

September 12, 1988

DISTRIBUTION:
See next page

Docket Nos. 50-325
and 50-324

LICENSEE: Carolina Power & Light Company (CP&L)
FACILITY: Brunswick Steam Electric Plant, Units 1 and 2
SUBJECT: SUMMARY OF MEETING HELD ON JULY 14, 1988 - HPCI/RCIC
VALVE OPERABILITY AND SAFETY SYSTEM RELIABILITY (TAC
NO. 68674)

Background

A meeting was held in Rockville, Maryland on Thursday, July 14, 1988, to discuss the specifics of CP&L's recently submitted Justification for Continued Operation (JCO) with respect to Brunswick Steam Electric Plant, Units 1 and 2. The meeting also was to address safety system reliability in light of a recent trend involving an increased number of reportable events. Participants in the meeting included representatives of the NRC and CP&L. The list of attendees is provided as Enclosure 1.

The specific events which focused attention on Brunswick's HPCI system were:

1. A turbine steam supply valve (F001) failed to open and the HPCI system was declared inoperable on June 30, putting Unit 1 in a 14 day LCO.
2. On July 5, upon determining that an undersized motor operator was used in the design for valve F006 (MOV injection valve), Unit 2 entered a 14 day LCO.

The licensee developed a JCO to support operation until the next refueling outages without making any physical changes to the injection valves. Subsequently, CP&L decided to shut down Unit 1 to replace the deficient motor operator on injection valve F006. Then, after Unit 1 was restarted and reached 60%, Unit 2 would be shut down for similar repair work. The NRC had concerns about the JCO and safety system reliability, which the meeting was organized to address. The agenda communicated to the licensee in a teleconference is shown in Enclosure 2.

Summary

In response to the questions reflected in the agenda, the licensee made a slide presentation addressing NRC concerns on technical issues, and discussing failure modes, corrective actions and the bases for projected future performance. The slides presented and clarifying information are provided in Enclosure 3.

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At the close of the meeting, CP&L summarized the following action items:

- ° Complete short term repairs.
 1. Remove starting resistors on F013 valves.
 2. Investigate whether removal of starting resistors from other similar valves is appropriate.
 3. Reverify findings of INPO SOER 84-7.
 4. Evaluate temperature effects on motor heater and shunt field.
- ° Long term program to be developed to include the complete analysis of safety related valves with respect to design basis requirements.

Schedule

- 08/15/88 - Prepare a plan and schedule that will establish milestones and completion dates for the analysis phase.
- 12/31/88 - Complete the design analysis of safety related valves.
- 02/28/89 - Complete development of a corrective action implementation plan to address problems identified.

Along with these CP&L proposals, the NRC requested intermediate briefings on the progress relative to the above-mentioned actions.

The licensee was instructed to prepare a confirmation of corrective actions letter specifically addressing the very near term actions to support restart. Also, a commitment was made by CP&L to obtain NRC approval prior to restarting Unit 1 after the valve repair outage.

A followup letter is expected in a couple of weeks after this meeting focusing on near term and long term actions. It is expected that the licensee's program will be somewhat evolutionary.

151

Brenda Mozafari, Project Engineer
Project Directorate II-1
Division of Reactor Projects I/II

Enclosure:
As stated

cc w/encls:
See next page

OFC	:PE:PD21:DRPR:D:PD21/DRPR :
NAME	:BMOzafari:jw:EAdensam :
DATE	:9/ /88: :9/11/88 :

DISTRIBUTION FOR MEETING SUMMARY DATED: September 12, 1988

Facility: Brunswick Steam Electric Plant, Units 1 and 2

Docket File

NRC PDR
Local PDR
PDII-1 Reading
E. Adensam
P. Anderson
B. Mozafari
B. Buckley
OGC
E. Jordan (MNBB 3302)
B. Grimes (9A2)
ACRS (10)
B. Troskoski (17D19)

cc: Licensee/Applicant Service List

AEC Participants

B. Buckley
N. Grace, RII
L. Reyes, RII
J. Sniezek (12G18)
G. Lainas
T. Marguies (12D20)
F. Rosa (8D20)
E. Brown (EWS 207)
O. Rothberg (NS 217A)
T. Martin (12G18)
S. Long (10A2)
R. Barrett (10A2)
K. Eccleston (14H3)
W. Ruland, RII
B. Troskoski RII
E. Adensam
B. Mozafari
J. Huang (9H3)
F. Miraglia (12G18)
A. Thadani (7E4)
D. Tondi (8D20)
P. Kang (8D20)
T. Collins (8E23)

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'11

Mr. E. E. Utley
Carolina Power & Light Company

Brunswick Steam Electric Plant
Units 1 and 2

cc:

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LIST OF ATTENDEESJULY 14, 1988

<u>Name</u>	<u>Organization</u>
B. Buckley	NRC
N. Grace	NRC
L. Reyes	NRC
J. Sniezek	NRC
G. Lainas	NRC
E. Utley	CP&L
P. Howe	CP&L
C. Dietz	CP&L
R. Helme	CP&L
J. O'Sullivan	CP&L
T. Marguiles	NRC
J. Boone	CP&L
R. Richey	CP&L
F. Rosa	NRC
E. Brown	NRC
O. Rothberg	NRC
T. Martin	NRC
S. Long	NRC
R. Barrett	NRC
K. Eccleston	NRC
W. Ruland	NRC SRI
B. Troskoski	NRC
E. Adensam	NRC
B. Mozafari	NRC
J. Huang	NRC
F. Miraglia	NRC
A. Thadani	NRC
D. Tondi	NRC
P. Kang	NRC
T. Collins	NRC

AGENDA

JULY 14, 1988

- I. Specifics on JCO
 - A. Define problems with each valve.
 - B. Identify changes proposed or implemented to resolve the defined problems.
 - C. Basis for determining that the problems will be solved by the changes and not introduce new problems.
 - D. Describe the testing proposed to demonstrate that the changes have resolved the identified problem.
 - E. Previous operating history for each valve.
 - F. Testing experience with MOVATS-type program for these valves.
 - G. Discuss differences between units on torque requirements for sister valves.
- II. Address Safety System Reliability at Brunswick.

PRESENTATION TO
U.S. NUCLEAR REGULATORY COMMISSION

JULY 14, 1988

0 OBJECTIVES

- o TO REVIEW SPECIFIC TECHNICAL ISSUES THAT IMPACT THE BASES OF BNP'S JUSTIFICATION FOR CONTINUED OPERATION FOR THE UNIT 1 AND UNIT 2 HIGH PRESSURE COOLANT INJECTION SYSTEMS, JULY 10, 1988.

- o TO REVIEW BNP SAFETY SYSTEM RELIABILITY, SPECIFICALLY FOCUSED TO THE HIGH PRESSURE COOLANT INJECTION SYSTEMS. PRESENTATION IS STRUCTURED TO DISCUSS FAILURE MODES, CORRECTIVE ACTIONS, AND THE BASES FOR PROJECTED FUTURE PERFORMANCE.

PRESENTATION TO
U.S. NUCLEAR REGULATORY COMMISSION

JULY 14, 1988

- 0 SAFETY SYSTEM RELIABILITY R. E. HELME
 - o HISTORICAL PERFORMANCE
 - o FAILURE RESPONSE
 - o CORRECTIVE ACTIONS
 - o RESULTS OF CORRECTIVE ACTIONS
 - o CURRENT FAILURE HISTORY
 - o SEQUENCE AND TYPE

- 0 CONCLUSIONS C. R. DIETZ

PRESENTATION TO
U.S. NUCLEAR REGULATORY COMMISSION

JULY 14, 1988

AGENDA

- 0 JUSTIFICATION FOR CONTINUED OPERATION RESPONSE J. S. BOONE
 - o PROBLEMS IDENTIFIED PER VALVE
 - o INDIVIDUAL MODIFICATIONS PER VALVE
 - o ACCEPTABILITY OF CORRECTIVE ACTIONS
 - o ACCEPTANCE TESTING

- 0 HPCI VALVE PERFORMANCE J. O'SULLIVAN
 - o MECHANICAL ANALYSIS CHARACTERIZATION (MAC)
 - o TORQUE SETTING VARIANCE
 - o CORRECTIVE ACTIONS
 - o INTERIM
 - o LONG TERM

PRESENTATION TO
U.S. NUCLEAR REGULATORY COMMISSION

JULY 14, 1988

0 CONCLUSIONS

o PREVIOUS CORRECTIVE ACTIONS

o NARROWLY FOCUSED

o FAILURE TO CHALLENGE DESIGN/AS-INSTALLED
VERSUS THE DESIGN BASES/CRITERIA

o CURRENT AND PROJECTED CORRECTIVE ACTIONS

o CONFIDENT IN THE RESULTS. . . , PROVE IT!!

o ASSESSING SELECTIVE DECREASES IN SURVEILLANCE
INTERVALS OR INCREASED FREQUENCY OF TESTING
FOR HISTORICAL POOR PERFORMANCE

o CONFIDENT IN THE RESULTS. . . , WHY IMPROVE?

o PLANT MODIFICATIONS ARE DEVELOPED TO IMPROVE
OPERATING MARGINS COMPARED TO THE ENTIRE
SPECTRUM OF DESIGN BASES REQUIREMENTS

o ROOT CAUSE DETERMINATIONS WILL ENABLE
ELIMINATION OF CHRONIC FAILURE CONTRIBUTORS

o VOLTAGE SURGE PROTECTION

PRESENTATION TO
U.S. NUCLEAR REGULATORY COMMISSION

JULY 14, 1988

IMPROVE (?), . . . (CONTINUED)

- o ELIMINATION OF STARTING RESISTORS
- o VALVE APPLICATIONS TO ELIMINATE THERMAL BINDING
- o VALVE RELOCATION TO IMPROVE OPERATING ENVIRONMENT/TEMPERATURE IMPACT ON MOTOR CAPACITY
- o EFFECT OF THE ABOVE ACTIONS IS NOT YET QUANTIFIABLE
- o OTHER FAILURES SUCH AS THE HIGH STEAM FLOW ISOLATION SETPOINTS ARE CONSIDERED TO BE ISOLATED OCCURRENCES

