

These solenoid valves were originally supplied with DC solenoid coils but were later replaced with AC solenoids by Automatic Valve Co.

The circumstances indicate that the cause of the failure was due to some foreign object being lodged in the cavity between the plunger and the upper orifice. This would cause the plunger to oscillate and to hammer with significant upward force, pulverizing the foreign object and plugging the upper orifice with the debris. This oscillation would also cause the solenoid to draw more current. It appears that the impacting of the plunger must also have dislodged and pulverized the copper shading ring which is there to prevent oscillation of the plunger. The end of the plunger was deformed from the impact with the upper orifice such that it shortened the plunger and changed its appearance. It appears that it is a standard plunger misshapen by the impacting. When the valve was tested two days prior to shutdown this orifice was most likely already plugged.

It appears that this is a one of a kind occurrence since vendor records since 1972 do not show any other such occurrence.

3.0 RESULTS OF EXAMINATIONS

3.1 Visual Examinations

FO22A Valve The plunger from SV #1 was shorter than other plungers (1.210" versus 1.275") and the spring length was also shorter (0.710" versus 0.725 to 0.790), Figure 5. The plunger showed a heavy wear pattern, Figure 6. The front end of the plunger was dished to approximately 0.85" deep. The normal configuration is flat with no dish. The tail end of the plunger was coated with a dark foreign material. The plunger housing was plugged solid at the tail end, Figure 7. Some wear marks were also present on one other plunger from FO22A. The third plunger was bright with no wear marks. Some oil deposits were noted on the Viton seats.

FO22B Valve One of the plungers had a light wear pattern while the other two were bright. There were heavy oil deposits on the Viton seat areas. There was also some dark debris on the tail end of one of the plungers.

FO22C Valve All three of the plungers had light wear patterns. There were heavy oil deposits on all the Viton seat areas. There was debris on the tail end of two of the plungers.

FO22D Valve There was moderate wear on one of the plungers. There was heavy oil deposits on most Viton seats. One of the plungers had heavy dark debris on the tail end.

FO28A Valve These solenoid valve plungers were very similar in appearance to the FO22 valves except that all of the plungers were of the correct length. There was oil on the Viton seats and dark debris on the tail end of some.

OTHER VISUAL OBSERVATIONS

It was noted that the wiring insulation for all three solenoids of FO22A valve was broken where the wire joined the solenoid, Figure 3. It appeared that the process of potting the coil could have caused the insulation to fracture and peel. There was no evidence of shorting but the wires were bare for approximately 3/4 inch.

There were some of the solenoid plunger bodies which were crimped, one of which was crimped badly enough to potentially freeze the plunger. This crimping appeared to be from use of pliers to remove the tubes from the body of the valve.

3.2 CHEMICAL ANALYSIS

A chemical analysis was performed on the black debris from the solenoid valve aluminum body in the No 1 hole, Figure 1. The analysis showed the black deposit was composed of approximately 50% carbon and 50% metal or metal oxides. The major metals present were iron, chrome and copper (43.9%, 14.4% and 15.5% respectively)

3.3 SEM/EDX EXAMINATIONS

Scanning electron microscope (SEM) revealed a typical wear pattern for a soft material, Figure 6. EDX analyses showed the plunger material to be an iron-chrome alloy. The analyses also showed some contaminants of aluminum, sulfur, chlorine, and calcium present, Figure 9.

Hardness measurements of the plunger gave a hardness of RB82 in the unworn area and RB75 in the worn area. This is extremely soft for a martensitic stainless steel which means that it is in the fully annealed condition or it is a non hardenable grade.

G R Hanson 5/7/87

G.R. HANSON

PRINCIPAL ENGINEER

PLANT AND FUELS MATERIALS

APPLICATION

HPCR1.TXT

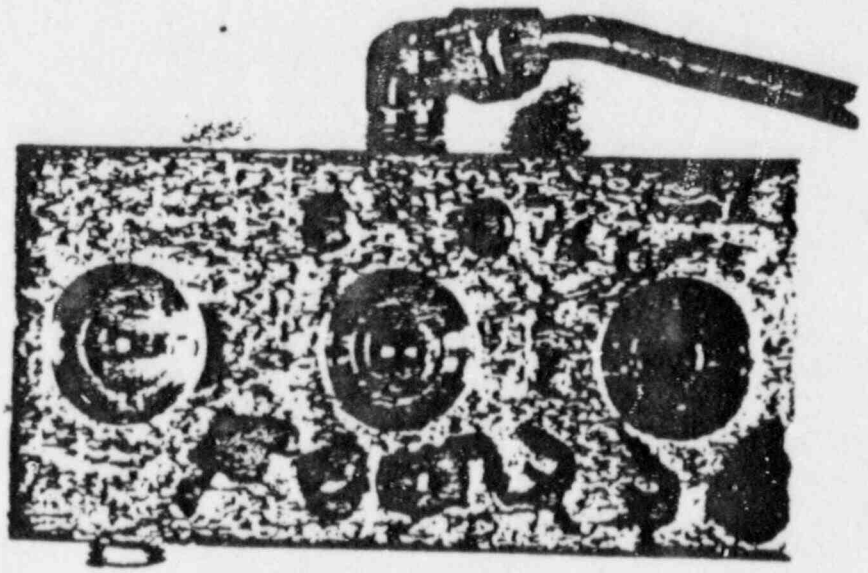


Figure 1. Solenoid Valve Base Showing Some Dark Deposits in the Hole on the Right.

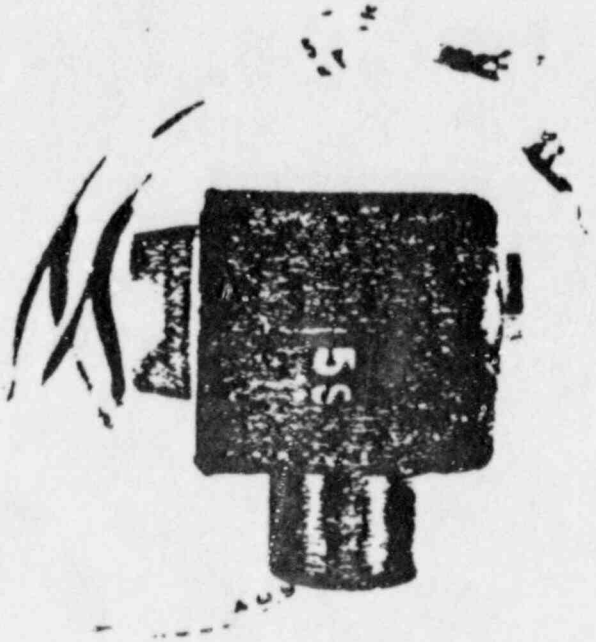


Figure 2. Solenoid, Overall View

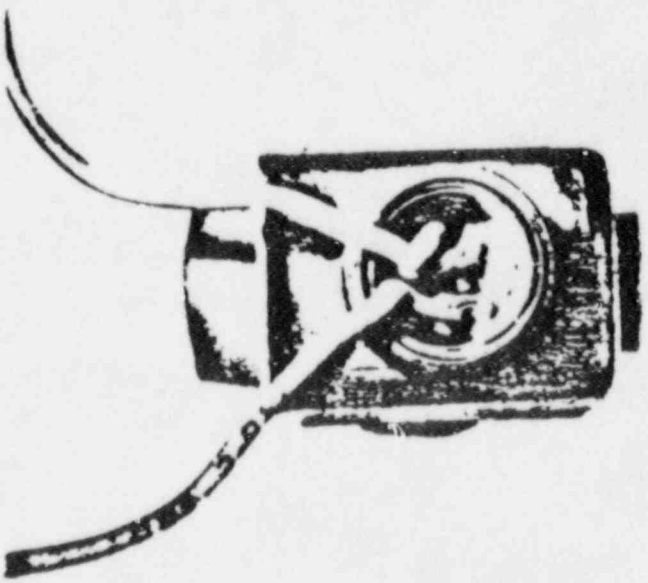


Figure 3. Solenoid Showing Damaged insulation

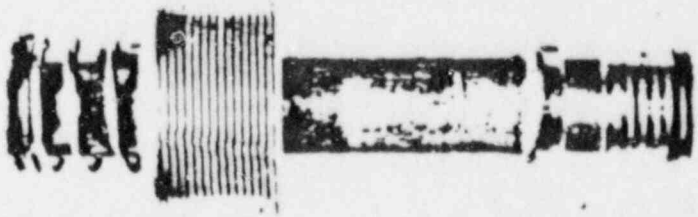


Figure 4. Plunger and Plunger Housing, FO22A, SV#1

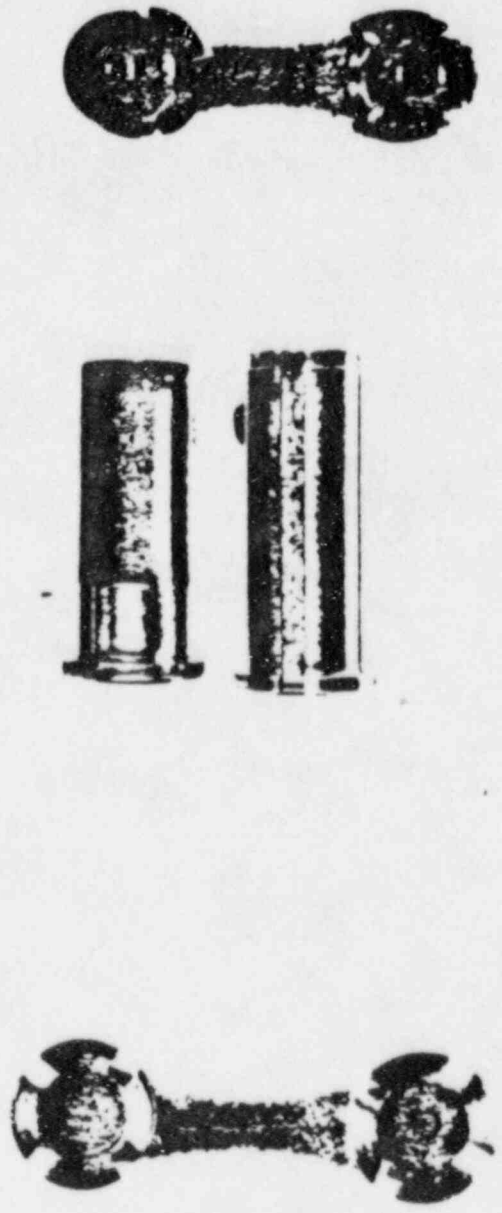


Figure 5. Damaged Plunger (Left) Compared with Standard Plunger (Right)

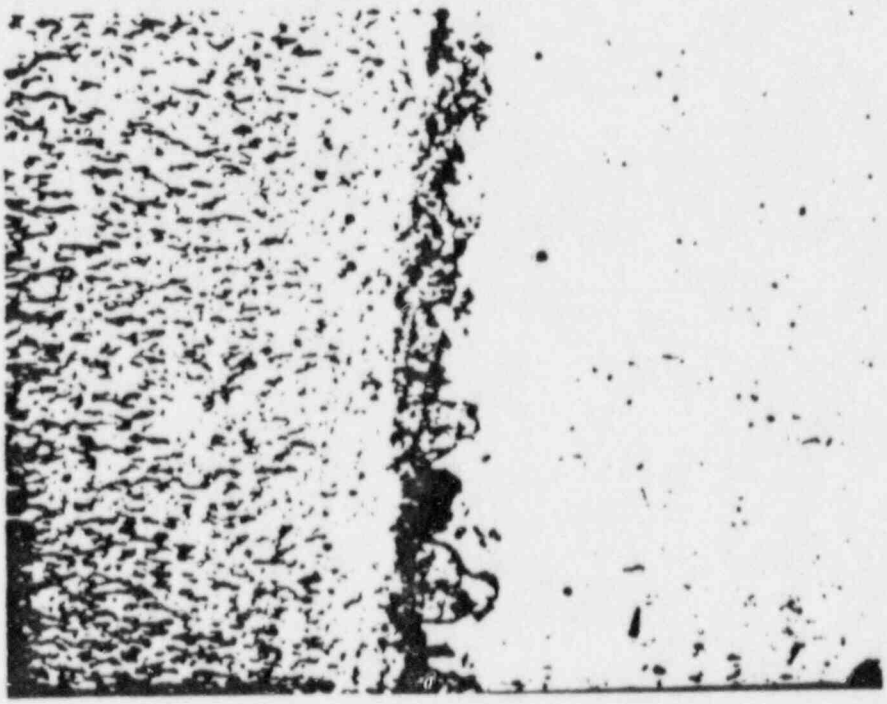


Figure 6. Surface Appearance of Damaged Plunger. Worn Surface is on the Left, 35X, SEM.

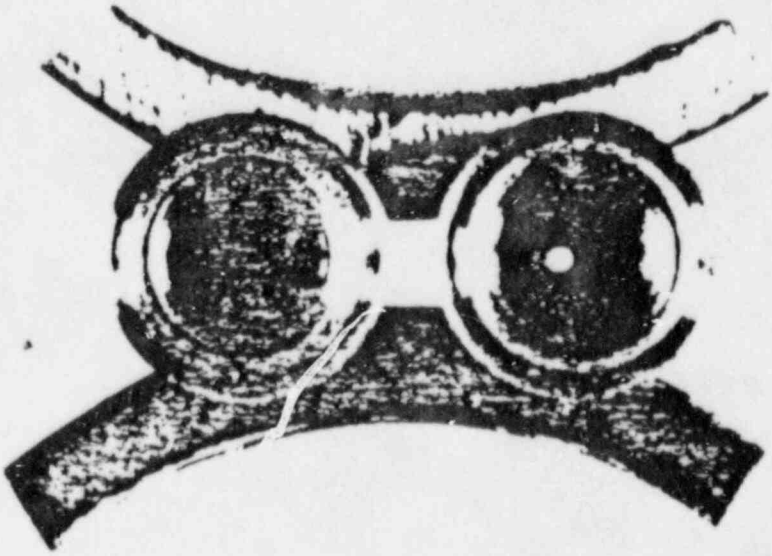


Figure 7. View of Plunger Housings Looking into the Plunger End. The Plugged Housing is on the Left. FO22A, SV #1

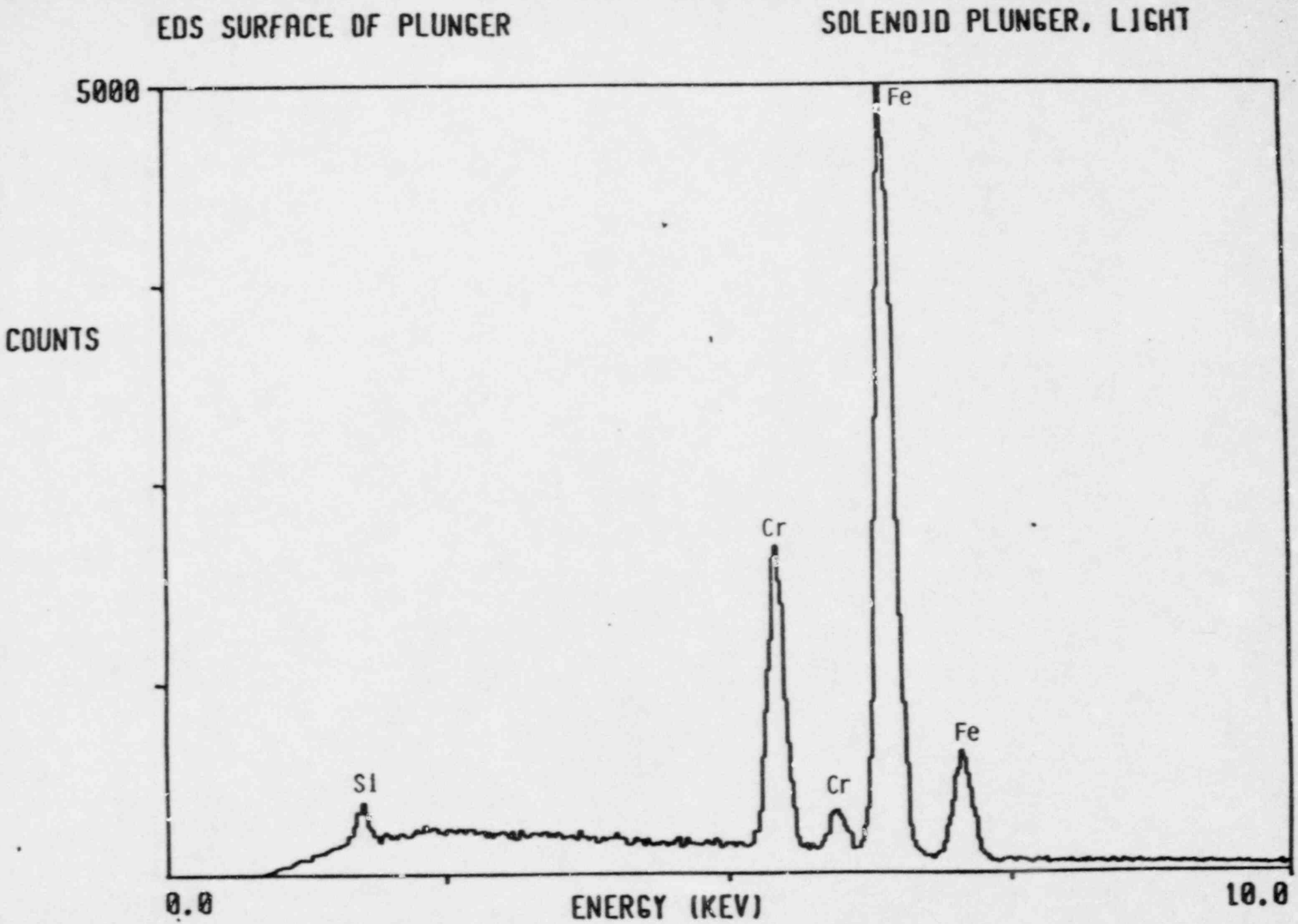


FIGURE 8. EDX ANALYSIS OF UNWORN SURFACE OF PLUNGER

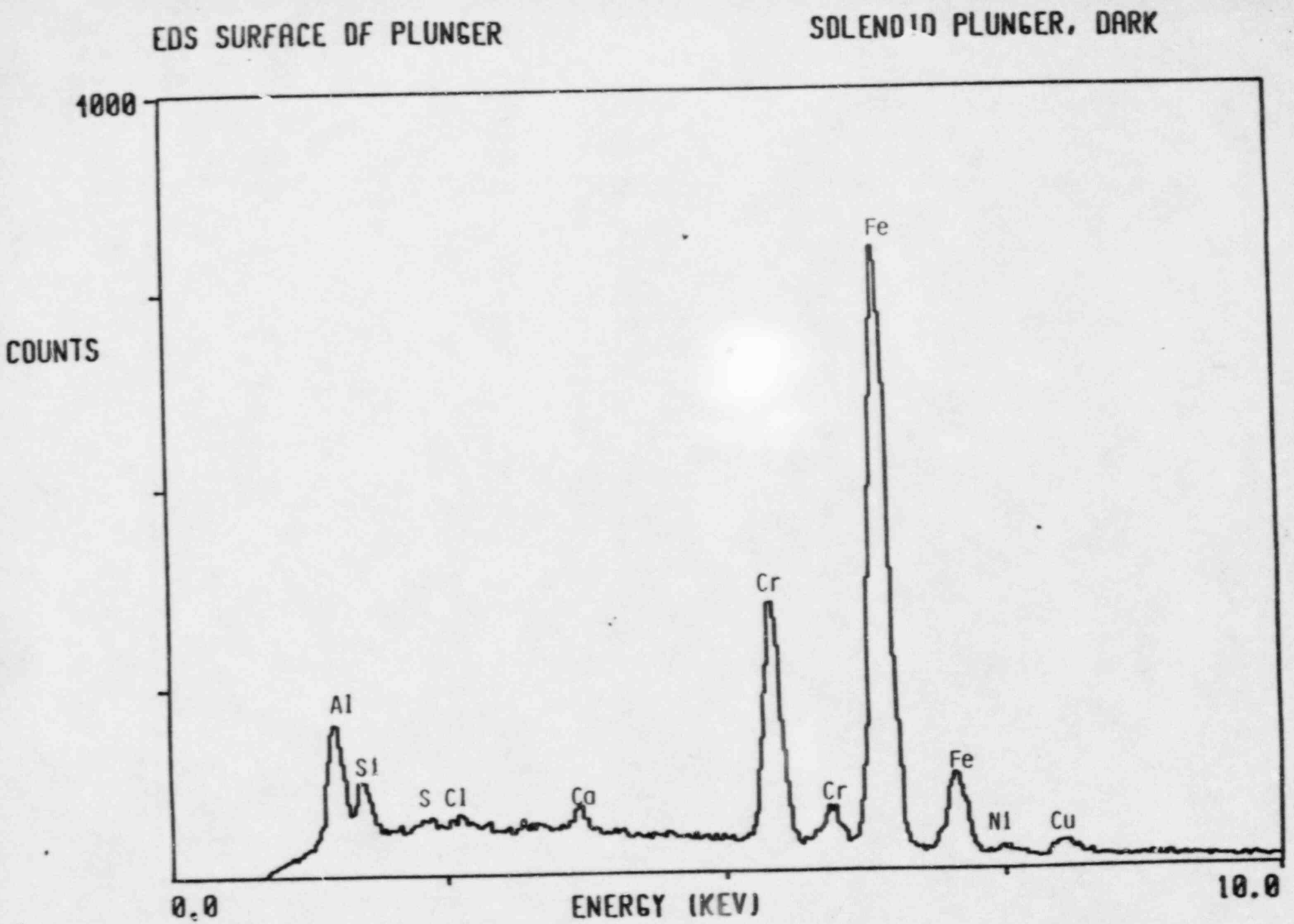


FIGURE 9. EDX ANALYSIS OF WORN SURFACE OF PLUNGER

HOPE CREEK, MALFUCTION OF MSIV F022A

ATTACHMENTS

-SPEC LAB-
(SPECTROGRAPHIC ANALYSIS LAB)
3684 BASSETT STREET
SANTA CLARA, CA. 95050

P.O. BOX 4218
SANTA CLARA, CA. 95054

Acceptance Testing | Quality Control | ____ | Applied Research | Process Trouble-Shooting

LABORATORY REQUEST

No. _____

R. Tunder MC 785
General Electric Company
175 Curtner Ave.
San Jose, Ca. 95125

3/27/87

Subject: Analtysis of Black Deris from a Metal Block; for the purpose of identification and establishing data to be useful in establishing it's source (reference your request dated 3/23/87).

Scope of analysis:

1. Thermal exposure to determine the feasiability for infrared analysis.
2. Trace analysis of the Debris; for the elemental composition.
3. Solution analysis, using 1 pt. nitric acid to 5 parts of hydrochloric, and performing quantitative analysis of the soluble material; approx. 50 percent of the sample was dissolve and the undissolved existed as a very fine suspension that settled with centrifugal force.
4. Micro photographs were made of the undissolved part and compared to photographs of graphite particles/flakes (see photo).
5. Identification of the base metal of the block.
6. Measurements of the the three holes and the inside "nipple" containing a machined in-place orfice.
7. Commeents:

Data:

1. Observaions: The sample resisted a yellow flame, having a temperature softened glass. (yellow flam).
2. Trace analysis of Debris as is:

Fe	Principal
Cr	Minor
Cu	Minor
Ni	Trace
Mn	Trace
Si	Trace
Mg	Trace
Al	Trace
Mo	Trace

3. Solution analysis of the dissolved Debris:

	Dissolved portion	Percent of total sample
Fe	43.9%	21.9%
Cr	14.4%	7.2%
Cu	15.05%	7.5%
Ni	1.25%	0.62%
Mn	0.63%	0.3%

4. Micro photographs: identified the undissolved material as graphite particle/flakes (see photo).

(SPECTROGRAPHIC ANALYSIS LAB)
3684 BASSETT STREET
SANTA CLARA, CA. 95050

P.O. BOX ...
SANTA CLARA, CA. 95054

Acceptance Testing | Quality Control | Applied Research | Process Trouble-Shooting

LABORATORY REQUEST

No. _____

5. Identification of the base plate:

Al	Principal
Cu	1.5-3.0%
Mg	0.5-1.0%
Mn	0.5-1.0

6. Measurements:

Hole:	#1	#2	#3
	0.600" I.D.	0.600"	0.600"
Nipple:	0.222" O.D.	0.221"	0.221"

7. Comments:

1. The data indicates/if not conclusive that the Debris is foeign to the base plate and not a corrosion product.
2. Fifty percent of the sample is soluble as indicated above with the composition given.
3. Fifty percent of the sample is insoluble as indicated above and identified as graphite particle/flakes.
4. A trace of molybednum in the Debris may be used as a indicator of the origin of the "graphite" material.

Reference: Disc #41

Spectrographic Analysis Laboratory

By: Lee Hurt

FROM

AUTOMATIC VALVE CORP.
Valves & Cylinders
41144 VINCENTI COURT P. O. BOX 498
NOVI, MICHIGAN 48050
TEL: 1-313-474-6700 FAX: 1-313-474-6732

General Electric
Nuclear Energy Systems Division
San Jose, CA 95125
408 925-2790

Attention: Mr. Hassan Ehsan
Manager Engineering Services
Mail Code 753

Inspection report of failed solenoid operator from Hope Creek follows:

1. Manifold 4088-005 contaminated with carbonized coal material, carbonized lubricant or carbonized air line sediment.

2. Carbonized material was black. Heavy concentration found at inlet of manifold and in #1 solenoid cavity.

3. Solenoid #2 and #3 cavities had small amounts of black residue.

4. Failed plunger top seat was peened into a bullet shape. Length was reduced to 1.212 inches from design length of 1.278 inches. A difference of 0.066 inches.

5. Top of plunger discolored black, appears to be carbonized material mentioned in paragraph 1.

6. Bottom of plunger to specifications - viton seat. Seal worn and erroded into a concave shape.

7. Plunger Guide to specifications. Tube portion deformed by vise grip pliers, not enough to restrict plunger movement of solenoid #1.

8. Plunger guide inside cavity. Top seat peened into a concave bullet shape. Seat was indented 0.050 inches. Exhaust port, 0.094 inches in diameter was plugged with a black carbonized and metallic residue.

9. Plunger and Guide returned to manufacturer for analysis and report.

10. Solenoid Exhaust Adaptor #3324-001, 1/2" x 20 thread was cross threaded. This is part of #1 solenoid assembly.

11. Solenoid lead wire insulation stripped at conduit hub.

12. All other solenoids marked as #1, 2 and 3 exhibited some black residue and two exhibited rust scale. All were in good condition and they were to specifications.

13. One plunger guide tube was badly deformed by vise grips - its plunger would bind in an energized position.

This report has been delayed to include inspection report from manufacturer. Information not available at this time. We will forward once it is recieved.

It is obvious from our inspection, cpanner wrenches provided with solenoids were not used at assembly or disassembly of solenoids.

Spanner wrenches must be used to prevent damange to solenoid tube guides.

This failure appears to have been caused by accidental inclusion of foreign material, probably a loose seal.

This kept plunger from completing its magnetic metal to metal flux path, of plunger to guide stop.

The plunger probably oscillated at full power at 60 to 120 cycles per second, drawing inrush current, bringing temperature of the solenoid up to 200° F carbonizing the foreign material lodged between the plunger and its stop.

This destructive seating process probably dislodged a copper shading ring installed in the plunger stop, further preventing the solenoid plunger from seating.

At this point the plunger pulverized the shading ring preventing plunger seating action.

This solenoid installation was modified in the field at Hope Creek. Solenoid #1 was changed from 125VDC to a 120V 60 cycle assembly by plant personnel.

It appears that this is a one of kind occurrence. Our performance record since 1972 does not show any other occurrences of this kind.

We will revise our QA Procedures to monitor and prevent future problems of this kind in the future. These will be submitted to you shortly for your approval.

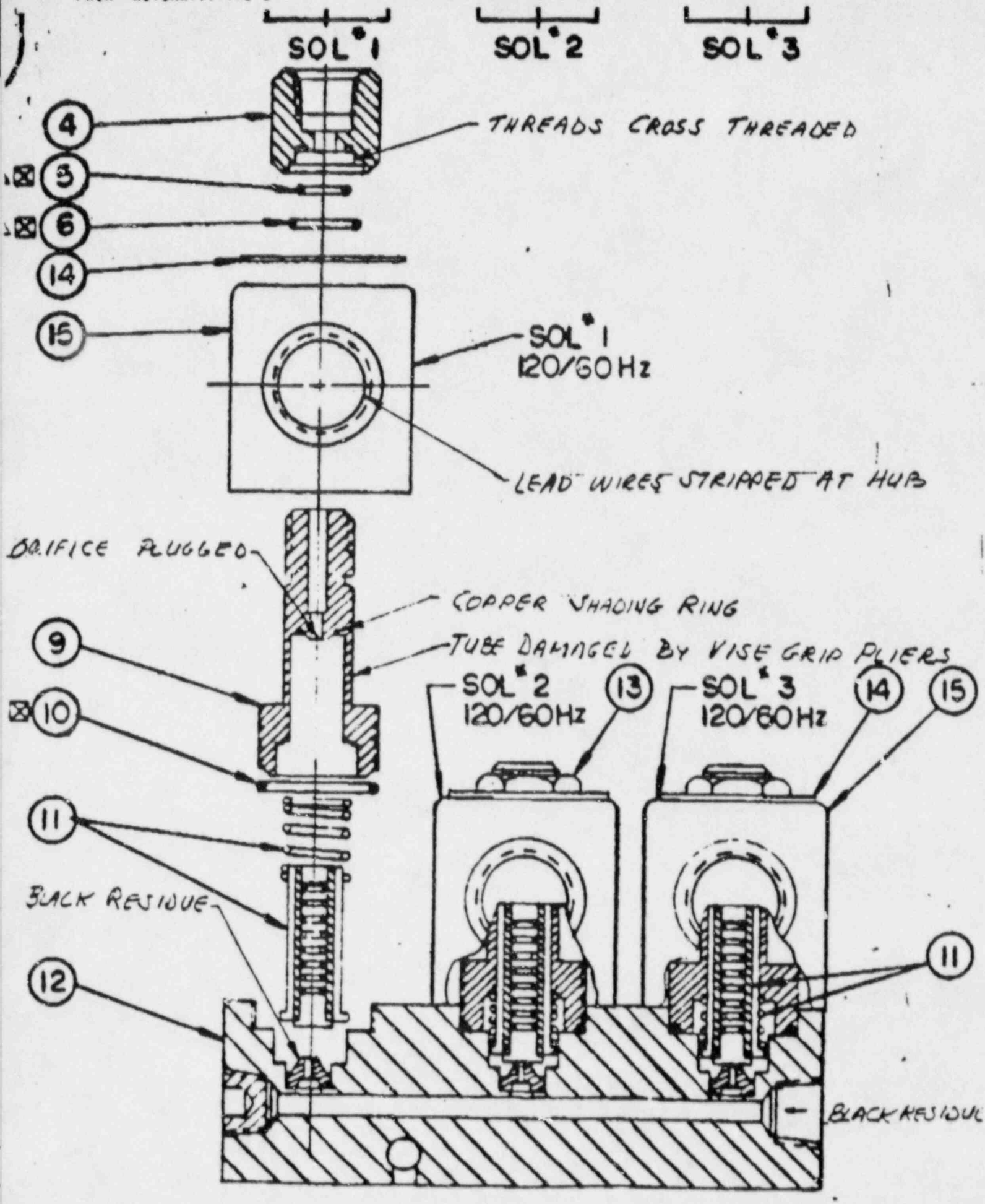
A functional air pressure and electrical current test will be added to verify the integrity of the solenoid plunger magnetic circuit.

I have attached a copy of Hope Creek's C6930-070 solenoid manifold with pencil notes, identifying the damaged adaptor, solenoid, lead wires, copper shading ring, plunger tube and black residue for your reference.

Very truly yours,
AUTOMATIC VALVE CORPORATION

J. B. Komenders

JBK/da


SOL #1
SOL #2
SOL #3
4
THREADS CROSS THREADED
3
6
14
15
SOL #1
120/60 Hz
LEAD WIRES STRIPED AT HUB
ORIFICE PLUGGED
COPPER SHADING RING
9
TUBE DAMAGED BY VISE GRIP PLIERS
10
SOL #2
120/60 Hz
13
SOL #3
120/60 Hz
14
15
11
BLACK RESIDUE
12
11
BLACK RESIDUE

Perry NPP
memo 8 11/8/87

Subject: Scram Solenoid Pilot Valves and Instrument Air System

A maintenance history review has been conducted for the Scram Solenoid Pilot Valves (SSPV). Several Work Authorizations were issued during 1984 and 1985 to replace, rebuild or repair SSPVs. In most cases the valve internal parts were replaced using rebuild kits. Some valves were reassembled using the same parts, only after complete disassembly, inspection and cleaning using the procedure outlined in GEK 63100. The SSPVs have performed without incident during numerous Reactor Protection System (RPS) actuations during the past two years. Enclosed are the summary of maintenance history for the SSPVs, a sample maintenance procedure and applicable pages from the vendor manual.

During July 1987, leaks in the Instrument Air System were repaired and additional isolation valves installed. Temporary air was supplied to critical air users while the repairs were being performed. The temporary air was supplied from connectors in the Instrument Air System by temporary air hoses and tubing. Numerous air blows were performed and samples drawn to ensure air quality of the temporary supply. Upon completion of the work, air blows and sampling were again conducted to ensure all foreign materials removed prior to placing each section of the system back in service. Enclosed are copies of the Design Change Package, the Work Order used to complete the above repairs and system drawings of the Service Air System and the Instrument Air System. Additionally, three Condition Reports (86-999, 86-1009 and 87-100) discussing previous problems with Instrument Air System filters are enclosed.

If you have any further questions, please do not hesitate to call.

G.A. Dunn

B/63

MAINTENANCE HISTORY REVIEW FOR ALL CLASS 1E ASCO VALVES

Excluding the MSIV applications, PNPP employs a total of 55 of the ASCO NP series valves. Based on thorough research of both the Work Order (WO) and Work Authorization (WA) histories for these valves, there is no evidence of any rebuilds/reworks performed, or problems with seat to disk "sticking" or O-ring degradation.

Concerning the ASCO valves used in the SSPV (Scram Solenoid Pilot Valve; HCUs) application, several histories were identified including two (2) 100% scope replacements accomplished under GE FDDRs and various WAs. (NOTE: These ASCO valves are Model No. HVA-176-816-1; not NP series valves.)

The following is a chronology of the events surrounding the SSPVs (EP-139), and their replacement:

7/13/84 — FDDR No. KL1-473 was issued to retrofit the SSPVs to the as-tested configuration per GE Environmental Qualification Report NEDC-30208, Rev 1, 9/84. The Unit 1 valves installed at the time were swapped with the upgraded Unit 2 valves. The required retrofit was documented on NR #OQC-729 and the NR closure served to close the FDDR on 11/7/87. The retrofit included change-out of the valve core disc/diaphragm assembly from Buna-N & Urethane materials to Buna-N & Viton.

11/25/84 — WA No. NTS 84-7665 was written to rework wiring in 177 HCU Scram Valve boxes, per disposition of NR #CQC-3104 and FDDR No. KL1-1125. These wiring deficiencies were earlier identified (1/30/84) in twenty (20) of the HCU panels and later NR No. CQC-3104 was revised to include all 177 panels. This WA was closed on April 9, 1985.

1/25/85 — WA No. NTS-85-1226 was written to remove and replace 71 of the SSPVs in response to NR No. NTS-208. According to the NR description, 71 of the 177 solenoid valves (EP-139) were chattering and would not seat properly. As per the disposition to the NR, these valves were replaced by Unit 2 valves obtained by MTA, but due to expired shelf life, required seal replacement. The under-voltage condition that caused the chattering and created dust in the valves was corrected by increasing the wire size to minimize voltage drop under ECN 25881-33-4563.

1/30/85 — WA No. NTS-85-1374 was written to include the remaining SSPVs not addressed in WA 85-1226. Therefore, all 177 valves were replaced (and rebuilt, as required, per the WA, NTS 85-1374).

1/31/85 WA No. NTS 85-1461 was written to support WA No. NTS 85-1374 and allowed for determination and retermination of solenoid valves (EP-139).

5/30/85 As a result of NR OPQC 1333, the solenoid valves removed by WAs 85-1226 and 85-1374 (located in warehouse) were rebuilt by WA NTS 85-6827.

6/3/85 WA NTS 85-6981 was written, also in response to NR OPQC-1333, to install the rebuilt scram pilot valves (EP-139). NOTE: This WA only installed 164 of the 177 valves because 13 of them were rebuilt per WA NTS 85-1374. This WA (85-6981) was field complete 7/1/85 and finally closed 10/7/85.

6/10/85 WA NTS 85-7276 was written to rework scram pilot valves to obtain satisfactory electrical functional test results. NOTE: These valves (24) were previously rebuilt under WA NTS 85-6827. This work was field complete 6/26/86 and the WA closed on 7/31/85.

9/4/85 WA NTS 85-10655 was written as a result of NR NTS-810, which addressed a chattering problem on one solenoid. This work was completed on 9/12/85 and closed 9/20/85. Work included rebuild of solenoid coil, only . Valve body parts were determined to be acceptable.

10/11/85 In response to NR No. NTS-926, WA No. NTS 85-12233 was written to rebuild two (2) SSPVs which were chattering. Actual disposition was to rework in accordance with GE response attached to the NR. This response stated that solenoid coil was to be inspected and replaced, if necessary. The response also called for following the procedure outlined in GEK 63100, checking for deterioration of valve internals (Buna-N components) and replacing parts if required. The work was field complete on 11/15/85, and the WA finally closed on 11/16/85.

SUMMARY:

The only malfunctions identified via this maintenance history review were instances of solenoid valve chattering (SSPVs only). Except for isolated occurrences noted above, chattering was due to undersized wiring. In all cases, valves were replaced (and rebuilt, as required) due to overheating of coils.

D. Electrically reconnect the pilot valve at the electrical box.

NOTE

Prior to returning the HCU to service following inlet or outlet scram valve maintenance, the scram valves and scram pilot valve must be tested as a unit. Refer to Section IV, Paragraph 4-10.

5-65 SCRAM PILOT VALVE. The scram pilot valve installed in the HCUs is a ASCO three-way redundant piloted solenoid valve (139). Maintenance on this valve may be accomplished during normal reactor operation without removing the defective valve from the HCU. However, the HCU must be isolated and the scram accumulator discharged as described in Section III, Paragraphs 3-25.

5-66 After continuous operation, the scram pilot valve solenoid enclosures become hot to the touch; this is a safe operating temperature and not an indication of a malfunction. Excessive heating is indicated by the presence of smoke and the odor of burning coil insulation. The scram pilot valve includes internal components such as the Buna-N rubber discs at one end of the solenoid core assembly which are adversely affected by long term exposure to the heat of the normally-energized solenoid coil. Cracking and deterioration of the Buna-N disc material can be accelerated in this environment so that small pieces of the Buna-N material wedge between the core assembly and the valve pilot body to prevent proper movement of the plungers. Thus, the scram pilot valves should be rebuilt periodically to assure that the Buna-N parts are not used in excess of seven years. For any one outage, HCUs should be selected based on a checkerboard distribution of the associated CRDs. The remaining scram valves can be rebuilt during subsequent outages.

NOTE

The recommended replacement maintenance cycle for the scram pilot valve internal parts is seven years. The seven years include the shelf life plus the in-service life. (See SIL 128 for additional details.)

5-67 In general, if the voltage to the coil is correct, sluggish valve operation, excessive leakage, or noise will indicate that cleaning is required. Procedures for solenoid coil replacement as well as procedures for disassembly

of the valve for gasket and diaphragm replacement are provided below. Figure 5-15 shows an exploded view of the scram pilot air valve and the parts referred to in the following paragraphs.

5-68 Coil Replacement. Solenoid chatter, or noise, indicates low voltage or leakage and can result in over heating of the solenoid coil. If solenoid chatter developes the coil should be replaced. Proceed as follows to replace the coil in either housing subassembly "A" or "B".

A. Ensure that the electrical power supply is turned off and remove the cover with cover screws and cover gasket attached.

B. Loosen the three cover screws on the housing subassembly and remove the cover with cover screws and cover gasket attached.

C. Remove the retaining clip and slip the fluxwasher and yoke containing coil and sleeve off the solenoid base subassembly. Loosen the housing subassembly as required to facilitate removal of the above parts.

D. Remove the coil and replace, if required.

E. Reassemble the solenoid coil, sleeves, yoke, fluxwasher and retaining clip using the exploded view in Figure 5-15 for identification and placement of parts. Tighten the cover screws evenly to ensure proper gasket compression, then torque the screws to 10 in.-lbs. (11.5 kg-cm).

F. Install terminals at ends of coil head wires (see drawing and parts list 131C8479 for details).

CAUTION

The solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit.

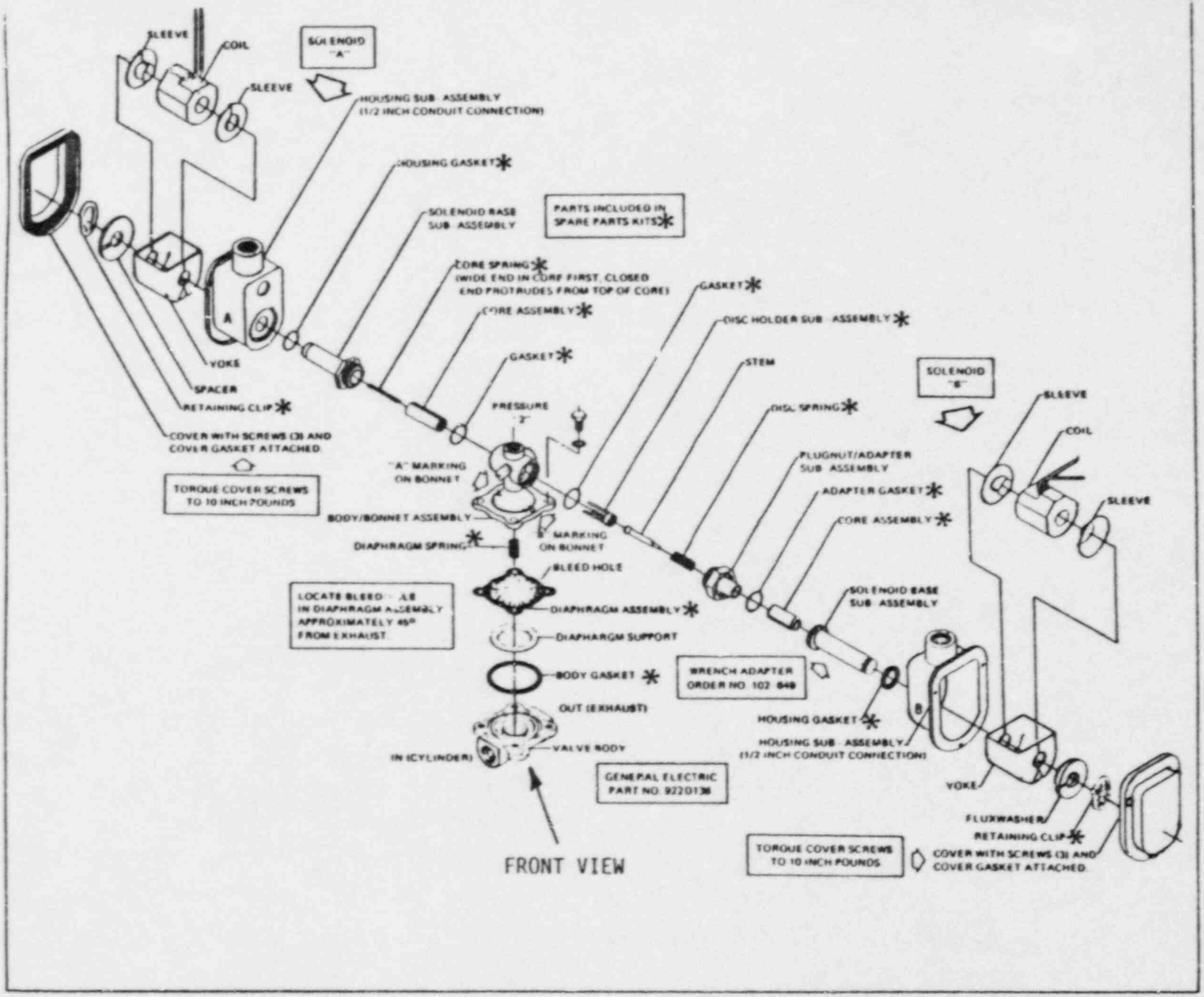


Figure 5-15. Scram Pilot Air Valve (139) - Exploded View

5-69 Valve Internal Parts Replacement.

CAUTION

Before attempting any maintenance on the scram pilot valve 139, ensure that it has been depressurized and electrically disconnected.

NOTE

Identify the "A" and "B" markings on the body/bonnet assembly. In reassemblying the valve it is important that the parts from side "A" are replaced on the side "A" and "B" parts on side "B".

A. Remove the solenoids "A" and "B" by following the instructions under coil replacement, Paragraph 5-68.

B. Facing the "IN" (cylinder) connection, unscrew the left side solenoid base subassembly (solenoid "A") with the housing gasket attached. Remove the gasket, core assembly and core spring.

C. Remove the housing gasket on the right side (Solenoid "B") and unscrew solenoid base subassembly using a special wrench adapter 102-659 (G.E. drawing 166B8850P1). Remove the solenoid base subassembly, adapter gasket and core.

D. Unscrew the plug nut/adapter and remove the disc spring, stem, disc holder subassembly and gasket.

E. Remove the four bolts holding the body/bonnet assembly, diaphragm spring, diaphragm assembly, diaphragm support and body gasket.

F. All parts are now accessible for cleaning and replacement.

5-70 VALVE REASSEMBLY

NOTE

Replace parts using spare parts kit (G.E. SPL 283X851, Item 133 - 283X352-1, Item 23).

The recommended replacement maintenance cycle for the scram pilot valve internal parts is seven years. The seven years includes the shelf life plus the in-service life. (See SIL 128 for additional details.)

A. Install the new body gasket.

CAUTION

Insure that the lip of the diaphragm support faces downward into the valve body.

B. Install the new diaphragm assembly, locating the bleed hole approximately 45° from the outlet (exhaust). Note that the metal stud in the center of the diaphragm assembly faces up so that the new diaphragm spring is placed over it.

C. Install the body/bonnet assembly and the four bolts, tightening them in a crisscross manner, then torque the bolts to 70 to 80 in.-lb (80.7 to 92.2 kg-cm).

D. Install the new disc holder subassembly and new gasket. Replace the stem and new disc spring into the plug nut adapter assembly and screw the plug nut/adapter subassembly into the body bonnet assembly (side "B").

E. Install the new adapter gasket, new core assembly, and solenoid base subassembly into the plug/nut adapter, using the wrench adapter (see above). Note that the small end of the core assembly goes into the solenoid base subassembly first.

F. Install the new housing gasket, housing subassembly, the yoke containing "B" coil and sleeves, fluxwasher, new retaining clip and housing cover, torquing the three housing subassembly cover screws to 10 in.-lbs. (11.5 kg-cm.)

NOTE

Replace solenoid "B", ensuring that it goes to the side of the body/bonnet assembly marked "B".

G. For solenoid "A", install the new gasket, new core spring, and new core assembly, ensuring that the wide end of the spring goes in first, and that the closed end protrudes from the top of the core. Insert the assembly to the solenoid base subassembly, and assemble the parts into the "A" side of the bonnet.

H. Install the new housing gasket, housing subassembly, the yoke containing coil and sleeves, spacer, new retaining clip and housing cover, torquing the three housing subassembly cover screws to 10 in.-lbs. (11.5 kg-cm.)

I. Note that "B" coil is at "B" side of body/bonnet. After reassembly, the scram pilot valve should be actuated a few times to ensure proper operation.

5-71 DIRECTIONAL CONTROL VALVES. In the event of operational failure of a directional control valve (120, 121, 122 or 123), the HCU should be isolated as described in Section III, paragraph 3-24, and the directional control valve removed and replaced with a spare. Following removal, the defective valve may be repaired or replaced as required. The following paragraphs contain procedures for directional control valve removal and replacement and servicing instructions for directional control valves.

5-72 Removal And Replacement. With the HCU isolated as described in Section III, paragraph 3-24, proceed as follows to remove and replace a defective directional control valve.

A. Disconnect the directional control valve wiring at the connector in the wiring trough transponder circuit board.

CLASS 1E SOLENOID VALVES
(ASCO NP SERIES)

EXCLUDING THE MSIV APPLICATIONS, PNPP EMPLOYS A TOTAL OF 55 OF THE SUBJECT VALVES.

OF THIS 55, 37 ARE EITHER LOCATED IN MILD ENVIRONMENTS OR HAVE NO DESIGN BASIS EVENT SAFETY FUNCTION AND ARE VERIFIED NOT TO FAIL IN A MANNER DETRIMENTAL TO OTHER SAFETY SYSTEMS, ie, ARE CLASSIFIED AS "A3" (NUREG 0588 APPENDIX E, PARA.2.C.)

EXCLUDING THESE 37 LEAVES A TOTAL OF 18 WITH DESIGN BASIS EVENT SAFETY FUNCTIONS FOR WHICH THEY ARE CURRENTLY QUALIFIED. OF THIS 18 THERE ARE A TOTAL OF 5 WHICH ARE OF NORMALLY-ENERGIZED CONFIGURATION.

TECH. SPEC REQUIREMENTS REQUIRE THAT THESE 5 BE CYCLED PER THE APPLICABLE SVI'S AT FREQUENCIES OF 92 DAYS (QUARTERLY) OR LESS.

BASED ON MAINTENANCE HISTORIES REVIEW, THE SVI'S HAVE BEEN PERFORMED PROPERLY, AS SCHEDULED. NONE OF THE WORK HISTORIES SHOW ANY PROBLEMS WITH THE OPERABILITY OF THESE SOLENOID VALVES WITH RESPECT TO SEAT/DISC "STICKING".

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11-8-87

ROOT CAUSE ANALYSIS

EXECUTIVE SUMMARY

This document describes the evaluations performed to determine the cause of events on October 29 and November 3, 1987 when Perry I Main Steam Isolation Valves (MSIVs) failed to fast close on command. The most probable root cause, based on data currently available, is failure of an Automatic Switch Company (ASCO) Model 8323 3-way dual solenoid valve. The primary suspected cause is hardening and dimpling of the EPDM rubber disc seat material and other EPDM seals, causing the disc holder assembly to wedge in place when the solenoid was de-energized. Several mechanisms have been proposed that might lead to EPDM degradation, the most probable of which is a local high temperature environment.

The document is organized in four section. Section 1 describes the most probable root cause, and the basis for its selection as such. Section 2 gives an overview of how the root cause analysis team reached its conclusions, Section 3 describes potential component failure modes that could lead to MSIV failure to close, and finally, Section 4 describes specific failures within the ASCO Model 8323 valve that could lead to the observed conditions, and discusses environmental conditions that could lead to the failure.

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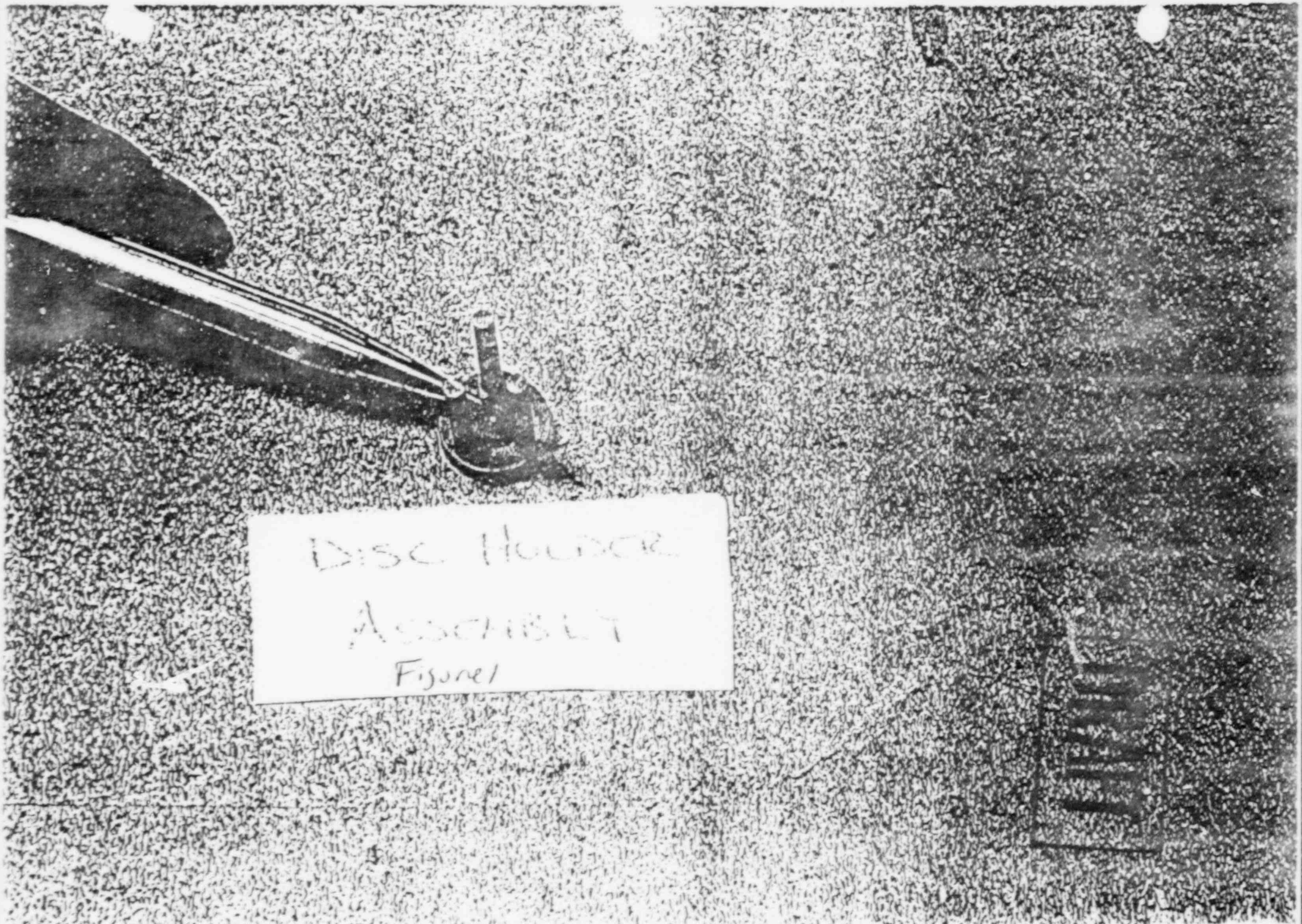
SECTION 1 MOST PROBABLE ROOT CAUSE

