H. Parler

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

August 30, 1979

George L. Edgar, Esquire
Morgan, Lewis & Bockius
1800 M Street, N.W.
Washington, D. C. 20036

Dear George:

This will confirm my request to you on the telephone today that Babcock and Wilcox provide us with copies of the Site Problem Reports and Preliminary Safety Concerns listed below.

If it would be overly burdensome to provide photocopies of all of these documents, and if fiche is not a quick solution, I suggest that where files are quite thick the cover memo describing the PSC or SPR could be copied and sent to us; when we are down in Lynchburg conducting depositions, we can then review follow-up and other material for those files that appear to be most relevant.

SPRs

11100	PZR EMO Relief Lifted Inadvertently
22000	Inadvert. RC-V3 open
23500	Cant flush resin completely
2[illegible]	Req. Dev. to perform PZR oper.
255[illegible]	Low RG Flow Indication
26200	PZR Relief Valve Leakage
28000	Dropped Spare PZR relief va.
44401	RCU-1 Stm Leak and Damaged
45400	Check for resin in FW
53300	Loss FW pump/Emerg. FWF No. 5
54600	RC-V1 Shaft Scored
55600	Resin may be in SG frm POWD
56001	RC-V2 motor burnout-OULD
67900	ICS module failure
4600	No PRZ SPR VAL 40
5700	ICS Wiring Errors
6300	Excessive flow during ESOP
11300	Excess RCS cooldown rate inc.
19300	RCUI failed open - one more
19301	IRRC - failed in open pos.
19500	ICS run BK stpt on FDP PP
19600	HPI valve position for oper
22200	Leaking PRZ relief, block va

8001170 761

P

SPRs (contd)

29100	ICS transient
4100	PZR level comp cannot calib.
25400	IC Sys. Incident
28900	ICS response during turb. tri.
32200	ICS perf. flwng gen/ref trip
10700	ICS errors
14300	Electromatic relief leakage
18300	RC-RV2 failed open reactor
18500	FW trip on 4/19/78
19500	RC RV-2 Electromatic relief
30400	Electro relief salonoid STI
31900	Relief val. replacement
44500	OTSG boiled dry
46300	Loss of FW Booster Pump
46900	Reactor trip
31500	ICS amplifier failure
45600	Level indication PZR
57100	Loss of feedwater to OTSG
59600	Dry OTSG after turbine trip
5800	Elect. rel. valv.
6200	Quench tank over-PRZ
6600	Position Indication Malfunc.
13600	OP error - improper FW lineup
14500	No PZR spray with 1 RCP OPE
16000	ICS transient
32400	PZR vent isol. VLV pkgn leak
33000	Rapid cooldown transient
1200	QA Missing
1300	No QA
1400	QA Missing
11100	Relief valves - FHE diffr.
21000	PZR safety valves set point
24100	ICS component failures
33200	ICS turbine bypass control
36900	Electromatic relief vlv dan
37900	Electromatic relief vlv mod
38600	Elec. relief valve failure
38800	ICS feedwater flow control
39101	Failred Incore Detectors
39400	ICS turbine HDR press contr
41200	Dry OTSG conditions
44000	ICS module failures
44600	Upgrade of valves documents

PSCs

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In addition, I forgot to mention to you on the telephone that there are a number of specific drawings or diagrams, portions of which were exhibits to the Stevens Deposition taken by the President's Commission, that we would like to obtain in their entirety. These are drawings which were Deposition Exhibits 73 through 84, inclusive. (The drawing numbers are 136019 through 136027E, inclusive; 30755F; and 30765F, Rev. 4). Also, Exhibit 71 to the Stevens Deposition, a Standard Guide Spec., contains a drawing of the control room console layout (on page 4 of the spec) which makes it impossible on our copy to make out names and numbers. Could we get a better or larger copy of this page?

Thank you for your assistance.

Sincerely,

George T. Frampton Jr

George T. Frampton, Jr.
Deputy Director
NRC/TMI Special Inquiry Group

cc: Byron Nelson, Esq.
Babcock & Wilcox
Power General Group
P.O. Box 1260
Lynchburg, VA 24505

SPR 111

TITLE Pressurizer EMO Relief lifted Inadvertently

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to

NSS- . The following

is the status and/or resolution of this SPR on other contracts.

REMARKS

3/25/74 — Return sheet to JFC / w/ SPR

NA

Not Generic

RJP

NSS-

Instructions For PDS-21091 - Site Problem Report
Initiated by Nuclear Service - Refer to NPG-0503-04
Initiated by B&W Construction Co. - Refer to NPG-0503-05
For Unirradiated CNFP-Supplied Core Components - Refer to NPG-0503-10
Affected Documentation audited by R Maggi Date 4-25-73

Changes Required: No

Yes (See Below)

Site Problem Report Affected Documentation Control for SPR- 111		
Cognizant Engineer-	NSS - 03	
The following documentation requires revision as noted on the front of this Site Problem Report. This CONTROL shall remain in effect until the described changes have been completed or otherwise resolved.		
Description of Changes	Resolution	Completed
Title		By
		Date
Title		By
		Date

Distribution:

Nuclear Service - 1202
Central Eng. Files

FIELD OPERATIONS SITE PROBLEM REPORT

SPR# 111 Title ELECTROMATIC RELIEF INADVERTENT ACTUATION

1. CUSTOMER Duke Power Company NSS 3 VENDOR BMCo. DATE 6/9/71

SYSTEM AND COMPONENT (S) NNI-Reactor Pressure CREST# 22 00 00

REFERENCES B&W Dwg. #24918F

2. DESCRIPTION OF PROBLEM: At 11:55, 6/5/71, hand and auto power to NNI/ICS cabinet 4 were inadvertently de-energized and then re-energized. This resulted in depressurizing the RCS from 410 psig to zero in <5 seconds, due to lifting of the electromatic relief valve on the pressurizer. It is not known at this time whether the relief lifted on the loss or reapplication of power. The relief valve control circuit (RC3-PS8) is temporarily modified to provide a NDT relief at 450 lb. It receives its control signal from wide range reactor pressure and a wide range reactor pressure transmitter was recalibrated to 0-500 vs 0-2500 psig. This report documents fact that valve worked under these conditions.

3. ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITTMENTS MADE, ETC.:

None.

4. IS FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL:

~~YES~~/NO
BY WHOM:

5. RECOMMENDED ACTION:

6. RESOLUTION (INCLUDE JUSTIFICATION)

None Required.

7. THIS PROBLEM ~~DOES~~/DOES NOT AFFECT OTHER CONTRACTS.

Distribution:

W. Fausse	R. V. Straub
D. W. Berger	G. E. Kulynych
J. C. Deddens	C. E. Thomas
H. F. Dobel	H. Hennicke

Originated by: B.L.Day
Submitted by
S. O. M. H. A. Bailey
H. A. Bailey

Problem Cleared 6/9/71
Cog. Field Eng.
SOM H. A. Bailey
H. A. Bailey

LSS 3-12K 80-111

FIELD OPERATIONS SITE PROBLEM REPORT

SPR# 111 Title ELECTROMATIC RELIEF INADVERTENT ACTUATION

1. CUSTOMER Duke Power Co. NSS 3 VENDOR Bailey M.C DATE 6/9/71

SYSTEM AND COMPONENT (S) NNI-Reactor Pressure CREST# 22 00 00

REFERENCES B&W Dwg. #24918F

2. DESCRIPTION OF PROBLEM: At 11:35, 6/5/71, hand and auto power to NNI/ICS cabinet 4 were inadvertently de-energized and then re-energized. This resulted in depressurizing the RCS due to lifting of the electromatic relief valve on the pressurizer. It is not known at this time whether the relief lifted on the loss or reapplication of power. The relief valve control circuit (RC3-PS8) is temporarily modified to provide a HDT relief at 450 lb. It receives its control signal from wide range reactor pressure and a wide range reactor pressure transmitter was recalibrated to 0-500 vs 0-2500 psig.

3. ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.:

None.

4. IS FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL:

~~YES~~/NO
BY WHOM:

5. RECOMMENDED ACTION: When system is returned to normal line up, run power loss and reapplication test.

6. RESOLUTION (INCLUDE JUSTIFICATION)

7. THIS PROBLEM ~~DOES~~/DOES NOT AFFECT OTHER CONTRACTS.

Distribution:

W. Faasse	R. V. Straub	Originated by B.L. Day	Problem Cleared
D. W. Berger	G. E. Kulynych	Submitted by	Cog. Field Eng.
J. C. Deddens	C. E. Thomas ✓	S. O. M. H.D. Bailey	SOM
N. F. Dobel	H. Hennicke ✓		

NSS- 3
SPR 255

TITLE Low R.C. Flow Indication
RELATED SPRs SPR 256

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- 6, 7, 12, 13, & 14. The following is the status and/or resolution of this SPR on other contracts.

REMARKS

2/26/74 - Review sheet to J.F.C. w/SPR.

3/20/74 Review Sheet to B.A.K.

On Oct 25, 1974 I discussed this flow measuring system modification with Ken Wendling, Nuclear Service, and presented the information that Control Analysis has been sending a letter out applicable for each plant as to the full range ~~flow~~ flow values and corresponding differential pressure transmitter range to have flows consistent with this SPR equation.

Robert Winks

Based on Control Analysis involvement in this entire problem & how it must be handled individually on each contract the problem will be taken off the generic problem list & closed. It's something that can't be cut off ahead of time & Control analysis is working continuously on it.

RLP
12-15-74

NSS-

Instructions For FDS-21091 - Site Problem Report
Initiated by Nuclear Service - Refer to NPG-0503-04
Initiated by B&W Construction Co. - Refer to NPG-0503-05
For Unirradiated CNFP-Supplied Core Components - Refer to NPG-0503-10
Affected Documentation audited by K. C. Moore Date 1-2-73

Changes Required: No
Yes (See Below)

Site Problem Report Affected Documentation Control for SPR- 256
Cognizant Engineer- J. D. Carlton | NSS - 23

The following documentation requires revision as noted on the front of this Site Problem Report. This CONTROL shall remain in effect until the described changes have been completed or otherwise resolved.

Description of Changes	Resolution	Completed
Title Low RC Flows	J. D. Carlton's memo to Distribution dtd Jan. 19, 73 forwards the results of the Reactor Coolant flow tests performed in December 1972 at Oconee I. Also, this memo projects the results of these tests to the expected flow with the core.	By J Carlton Date 1/19/73
Title		By Date

Distribution:

Nuclear Service - 12M2
Central Eng. Files

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

FILE: 12M2
Contract 620-00 -03
SPR 255
TITLE LOW RC FLOW INDICATION

DATE 10-13-72

To R J McConnell (2) For Information
J.D. CARLTON
G. Kulynych - Sr. Project Manager
C. C. Plunkett - Contract Admin.
Central Engineering Files
H. F. Dobel - Quality Assurance

The attached, cleared SPR is submitted for your information.

TO: ____ N. S. Embrey
____ G. E. Kulynych
____ J. McFarland
✓ G. M. Olds
✓ R. T. Schomer
✓ E. G. Ward
____ J. Kaelin
____ J. Kennedy
____ K. Suhrke

Attached is one copy of Site Problem Report No. 255 which has been processed on Contract 620-00 03. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS:

cc: R. Burnley

R. L. Pittman
NUCLEAR SERVICE SUPPORT ENGINEER

PDS-21091

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company CONTRACT NO. 620-0003 SPR NO. 255 SPR REV. NO.

VENDOR Bailey Meter P.O. NO. COMP. NO. 1 GROUP NO. 23 SEQ NO. 39/4d

PRIMARY DOCUMENTS: SPEC NOS.
DWG NO. EQUIP CODE LEVEL DATE
QA LEVEL II QA SPEC NO.

PRIORITY 1

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
H. Hennicke			

TITLE (MAX. 30 SPACES) Low RC Flow Indication

DESCRIPTION OF PROBLEM

During operation of the two RC pumps in the "B" loop, the Bailey Meter Company flow instrumentation indicated lower than actual flow. Based on flow factors from University of Minnesota and measured ΔP, the dual pump flow was calculated to be 117.1×10^6 lbs/hr. The compensated flow indication is calibrated for $0\text{-}100 \times 10^6$ lbs/hr. The uncompensated flow is calibrated for $0\text{-}80 \times 10^6$ lbs/hr. The calculated ΔP for 100×10^6 lbs/hr at 160F and 400 PSIG is 782" H_2O compared to the 716.18" H_2O range of the BMCO delta transmitters.*

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

RECOMMENDED ACTION

Advise correct calibration for ΔP transmitters.
Investigate whether static multiplier is good for revised calibration.

* NOTE: Attachments following are J.L. Hawks' calculations showing required ΔP's for 100×10^6 lbs/hr (1) and maximum obtainable flows with present delta range (2).

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	H. Hennicke (TWK)	—
SITE CONSTR. REP.		
SITE OPER. MGR.	R. J. McConnell RJM (TWK)	—
NS SUPPORT ENGR.	[signature]	1-27-72
PROJECT MANAGER		

COMMENTS AFFECTED: ☐ Drawings ☐ Proc. Specs ☐ Instr. Books ☐ Operating Procedures ☐ Tech. Specs. ☐ PSAR/FSAR ☐ ☐ Recommended Site Change

ACTION TAKEN

DISTRIBUTION
SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12T SPR-255

Cost Category ☐ Norm ☐ C ☐ A ☐ S ☐ L

Auth. Charge No. 5RC-SCC 3-38

RESPONSIBILITY ASSIGN. NSE - LYNCHBURG

Date Completed
By:

OTHER CONTRACTS AFFECTED

DEVIATIONS ☐ NONE ☐ SEE REV.

Field Change Req. ☐
Field Change No.

Complete
RJMcConnell
10/11/72

Ittner

Babcock & Wilcox

Power Generation Division
P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (703) 384-5111

October 11, 1972

SOM 312
SDR 255
NSS-3

Duke Power Company
Oconee Nuclear Station
P.O. Box 1175
Seneca, SC 29678

Attention: J. Ed Smith

Subject: RC Flow Calibration For HFT

Dear Sir:

As a result of all of the data taken during the last plant operation, the following recommendations are made as to reactor coolant flow measurements for the next HFT.

1. The flow ranges should remain as they now are RPS - 0 - 90 x 10^6 #/hr.
   NNI - 0 -110 x 10^6 #/hr.

2. The flow coefficient that should be used in the flow equation is now 397100.00 instead of the 457443.76 as stated in my memo to you dated 2/15/72.

3. The 'By' Transmitters should be calibrated for 0 - 1202.8" H_2O.

$$\text{Flow} = 397100 \sqrt{\Delta P/.023416}$$

where .023416 = specific vol. @ 604°F 2170 psia

$$90 \times 10^6 \text{ \#/hr.} = 397100 \sqrt{\Delta P/.023416}$$

$$\Delta P = \left(\frac{90 \times 10^6}{39.71 \times 10^4}\right)^2 \times .023416$$

$$\Delta P = 1202.8 \text{ "}H_2O$$

Depending upon the results from HFT an additional range changemay be required prior to fuel loading. In any event, a final range change will be required after establishing the true flow from the secondary heat balance.

Yours truly,

THE BABCOCK & WILCOX COMPANY

R. J. McConnell

R. J. McConnell
Site Operations Manager

RJM/elh

Babcock & Wilcox

Power Generation Division

P.O. Box 1260, Lynchburg, Va. 24505

Telephone (703) 384-5111

September 14, 1972

B72-305

Mr. S. K. Blackley
Mr. P. H. Barton
Duke Power Company
P. O. Box 2178
Charlotte, N. C. 28201

Subject: Oconee 1 R-40000
BAW #10016

Gentlemen:

Attached are three copies of B&W Topical Report BAW-10016, "Analysis of Anticipated Transients Without Trip", which was submitted to the AEC on September 1, 1972. B&W has submitted this topical report in order to help you respond to the past and current ACRS concern for applicants to make a "study of means of preventing common failure modes from negating scram action and of design features to make tolerable the consequences of failure to scram during anticipated transients". B&W feels that this study provides a strong base from which you can work in establishing not only that the design features of your plant make tolerable the consequences of failure to scram during most of the postulated transients, but that the design features of your plant ensure the improbability of any such occurrences.

The following comments should be noted concerning our submittal of BAW-10016:

(1) The cover letter for BAW-10016 states: "The accident analysis presented in the report is applicable for all B&W 177-fuel assembly plants with rated power levels of 2772 MWt or less." B&W does not identify the probability analysis presented in the report as being applicable to all plants.

(2) Part of the introduction to the probability analysis section of the report states: "Due to the nature of probability analysis, it is necessary to study detailed hardware arrangements. Therefore, the probability analyses for the complete loss of feedwater flow and the reactor coolant pump coastdown transients presented in sections 4.3 and 4.4 were performed using a specific balance-of-plant system arrangement including a B&W NSS. While the numerical results presented in sections 4.3 and 4.4 may not be strictly applicable to all B&W NSS-supplied plants, it is felt that the conclusions based on these numerical results are indicative of the improbability of these postulated transients."

This qualification of section 4.3 and 4.4 of the probability analysis results allows B&W to make a positive statement concerning the improbability of these postulated occurrences, and at the same time does not require that you adopt any specific probability results as part of your application.

You should evaluate your system design in light of the CRITERION transmitted to you in our letter of August 10, 1972 and develop a position concerning the improbability of these postulated occurrences. It is our understanding that the AEC intends to decide on and announce their guidelines related to ATWS in the near future; therefore, B&W submitted BAW-10016 at this time to assure that the AEC is aware of B&W's findings on the ability of the plants for which we supply the NSS to adequately terminate such accidents.

Very truly yours,

R. V. Straub

R. V. Straub
Project Manager

RVS/slb
Attachments
CC: C. L. Sansbury w/o
G. M. Baccich w/o
W. Faasse w/o
R. J. McConnell w/o

R.J. McConnell

SAR-255
-256
-315

Roy heres some of Rudy's comments on this.

MEMORANDUM FOR FILE

SUBJECT: Review of CTI Procedures
AEC Compliance
July 21, 1972

On the above date Doc Murphy and Mike Kidd from AEC Compliance gave M.D. McIntosh and I several comments which they had on procedures completed during Hot Functional Testing. During the discussion of TP/1/B/-00/2B, [illegible], they injected several concerns broadly covering our problems with RC flow.

1. They understand we have approximately 1?? RC Flow on Unit 1 rather than 100%. They feel that the FSAR should be revised to reflect these flow numbers. i.e.,

   100% flow = 131 x 10^6 x 1.03 lb/hr

   NO.. [illegible]

   If we left out of [illegible] could [illegible]

2. What is the effect on reactor safety of the high flow rate? This question should be addressed in a revised FSAR safety analysis.

   NO.

3. What is the effect on safety of the installed snubbers in the RC flow impulse lines?

   Doc Murphy would like to see a report which justifies the installation of snubbers on the basis of data taken during TP/1/B/300/3B.

   This [illegible] [illegible] [illegible] in our [illegible]

   Can do.

Based on the letter from R.W. Straub to S.K. Blackley on RC Flow and Flow Signal Analysis dated June 28, 1972, I informed Doc Murphy that we expected further information from B&W on the snubber installation.

Robert M. [illegible]
Technical Support Engineer

RMK/mob

cc: J.E. Smith
R.L. Wilson
R.C. Collins
R.J. McConnell
D.S. [illegible]
J.M. Hampton

RWS/JPI
The above questions SAR 255, 256 & 315 have been satisfactorily [illegible]. TP 200/3B was completed [illegible] Feb 72. [illegible] [illegible] [illegible] of the [illegible] potentially major [illegible] [illegible] with the AEC.
R

* THE [illegible] FLOW [illegible] NOW [illegible] IS EXACTLY WHAT [illegible] [illegible] [illegible] [illegible] [illegible] OF OVERFLOW PROBLEMS [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

THE BABCOCK & WILCOX COMPANY R. J. McCrell
POWER GENERATION DIVISION LYNCHBURG, VIRGINIA

cc: G. E. Kulynych
D. W. Montgomery

SPR-247

To R. V. STRAUB - PROJECT MANAGEMENT

From J. D. CARLTON JDC UNIT MANAGER, CONTROL ANALYSIS (EXT. 2269)

Cust. DUKE POWER COMPANY

File No. or Ref. NSS-3/13E13

Subj. EVALUATION OF FLOW DATA

Date JUNE 28, 1972

This letter to cover one customer and one subject only.

We have evaluated the data taken in February and the basic conclusions we have reached from that data are described below.

1. The system flow rate based on the test data and adjusted for the core in place is expected to be 102% of design flow. This is 102% of 88,000 gpm per pump or approximately 90,000 gpm per pump. The overall accuracy for the measurements and calculations of flow has been established as ±4%. We expect that the next refinement of the total flow will occur when a secondary heat balance is available. We expect that the heat balance will reduce the tolerance to ±2%. The expected flow rate noted above was determined from evaluation of reactor vessel, steam generator, piping and pump pressure drop data, and correlation with the Westinghouse reactor coolant pump head capacity curves.

2. The results of the instrument line test carried out first at Oconee and in more detail at the Alliance Research Center indicates that instrument line motion contributes to, but is not a major factor in the flow signal oscillations. The pressure and Δpressure data taken at Oconee and loop and flow meter data taken at Alliance and flow meter output data obtained from Surrey indicate that the oscillations which were observed are typical system noise in high velocity systems with numerous bends, expansions and contractions. We believe that the Ashcroft snubbers, as outlined on the ΔY transmitters, provide an acceptable signal for protection and control. In addition we believe that the Oconee instrument line pipe arrangement is adequate and the Alliance tests indicate the coil arrangement is better than straight pipe for detuning mechanical vibration.

3. The coastdown data has been normalized to system pressure drop with the core in place and the coastdown criteria are met during the important part of the transient (the first 10 seconds). The cold coastdown results in several cases show a deviation below the acceptance criteria. We believe that the most significant information from the cold coastdown tests are the trends of the data, that is the flow is coasting approximately as expected and since operation is not planned or expected at low temperatures the absolute values of the coastdown flow are of no particular significance. We intend to repeat selected coastdowns with the core installed to verify the results. Test procedures are being written to simplify the coastdown tests. In addition, the acceptance criteria will be defined for hot coastdown with the core only.

A final report covering the three subjects above is in preparation and we expect these reports for internal review and limited external review to be available in early July.

JDC:khj

Please do not write below this line

SPR 251

Babcock & Wilcox

Power Generation Division
P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (703) 384-5111

June 28, 1972

B72-233

Mr. S. K. Blackley
Duke Power Company
P. O. Box 2178
Charlotte, N. C. 28201

Subject: Oconee 1, R-40000
RC System Flow and Flow Signal Analyses

Dear Mr. Blackley:

B&W has evaluated the magnitude of flow and flow signal oscillations recorded during the initial hot functional testing of Oconee 1 and reports are being drafted for internal review.

Several conclusions are firm and will be supported in the final reports:

1. Total reactor (with core) flow is expected to be 102% of 88,000 gpm. (Nominal flow rate per pump). The uncertainty now placed on this number is plus or minus 4%. This value is determined from evaluation of Delta-P's throughout the system, i.e., pumps, steam generator, reactor vessel, etc. This uncertainty is expected to reduce to ± 2% when determined by a secondary heat balance. However, the 4% uncertain is being used in evaluations concerning acceptability of the flow signal for protection system use.

2. Coastdown evaluations resulted in flows on or above the original coastdown criteria for the first 10 seconds. The critical DNBR point is during the first five seconds. Test procedures are being written at the site and coastdowns are being limited to one test hot and one cold without the core. These will be considered information gathering tests only to help interpret the later hot (with core) results. An acceptance criteria will only be placed on the coastdown test run with the core.

3. The flow signal pulsations witnessed during hot functional testing have been evaluated by analysis and testing. B&W considers the signals to be typical of all flow loops, and capable of being conditioned for use within the reactor protection system. The Ashcroft snubbers are considered the best conditioning device having the best relationship of magnitude and time response. The flow meter impulse line piping is considered adequate for transmitting the flow signal to the RPS.

Reports are now in draft form regarding the flow coastdown and flow signal pulsations. I expect these reports to be ready for your information in early July.

In summary, the following conclusions have been reached by B&W:

1. Impulse line piping from the RC system flow meter is acceptable in its present state.

2. Ashcroft snubbers as they are installed with the mid-point position are considered best for conditioning the flow signal.

Please call if there are further concerns prior to receipt of reports on these topics.

Very truly yours,

R. V. Straub

R. V. Straub
Project Manager

RVS/slb

CC: C. M. Boccich
W. Haasse
R. J. McConnell✓

To: J. D. CARLTON	
From: R. V. STRAUB, PROJECT MANAGER, EXT. 2251	
Cust.: DUKE POWER COMPANY	File No. or Ref.: SPR - General
Subj.: REACTOR COOLANT FLOW PROBLEMS - SPR Resolutions	Date: JUNE 26, 1972

This letter to cover one customer and one subject only

There are several SPR's in the general area of reactor coolant flow measurement problems that are still outstanding and I believe could be brought to a conclusion with some very concise statements from engineering. These SPR's are the following:

SPR - 217 - RC flow element noise
SPR - 255 - Low RC flow indication
SPR - 256 - High RC flow

It is my opinion that all of the above SPR's could have firm and final conclusions written by engineering, although not all of the flow or signal problems are yet completely analyzed and firm. Please respond to each of the above SPR's so that they can be put to rest and we can bore in on the problems needing resolution rather than documentation. Please respond by 6-29-72.

R. V. Straub
Project Manager

R. V. Straub

RVS/slb
CC: J. P. Ittner ✓
R. J. McConnell

Please do not write below the box.

Babcock & Wilcox

Power Generation Division
P.O. Box 1260, Lynchburg, Va. 24505
Telephone (703) 384-5111

bc: 12E22
G. D. Quale
J. D. Carlton
J. L. Hawks
J. P. Ittner

May 1, 1972

B72-168

Mr. S. K. Blackley
Duke Power Company
P. O. Box 2178
Charlotte, N. C. 28201

Attention: Mr. R. M. Sandifer

Subject: Oconee 1-3 R-40000, R-75748
Reactor Coolant Flow Measurement
Bailey "BY" Transmitters

Reference: Duke letter of April 14, 1972, same subject

Gentlemen:

B&W began action on March 7, 1972 to determine the 0-1000 inch range "BY" transmitter performance above the stated range. In addition, the effects on the RPS System were considered essential to the investigation.

Testing is now scheduled to begin first week in May and will consist of the following test activities:

1) Perform the following tests on two BMCo BY 3x41k-A transmitters 0-1000" range.

   A. Calibrate both transmitters for a range of 0-800" H_2O. Record characteristics for both increasing and decreasing differential pressure over the 0-800" H_2O.

   B. Increase differential pressure to 1500" H_2O. Hold 1500" H_2O delta-P for a minimum of 12 hours.

   C. Check for calibration drift by increasing and decreasing delta-P over the 0-800" H_2O range. Record characteristics for both increasing and decreasing delta-P over the 0-800" H_2O range. Record characteristics for both increasing and decreasing delta-P.

   *D. Calibrate both transmitters for 0-1000" H_2O range and repeat steps A through C varying delta-P over the 0-1000" H_2O. Record characteristics.

   E. Determine and calibrate both transmitters for maximum range (not nameplate range) and repeat steps A through C for maximum range calibration. Record characteristics.

   F. Apply delta-P to both transmitters for 150% range for 12 hours and repeat steps A through C at maximum range. Record characteristics.

Babcock & Wilcox

Mr. S. K. Blackley Page 2 May 1, 1972

*NOTE: Step "D" may be eliminated if the results of Step "E" are satisfactory.

G. Analyze the data obtained from the preceding tests for calibration drift, linearity or accuracy changes. Check for possible damage or changes in accuracy due to over-ranging. Check accuracy of equipment operating outside of design limits (Steps E and F).

2) Analyze the RPS System input circuits to determine if and how voltage will affect the RPS. This voltage should be equal to the maximum voltage that the BY transmitter is capable of producing as an output voltage.

3) Analyze the NNI flow channel to determine if and how over-voltage will affect this channel. This voltage should be equal to the voltage used in preceding Step 2.

We will keep you advised of progress during the month of May, and will supply a final test report for inclusion in the "BY" report. If you have any other immediate concerns please call.

Yours very truly,

R. V. Straub

R. V. Straub
Project Manager

RVS:jdd
CC: F. H. Barton
G. M. Baccich
W. Enasse
R. J. McConnell

J. C. Bradham

Babcock & Wilcox

Power Generation Division

P.O. Box 1260, Lynchburg, Va. 24505

Telephone (703) 846-7361

February 15, 1972

OOM-127

OPR-255

J. C. DEDDENS

FEB 17 1972

Duke Power Company
Oconee Nuclear Plant
Seneca, S. Carolina

Attention: O. Bradham

Re: IPR #347, RC Flow Range & Oscillation

Dear Sir:

As you stated in the reference IPR during initial runs of the RC pumps the calibration of the RC flow "DP's" did not allow for indication of the flow rates and ΔP's that existed.

Operation of the pumps during October and November, 1971, indicated that the RCP(s) were pumping higher volumes than expected. This determination was initially based upon Gentile-Dahl flow tube measurements. Subsequent information has confirmed that the true RCS flow is lower than that measured by the flow tube. A partial list of observations that support this are:

1. RCS system pressure drops, i.e. OTSG, Rx vessel elbows.
2. Pump power.
3. Westinghouse pump data.

Unfortunately none of the above are sufficiently precise to provide us with a very accurate determination of what the real system flow is. The absolute determination, of just what the flow is, will have to await a secondary heat balance. It should be remembered that the purpose of the flow tubes is to indicate a function of flow, not absolute flow.

The attached calculations have been made based on the best data at this time. It is felt that at this time the RC flow channels should be modified as stated in the attachments. This change is ment to be temporary and will be further reviewed as additional information is obtained.

For further information, please contact J. L. Hawks.

Yours truly,

BABCOCK & WILCOX CO.

R. J. McConnell

R. J. McConnell
Site Operations Manager

JLH/jmr

cc: J. C. Deddens
G. E. Kulynych

THE BABCOCK & WILCOX CO.
GENERAL CALCULATIONS

[illegible]

CUSTOMER		PROP. NO.	JOB NO.
SUBJECT		DWG. NO.	EST. NO.
		SUMM. SHEET NO.	
PREP. BY	DATE	CHKD. BY	DATE	ANAL. NO.	COMPONENT NO.	SHEET NO.

THE BABCOCK & WILCOX CO.
GENERAL CALCULATIONS

... INDICATIONS ... THE ... FLOW ...

... BE ...

... THE ... FLOW ...

... COULD ... THE FLOW ...

NOVEMBER 22 1971

TWX 0313

2660

NOV 23 71 AM

TO: P. K. SMITH

FROM: R. J. MCCONNELL

SUBJ: SPR #255

CUSTOMER: DUKE POWER CO.&CONTRACT NO: 0003

VENDOR BMCO. COMP NO. 1 GROUP NO 23 SEQ NO. 39/48

SITE ENGINEER H. HENNICKE

TITLE LOW RC FLOW INDICATION

DESCRIPTION: DURING OPERATION OF THE TWO RC PUMPS IN THE "B" LOOP THE BMCO FLOW INSTRUMENTATION INDICATED LOWER THAN ACTUAL FLOW. BASED ON FLOW FACTORS FROM UNIVERSITY OF MINNESOTA AND MEASURED "TWO" DELTA P, THE DUAL PUMP FLOW WAS CALCULATED TO BE 117.1 X 10 6 #/HR. THE COMPENSATED FLOW INDICATION IS CALIBRATED FOR 0-100 X 10 6 #/HR. THE UNCOMPENSATED FLOW IS CALIBRATED FOR 0-80 X 10 6 #/HR. THE CALCULATED DELTA P FOR 100 X 10 6 #/HR AT 160F 400 PSIA IS 782 "H2O COMPARED TO THE 716.18 "H2O RANGE OF THE BMCO DELTA TRANSMITTERS.

NOVEMBER [illegible] 1971

[illegible]

TO: F. [illegible] SMITH

NOV 23 71 AM

FROM: [illegible] MCDONNELL

[illegible]

VENDOR [illegible] NO. 1 [illegible] GROUP NO 23 SEQ NO. [illegible]

SITE ENGINEER [illegible] H. [illegible]

TITLE [illegible] FLOW [illegible]ATION

DESCRIPTION: DURING OPERATION [illegible] THE TWO RC PUMP[illegible] [illegible] FLOW INSTRUMENTATION [illegible] LOWER THAN ACTUAL FLOW. [illegible] UNIVERSITY OF MINNESOTA [illegible] PUMP FLOW WAS CALCULATED [illegible] CALCULATED FLOW INDICATION IS [illegible] CALCULATED FLOW IS [illegible] CALCULATED [illegible] [illegible]

A

[illegible]

[illegible] "DRY" DELTA P, THE DUAL PUMP FLOW WAS CALCULATED TO [illegible] 117.1 X 10 6 #/HR. THE COMPENSATED FLOW INDICATION IS CALIBRATED FOR 0-105 X 10 6 #/HR. THE UNCOMPENSATED FLOW IS CALIBRATED FOR 0-80 X 10 6 #/HR. THE CALCULATED DELTA P FOR 100 X 10 6 #/HR AT 160F [illegible] PSIA [illegible] 122 "H2O COMPARES TO THE 715.1" H2O RANGE OF THE PMUD DELTA TRANSMITTERS.

NOTE: ATTACHMENTS FOLLOWING ARE J. L. HAWKS CALCULATIONS SHOWING [illegible] DELTA P N FOR 100 X 10 6 #/HR (1) AND MAXIMUM OBTAINABLE FLOWS WITH [illegible] DELTA [illegible] (2).

ACTION:

[illegible]

RECOMMENDED ACTION:

ADVISE CORRECT CALIBRATION FOR DELTA P TRANSMITTERS.

INVESTIGATE WHETHER STATIC MULTIPLIER IS GOOD FOR REVISED CALIBRATION.

CC: R. E. KULYKYCH

JSM

JMK [illegible] 11/[illegible]

[illegible]

Instructions For FDS-21091 - Site Problem Report
Initiated by Nuclear Service - Refer to NPG-0503-04
Initiated by B&W Construction Co. - Refer to NPG-0503-05
For Unirradiated CNFP-Supplied Core Components - Refer to NPG-0503-10
Affected Documentation audited by R. J. Miggi Date 4-2-73

Changes Required: No

Yes (See Below)

Site Problem Report Affected Documentation Control for SPR- 263	
Cognizant Engineer-	NS - 23

The following documentation requires revision as noted on the front of this Site Problem Report. This CONTROL shall remain in effect until the described changes have been completed or otherwise resolved.

Description of Changes	Resolution	Completed
Title		By
		Date
Title		By
		Date

Distribution:

Nuclear Service - 1242
Central Eng. Files

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

To ______________ For Information

W.C. BUTT - NSE

G.E. Kulynych Sr. Project Manager

C. C. Plunkett - Contract Admin.

P. A. Hanson - Eng. Files

H. F. Dobel - Quality Assurance

FILE: 1212

Contract 620-00 03

SPR #262

TITLE PRESSURIZER SAFETY VALVE LEAKAGE

DATE 5-15-72

The attached, cleared SPR is submitted for your information.

TO:

X N. S. Embrey	X R. T. Schomer
G. E. Kulynych	X E. G. Ward
X J. McFarland	
F. Norman	
X G. M. Olds	

Attached is one copy of Site Problem Report No. 262 which has been processed on Contract 620-00 03. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: This fix applies as well to flat-face joints, where a standard compression-ring (CG) flexitallic can be used.

cc:

NUCLEAR SERVICE SUPPORT ENGINEER

FDS-21091-1

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company	CONTRACT NO. C003	SPR NO. 262	SPR REV NO.
VENDOR Dresser	P.O. NO. 804042 COMP. NO. 28	GROUP NO. 41	SEQ NO. 5

PRIMARY DOCUMENTS: SPEC NOS.

DWG NO 28-41-602-04 EQUIP CODE/LEVEL DATE

QA LEVEL QA SPEC NO.

PRIORITY 1

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
J. D. Phinney			1/15/72

TITLE (MAX. 30 SPACES) PRESSURIZER SAFETY VALVE LEAKAGE

DESCRIPTION OF PROBLEM

Pressurizer safety valve 1RC-RV4B is leaking past its seat when the RCS is pressurized. Leakage was detected with the RCS at 350 psig, with a steam bubble in the pressurizer at 437°F. The downstream piping is considerably hotter (40-60°F) from this valve than the other valves at equal distances from the valve. Pipe temperatures rose proportionally when the system was taken to 1000 psig, 544°F in the pressurizer. The leak rate is low, the rise in general tank level is not noticeable over a short period of time (1 hour).

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

Duke is aware of symptoms (Maurice MacIntosh). Discussed with R. G. Burnley and P. K. Smith (B&W, LYN); recommend action reflects their comments.

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

NSE, LYN

RECOMMENDED ACTION

Contact Dresser for recommended approach to corrective action. Replace RV4B with one of the spare valves, ordered with the contract, which are on site. Return 1RC-RV4B to Dresser for repair. There is no evidence that any pressurizer safety valve has been tampered with at the site.

See attached memo for resolution

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	J. P. Kennedy	
SITE CONSTR. REP.		
SITE OPER. MGR.	RJ McConnell	11/30/71
NS SUPPORT ENGR.		
PROJECT MANAGER		

DOCUMENTS AFFECTED / ACTION TAKEN: ☐ Drawings ☐ Proc. Specs ☐ Instr. Books ☐ Operating Procedures ☐ Tech. Specs ☐ FSAR/PSAR ☐ ☐ Recommended Stds. Change

DISTRIBUTION: SITE OPS MANAGER, PROJECT MANAGER, N.S. SUPPORT ENGR., COGNIZANT ENGR., CONTRACT ADMIN., NPG QA, FILE 12M2 ____

Cost Category ☐ Warr ☐ C ☐ D ☐ S ☐ I

Auth. Charge No.

RESPONSIBILITY ASSIGN. DRESSER PROD.

Date Completed 5/12/72

By [signature]

OTHER CONTRACTS AFFECTED ALL

DEVIATIONS ☐ NONE ☐ SEE REV ____

Field Change Req. ☐

Field Change No ____

Closed RJ McConnell 5/15/72

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION LYNCHBURG, VIRGINIA

To	J. P. Ittner, Nuclear Service Support Engineer
From	E. L. Brown, Field Operations, Nuclear Service
Cust.	Duke Power Company
File No. or Ref.	NSS-3, 12M2 (SPR-262)
Subj.	Pressurizer Relief Valve Gaskets
Date	February 2, 1972

This letter to cover one customer and one subject only.

The Flexitallic Gasket Company recommends that ASME Code calculations be used to determine bolting loads but takes issue with Code recommended (but not mandatory) values for "m" (gasket factor) and "y" (minimum gasket seating stress). Using Code calculations with Flexitallic values we can determine required loading as follows:

a) Obtain minimum required bolt load for operating conditions using this formula:

$$W_{m1} = \frac{3.14\ G^2P}{4} + 2b3.14GmP$$

where G = dia. of location of gasket load reaction (mean dia. in this case)

P = pressure
b = effective seating width N/2 or 3/32"
m = gasket factor (3 for S.S.)

b) Calculating on basis of 3125 psi (hydro., which is maximum pressure) joint will see:

$$W_{m1} = \frac{(3.14)(3.562)^2(3125)}{4} + (2)(.094)(3.14)(3.562)(3125)(3)$$

$$= 51{,}000 \text{ lbs.}$$

Gasket seating requires a force equal to:

$$W_{m2} = 3.14\ bGy$$
$$= (3.14)(.094)(3.562)(9000)$$
$$= 9485 \text{ lbs.}$$

The minimum torque is, for 8, 1-1/8-8 bolts:

$$T = (.2)(1.125)(51{,}000)/(8)(12)$$
$$= 95.6 \text{ ft.-lbs.}$$

The gasket seating stress is:

$$D_G = \frac{51{,}000}{(3.14)(.094)(3.562)}$$

= 48,500 psi ← This is excessive, compression stop required.

Please do not write below this line.

At this point the Flexitallic Company (Mr. Wonderland) in Camden, New Jersey, was contacted and agreed to determine load required to reach optimum compression of gasket, provide recommended torque value and any other suggestions. Tests indicated that 10-12,000 lbs load was required to compress gasket to recommended thickness. Further compression will reduce recovery rate of gasket. Applying the full 51,000 lb load will reduce recovery of gasket to "in the neighborhood" of 1-2 mils. Any flange separation beyond this would result in leakage. Shaving of the male tongue on the valve or use of spacers (gauge ring) is recommended. Flexitallic agrees with loads and torques above.

E. L. Brown/nw

ELB/nw

cc: RG Burnley
GE Kulynych
RJ McConnell
RA Wallin

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION LYNCHBURG, VIRGINIA

SPR-262

To	W. HAASSE - OCONEE
From	L. R. ALLEN - ASSOCIATE PROJECT MANAGER
Cust.	DUKE POWER COMPANY
File No. or Ref.	620-0004/0009 12F28
Subj.	PRESSURIZER RELIEF VALVE INSTALLATION
Date	MAY 15, 1972

This letter to cover one customer and one subject only.

As a result of problems experienced on Unit 1 with leaking pressurizer code relief valves, you are requested to install these valves on Units 2 and 3 per the attached letter and sketch. Please note that the backing ring should be fabricated from stainless steel to the dimensions as shown (0.1625" thick, ID same as groove OD, OD to clear bolts).

Installation of the pressurizer code relief valves in this manner should circumvent the leakage problems experienced on Unit 1. This work is considered to be a normal change to the particular contract involved.

L. R. Allen

LRA:jdd
CC: J. F. Ittner
R. G. Burnley
R. J. McConnell

Please do not write below this line.

BABCOCK & WILCOX
Nuclear Power Generation Department

Contract No. 620-0003

File No. 12M2
SPR-262

Record of Telephone Call

To J.P. ITTNER

From K.R. ELLISON

Date 2-18-72

Subject PZR Relief Valve Flange.

Route To:

W.C. BUTT

J.D. PHINNEY

E.L. BROWN

R.V. STRAUB

Reference: J.P. Ittner to R.J. McConnell, "Pressurizer Relief Valve Installation, 9 February, 1972.

Attached drawing to the above memo stated that backing ring material should be stainless steel. Previous to actual receipt of the memo, site had rings made of carbon steel.

The only requirement of the backing ring material be that it withstand the compression of the flanges; therefore, ~~carbon steel rings are acceptable.~~

Stainless steel rings are preferred if the rings are to be compressed between the raised faces of the flange. These faces are also stainless steel. Transfer of corrodible film from carbon steel rings will require that the facings be dressed at each reinstallation. Also, leakage of borate-carrying steam, if any, would destroy carbon steel rings and require them to be replaced.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION DIVISION LYNCHBURG, VIRGINIA

To: E. J. McDonnell - Plant Operations Manager

From: J. P. Ittner - Nuclear Service Support Engineer

Cust.: Duke Power Company

File No. or Ref.: [illegible]

Subj.: Pressurizer Relief Valve Reinstallation

Date: February 9, 1972

This letter to cover one customer and one subject only.

Reference: 1. E.L. Brown to J.P. Ittner, "Pressurizer Relief Valve Gaskets," February 2, 1972.

2. Drawing Nos: [illegible] (Dresser)
129[illegible] (B&W)

The relief valve gasketing and bolting configuration has been discussed with E. L. Brown and W. C. Butt, and it is agreed that the best and only proper method of making up the joint between the code relief valve and pressurizer nozzle flanges is as follows:

1. The flanges are standard 2-1/2-inch 2500# small-tongue-and-groove. According to ASA and ASME tables, the dimensions should be as per the attached sketch. Verify these dimensions.

2. In order to provide adequate flange compression for the type service involved, and to prevent overcompression of the Flexitallic [illegible] gasket, a [illegible] is necessary, [illegible] according to the attached sketch. Unless measurements show that the joint is not of the dimensions sketched, the dimensions shown for the backing ring should be used.

3. If different dimensions are determined by the site, the thickness of the backing ring should be such as to limit compression of the gasket to .100" ± .005".

4. The recommended torque is 190 ft-lbs. Maximum torque is 240 ft-lbs for this design flange and bolts. The studs and nuts should be thoroughly lubricated per standard practice.

J P Ittner

Systems Engineering concurs with the above recommendations.

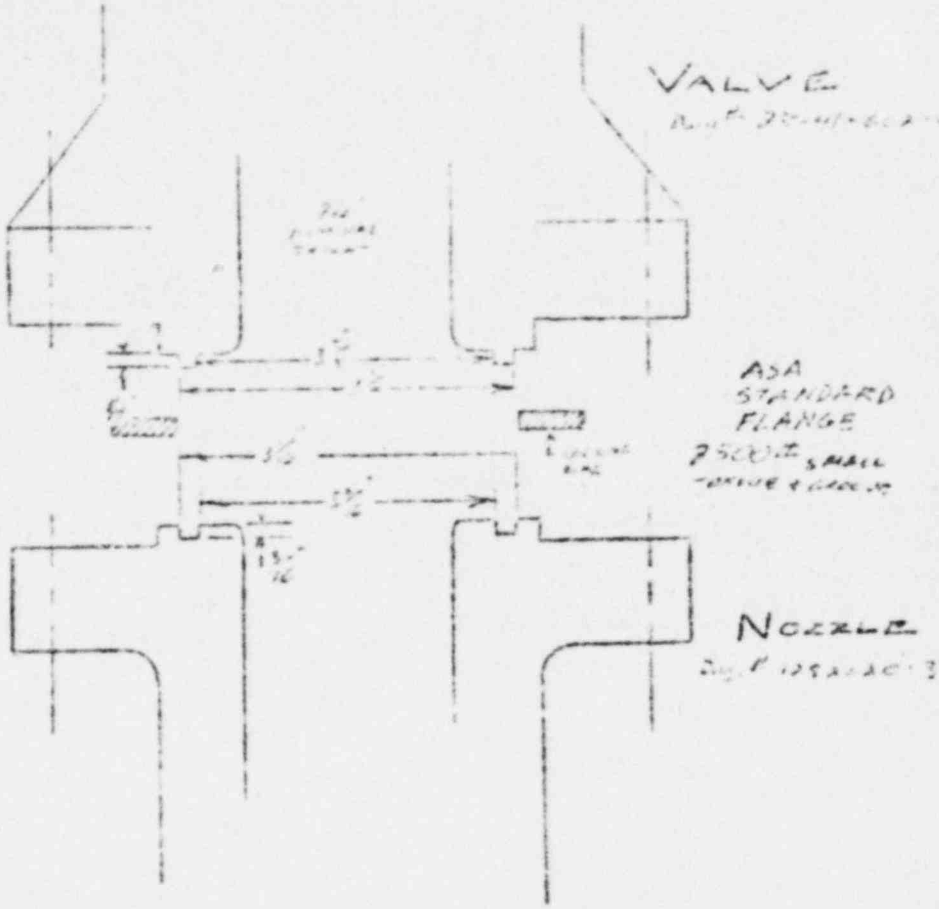
W C Butt

W. C. Butt
Auxiliary Equipment, NPD

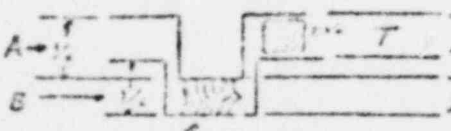
JPI/nw

cc: EL Brown
WC Butt
JD Phinney
K Schroeder
LV [illegible]

Please do not write below this line



TORQUE
MIN: 200 FT-LBS
MAX: 240 FT-LBS
BEST: 150 FT-LBS
CHECK FLANGE
SEPARATION VERIFY
VALVE NOT CRACKED



.1625" THICKNESS OF BACKING RING

.100 ± .005"

FLEXITALLIC
R4-25H
.125" OR R
.100" COMP.

IF NOT STANDARD FLANGE
T = RING THICKNESS
A = TONGUE
B = GROOVE
T = (A - B + .100) ± .005

RING DIMENSIONS
I.D. = SAME AS GROOVE O.D.
O.D. = CLEAR BOLTS
MATERIAL = STAINLESS STEEL (RING WILL REST ON SS FACINGS)

DUKE POWER COMPANY
PZR Relief Valve Installation

620-0005
12MX-SPR202

JPI 2-9-72 KCR 2-9-72 1

FILE 12.M.2. SPR 262

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To R. McConnell For Action

G. KATNYCH - NSS CONTS
R. HOLLANDER - ATV
K. SCHROEDER - SYS ENG

To PEGGY HANSON CLN ENG FILES For Information
C. PLUNKETT - NSS CONT
H. DOBEL - QA
K. SUMRKE - NUC SVC
C. WOLFF - NUC SVC

Contract 620-00 03

SPR 262

TITLE PRESS SAFETY VALVE LEAKAGE

MANHOUR LIMITS —

COST LIMITS —

DATE 12-15-71

CHARGE NO 620-0003-28

ACTION REQUIRED 1. DRESSER PRODUCTS WAS CONTACTED AND THEY ADVISED CHECKS OF BOLTS ETC. A TEST IS BEING PERFORMED TO VERIFY IF VALVE IS LEAKING. SITE TO ADVISE RESULTS.

2. RECOMMENDED TORQUE ON JOINT STUDS IS 100 FT LB PER ATTACHED CALCS.

DATE FOR ACTION TO BE COMPLETED AS SOON AS PRACTICAL

[signature]
Technical Support
Engineer

FILE 12.M.2. SPR 26

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To T. VIAR - PURCH For Action
R. McCONNELL - NUC SVC

Contract 620-00 03

SPR 262

TITLE LEAKING PRESSURIZER RELIEF VALVE

MANHOUR LIMITS —

COST LIMITS —

DATE 12-16-71

CHARGE NO. 620-003-

To For Information

G. BURNLEY - SYSENG
G. KULYNYCH - NSS CONT
C. WOLFF - NUC SVC

ACTION REQUIRED TESTS WERE COMPLETED AT THE SITE ON 12-16-71 AND LEAKAGE WAS CONFIRMED. DRESSER PROD WITNESSED THE TEST AND CONCURS THAT LEAKAGE EXISTS. THE SITE HAS BEEN ADVISED TO REPLACE THE VALVE WITH A SPARE AT THE SITE AND SHIP DEFECTIVE VALVE ~~DATE FOR ACTION TO BE COMPLETED~~ TO DRESSER FOR REPAIR.

Paul Holmes
Technical Support
Engineer

1. REFERENCES:

A. FLEXITALLIC CATALOG - SPIRAL WOUND GASKETS - ELEVENTH EDITION - COPYRIGHT 1967 (AVAILABLE FROM MR E. BROWN NUCLEAR SERVICE).

B. FLEXITALLIC SPIRAL WOUND GASKET DESIGN CRITERIA - COPYRIGHT 1971 (AVAILABLE FROM MR E. BROWN - NUCLEAR SERVICE)

C. SECTION VIII ASME CODE, 1968 EDITION

FROM REF B, THE MIN REQUIRED LOAD ON THE GASKET IS THE LARGER OF THE FOLLOWING:

$$LOAD = W_1 = \frac{3.14\,G^2P}{4} + 2b\,3.14\,G\,m\,P$$

OR

$$LOAD = W_2 = 3.14\,b\,G\,y$$

where:

(FOR R4-25H GASKET)

$G = 3.281'$

$P = 2500$

$b = b_o = N/2 = .094$

$m = 3$

$y = 9000$

$$W_1 = \frac{3.14(3.281)^2 2500}{4} + 2(.094)3.14(3.281)3(2500)$$

$= \cancel{23,250}$ 35,650 #

$W_2 = 3.14 \times .094 \times 3.281 \times 9000 = 8700$ #

BABCOCK & WILCOX

∴ LOAD ON GASKET = ~~23,250~~ 35,650# MIN.

THERE ARE 8 STUDS, 1½" 1⅛ 8 NC THREADS FROM SA 193-B7 LOW ALLOY STEEL WITH ALLOWABLE STRESS OF 20,000 PSI.

$$\text{MIN TORQUE} = \frac{KFD}{12 \times 8} = \frac{.194 \times \cancel{23,250}\ 35,650 \times 1.1.25}{12 \times 8}$$

$$= \cancel{53}\ 81 \text{ FT LB}$$

FROM REF A, PAGE 32 THE BOLT STRESS AT ~~53~~ 81 FT LB IS:

$$\frac{30,000}{355} \times \cancel{53}\ 81 = \cancel{4,500}\ 6800 \text{ PSI}$$

HIGHEST TORQUE ALLOWABLE IS: 2 load for

$$\tfrac{2}{3} \times 355 = 236 \text{ FT LBS} = 315$$

ASSUMING FLANGE CAN TAKE LOAD, TORQUE CAN VARY FROM RANGE OF ~~53~~ 81 TO 236 FT LBS.

RECOMMENDED VALUE IS 100 FT LBS.

P.K. SMITH 12-15-71

3

SPR 280

TITLE Dropped Spare Pressurizer Relief Valve

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- None. The following is the status and/or resolution of this SPR on other contracts.

REMARKS

The pressurizer relief valve was dropped 4' from a fork lift. Sent back for inspection & retest. Test sat.

N.A to any other contract. (operator error.)

NSS-

ACTION COMPLETE
ON ALL CONTRACTS

Instructions For PDS-21091 - Site Problem Report
Initiated by Nuclear Service - Refer to NPG-0503-04
Initiated by B&W Construction Co. - Refer to NPG-0503-05
For Unirradiated CNFP-Supplied Core Components - Refer to NPG-0503-10
Affected Documentation audited by R. Maggi Date 3-29-73

Changes Required: No

Yes (See Below)

Site Problem Report Affected Documentation Control for SPR- 280

Cognizant Engineer- NSS - 03

The following documentation requires revision as noted on the front of this Site Problem Report. This CONTROL shall remain in effect until the described changes have been completed or otherwise resolved.

Description of Changes	Resolution	Completed
Title		By
		Date
Title		By
		Date

Distribution:

Nuclear Service - 12M2
Central Eng. Files

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

To ______________ For Information

FILE: 12M2
Contract 620-00 03

SPR - 280

TITLE SPARE PZR RELIEF VALVE

G. E. Kulynych - Sr. Project Manager

C. C. Plunkett - Contract Admin.

P. A. Hanson - Eng. Files

H. F. Dobel - Quality Assurance

DATE 5-15-72

The attached, cleared SPR is submitted for your information.

TO: ~~____ N. S. Embrey~~ ~~____ R. T. Schomer~~

~~____ G. E. Kulynych~~ ~~____ E. G. Ward~~

~~____ J. McFarland~~

~~____ F. Norman~~

~~____ G. M. Olds~~

Attached is one copy of Site Problem Report No. ________ which has been processed on Contract 620-00________. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: ______________

cc:

J. P. ITTNER
MAY 19 1972
SUPPORT ENG.

NUCLEAR SERVICE SUPPORT ENGINEER

PDS 21091.1

SITE PROBLEM REPORT — BABCOCK & WILCOX-NPG

CUSTOMER	Duke Power Company	CONTRACT NO.	0003	SPR NO.	280	SPR REV NO.	0
VENDOR	B&W	P.O. NO.	804047	COMP NO.	28	GROUP NO. 41	SEQ NO. 6

PRIMARY DOCUMENTS: SPEC NOS.

DWG NO. EQUIP CODE LEVEL DATE

QA LEVEL I QA SPEC NO. 18A1 SE 337

PRIORITY 02

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
J. D. Rainney			

TITLE (MAX. 30 SPACES) SPARE PRZR RELIEF VALVE

DESCRIPTION OF PROBLEM

During preparation of a spare Pzr relief valve for installation, a tag was found on valve indicating that the valve had been dropped. Investigation indicates that the valve fell from a fork lift 4'. There is no visible damage.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC

Duke, Dresser. Recommended to Duke that valve be returned to Dresser for inspection and retest.

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

NO

RECOMMENDED ACTION

Return valve to Dresser for inspection and retest.

Valve returned to Site

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	J D Rainney Jr	12/28/71
SITE CONSTR. REP.		
SITE OPER. MGR.	J M McConnell	12/28/71
NS SUPPORT ENGR.	R K Smith	1/3/72
PROJECT MANAGER	NA	

COMMENTS AFFECTED: ☐ Drawings ☐ Proc. Specs ☐ Instr. Books ☐ Operating Procedures ☐ Tech Specs ☐ PSAR/FSAR ☐ ☐ Recommended Site Change

ACTION TAKEN

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPC QA
FILE 12M.2 SPR 280

Cost Category ☐ Norm ☐ C ☐ D ☐ G ☐ I

Auth Charge No. 620-0003-28

RESPONSIBILITY ASSIGN. DPC

Date Completed 5/12/72

By: J D Rainney

OTHER CONTRACTS AFFECTED NONE

DEVIATIONS ☐ NONE ☐ SEE REV

Field Change Req'd ☐

Field Change No.

Are QA acceptable
J M McConnell
5/12/72

File No. SPR 280

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To R. McConnell For Action

T. VIAR - PURCH
G. KLETNICH - NSS CONTS
R. SCHROEDER - SYS ENG
To PEGGY HANSON - CEN ENG FILES For Information
C. PLUNKETT - NSS CONTS
H. DOBEL - QA
K. SUHRKE - NUC SVC
C. WOLFF - NUC SVC

Contract 620-00 03

SPR 280

TITLE SPARE PZR RELIEF VALVE

MANHOUR LIMITS —

COST LIMITS

DATE 1-3-72

CHARGE NO. 620.0003-28

ACTION REQUIRED THE SITE IS REQUESTED TO CLEAR THE SPR AFTER THE VALVE HAS BEEN CLEARED.

DATE FOR ACTION TO BE COMPLETED AS SOON AS PRACTICAL

[signature]
Technical Support
Engineer

SITE PROBLEM

REPORT TRANSMITTAL

CLOSED

**** CLEARED ****

TO: Change Control For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

T. G. Wolcott - Task Engineer

J. Lauer - Project Manager

FILE: 13-14-388

CONTRACT NO: 620-00 14

SPR 388

TITLE ICS Feedwater Flow Control

DATE: 3/27/78

STATUS CODE C

________ L. C. Rogers - MET. ED. ________

________ F. R. Faist - TOLEDO ________

________ J. R. Bohart - Intl. Support ________

________ J. L. Donnell - OFR ________

________ B. A. Karrasch - Plant Integration ________

Attached is one copy of Site Problem Report No. 388 which was processed on Contract 620-00 14. Future contracts have been reviewed for the potential of a similar problem. This problem ~~is~~/is not considered applicable to other contracts ________.

REMARKS:

B. Harris

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

1 of 6

J.P. Faist Cleared

PDS-21091-5(8-76)

SITE PROBLEM REPORT

BABCOCK & WILCOX SPR #388

CUSTOMER	ORIGINATOR	DATE	DOC. ID.	CONT. NO.	SPR NO.	REV. NO.
Toledo Edison Company	F.R.Faist	11/7/77	13 -	620-0014	388	0

VENDOR	P.A. NO.	PART NO./PROC. NO.	GROUP NO.	SEQ. NO.
BMCo	020 592 L	2-15/4013		

TITLE (MAX 30 CHARACTERS)
ICS Feedwater Flow Control

PROB. COORDINATOR: [illegible] Wilson

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM:

See attachment.
(DB-267)

Req'd. Resolution Date: 11/15/77

Req'd. Completion Date: 1/1/78

CLOSED

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:
Terry Murray, TECo, knows of this problem and is aware of the corrective action. Tom Wolcott, Lynb. Engineering, is aware of the problem and has approved the solution.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL: 1. Wiring changes have been made as outlined in "Description of Problem". 2. Correct Dwg. No. D8034800C, per marked up drawing attached and "Description of Problem", and issue revised drawings to TECo, etc.

RESOLUTION

RESOLUTION: DRawing D8034800 Sheet 5 location 5C relay 83/AFWP Should be 83/BFWP. BmCo will Correct drawing on final update. Other discrepancies noted between this drawing and actual wiring should be wired according to this drawing.

/s/ G. J. Gibbs
/s/ T. G. Wolcott

PREPARED BY	DATE	APPROVED BY	DATE
B. Harris	3/21/78		
REVIEWED BY: W. E. Wilson for N. A. Bauer	3/21/78	J. P. Lauer	3-21-78

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM ☒ OTHER	☐ YES ☒ NO	04- N/A	☐ YES ☒ NO

COMPLETION

SITE COMPLETION REPORT: ICS wiring was corrected as noted in SPR. BMCo to make drawing corrections on final drawing update.

DEVIATIONS: ☒ NONE SPR REV NO. ☐

DATE COMPLETED: 3/27/78

COMPLETED BY: F. R. Faist — F. Faist — DATE 3/27/78

F. R. Faist — F. Faist — 3/27/78

SHEET 2 OF 6

SPR #388
620-0014
Description of Problem
11/7/77

Problem:

Problems surfaced when the F. W. pump controllers were placed on auto. Tracing out wiring showed some discrepancies. Dwg. D60348000 shows contacts 3, 4, and 5 of 83/AFWP being used twice, for different functions.

Checking logic makes it appear that the set towards the center of the drawing should be 83/BFWP, and the set towards the top left side should remain 83/AFWP. However, the wiring was found to be in the reverse of this order.

The wiring of contacts 6, 7, 8, 9, 10, and 11 of 83/BFWP were found connected to 6, 7, 8, 9, 10, and 11 of 86/BFWPT. The wires that the drawing shows as going to 6, 7 and 8 of 86/BFWPT were, in turn, connected to 12, 13 and 14 of 86/BFWPT. There were no wires on 6, 7, 8, 9, 10, and 11 of 83/BFWP.

Loop 2 was found to have the same mistakes, involving the shift of wires from 83/AFWP to 86/AFWPT, the shift of wires from 6, 7, and 8 of 86/AFWPT, and no wires on 6, 7, 8, 9, 10 and 11 of 83/AFWP.

Dick Shaffer (BMCo) and Fred Faist (B&W) contacted J. Courtwright (BMCo) and T. Wolcott (B&W - Lynchburg). They reached a verbal agreement that the drawing be changed to show that contacts 3, 4 and 5 of 83/AFWP towards the center should be 83/BFWP, and that the appropriate wiring changes be made to order.

It was also agreed, on that matter of the other wiring discrepancies, that the wiring be changed to match the drawing. The wiring changes were made and the field drawings corrected. The systems then functioned properly.

DB-267

PROBLEM REPORT	PRODUCT SYSTEM	FILE NO. (TS)	DATE OF PROBLEM 11/3/77	FROM T.L. Grubaugh	
	CMO USE ONLY		BMCO S.O. NO./P.O. 1220 M	EMP NO 5221	ACCT NO 783
CUSTOMER & PLANT: Toledo Edison, Davis-Besse I			CUST ORDER NO 020 592 LJ	MAIL STA/DO Site (LB-267)	
SUBJECT (ONE ONLY) AND TYPE OF SYSTEM/PRODUCT: F. W. Pump Control Loops Wiring Change			NOMENCLATURE SERIES LABEL -- / DATE CODE N/A	SERIAL NO AND OR PART NO N/A	

PROBLEM

See attached sheet.

FOR FIELD USE: DAYS SERVICE ___ CLASS OF SERVICE ___ EXPENSES $ ___ MATERIAL $ ___ SFO NO ___

ALLOCATION: ☐ PRODUCT ☒ SYSTEM ☐ WARRANTY ☐ SYS. ENGR. ERROR ☐ OTHER

DEFECTIVE PART RETURNED: ☒ NO ☐ YES ON ___ DATE ___ RM NO ___

FAILURE OCCURRED: ☐ ON RECEIPT ☐ IN SERVICE (WARRANTY) ☒ IN SERVICE (NON WARRANTY) 2 yrs. EST. TIME IN SERVICE

POSSIBLE CAUSE FOR PROBLEM: 80 ☐ FAULTY MATERIAL 81 ☐ FAULTY MANUFACTURING 82 ☐ FAULTY DESIGN 83 ☐ PERFORMANCE DEFICIENCY 84 ☐ FAULTY PACKAGING 85 ☐ COMPONENT FAILURE 86 ☐ WEAROUT 87 ☐ IMPROPER APPLICATION 88 ☐ OPERATING ENVIRONMENT 89 ☐ INSUFFICIENT INSTRUCTIONS (DOCUMENTATION)

CUSTOMER ATTITUDE: ☒ MAJOR CONCERN ☐ CONCERNED ☐ UNCONCERNED

EFFECT ON SYSTEM (BRIEFLY): F.W. Pump Control Loops would not work in automatic.

☐ CONT'D ON SEPARATE SHEET

DATE SOLUTION REQUIRED ___ OR ☒ INFO ONLY

SIGNATURE T.L. Grubaugh DATE 11/7/77

REPORT OF INVESTIGATION & CORRECTIVE ACTION (FIELD IF APPLICABLE)

OPERATING CONDITIONS: AMBIENT TEMP 75 °F; ATMOSPHERE ☐ CLEAN ☒ AVERAGE ☐ DIRTY; HUMIDITY ☐ HI ☐ LO ☒ AVG

TIME REQUIRED TO: REPAIR ___ TROUBLESHOOT ___ RECALIBRATE ___

FAILURE DETAILS: BMCO PART NO ___ DESCRIBE (DIODE, CAP, TRANSISTOR, ETC.) ___ CIRCUIT SYMBOL (C1, R1, Q1) ___ MFG. OF PART (IF KNOWN) ___

HOW PART FAILED: ☐ SHORT ☐ OPEN ☐ MECH. DAMAGE ☐ ADJUSTMENT ☐ DIRTY ☐ UNKNOWN ☐ OTHER (DESCRIBE)

COPIES: QUALITY ASSURANCE, PROD. LIABILITY, PROD. MANAGEMENT, NPO, FPO, PPO, ASPO, WARRANTY REPAIR, CONTINUATION ENGR., COMPONENT ENGR.

COPIES ___

☐ PRELIMINARY ANS ☐ FINAL SOLUTION | SIGNATURE ___ DATE ___ | APPROVAL ___ DATE ___

FOLLOW UP ON CORRECTIVE ACTION

DISP. OF R.M. ___ DATE REC'D ___ DATE RETURNED ___

HOURS SPENT SOLUTION: DEPT | MAN | HRS

QTY	NAME	PART NO	COMMENTS

4 of 6

FORM TOR-478

DB-267
620-0014
1220M
11/7/77

Problem.

Problems surfaced when the F. W. pump controllers were placed on auto. Tracing out wiring showed some discrepancies. Dwg. D80348C0C shows contacts 3, 4, and 5 of 83/AFWP being used twice, for different functions.

Checking logic makes it appear that the set towards the center of the drawing should be 83/BFWP, and the set towards the top left side should remain 83/AFWP. However, the wiring was found to be in the reverse of this order.

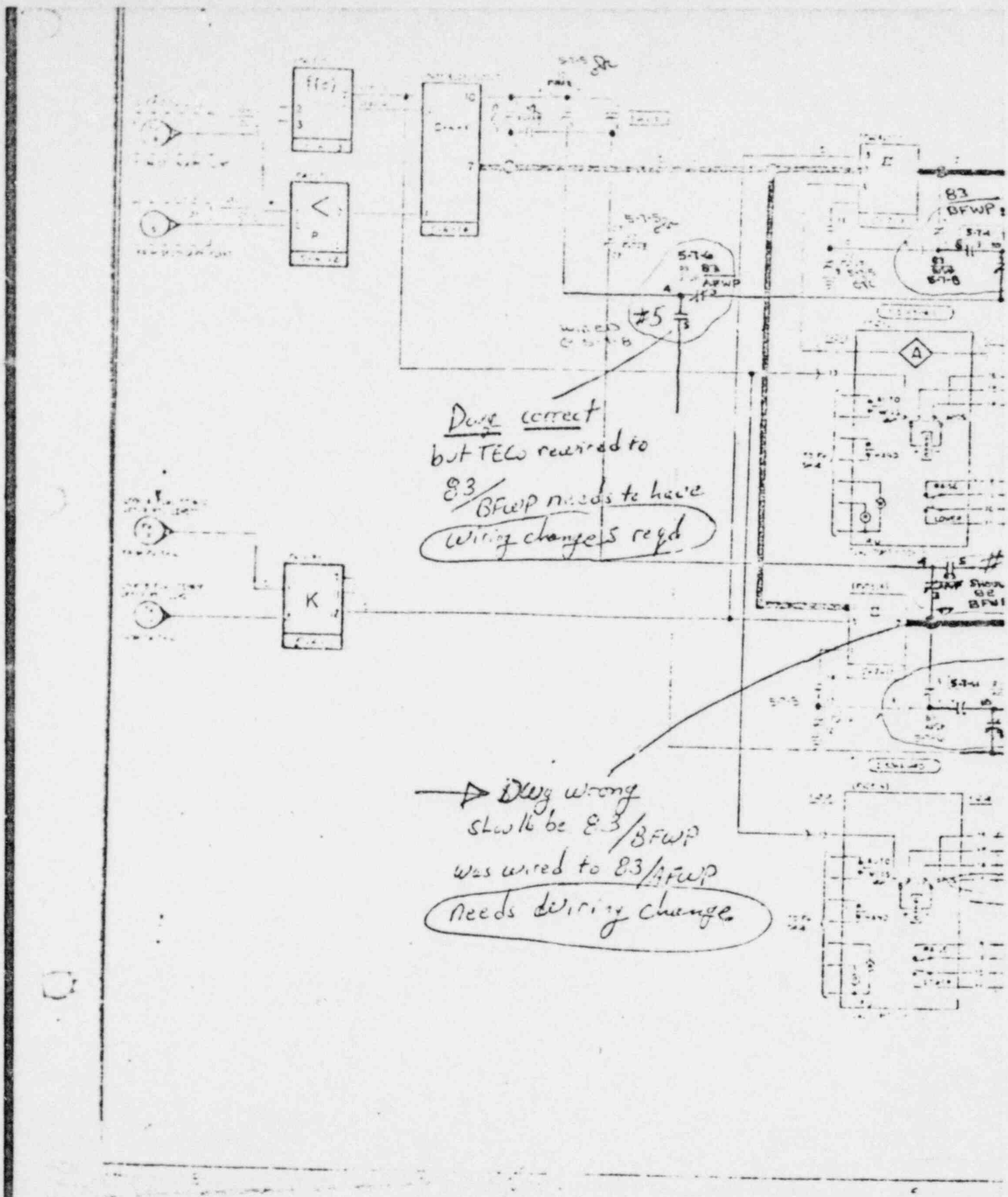
The wiring of contacts 6, 7, 8, 9, 10, and 11 of 83/BFWP were found connected to 6, 7, 8, 9, 10, and 11 of 86/BFWPT. The wires that the drawing shows as going to 6, 7 and 8 of 86/BFWPT were, in turn, connected to 12, 13 and 14 of 86/BFWPT. There were no wires on 6, 7, 8, 9, 10, and 11 of 83/BFWP.

Loop 2 was found to have the same mistakes, involving the shift of wires from 83/AFWP to 86/AFWPT, the shift of wires from 6, 7, and 8 of 86/AFWPT, and no wires on 6, 7, 8, 9, 10 and 11 of 83/AFWP.

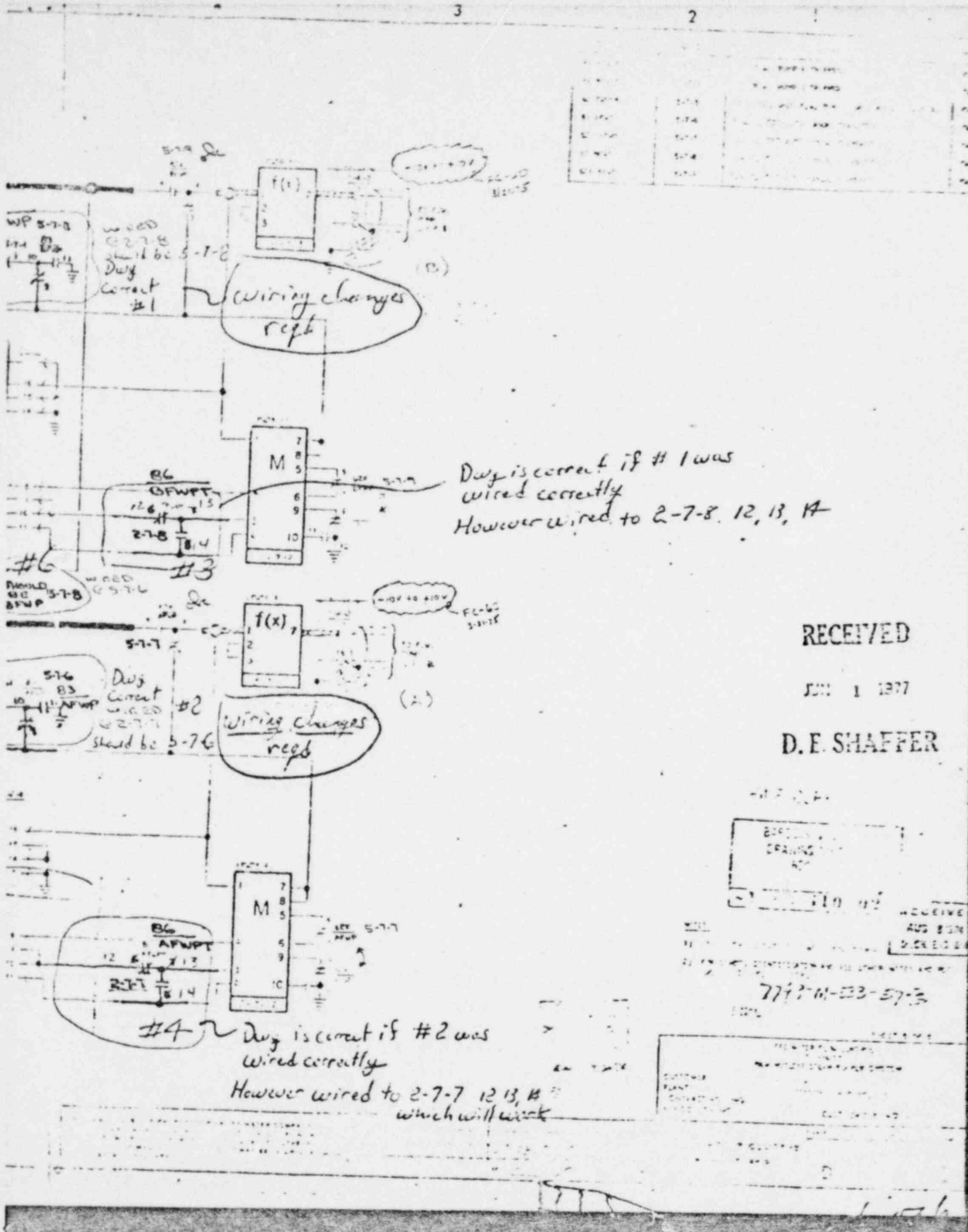
Dick Shaffer (BMCo) and Fred Faist (B&W) contacted J. Courtwright (BMCo) and T. Wolcott (B&W - Lynchburg). They reached a verbal agreement that the drawing be changed to show that contacts 3, 4 and 5 of 83/AFWP towards the center should be 83/BFWP, and that the appropriate wiring changes be made to order.

It was also agreed, on that matter of the other wiring discrepancies, that the wiring be changed to match the drawing. The wiring changes were made and the field drawings corrected. The systems then functioned properly.

TLG:nlf



f(t)
K
83
BFWP
#5
83
AFWP
Dwg correct
but TECo rewired to
83/BFWP needs to have
wiring changes reqd
Dwg wrong
should be 83/BFWP
was wired to 83/AFWP
needs wiring change


3
2
f(x)
wired
2-7-8
should be 5-7-8
Dwg
Correct
#1
wiring changes
req'd
(B)
M
B6
BFWPT
2-7-8
#3
Dwg is correct if #1 was
wired correctly
However wired to 2-7-8. 12, 13, 14
#6
5-7-8
f(x)
-10V to +10V
5-7-7
5-7-6
B3
Dwg
Correct
wired
2-7-7
should be 5-7-6
#2
wiring changes
req'd
(A)
RECEIVED
JUN 1 1977
D. E. SHAFFER
M
B6
AFWPT
5-7-7
#4
Dwg is correct if #2 was
wired correctly
However wired to 2-7-7 12 13, 14
which will work

BWNP-20345 (6-78)

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

To: Change Control For Distribution
S. H. Klein - Quality Assurance
Central Engineering Files
G. J. Gibes - Task Engineer(s)
R. C. Luken - Project Manager

File: 13-14-392
Contract No.: 620-00 14
SPR: 392 Rev 0
Title: Four Amper Cd. Board Failures
Date: 6/19/78
Status Code: C

✓ L. C. Rogers - MET. ED.
✓ F. R. Faist - TOLEDO
✓ J. R. Bohart - Intl. Support
✓ B. A. Karrasch - Plant Integration
✓ P. E. Perrone
✓ W. M. Kelly

Attached is one copy of Site Problem Report No. 392 which was processed on Contract 620-00 14. Future contracts have been reviewed for the potential of a similar problem. This problem ~~is~~/is not considered applicable to other contracts ______ ______.

REMARKS:

J. D. Fulcher
NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

Pg 1 of 4

Cleared DEC 2 1977 PDS-21091-5(3-76)

FRFaist

SITE PROBLEM REPORT — BABCOCK & WILCOX — SPR #392

CUSTOMER	ORIGINATOR / DATE	DOC. ID. CONT. NO.	SPR NO.	REV. NO.
Toledo Edison	F.R.Faist 11/15/77	13 - 620-0014	392	0
VENDOR	**P.A. NO.**	**PART NO./TASK NO.**	**GROUP NO.**	**SEQ. NO.**
Bailey Meter Co.	020 592 LJ	25/001/001		
TITLE (MAX 30 CHARACTERS)		**PROBLEM CONTACT**		
Four Ampex Ckt. Board Failures		M. L. Nelson MLN		

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM: (DB-269/DB-270) Intermittent failures of the 855 plant computer on 11/6/77 were determined to be caused by the Ampex Circuit Boards listed below: (1) DR4-3228802-02L - possible failure of 2nd bit assigned 70,000 - 77,777. Bits 0 - 3. Intermittent loss of "1" bit. (2) DR4-3228802-02J - Possible failure of 3rd bit assigned 20,000 - 27,777. Bits 24, 25 and parity. Intermittent loss of parity bit. R. W. Kunes of BMCo arrived on site on 11/7/77, but the above cards had already been replaced. Mr. Kunes did, however, help TECo identify the problem with the paper tape punch (SPR #393).
The above two boards failed again 11/14/77 and were replaced. (3) DR4-3228802-02L, from Drawer 3, A-17. Failure of Bits 0, 1, 2, 3 for Address 20,000 - 27,777. (4) DR4-3228802-02J, From Drawer 3, B-22. Failure of Bits 20, 21, 22, 23 for addresses 30,000 - 37,777.

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED: Above four cards returned to Bailey. TECo P. O. #020 561 LF. B&W P. O. #032424LT. Dennis Rice contacted for the P. O. number.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:
Site to clear on return of the four boards.

RESOLUTION

RESOLUTION: Repair above cards on PO# 032424 LT. (BMCo)

PREPARED BY	DATE	APPROVED BY	DATE
Doug Holstead	11-18-77	J. R. Faist	11-18-77
REVIEWED BY	**DATE**		
H.M. Quilig for KRELL40M	11-18-77		

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM OTHER ☒	☐ YES NO ☒	04- N/A	☐ YES NO ☒

COMPLETION

SITE COMPLETION REPORT:
Per BMCo P.S.S. all parts returned to TECo.

DEVIATIONS: ☒ NONE — SPR REV NO. ☐

DATE COMPLETED: 6/6/78

COMPLETED BY — DATE
F. R. Faist FRFaist 6/6/78

F. R. Faist FRFaist 6/6/78

SHEET 2 OF 4

DB-210

PROBLEM REPORT

FILE NO. (TS)

DATE OF PROBLEM: 11/14/77

FROM: T. L. Grubaugh

EMP. NO.: 5221 | ACCT. NO.: 783

CMO USE ONLY

RECORD NO. P.O.: 1220 M

CUSTOMER & PLANT: Toledo Edison, Davis-Besse I

CUST. ORDER NO.: 020 561 LF

MAIL STA/DO: Site (DB-270)

SUBJECT: Ampex Ckt. Board Failures (855)

NOMENCLATURE SERIES LABEL: — | DATE CODE: —

SERIAL NO. AND/OR PART NO.: BW DR4-3228802-02L 02J

PROBLEM:

DR4-3228802-02L From Drawer 3, A-17. Failure of Bits 0, 1, 2, 3 for Address 20,000 - 27,777.

DR4-3228802-02J, From Drawer 3, B-22. Failure of Bits 20, 21, 22, 23 for addresses 30,000 - 37,777.

Also cracked transformer.

FIELD USE: DAYS SERVICE ___ CLASS OF SERVICE ___ EXPENSES $ ___ MATERIAL $ ___ SEQ NO. ___

ALLOCATION: [X] PRODUCT [ ] SYSTEM [ ] WARRANTY [ ] SYS. ENGR. ERROR [ ] OTHER

DEFECTIVE PART RETURNED: [ ] NO [X] YES ON 11-15-77 DATE; RM NO. 20574

FAILURE OCCURRED: [ ] ON RECEIPT [ ] IN SERVICE (WARRANTY) [X] IN SERVICE (NON-WARRANTY); 1-5 yrs EST. TIME IN SERVICE

EFFECT ON SYSTEM (BRIEFLY): Misc. failures within computer.

POSSIBLE CAUSE FOR PROBLEM: 80 [ ] FAULTY MATERIAL; 81 [ ] FAULTY MANUFACTURING; 82 [ ] FAULTY DESIGN; 83 [ ] PERFORMANCE DEFICIENCY; 84 [ ] FAULTY PACKAGING; 85 [X] COMPONENT FAILURE; 86 [ ] WEAROUT; 87 [ ] IMPROPER APPLICATION; 88 [ ] OPERATING ENVIRONMENT; 89 [ ] INSUFFICIENT INSTRUCTIONS (DOCUMENTATION)

CUSTOMER ATTITUDE: [X] MAJOR CONCERN [ ] CONCERNED [ ] UNCONCERNED

[ ] CONT'D ON SEPARATE SHEET

DATE SOLUTION REQUIRED: ASAP [ ] INFO ONLY

SIGNATURE: T. L. Grubaugh KEY | DATE: 11/14/77

REPORT OF INVESTIGATION & CORRECTIVE ACTION (BY FIELD IF APPLICABLE)

OPERATING CONDITIONS: AMBIENT TEMP. 70 - 90 °F; ATMOSPHERE [ ] CLEAN [X] AVERAGE [ ] DIRTY; HUMIDITY [ ] HI [ ] LO [ ] AVG

TIME REQUIRED TO: REPAIR ___ TROUBLESHOOT ___ RECALIBRATE ___

FAILURE DETAILS: BMCO PART NO. ___; DESCRIBE (DIODE, CAP, TRANSISTOR, ETC.) ___; CIRCUIT SYMBOL (C1, R1, Q1) ___; MFG. OF PART (IF KNOWN) ___

HOW PART FAILED: [ ] SHORT [ ] OPEN [ ] MECH. DAMAGE [ ] ADJUSTMENT [ ] DIRTY [ ] UNKNOWN [ ] OTHER (DESCRIBE)

COPIES: QUALITY ASSURANCE; PROD. LIABILITY; PROD. MANAGEMENT; MPO; FPO; IPPO; ASPO; WARRANTY REPAIR; CONTINUATION ENGR.; COMPONENT ENGR.

COPIES

[ ] PRELIMINARY ANS. [ ] FINAL SOLUTION | SIGNATURE | DATE | APPROVAL | DATE

FOLLOW UP ON CORRECTIVE ACTION

DISP. OF R.M. ___ DATE REC'D. ___ DATE RETURNED ___

HOURS SPENT SOLUTION

DEPT.	MAN	HRS.

QTY	NAME	PART NO.	COMMENTS

FORM 506 - 5/75

THIS REPORT TO COVER ONE PROBLEM ON ONE PRODUCT OR SYSTEM ONLY.

3 of 4

PROBLEM REPORT

DATE OF PROBLEM: 11/8/77

FROM: T. L. Grubaugh

BMCO S.O. NO.: 1220 M

EMP. NO: 5221 ACCT. NO: 783

CUSTOMER & PLANT: Toledo Edison, Davis-Besse I

CUST ORDER NO: 020 561 LF

MAIL STA/DO: Site (DB-269)

SUBJECT (ONE ONLY) AND TYPE OF SYSTEM/PRODUCT: 2 - Ampex Ckt. Board Failures (855)

SERIAL NO. AND/OR PART NO.: DR4-3228802-02L/02J

DR4-3228802-02L: Possible failure of 2nd bit assigned 70,000 - 77,777 - Bits 0-3. Intermittent loss of "1" Bit.

DR4-3228802-02J: Possible failure of 3rd bit assigned 20,000 - 27,777 - Bits 24, 25 and parity. Intermittent loss of parity bit.

FOR FIELD USE: DAYS SERVICE / CLASS OF SERVICE / EXPENSES $ / MATERIAL $ / SDO NO.

ALLOCATION:
- [x] PRODUCT
- [ ] SYSTEM
- [ ] WARRANTY
- [ ] SYS. ENGR. ERROR
- [ ] OTHER

DEFECTIVE PART RETURNED:
- [ ] NO
- [x] YES ON 11-15-77 DATE

RM NO. 20373

FAILURE OCCURRED:
- [ ] ON RECEIPT
- [ ] IN SERVICE (WARRANTY)
- [x] IN SERVICE (NON WARRANTY)

2 yrs EST. TIME IN SERVICE

EFFECT ON SYSTEM (BRIEFLY): Caused intermittent failure of plant computer system.

CUSTOMER ATTITUDE:
- [ ] MAJOR CONCERN
- [x] CONCERNED
- [ ] UNCONCERNED

[ ] CONT'D ON SEPARATE SHEET

DATE SOLUTION REQUIRED ______ OR [x] INFO. ONLY

SIGNATURE: T. L. Grubaugh DATE: 11/8/77

POSSIBLE CAUSE FOR PROBLEM:
- 60 [ ] FAULTY MATERIAL
- 61 [ ] FAULTY MANUFACTURING
- 62 [ ] FAULTY DESIGN
- 63 [ ] PERFORMANCE DEFICIENCY
- 64 [ ] FAULTY PACKAGING
- 65 [ ] COMPONENT FAILURE
- 66 [ ] WEAROUT
- 67 [ ] IMPROPER APPLICATION
- 68 [ ] OPERATING ENVIRONMENT
- 69 [ ] INSUFFICIENT INSTRUCTIONS (DOCUMENTATION)

REPORT OF INVESTIGATION & CORRECTIVE ACTION (BY FIELD IF APPLICABLE)

OPERATING CONDITIONS:
AMBIENT TEMP 70-90 °F
ATMOSPHERE: [ ] CLEAN [x] AVERAGE [ ] DIRTY
HUMIDITY [ ] HI [ ] LO [x] AVG.

TIME REQUIRED TO: REPAIR ____ TROUBLESHOOT ____ RECALIBRATE ____

FAILURE DETAILS:
BMCO PART NO ____
DESCRIBE (DIODE, CAP., TRANSISTOR, ETC.) ____
CIRCUIT SYMBOL (C1, R1, Q1) ____
MFG. OF PART (IF KNOWN) ____
HOW PART FAILED: [ ] SHORT [ ] OPEN [ ] MECH. DAMAGE [ ] ADJUSTMENT [ ] DIRTY [ ] UNKNOWN [ ] OTHER (DESCRIBE)

COPIES: QUALITY ASSURANCE / PROD. LIABILITY / PROD. MANAGEMENT / NPO / FPO / IPPO / ASPO / WARRANTY REPAIR / CONTINUATION ENGR. / COMPONENT ENGR.

COPIES

[ ] PRELIMINARY ANS. [ ] FINAL SOLUTION

SIGNATURE ____ DATE ____ APPROVAL ____ DATE ____

FOLLOW UP ON CORRECTIVE ACTION

DISP. OF R.M. ____
DATE REC'D ____
DATE RETURNED ____

HOURS SPENT SOLUTION

DEPT.	MAN	HRS.

QTY	NAME	PART NO	COMMENTS

FORM 805 - 875

USE ONE SHEET TO SOLVE ONE PROBLEM ON ONE PRODUCT OR SYSTEM ONLY

TITLE Do pressurizer spray Valve 40% open light

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS-. The following is the status and/or resolution of this SPR on other contracts.

REMARKS 3/26/74 --- Review sheet to JFC

J.O. error. Not Generic says Leon McBee.

P. Pothman 10/18/77
L.M

NSS-

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

To R. J. McConnell For Information

FILE: 12M2
Contract 620-00 - 04

SPR 46

TITLE PRZ SPRAY VALVE 40% LIGHT

DATE 9-7-73

G. E. Kulynych - Sr. Project Manager

C. C. Plunkett - Contract Admin.

Central Engineering Files

E. V. DeCarli - Quality Assurance

The attached, cleared SPR is submitted for your information.

TO: ✓ J. N. Kaelin-Arkansas

✓ J. P. Kennedy-SMUD

✓ K. E. Suhrke

~~R. J. Worsham~~

✓ J. D. Phinney-Met Ed

Attached is one copy of Site Problem Report No. 46 which has been processed on Contract 620-00 - 04. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS:

cc: G. QUALE
R. BURNLEY

R. L. Pittman
NUCLEAR SERVICE SUPPORT ENGINEER

PDS-21091-1

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company	CONTRACT NO 620-0004	SPR NO. 46	SPR REV NO 0
VENDOR BMCo	P.O. NO.	COMP.NO. 22 GROUP NO. 01	SEQ NO. 01

PRIMARY DOCUMENTS: SPEC NOS.
DWG NO. EQUIP CODE/LEVEL/DATE
QA LEVEL QA SPEC NO.

PRIORITY 2

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
J. L. Hawks			1-1-73

TITLE (MAX. 30 SPACES) PRZ Spray Valve 40% Light

DESCRIPTION OF PROBLEM

See Attached BMCo PR ONS 1-37

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

Reported to BMCO

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

By BMCo through Site Representative.

RECOMMENDED ACTION Refer to reply from BMCo. Nuclear Project office on the attached BMCo. PR.
RFP

BMCo. REP. REPORTS THAT PROPER INDICATION HAS NOW BEEN INSTALLED.
JLW
8/23

APPROVALS TITLE	APPROVAL SIGNATURE	DATE	DOCUMENTS AFFECTED	ACTION TAKEN
ORIGINATOR	James L. Hawks	10/12/72	☐ Drawings	
SITE CONSTR. REP.			☐ Proc. Specs.	
SITE OPER. MGR.	J. W. McConnell	10/12/72	☐ Instr. Books	
NS SUPPORT ENGR.	R. L. Pittman	10/18-72	☐ Operating Procedures	
			☐ Tech. Specs.	
			☐ PSAR/FSAR	
PROJECT MANAGER	— N R —	—	☐	
			☐ Recommended Stds. Change	

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 SPR 46

Cost Category ☐ ☐ ☐ ☐ ☐

Auth. Charge No. NONE

RESPONSIBILITY ASSIGN
BMCo

Date Completed
By:

OTHER CONTRACTS AFFECTED

DEVIATIONS
☐ NONE
☐ SEE REV.

Field Change Rqd. ☐

Field Change No

Complete
J. W. McConnell
9-4-73

INSTRUCTIONS FOR PDG-21091 - SITE PROBLEM REPORT

Initiated by B&W Nuclear Service

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title, Description of Problem; Status, Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SITE OPERATIONS MANAGER - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer; Early Start Date; Required Completion Date; Approval Signature; Date.

   Note: Assign priority No. 1 or 2 defined as follows:

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. NUCLEAR SERVICE SUPPORT ENGINEER - FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No., Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal nuclear service expenditures) are not to be incurred, take the following steps: (a) Approve SPR, (b) Indicate "Not Required" in space provided for project manager's approval, and (c) Distribute as indicated in step 5 below.

   If field change is not required but additional costs (over and above normal nuclear service expenditures) are to be incurred, approve SPR and forward to project manager for approval (step 4).

   If field change is required, see procedure No. NPG-0402-07, obtain field change No. from project manager, and indicate field change No. on SPR.

4. PROJECT MANAGER - Approve SPR and Return to Nuclear Service Support Engineer.

5. NUCLEAR SERVICE SUPPORT ENGINEER - Distribute in Accordance With Procedure No. NPG-0402-04; Initial Action Taken Box (on Support Engineer's File Copy) When Documents Affected Have Been Corrected.

6. SITE OPERATIONS MANAGER - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-04. Return completed SPR to nuclear service support engineer.

Initiated by B&W Construction Company

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title; Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SENIOR CONSTR. CO. SITE REPRESENTATIVE - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer. Early Start Date. Required Completion Date; Approval Signature, Date.

   Note: Assign priority No. 1 or 2 defined as follows.

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. PROJECT MANAGER - FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No., Responsibility Assignment, Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal construction Co. expenditures) are not to be incurred, take the following steps: (a) Approve SPR, and (b) Distribute in accordance with procedure No. NPG-0402-05.

   If field change is not required but additional costs (over and above normal construction Co. expenditures) are to be incurred, obtain abnormal cost charge No. from contract administration; approve and distribute in accordance with procedure No. NPG-0402-05.

   If field change is required, see procedure No. NPG-0402-07, assign field change No., have approved and distribute in accordance with procedure No. NPG-0402-05.

4. SENIOR CONSTR. CO. SITE REPRESENTATIVE - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-05. Return completed SPR to the project manager.

PROBLEM REPORT

TO: SERVICE ENGINEERING MAIL STA. NC A3-23

DATE: October , 1972

FROM: R. T. Getty

RMCO S.O. NO.: 2130K/1600L1002

EMP. NO.: 2550

ACCT NO.: 773

CUSTOMER & PLANT: Duke Power Co., Oconee Unit #2

CUST. ORDER NO.: A-28855

MAIL STA.: Clemson

SUBJECT (ONE ONLY): Press. Spray Valve 40% Open Ind. Light

PROBLEM

RC3-MIS-1 and RC25-MIS were supplied as Type RZ1000BX Model CCCACC-1 on SO 1700K1002, page 2. On Units 2 and 3 2130K1002, page 2 and 1600L1002, page 2 a Type RZ1000BX Model CCCOCC-1 was supplied. This indicator does not have pressurizer spray valve 40% indicating lights. The relay logic for this light is shown on Unit 2 Dwg. 8038900. Unit 3 drawing is ~~available for checking~~. 8041467

2 P/N 6621475-10-YO indicator assemblies with proper engraving have been ordered on FR 7167 and will be installed to correct Units 2 and 3.

[X] CONT'D ON SEPARATE SHEET

DATE SOLUTION REQUIRED 11/1/72 OR [ ] INFO ONLY

R T Getty

FOR FIELD USE: DAYS SERVICE; SERVICE $; EXPENSES $; MATERIAL $; S.E.O. NO.

ALLOCATION
- [ ] PRODUCT
- [ ] PRODUCT APPLICATION
- [X] SYSTEM
- [ ] SYSTEM APPLICATION
- [ ] WARRANTY
- [ ] OTHER

DEFECTIVE PART RETURNED
- [X] NO
- [ ] YES ON ____ DATE ____
- RM NO

FAILURE OCCURRED
- [ ] IN WARRANTY
- [X] ON RECEIPT
- [ ] IN SERVICE
- EST. TIME IN SERVICE

POSSIBLE CAUSE FOR PROBLEM
- [ ] FAULTY MATERIAL
- [ ] FAULTY MANUFACTURING
- [ ] FAULTY DESIGN
- [ ] PERFORMANCE DEFICIENCY
- [ ] FAULTY PACKAGING
- [ ] COMPONENT FAILURE
- [ ] WEAROUT
- [ ] IMPROPER APPLICATION
- [ ] OPERATING ENVIRONMENT
- [ ] INSUFFICIENT INSTRUCTIONS

REPORT OF INVESTIGATION & CORRECTIVE ACTION (BY FIELD IF APPLICABLE)

ACTION: INVESTIGATOR ASSIGNED; MAIL STA.; ACTION DATE; EXPECTED REPLY DATE

FINAL DISPOSITION SIGNATURES: ENGINEERING; RELIABILITY; QC/QA; MFG. FOREMAN

DISPOSITION OF RM #; DATE RECEIVED; DATE RETURNED

CLASSIFICATION (RELIABILITY)
- [ ] MFG & QC
- [ ] RELIABILITY
- [ ] DESIGN
- [ ] STANDARDS
- [ ] APPLICATION
- [ ] PACKAGING
- [ ] FIELD
- [ ] OTHER

[ ] PRELIM. ANSWER [ ] FINAL SOLUTION SIGNATURE DATE

ACCOUNT ALLOCATION: COST CENTER; ASSIGNING INITIALS; APPROVAL INITIALS

COPIES (R: REF. S: SOL.)

FOLLOW UP ON CORRECTIVE ACTION (FIELD OR CMC)
ACTION REQUESTED

RESULTS

ASSIGNED TO; DATE; APPROVAL; DATE

PARTS REPLACED DURING REPAIR IN FIELD, MFG OR ENGINEERING

QTY	NAME	PART NO	COMMENTS

RM NO; DATE RCVD; REPAIR NO.; REPAIRED BY; DEPT.; DATE

The specification sheets for 2[illegible]30K and 1600L1002, page 2, should be revised at the earliest date possible ~~with~~ AT the discretion of the System Manager.

[illegible signature]

BWNP-20345 (6-78)

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

To: Change Control For Distribution
S. H. Klein - Quality Assurance
Central Engineering Files
P.E. Mauela - Task Engineer(s)
R.C. Luken - Project Manager

File: 13-14-391-01
Contract No.: 620-00 14
SPR: 391, Rev 01
Title: Failed Incore Detectors

Date: 7/6/78
Status Code: C

✓ L. C. Rogers - MET. ED.
✓ F. R. Faist - TOLEDO
✓ J. R. Bohart - Intl. Support
✓ B. A. Karrasch - Plant Integration
✓ P. E. Perrone

Attached is one copy of Site Problem Report No. 391-01 which was processed on Contract 620-00 14. Future contracts have been reviewed for the potential of a similar problem. This problem ~~is~~/is not considered applicable to other contracts.

REMARKS:

COMPLETED

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

sh 186

Cleared

PDS-21091-5(8-76)

SITE PROBLEM REPORT

BABCOCK & WILCOX SPR #391.01

CUSTOMER	ORIGINATOR DATE	DOC. ID. CONT. NO.	SPR NO.	REV. NO.
Toledo Edison Company	F.R.Faist 11/22/77	13 - 620-0014	391	01

VENDOR	P.A. NO.	PART NO./TASK NO. GROUP NO. SEQ. NO.
B&W	0267341K	24/001/001

TITLE (MAX 30 CHARACTERS)	PROBLEM CONTACT
Failed Incore Detectors	D. L. Allison D.L.Allison

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM:

In accordance with P. E. Mamola & H. D. Warren's request, additional leakage measurements have been performed to verify the measurement technique used in SPR #391, Rev. 0. The following information is provided under Enclosure 01. (See attachment).

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED: Discussed the information obtained on 11/15/77 with P. E. Mamola and H. D. Warren. Received concurrence the information obtained on string 31 is consistent with leakage measurements of MUO.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL: TECo I&C to check levels 1 & 3 on string #9 from the multiplexer through the detector to verify operability of these levels. Site to clear this Rev. when Rev. 0 is cleared.

RESOLUTION

RESOLUTION: Site to hold SPR until Rev. 0 is cleared. (Rev. 0 resolution transmitted 11-22-77)

PREPARED BY	DATE	APPROVED BY	DATE
Doug Holstead	11-22-77		
REVIEWED BY D. L. Hallman	12/9/77	J. Q. Lamer	12-12-77

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM ☒ OTHER	☐ YES NO ☒	04- N/A	☐ YES NO ☒

COMPLETION

SITE COMPLETION REPORT:

See Rev. 0 of this SPR for site completion report.

DEVIATIONS: ☒ NONE SPR REV NO. ☐

DATE COMPLETED: 6/21/78

COMPLETED BY	DATE
F. R. Faist F.R.Faist	6/21/78
F. R. Faist F.R.Faist	6/21/78

SHEET ~~2~~ OF ~~5~~ 2 OF 6

SPR #391, Rev. 01
620-0014
November 21, 1977

ENCLOSURE 01

On 11/15/77, incore leakage measurements were performed on string #31. String #31 is a non-symmetric detector using Al_2O_3 insulation. The following are the results.

String #31

	NO VOLTS APPLIED	+10 V	-10 V
Level 1	$+.21 \times 10^{-6}$	$+.15 \times 10^{-6}$	$+.275 \times 10^{-6}$
Level 2	$+.3 \times 10^{-6}$	$-.36 \times 10^{-6}$	$+.97 \times 10^{-6}$
Level 3	$+.32 \times 10^{-6}$	-1.2×10^{-6}	$+1.75 \times 10^{-6}$
Level 4	$+.33 \times 10^{-6}$	-1.5×10^{-6}	$+2.2 \times 10^{-6}$
Level 5	$+.34 \times 10^{-6}$	-1.25×10^{-6}	$+1.95 \times 10^{-6}$
Level 6	$+.295 \times 10^{-6}$	-2.25×10^{-6}	$+2.85 \times 10^{-6}$
Level 7	$+.14 \times 10^{-6}$	-2.2×10^{-6}	$+2.45 \times 10^{-6}$
Bkg.	-7.4×10^{-9}	-3.1×10^{-6}	$+3.1 \times 10^{-6}$

In addition to the above measurements, String 9, Levels 1, 3, 2 & 4 were rechecked with the following results:

String #9	NO VOLTS	+10 V	-10 V
Level 1	$-.1 \times 10^{-6}$	$> -10 \times 10^{-3}$	$+5.3 \times 10^{-3}$
Level 3	$+.02 \times 10^{-3}$	$> -10 \times 10^{-3}$	$+4.9 \times 10^{-3}$
	$+3.4 \times 10^{-6}$	$> -10 \times 10^{-3}$	$+5.5 \times 10^{-3}$
	Varying - went to $-.2 \times 10^{-3}$		
Level 2	$+.39 \times 10^{-6}$	$+.38 \times 10^{-6}$	$+.39 \times 10^{-6}$
Level 4	$+.1 \times 10^{-9}$	$+.02 \times 10^{-9}$	$+.05 \times 10^{-9}$

386
3 of 5

Levels 1 & 3 are still questionable - A leakage measurement on string #9 will be performed for these levels from the multiplexer to the detector. It was concluded after discussions with P. E. Mamola and H. D. Warren that the values obtained are still not a good indication of a failed detector since + Nan-o-Amp values are still measured. There still may be a problem with the hook-up unique to string #9, since leakage measurements have varied and computer data also varies.

Level #2 - Good detector.

Level #4 - Values too low - would indicate an open in the lead wire or at the female connector more than a bad detector. In any case, bad detector.

Cables were interchanged between string 31 & 32. Both cables were disconnected at the multiplexer and the incore tank. The values on string 32, per Attachment 1, are string #32's values. TECo should replace either the connector in the incore tank or cable.

This data is provided for information for further analysis, if desired.

Based on the data herein, the measurement techni has been verified and additional checks will be performed.

DLA:nlf
encl.
11/21/77

4086
4085

Attachment 1

```
        OUTPUT ... DATA OUTPUT SEGMENT 2
        PLANT: TOLEDO EDISON CO. DAVIS BESSE ONE
        TIME: YEAR 77 MONTH 11 DAY 15 HOUR 14 MINUTE 31 ... EST
        SPND-UNC  28224E 03 43985E 03 47151E 03 48726E 03 79434E 02 42776E 03 15622E
                  24594E 03 35656E 03 36837E 03 40046E 03 40928E 03 36151E 03 19492E
                . 28928E 03 42654E 03 45263E 03 45458E 03 46858E 03 41287E 03 20972E
                  28175E 03 40957E 03 42321E 03 44184E 03 39423E 03 39778E 03 16277E
                  27972E 03 41251E 03 39745E 03 41238E 03 45734E 03 41361E 03 23702E
                  22479E 03 33107E 03 34545E 03 35297E 03 36729E 03 34089E 03 95752E
                  27314E 03 40147E 03 39044E 03 40953E 03 44844E 03 39269E 03 22351E
                  23915E 03 34987E 03 36589E 03 36475E 03 38503E 03 32933E 03 15953E
        9-       -76856E 18 41303E 03 14109E 04-76856E 18 46105E 03 41946E 03 24333E
                  23178E 03 33970E 03 34817E 03 34948E 03 37559E 03 33689E 03 19129E
                  27468E 03 39927E 03 39122E 03 41572E 03 44413E 03 42497E 03 22409E
        12-      -76856E 18-76856E 18-76856E 18-76856E 18-76856E 18-76856E 18 58557E
                  26580E 03 42161E 03 39019E 03 39825E 03 45549E 03 41742E 03 23626E
                  28253E 03 41059E 03 41025E 03 42184E 03 44919E 03 40193E 03 22153E
                  24150E 03 33726E 03 31283E 03 32874E 03 37763E 03 35325E 03 18181E
                  27569E 03 40421E 03 38970E 03 40212E 03 45237E 03 38285E 03 21565E
                  23587E 03 33451E 03 28036E 03 38560E 03 35217E 03 29713E 03 22044E
                  22495E 03 32721E 03 29465E 03 31171E 03 35954E 03 32529E 03 13554E
                  26432E 03 40330E 03 39164E 03 41236E 03 45315E 03 41083E 03 22531E
                  23807E 03 34047E 03 31036E 03 32946E 03 38594E 03 34323E 03 19993E
                  26168E 03 37294E 03 37303E 03 38733E 03 42009E 03 36516E 03 19172E
                  29517E 03 42447E 03 40674E 03 43138E 03 45512E 03 43378E 03 21489E
                  23056E 03 32444E 03 29323E 03 30914E 03 36397E 03 33793E 03 18727E
                  27284E 03 39464E 03 21626E 03 22169E 03 43159E 03 38555E 03 19719E
        35%       27156E 03 39428E 03 40359E 03 41746E 03 45523E 03 42387E 03 24051E
        FP        26086E 03 37376E 03 34151E 03 36108E 03 42978E 03 40163E 03 18187E
                  26455E 03 38324E 03 19556E 03 21541E 03 41110E 03 35964E 03 19772E
        NEW       21565E 03 33036E 03 30827E 03 31341E 03 35566E 03 34168E 03 19085E
        CABLE     27192E 03 43970E 03 42539E 03 43496E 03 45781E 03 41287E 03 23267E
                  26275E 03 41946E 03 44231E 03 43995E 03 45958E 03 39757E 03 14454E
        31        22611E 03-76856E 18-76856E 18-76856E 18-76856E 18-76856E 18-76856E
        32        22316E 03 33203E 03 30930E 03 32834E 03 35172E 03 33756E 03 18132E
                  21128E 03 30342E 03 25900E 03 28584E 03 32495E 03 29455E 03 16574E
                  21534E 03 30657E 03 27516E 03 28621E 03 34251E 03 32015E 03 17225E
                  22688E 03 33930E 03 31199E 03 31837E 03 37702E 03 34488E 03 16513E
                  24547E 03 36567E 03 37417E 03 37616E 03 39220E 03 34328E 03 16271E
                  17959E 03 28900E 03 31337E 03 31373E 03 32256E 03 27963E 03 12990E
                  22930E 03 35932E 03 31952E 03 35237E 03 35267E 03 32824E 03 12783E
        39       -76856E 18-76856E 18-76856E 18 95507E 02-76856E 18 48119E 02-76856E
                  23781E 03 35017E 03 32682E 03 36564E 03 40373E 03 35763E 03 17659E
                  22498E 03 32964E 03 30597E 03 31852E 03 35938E 03 32766E 03 16571E
                  24225E 03 36593E 03 33307E 03 35079E 03 35541E 03 35016E 03 16620E
                  23022E 03 32806E 03 30751E 03 30125E 03 35617E 03 34507E 03 18681E
        44-      -76856E 18 34936E 03 34560E 03 35572E 03 35746E 03 34325E 03 13849E
                  16036E 03 25454E 03 26600E 03 28521E 03 29249E 03 25348E 03 13576E
                  12138E 03 19044E 03 20275E 03 20025E 03 21278E 03 18531E 03 32423E
                  22034E 03 33432E 03 30212E 03 32118E 03 37459E 03 33807E 03 18324E
                  15349E 03 22682E 03 22835E 03 23030E 03 24894E 03 21925E 03 12773E
                  16440E 03 25319E 03 25730E 03 26100E 03 26167E 03 25733E 03 12573E
                  23107E 03 33588E 03 30967E 03 25845E 03 37052E 03 33168E 03 16814E
                  24977E 02 13957E 03 14787E 03 15178E 03 17021E 03 14706E 03 83015E
                  10159E 03 14519E 03 14069E 03 15375E 03 15865E 03 14720E 03 54285E
        BKGD     -83012E 02 28172E 02-85051E 01-37477E 01 14267E 02-12529E 02 25962E
        12       -24490E 01 18486E 02-91553E 01 48471E 01-76856E 18 14932E 02-23467E
                  15976E 02 43990E 01-12879E 01 72482E 01 47327E 01-10761E 02-54671E
                 -15250E 02 99715E 01-42424E 01 21418E 02-72758E 01-55169E 01-12452E
        31       -32073E 02-26925E 02-76856E 18-11842E 01-12482E 01 34995E 01 14525E
        39        63175E 01 56127E 00-34803E 02-76856E 18-84582E 01 75767E 01-49917E
                  86718E 01-28797E 02-44028E-01 39216E 01 43755E 01 57224E 01-14271E
                  10...E 01 28553E 01-12...E 02
```

5086 5085

BWNP-20217 (12-76)

SITE PROBLEM REPORT

TRANSMITTAL FOR ACTION

DEC 19 1977

To: Change Control	For Distribution	File: 13-	
S. H. Klein	For Information	Contract No:	620-00 14
To: F. Faist	For Action	SPR Number:	391- Rev. 01
J.A. Castanea	For ~~Action~~ info	Title:	Failed Incore Detectors
To:	For Information		
B. A. Karrasch	For Information		
D. Halloran	Nuclear Service	Status Code:	R

Date of Transmittal: 12-13-77

Reply Required By: ASAP

Action Requested: Fred Faist is requested to complete this SPR.

Reply and Return This Transmittal to: Doug Holsted
Nuclear Service Support Engineer

Reply: Please provide resolution on the SPR Form

1. Is this problem applicable to other contracts? Yes ___ ; No ___

   A. If yes - identify applicable contracts ___

2. Please provide Disposition on or before the Reply Required date if Resolution is incomplete ___

(Signed) (Date)

CC: C. C. Plunkett-Contract Administration (1)
J. R. Bohart - International Support
F. R. Faist-TECo Site
L. C. Rogers-TMI Site
P. E. Perone-OFR (1&2)

A006
6026

BWNP-20345-1 (8-78)

X

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

To: Change Control For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

B.J Shepherd - Task Engineer (s)

R.C. Cohen - Project Manager

File: 13- 14- 440

Contract No.: 620-00 14

SPR: 440 , Rev 0

Title: ICS Module Failures (820)

Date: 10/4/78

Status Code: C

✓ L. C. Rogers - MET. ED.

✓ J. R. Bohart - Intl. Support

✓ B. A. Karrasch - Plant Integration

✓ P. E. Perrone

✓ J. Laubenheimer

Attached is one copy of Site Problem Report No. 440 which was processed on Contract 620-00 14. This SPR has been reviewed for generic applicability and this problem ~~is~~/is not considered applicable to other contracts.

REMARKS:

RECEIVED OCT 05 P.M. DBO

COMPLETED

J.D. Fulcher

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

184

TELECOPY TO: BOBBY HARRIS ... pages ... F. R. Faist

PDS-21091-5(8-76)

SITE PROBLEM REPORT — BABCOCK & WILCOX — SPR #440

CUSTOMER	ORIGINATOR / DATE	DOC. ID. / CONT. NO. / SPR NO. / REV. NO.
Toledo Edison Company	F. R. Faist 4/21/78	13 - 620-0014 / 4 / 0
VENDOR: BMCo	F.A. NO.: 020 592 LJ	PART NO./TASK NO. GROUP NO. SEQ. NO.: 21/015/001
TITLE (MAX 30 CHARACTERS): ICS Module Failures (820)		PROBLEM CONTACT: F. P. Faist

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM:

#1 P/N 6623695A1 Summer + Bias Module - Summer output oscillates +1-0.06 VDC.

#2 P/N 6624150A1 Summer + Integral Module (BAL-2 Pot has no effect) - will not slow down, will not speed up. Can't balance - Pin 11 grounded.

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

TECo aware of problem. Requested RMM & P. O.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

1. Bobby Harris obtain P. O. requisition.
2. Site to clear upon repair and return of parts.

RESOLUTION

RESOLUTION:

MODULES TO BE REPAIRED UNDER P.O. # 032931 LT (C.A. #83-761094-04)

PREPARED BY	DATE	APPROVED BY	DATE
Dennis Z. Rice		J. C. Lauer	4-25-78
REVIEWED BY: R. E. Wilson for ...	4/24/78		
4/25/78			

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM OTHER ☒	☐ YES NO ☒	04- N/A	☐ YES NO ☒

COMPLETION

SITE COMPLETION REPORT: Bailey records show repaired parts returned to TECo via UPS on 7/5/78. TECo records are not able to confirm. Customer notified. We consider the item closed.

DEVIATIONS: ☒ NONE SPR REV NO. ☐

DATE COMPLETED: 9/22/78

COMPLETED BY: T. F. Scott — DATE 9/22/78

I. D. Green, I D Green 9/22/78

SHEET 1 OF 3

BWNP-20090A-3(1-78)

BABCOCK & WILCOX

NPGD

PROCUREMENT AUTHORIZATION (PA)

SHEET 1 OF 2

TO: D. M. TURNER	CONTRACT NO. 620-0014	PS NO. 83-761094-04
FROM: D. L. RICE	SUPPLIER Bmco.	DATE 4-21-78
CUSTOMER & PLANT SITE TECO DAVIS BESSE I		PURCHASE ORDER NO. 0324 7147

FUNCTION
- [ ] REQUEST FOR BID
- [x] PLACEMENT OF ORDER
- [ ] RELEASE FOR ENGRG
- [ ] REL. FOR MAT'L PROC.
- [ ] RELEASE FOR MFG.
- [ ] RELEASE FOR SHIP.
- [ ] CHANGE ORDER
- [ ] HOLD
- [ ] OTHER

ATTACHMENTS: SPR - 440

RECEIVED

APR 24 1978

Release Administration

- [ ] QA APPROVED SUPPLIER NOT REQUIRED

DOES 10CFR21 APPLY? [ ] YES [x] NO IF YES, IDENTIFY APPLICABLE ITEMS

INSTRUCTIONS

Re. old P.O. # 020 542 LJ

SPR # 440

REQUEST A PURCHASE ORDER BE ISSUED TO Bmco. TO REPAIR OR REPLACE THE FOLLOWING (820) MODULES:

1) SUMMER + BIAS MODULE, P/N 662369 5 A1.

2) SUMMER + INTEGRAL MODULE, P/N 662415 0 A1.

CHARGE NO.		DISTRIBUTION LIST	SIGNATURE & DATE
859-7014 21-14		J.A. LAUER	PREPARED BY Connie L. Rice 4-21-78
ITEM NO	PART OR TASK GROUP SEQ	R.L. PITTMAN	REVIEWED BY for W.H. Spangler 4-21-78
A1	21-015-001	T.G. WOLCOTT	APPROVED BY C.C. Lauer 4-24-78
		F.R. FAIST	SUPPLIER/FABRICATOR ACCEPTANCE*
		PROJECT CONTROL C.L. PLUNKETT	
		QUALITY ASSURANCE S.H. KLEIN	
		REL. ADM./R.C.	

*ALTERING THIS PA CONSTITUTES A REJECTION REQUIRING WRITTEN ASSENT FROM THE ORIGINATOR BEFORE PROCEEDING.

Pg 2 of 3 3 of 4 SPR 440

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	T. D. Murray, Station Superintendent		
From	I. D. Green, Site Operations Manager, NSS-14		BDS 663-5
Cust.	Toledo Edison Company	File No. or Ref.	620-0014 12B21
Subj.	Bailey Shipment of Repaired Equipment	Date	9/22/78

This letter to cover one customer and one subject only

Dear Terry:

Bailey's records of repaired equipment indicate that the following equipment has been shipped to Toledo Edison, Davis-Besse I, by UPS on July 5, 1978:

a. Summer & Integral Module (820), Part #6624150A1 (RMR-6188).

b. Summer & Bias Module (820), Part #6623695A1 (RMR-6187).

We have tried to confirm the receipt of this equipment in TECo's storeroom. but have been unsuccessful. B&W is closing our records on these repairs.

If you have any questions, please advise.

IDG:TFS:nlf
cc: J. R. Lingenfelter
D. C. Hitchens
K. P. Aeble

484

~~Start 3 of~~ 3
SUB 440

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

To: Change Control For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

RL Lutz - Task Engineer(s)

R.C. Luken - Project Manager

File: 13-14-379

Contract No.: 620-00 14

SPR: 379, Rev 0

Title: 2 Ampex Ckt. Brd. Failures (855)

Date: 7/31/78

Status Code: C

L. C. Rogers - MGT. ED.

I-D. GREEN-TOLEDO

J. R. Bohart - Intl. Support

B. A. Karrasch - Plant Integration

P. E. Perrone

Attached is one copy of Site Problem Report No. 379 which was processed on Contract 620-00 14. Future contracts have been reviewed for the potential of a similar problem. This problem is/is not considered applicable to other contracts __________.

REMARKS:

J.D. Fulcher

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

1 of 3

NOV 1 0 1977 Cleared PDS-21091-5(8-76)

SITE PROBLEM REPORT

BABCOCK & WILCOX SPR #379

PROBLEM IDENTIFICATION

CUSTOMER	ORIGINATOR / DATE	DOC. ID. / CONT. NO. / SPR NO. / REV. NO.
Toledo Edison Company	F.R.Faist 10/24/77	13 · 620-0014 · 379 · 0
VENDOR: BMCo	P.A. NO.: 020 561 LF	PART NO./TASK NO. / GROUP NO. / SEQ. NO.: 25/030/003
TITLE (MAX 30 CHARACTERS): 2 Ampex Ckt. Brd. Failures (855)		PROBLEM CONTACT: D. L. Allison

DESCRIPTION OF PROBLEM: (DB-255) Part #DR-4-3228802-02J
One card, as tagged, DRB-20 from Drawer 4 has a failure associated with Bit 3. Other card, as tagged, DRB-17 from Drawer 5 has an intermittent loss of Bit 2. Both problems were corrected by replacing the card from customer stock.

Req'd. Resolution Date: 11/20/77 Req'd. Completion Date: 12/1/77

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:
BMCo P.S.S. aware of problem.
TECo aware of problem.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:
Dennis Rice is requested to obtain P. O. for repair of the above two cards.

RESOLUTION

RESOLUTION: Repair circuit cards on P.O.# 032372LT.
Use repaired circuit cards to replace spares.

PREPARED BY	DATE	APPROVED BY	DATE
J. Halsted	10-28-77	J. O. Lanes	11-2-77
REVIEWED BY: N. M. Sunding For K.R. Sullivan	10/31/77		

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM OTHER ☒	☐ YES NO ☒	04- N/A	☐ YES NO ☒

COMPLETION

SITE COMPLETION REPORT:
Bailey records show repaired parts returned. TECo records are not able to confirm. Customer notified. We consider the item cleared.

DEVIATIONS: ☒ NONE SPR REV NO. ☐

DATE COMPLETED: 7/28/78

COMPLETED BY	DATE
T. F. Scott	7/28/78
F. R. Faist	7/28/78

SHEET 2 OF 3

DB-255 DLA

PROBLEM REPORT

Product/System	File No.	Date of Problem	From
		10/?/77	D. E. Shaffer
		1220 M	Emp No. 2432 / Acct No. 753
Customer/Plant: Toledo Edison, Davis-Besse I		020 561 LF	Mail Sta/Loc: Site (DB-255)
- Aplex Ckt. Boards Failures (655)		-- / Date Code --	Serial No. and/or Part No.: DP-4-3228802-02J

PROBLEM

One card, as tagged: DRB-20 from Drawer 4 has a failure associated with Bit 3.

Other card, as tagged: DRB-17 from Drawer 5 has an intermittent loss of Bit 2.

Both problems were corrected by replacing the card from customer stock.

For Field Use: Days Service / Class of Service / Expenses $ / Material $ / SPO No.

Allocation: [X] Product [ ] System [ ] Warranty [ ] Sys. Engr. Error [ ] Other

Defective Part Returned: [ ] No [X] Yes On ____ Date ____ RM No.

Failure Occurred: [ ] On Receipt [ ] In Service (Warranty) [X] In Service (Non Warranty)

3 yrs. Est. Time in Service

Possible Cause for Problem: 80 Faulty Material; 81 Faulty Manufacturing; 82 Faulty Design; 83 Performance Deficiency; 84 Faulty Packaging; 85 Component Failure; 86 Wearout; 87 Improper Application; 88 Operating Environment; 89 Insufficient Instructions (Documentation)

Effect on System (Briefly): Caused intermittent failures of the plant computer system.

Customer Attitude: [ ] Major Concern [X] Concerned [ ] Unconcerned

[ ] Cont'd on separate sheet

Date Solution Required ____ or [X] Info Only

Signature: ____ Date: 10/19/77

REPORT OF INVESTIGATION & CORRECTIVE ACTION (BY FIELD IF APPLICABLE)

Operating Conditions: Ambient Temp. 70-90 °F; Atmosphere [ ] Clean [X] Average [ ] Dirty; Humidity [ ] Hi [ ] Lo [X] Avg.

Time Required to: Repair ____ Troubleshoot ____ Recalibrate ____

Failure Details: Part No. ____ Describe (Diode, Cap., Transistor, Etc.) ____ Circuit Symbol (C1, R1, Q1) ____ Mfg. of Part (If Known) ____

How Part Failed: [ ] Short [ ] Open [ ] Mech. Damage [ ] Adjustment [ ] Dirty [ ] Unknown [ ] Other (Describe)

Copies: Quality Assurance; Prod. Liability; Prod. Management; NPO; FPO; IPPO; ASPO; Warranty ...; ... Engr.; Component Engr.

Copies ____ [ ] Preliminary Ans. [ ] Final Solution | Signature | Date | Approval | Date

Follow Up on Corrective Action

Disp. of R.M. ____ Date Rec'd ____ Date Returned ____

Hours Spent Solution: Dept. | Man. | Hrs.

Qty	Name	Part No.	Comments

3 of 3

MAR 7 1978

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

TO: Change Control ______ For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

B.J. Shepherd - Task Engineer

J. Lauer - Project Manager

N.M. Seeling

FILE: 13-14-394

CONTRACT NO: 620-00 14

SPR 394

TITLE ICS Turbine Header Pressure Control

DATE: 2/20/78

STATUS CODE C

______ L. C. Rogers - MET. ED.

______ F. R. Faist - TOLEDO ______

______ J. R. Bohart - Intl. Support ______

______ J. L. Donnell - OFR ______

______ B. A. Karrasch - Plant Integration ______

______

CLOSED

Attached is one copy of Site Problem Report No. 394 which was processed on Contract 620-00 14. Future contracts have been reviewed for the potential of a similar problem. This problem ~~is~~/is not considered applicable to other contracts ______.

REMARKS: ______

[signature]

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

1 of 3

MAR 7 1978 Cleared

FB6-21091-9(6-76)

SITE PROBLEM REPORT — BABCOCK & WILCOX — SPR #394

CUSTOMER	ORIGINATOR	DATE	DOC. ID.	CONT. NO.	SPR NO.	REV. NO.
Toledo Edison Company	F.R.Faist	11/23/77	13	620-0014	394	0

VENDOR	P.A. NO.	PART NO./TASK NO. GROUP NO. SEQ. NO.
BMCo	020 592 LJ	21/030/001

TITLE (MAX 50 CHARACTERS)	PROBLEM CONTACT
ICS Turbine Header Pressure Control	P. C. Rouse W. Rouse

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM: On 11/21/77, while trouble shooting a problem with #2 HP governor valve, the turbine "latch" was reset while the turbine bypass valves were in automatic. This action caused the ICS to control from the selected pressure transmitter. The opposite header pressure went high and lifted the main steam code safety valves. TECo operations know they should have taken manual control of turbine bypass valves in accordance with startup procedure. SPR #356 addresses the same type problem.

Req'd. Resolution Date: ASAP
Req'd. Completion Date: ASAP

CLOSED

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

TECo aware of problem. Gary Gibbs aware of problem.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

NPGD Engineering evaluate configuration of ICS as wired per FCP #33, Rev. 01.

RESOLUTION

RESOLUTION:

See attached sheet

PREPARED BY	DATE	APPROVED BY	DATE
R. H. Harris	2/13/78	J. A. Lauer	2-20-78
REVIEWED BY K. R. Ellison for K.R.Ellison	2/14/78		

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM ☐ OTHER — NONE	☐ YES NO ☑	04- N/A	☐ YES NO ☑

COMPLETION

SITE COMPLETION REPORT:

See attached sheet.

DEVIATIONS: ☒ NONE SPR REV NO. ☐

DATE COMPLETED: 2/8/78

COMPLETED BY F. R. Faist F.R. Faist DATE 2/8/78

F. R. Faist F.R. Faist 2/8/78

SHEET 2 OF 3

SPR #394
620-0014

<u>SITE COMPLETION REPORT:</u>

No further action required.

This situation was created when the resolution to SPR #356 was implemented.

Turbine trip signal to ICS is a turbine latch signal, and doesn't necessarily mean that both MS loops are connected when trying to control bypass valves in both loops with one signal.

Operators have resolved this by placing turbine bypass valve controls in manual when latching turbine. Once stop valves are opened, they return them to manual.

<u>RECOMMENDATION:</u>

Turbine trip signal to ICS should come off turbine stop valve closed position, or operators should be instructed to take manual control of turbine bypass valves when stop valves are closed.

FRP:nlf
2/8/78

3 of 3

FEB 1 3 1978

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

FILE: 13-09-145

CONTRACT NO: 620-00 09

SPR 145

TITLE No PZR Spray flow with 1 RCP Op.

DATE: 2-1-78

STATUS CODE C

TO: Change Control For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

R.G. Barnley - Task Engineer

C.D. Russell - Project Manager

[redacted]

L. C. Rogers - MET. ED.

F. R. Faist - TOLEDO

J. R. Bohart - Intl. Support

J. L. Donnell - OFR

B. A. Karrasch - Plant Integration

CLOSED

Attached is one copy of Site Problem Report No. 145 which was processed on Contract 620-00 09 . Other contracts have been reviewed for the potential of a similar problem. This problem is/~~is not~~ considered applicable to other contracts Is [illegible] generic "problem" although it does occur [illegible]

REMARKS:

NSS LOST CAPACITY CLEARED

[illegible]

NUCLEAR SERVICE SUPPORT ENGINEER

1 of 3

PDS-21061-3(8-76)

FEB 1 3 1978

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER	ORIGINATOR	DATE	DOC. ID. CONT. NO.	SPR NO.	REV. NO.
Duke Power Co.	H.W. Pollock	1/25/78	13 - 620-0009	145	00

VENDOR	P.A. NO.	PART NO./TASK NO.	GROUP NO.	SEQ. NO.
		28	41	02

TITLE (MAX 30 CHARACTERS)	PROBLEM CONTACT
No PZR Spray with 1 RCP Op.	H.W. Pollock

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM:

1-24-78 (1200) - Plant was being heated up following final venting after maintenance S/D. Temp = 200°F, Press. = 400 psi. Attempts to initiate spray flow with one RCP operating, were unsuccessful. RCP 3B1 was operating, and all parameters appeared normal. As a further effort, RC1 → closed and RC-2 & 3 → opened, but this was also unsuccessful. One RCP provides insufficient dP to cause spray flow.

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

Started RCP 3A1 and noted normal spray flow. Heatup was delayed approx. 6 Hrs.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

Site will provide a note in the startup procedure calling attention to possible necessity to have 2 RCP's running in order to achieve proper spray flow.