PROBLEMS

0 SUMMARY

- o THERMAL BINDING
 - o CHANGES IN VALVE TEMPERATURE INCREASE TORQUE REQUIREMENTS
 - o NO ALLOWANCE IN ORIGINAL MOTOR SIZING BY VENDOR
 - o CAUSED BY CLOSING HOT; OPENING COLD
 - o VALVE BODY CONTRACTION EXCEEDS DISK CONTRACTION
- o MOTOR TORQUE DEFICIENCY
 - o MOTOR UNABLE TO DEVELOP REQUIRED TORQUE IN SOME CONDITIONS
 - o STARTING RESISTOR
 - o REDUCED STARTING VOLTAGE FOR 1-2 SECONDS
 - o FOR OPENING,
 - o MAXIMUM TORQUE NEEDED TO UNSEAT
 - o MOTOR MAY STALL AND NOT RESTART EVEN WITH FULL VOLTAGE

- o FOR CLOSING,
 - o MINIMAL TORQUE NEEDED TO START
 - o NO IMPACT
- o PRESENCE OF STARTING RESISTORS NOT CONSIDERED IN MOTOR SIZING BY VENDOR
- o CABLE SIZING
 - o UNABLE TO SUPPLY SUFFICIENT CURRENT TO DEVELOP ASSUMED TORQUE FOR ALL CONDITIONS
 - o ACTUAL MOTOR AND CABLE TEMPERATURES REDUCE ASSUMED CURRENT CAPABILITY
 - o CABLE NOT SIZED FOR FULL LOAD REQUIRED TO UNSEAT OR TORQUE SEAT VALVE
- o TORQUE SWITCH SETTING
 - o MOTOR SIZED FOR MAXIMUM DESIGN LOAD
 - o TORQUE SWITCH SET ABOVE MAXIMUM DESIGN LOAD

0 UNIT 1 HPCI STEAM SUPPLY VALVE (1-E41-F001)

o THERMAL BINDING

o EXISTS UP TO APPROXIMATELY TWO HOURS AFTER HPCI STEAM LINE PRESSURIZED

o OCCURS ONLY AFTER STEAM LINE ISOLATED FOR MAINTENANCE OR TESTING

o DISAPPEARS AFTER RETURN TO NORMAL TEMPERATURE

o MOTOR TORQUE DEFICIENCY

o INSUFFICIENT TORQUE TO OPEN VALVE

o RESULTS FROM A LOSS OF OFF-SITE POWER WHICH CAUSES MINIMUM BUS VOLTAGE

o EMERGENCY DIESEL GENERATOR OPERATION RESTORES ADEQUATE VOLTAGE IN 10 SECONDS

0 UNIT 1 AND 2 HPCI INJECTION VALVES (E41-F006)

o MOTOR TORQUE DEFICIENCY

o INSUFFICIENT TORQUE TO OPEN VALVE

o INSUFFICIENT TORQUE TO TORQUE SEAT VALVE CLOSED

o OCCURS ONLY DURING A MAIN STEAM LINE BREAK ACCIDENT IN THE MSIV PIT

0 UNIT 1 AND 2 RCIC INJECTION VALVE (E51-F013)

o NO PROBLEMS FOUND

RESOLUTIONS

0 THERMAL BINDING

- o E41-F001 (UNIT 1 AND UNIT 2)
 - o EXTENDED HPCI STEAM LINE PRESSURIZATION/WARM-UP TIME TO FOUR HOURS AFTER UNISOLATING
 - o HPCI CONTINUES TO BE CONSIDERED INOPERABLE DURING THIS PERIOD
 - o NO CREDIT TAKEN FOR HPCI DURING PERIOD THERMAL BINDING COULD EXIST
- o ACCEPTABILITY
 - o HPCI NOT CONSIDERED OPERABLE WHEN POTENTIAL FOR THERMAL BINDING EXISTS
 - o SUSCEPTIBLE CONDITION EXISTS ONLY APPROXIMATELY TWO HOURS AFTER HPCI STEAM LINE IS PRESSURIZED FOLLOWING MAINTENANCE OR TESTING

0 MOTOR TORQUE DEFICIENCY

- o E41-F001 (UNIT 1)
 - o ELIMINATED REDUCED VOLTAGE STARTING
 - o INCREASED POWER CABLE SIZE
 - o CHANGED OPERATOR GEAR RATIO TO INCREASE TORQUE

- o E41-F006 (UNIT 1)
 - o ELIMINATED REDUCED VOLTAGE STARTING
 - o OUTAGE BEGUN TO INSTALL LARGER MOTOR
- o E41-F006 (UNIT 2)
 - o ELIMINATED REDUCED VOLTAGE STARTING
 - o OUTAGE PLANNED TO BEGIN ABOUT JULY 17 TO INSTALL LARGER MOTOR
- o E51-F013 (UNIT 1 AND UNIT 2)
 - o ELIMINATING REDUCED VOLTAGE STARTING
 - o SUFFICIENT MOTOR TORQUE AVAILABLE
 - o CHANGE PERFORMED TO ACHIEVE ADDED MARGIN
- o ACCEPTABILITY
 - o ADEQUATE TORQUE CAPABILITY RESTORED FOR DESIGN CONDITIONS
 - o CHANGES REVIEWED WITH VENDORS
 - o OTHER DESIGN REQUIREMENTS SATISFIED
 - o DC LOAD STUDY
 - o CABLE SIZING
 - o MCC/BREAKER/STARTER CAPACITY

ACCEPTANCE TESTING

0 E41-F001 VALVE

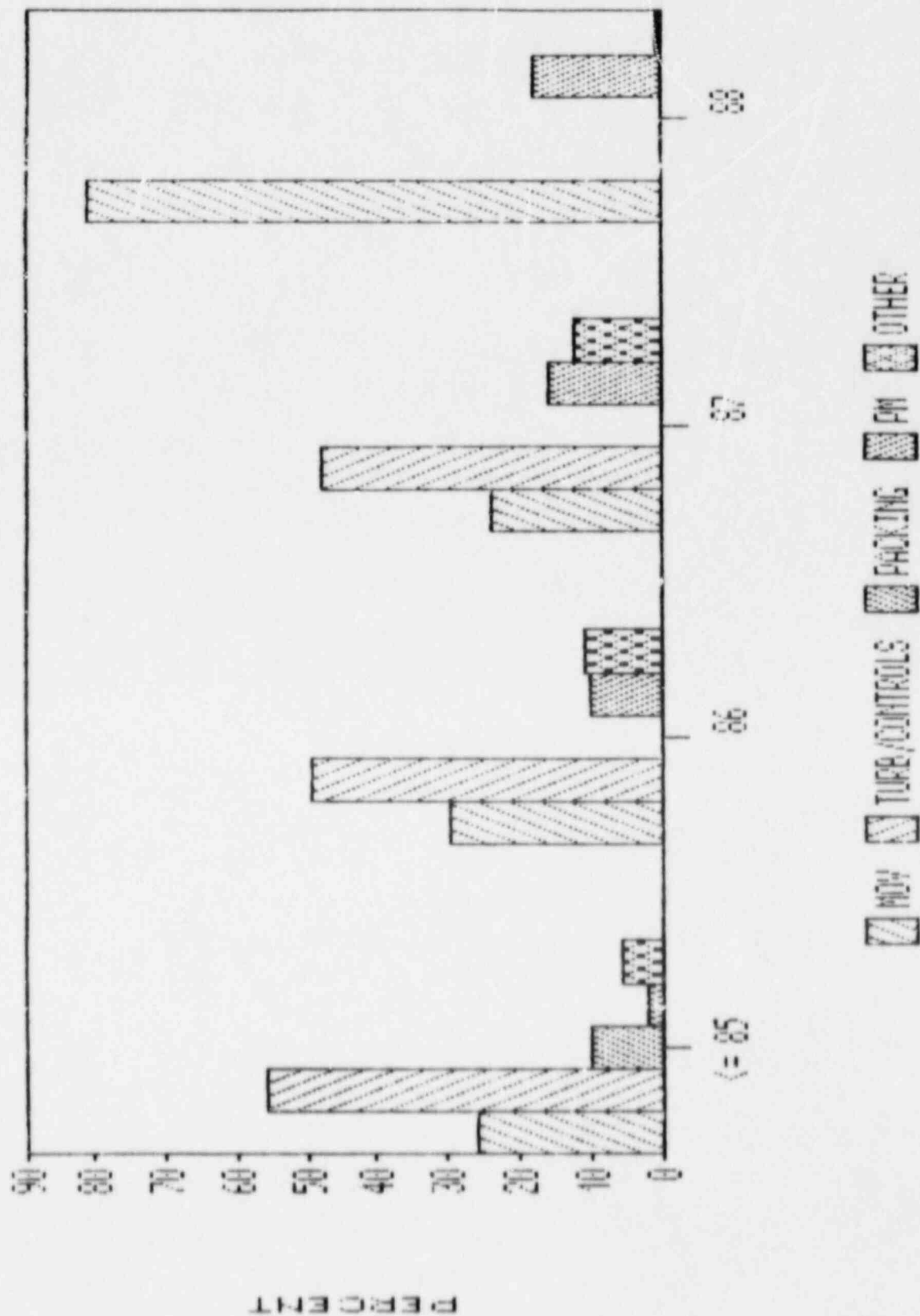
- o MAC TEST AT 0# AND 1000#
 - o STROKE TIME
 - o CURRENT TRACE
 - o TORQUE
- o HPCI OPERABILITY SURVEILLANCE
 - o TECHNICAL SPECIFICATION FUNCTIONAL TEST
 - o ISI PERFORMANCE TESTS ON SYSTEM AND F001 AND F006 VALVES

0 E41-F006

- o STROKE TIME
- o CURRENT TRACE
- o MAC TEST (PLANNED)
 - o STROKE TIME
 - o CURRENT TRACE
 - o TORQUE

- o HPCI OPERABILITY SURVEILLANCE (PLANNED)
 - o TECHNICAL SPECIFICATION FUNCTIONAL TEST
 - o ISI PERFORMANCE TESTS ON SYSTEM AND F001 AND F006 VALVES
- 0 E51-F013
- o STROKE TIME
 - o CURRENT TRACE

