



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION IV

511 RYAN PLAZA DRIVE SUITE 400  
ARLINGTON TEXAS 76011-8264

JUL 23 1992

Docket No. 50-285  
License No. DPR-40

Omaha Public Power District  
ATTN: W. G. Gates, Division Manager  
Nuclear Operations  
444 South 16th Street Mall  
Mail Stop 8E/EP4  
Omaha, Nebraska 68102-2247

Gentlemen:

This refers to the management meeting conducted at Region IV's request in Arlington, Texas, on July 16, 1992. This meeting related to activities authorized by NRC License DPR-40 for the Fort Calhoun Station and specifically addressed the licensee's review and corrective actions for the event of July 3, 1992. The meeting was attended by those on the attached Attendance List.

The subjects discussed at this meeting are described in the enclosed Meeting Summary.

It is our opinion that this meeting was beneficial and has provided the NRC a better understanding of the causes of the event and the actions taken by you to ensure safe operation of the Fort Calhoun Station. In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter will be placed in the NRC's Public Document Room.

Should you have any questions concerning this matter, we will be pleased to discuss them with you.

Sincerely,

Bill Beach, Director  
Division of Reactor Projects

Enclosure:  
Meeting Summary w/attachments

cc w/attachments: (see attached)

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PDR ADOCK 05000285  
P PDR

*JEH*

cc w/attachments:

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Nebraska Department of Health  
ATTN: Harold Borchert, Director  
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Fort Calhoun Station  
ATTN: T. L. Patterson, Manager  
P.O. Box 399  
Fort Calhoun, Nebraska 68023

JUL 29 1992

bcc to DMB (IE45)

bcc distrib. by RIV:

J. L. Milhoan

DRSS-FIPS

MIS System

DRP

Project Engineer (DRP/C)

DRS

Senior Resident Inspector - Cooper

Senior Resident Inspector - River Bend

Resident Inspector

Section Chief (DRP/C)

RIV File

RSTS Operator

Lisa Shea, RM/ALF, MS: MNBB 4503

Chief, Technical Support Section

*RIV:PE:DRP	*C:DRP	D:DRP		
FECollins	PHHarrell	ABBeach		
7/ /92	7/ /92	7/29/92		

\*previously concurred

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## MEETING SUMMARY

Licensee: Omaha Public Power District (OPPD)  
Facility: Fort Calhoun Station  
License No.: DPR-40  
Docket No.: 50-285  
Subject: Management Meeting

On July 16, 1992, representatives of Omaha Public Power District met with Region IV personnel in Arlington, Texas, to discuss the causes for the event of July 3, 1992, the licensee's corrective actions, and the licensee's plans to ensure safe operation of the Fort Calhoun Station. The conference was held at the request of Region IV as was indicated in Confirmatory Action Letters dated July 4 and 5, 1992. The attendance list and licensee presentation are attached to this summary.

The licensee presented the sequence of events, equipment analysis/actions, and recovery plan actions. A copy of the licensee's presentation is enclosed in Attachment 2.

### Attachments:

1. Attendance List
2. Licensee Presentation (NRC distribution only)

ATTENDANCE LIST

Attendance at the OPPD/NRC management meeting on July 16, 1992, at Arlington, Texas:

OPPD

W. Jores, Senior Vice President, Nuclear Operations  
W. Gates, Division Manager, Nuclear Operations Division  
S. Gambhir, Division Manager, Production Engineering  
T. Patterson, Plant Manager, Fort Calhoun Station  
R. Short, Manager, Nuclear Licensing  
C. Boughter, Supervisor, Special Services Engineering  
G. Cook, Supervisor, Station Licensing  
M. Core, Supervisor, Electrical/I&C Engineering  
R. Lewis, Principal Engineer

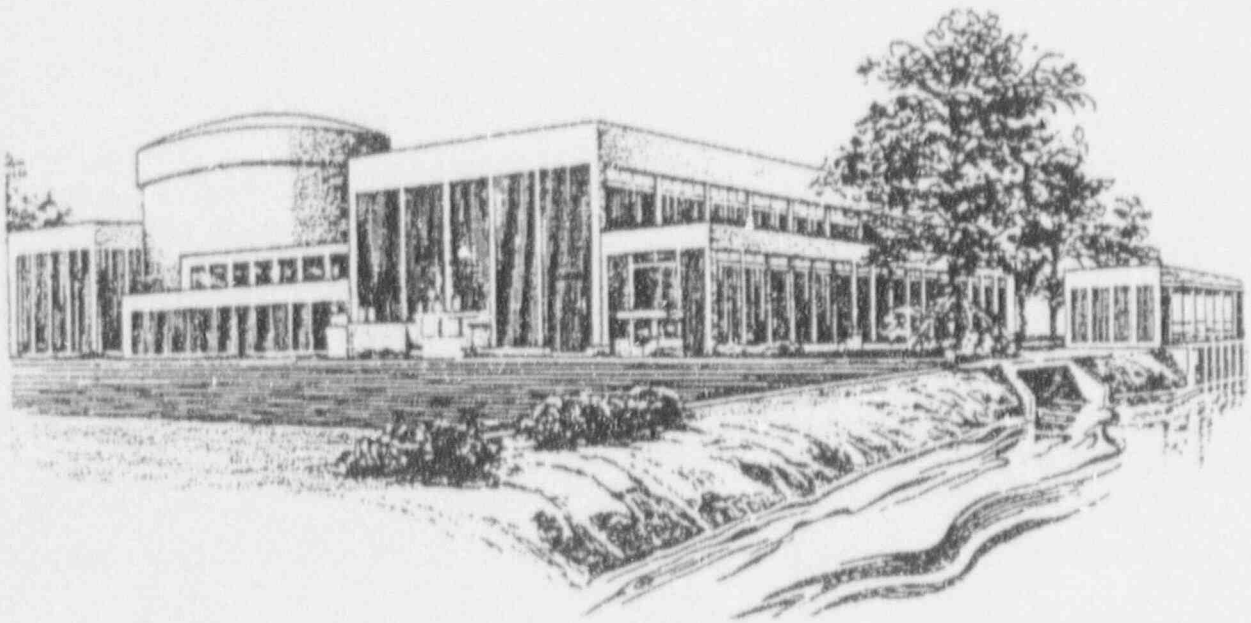
NRC

J. Milhoan, Regional Administrator  
J. Montgomery, Deputy Regional Administrator  
S. Collins, Director, Division of Reactor Safety (DRS)  
P. Harrell, Chief, Project Section C, Division of Reactor Projects (DRP)  
T. Westerman, Chief, Plant Systems Section, DRS  
J. Larkins, Project Director, Project Directorate IV-1, Office of Nuclear Reactor Regulation (NRR)  
R. Mullikin, Senior Resident Inspector, Fort Calhoun Station  
P. Wagner, Team Leader, DRS  
G. Hammer, Mechanical Engineering Branch, NRR  
M. Wegner, Analysis and Evaluation of Operational Data, Reactor Operations Analysis Branch (by telephone)  
C. Pauk, Reactor Inspector, DRS  
P. Goldberg, Reactor Inspector, DRS  
M. Runyan, Reactor Inspector, DRS  
J. Gilliland, Public Affairs Officer, RIV  
E. Collins, Project Engineer, DRP  
B. Brown, RIV Counsel