RESOLUTION

RESOLUTION:

INFORMATION ONLY CLOSED

NSS

LOST

PREPARED BY	DATE	APPROVED BY	DATE
D.J. Curtin	2-...		
REVIEWED BY	DATE		

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM ☐ OTHER	☐ YES ☐ NO	04- NA	☐ YES NO ☒

COMPLETION

SITE COMPLETION REPORT:

INOPERABLE CAPACITY

DEVIATIONS: ☐ NONE	SPR REV NO. ☐
COMPLETED:	
COMPLETED BY	DATE

SHEET 2 OF 3

SITE PROBLEM REPORT — BABCOCK & WILCOX

CUSTOMER	ORIGINATOR	DATE	DOC. ID. CONT. NO. SPR NO. REV. NO.
ANS-3	[illegible]	1/25	13

VENDOR	P.A. NO.	PART NO./TASK NO. GROUP NO. SEQ. NO.
B/W		

TITLE (MAX 30 CHARACTERS)	PROBLEM CONTACT
Misc delays in start-up	

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM:

① 1200 - 1/24/78 Initiating RCS heat up following completion of final vent. Attempted to initiate spray flow via RC-1 & RC-3. unsuccessfull. 3B1 RCP pump operating, all parameters appeared normal. ~ 6 hours (~.24)

~ 400 psi
200 °F

② 1-23 thru 1/25/78 Misc chemistry holds. RCS Cl & secondary spec. cond. ~ 19 hrs final FW.
~ 24 hour total

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

① closed RC-1, opened RC-2 & RC-3 in attempt to establish spray flow. Not successful. Started RCP 3A1. Flow normal. Evident that under certain conditions, RCP provides insufficient ΔP to establish flow.

② Clean up RCS via deborating demin proved successful. [illegible]

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

① Insert note in start up procedure to highlight possibility of possible requirement for 2 RCP's to provide PZR spray flow.

② Request Powdex Recoat prior to RCS heatup.

RESOLUTION

RESOLUTION:

GRP - Seq - Mark No.
047 002 3RC-V2 [illegible] spray control valve
091 006 3RC-V5/3-50-3 PZR spray Isol V/v
No failure of equipment. Error in procedure.

PREPARED BY	DATE	APPROVED BY	DATE
[illegible]	1/25		
REVIEWED BY	DATE		

	COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
	☐ NORM OTHER ☐	☐ YES NO ☐	04-	☐ YES NO ☐

COMPLETION

SITE COMPLETION REPORT:	DEVIATIONS: ☐ NONE SPR REV NO ☐
	DATE COMPLETED:
	COMPLETED BY DATE
	SHEET 3 OF 3

BWNP-20345-1 (8-78)

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

To: Change Control For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

[illegible] - Task Engineer (s)

[illegible] Project Manager

File: 13- 4-291

Contract No.: 620-00 04

SPR: 291 Rev 0

Title: ICS transient

Date: 2/9/79

Status Code: C

______ L. C. Rogers - MET. ED.

______ J. P. Bohart - Intl. Support

______ B. A. Karrasch - Plant Integration

______ P. E. Perrone

______ A. E. Paulson

______ B.W. Street

Attached is one copy of Site Problem Report No. 216 which was processed on Contract 620-00 04. This SPR has been reviewed for generic applicability and this problem ~~is~~/is not considered applicable to other contracts.

REMARKS: Fixed load reduction

RECEIVED FEB 16 A.M. DBO

COMPLETED

Mike Duren

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

1-82

FDS-21091-5(8-74)

SITE PROBLEM REPORT — BABCOCK & WILCOX

PROBLEM IDENTIFICATION

CUSTOMER	ORIGINATOR / DATE	DOC. ID. CONT. NO. / SPR NO. / REV. NO.
[illegible]	[illegible]	13 - [illegible] / 291 / [illegible]

VENDOR	P.A. NO.	PART NO./TASK NO. / GROUP NO. / SEQ. NO.
[illegible]		21 / 030 / 003

TITLE (MAX 30 CHARACTERS)	PROBLEM CONTACT
[illegible]	[illegible]

DESCRIPTION OF PROBLEM:

On [illegible] while [illegible] at [illegible], the [illegible] put the [illegible] in manual. He [illegible] the [illegible] [illegible] and [illegible] the [illegible] stations to manual. After [illegible] placed the ICS to Auto but a ΔT_c oscillation resulted [illegible] that required the operator to take manual control of FW and a reduction in Rx [illegible] from ≈ 99% to 75%. (RPS limits were observed during the transient)

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

A work request was written to investigate.

@ ≈ 1630 h. pwr was ↑ to ≈100%

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

For Information Only

INFORMATION ONLY

RESOLUTION

RESOLUTION:

NSS LOST CAPACITY

PREPARED BY	DATE	APPROVED BY	DATE
REVIEWED BY	DATE		

	COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
	☐ NORM ☐ OTHER	☐ YES ☐ NO	04-	☐ YES ☐ NO

COMPLETION

SITE COMPLETION REPORT:

DEVIATIONS: ☐ NONE — SPR REV NO. ☐

DATE COMPLETED:

COMPLETED BY: [illegible signature] — DATE: 2/9/79

SHEET 1 OF 1

NSS- 8
SPR 596

TITLE Dry OTSG Following Turbine Trip Test
RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS-____________________. The following is the status and/or resolution of this SPR on other contracts.

REMARKS

Not Generic.

RLP
1-13-75

NSS-

(3)

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

**** CLEARED ****

TO: ______________________ For Information

Central Engineering Files

C. C. Plunkett - Contract Admin.

C. M. Fletcher - Quality Assurance

J. F. Hoasie - Task Engineer

G. M. Olds - Sr. Proj. Manager

FILE: 12M2

CONTRACT NO: 620-00 08

SPR 596

TITLE Dry OTSG After Turbine Trip Test.

DATE: 2/18/75

The attached, cleared SPR is submitted for your information.

TO: ______ J. L. Hollis - FLORIDA

______ E. L. Logan - SMUD

______ B. L. Day - TOLEDO

______ J. A. Bailey - Ark.

Attached is one copy of Site Problem Report No. 596 which was processed on Contract 620-00 08. Future contracts have been reviewed for the potential of a similar problem. This problem is/is not considered applicable to other contracts ______________________.

REMARKS:

cc: R. E. Kosiba

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

-21091-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Arkansas Power & Light CONTRACT NO. 0008 SPR NO. 596 REV. NO. 0

VENDOR B&W P.O. NO. 8M04 TASK NO. 55 GROUP NO. 10 SEQ. NO. 1

SITE ENGINEER D. A. Downtain | REQ'D. RESOL. DATE | REQ'D. COMP. DATE

TITLE
DRY OTSG FOLLOWING TURBINE TRIP TEST

DESCRIPTION OF PROBLEM

See Attached Sheet.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

See Attached Sheet.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

See Attached Sheet.

David A. Downtain 1/8/75 | J. A. Bailey 1/8/75

RESOLUTION SEE J.F. HOOSIC'S LETTER TO G.K. WAMBLING DATED 1/17/75 (ATTACHED) CLASSIFIES TRANSIENT.

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[signature]	1/20/75
TASK ENGINEER	SEE LETTER FROM J.F. HOOSIC DATED	1/17/75
	STATING CLASSIFICATION OF TRANSIENT.	
PROJECT MANAGER	[signature]	2/19/75

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR/CLAIM

AUTH. CHARGE NO ☐ FIELD CHANGE REQ FC NO

SITE COMPLETION REPORT

~~SCM~~ REM - 1 written to customer advising him of classification of transient.

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED 1/24/75 SIGNED BY David A. Downtain

S.O.M./CONSTR. REP. APPROVAL J. A. Bailey DATE 1/24/75

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 12V.2

Babcock & Wilcox

SPR #596

Description of Problem

Following the Turbine Trip Test from 100% FP, the plant operators started the Auxiliary Feedwater Pump and secured the Main Feedwater Pump (actual elapsed time between trip and securing of Main FW Pump is unknown - estimated to be ≈3 to 5 minutes). Because of problems with the Auxiliary FW Pump, feedwater flow was not adequate to maintain OTSG level. As a result, approximately 27 minutes after the Turbine was tripped, the level in 'A' OTSG had dropped below 8 inches on the Startup Range with an accompanying drop in OTSG outlet steam pressure from approximately 960 psig to approximately 700 psig. Attached is Figure 8 - OTSG Pressure and Level vs. Time, from STR #189-Turbine/Reactor Trip, TP 800.14-Turbine Trip from 100% FP.

At the same time, 'B' OTSG level reached approximately 8 inches on the Startup Range and steam pressure of approximately 700 psig. At this point in time, Emergency Feedwater was initiated and 'A' OTSG level was restored using condensate from the Condensate Storage Tank while 'B' OTSG remained on Main Feedwater.

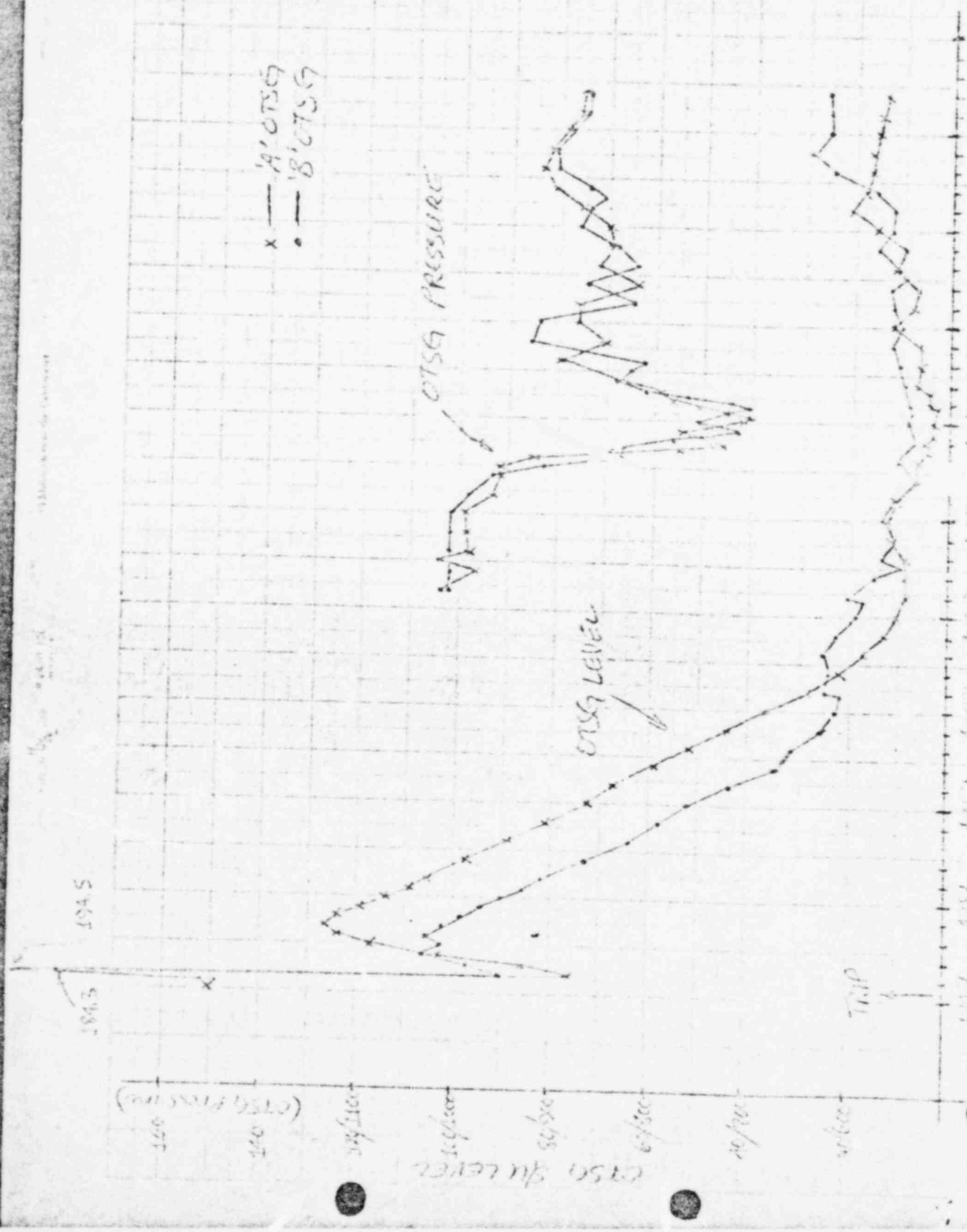
Status - Action to Date Including Persons Contacted

R. J. McConnell, et. al., informed during morning status telecon.

Further Action Recommended by Site Personnel

Request that Lynchburg analyze data for classification of transient.

FIG. 8 - OTSG PRESSURE & LEVEL VS. TIME



THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	G. K. WANDLING - NUCLEAR SERVICE, LYNCHBURG
From	J. P. HOOSIC - NPGD - MECHANICAL DESIGN WEST BARBERTON ENGINEERING
Cust.	ARKANSAS POWER
File No. or Ref.	620-0008-55
Subj.	SPR NO. 596 - DRY OTSG FOLLOWING TURBINE TRIP TEST
Date	JAN. 17, 1975

This letter to cover one customer and one subject only.

West Barberton's choice for classification of this transient is 17A (loss of feedwater to one OTSG), as described in Specification CS(F) 3-33/NSS-8/0372. The second most appropriate choice is 8B (reactor trip).

J. P. Hoosic

J. P. Hoosic

JPH:cak

(2)

PLANT STARTUP SERVICE

SITE PROBLEM REPORT TRANSMITTAL

TO: J. A. BAILEY — For Action

FILE - 12M2

CONTRACT 620-00 08

SPR 596

TITLE DRY OTSG FOLLOWING TURBINE TRIP TEST.

TO: G. M. OLDS — For Information

J. F. HOOSIC

E. M. LIVINGSTON

DATE 1/20/75

Date Final Resolution Required by Nuclear Service Support Engineer

Action Requested: SITE IS REQUESTED TO CLEAR THIS SPR. TRANSIENT CLASSIFIED BY WEST BARBERTON (J. F. HOOSIC) - SEE ATTACHED MEMO.

cc: Central Engineering Files
C. C. Plunkett - Contract Admin.
C. M. Fletcher - NPG Quality Assurance
E. L. Logan - SMUD
J. A. Bailey - ARKANSAS
B. L. Day - TOLEDO
J. L. Hollis - FLORIDA
R. E. Kosiba

Direct reply in writing to N.S. Support Engineer. Please reply immediately whether answer is final or preliminary.

G. K. WANDLING

Nuclear Service Support Engineer

NSSE

MANHOUR LIMITS	
COST LIMITS	
CHARGE NO.	
APPROVED:	Project Manager

ORIGINAL

PLANT STARTUP SERVICE

SITE PROBLEM REPORT TRANSMITTAL

FILE - 12M2

TO: E. M. LIVINGSTON For Action

CONTRACT 620-00 08

SPR 596

TITLE DRY OTSG FOLLOWING TURBINE TRIP TEST.

TO: G. M. OLDS For Information

DATE 1/13/75

Date Final Resolution Required by Nuclear Service Support Engineer

Action Requested: E. M. LIVINGSTON IS REQUESTED TO ANALYZE THIS SPR & ACCOMPANYING DATA FOR CLASSIFICATION OF TRANSIENT.

cc: Central Engineering Files
C. C. Plunkett - Contract Admin.
C. M. Fletcher - NPG Quality Assurance
E. L. Logan - SMUD
J. A. Bailey - ARKANSAS
B. L. Day - TOLEDO
L. C. Rogers - MET ED
J. L. Hollis - FLORIDA
K. E. Kosiba

Direct reply in writing to N.S.Support Engineer. Please reply immediately whether answer is final or preliminary.

G. K. WANDLING

G K Wandling

Nuclear Service Support Engineer

MANHOUR LIMITS ________

COST LIMITS ________

CHARGE NO. ________

APPROVED: ________
Project Manager

NS-009
SPR-58

TITLE Elect. rel. valve

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS-__________. The following is the status and/or resolution of this SPR on other contracts.

REMARKS

ORIGINAL

Not a B&W Problem – customer problem
RSB

NSS-

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

To ______________________ For Information

C.A. Creacy

C. C. Plunkett - Contract Admin.

Central Engineering Files

C.M. Fletcher Quality Assurance

FILE: 12M2
Contract 620-00 09

SPR 58

TITLE Electromatic Relief Valve failed to open

DATE AUG 6 1974

The attached, cleared SPR is submitted for your information.

TO: ____ B.L. Day ____ J. N. Kaelin

____ L.C. Rogers

____ E.L. Logan

____ R.G. Bumley

Attached is one copy of Site Problem Report No. 58 which has been processed on Contract 620-00 09. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: At normal temperature and pressure the valve operated properly

cc:

Earl H. Davis

NUCLEAR SERVICE SUPPORT ENGINEER

Earl H. Davis, Jr.

CLEARED

PDS-21091-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO 620-0009	SPR NO. 58		REV. NO. 0
VENDOR DRESER	P.O. NO.	TASK NO. 28	GROUP NO 41	SEQ. NO. 02
SITE ENGINEER J. J. Wald	REQ'D. RESOL. DATE	REQ'D. COMP. DATE		

TITLE

ELECTROMATIC RELIEF VALVE 3 RC - 66 (3 RC - RV3)

DESCRIPTION OF PROBLEM

SEE ATTACHED:

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

NONE - for information only

Will clear SPR if valve operates satisfactory at 2155 psi and 532° F Reactor Coolant System conditions.

ORIGINATOR SIGNATURE	DATE	SIGNATURE	DATE
J.J. Wald	6/4/74	R J Bakerf	6/4/74

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER EJP		
TASK ENGINEER		
PROJECT MANAGER		

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO

COMPLETION

SITE COMPLETION REPORT

AT REACTOR COOLANT SYSTEM CONDITIONS OF 2155 PSI AND 532°F VALVE 3RC-66 (3RC-RV3) OPERATED PROPERLY.

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO

DATE COMPLETED 6-20-74 SIGNED BY J. R. Albert

S.O.M./CONSTR. REP. APPROVAL DATE 6/20/74

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 12M.2

Babcock & Wilcox

SPR - #58 Rev. 0
June 4, 1974
Oconee - Unit 3

Title: ELECTROMATIC RELIEF VALVE 3 RC-66 (3RC-RV3)

DESCRIPTION OF PROBLEM

The pilot actuated electromatic relief valve failed to open during the low pressure steam test sequence of TP/230/10, Quench Tank Operational Test. Subsequent investigation revealed that the vent port plug cap had not been removed. After the plug cap had been removed, the valve opened normally; however, it would not close. The solenoid shaft had become cocked and jammed against the pilot valve lever arm. Duke Power Company Maintenance personnel reported that after re-aligning the shaft and lubricating the roller, the valve operated properly.

JJW/bh

BWNP-20345 (6-78)

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

JUN 26 1978

To: Change Control For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

B.J. Shepherd - Task Engineer(s)

L.R. Plethe - Project Manager

File: 13-06-185

Contract No.: 620-00 06

SPR: 185, Rev 0

Title: Loss of Feedwater Trip on 19 Apr '78

Date: 6/23/78

Status Code: C

\- L. C. Rogers - MET. ED.

\- F. R. Faist - TOLEDO

\- J. R. Bohart - Intl. Support

\- B. A. Karrasch - Plant Integration

\- P. E. