



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

5/8/86

Docket No. 50-318


MEMORANDUM FOR: H. Denton J. Lyons
D. Eisenhut T. Speis
H. Thompson J. Knight
F. Miraglia R. Bernero
T. Novak G. Holahan
G. Lainas D. Vassallo
D. Crutchfield J. Stolz
J. Zwolinski S. Varga
B. Snyder

THRU: Ashok C. Thadani, Director AT
PWR Project Directorate #8

FROM: David H. Jaffe, Project Manager
PWR Project Directorate #8

SUBJECT: DAILY HIGHLIGHT - CALVERT CLIFFS
UNIT 2 MAIN STEAM SAFETY VALVES

A meeting will be held in AR 2242 on November 26, 1985 at 9:00 A.M. with Baltimore Gas and Electric. The purpose of the meeting will be to discuss the return to service of Calvert Cliffs Unit 2 in light of recent main steam safety valve setpoint problems.


David H. Jaffe, Project Manager
PWR Project Directorate #8

AGENDA
U-1

- . Past Test Results
- . Estimated Current Condition of Valves
- . Conclusions
- . Future Actions

MSSV UNIT 1 LIFT SETPOINT TEST
(AS FOUND/AS LEFT PSIG)

<u>Valve</u>	<u>Setpoint (±1% PSIG)</u>	<u>Hydroset Test Oct. 11, 1983</u>	<u>Hydroset Test April, 1985</u>	<u>As Left Hydroset Test June, 1985</u>
3992	985		959/975	933
3993	985		975/988	
3994	995		995/995	
✓ 3995	995		987/987	990
3996	1015	989/1024	1024/1024	
✓ 3997	1015		1014/1014	
3998	1035		1023/1028	
✓ 3999	1035		1010/1034	
4000	985	990/990	980/980	978
4001	985	981/981	964/983	983
4002	995		961/996	990
4003	995		987/987	999
4004	1015		1024/1024	1016
4005	1015		986/1010	1012
4006	1035	1058/1040		1030
4007	1035	1043/1043		

Test Results:

1 Low
1 High
3 Sat

6 Low
0 High
8 Sat

mssvul

U-1

CONCLUSIONS

Valves will open, provide full capacity,
and reset as designed.

No safety implications

U-1

FUTURE ACTIONS

Verify setpoints of all 16 valves during next outage.

— with hydrosit

Reset any valves outside $\pm 1\%$

If necessary to reset any valve, verify setpoint of valves during first outage after 3 months operation.

~~CHK. on S L P R Files - Is it
necessary to have f. study files -
How do they improve - replies.~~

~~Repture Dick Code Case - Should go
to SCSV after review to see
if III III with transmittal to
(W. Brunlow - in line with) - see p. 5
Action - Cherry for Mrs. M + G.~~

Item NP-1-86

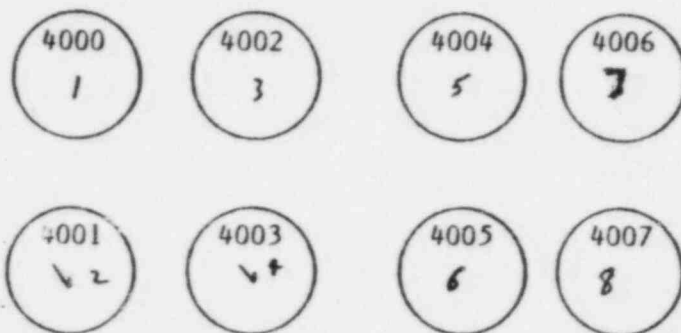
Production Testing of CL2 / H / SSV's
Propose chg. to MD-7512.1 -
Fall F150 Steam Test,

AGENDA
U-2

- . Describe Safety Valves
- . Describe As-Found Results
- . Results of Safety Analysis
- . Outline Test Program
- . Test Program Results
- . Conclusions
- . Future Actions

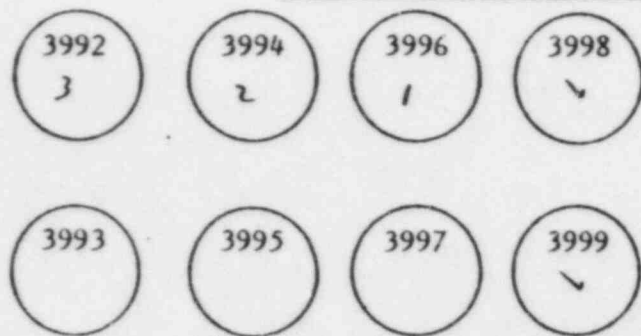
u2agenda

STEAM GENERATOR #22



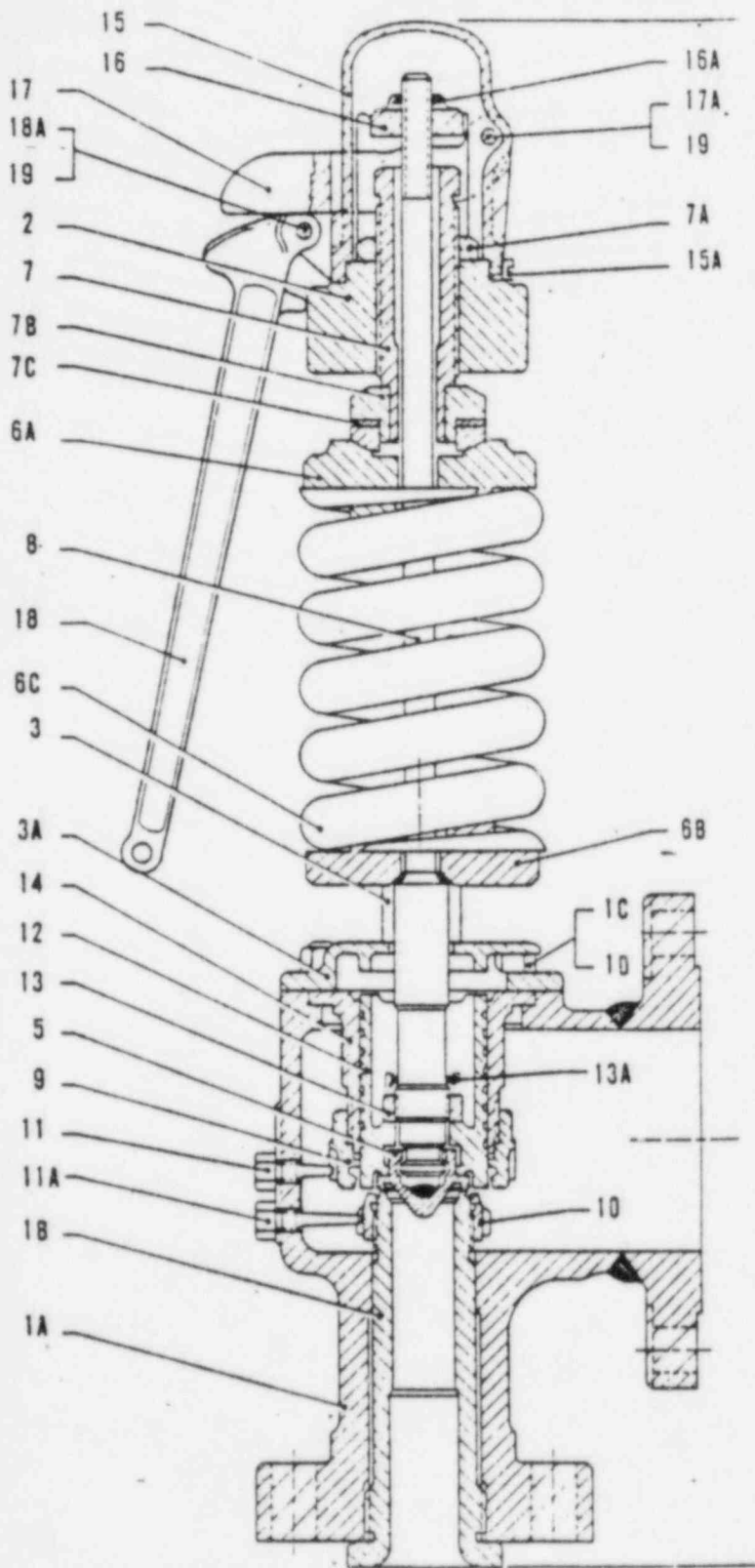
22 MSIV

STEAM GENERATOR #21



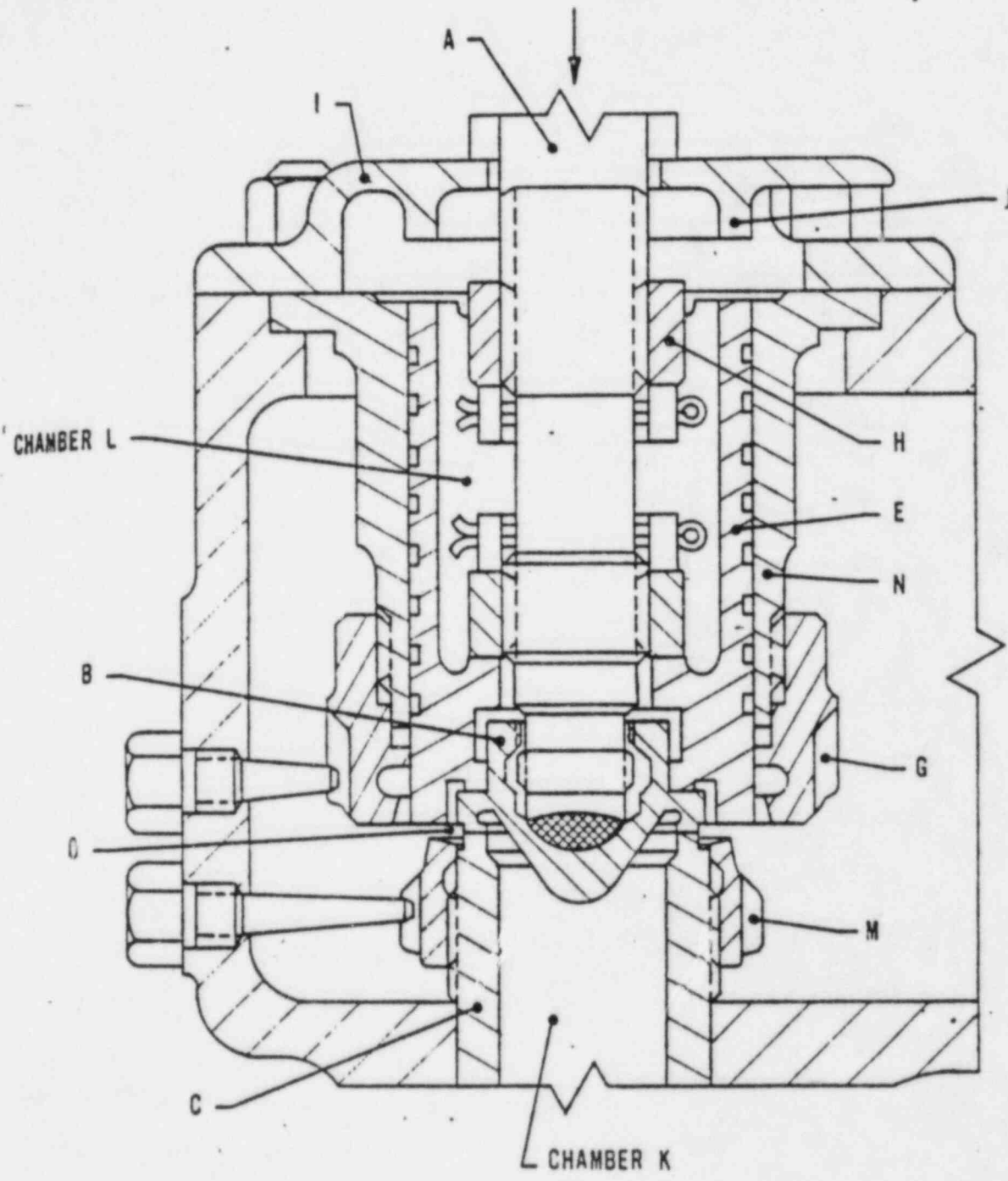
21 MSIV



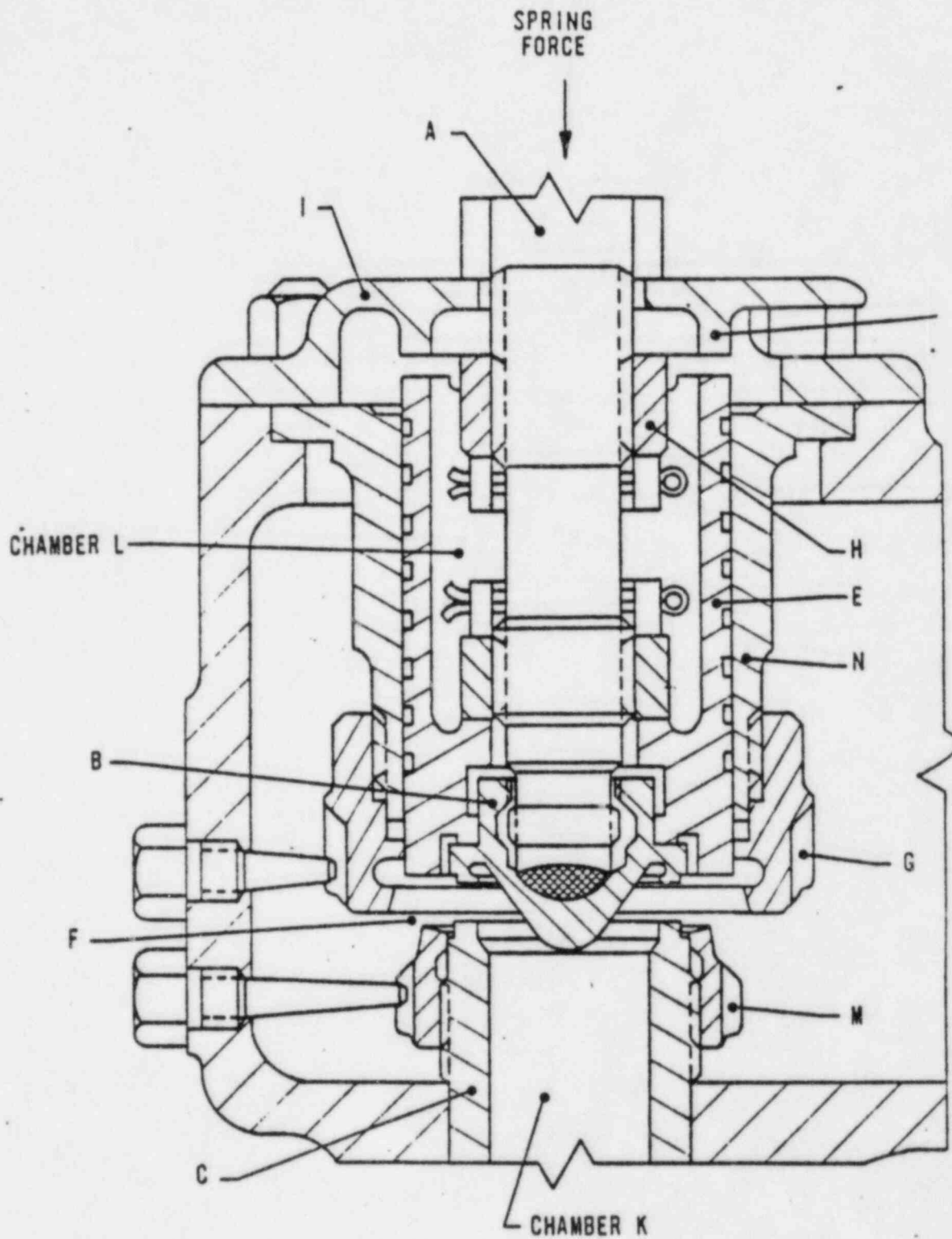


REF NO	QTY	NOMENCLATURE
1		BASE ASSEMBLY
1A	1	BASE
1B	1	NOZZLE
1C	10	BASE STUD
1D	10	BASE STUD NUT
2	1	YOKE
3	2	YOKE ROD
3A	1	COVER PLATE
4	4	YOKE ROD NUT (NOT SHOWN)
5	1	DISC
6		SPRING ASSEMBLY
6A	1	TOP SPRING WASHER
6B	1	BOTTOM SPRING WASHER
6C	1	SPRING
7	1	COMPRESSION SCREW
7A	1	COMPRESSION SCREW LOCKNUT
7B	1	COMPRESSION SCREW ADAPTOR
7C	1	THRUST BEARING
8	1	SPINDLE
9	1	UPPER ADJ. RING
10	1	LOWER ADJ. RING
11	1	UPPER RING PIN
11A	1	LOWER RING PIN
12	1	DISC HOLDER
13	1	DISC COLLAR
13A	1	DISC COLLAR COTTER PIN
14	1	GUIDE
15	1	CAP
15A	1	CAP SET SCREW
16	1	RELEASE NUT
16A	1	RELEASE NUT COTTER PIN
17	1	TOP LEVER
17A	1	TOP LEVER PIN
18	1	DROP LEVER
18A	1	DROP LEVER PIN
19	2	LEVER COTTER PIN

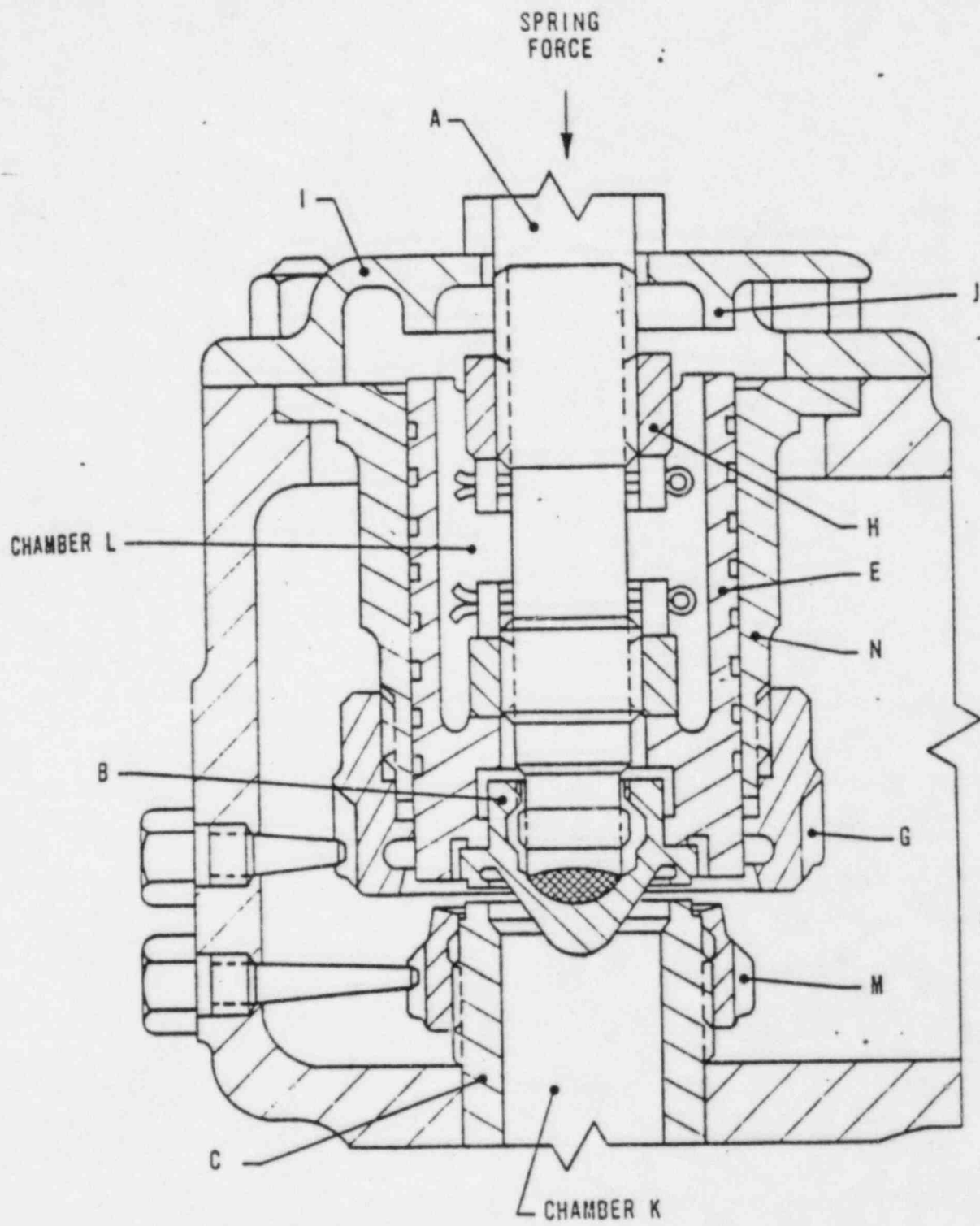
SPRING
FORCE



Valve closed



- Valve in full lift



Valve closing

MSSV UNIT 2 LIFT SETPOINT TEST
(AS FOUND/AS LEFT PSIG)

<u>Valve</u>	<u>Setpoint (± 1% PSIG)</u>	<u>Oct. 1982</u>	<u>Apr. 1984</u>	<u>Oct. 1985</u>	<u>As Found With Hydroset Correction</u>
3992	985		1009/982	991/991	987
3993	985		963/975	1015/985	1011
3994	995		1022/996	1001/1001	997
3995	995		962/989	1035/1004	1031
3996	1015	1021/1021	1037/1006	1024/1024	1020
3997	1015	1015/1015	1044/1008	1020/1020	1016
3998	1035	929/1035 ^{±10}	1065/1038	1044/1044	1040
3999	1035	1032/1032	1053/1038	1057/1038	1053
4000	985		974/981	1037/993	1033
4001	985	987/987	972/985	1040/992	1036
4002	995	998/998	1004/1004	1059/993	1055
4003	995	996/996	1014/990	1047/997	1043
4004	1015		1018/1018	1070/1018	1065
4005	1015		1012/1012	1054/1018	1050
4006	1035		991/1036	1104/1035	1100
4007	1035		980/1034	1106/1039	1102

Test Results:

1 Low
0 High
6 Sat

6 Low
7 High
3 Sat

0 Low
11 High
5 Sat

0 Low
11 High
5 Sat

mssvu2

ACCIDENTS PREDICTING MSSV OPERATION

- . Loss of Load
- . Loss of Load to One Steam Generator
 - . CEA Withdrawal
 - . Feed Line Break
- . Loss of Non-Emergency AC Power
 - . Loss of Feedwater
 - . Small Break LOCA

revised table

MAIN STEAM SAFETY VALVE SAFETY ANALYSES

	Nominal Setpoint PSIG	As-Found Setpoint PSIG	As-Found Analysis PSIG	U1C8* Analysis PSIG
RV-3992/4000	985	991/1037	1037/1037	1035**
RV-3993/4001	985	1015/1040	1040/1040	1035**
RV-3994/4002	995	1001/1059	1059/1059	1035
RV-3995/4003	995	1035/1047	1047/1047	1035
RV-3996/4004	1015	1024/1070	1070/1070	1065
RV-3997/4005	1015	1020/1054	1054/1054	1065
RV-3998/4006	1035	1044/1104	1104/1104+	1065
RV-3999/4007	1035	1057/1106	1106/1106+	1065

* This configuration has been shown to be applicable for U2C6.

** Small Break LOCA assumes 995 PSIG.

+ RV-4006 and RV-4007 were assumed stuck closed for Loss of Load analysis.
RV-3998 and RV-3999 opened at 991 and 1001 PSIG, respectively.

Superseded

MAIN STEAM SAFETY VALVE SAFETY ANALYSIS

	Nominal Setpoint PSIG	As-Found Setpoint PSIG	As-Found Analysis PSIG	U1C8* Analysis PSIG
RV-3992/4000	985	991/1037	1035	1037/1037
RV-3993/4001	985	1015/1040	1035	1040/1040
RV-3994/4002	995	1001/1059	1035	1059/1059
RV-3995/4003	995	1035/1047	1035	1047/1047
RV-3996/4004	1015	1024/1070	1065	1070/1070
RV-3997/4005	1015	1020/1054	1065	1054/1054
RV-3998/4006	1035	1044/1104	1065	1104/1104+
RV-3999/4007	1035	1057/1106	1065	1106/1106+

* This configuration has been shown to be applicable for U2C6.

** Small Break LOCA assumes 995 PSIA.

+ RV-4006 and RV-4007 were assumed stuck closed for Loss of Load analysis.
RV-3998 and RV-3999 opened at 991 and 1001 PSIG, respectively.

RESULTS

SMALL BREAK LOCA

- . Available High Pressure Safety Injection flow is higher than assumed in analysis.

- . Higher flow compensates for higher MSSV setpoints.

NON-LOCA SAFETY ANALYSIS

LIMITING EVENTS

- . Loss of Load
- . Loss of Load to one steam generator

LIMITING PARAMETER

- . Peak secondary system pressure: Limit less than 1100 PSIA.

RESULTS

NON-LOCA SAFETY ANALYSIS

LOSS OF LOAD TO ONE STEAM GENERATOR

- . As-found setpoints used
- . Otherwise identical to U1C8 analysis
- . Peak secondary system pressure = 1080 psia

LOSS OF LOAD

- . As-found setpoints used
- . MTC = $0.0E-4$ delta rho/F vs. $+0.7E-4$ delta rho/F (U1C8)
- . Otherwise identical to U1C8 analysis
- . Peak secondary system pressure = 1093 psia

MSSV TESTING PROGRAM

2-RV-3993

1. At 70°F ambient, 500°F steam
 - a. Thermal equilibrium
 - b. Test set pressure
 - c. Full Flow Test
 - d. Check leakage
 - e. Retest set pressure.
2. At 70°F ambient, 530°F steam, repeat 1a - e.
3. Heat up transient at 120°F ambient, 530°F steam prior to thermal equilibrium, repeat 1b - d.
4. Heat up to thermal equilibrium at 120°F ambient, 530°F steam, repeat 1b - e.
5. Set with new hydroset, check with old hydroset at 985, 995, 1015, and 1035 psig.
6. Reset to 985 psig at 120°F ambient and 530°F steam, repeat 1b - e and check with 2 full flow tests.

2-RV-3992

1. At 120°F ambient, 530°F steam
 - a. Thermal equilibrium
 - b. Test set pressure
 - c. Full Flow Test
 - d. Check leakage
 - e. Retest set pressure

NOTE: For all tests, record value of temperature vs. time for inlet nozzle, body, spring, and outlet flange.

Wyle Test Valve BM-7771
11/12 - 14/85

1. Valve Set at 985 ± 10
Ambient - Avg. 86.3°F
System - Avg. 495.5°F

Hydroset - Avg. 975.6 psi set pressure
Full Flow - Avg. 986.3 psi pop pressure
2. Ambient - Avg. 74.6°F
System - Avg. 537.7°F

Hydroset - Avg. 966.3 psi set pressure
Full Flow - Avg. 979 psi pop pressure
3. Ambient - Avg. 119.8°F 1 hr. heat up
System - Avg. 526.2°F

Hydroset - Avg. 973.8 psi
Full Flow - Avg. 979 psi
4. Ambient - Avg. 118.3°F 4 hr. heat up
System - Avg. 527°F

Hydroset - Avg. 965.8 psi set pressure
Full Flow - Avg. 976 psi pop pressure
5. Valve set at 1035 ± 10

Ambient - Avg. 119.5°F
System - Avg. 527.5°F

Hydroset - Avg. 1035.6 psi set pressure
Full Flow - Avg. 1030.5 pop pressure
6. Valve Reset at 985 ± 10

Ambient - Avg. 119°F
System - Avg. 523.5°F

Hydroset - Avg. 967.5 psi set pressure
Full Flow - Avg. 981.3 psi pop pressure
7. Wyle Test Valve BM 7787 - 11/14/85

Ambient - Avg. 122.7°F
System - Avg. 523°F

Hydroset - Avg. 966.3 psi set pressure
Full Flow - Avg. 984.5 psi pop pressure

Valve 2-RV	Ring Setting Top Bottom (Note 2)		Surface Film/Cond.	Stem Run Out (Note 1)	Avg. Disk to Guide Clearance **	Maximum Set Pressure (PSIG)	1985 As Found Set Pressure (PSIG)
3992	-7t	-2	very light/good	OK	19t	995	987
3993	+22t	+12	very light/good	OK	17t	995	1011
3994	113t	-15	very light/good	8t	18t	1005	997
3995	6t	-2	very light/some wear	OK	15t	1005	1031
3996	-11t	-3	very light/good	15t	15t	1025	1020
3997	12t	-2	very light/good	8t	13t	1025	1016
↓ 3998	13t	-	✓ heavy/good	10t	14t	1045	1040
↓ 3999	-7t	-1	✓ heavy/good	24t	13t	1045	1053
4000	4t	-9	very light/good	21t	14t	995	1033
↓ 4001	12t	-1	✓ heavy/good	14t	14t	995	1036
4002	95t	-3	very light/good	10t	14t	1005	1055
↓ 4003	12t	-7	✓ heavy/good	13t	13t	1005	1043
4004	25t	-3	very light/good	29t	11t	1025	1065
4005	52t	-3	very light/good	20t	15t	1025	1050
4006	27t	-1	very light/good	13t	13t	1045	1100
4007	22t	-1	very light/good	18t	12t	1045	1102

all values at: 160 t -9
(result) mthl

may 60

not
100

t = 10⁻³ inches

**Min. old disk to guide clearance 10t

***Min. new disk to guide clearance 15t

1. No effect below 0.0625"

2. As-Found ring positions affect setpoint by less than 1% and yield 15% or less blowdown.

U-2

CONCLUSIONS

Apparent setpoint changes not explained by as-found condition of valves.

Apparent setpoint changes may possibly be the result of measurement technique.

Rebuilt valves will perform as designed.

U-2

FUTURE ACTIONS

Procedural Enhancements

Set valves at 530°F vice 500°F

Provide QC coverage while verifying setpoints

Independently reverify setpoints of 4 valves 12 hours after initial setting.

Verify setpoints of 4 valves during first outage after 4 month operation.

1. NC 100.
into NC rewrite

pl. list per 2-1-17

EXISTING

NC-7512 Safety Valve Operating Requirements

NC-7512.1 Antichattering and Lift Requirements. Safety valves shall be constructed to operate without chattering and to attain rated lift at a pressure not greater than 3% above their set pressures.

NC-7512.2 Opening Pressure Tolerance

(a) The opening pressure tolerance plus or minus shall not exceed the following: 2 psi for pressures up to and including 70 psi, 3% for pressures over 70 psi to 300 psi, 10 psi for pressures over 300 psi to 1000 psi, and 1% for pressures over 1000 psi.

(b) Conformance with the requirements of (a) above shall be established for each production valve by test. Steam valves shall be tested on steam.

NC-7512.3 Blowdown Requirements. Safety valves shall be adjusted to close after blowing down to a pressure not lower than that specified in the valve Design Specification. The adjustment shall be determined by test or by proration from the Certificate Holder's blowdown test data.

REVISED

NC-7512 Safety Valve Operating Requirements

NC-7512.1 Antichattering and Lift Requirements.

(a) Safety valves shall be constructed and adjusted to operate without chattering and to attain ~~rated~~ lift at a pressure not greater than 3% above their set pressures.

for steam opening

(b) For valves used for main steam ^{testing at the terminal} service, conformance with (a) ~~above~~ shall be established for each production valve by ~~full flow testing on steam~~ ^{inlet piping}. The test shall take into account valve ~~inlet piping pressure losses~~ and discharge piping back pressure as specified in the valve Design Specification.

NC-7512.3 Blowdown Requirements.

(a) ← Safety valves shall be adjusted to close after blowing down to a pressure not lower than that specified in the valve Design Specification.

(b) For valves used for main steam service, conformance with (a) ~~above~~ shall be established for each production valve by ~~full flow testing on steam~~. The test shall take into account valve ~~inlet pressure losses~~ and discharge piping back pressure as specified in the valve Design Specification.

(c) For valves used for other than main steam service, the adjustment shall be determined by test or proration from the Certificate Holder's blowdown test data.

B/14

EXISTING

107
REVISED

NC-7512 Safety Valve Operating Requirements

NC-7512.1 Antichattering and Lift Requirements.
Safety valves shall be constructed to operate without chattering and to attain rated lift at a pressure not greater than 3% above their set pressures.

NC-7512 Safety Valve Operating Requirements

NC-7512.1 Antichattering and Lift Requirements.

(a) Safety valves shall be constructed ^{and adjusted} to operate without chattering and to attain rated lift at a pressure not greater than 3% above their set pressures.

(b) For valves used for main steam service, conformance with (a) above shall be established for each production valve by full flow testing on steam. The test shall take into account valve inlet piping pressure losses and discharge piping back pressure as specified in the valve Design Specification.

NC-7512.2 Opening Pressure Tolerance

(a) The opening pressure tolerance plus or minus shall not exceed the following: 2 psi for pressures up to and including 70 psi, 3% for pressures over 70 psi to 300 psi, 10 psi for pressures over 300 psi to 1000 psi, and 1% for pressures over 1000 psi.

(b) Conformance with the requirements of (a) above shall be established for each production valve by test. Steam valves shall be tested on steam.

NC-7512.3 Blowdown Requirements. Safety valves shall be adjusted to close after blowing down to a pressure not lower than that specified in the valve Design Specification. The adjustment shall be determined by test or by proration from the Certificate Holder's blowdown test data.

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(a) ← Safety valves shall be adjusted to close after blowing down to a pressure not lower than that specified in the valve Design Specification.

(b) For valves used for main steam service, conformance with (a) above shall be established for each production valve by full flow testing on steam. The test shall take into account valve inlet piping pressure losses and discharge piping back pressure as specified in the valve Design Specification.

(c) For valves used for other than main steam service, the adjustment shall be determined by test or proration from the Certificate Holder's blowdown test data.