HPCI - UNIT 1 AND UNIT 2



VALVE MOTOR FAILURE HISTORY

1-E41-F001 (4 FAILURES)

10/08/86

12/31/87

05/28/87

07/01/88

2-E41-F001 (0 FAILURES)

1-E41-F006 (0 FAILURES)

2-E41-F006 (1 FAILURE)

01/05/87

1-E51-F013 (0 FAILURES)

2-E51-F013 (0 FAILURES)

VALVE TEST DATA

(MOTOR ACTUATOR CHARACTERIZER)

		<u>TORQUE</u> (FT LBS)	<u>CURRENT</u> (AMPS)	<u>T.S.</u>
1-E41-F001				
5/17/87	CLOSING	584.5	26.25	2 1/4
	OPENING	245.9	11.11	
7/10/88	CLOSING	569.0	45.66	2 1/8
	OPENING	379.1	18.8	
2-E41-F001				
1/15/88	CLOSING	606.3	33.43A	2 3/8
	OPENING	305.1	10.13A	
7/12/88(1)	CLOSING	601.9	31.77A	2 3/8
	OPENING	257.5	12.72A	
1-E41-F006				
5/31/87	CLOSING	1,771.3	64.2	1.5
	OPENING	413	35.8	
7/10/88(1,2)	CLOSING	NA	66.18	NA
	OPENING	NA	82.78	
2-E41-F006				
3/31/88	CLOSING	1,871.3	61.78	1 3/4
	OPENING	1,211.1	28.08	
7/11/88(1,2)	CLOSING	NA	78.39A	NA
	OPENING	NA	55.92A	

NOTE: (1) WITHOUT STARTING RESISTORS.

(2) AT 1000 PSI DIFFERENTIAL PRESSURE-CURRENT TRACE ONLY.

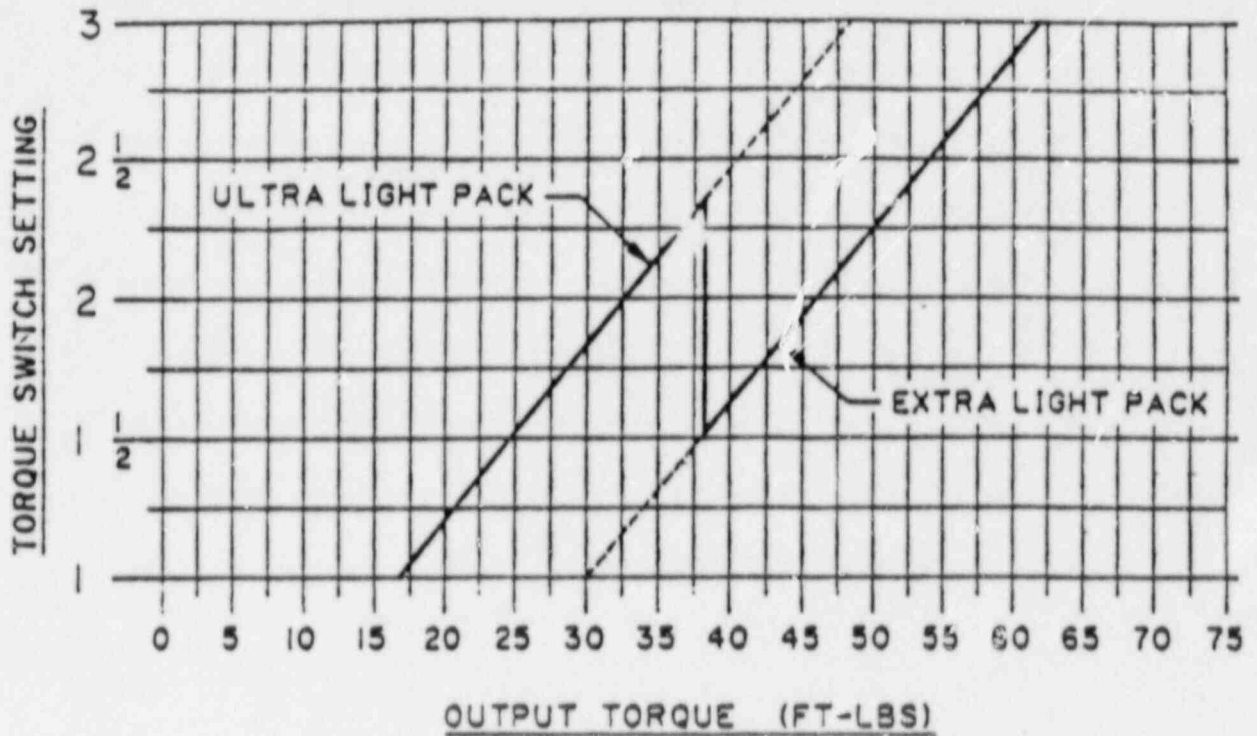
VALVE TEST DATA

(MOTOR ACTUATOR CHARACTERIZER)

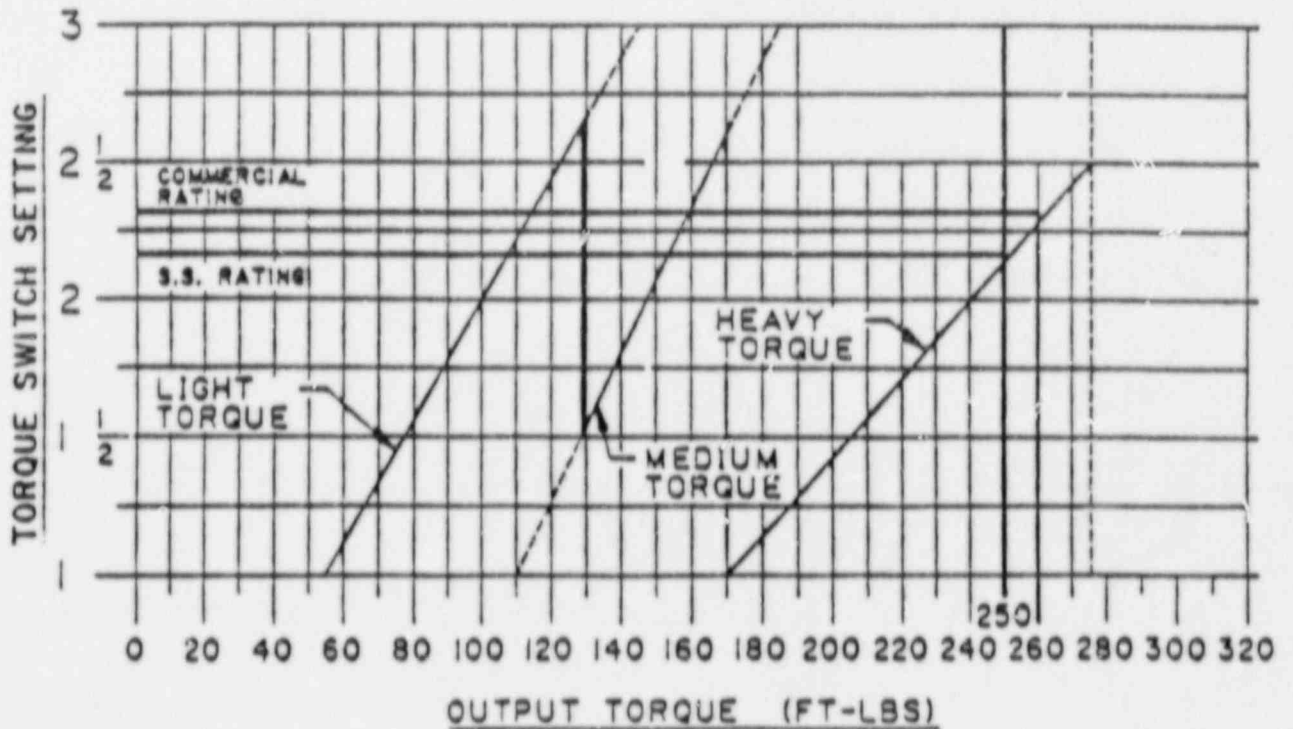
(CONT'D)

		<u>TORQUE</u> (<u>FT LBS</u>)	<u>CURRENT</u> (<u>AMPS</u>)	<u>T.S.</u>
1-E51-F013				
5/24/87	CLOSING	3.2	7.55	1.5
	OPENING	35.4	3.88	
2-E51-F013				
3/2/88	CLOSING	76.2	4.4	1
	OPENING	56.5	3.29	

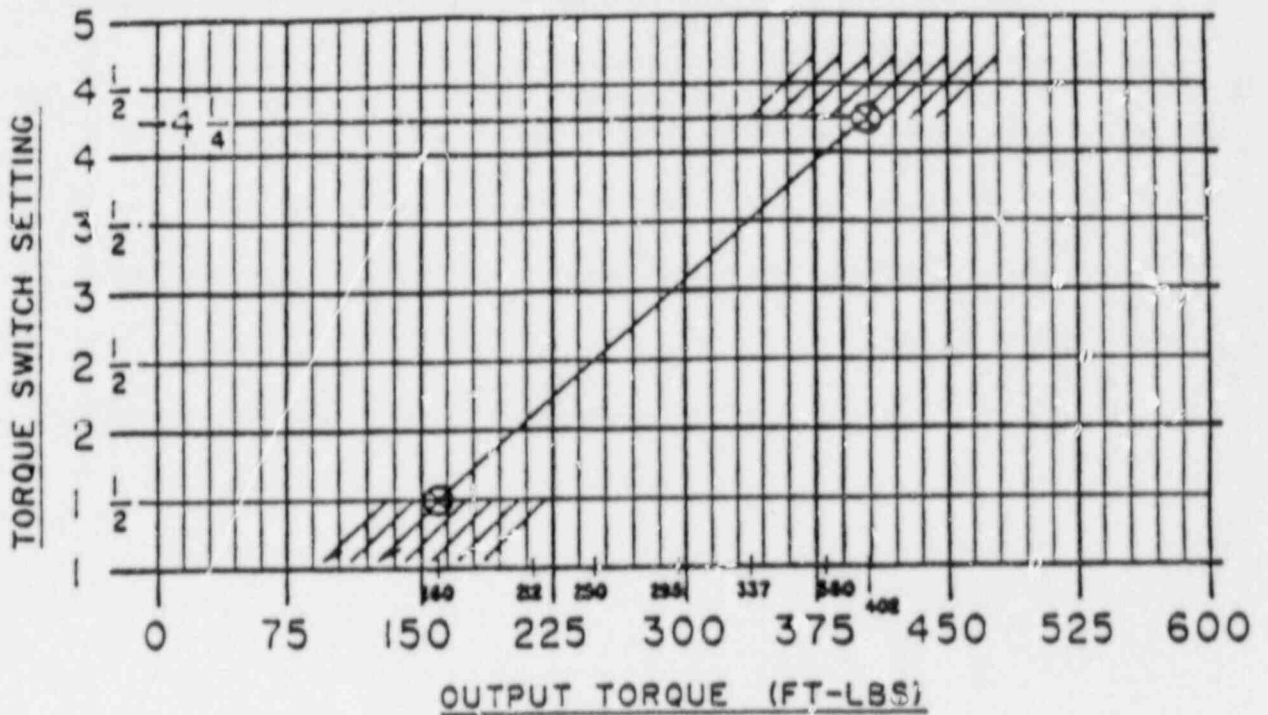
TECHNICAL DETAILS
 SMB-00 TORQUE SWITCH SETTING CHART
 EXTRA AND ULTRA LIGHT TORQUE



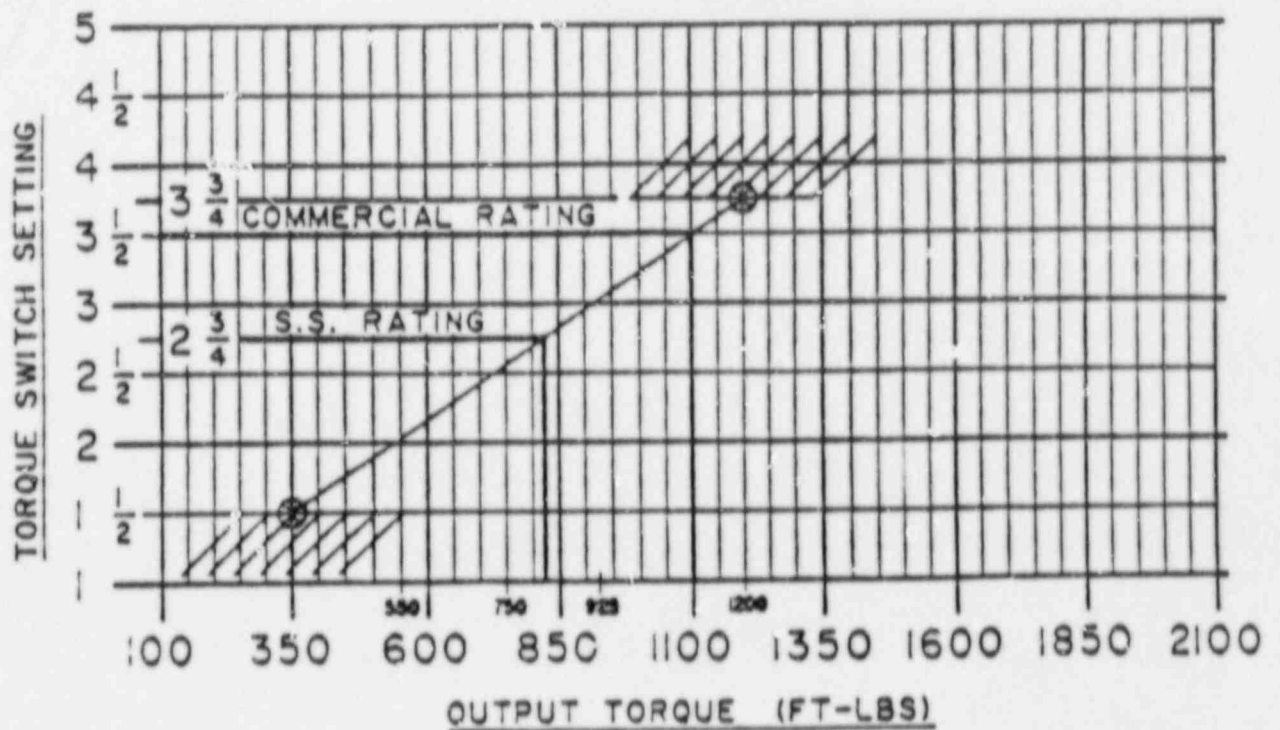
TECHNICAL DETAILS
 SMB-00 TORQUE SWITCH SETTING CHART
 LIGHT, MEDIUM AND HEAVY TORQUE



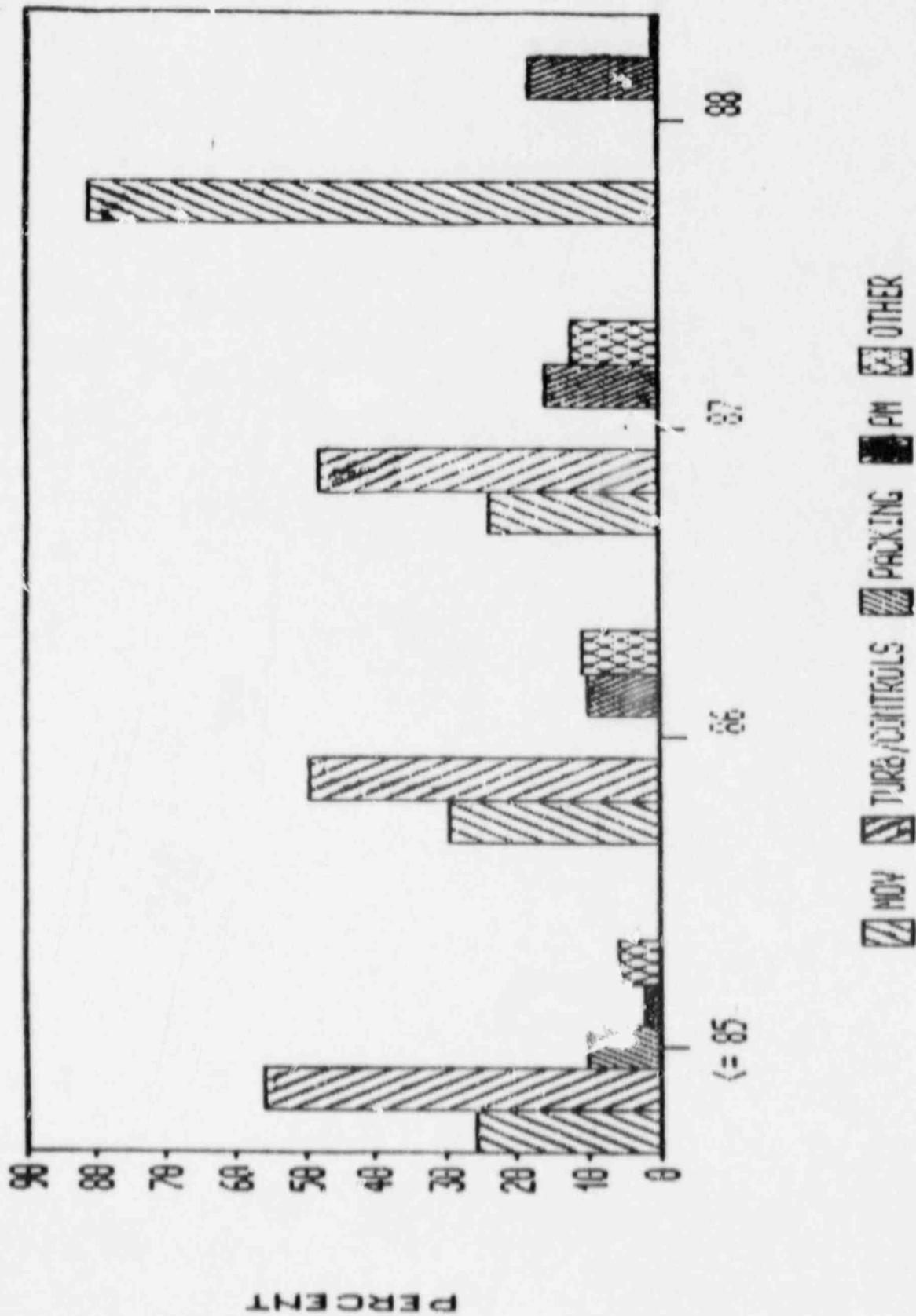
TECHNICAL DETAILS
 SMB-1 TORQUE SWITCH SETTING CHART
 LIGHT TORQUE



TECHNICAL DETAILS
 SMB-1 TORQUE SWITCH SETTING CHART
 HEAVY TORQUE

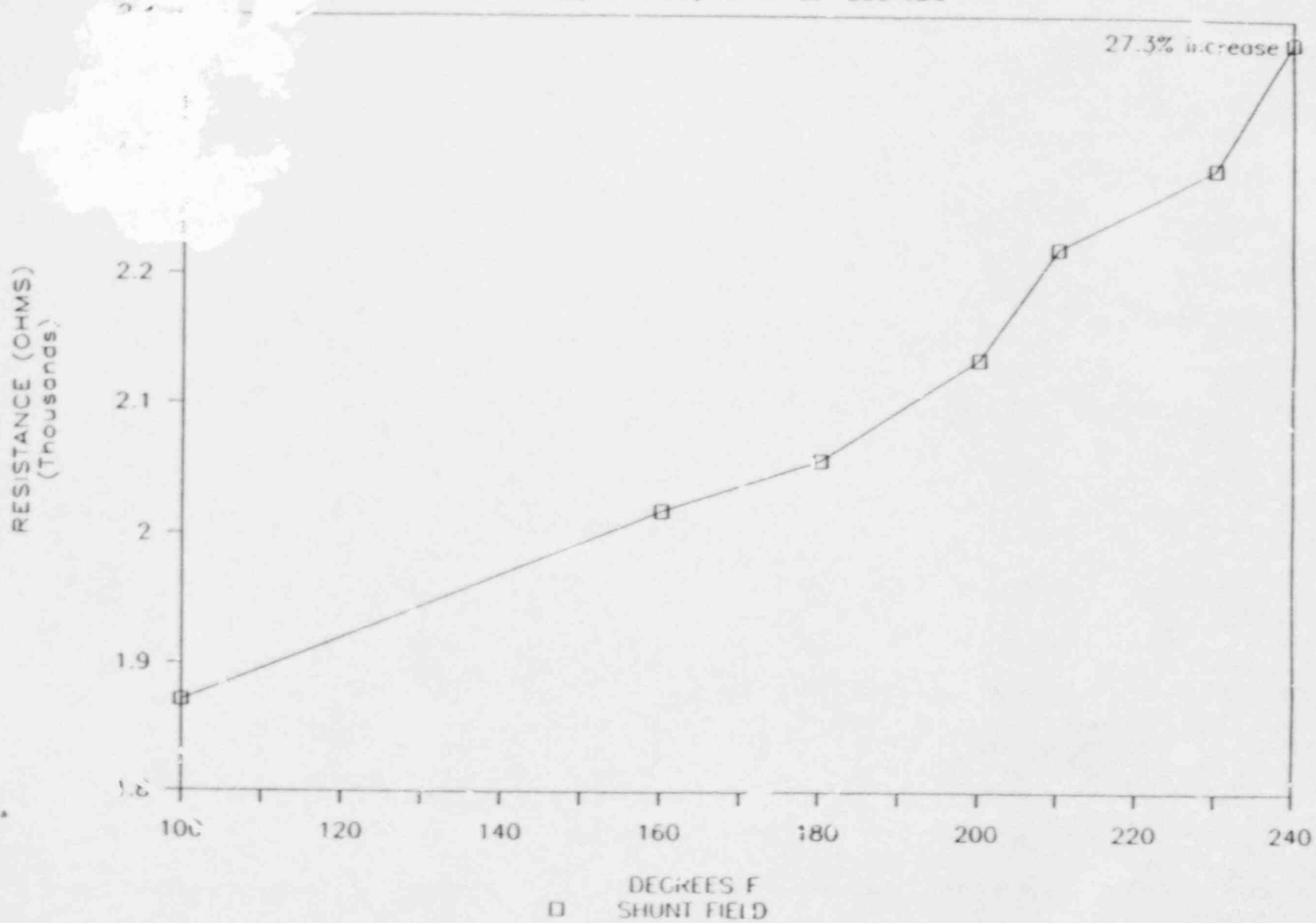


HPCI - UNIT 1 AND UNIT 2



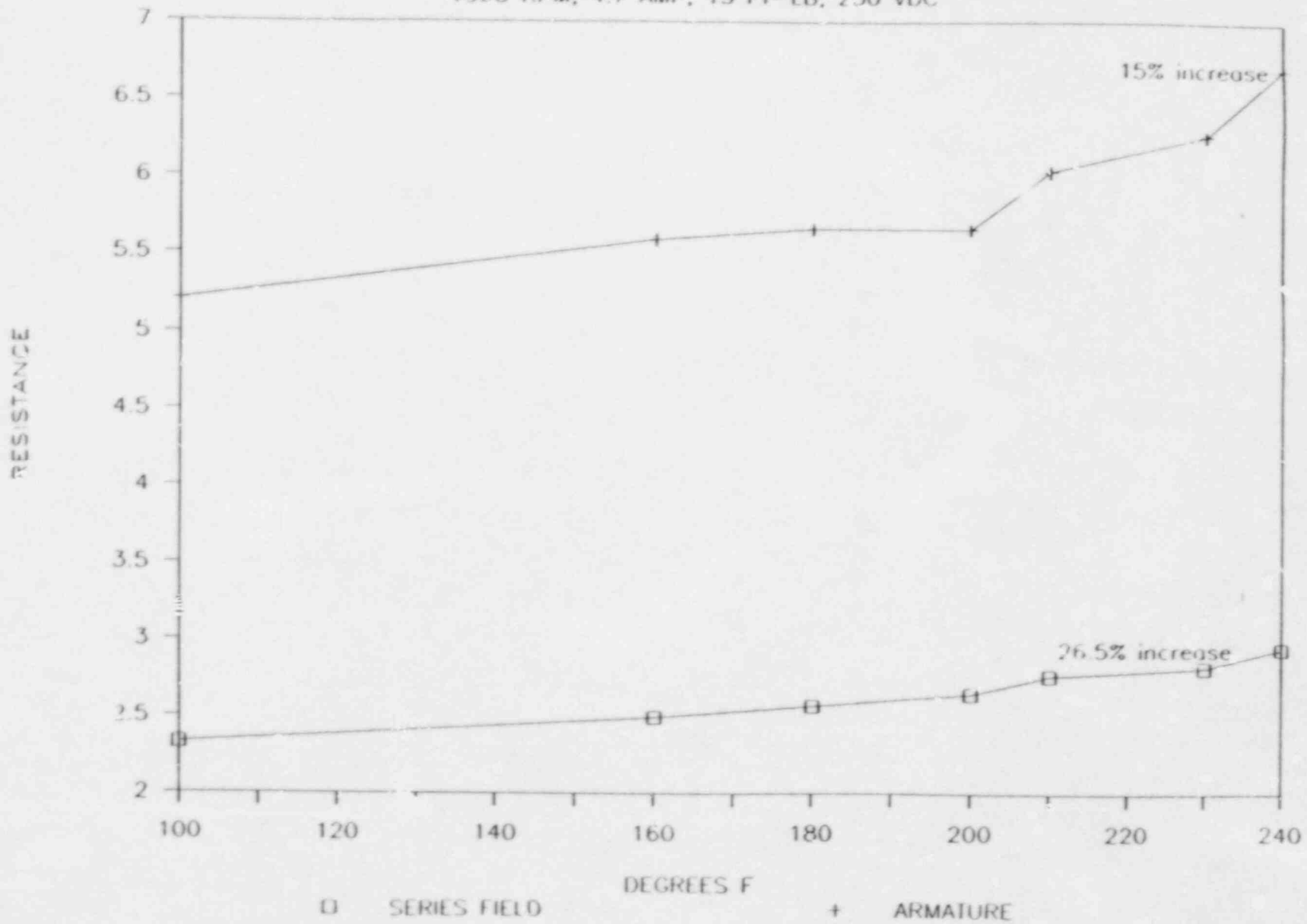
TEMP vs OHMS FOR A LIMITORQUE MOTOR

1900 RPM, 4.7 AMP, 15 FT-LB 250 VDC



TEMP vs OHMS FOR A LIMITORQUE MOTOR

1900 RPM, 4.7 AMP, 15 FT-LB, 250 VDC



SMB/HMB-3 TORQUE SWITCH SETTING CHART

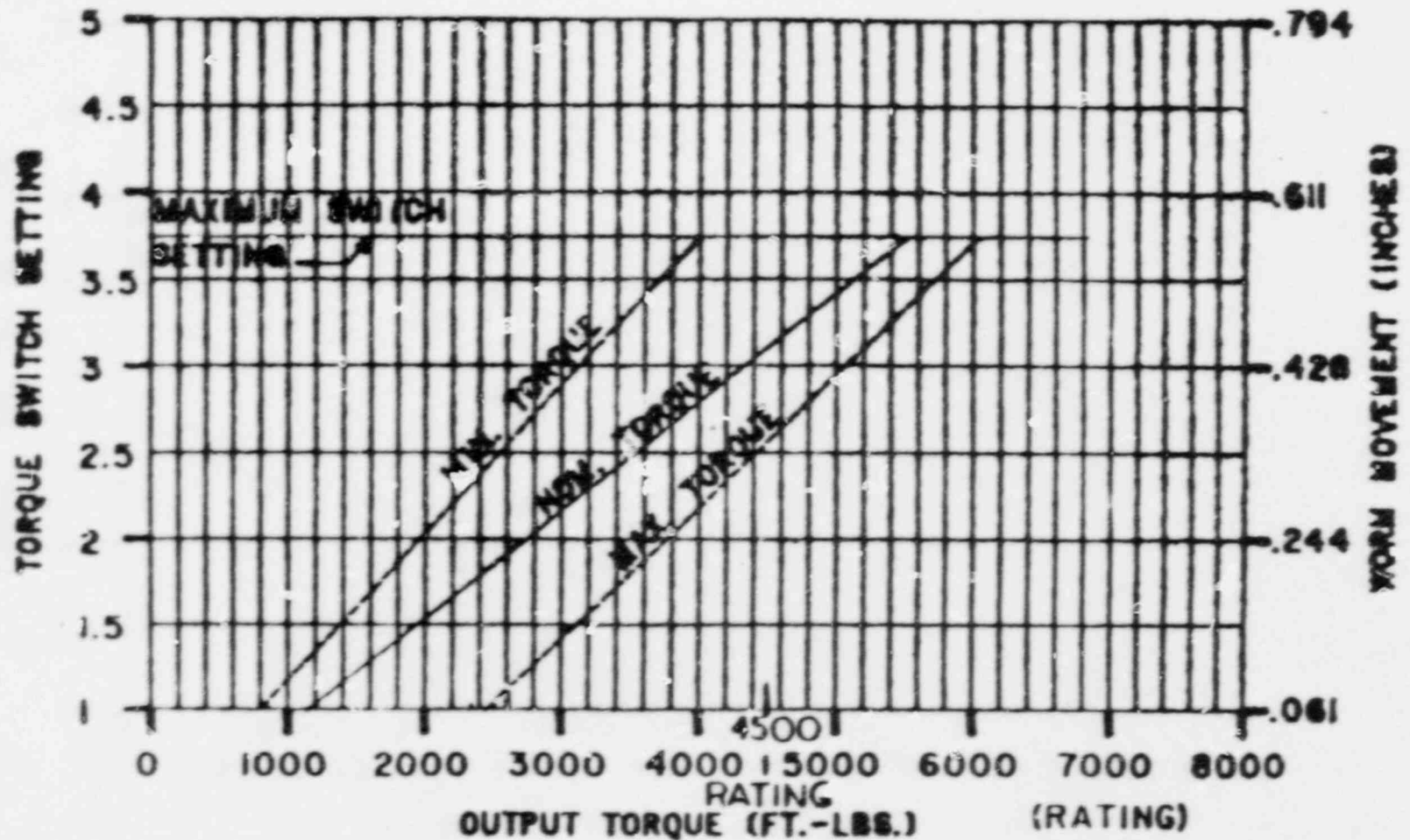
10 SPRINGS - .124" PRELOAD

DWG. NO. 60-600-0079-1

CALIBRATION NAMEPLATE

NO 60-682-0405-1

MAXIMUM TORQUE SWITCH SETTING - 3 3/4



B/M: NO. 1106-1-2

DRN.

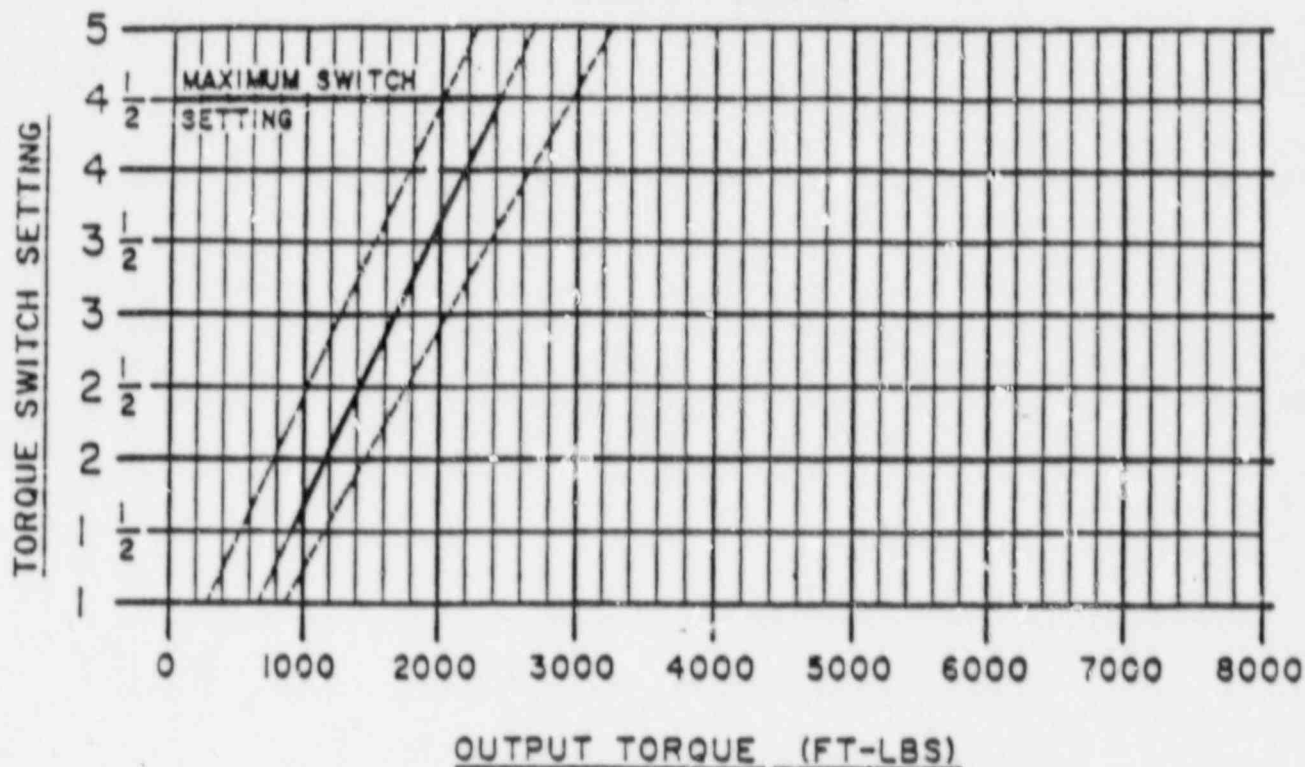
R.GLOVER

DATE

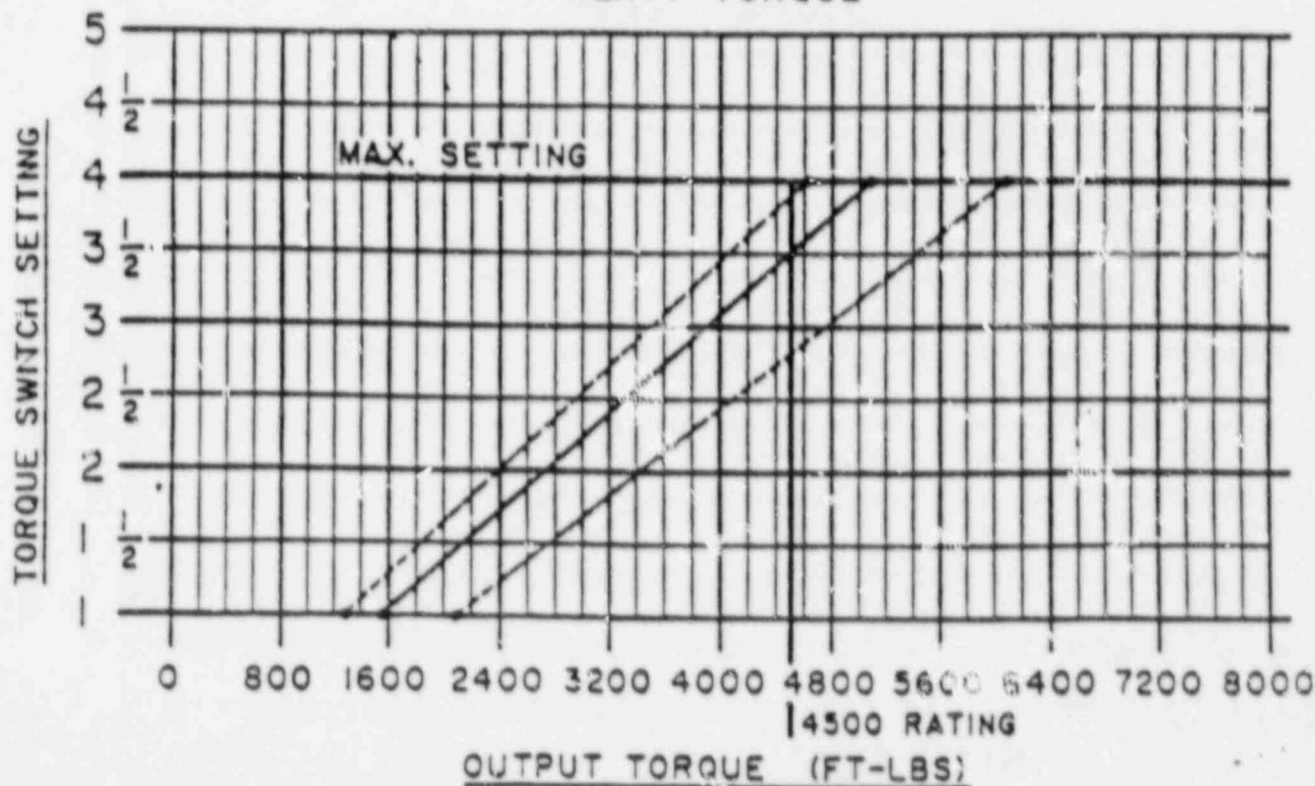
8-27-82

REV.

TECHNICAL DETAILS
 SMB-3 TORQUE SWITCH SETTING CHART
 LIGHT TORQUE

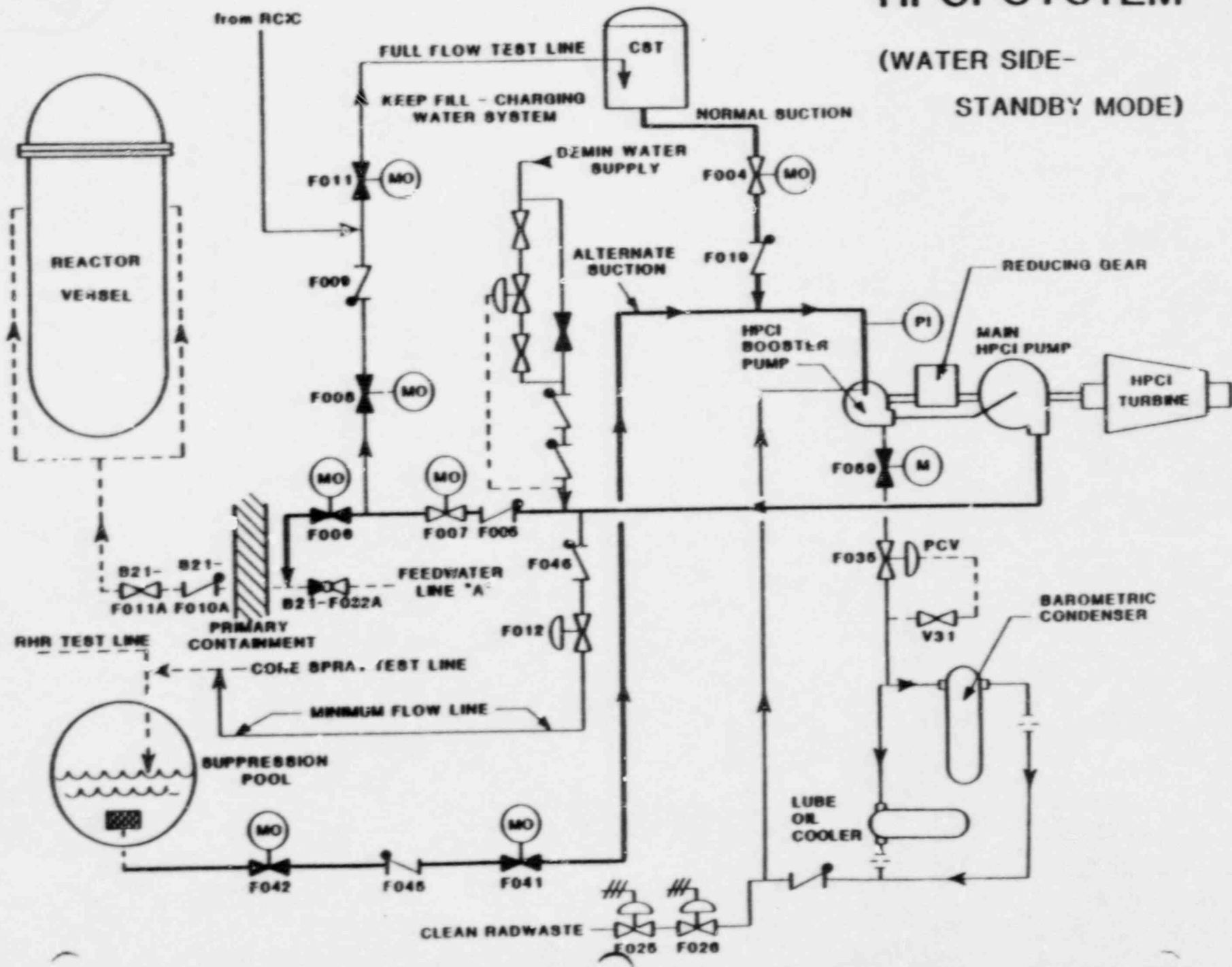


TECHNICAL DETAILS
 SMB-3 TORQUE SWITCH SETTING CHART
 HEAVY TORQUE

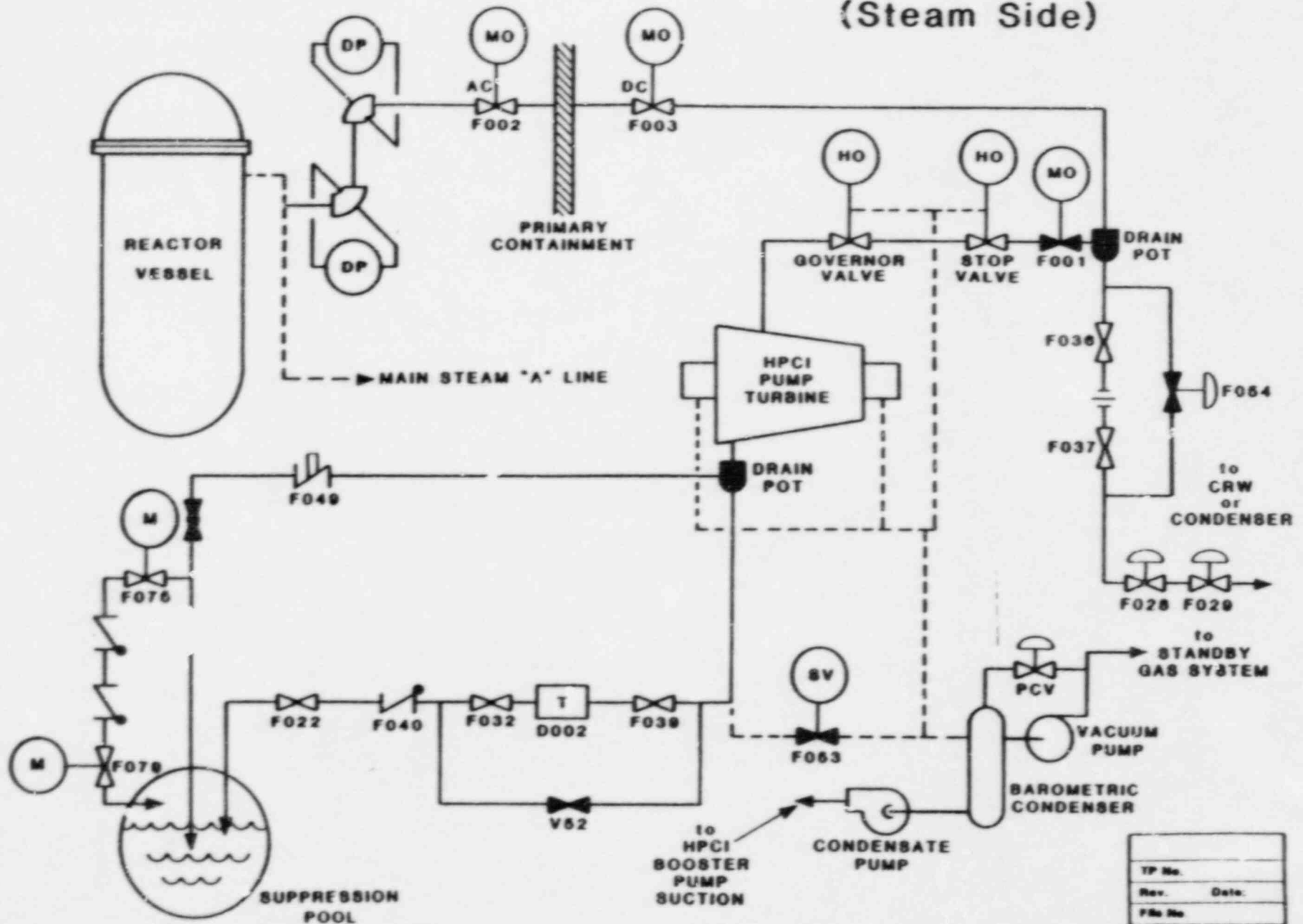


HPCI SYSTEM

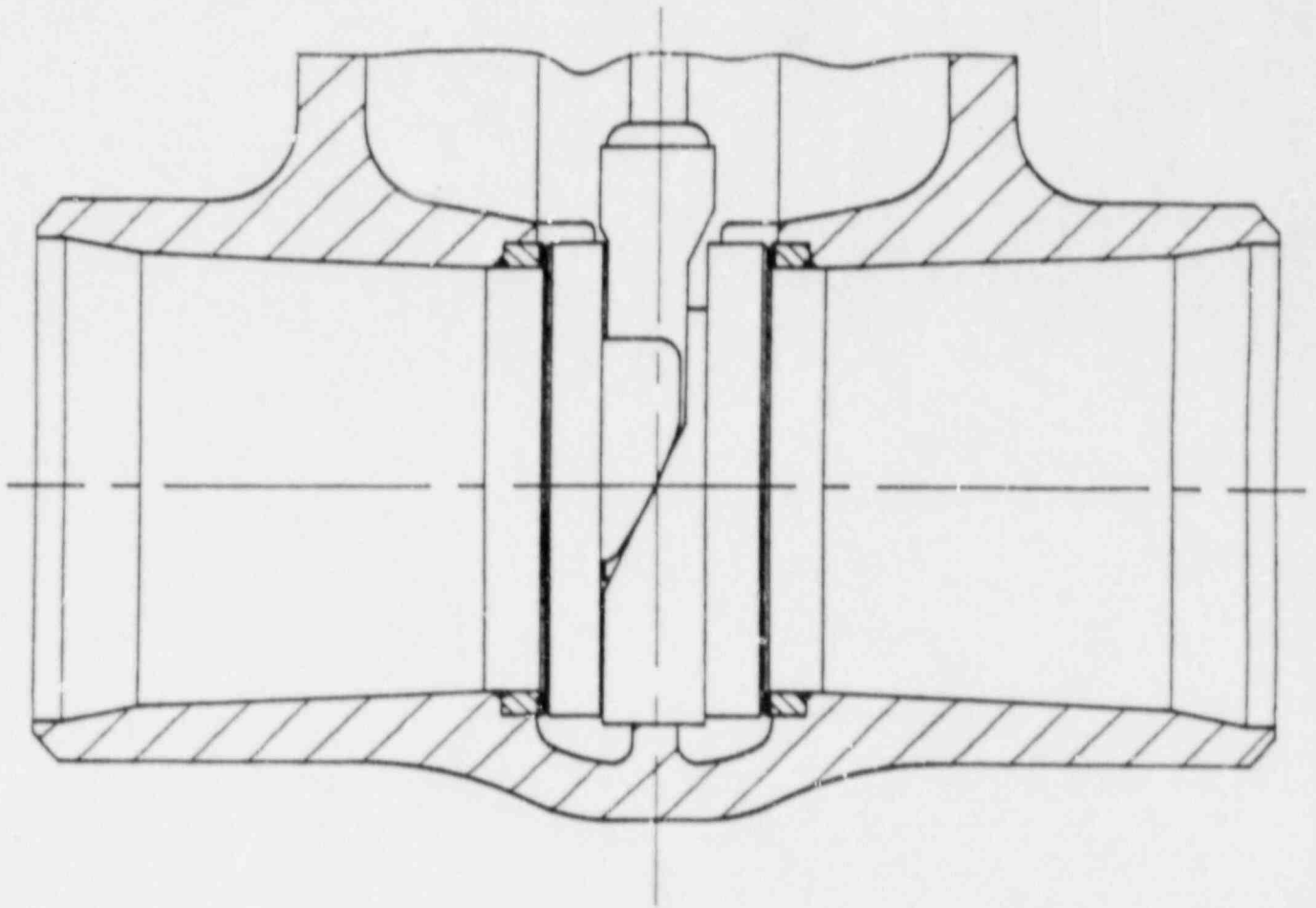
(WATER SIDE-
STANDBY MODE)