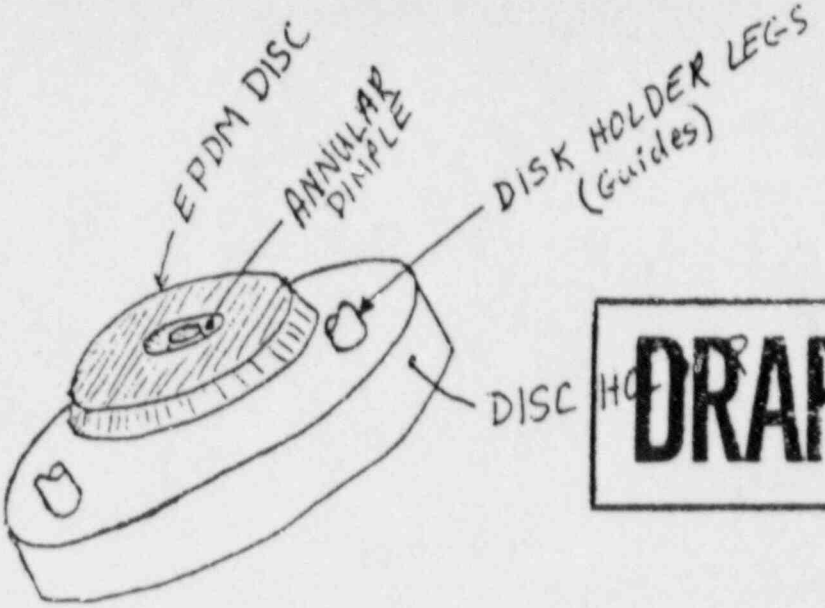
The most probable root cause of the observed MSIV failure to close is failure of the Automatic Signal Company (ASCO) Model 8323 3-way dual solenoid valve to shift from the energized to de-energized position. Within the component, the Ethylene Propylene Diene Monomer (EPDM) rubber disc seat material was found to be deformed. A "dimple" (see figure 1 and 2) was found in the EPDM seat material on the disc holder. This is also indicative of a general hardening and degradation of the rubber seals within the valve. If the disc holder sticks to the orifice the MSIV will not close. Delayed closure is consistent with de-energizing of the solenoid, followed by sticking of the disc holder to the orifice for some period of time, when the disc holder breaks loose and allows the air pressure to relieve through the orifice. Once the air pressure is relieved, the MSIV will close.

Failure of this component is the only failure that is consistent with the observed failure. No other single component failure will result in a delayed MSIV closure.

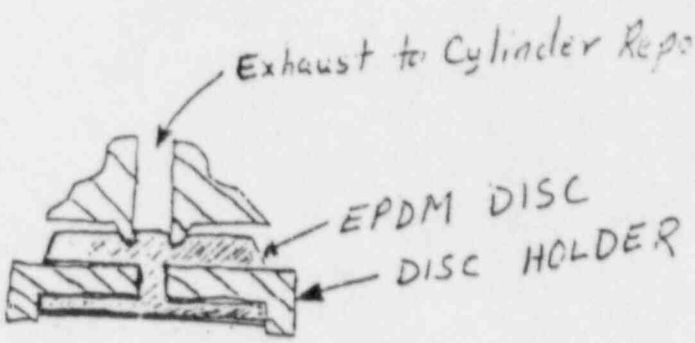
The EPDM degradation is most probably caused by exceeding the temperature limits of the EPDM material. EPDM was chosen for this application because of its radiation resistance from an equipment qualification standpoint. It is qualified to a temperature of 140°F. Perry has experienced bulk drywell and steam tunnel temperatures which have approached tech spec limits during much of the startup test program. Additionally, steam leaks have occurred in the vicinity of the affected MSIV solenoids. While no data exists to actually confirm that the local temperatures have exceeded the capability of the EPDM rubber, a good correlation exists between the location of steam leaks and the affected valves.

Several other mechanisms have been postulated for the EPDM degradation, and sufficient data does not currently exist to absolutely prove or disprove any hypothesis. It is true, however, that the temperatures near the valves have been close to the maximum allowable for EPDM material, and this is the most likely cause.


DISC HOLDER
ASSEMBLY
Figure 1



SKETCH SHOWING DISC HOLDER GENERAL APPEARANCE



SKETCH SHOWING CROSS-SECTION OF DISC IN ITS SEATED POSITION

Figure 2

SECTION 2 ANALYSIS TECHNIQUES AND OVERVIEW

Following the failure of the B21-F022"B" and "D" Main Steam Isolation Valves, a multi-discipline team was convened with the charter to determine the most likely cause of the problem. This activity would be useful prior to actuator disassembly and inspection. The team consisted of senior engineers from the CEI mechanical and electric engineering, and CEI technical departments, as well as the architect engineer (Gilbert) and NSSS supplier (General Electric).

Problems analysis proceeded using standard Kepner-Tregoe (KT) Problem Analysis techniques. The initial thrust of the team was to determine which equipment failures would cause the failure of a MSIV to close in the delayed manner observed. An initial brainstorming session was held to determine potential component failure which might cause the observed behavior. These potential failures were then compared with known facts and design conditions, using "is/is-not" techniques to rate the postulated failures as to probability.

Twenty four (24) potential failures were initially postulated as to component failures. Of these, 19 were rated as unlikely, one (1) as potential, and four (4) as probable causes. All five of the potential and highly likely candidates involved either the ASCO Model 8323 3-way Dual Solenoid Valve, or the air supply to these components. Specific work items and inspection steps were thus incorporated in other site action plans to address these components in detail.

Section 3 of this report documents each of the 24 original component failures. It is organized in order of highest to lowest probability. Each potential cause is described, discussed and conclusions drawn with regard to root component failure.

Following disassembly of the actuator air packs and diagnostic tests on the air supply system, it was determined that the most likely failure mode was, in fact, the ASCO Model 8323 3-way dual solenoid valve. The suspected cause was dimpling of the EPDM rubber disc seat material, causing the disc holder assembly to wedge in place when the solenoid was de-energized. The team was again convinced, this time to evaluate the environmental and design conditions which might be responsible for the observed component failure.

Analysis techniques similar to those utilized in the component evaluation were used to screen the potential causes. Absolute determination of the root cause is difficult, however, the most likely conditions leading to the failure was local high temperatures leading to EPDM degradation. Analysis results are given in Section 4, again describing each of the nine (9) postulated root cause conditions and discussion of the evidence to confirm or deny the postulated condition as root cause.

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SECTION 3

COMPONENT FAILURE DESCRIPTIONS

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Potential Cause

Failure of the Part #4 ASCO Model 8323 3-way Dual Solenoid Valve

Discussion

Failure of the ASCO Model 8323 3-way dual solenoid valve to shift from the energized to de-energized position could cause the delayed closure event experienced by Perry.

This failure mode has happened in the past due to various reasons as evidenced by IE Notices 85-17 and 86-57, and INPO SER 57-85.

Conclusion

This failure mode is the most likely candidate for root component failure of the problem. The post-disassembly inspection has found dimpling of the EPDM rubber disc seat material. This could cause the disc holder assembly to wedge in place when the solenoid is de-energized. This would in turn not allow air pressure to relieve through the #3 air port, and preclude MSIV closure.

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Potential Cause

Instrument Air System Quality
(oils, moisture, particulates)

Discussion

This potential cause has been experienced at other plants. This is evidenced by IE Information Notices No. 86-57 and 85-17.

In the likelihood that poor instrument air quality, such as; moisture, particulate, and/or oils been present, the possibility of failure related to several Mainsteam Isolation Valve components would be highly likely. The main concerns would resolve around the Automatic Switch Company (ASCO) solenoid valves. Since the seal and discs internal to these valves are Ethylene propylene, any intrusion of oil into the instrument air system could cause degradation. Degradation of the seals and discs would, in this case be caused by hydrocarbon contamination that would distort them and could result in sticking of the valves. Although at Perry this is unlikely because of our "oil free air system". Disassembly and inspection of the ASCO NP8323-20E dual solenoid valve from MSIV F022D did not reveal any hydrocarbon substance which could have been borne from the instrument air. Additionally, a sample of the instrument air showed no signs of hydrocarbon contamination.

The possible intrusion of water or moisture into the air system could cause residue to form on the ASCO valve internals and cause sticking of the valves over a period of time. The moisture may collect during outage periods and become residue during plant operation when the ambient temperatures are higher. Particulate intrusion greater than the 40 micron allowables would be a major concern since they could plate out on the solenoid valve core and/or base sub-assembly resulting in slow operation of the solenoid valve. The disassembly and inspection of the ASCO NP8323-20E dual solenoid valve revealed no traces of moisture or particulate contamination.

The concerns addressed above also apply to the C.A. Norgren Shuttle Valves; however, the solenoid valves are much more susceptible to instrument air quality.

Conclusion

This item was initially considered to be a high potential, but following analysis of air samples, this item was changed to low probability.

Potential Cause

Obstructions/Foreign Materials in Air Lines/Accumulators

Discussion

This potential cause has been experienced at other plants as evidenced by IE Information Notice 86-57 and 85-17. Obstructions/Foreign Materials in the air lines/accumulators is a likely cause since it would permit valve failures as experienced. The obstructions may permit periodic operation of the valves and depending on the instrument air cycling could temporarily become dislodged. This could result in the same characteristics discussed in the write-up on "Poor Air Quality".

Conclusion

This item was initially considered to have a high potential as root component failure. Inspections of the air lines and accumulators found no defect that could cause the observed operational pattern, however, so this potential cause is unlikely to be a root component failure.

Potential Cause

One or both of the pilot solenoid valves for each of the MSIVs failed to de-couple (mechanical action) upon de-energization.

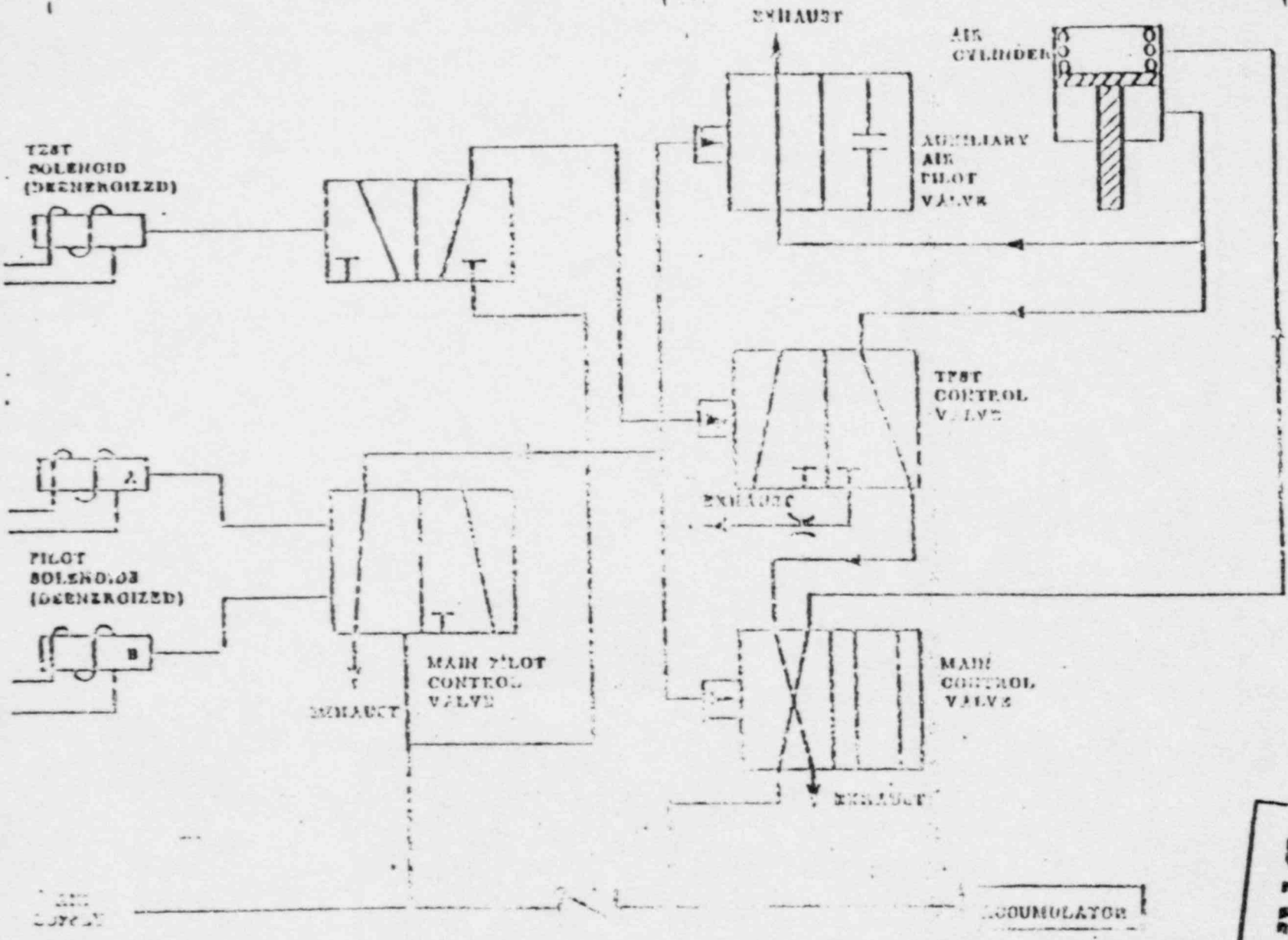
Discussion

Electrical control circuits identify positive de-energization of the respective pilot solenoids. This is verified via the indicating light and any meters as shown per elementary diagrams per B-208-013 H011 and H036. The testing sequence and visual verification has identified that the solenoids have been de-energized, although the valves failed to open or delayed opening. If either solenoids fails to de-couple then the valves will not operate. No method exists to remotely determine whether one or both of the solenoids for a particular valve failed to de-couple.

The mis-operation (erratic) closure or deferred closure may possibly be attributed to this occurrence. As such it may be a highly susceptible cause. Further evaluation identified that each of the pilot solenoids were sealed with Bisco LOCA Seal at the conduit entry point. This design change implemented per DCP 8.0618 is the only change initiated recently. The degradation and/or migration of foreign matter could also be a cause to prevent de-coupling of the solenoids.

Conclusion

This item was initially classified as a high potential, and condition of the Bisco LOCA seal was evaluated upon solenoid disassembly. Since no interference with the valve operation was noted, this cause has been eliminated from consideration.


EXHAUST
AIR CYLINDER
AUXILIARY AIR PILOT VALVE
TEST SOLENOID (DEENERGIZED)
TEST CONTROL VALVE
EXHAUST
PILOT SOLENOID (DEENERGIZED)
MAIN PILOT CONTROL VALVE
EXHAUST
MAIN CONTROL VALVE
EXHAUST
ACCUMULATOR

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PARTIAL DWG of
D209-013 sheet 2

DRAWING UNI
CONFIGURATION
AS OF REV. ____

(D1) (D2) NUCLEAR SA

NOTES -

1. FOR GENERAL NOTES, SEE DWG. D-209-001, SHEETS 1 AND 2.
2. TERMINAL BOX LAYOUT, SEE DWG. D-209-001, SHEET 1.
3. FOR PHYSICAL LAYOUT AND WIRING INFORMATION, SEE ATKOCO & MORRILL COMPANY DWG. 13560-01-H, SHEETS 1 THRU 4. (FLOW-SAVE, SHEETS 1 THRU 4) OR G.E. DWG. 10505220.
4. WIRED BY VENDOR.
5. JUMPERS FIELD TO INSTALL; COLOR PER FIELD CABLE DIVISION.
6. FOR CONAX CONDUIT SEAL ASSEMBLY WIRING DETAILS, SEE DWG. D-209-001 SHEETS 7, 8, 9, & 10.
7. BISCO TYPE LOCA SEAL INSTALLED IN CONDUIT ASSEMBLY FOR EACH SOLENOID TO SERVE AS AN ENVIRONMENTAL MOISTURE SEAL (DCP 85-0618).

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1521 - FORZZA
SOLENOID VALVES NOTE 6

NOTE 6

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SOLENOID

	WIRE MARK	COLOR CODE
1	B21H3613A	6
2	B21H3615A	5

PARTIAL DWG :
D209-013 sheet 2

SOLENOID # 2

	WIRE MARK	COLOR CODE
1	B21H3613A	4
2	B21H3611A	3

NOTE 4 AND NOTE 7

SOLENOID # 3

	WIRE MARK	COLOR CODE
1	B21H3603A	2
2	B21H3601A	1

NOTE 4 AND NOTE 7

Potential Cause

Solenoid valve exhaust port blocked.

Discussion

Blockage of the exhaust port could occur through internal or external contamination. The port is open to the ambient. Particles may fall below the disc preventing shifting of the solenoid valve from its normally energized to normally de-energized position. Subsequent actuation could blow the blockage out of the valve allowing normal operation thereafter. This is considered a potential cause for the Perry delayed MSIV closure experience.

Conclusion

This was initially considered to be a potential cause for the Perry delayed MSIV closure experience. Inspection for blockage was performed, and on one solenoid a piece of tape was discovered to be blocking one port. Subsequent testing determined that this blockage was insufficient to preclude MSIV actuation.

Potential Cause

Failure of the Part #3 Norgren Model B0004A 2-way shuttle valve.

Discussion

The 2-way shuttle valve works in conjunction with the Part #1 4-way shuttle valve to open and close the MSIV. The 4-way shuttle valve provides the primary logic for pressurization and venting of the actuator cylinder. The potential failure mode description is the same as that for the 4-way shuttle valve operation.

The 2-way shuttle valve cannot by itself open or maintain the actuator in the open position unless the 4-way valve is energized or stuck in the energized position.

Conclusion

The delayed closure event experienced at Perry is unlikely to have been caused by the 2-way valve failure, since it requires dual mode failure.

Potential Cause

Hydraulic Speed Control Failure

Discussion

The hydraulic cylinder function is to slow the closing speed of the MSIV to specification limits under a wide variation of applied forces.

The closing speed of the MSIV is accomplished through adjustment of the Monatrol needle flow control valves Parts #6 and #7 has shown in the drawing 13560-01-4 hydraulic flow logic schematic.

Should either or both flow control valve(s) become totally blocked and also all other fluid leak paths (e.g. ring gaps in piston) motion would be prevented.

Such a situation is unlikely because:

1. The amount of contamination would need to be so large that it would not disappear after one cycle.
2. The hydraulic fluid was installed under clean controlled conditions. The system is closed and pressurized, preventing contamination from external sources.
3. Such a failure mechanism is not supported by historical experience.

NOTE: The flow control valves are designed to provide a flow path even at the maximum choked condition.

Conclusion

Unlikely to be occurring.

Potential Cause

MSIV internal binding.

Discussion

Poppet binding against the upper body ribs due to poppet rotation is very unlikely due to poppet concentricity and long length of rib engagement. Binding of the stem against the packing gland edge is considered extremely unlikely by the valve manufacturer. Potential for the lantern ring to cock and bind to the stem is a possibility with inadequate packing compression but is also considered unlikely. The packing compression used in the reassembled valves is estimated to be adequate to prevent lantern ring movement.

Conclusion

The low probability of binding and lack of reported industry cases, is inconsistent with the multiple valve failures or the time factor seen in the free up of some valves. This is unlikely to be occurring.

Potential Cause

Swagelok fittings improper installation/assembly/leakage

Discussion

Excessive fitting leakage would not cause an irregular operation of the valve. This type of leakage would induce a constant operational characteristic i.e. slow rate of change.

Likewise if leakage exists accumulator would close valve in case of leakage on ASCO pilot control valve tubing.

Conclusion

Unlikely to be occurring.

Potential Cause

Failure of the Part #5 ASCO Model 8320 3-way solenoid valve.

Discussion

The model 8320 3-way solenoid valve is used to slowly stroke the MSIV (close MSIV when energized). When the solenoid valve is energized (opened) pneumatic pressure is routed to the Part #2 3-way air valve. This causes the 3-way air valve to vent the rod side of the actuator through a flow control orifice, while blocking the inlet air from air valve Part #1. The gradual loss of pressure from beneath the piston allows the actuator springs to slowly close the MSIV (up to 60 seconds).

The potential failure modes of the valve are:

a. Stuck open (failure to close when de-energized)
b. Stuck closed (failure to open when energized)
c. Stuck partially opened
d. Catastrophic failure of valve body

The effects of these failure modes are as follows:

a. A stuck open valve prevents reopening of the MSIV.
b. A stuck closed valve prevents operation of the MSIV in the slow closure mode. This is the normal (nontest) mode of the valve and does not affect the normal closure functions of the other subcomponents.
c. A partially opened valve will tend to close the MSIV; however more slowly than the normal fully opened condition. This affect can be visualized in the drawing 13560-01-H schematic. The 3-way solenoid valve, partially opened, would bleed inlet air from the system exhausting it. Additionally it could pressurize the 3-way air valve resulting in further exhausting of both inlet and air pressure.
d. A catastrophic failure of the valve body would result in loss of pneumatic pressure resulting in MSIV closure.

None of the above failure modes support the delayed closure event at Perry.

Conclusion

Unlikely to be occurring.

Potential Cause

Valve packing too tight.

Discussion

Grafoil packing has replaced earlier asbestos packing on 7 of 8 MSIVs. While it is likely that the grafoil packing has greater breakaway friction due to increased compression of the softer material, the circumstances of the events showing quick closure after initial release make this somewhat unlikely as the cause.

Conclusion

Because other valves with grafoil packing and equal packing compression requirement showed no effect during fast or slow speed testing and the lack of industry experience of an MSIV being held up due to packing, this cause must be considered unlikely.

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Potential Cause

Failure of the Norgren Model F0013A 4-way shuttle valve.

Discussion

The 4-way shuttle valve is energized by the Part #4 3-way dual solenoid valve. Upon energization it routes pneumatic pressure to the rod (bottom) side of the actuator cylinder piston and vents the blind (top) side of the piston. The resulting pressure differential across the piston forces the rod up, opening the MSIV.

The 3-way dual solenoid valve when de-energized, vents (de-energizes) the 4-way shuttle valve, venting the rod side and pressurizing the blind side. The resulting pressure differential across the piston in conjunction with the springs forces the MSIV closed.

The Part #3 2-way air valve is provided in the circuit to eliminate a single mode failure of the 4-way valve.

The failure mode of interest concerns failure of the MSIV to close when the 3-way dual solenoid valve is de-energized. Should the pressure leg of the 4-way valve stick, the pressure is still vented by the Part #3 2-way valve. If the exhaust leg sticks upon de-energization of the valve, the springs alone are capable of closing the MSIVs although at a slower rate.

If either leg partially sticks, the inlet pressure is exhausted, promoting closure of the MSIV.

Conclusion

The only failure of the 4-way valve which can result in delayed closure of the MSIVs as experienced at Perry is sticking of the pressure leg with a concurrent failure of the Part #3 2-way air valve. This is unlikely as it is as double mode failure - requiring failure of two separate subcomponents. Thus this is unlikely to be occurring.

Potential Cause

Corrosion within solenoid enclosure.

Discussion

The "B" coil housing in the F028 MSIV dual solenoid valve was found to contain moisture and corrosion. Corrosion within the solenoid coil housing cannot affect the valve internals as the valve body is protected from external contamination through body gasket seals in the vicinity of the coil. The subject coil ("B" side) is the lower coil, such that any corrosion products escaping the coil enclosure would fall down away from the solenoid valve body. Additionally, corrosion products were not found within the valve body.

Conclusion

Very unlikely to affect performance.

Perry NPP Solenoid Valve eqpt list

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Ascom.1.1A

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV 01 LOCATION SUPPORT ZONE M/H
*1821 F 0460	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C 1/00-630 1821 F 0022A DW-1 HARSH
NO WORK HISTORY		
*1821 F 0461	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C 1/00-630 1821 F 0022B DW-1 HARSH
NO WORK HISTORY		
*1821 F 0462	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C 1/00-630 1821 F 0022C DW-1 HARSH
NO WORK HISTORY		
*1821 F 0463	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C 1/00-630 1821 F 0022D DW-1 HARSH
NO WORK HISTORY		
*1821 F 0480	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028A AB-7 HARSH
NO WORK HISTORY		
*1821 F 0481	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028B AB-7 HARSH
NO WORK HISTORY		

NP-8320-A185E
NP-8323-A20E

NP-8320-A185E
NP-8323 A20E

NP-8320 A185E
NP-8323 A20E

NP-8320 A185E
NP-8323 A20E

NP-8320 A185E
NP-8323 A20E

NP-8320 A185E
NP-8323 A20E

B/62

Asco mod. 1 A

NP-8320-A18SE
NP-8323-A20E

NP-8320-A18SE
NP-8323-A20E

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DIV LOCATION SUPPORT ZONE M/H
*1821 F 0482	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821HK 11 S D1 AXC/05-620 1821 F 0028C AB-7 HARSH
	No WORK HISTORY	
*1821 F 0483	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028D AB-7 HARSH
	No WORK HISTORY	

Asco Model H

NP8316A75E

NP8316A75E

NP8316A75E

NP8316A75E

NP8316A75E

NP8316A75E

			ZONE M/H
*1M14 F 0043	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F040 SOLENOID	1M14 008 G D1	C 0/12-689 1M14 F 0040 CT-0 HARSH
	NO WORK HISTORY		
*1M14 F 0048	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F045 SOLENOID	1M14 008 G D2	C 0/12-689 1M14 F 0045 CT-1 HARSH
	WO 86-1698 Repair Air Tube Leak		
*1M14 F 0058A	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F055A SOLENOID	1M14 009 K D1	C I/07-630 1M14 F 0055A DW-1 HARSH
	NO WORK HISTORY		
*1M14 F 0058B	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F055B SOLENOID	1M14 010 J D2	C 0/07-630 1M14 F 0055B CT-3 HARSH
	NO WORK HISTORY		
*1M14 F 0060A	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F060A SOLENOID	1M14 009 K D1	C I/16-630 1M14 F 0060A DW-1 HARSH
	NO WORK HISTORY		
*1M14 F 0060B	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F060B SOLENOID	1M14 010 J D2	C 0/16-630 1M14 F C060B CT-3 HARSH
	NO WORK HISTORY		

ASCO m.1.1 H

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV LOCATION SUPPORT ZONE M/H
NP8316A75E *1M14 F 0068	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F065 SOLENOID	1M14 011 H C 0/12-652 1M14 F 0065 CT-7 HARSH
	NO WORK HISTORY	
NP8316A75E *1M14 F 0073	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F070 SOLENOID	1M14 012 G C 0/12-652 1M14 F 0070 CT-7 HARSH
	NO WORK HISTORY	
NP8316A75E *1M14 F 0088	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F085 SOLENOID	1M14 011 H C 0/12-664 1M14 F 0085 CT-7 HARSH
	NO WORK HISTORY	
NP8316A75E *1M14 F 0093	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F090 SOLENOID	1M14 012 G C 0/12-664 1M14 F 0090 CT-0 HARSH
	NO WORK HISTORY	
NP8316A75E *1M14 F 0192	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F190 SOLENOID NO WORK HISTORY	1M14 013 F C 0/12-689 1M14 F 0190 CT-1 HARSH
NP8316A74E	1M14 F0197 NO WORK HISTORY	
NP8316A75E *1M14 F 0202	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F200 SOLENOID	1M14 013 F C 0/12-664 1M14 F 0200 CT-7 HARSH
	OPEN W.O. 86-3552 Tubing Air Leak	
NP8316A74E	1M14 F 0207	
	W.O. 86-3553 Tubing Air Leak (NONE found void)	

Asco m.1.1 #

TABLE 1 EQUIPMENT LIST

C D S	EQUIPMENT NUMBER	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV D LOCATION SUPPORT ZONE M/H
NP8316A74E	*1M14 F 0197	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F195 SOLENOID	1M14 016 D D C 0/12-689 1M14 F 0195 CT-1 HARSH
		NO WORK HISTORY	
NP8316A74E	*1M14 F 0207	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F205 SOLENOID	1M14 016 D D C 0/12-664 1M14 F 0205 CT-7 HARSH
		W.O. 86-3553 Tubing Air Leak voided none Qual	

ASCO Model #

SORT : 01
TITLE : EQPL/SP 607-000

AS OF 00762

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV D LOCATION SUPPORT ZONE M/H
NP8320A185E *1821 F 0451	NUCLEAR BOILER SYSTEM SOLENOID FOR VALVE F069 SOLENOID	1821A004 U D AX8/04-620 1821 F 0069 AB-7 HARSH
	W.O. 85-1674 Replace Copper Tubing	
NP8320 94E *1833 F 0419	REACTOR RECIRCULATION SYSTEM CONTROLS OPERATING AIR TO F019 SOLENOID VALVE	1821H009 U D C 0/02-620 1833 F 0019 CT-3 HARSH
	W.O. 86-3559 Air Tubing Leak	
NP8320 94E *1833 F 0420	REACTOR RECIRCULATION SYSTEM CONTROLS OPERATING AIR TO F020 SOLENOID	1821H009 U D C 0/02-620 1833 F 0020 CT-3 HARSH
	NO WORK HISTORY	
NP8320A185E *1E12 F 0451A	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F051A SOLENOID VALVE	1E12A041 F D AX8/06-620 1E12 F 0051A AB-4 HARSH
	NO WORK HISTORY	
NP8320A185E *1E12 F 0451B	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F051B SOLENOID VALVE	1E12A042 H D AX8/04-620 1E12 F 0051B AB-4 HARSH
NP8320A185E *1E12 F 0465A	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F065A SOLENOID VALVE	1E12A041 F D AX8/06-574 1E12 F 0065A AB-4 HARSH
	NO WORK HISTORY	

Asco m.1.1 H

TITLE : EQPL/SP 607-000

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV LOCATION SUPPORT ZONE M/H
NP 8320 A185E *1E12 F 0465B	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F065B SOLENOID VALVE	1E12 042 F AXC/04-574 1E12 F 0065B AB-4 HARSH
	NO WORK HISTORY	
NP 8320 A185E *1E51 F 0404	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F004 SOLENOID VALVE	1E51A007 P AXB/05-574 1E51 F 0004 AB-3 HARSH
	NO WORK HISTORY	
NP 8320 A185E *1E51 F 0405	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F005 SOLENOID VALVE	1E51A007 P AXB/05-574 1E51 F 0005 AB-3 HARSH
	NO WORK HISTORY	
NP 8320 A185E *1E51 F 0425	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F025 SOLENOID VALVE	1E51A007 P AXC/05-574 1E51 F 0025 AB-3 HARSH
	NO WORK HISTORY	
NP 8320 A185E *1E51 F 0426	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F026 SOLENOID VALVE	1E51A007 P AXC/05-574 1E51 F 0026 AB-3 HARSH
	NO WORK HISTORY	
NP 8320 A185E *1E51 F 0454	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F054 SOLENOID VALVE	1E51A007 P AXC/05-574 1E51 F 0054 AB-3 HARSH
	NO WORK HISTORY	

TITLE : EURL/SUM-ENV

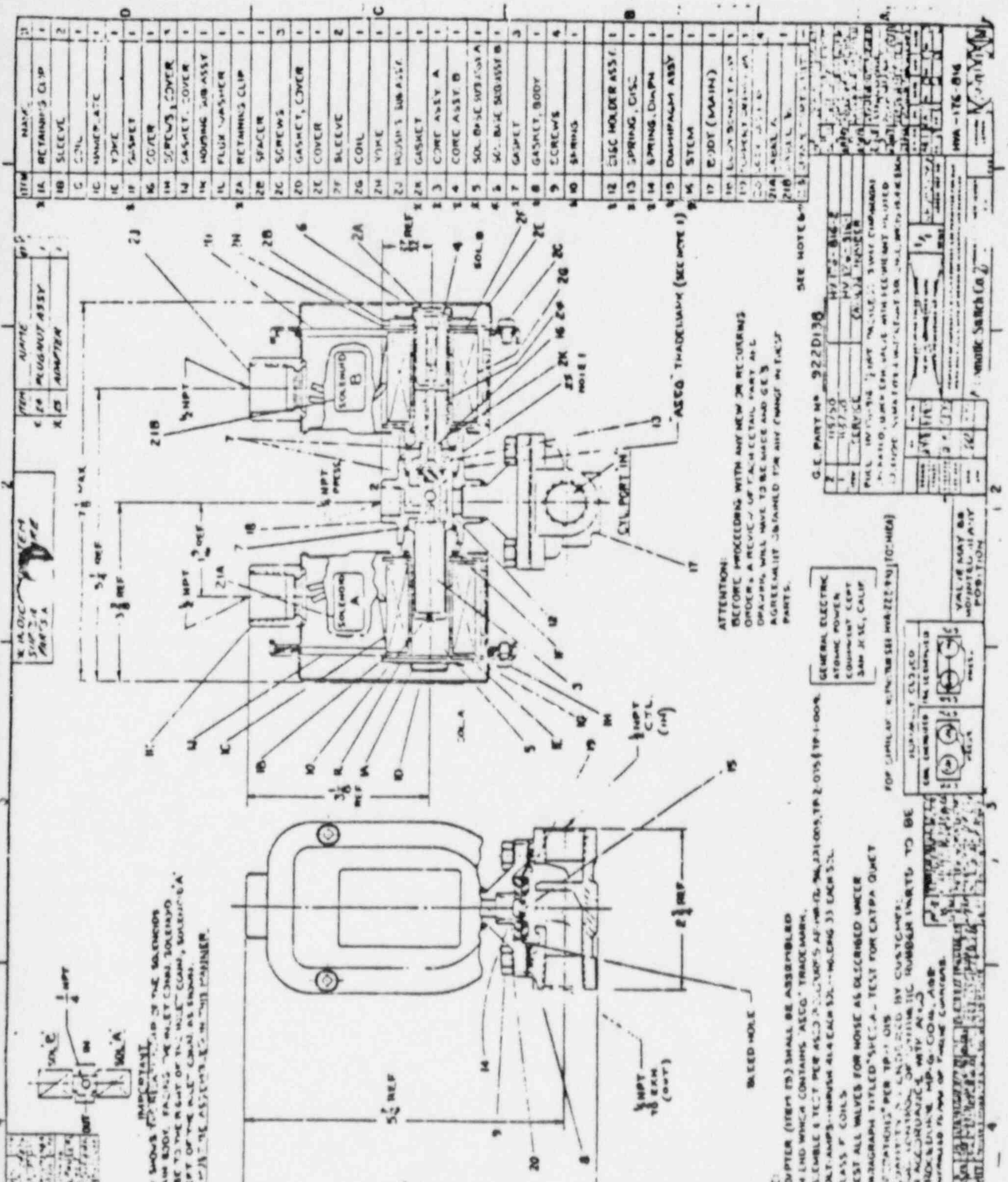
C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DI\ LOCATION SUPPORT ZONE M/H
*1C11 D 0001	REACTOR PROTECTION SYSTEM CRD-HCV/SCRAM SOLENOID PILOT VALVE SOLENOID(TYPICAL-177 CRDS-2 SSPV PER CRD)	1C71A010 H VA C 0/14-620 LOCAL-CF CT-3 HARSH

Solenoid Hacked

ASCO MODEL # HVA-176-816-1

HCU's

Computer search could not identify Solenoid work



NEDC-30208

Automatic Switch Co.
FLORHAM PARK, NEW JERSEY
Printed in U S A

PRODUCTION SPECIFICATION
BILL OF MATERIAL

FVP – 176-816
PAGE 1 OF 4 PAGE

CHG LTR

CATA. NO. HV176-816-1 & HV176-816-2

SHOP ORDER NO

BULL. NO. HV176-816, 1/2 NPT, PACKLESS, 3 WAY DIAPHRAGM OPERATED, QUICK EXH. VALVE WITH REDUNDANT PILOTED SOLENOID, NEMA TYPE 4 WATERTIGHT SOL. ENCL. WATTS: 15.4 AC (FT) EACH.

NO OF PARTS LIST PER ASS'Y 1

ASSEMBLY REF HVA-176-816

ER NO	CHG LTR	ER NO	CHG LTR
73932	H		
70577	F		
69292	E		
69132	D		
68347	C		
67826	B		

FVP – 176-816

ITEM	PART NUMBER	CHG LTR	NOTE	MATERIAL	PART NAME	QUANTITY UNIT	REQ'D	DELVD
1	HVA-172-464	F	1		SOL. ASS'Y A (M-12)	1		
1A	GV-176-593-1	H		ST. STEEL	RETAINING CLIP	1		
1B	FV-99-033-1	H		STEEL	SLEEVE	2		
1D	GV-172-739-1	E		ALUM.	NAMEPLATE	1		
1E	HV-96-815-1	N		STEEL	YOKE	1		
1F	GV-39-619-5-HT	CV		ETHYLENE PROPYLENE	GASKET, HOUSING	1		
1G	FV-168-808-1	F		STEEL	COVER	1		
1H	FV-172-788-1	C		STEEL	SCREW, COVER	3		
1J	FV-172-759-1	D		BUNA-N	GASKET, COVER	1		
1L	FV93-233-1 ~~FV-176-338-1~~	B		STEEL	FLUX WASHER	1		
2	HVA-176-730	A	2		SOL. ASS'Y, B (M-12)	1		
2A	GV-176-593-1	H		ST. STEEL	RETAINING CLIP	1		
2B	FV-176-337-1	C		STEEL	SPACER	1		
2C	FV-172-788-1	C		STEEL	SCREW, COVER	3		
2D	FV-172-759-1	D		BUNA-N	GASKET, COVER	1		
2E	FV-168-808-1	F		STEEL	COVER	1		
2F	FV-99-033-1	H		STEEL	SLEEVE	2		
2H	HV-96-815-1	N		STEEL	YOKE	1		
2K	FV-180-769-3	B		ETHYLENE PROPYLENE	GASKET, HOUSING	1		
7	GV-39-619-6-VI	DU		VITON-A	GASKET	3		
9	GH-70-022-9C1	P		ST. STEEL	WASHER	4		
9	GH-73-102-3C1	N		ST. STEEL	SCREW	4		
8	GH-88-224-133A	Y		BUNA-N	GASKET			

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FLORHAM PARK, NEW JERSEY
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PRODUCTION SPECIFICATION
BILL OF MATERIAL

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CATA. NO. HV176-816-1 & HV176-816-2

SHOP ORDER NO

BULL. NO. - HV176-816

NO OF PARTS LIST PER ASSY 1

ASSEMBLY REF HVA-176-816

ER NO	CHG LTR	ER NO	CHG LTR
74[illegible]	K	[illegible]	L
74[illegible]	J	[illegible]	M
73[illegible]	H	[illegible]	N
71[illegible]	G	[illegible]	P
70577	F	[illegible]	R
69[illegible]	E		
69132	D		
68347	C		
67826	B		

FVP-176-816

ITEM	PART NUMBER	CHG LTR	NOTE	MATERIAL	PART NAME	QUANTITY UNIT	REQ'D	DELV'D
3	GV-89-653-5	BA			CORE ASS'Y. SOL. A	1		
	FV-91-084-1	G		ST. STEEL	CORE	1		
	GV-60-452-9	EM		VITON-A	DISC	1		
	~~FV-97-097-2~~			~~NOSEPIANE~~				
~~11~~	~~GV-97-092-1~~	~~E~~			~~ADAPTER/PLUGNUT ASSY.~~	~~1~~		
	~~GV-97-091-1~~	~~B~~		~~BRASS~~	~~ADAPTER~~	~~1~~		
	~~FV-99-039-1~~	~~E~~			~~PLUGNUT SUB-ASS'Y.~~	~~1~~		
	~~FV-159-244-1~~	~~A~~		~~ST. STEEL~~	~~PLUGNUT~~	~~1~~		
	~~FV-158-247-1~~	~~E~~		~~COPPER~~	~~SHADING COIL~~	~~1~~		
12	FV-101-749-4K	Z			DISC HOLDER ASS'Y	1		
	GV100-820-4	R		VITON A	DISC	1		
	GV-174-682-1	C		ST. STEEL	DISC. HOLDER	1		
19	FV-160-219-2	C		ST. STEEL	SUPPORT	1		
13	FV-162-939	-		ST. STEEL	SPRING, DISC	1		
6	FV-96-678-4	H			SOL. BASE SUB-ASS'Y. B	1		
	FV-172-472-1	A		ST. STEEL	DISC, FORMING	1		
	FV-166-960-2	F		ST. STEEL	CORE TUBE	1		
	FV-96-677-3	H		ST. STEEL	BONNET	1		
14	FV-178-088	-		ST. STEEL	SPRING, DIAPH.	1		
23	FV-186-495	A	3	——	SPARE PARTS KIT	-		
5	GV-200-153-1	J		BRASS	ADAPTER	1		
	FV-206-048-1	F			PLUGNUT ASSY	1		
	FV-158-248-1	E		COPPER	SHADING COIL	1		
	GV-200-152-1	J		ST. ST.	PLU[illegible]			

NOTICE
THIS INFORMATION IS SUPPLIED IN ACCORDANCE WITH ARTICLE XVII OF THE NUCLEAR STEAM SUPPLY SYSTEM CONTRACT BETWEEN GENERAL ELECTRIC COMPANY AND CLEVELAND ELECTRIC ILLUMINATING COMPANY DATED JUNE 1, 1972. THE USE OF THIS INFORMATION BY ANYONE OTHER THAN AGENTS OR EMPLOYEES OF CLEVELAND ELECTRIC ILLUMINATING COMPANY FOR ANY PURPOSE OTHER THAN THE DESIGN, CONSTRUCTION, LICENSING OR OPERATION OF THE PERRY NUCLEAR POWER [illegible]

Automatic Switch Co.
FLORHAM PARK, NEW JERSEY
Printed in U. S. A.

PRODUCTION SPECIFICATION
BILL OF MATERIAL

AE ☐ CH ☐
CA ☐ AV ☐
AL ☐ ☐
AM ☐ ☐
KA ☐ ☐

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CHG LTR

CATA. NO. HV 176-816-1 & HV176-816-2

SHOP ORDER NO

BULL. NO. HV 176-816

NO OF PARTS LIST PER ASSY 1

ASSEMBLY REF HVA-176-816

ER NO	CHG LTR	ER NO	CHG LTR
70577	F	101004	R
69132	D		
60347	C		
67826	B		

FVP – 176-816

ITEM	PART NUMBER	CHG LTR	NOTE	MATERIAL	PART NAME	QUANTITY UNIT	REQ'D	DELVD
15	FV-178-091-1	A			DIAPHRAGM/DISC SUB-ASS'Y.	1		
	FV-178-092-1	A		ST. STEEL	RIVET	1		
	FV-103-889-1	L			DISC, SUB-ASS'Y.	2		
	FV-103-888-2	B		ST. STEEL	INSERT	2		
	GV-164-054-34	S		BUNA-N	DIAPHRAGM	1		
14	FV-178-114-1	B		ST. STEEL	STEM	1		
	GV-178-122-1	A		BRASS	BODY, MAIN	1		
	FV-178-247-1	C			BODY & BONNET SUB-ASS'Y.	1		
	FV-178-110-1	B		BRASS	BODY	1		
	GV-178-089-1	C		BRASS	BONNET	1		
10	FV-178-547	B		17-7PH	SPRING	1		
5	GV-180-817-31	F			SOL. BASE SUB-ASS'Y. A	1		
	FV80-630-14	W			PLUGNUT SUB-ASS'Y.	1		
	FV180-422-1	-		ST. STEEL	PLUGNUT	1		
	FV-158-247-1	F		COPPER	SHADING COIL	1		
	FV-180-536-4	A		BRASS	BONNET	1		
	FV-164-996-1	E		ST. ST.	CORETUBE	1		
4	FV-182-125-1	-			CORE ASS'Y, SOL. B	1		
	FV-162-970-1	B		ST. ST.	CORE	1		
	FV-162-968-2	A		BRASS	GUIDE, SPRING	1		
	FV-180-347	A		ST. ST.	SPRING, CORE	1		
	FV-162-969-1	C		BRASS	PLUG, CORE	1		
21	FV-166-647-1	A		PLASTIC	LABELS A & B			
22	FV-166-647-2			PLASTIC	LABEL			

NOTICE
THIS INFORMATION IS SUPPLIED IN ACCORDANCE WITH ARTICLE XVII OF THE NUCLEAR STEAM SUPPLY SYSTEM CONTRACT BETWEEN GENERAL ELECTRIC COMPANY AND CLEVELAND ELECTRIC ILLUMINATING COMPANY DATED JUNE 2, 1972. THE USE OF THIS INFORMATION BY ANYONE OTHER THAN AGENTS OR EMPLOYEES OF CLEVELAND ELECTRIC ILLUMINATING COMPANY OR THE PERRY NUCLEAR POWER PLANT FOR ANY PURPOSE OTHER THAN THE DESIGN, CONSTRUCTION, LICENSING OR OPERATION OF THE PERRY NUCLEAR POWER

Automatic Switch Co.
FLORHAM PARK, NEW JERSEY
Printed in U.S.A.

PRODUCTION SPECIFICATION
BILL OF MATERIAL

AE | CH
CA | AV
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FVP—176-816
PAGE 1 OF 4 PAGE

CHG LTR

[illegible]	K		L
[illegible]	J	[illegible]	M
73032	H	[illegible]	N
71[illegible]	G		P
70577	F	10[illegible]	R
69[illegible]	E		
69132	D		
68347	C		
67826	B		
ER NO	CHG LTR	ER NO	CHG LTR

CATA. NO. HV 176-816-1 HV 176-816-2

SHOP ORDER NO

BULL. NO. HV 176-816

NO OF PARTS LIST PER ASSY: 1

ASSEMBLY REF: HVA-176-816

FVP—176-816

ITEM	PART NUMBER	CHG LTR	NOTE	MATERIAL	PART NAME	QUANTITY UNIT	QUANTITY REQ'D	QUANTITY DELVD
	NOTES:							
	1. IN SOLENOID ASSEMBLY	A,	CUT GROUND		SCREW AND SUBSTITUTE THE FOLLOWING:			
1C	GV-99-257-1G 115/60	AB			CATA HV 176-816-1 COIL - REMARK TO 115/60	1		
1C	GV-99-257-25G115/50	AB			CATA HV 176-816-2 COIL -	1		
1K	FV-172-444-6	C			HOUSING/CONDUIT ASSEMBLY	1		
	GV-168-736-6	H		STEEL	HOUSING	1		
	FV-33-103-1	X		ALUMINUM	CONDUIT CONNECTION	1		
	2. IN SOLENOID ASSEMBLY	B,	CUT GROUND		SCREW AND NAMEPLATE AND SUBSTITUTE THE FOLLOWING:			
2G	GV-99-257-1G 115/60	AB			CATA HV 176-816-1 COIL - REMARK TO 115/60	1		
2G	GV-99-257-25G 115/50	AB			CATA HV 176-816-2 COIL -	1		
2J	FV-172-444-6	C			HOUSING/CONDUIT ASSEMBLY	1		
	GV-168-736-6	H		STEEL	HOUSING	1		
	FV-33-103-1	X		ALUMINUM	CONDUIT CONNECTION	1		
	3. QUANTITY AS ORDERED BY CUSTOMER.							

ATTENTION:

BEFORE PROCEEDING WITH ANY NEW OR RECURRING ORDERS A REVIEW OF EACH DETAIL PART AND DRAWING WILL HAVE TO BE MADE AND G.E.'S AGREEMENT OBTAINED FOR ANY CHANGE IN THESE PARTS.

Gary Rhoads

Preliminary Search of ASCO Applications at Perry

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DI LOCATION SUPPORT ZONE M/H
*1821 F 0460	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C 1/00-630 1821 F 0022A DW-1 HARSH
*1821 F 0461	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C 1/00-630 1821 F 0022B DW-1 HARSH
*1821 F 0462	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C 1/00-630 1821 F 0022C DW-1 HARSH
*1821 F 0463	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C 1/00-630 1821 F 0022D DW-1 HARSH
*1821 F 0480	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028A AB-7 HARSH
*1821 F 0481	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028B AB-7 HARSH

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DIV LOCATION SUPPORT ZONE M/H
*1B21 F 0482	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1B21HO11 S D1 AXC/05-620 1B21 F 0028C AB-7 HARSH
*1B21 F 0483	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1B21HO11 S D1 AXC/05-620 1B21 F 0028D AB-7 HARSH

EQUIPMENT NO.	EQUIPMENT NAME	SUPPORT ZONE B/H
*1M14 F 0043	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F040 SOLENOID	1M14 008 G D1 C 0/12-68? 1M14 F 0040 CT-0 HARSH
*1M14 F 0048	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F045 SOLENOID	1M14 008 G D2 C 0/12-68? 1M14 F 0045 CT-1 HARSH
*1M14 F 0058A	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F055A SOLENOID	1M14 009 K D1 C I/07-630 1M14 F 0055A DW-1 HARSH
*1M14 F 0058B	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F055B SOLENOID	1M14 010 J D2 C 0/07-630 1M14 F 0055B CT-3 HARSH
*1M14 F 0063A	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F060A SOLENOID	1M14 009 K D1 C I/16-630 1M14 F 0060A DW-1 HARSH
*1M14 F 0063B	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F060B SOLENOID	1M14 010 J D2 C 0/16-630 1M14 F 0060B CT-3 HARSH

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV C LOCATION SUPPORT ZONE M/H
*1M14 F 0066	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F065 SOLENOID	1M14 011 H C 0/12-652 1M14 F 0065 CT-7 HARSH
*1M14 F 0073	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F070 SOLENOID	1M14 012 G C 0/12-652 1M14 F 0070 CT-7 HARSH
*1M14 F 0088	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F085 SOLENOID	1M14 011 A C 0/12-664 1M14 F 0085 CT-7 HARSH
*1M14 F 0093	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F090 SOLENOID	1M14 012 G C 0/12-664 1M14 F 0090 CT-C HARSH
*1M14 F 0192	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F190 SOLENOID	1M14 013 F C 0/12-689 1M14 F 0190 CT-1 HARSH
1M14 F0197		
*1M14 F 0202	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F200 SOLENOID	1M14 013 F C 0/12-664 1M14 F 0200 CT-7 HARSH
1M14 F 0207		

TABLE 1 EQUIPMENT LIST

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV 01 LOCATION SUPPORT ZONE M/H
*1M14 F 0197	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F195 SOLENOID	1M14 C16 D 01 C 0/12-689 1M14 F 0195 CT-1 HARSH
*1M14 F 0207	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F205 SOLENOID	1M14 C16 D 01 C 0/12-689 1M14 F 0205 CT-7 HARSH

TITLE : EQRL/SUM-ENV

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DIV LOCATION SUPPORT ZONE M/H
*1C11 D 0001	REACTOR PROTECTION SYSTEM	1C71A010 H VA
	CRD-HCV/SCRAM SOLENOID PILOT VALVE	C 0/14-620
	SOLENOID(TYPICAL-177	LOCAL-CF
	CRDS-2 SSPV PER CRD)	CT-3 HARSH

ASCO MODEL # HVA-176-816-1

SELECT :
SORT : 01 AS OF 00762
TITLE : EQPL/SP 607-000

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DI LOCATION SUPPORT ZONE M/H
*1821 F 0451	NUCLEAR BOILER SYSTEM SOLENOID FOR VALVE F069 SOLENOID	1B21A004 U D2 AXB/04-620 1B21 F 0069 AB-7 HARSH
*1833 F 0419	REACTOR RECIRCULATION SYSTEM CONTROLS OPERATING AIR TO F019 SOLENOID VALVE	1B21H009 U D2 C 0/02-620 1833 F 0019 CT-3 HARSH
*1833 F 0420	REACTOR RECIRCULATION SYSTEM CONTROLS OPERATING AIR TO F020 SOLENOID	1B21H009 U D2 C 0/02-620 1833 F 0020 CT-3 HARSH
*1E12 F 0451A	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F051A SOLENOID VALVE	1E12A041 F D1 AXB/06-620 1E12 F 0051A AB-4 HARSH
*1E12 F 0451B	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F051B SOLENOID VALVE	1E12A042 H D2 AXB/04-620 1E12 F 0051B AB-4 HARSH
*1E12 F 0465A	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F065A SOLENOID VALVE	1E12A041 F D1 AXB/06-574 1E12 F 0065A AB-4 HARSH

TITLE : EQPL/SP 607-000

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV D LOCATION SUPPORT ZONE M/H
*1E12 F 04658	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F0658 SOLENOID VALVE	1E12 042 F D AXC/04-574 1E12 F 00658 AB-4 HARSH
*1E51 F 0404	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F004 SOLENOID VALVE	1E51A007 P D AXB/05-574 1E51 F 0004 AB-3 HARSH
*1E51 F 0405	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F005 SOLENOID VALVE	1E51A007 P D AXB/05-574 1E51 F 0005 AB-3 HARSH
*1E51 F 0425	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F025 SOLENOID VALVE	1E51A007 P D AXC/05-574 1E51 F 0025 AB-3 HARSH
*1E51 F 0426	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F026 SOLENOID VALVE	1E51A007 P D AXC/05-574 1E51 F 0026 AB-3 HARSH
*1E51 F 0454	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F054 SOLENOID VALVE	1E51A007 P D AXC/05-574 1E51 F 0054 AB-3 HARSH

Ascm.1.1A.

NP-8320-A185E
NP-8323 A20E

NP-8320-A185E
NP-8323 A20E

NP-8320 A185E
NP-8323 A20E

NP-8320 A185E
NP-8323 A20E

NP-8320 A185E
NP-8323 A20E

NP-8320 A185E
NP-8323 A20E

C EQUIPMENT NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV 01 LOCATION SUPPORT ZONE M/H
*1821 F 0460	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C I/00-630 1821 F 0022A DW-1 HARSH
*1821 F 0461	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C I/00-630 1821 F 0022B DW-1 HARSH
*1821 F 0462	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C I/00-630 1821 F 0022C DW-1 HARSH
*1821 F 0463	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1821H010 R D2 C I/00-630 1821 F 0022D DW-1 HARSH
*1821 F 0480	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028A AB-7 HARSH
*1821 F 0481	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028B AB-7 HARSH

Asco mod. 1 A

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DIV LOCATION SUPPORT ZONE M/H
*1821 F 0482	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028C AB-7 HARSH
*1821 F 0483	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1821H011 S D1 AXC/05-620 1821 F 0028D AB-7 HARSH

NP-8320-A18SE
NP-8323-A20E

NP-8320-A18SE
NP-8323-A20E

Asco Model #

			ZONE	M/H
*1M14 F 0043	NP8316A75E	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F040 SOLENOID	1M14 008 G C 0/12-689 1M14 F 0040 CT-0 HARSH	D1
*1M14 F 0048	NP8316A75E	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F045 SOLENOID	1M14 008 G C 0/12-689 1M14 F 0045 CT-1 HARSH	D2
*1M14 F 0058A	NP8316A75E	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F055A SOLENOID	1M14 009 K C I/07-630 1M14 F 0055A DW-1 HARSH	D1
*1M14 F 0058B	NP8316A75E	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F055B SOLENOID	1M14 010 J C 0/07-630 1M14 F 0055B CT-3 HARSH	D2
*1M14 F 0063A	NP8316A75E	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F060A SOLENOID	1M14 009 K C I/16-630 1M14 F 0060A DW-1 HARSH	D1
*1M14 F 0063B	NP8316A75E	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F060B SOLENOID	1M14 010 J C 0/16-630 1M14 F 0060B CT-3 HARSH	D2

ASCO m.d.1 H

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV C LOCATION SUPPORT ZONE M/H
NP8316A75E *1M14 F 0068	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F065 SOLENOID	1M14 011 H C 0/12-652 1M14 F 0065 CT-7 HARSH
NP8316A75E *1M14 F 0073	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F070 SOLENOID	1M14 012 G C 0/12-652 1M14 F 0070 CT-7 HARSH
NP8316A75E *1M14 F 0088	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F085 SOLENOID	1M14 011 H C 0/12-664 1M14 F 0085 CT-7 HARSH
NP8316A75E *1M14 F 0093	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F090 SOLENOID	1M14 012 G C 0/12-664 1M14 F 0090 CT-0 HARSH
NP8316A75E *1M14 F 0192	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F190 SOLENOID	1M14 013 F C 0/12-689 1M14 F 0190 CT-1 HARSH
NP8316A74E 1M14 F0197		
NP8316A75E *1M14 F 0202	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F200 SOLENOID	1M14 013 F C 0/12-664 1M14 F 0200 CT-7 HARSH
NP8316A74E 1M14 F 0207		

Asco m.1.1 A

TITLE : EQUIPMENT LIST

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV D1 LOCATION SUPPORT ZONE M/H
NP8316A74E *1M14 F 0197	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F195 SOLENOID	1M14 016 D D1 C 0/12-689 1M14 F 0195 CT-1 HARSH
NP8316A74E *1M14 F 0207	CONTAINMENT VESSEL AND DRYWELL PURGE OP AIR TO F205 SOLENOID	1M14 016 D D1 C 0/12-664 1M14 F 0205 CT-7 HARSH

AS of Mod. 1 #

SORT : 01 AS OF 00762
TITLE : EQPL/SP 607-000

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV D LOCATION SUPPORT ZONE M/H
NP8320A185E *1821 F 0451	NUCLEAR BOILER SYSTEM SOLENOID FOR VALVE F069 SOLENOID	1B21A004 U 02 AX8/04-620 1821 F 0069 AB-7 HARSH
NP8320C94E *1833 F 0419	REACTOR RECIRCULATION SYSTEM CONTROLS OPERATING AIR TO F019 SOLENOID VALVE	1821H009 U 02 C 0/02-620 1833 F 0019 CT-3 HARSH
NP8320 94E *1833 F 0420	REACTOR RECIRCULATION SYSTEM CONTROLS OPERATING AIR TO F020 SOLENOID	1821H009 U 02 C 0/02-620 1833 F 0020 CT-3 HARSH
NP8320A185E *1E12 F 0451A	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F051A SOLENOID VALVE	1E12A041 F D1 AX8/06-620 1E12 F 0051A AB-4 HARSH
NP8320A185E *1E12 F 0451B	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F051B SOLENOID VALVE	1E12A042 H 02 AX8/04-620 1E12 F 0051B AB-4 HARSH
NP8320A185E *1E12 F 0465A	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F065A SOLENOID VALVE	1E12A041 F D1 AX8/06-574 1E12 F 0065A AB-4 HARSH

Asco m.1.1 A

TITLE : [illegible] 'SP 607-000

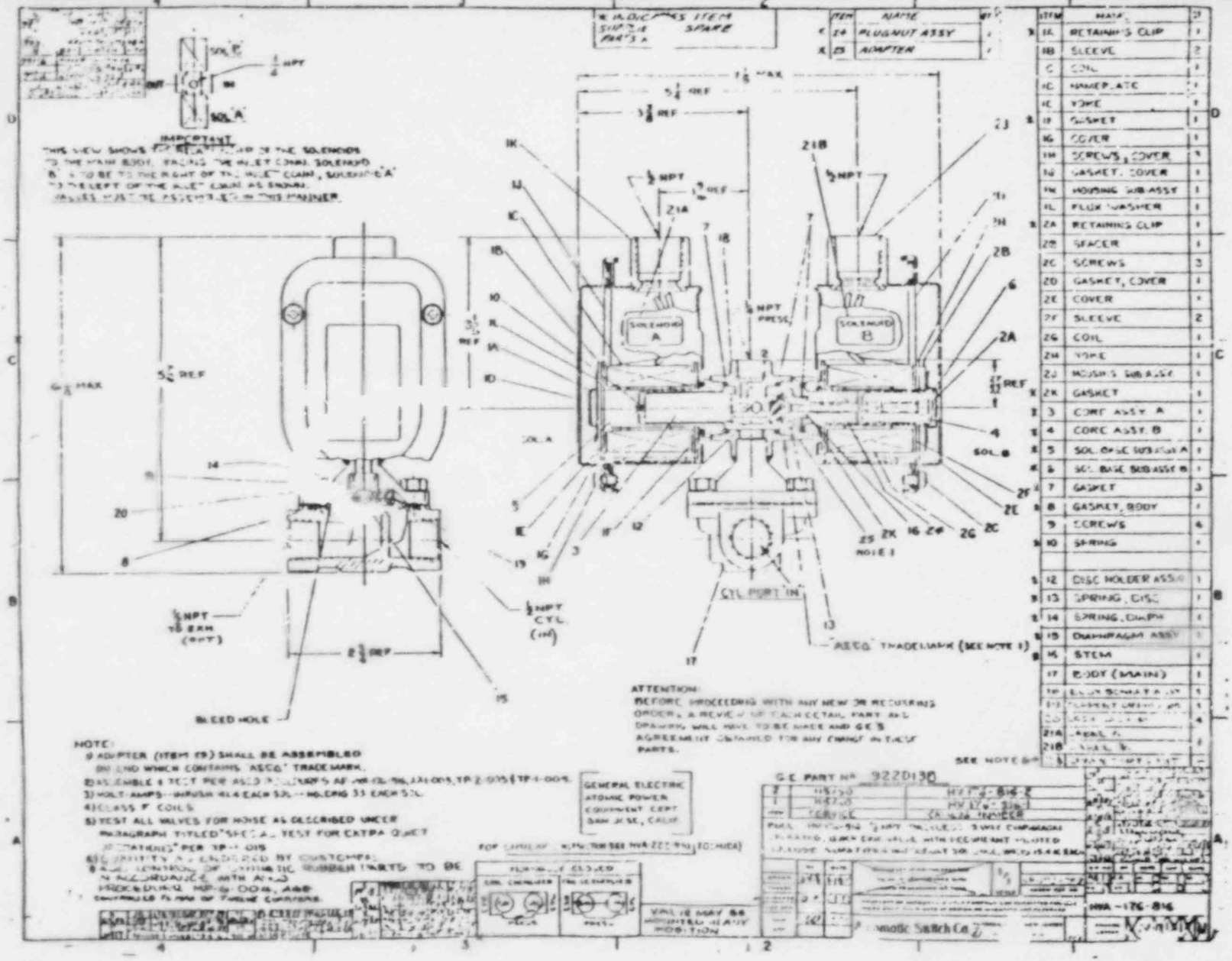
C D S	EQUIPMENT NUMBER	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV D LOCATION SUPPORT ZONE M/H
NP 8320 A155E	*1E12 F 04658	RESIDUAL HEAT REMOVAL SYSTEM CONTROLS OPERATING AIR TO F0658 SOLENOID VALVE	1E12 042 F D AXC/04-574 1E12 F 00658 AB-4 HARSH
NP 8320 A155E	*1E51 F 0404	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F004 SOLENOID VALVE	1E51A007 P D AXB/05-574 1E51 F 0004 AB-3 HARSH
NP 8320 A155E	*1E51 F 0405	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F005 SOLENOID VALVE	1E51A007 P D AXB/05-574 1E51 F 0005 AB-3 HARSH
NP 8320 A155E	*1E51 F 0425	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F025 SOLENOID VALVE	1E51A007 P D AXC/05-574 1E51 F 0025 AB-3 HARSH
NP 8320 A155E	*1E51 F 0426	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F026 SOLENOID VALVE	1E51A007 P D AXC/05-574 1E51 F 0026 AB-3 HARSH
NP 8320 A155E	*1E51 F 0454	REACTOR CORE ISOLATION COOLING CONTROLS OPERATING AIR TO F054 SOLENOID VALVE	1E51A007 P D AXC/05-574 1E51 F 0054 AB-3 HARSH

TITLE : EQRL/SUM-ENV

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DIV LOCATION SUPPORT ZONE M/H
*1C11 D 0001	REACTOR PROTECTION SYSTEM	1C71A010 H VA
	CRD-HCV/SCRAM SOLENOID PILOT VALVE	C 0/14-620
	SOLENOID(TYPICAL-177	LOCAL-CF
	CRDS-2 SSPV PER CRD)	CT-3 HARSH

Sc. cH.ch.1

ASCO MODEL # HVA-176-816-1



ITEM	NAME	QTY
* 24	PLUGNUT ASSY	1
* 25	ADAPTER	1
1K	RETAINING CLIP	1
1B	SLEEVE	2
1C	COIL	1
1D	NAMEPLATE	1
1E	YOKE	1
1F	GASKET	1
1G	COVER	1
1H	SCREWS, COVER	3
1J	GASKET, COVER	1
1K	HOUSING SUB ASSY	1
1L	FLUX WASHER	1
2A	RETAINING CLIP	1
2B	SPACER	1
2C	SCREWS	3
2D	GASKET, COVER	1
2E	COVER	1
2F	SLEEVE	2
2G	COIL	1
2H	YOKE	1
2J	HOUSING SUB ASSY	1
2K	GASKET	1
3	CORE ASSY A	1
4	CORE ASSY B	1
5	SOL BASE SUB ASSY A	1
6	SOL BASE SUB ASSY B	1
7	GASKET	3
8	GASKET, BODY	1
9	SCREWS	4
* 10	SPRING	1
* 12	DISC HOLDER ASSY	1
* 13	SPRING, DISC	1
* 14	SPRING, DIAPH	1
* 15	DIAPHRAGM ASSY	1
* 16	STEM	1
17	BODY (MAIN)	1
19	ELBOW SCH 40 PIPE	1
20	[illegible]	1
21	[illegible]	4
21A	SEAL A	1
21B	SEAL B	1
22	[illegible]	1

NEDC-30208

B-13

NEDC-30208

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FLORHAM PARK, NEW JERSEY
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PRODUCTION SPECIFICATION
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CHG LTR

73932	H		
71252	G		
70577	F		
69292	E		
69132	D		
68347	C		
67826	B		
ER NO	CHG LTR	ER NO	CHG LTR

CATA. NO. HV176-816-1 & HV176-816-2

SHOP ORDER NO

BULL. NO. HV176-816, 1/2 NPT, PACKLESS, 3 WAY DIAPHRAGM OPERATED, QUICK EXH. VALVE WITH REDUNDANT PILOTED SOLENOID, NEMA TYPE 4 WATERTIGHT SOL. ENCL. WATTS: 15.4 AC (FT) EACH.

NO OF PARTS LIST PER ASS'Y: 1

ASSEMBLY REF: HVA-176-816

FVP-176-816

ITEM	PART NUMBER	CHG LTR	NOTE	MATERIAL	PART NAME	QUANTITY UNIT	REQ'D	DELVD
1	HVA-176-464	F	1		SOL. ASS'Y A (M-12)	1		
1A	GV-176-593-1	H		ST. STEEL	RETAINING CLIP	1		
1B	FV-99-033-1	H		STEEL	SLEEVE	2		
1D	GV-172-739-1	E		ALUM.	NAMEPLATE	1		
1E	HV-96-815-1	N		STEEL	YOKE	1		
1F	GV-39-619-5-HT	CV		ETHYLENE PROPYLENE	GASKET, HOUSING	1		
1G	FV-168-808-1	F		STEEL	COVER	1		
1H	FV-172-788-1	C		STEEL	SCREW, COVER	3		
1J	FV-172-759-1	D		BUNA-N	GASKET, COVER	1		
1L	FV93-233-1 ~~FV-168-838-1~~	B		STEEL	FLUX WASHER	1		
2	HVA-176-730	A	2		SOL. ASS'Y. B (M-12)	1		
2A	GV-176-593-1	H		ST. STEEL	RETAINING CLIP	1		
2B	FV-176-337-1	C		STEEL	SPACER	1		
2C	FV-172-788-1	C		STEEL	SCREW, COVER	3		
2D	FV-172-759-1	D		BUNA-N	GASKET, COVER	1		
2E	FV-168-808-1	F		STEEL	COVER	1		
2F	FV-99-033-1	H		STEEL	SLEEVE	2		
2H	HV-96-815-1	N		STEEL	YOKE	1		
2K	FV-180-769-3	B		ETHYLENE PROPYLENE	GASKET, HOUSING	1		
7	GV-39-619-6-VI	DU		VITON-A	GASKET	3		
0	GH-70-022-9C1	P		ST. STEEL	WASHER	4		
9	GH-73-102-3C1	N		ST. STEEL	SCREW	4		
8	GH-88-224-133A	Y		BUNA-N	GASKET			

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CHG LTR: J K L M N P R S

CATA. NO. HV176-816-1 & HV176-816-2

SHOP ORDER NO

BULL. NO. HV176-816

NO OF PARTS LIST PER ASS'Y: 1

ASSEMBLY REF: HVA-176-816

ER NO	CHG LTR	ER NO	CHG LTR
72[illegible]	K	[illegible]	L
72[illegible]	J	[illegible]	M
73537	H	[illegible]	N
71853	G	[illegible]	P
70577	F	[illegible]	R
69[illegible]	E	[illegible]	S
69132	D		
68347	C		
67826	B		

FVP-176-816

ITEM	PART NUMBER	CHG LTR	NOTE	MATERIAL	PART NAME	QUANTITY UNIT	QTY REQ'D	QTY REC'D
3	GV-89-653-5	BA			CORE ASS'Y. SOL. A	1		
	FV-91-084-1	G		ST. STEEL	CORE	1		
	GV-60-452-9	EM		VITON-A	DISC	1		
11	~~GV-97-091-1~~	~~F~~			~~ADAPTER/PLUGNUT ASSY.~~	~~1~~		
	~~GV-97-031-1~~	~~R~~		~~BRASS~~	~~ADAPTER~~	~~1~~		
	~~FV-98-039-1~~	~~E~~			~~PLUGNUT SUB-ASS'Y.~~	~~1~~		
	~~FV-143-246-1~~	~~1~~		~~ST. STEEL~~	~~PLUGNUT~~	~~1~~		
	~~FV-158-247-1~~	~~E~~		~~COPPER~~	~~SHADING COIL~~	~~1~~		
12	FV-101-749-4 K	Z			DISC HOLDER ASS'Y	1		
	GV100-820-4	R		VITON A	DISC	1		
	GV-174-682-1	C		ST. STEEL	DISC. HOLDER	1		
19	FV-160-219-2	C		ST. STEEL	SUPPORT	1		
13	FV-162-939	-		ST. STEEL	SPRING, DISC	1		
6	FV-96-678-4	H			SOL. BASE SUB-ASS'Y. B	1		
	FV-172-472-1	A		ST. STEEL	DISC, FORMING	1		
	FV-166-960-2	F		ST. STEEL	CORE TUBE	1		
	FV-96-677-3	H		ST. STEEL	BONNET	1		
14	FV-178-088	-		ST. STEEL	SPRING, DIAPH.	1		
23	FV-186-495	A	3	——	SPARE PARTS KIT	-		
5	GV-200-153-1	J		BRASS	ADAPTER	1		
	FV-206-048-1	F			PLUGNUT ASSY	1		
	FV-158-248-1	E		COPPER	SHADING COIL	1		
	GV-200-152-1	J		ST. ST.	PLU[illegible]			

NOTICE
THIS INFORMATION IS SUPPLIED IN ACCORDANCE WITH ARTICLE XVII OF THE NUCLEAR STEAM SUPPLY SYSTEM CONTRACT BETWEEN GENERAL ELECTRIC COMPANY AND CLEVELAND ELECTRIC ILLUMINATING COMPANY DATED JUNE 2, 1972. THE USE OF THIS INFORMATION BY ANYONE OTHER THAN AGENTS OR EMPLOYEES OF CLEVELAND ELECTRIC ILLUMINATING COMPANY FOR ANY PURPOSE OTHER THAN THE DESIGN, CONSTRUCTION, LICENSING OR OPERATION OF THE PERRY NUCLEAR POWER PLANT IS NOT AUTHORIZED BY THE GENERAL ELECTRIC COMPANY.

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FLORHAM PARK, NEW JERSEY
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CHG LTR

CATA. NO. HV176-816-1 & HV176-816-2

SHOP ORDER NO

BULL. NO. HV176-816

NO. OF PARTS LIST PER ASSY 1

ASSEMBLY REF HVA-176-816

ER NO	CHG LTR	ER NO	CHG LTR
70577	F	10004	R
69132	D		
60347	C		
67826	B		

FVP – 176-816

ITEM	PART NUMBER	CHG LTR	NOTE	MATERIAL	PART NAME	QUANTITY UNIT	REQ'D	DELVD
15	FV-178-091-1	A			DIAPHRAGM/DISC SUB-ASS'Y.	1		
	FV-178-092-1	A		ST. STEEL	RIVET	1		
	FV-103-889-1	L			DISC, SUB-ASS'Y.	2		
	FV-103-888-2	B		ST. STEEL	INSERT	2		
	GV-164-054-34	S		BUNA-N	DIAPHRAGM	1		
16	FV-178-114-1	B		ST. STEEL	STEM	1		
17	GV-178-122-1	A		BRASS	BODY, MAIN	1		
	FV-178-247-1	C			BODY & BONNET SUB-ASS'Y.	1		
	FV-178-110-1	B		BRASS	BODY	1		
	GV-178-089-1	C		BRASS	BONNET	1		
10	FV-178-547	B		17-7PH	SPRING	1		
5	GV-180-817-31	F			SOL. BASE SUB-ASS'Y. A	1		
	FV80-630-14 ~~FV-158-630-3~~	W			PLUGNUT SUB-ASS'Y.	1		
	FV186-422-1 ~~FV-158-245-3~~	-		ST. STEEL	PLUGNUT	1		
	FV-158-247-1	F		COPPER	SHADING COIL	1		
	FV-180-536-4	A		BRASS	BONNET	1		
	FV-164-996-1	E		ST. ST.	CORETUBE	1		
4	FV-182-125-1	-			CORE ASS'Y, SOL. B	1		
	FV-162-970-1	B		ST. ST.	CORE	1		
	FV-162-968-2	A		BRASS	GUIDE, SPRING	1		
	FV-180-347	A		ST. ST.	SPRING, CORE	1		
	FV-162-969-1	C		BRASS	PLUG, CORE	1		
21	FV-166-647-1	D		PLASTIC	LABELS A & B			
22	~~FV-166-647-2~~			~~PLASTIC~~	~~LABEL~~			

NOTICE

THIS INFORMATION IS SUPPLIED IN ACCORDANCE WITH ARTICLE XVII OF THE NUCLEAR STEAM SUPPLY SYSTEM CONTRACT BETWEEN GENERAL ELECTRIC COMPANY AND CLEVELAND ELECTRIC ILLUMINATING COMPANY DATED JUNE 1, 1972. THE USE OF THIS INFORMATION BY ANYONE OTHER THAN AGENTS OR EMPLOYEES OF CLEVELAND ELECTRIC ILLUMINATING COMPANY FOR THE PURPOSE OTHER THAN THE DESIGN, CONSTRUCTION, LICENSING OR OPERATION OF THE PERRY NUCLEAR POWER PLANT IS NOT AUTHORIZED BY THE GENERAL ELECTRIC COMPANY.

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PAGE 1 OF 4 PAGE

CHG LTR

72032	H		M
71[illegible]	G		N
70577	F	10101	P
69499	E		
69132	D		
68347	C		
67826	B		
ER NO	CHG LTR	ER NO	CHG LTR

CATA. NO. HV 176-816-1 HV 176-816-2

SHOP ORDER NO

BULL. NO. HV 176-816

NO OF PARTS LIST PER ASSY 1

ASSEMBLY REF HVA-176-816

FVP— 176-P16

ITEM	PART NUMBER	CHG LTR	NOTE	MATERIAL	PART NAME	QUANTITY UNIT	QUANTITY REQ'D	QUANTITY DELVD
	NOTES:							
	1. IN SOLENOID ASSEMBLY		A,	CUT GROUND	SCREW AND SUBSTITUTE THE FOLLOWING:			
1C	GV-99-257-1G 115/60	AB			CATA HV 176-816-1 COIL - REMARK TO 115/60	1		
1C	GV-99-257-25G115/50	AB			CATA HV 176-816-2 COIL -	1		
1K	FV-172-444-6	C			HOUSING/CONDUIT ASSEMBLY	1		
	GV-168-736-6	H		STEEL	HOUSING	1		
	FV-33-103-1	X		ALUMINUM	CONDUIT CONNECTION	1		
	2. IN SOLENOID ASSEMBLY		B,	CUT GROUND	SCREW AND NAMEPLATE AND SUBSTITUTE THE			
	FOLLOWING:							
2G	GV-99-257-1G 115/60	AB			CATA HV 176-816-1 COIL - REMARK TO 115/60	1		
2G	GV-99-257-25G 115/50	AB			CATA HV 176-816-2 COIL -	1		
2J	FV-172-444-6	C			HOUSING/CONDUIT ASSEMBLY	1		
	GV-168-736-6	H		STEEL	HOUSING	1		
	FV-33-103-1	X		ALUMINUM	CONDUIT CONNECTION	1		
	3. QUANTITY AS ORDERED BY CUSTOMER.							
	ATTENTION:							
	BEFORE PROCEEDING WITH ANY NEW OR RECURRING ORDERS A REVIEW OF EACH DETAIL PART AND DRAWING WILL HAVE TO BE MADE AND G.E.'S AGREEMENT OBTAINED FOR ANY CHANGE IN THESE PARTS.							

Surveillance C11 (Scram Pilot Solenoid)

SVI - B21 - T0252A - D — 18 months

SVI - B21 - T5363A - D — 18 months

SVI - C11 - T0044A - D — 31 days

SVI - C11 - T0045A - D — 18 months

SVI - C11 - T5376A - D — 31 days

SVI - C11 - T1006 — Special requirements

- After core alterations & Rx S/D > 120 days and prior to Rx pwr > 40%
- After individual rod maintenance
- 10% tested on a 120 day rotating basis at power

SELECT : 28E E301-S05-01
SELECT :
SORT : 01
TITLE : EQRL/SUM-ENV

EQUIPMENT LIST
AS OF 00758 07/02/87

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DIV LOCATION SUPPORT ZONE M/H	SP NO I GE PURCH DWG MANUFACTURER MODEL EC-FT-CAT-ACC-RT		-ENVIRONMENTAL- 1-2 SUM-ENV/ENV QFD 3-4 M-LF-MI/OPD-SEAL 5 ART DEMO
*1B21 F 0460	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1B21HO10 R D2 C I/00-630 1B21 F 0022A DW-1 HARSH	301 10504935 ASCO NP-8320/8323 A1 C N/A N/A		1 E301-S05-01 * 2 A 3 T 40Y 05Y 4 YES 5 YES
*1B21 F 0461	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1B21HO10 R D2 C I/00-630 1B21 F 0022B DW-1 HARSH	301 10504935 ASCO NP-8320/8323 A1 C N/A N/A		1 E301-S05-01 * 2 A 3 T 40Y 05Y 4 YES 5 YES
*1B21 F 0462	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1B21HO10 R D2 C I/00-630 1B21 F 0022C DW-1 HARSH	301 10504935 ASCO NP-8320/8323 A1 C N/A N/A		1 E301-S05-01 * 2 A 3 T 40Y 05Y 4 YES 5 YES
*1B21 F 0463	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-INBOARD TEST/PILOT SOLENOIDS (3)	1B21HO10 R D2 C I/00-630 1B21 F 0022D DW-1 HARSH	301 10504935 ASCO NP-8320/8323 A1 C N/A N/A		1 E301-S05-01 * 2 A 3 T 40Y 05Y 4 YES 5 YES
*1B21 F 0480	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1B21HO11 S D1 AXC/05-620 1B21 F 0028A AB-7 HARSH	301 10504935 ASCO NP-8320/8323 A1 C N/A N/A		1 E301-S05-01 * 2 A 3 T 40Y 05Y 4 YES 5 YES
*1B21 F 0481	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1B21HO11 S D1 AXC/05-620 1B21 F 0028B AB-7 HARSH	301 10504935 ASCO NP-8320/8323 A1 C N/A N/A		1 E301-S05-01 * 2 A 3 T 40Y 05Y 4 YES 5 YES

SELECT : 28E E301-S05-01
SELECT :
SORT : 01
TITLE : EQRL/SUM-ENV

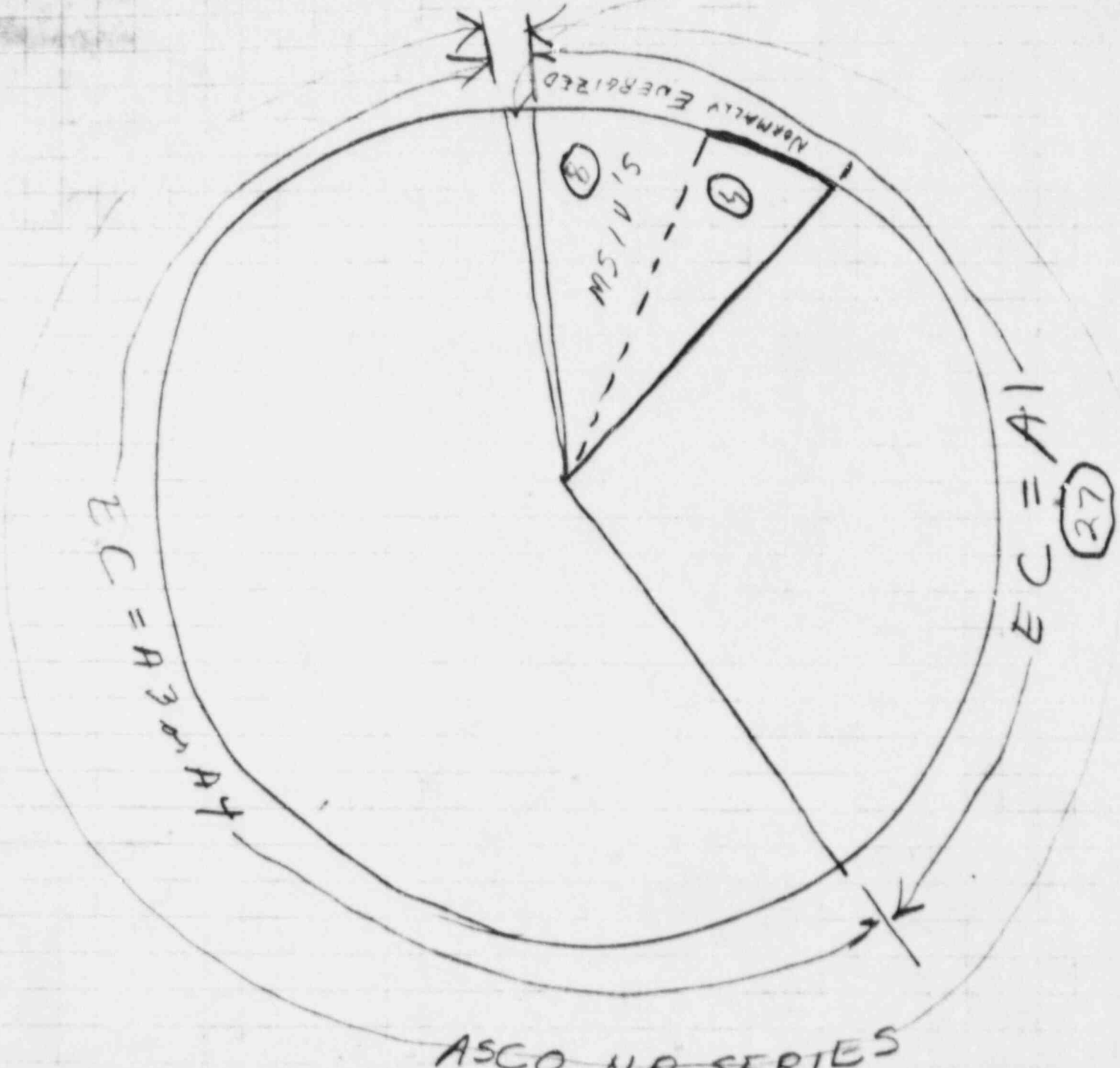
EQUIPMENT LIST
AS OF 00758 07/02/87

C EQUIPMENT D NUMBER S	DESCRIPTIONS SERVICE (2) EQUIPMENT (2)	DIAGRAM REV DIV LOCATION SUPPORT ZONE M/H	SP NO ; GE PURCH DWG MANUFACTURER MODEL EC-FT-CAT-ACC-RT	-ENVIRONMENTAL- 1-2 SUM-ENV/ENV QFD 3-4 M-LF-MI/OPD-SEAL 5 ART DEMO
*1B21 F 0482	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1B21HO11 S D1 AXC/05-620 1B21 F 0028C AB-7 HARSH	301 10504935 ASCO NP-8320/8323 A1 C N/A N/A	1 E301-S05-01 * 2 A 3 T 40Y 05Y 4 YES 5 YES
*1B21 F 0483	NUCLEAR STEAM SUPPLY SHUTOFF SYSTEM MAIN STEAM ISOLATION VALVE-OUTBOARD TEST/PILOT SOLENOIDS (3)	1B21HO11 S D1 AXC/05-620 1B21 F 0028D AB-7 HARSH	301 10504935 ASCO NP-8320/8323 A1 C N/A N/A	1 E301-S05-01 * 2 A 3 T 40Y 05Y 4 YES 5 YES

ASCO VALVES IN IE CIRCUITS

TOTAL = (64) *

* THE 144 HCU'S = 1 of the 64



Reportable Event Number 10555

Facility : PERRY
Unit : 1
Region : 3
Vendor : GE,GE
Operations Officer : Ron Young
NRC Notified By : HENRY KELLY
Rad Release : No
Cause : UNDER INVESTIGATION
Component : MSIVs

Date Notified : 11/03/87
Time Notified : 14:00
Date of Event : 11/03/87
Time of Event : 11:57
Classification : 10 CFR 50.72
Category 1 :
Category 2 :
Category 3 :
Category 4 :

WITH UNIT AT 80% POWER, WHILE STROKING MSIVs IN PREPARATION FOR A FULL MSIV ISOLATION STARTUP TEST, 2 MSIVs FOR THE "D" MAIN STEAM LINE (MSL) FAILED THE STROKE TIME FOR CLOSURE. THE VALVES SHOULD CLOSE IN 3 TO 5 SECONDS. ON THE FIRST ATTEMPT, THE INBOARD MSIV REQUIRED 18 SECONDS TO STROKE CLOSED; WHEN STROKED A SECOND TIME, THE INBOARD VALVE CLOSED IN 3 SECONDS. THE SWITCH FOR STROKING CLOSE THE OUTBOARD MSIV REMAINED IN THE CLOSE POSITION FOR 2 MINUTES AND 49 SECONDS, BUT THE OUTBOARD VALVE FAILED TO CLOSE. WHEN THE SWITCH WAS PLACED IN THE AUTO POSITION AND THEN RETURNED TO THE CLOSE POSITION, THE OUTBOARD VALVE STROKED CLOSED IN 3.4 SECONDS. SINCE THE DIFFICULTY WITH MSIV CLOSURE WITHIN A PRESCRIBED TIME HAS BEEN RECURRENT (SEE EVENT #10515, 10/30/87), TOGETHER WITH A FEW OTHER PROBLEMS, THE NRC REGION 3 OFFICE ORDERED THE LICENSEE TO COMMENCE A CONTROLLED S/D, WHICH BEGAN AT 1337 EST. OPERATORS WILL PROCEED TO THE COLD S/D MODE, WHERE MSIVs CAN BE INSPECTED AND PROVIDED WITH MAINTENANCE AS REQUIRED. THE REGION OFFICE WILL ALSO DISPATCH AN AUGMENTED INSPECTION TEAM (AIT) TO THE PLANT SITE FOR FURTHER INVESTIGATIONS. UNIT IS PRESENTLY AT 68% POWER AND DECREASING. NRC RESIDENT INSPECTOR WAS INFORMED. (NOTIFIED R3DO, DANIELSON)

B/64

Reportable Event Number 10560

Facility : PERRY
Unit : 1
Region : 3
Vendor : GE,GE
Operations Officer : Ron Young
NRC Notified By : ALLEN OKORN
Rad Release : No
Cause : UNDER INVESTIGATION
Component :

Date Notified : 11/03/87
Time Notified : 21:30
Date of Event : 11/03/87
Time of Event : 18:20
Classification : 10 CFR 50.72
Category 1 : ESF Actuation
Category 2 : SCRAM
Category 3 :
Category 4 :

WITH REACTOR AT ABOUT 23% POWER WHILE A CONTROLLED UNIT S/D WAS IN PROGRESS (SEE EVENT #10555), OPERATORS WERE FOLLOWING THE CONTROL ROD "PULL SHEET" (USED FOR ROD WITHDRAWAL/INSERTION) TO DETERMINE THE SEQUENCE FOR CONTROL ROD INSERTION WHEN REACTOR POWER DECREASED BELOW THE LOW POWER SETPOINT (i.e., POWER SETPOINT BELOW WHICH THE CONTROL ROD SEQUENCE AND CONFIGURATION MUST BE CONSISTENT WITH THE REQUIREMENTS OF THE ROD PATTERN CONTROLLER). SINCE THE CONTROL ROD SEQUENCE AND CONFIGURATION WERE DIFFERENT FROM THOSE REQUIRED BY THE ROD PATTERN CONTROLLER WITH REACTOR POWER BELOW THE LOW POWER SETPOINT, ROD BLOCKS WERE RECEIVED AND OPERATORS COULD NOT CONTINUE INSERTING CONTROL RODS. THEREFORE, OPERATORS MANUALLY SCRAMMED THE REACTOR TO COMPLETE THE S/D. LICENSEE SUSPECTS THAT THE REACTOR POWER DROPPED BELOW THE LOW POWER SETPOINT WHEN RECIRC PUMPS WERE SHIFTED FROM FAST TO SLOW SPEED AS PART OF THE NORMAL S/D PROCEDURE. THE LOW POWER SETPOINT VARIES BETWEEN 20% AND 35%, AND IS BASED ON TURBINE FIRST STAGE PRESSURE. UNIT IS STABLE IN THE HOT S/D. LICENSE INVESTIGATING HOW FOLLOWING THE PULL SHEET ALLOWED A CONTROL SEQUENCE AND CONFIGURATION THAT RESULTED IN ROD BLOCKS. NRC RESIDENT WAS INFORMED. (NOTIFIED R3DO, HARRISON)

B/G5