Other

O. Cooper, Reporter, Nebraska Public Radio  
J. Harkins, Senior Principal Control Engineer, Stone & Webster

# OMAHA PUBLIC POWER DISTRICT



## FORT CALHOUN STATION

NRC/OPPD MEETING  
JULY 16, 1992

## AGENDA

- |                               |                 |
|-------------------------------|-----------------|
| OPENING REMARKS               | W. C. JONES     |
| SEQUENCE OF EVENTS            | J. W. TILLS     |
| EQUIPMENT ANALYSIS/ACTIONS    | S. K. GAMBHIR   |
| . INVERTER No. 2              |                 |
| . TURBINE EHC CONTROLS        |                 |
| . PC-142                      | C. E. BOUGHTER  |
| RECOVERY PLAN ACTIONS         | T. L. PATTERSON |
| . RECOVERY PLAN DEVELOPMENT   |                 |
| . 24 POINT RECOVERY PLAN      |                 |
| . INSPECTIONS/TESTING PROGRAM |                 |
| SUMMARY/CLOSING REMARKS       |                 |



## SEQUENCE OF EVENTS

July 3, 1992

- 0433 - INVERTER NO. 2 PROBLEMS BEGIN
- 2300 - TWO INVERTER NO. 2 CIRCUIT BOARDS REPLACED
- 2336 - ATTEMPTED TO RETURN INVERTER NO. 2 TO SERVICE
- VOLTAGE OSCILLATIONS BETWEEN 0 AND 120 VAC
- TURBINE EHC CIRCUIT BREAKER TRIPS
- CONTROL VALVES CLOSE WITHOUT TURBINE TRIP
- MAIN STEAM SAFETIES OPEN
- REACTOR TRIP ON HIGH PRESSURIZER PRESSURE
- PORVS OPEN AND RESEAT AT 1745 PSIA
- 2343 - PRESSURIZER PRESSURE RETURNS TO 1923 PSIA AND THEN DROPS
- SIAS OCCURS
- 2344 - RCPS B AND D SECURED
- 2346 - PRESSURIZER LEVEL REACHES 100%
- 2349 - REMAINING RCPS ARE SECURED
- 2352 - ALERT DECLARED DUE TO FAILURE/CHALLENGE TO ONE FISSION PRODUCT BARRIER

## SEQUENCE OF EVENTS (CONT.)

2355 - PRESSURIZER QUENCH TANK RUPTURE DISK  
RUPTURES

### July 4, 1992

0006 - ALL CONTAINMENT COOLERS RUNNING -  
MAXIMUM CONTAINMENT PRESSURE OF 2.5 PSIG

0012 - COOLDOWN STARTED - MAXIMUM ~60° F/HR

0146 - RESET SAFEGUARDS

0151 - CHARGING AND LETDOWN REESTABLISHED

0329 - HPSI FLOW REDUCED TO ZERO

0334 - PORV BLOCK VALVE HCV-151 REOPENED TO  
ESTABLISH LTOP

0407 - PRESSURIZER LEVEL BACK ON SCALE  
96.4 % INDICATED - 69% CORRECTED

0620 - RCS LEAK RATE LESS THAN 5 GPM

0530 - DOWNGRADED TO NOUE

1312 - SHUTDOWN COOLING ESTABLISHED

1840 - TERMINATED NOUE

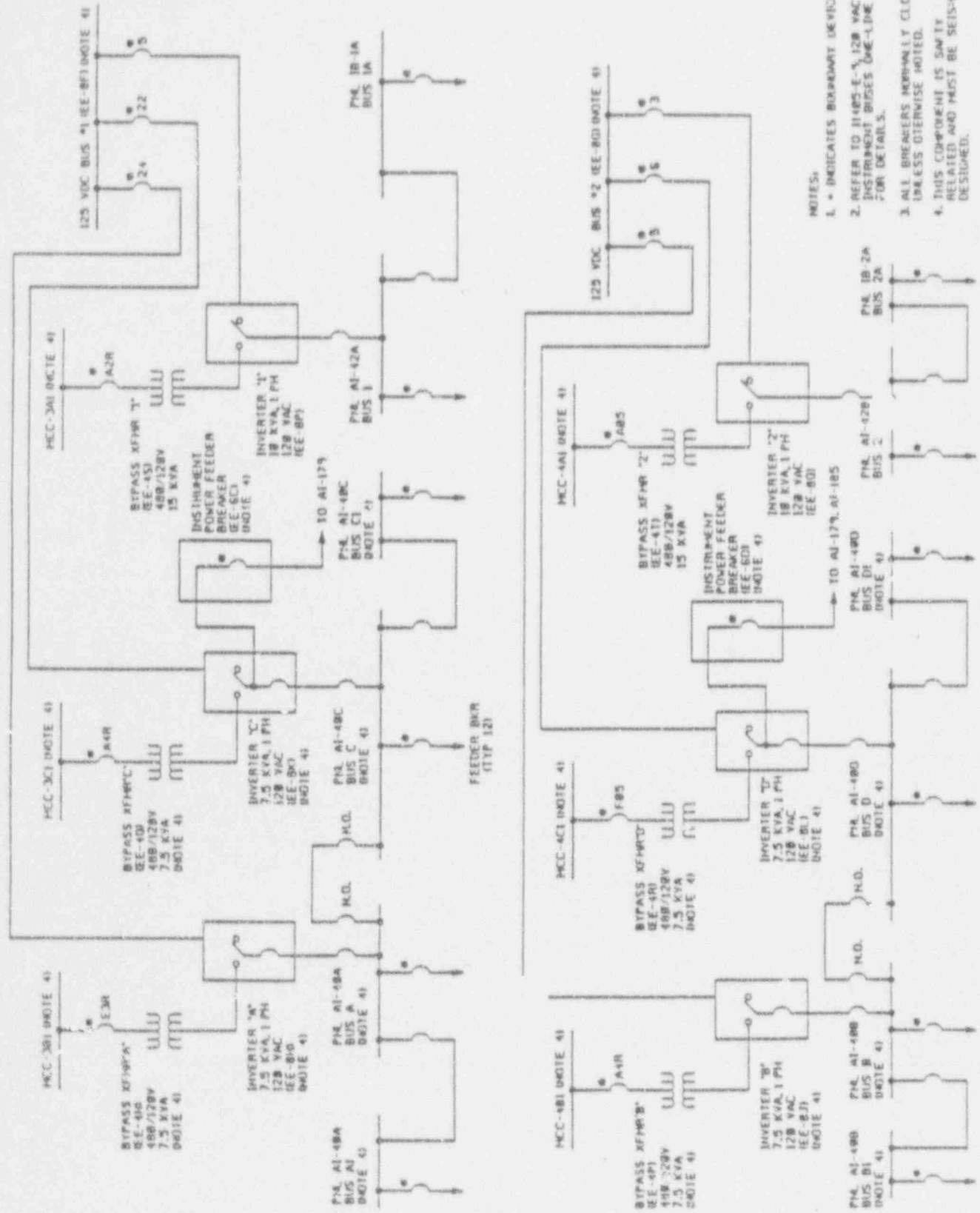
EQUIPMENT ANALYSIS/ACTIONS

## INVERTER NO. 2

- SYSTEM CONFIGURATION/BACKGROUND
  - SEE FIGURE 1
  
- ROOT CAUSE
  - INADEQUATE POST MAINTENANCE TESTING AS PROVISIONS WERE NOT MADE TO TEST THE INVERTER OFF-LINE
  
- CONTRIBUTING FACTORS

FIGURE 1

120V AC VITAL BUS BOUNDARY DIAGRAM



- NOTES:
1. + INDICATES BOUNDARY DEVICE.
  2. REFER TO IIEE-451, IIEE-452, IIEE-411, IIEE-412 INSTRUMENT BUSES ONE-LINE FOR DETAILS.
  3. ALL BREAKERS NORMALLY CLOSED UNLESS OTHERWISE NOTED.
  4. THIS COMPONENT IS SAFETY RELATED AND MUST BE SEIS-ICALLY DESIGNED.

**INVERTER NO. 2**  
**CORRECTIVE ACTIONS**

- 1) REPLACED CIRCUIT BOARDS AND INSTALLED JUMPER.
- 2) MODIFICATION TO PROVIDE OFF-LINE TEST CAPABILITY
- 3) EVALUATION OF INVERTER LOADINGS.
- 4) REVISE PM PROGRAM TO INSPECT SINGLE CLAD BOARD EVERY REFUELING OUTAGE FOR SIGNS OF DEGRADATION.
- 5) MAKE BETTER USE OF VENDOR FIELD SERVICES.
- 6) DEVELOP A TROUBLESHOOTING GUIDE.
- 7) CHANGE METAL JUMPERS ON TERMINAL BLOCKS TO WIRE JUMPERS.
- 8) INSPECT (AND IF REQUIRED) SOLDER WIRES LEADING TO THE GATES AND CATHODES OF ALL ACCESSIBLE INVERTER SCRS.
- 9) SHARED INFORMATION WITH OTHER UTILITIES (NUCLEAR NETWORK).
- 10) INCORPORATE LESSONS LEARNED IN THE TRAINING PROGRAM.
- 11) REVISE VENDOR MANUAL

NOTE: CORRECTIVE ACTIONS 4 THROUGH 8 APPLY TO SAFETY RELATED INVERTERS.

## TURBINE EHC CONTROLS

### PROBLEM

- LOSS OF POWER TO AI-50 (EHC PANEL) CAUSED CLOSURE OF TURBINE CONTROL VALVES.

### CAUSE

- NO BACK-UP POWER SOURCE FOR PT-939, 943, 944 & 945 (FIGURE 2)

### DESIGN EVALUATION/WEAKNESSES

- NO TURBINE TRIP ON LOSS OF LOAD.
- RELIANCE ON SINGLE SOURCE OF POWER FOR PRESSURE TRANSMITTERS.
- FAILURE OF INDIVIDUAL COMPONENTS CAN CAUSE CLOSURE OF TURBINE CONTROL VALVES.

# TURBINE EHC SYSTEM PRESSURE TRANSMITTERS

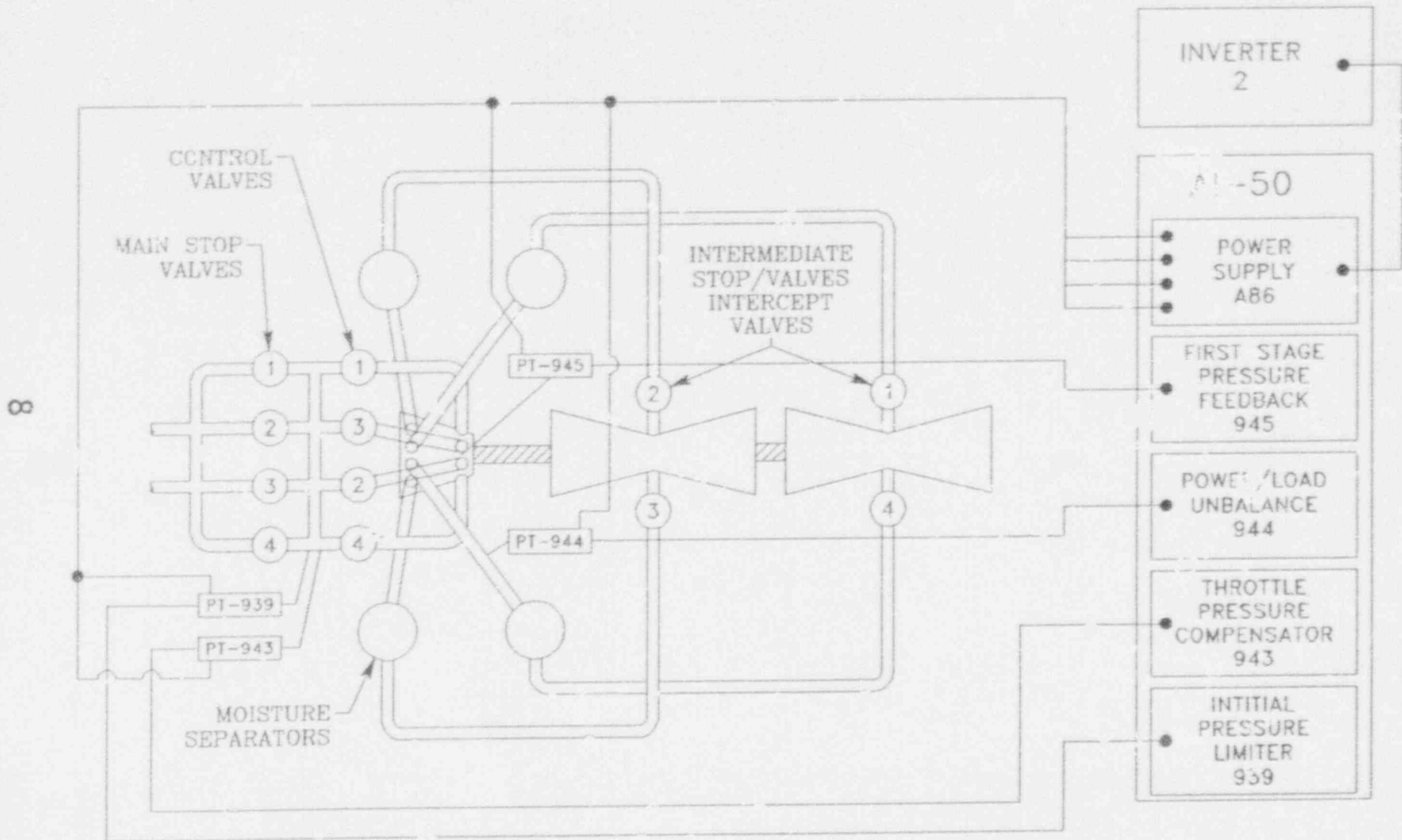


FIGURE 2



## TURBINE EHC CONTROLS (CONT.)

### CORRECTIVE ACTIONS

#### SHORT TERM

- PROVIDE TURBINE TRIP COINCIDENT WITH LOSS OF POWER TO AI-50 (INTERIM FIX TO BE COMPLETED PRIOR TO POWER OPERATION).

#### LONG TERM

- EVALUATE THE FOLLOWING OPTIONS:
  - PROVIDE TURBINE TRIP COINCIDENT WITH CLOSURE OF TURBINE CONTROL VALVES (EXCEPT DURING START-UP AND SHUTDOWN).

OR

- PROVIDE BACKUP POWER SOURCE (PERMANENT MAGNET GENERATOR) FOR EHC PRESSURE TRANSMITTERS.

## RC-142

### SYSTEM CONFIGURATION

- SEE FIGURE 3

### INVESTIGATION

- BELLOWS LEAKED AT 2.6 PSIG
- FOUND ADJUSTMENT BOLT BACKED OUT
- SETPOINT CHANGED
- INDICATIONS OF SEVERE CHATTERING (APPENDIX 1)

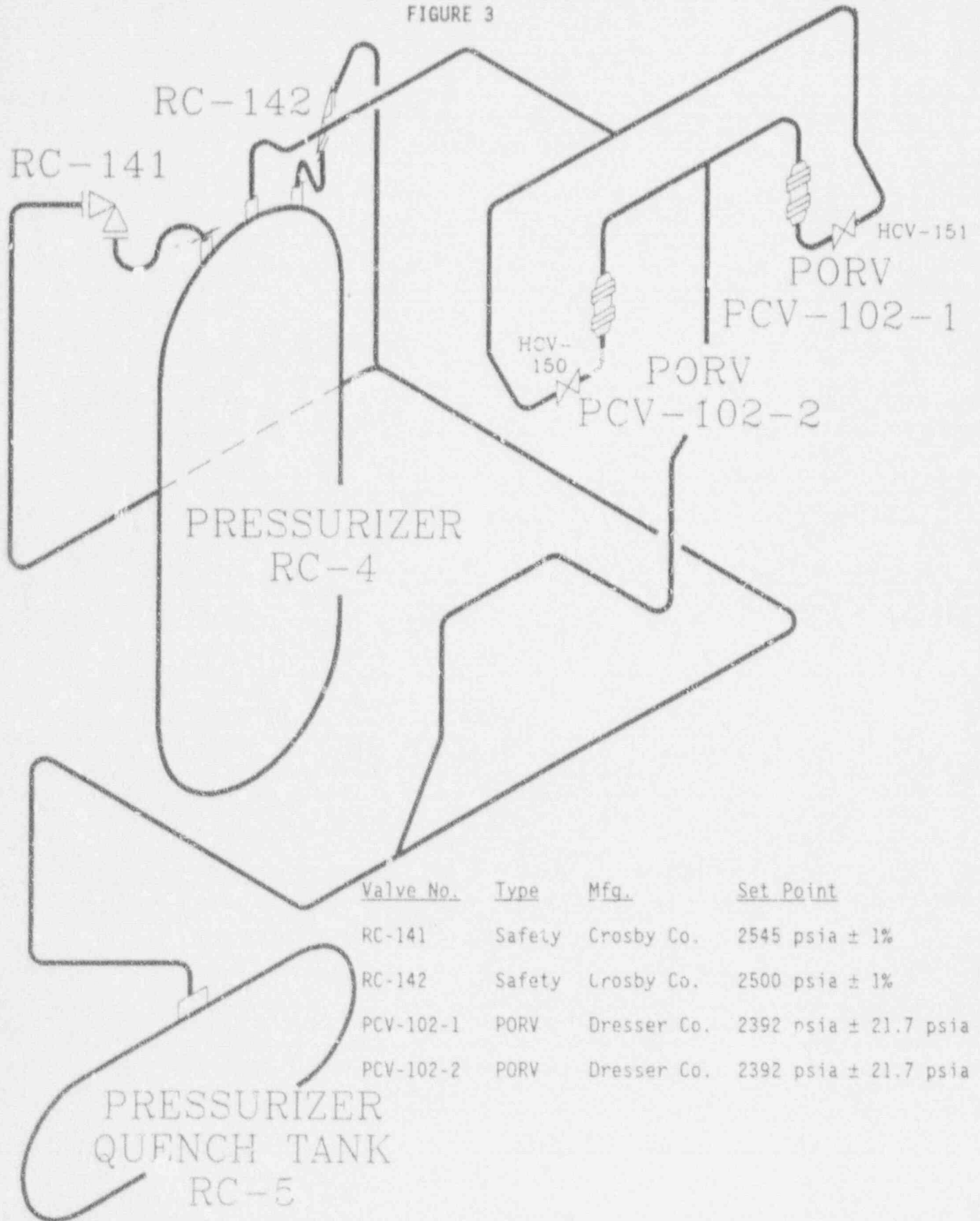
### ROOT CAUSE

- ADJUSTING BOLT NUT FAILED TO MAINTAIN THE ADJUSTING BOLT'S POSITION DURING RELIEF

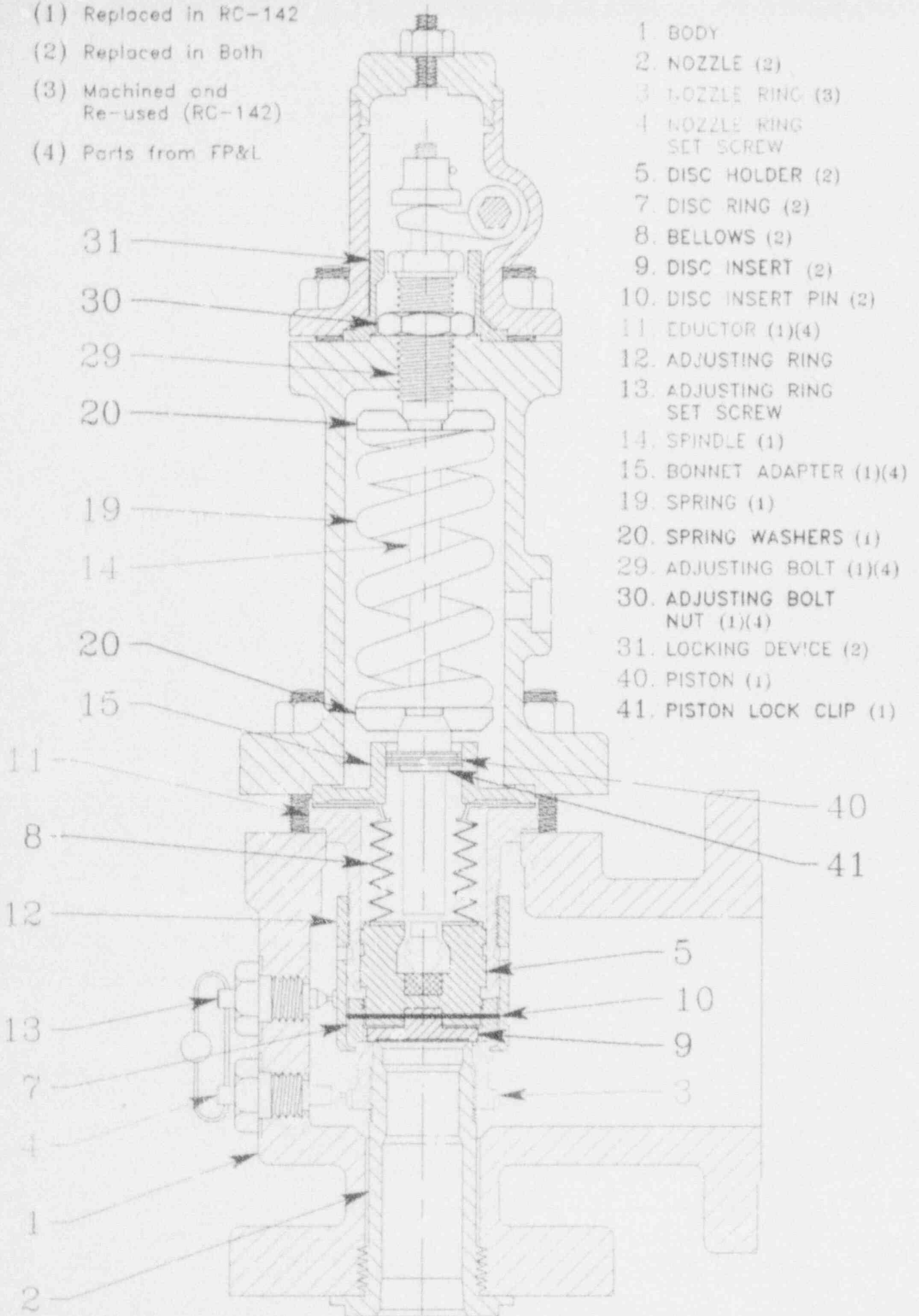
### CONTRIBUTING FACTORS

- NO DOCUMENTATION/TORQUE VALUE FOR ADJUSTING BOLT NUT
- LACK OF POSITIVE LOCKING DEVICE

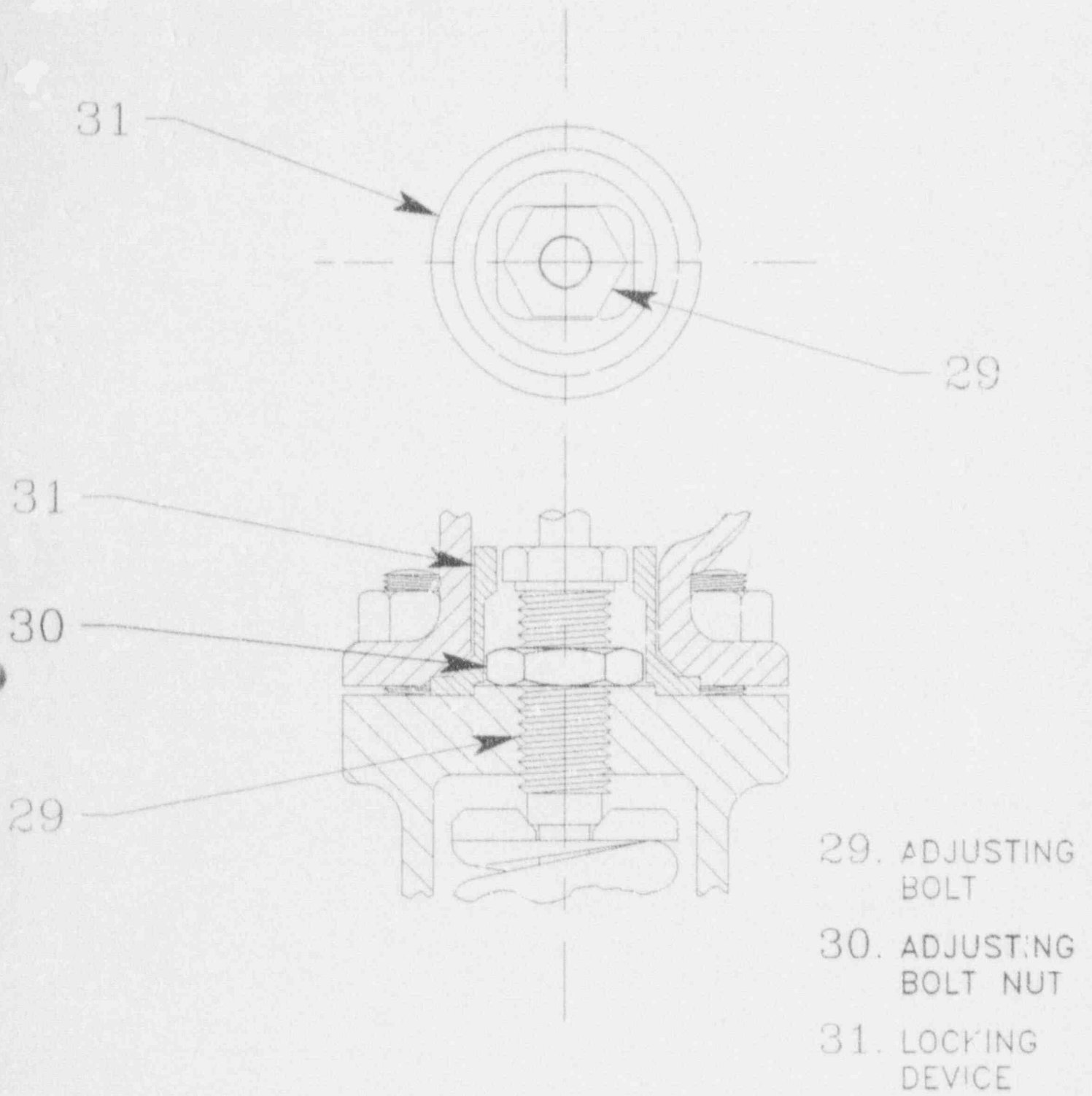
FIGURE 3



- (1) Replaced in RC-142
- (2) Replaced in Both
- (3) Machined and Re-used (RC-142)
- (4) Parts from FP&L



- 1. BODY
- 2. NOZZLE (2)
- 3. NOZZLE RING (3)
- 4. NOZZLE RING SET SCREW
- 5. DISC HOLDER (2)
- 7. DISC RING (2)
- 8. BELLOWS (2)
- 9. DISC INSERT (2)
- 10. DISC INSERT PIN (2)
- 11. EDUCTOR (1)(4)
- 12. ADJUSTING RING
- 13. ADJUSTING RING SET SCREW
- 14. SPINDLE (1)
- 15. BONNET ADAPTER (1)(4)
- 19. SPRING (1)
- 20. SPRING WASHERS (1)
- 29. ADJUSTING BOLT (1)(4)
- 30. ADJUSTING BOLT NUT (1)(4)
- 31. LOCKING DEVICE (2)
- 40. PISTON (1)
- 41. PISTON LOCK CLIP (1)



## RC-142 (CONT.)

### CORRECTIVE ACTIONS

#### SHORT TERM

- REFURBISHED RC-141 AND RC-142 (APPENDIX 1)
- RC-141/142 ADJUSTING BOLT MECHANICAL LOCKING DEVICE
- VERIFIED RING SETTINGS AND LOOP SEAL DESIGN ADEQUACY
- REQUESTED WYLE TO ADVISE THEIR CLIENTS OF POTENTIAL FOR THIS PROBLEM IN OTHER RELIEF VALVES
- INDUSTRY NOTIFICATION (NUCLEAR NETWORK)

#### LONG TERM

- EVALUATE OPTIONS TO ELIMINATE LOOP SEAL DESIGN CONSISTENT WITH INDUSTRY EXPERIENCE
- PERFORM FURTHER ANALYSIS ON BELLOWS AND SPRING REMOVED FROM RC-142
- INCORPORATE LESSONS LEARNED INTO RELIEF VALVE TESTING PROGRAM

RC-142 (CONT.)

GENERIC IMPLICATIONS

- RC-141
- NO OTHER CROSBY RELIEF VALVES IN SAFETY RELATED APPLICATIONS
- REVIEW OF OTHER RELIEF VALVE APPLICATIONS
- POTENTIAL 10 CFR PART 21

RECOVERY PLAN ACTIONS



## RECOVERY PLAN DEVELOPMENT CRITERIA

- ASSESS AND RESOLVE FAILURE OF RC-142
- UNDERSTAND INVERTER FAILURE AND DEFINE FIX
- EVALUATE IMPACT OF CONTAINMENT ATMOSPHERE ON STRUCTURES/EQUIPMENT
- EVALUATE THERMAL TRANSIENT IMPACT ON SYSTEMS
- UNDERSTAND AND RESOLVE OBSERVED ANOMALIES
- EVALUATE EHC DESIGN ADEQUACY
- DEFINE OTHER TASKS CONSISTENT WITH PLANT GOALS

## ELEMENTS OF "24" POINT RECOVERY PLAN

- INVESTIGATE FUNCTIONING OF PORVS/BLOCK VALVES
- RCA AND ACTION PLAN FOR INVERTER NO. 2
- EVALUATE RM-091A ANOMALIES
- EVALUATE ENVIRONMENTAL EFFECTS ON STRUCTURES
- ASSESS FUEL INTEGRITY
- DEFINE SURVEILLANCE TESTS REQUIRED FOR STARTUP
- DEFINE MODIFICATIONS TO BE PERFORMED
- ESTABLISH FORCED OUTAGE WORK LIST
- EVALUATE CONDITION OF PRESSURIZER HEATERS
- REVIEW SAFETY ANALYSES FOR OPERABILITY FOR CLOSEOUT
- COMPILE INDUSTRY EXPERIENCE AND EVALUATE APPLICABILITY

## ELEMENTS OF "24" POINT RECOVERY PLAN (CONT.)

- ASSESS CONDITION OF RCP SEALS
- INSPECT LOWER RV AND INSULATION
- INVESTIGATION OF SYSTEM RESPONSE
- ACCURATELY DEFINE AND EVALUATE SEQUENCE OF EVENTS (SOE)
- EVALUATE TRANSIENT'S IMPACT ON REACTOR VESSEL
- ASSESS POTENTIAL EQUIPMENT DAMAGE IN CONTAINMENT
- DEWATER CONTAINMENT SUMP/RV CAVITY
- INSPECT TRI-SODIUM PHOSPHATE BASKETS
- MODEL SOE TO CONFIRM EXPECTED RESPONSES
- INCORPORATE LESSONS LEARNED INTO PROCEDURES, ETC.

ELEMENT OF "24" POINT RECOVERY PLAN (CONT.)

- VERIFY OPERABILITY OF RPS/DSS
- RCA AND ACTION PLAN FOR RC-142
- CONTAINMENT CLEANUP
- ASSESS EFFECT OF TRANSIENT ON MECHANICAL SYSTEMS

INSPECTION / TESTING PROGRAM

ITEM	DESCRIPTION OF ACTIVITY	RESULTS	FOLLOW-ON ACTIONS
Identification of Anomalies	Identify system/component responses or indications which did not appear to be correct:  - System Engineer review of system - Discussions with involved operators - Review post-trip report	45 potential anomalies identified - Multiple events due to inverter voltage swings - SG Level Ch. D tripped late - LRC-101Y failed low - Pzr. Heater grounds	S/G Channel D required evaluation - No other generic problems identified. Plant responded as designed.
Walkdown of Mechanical Equipment	Walkdown of mechanical equipment which was or could have been affected by event. Especially evaluate effects of hanger supports, boric acid, etc. Used NRC report "Inadvertent Containment Spray Events at Commercial Nuclear Power Plants" to assist in review.	No discrepancies identified	None
Walkdown, inspection & testing of EEP equipment	Evaluated containment environment against EEQ qualification envelopes - Inspected all high risk equipment - Sampling of 15% of general area	- Moisture found in NR sump level transmitter - PQT level indicator small amount of water (Non-CQE) - HCV-155 nitrogen gauge, water in meter face (Non-CQE)	Repairs to 3 components Completed
Reactor Coolant Pumps	- Inspect motor condition - Sampled & analyzed oil	- No deterioration due to water	None
Inspect TSP Baskets	Performed normal refueling surveillance on TSP Baskets	- No degradation noted	None

33

INSPECTION / TESTING PROGRAM (Cont.)

ITEM	DESCRIPTION OF ACTIVITY	RESULTS	FOLLOW-ON ACTIONS
Inspection of Mechanical Systems	Inspected RC-142 discharge piping and supports to Pzr. Quench Tank and immediate surrounding supports at Main Steam Safety Valves	<ul style="list-style-type: none"> <li>- FW/MS supports, snubbers and piping are mechanically sound</li> <li>- RCS-63 support base plate pulled out 1/2 inch</li> <li>- RCH-42 rod bent at pipe clamp</li> </ul>	Repaired RCS-63 and RCH-42
High temperature effect on concrete	Evaluate impact of high temperature on concrete and structures visually and analytically	No problems identified	None
RV Insulation Inspection	Inspect general material condition of reactor cavity: <ul style="list-style-type: none"> <li>- Mirror insulation</li> <li>- Support structure for insulation framework</li> <li>- Bottom of reactor vessel</li> </ul>	<ul style="list-style-type: none"> <li>- No physical damage evident</li> <li>- Good physical condition</li> <li>- No problems identified</li> </ul>	None
Charcoal and HEPA Filters	Performed visual inspection of containment ventilation HEPA and charcoal filters. Performed efficiency test of charcoal filters.	Condition of all units and charcoal was good.	None

SUMMARY/CLOSING REMARKS

## SUMMARY/CLOSING REMARKS

- SAFETY SIGNIFICANCE

- ANALYZED EVENT - USAR SECTION 14.15 - SMALL BREAK LOCA
- EQUIPMENT PERFORMED AS DESIGNED WITH THE EXCEPTION OF RC-142

- LESSONS LEARNED

- VALUE OF OPERATOR/SIMULATOR/ERO TRAINING AND DRILLS
- EVENT SPECIFIC CORRECTIVE ACTIONS
- INDUSTRY NOTIFICATIONS
  - ELGAR STATIC CIRCUIT BOARD JUMPER
  - CROSBY SAFETY VALVE ADJUSTING BOLT

- COMPREHENSIVE CORRECTIVE ACTIONS

- FUEL
- REACTOR COOLANT SYSTEM
- CONTAINMENT
- ELECTRICAL SYSTEMS
- TURBINE CONTROLS
- PERSONNEL



APPENDIX 1  
RC-142 PARTS EVALUATION

PART NUMBER	COMPONENT	EVALUATION	DISPOSITION
2	Nozzle	Seating surface had chatter indications. No major damage, but met replacement criteria.	Replace
3	Nozzle Ring	Impressions of Disc Ring on top surface	Machine
4	Nozzle Ring Set Screw	No significant damage	Replace
7	Disc Ring	Marks due to impact with Nozzle Ring on top surface	Replace
9	Disc Insert	Disc Insert was mushroomed into the Disc Holder. Seating surface of Disc Insert was 0.002" below the top surface of Disc Ring. The Disc Insert protrusion should have been 0.010" to 0.023" above the top surface of the Disc Ring. Impact marks were visible on the seating surface	Replace
12	Adjusting Ring	A 1/2" circumferential band of minor indentations was observed on the inner vertical surface of the Adjusting Ring. No affect on valve operation.	Use in the "as-is" condition. No machining required
13	Adjusting Ring Set Screw	No significant damage	
10	Disc Insert Pin	Although this pin should be contained within the Disc Holder (5), it was protruding from the Disc Holder by approximately 1/4"	Replace
5	Disc Holder	Disc Insert could not be removed from the Disc Holder. The Eductor guiding surfaces of the disc holder displayed significant wear	Replace
6	Disc Bushing	Uneven wear on the top spherical concave surface	Replace
8	Bellows	The Bellows assembly (Part Number 5, 6, and 8) was found broken into three pieces. The fractures occurred near the upper mounting plate and the top of the Disc Holder	Replace
11	Eductor	Minor wear on the Disc Holder guiding surface of the Eductor	Replace**

APPENDIX 1  
RC-142 PARTS EVALUATION (Continued)

PART NUMBER	COMPONENT	EVALUATION	DISPOSITION
14	Spindle	Chatter indications on the lower Spring Washer bearing surfaces of the Spindle. Uneven wear of the bottom spherical surface of the Spindle. This surface is a ball which is pressed into the bottom end of the Spindle. The ball had rolled within the cavity	Replace
40	Piston	Chatter indications on the outer guiding surface of Piston	Replace
15	Bonnet Adapter	Excessive wear on piston guiding surface of Bonnet Adaptor	Replace**
20	Spring Washers	Chatter indications on pressure bearing surfaces of both upper and lower Washers	Replace with new spring assembly
29	Adjusting Bolt	Galling on bearing surface	Replace**
19	Spring	No damage but part of spring assembly with washers	Replace
30	Adjusting Bolt Nut	Nut was found backed off of the bonnet surface approximately 1/4". Loose fit with adjusting bolt	Replace and add locking device**

NO OTHER SIGNIFICANT DAMAGE WAS NOTED

\*\* Parts that were obtained from a Florida Power and Light relief valve

## APPENDIX I

## REPLACED AND REPAIRED PARTS FOR RC-141 AND-142

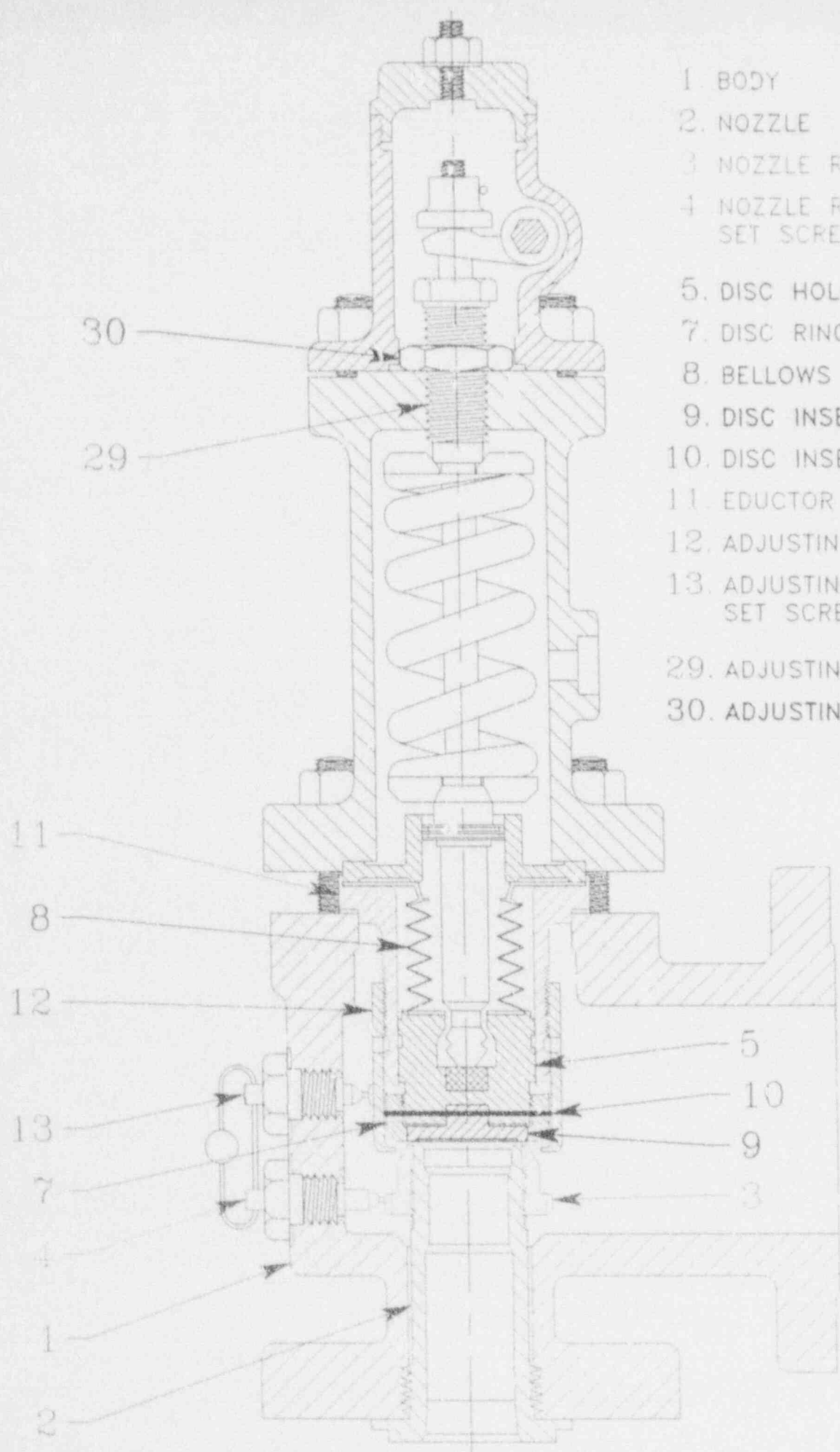
PART NUMBER	COMPONENTS	JUSTIFICATION FOR REPLACEMENT
REPLACED PARTS FOR RC-141		
2	Nozzle	Replaced upon reaching minimum replacement criteria. Nozzle measurement 0.859 (minimum allowable 0.860).
9	Disc Insert	Replaced based upon reaching minimum replacement criteria. Disc Insert measurement 0.817 (minimum allowable 0.817).
10	Disc Insert Pin	Replaced based on Maintenance good work practices.
5, 6, 7, and 8	Bellows Assembly	Bellows Assembly consists of Bellows, Disc Bushing, Disc Holder and Disc Ring. Bellows was replaced due to management recommendation and to permit material testing as directed by Special Services Engineer Materials Expert.
REPAIRED PARTS FOR RC-142		
3	Nozzle Ring	A skim cut of 0.002 was taken to remove impressions of Disc Ring on top surface of Nozzle Ring.
REPLACED PARTS FOR RC-142		
2	Nozzle	Replaced based upon reaching minimum replacement criteria. Nozzle measurement was 0.824. (minimum allowable is 0.860).
9	Disc Insert	Replaced based on damage sustained in event.
10	Disc Insert Pin	Replaced based on Maintenance good work practices.
5, 6, 7, and 8	Bellows Assembly	Bellows Assembly consists of Bellows, Disc Insert Busing, Disc Holder and Disc Ring. Replaced based on wear and damage sustained in the event.
11	Eductor	Replaced based on being as maximum dimension on inside guiding surface for replacement criteria in addition to being bell shaped on bottom of Eductor. A skim cut is required to remove the chatter marks and any removal of material will require a new Eductor. Eductor measurement 2.438 in main portion of body and 2.440 on lower lip. (Maximum allowable 2.438).
15	Bonnet Adaptor	Replaced based on exceeding maximum replacement criteria for the inside guiding surface. Bonnet Adaptor measurement is 1.924. (Allowable maximum is 1.916).

## APPENDIX I

## REPLACED AND REPAIRED PARTS FOR RC-141 AND-142

PART NUMBER	COMPONENTS	JUSTIFICATION FOR REPLACEMENT
14	Spindle	Replaced based on chatter marks on washer and bushing surfaces. Machining of the damaged surface require special tooling not available.
40 and 41	Piston Assembly	Piston Assembly consists of Piston and Piston Lockclip. Replaced on chatter marks. Could have been machined and used but not cost effective.
19 and 20	Spring Assembly	Spring Assembly consists of Top and Bottom Washers and Spring. Replaced at the recommendation of management. We had two assemblies in stock and this is a low replacement demand stock item.
29 and 30	Adjusting Bolt and Nut**	Replaced based on galling on bearing surface. Machining requires special tooling not available. Adjusting Bolt (lock) Nut was replaced because it had a very sloppy fit with Adjusting Bolt.

\*\* The adjusting bolt was machined to accept the new Adjust Bolt Locking Device. The Cap Gasket (37) will no longer be used. The flange of the new Adjusting Bolt Locking Device will be used in the Cap Gasket's place.



- 1. BODY
- 2. NOZZLE
- 3. NOZZLE RING
- 4. NOZZLE RING SET SCREW
- 5. DISC HOLDER
- 7. DISC RING
- 8. BELLOWS
- 9. DISC INSERT
- 10. DISC INSERT PIN
- 11. EDUCTOR
- 12. ADJUSTING RING
- 13. ADJUSTING RING SET SCREW
- 29. ADJUSTING BOLT
- 30. ADJUSTING BOLT NUT