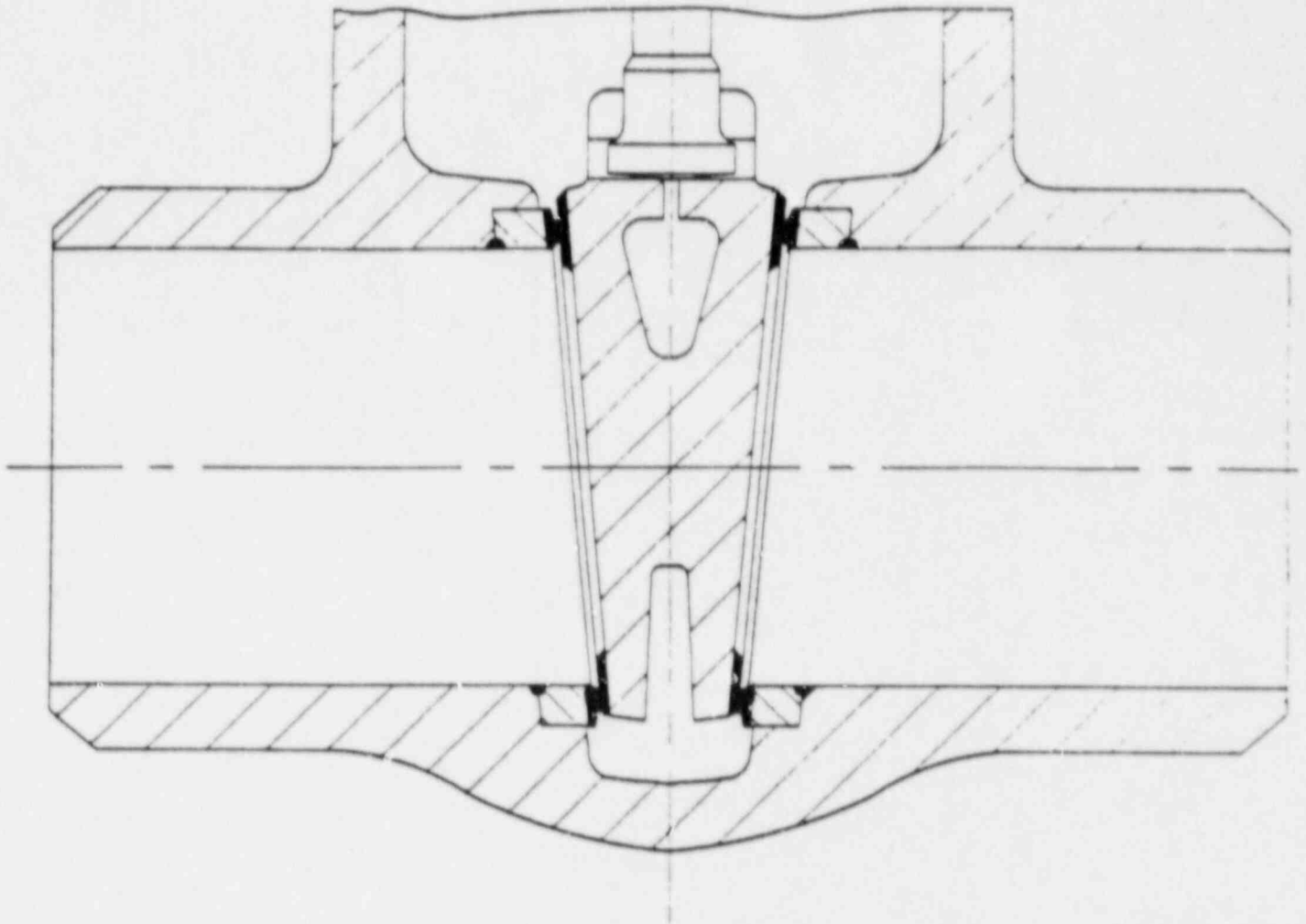
HPCI SYSTEM (Steam Side)



TP No.	
Rev.	Date.
File No.	
Ref. Desg.	
App.	
TRAINING USE ONLY	



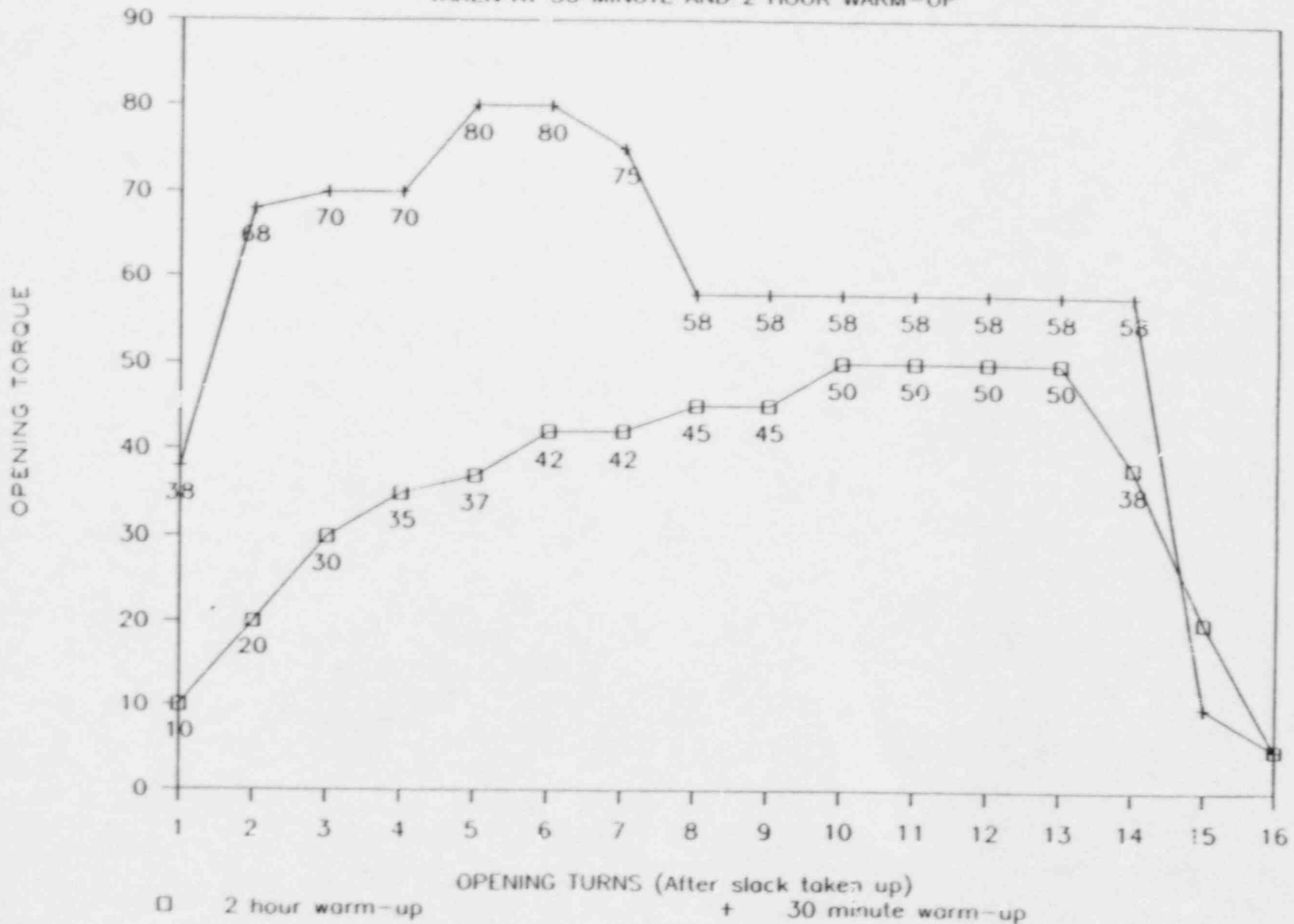
DOUBLE DISC PARALLEL SEAT GATE VALVE



FLEX WEDGE GATE VALVE

1-E41-FOJ1 VALVE OPENING TORQUES

TAKEN AT 30 MINUTE AND 2 HOUR WARM-UP



VALVE MOTOR OPERATOR DATA

E41-F001:

SIZE:	SMB-1 (60'#)	MOTOR:	1900
DIFF PRESS:	1118 PSI	MOTOR HP:	4.35
STROKE TIME:	20 SEC	FULL LOAD AMPS:	17
POWER SUPPLY:	DC	LOCKED ROTOR AMPS:	105
VOLTAGE:	240		

E41-F006:

SIZE:	SMB-3 (100'#)	MOTOR:	1900
DIFF PRESS:	1550 PSI	MOTOR HP:	7.25
STROKE TIME:	20 SEC	FULL LOAD AMPS:	30
POWER SUPPLY:	DC	LOCKED ROTOR AMPS:	146
VOLTAGE:	240		

NEAR TERM ENHANCEMENTS

1-E51-F013
2-E51-F013

REMOVE STARTING RESISTORS TO INCREASE
OPERATING MARGINS.

1-E41-F012
1-E41-F041
1-E41-F042
1-E41-F059

REMOVE STARTING RESISTORS.

1-E51-F019
1-E51-F029
1-E51-F031

REMOVE STARTING RESISTORS.

REVERIFY INPO SOEK 84-7 FINDINGS.

EVALUATE THE EFFECTS OF TEMPERATURE CONTRIBUTED BY MOTOR HEATERS
AND SHUNT FIELD.

MISSION STATEMENT

THROUGH SYSTEMATIC ANALYSIS DETERMINE THAT THE BRUNSWICK PLANT'S SAFETY RELATED MOTOR-OPERATED VALVES WILL FUNCTION PROPERLY WHEN SUBJECTED TO DESIGN BASIS OPERATING, ENVIRONMENTAL AND DEGRADED VOLTAGE SCENARIOS. VALVES AND OPERATORS WHOSE DESIGN OR APPLICATION DOES NOT OFFER ADEQUATE DESIGN OPERATING MARGIN WILL BE IDENTIFIED FOR REPLACEMENT OR MODIFICATION AS APPROPRIATE.

VALVE ANALYSIS OVERVIEW

- CONSISTENT WITH DEVELOPED PRA TECHNIQUES, ESTABLISH A PRIORITIZATION SCHEME DESIGNED TO SELECT VALVES FOR EXAMINATION BASED ON THE FOLLOWING:
 - CRITICALITY OF SERVICE
 - OPERATING HISTORY IN-PLANT
 - INDUSTRY OPERATING HISTORY
- ESTABLISH EFFECTIVE LIAISON WITH VALVE AND OPERATOR VENDORS.
- OBTAIN UPDATED VALVE AND OPERATOR DATA FROM VENDORS.
- DEVELOP CRITERIA FOR EVALUATING EXISTING VALVE INSTALLATIONS TO UPDATED DESIGN INFORMATION.
- DEVELOP A PROJECT PLAN AND SCHEDULE TO IDENTIFY NEAR-TERM AND LONG-TERM OBJECTIVES BASED ON PRIORITIZATION SCHEME.

SCHEDULE

- AUGUST 15, 1988: PROMULGATE A PLAN AND SCHEDULE THAT WILL ESTABLISH MILESTONES AND COMPLETION DATES FOR THE ANALYSIS PHASE.
- DECEMBER 31, 1988: COMPLETE THE DESIGN ANALYSIS OF SAFETY RELATED VALVES.
- FEBRUARY 28, 1989: COMPLETE DEVELOPMENT OF A CORRECTIVE ACTION IMPLEMENTATION PLAN TO ADDRESS PROBLEMS IDENTIFIED.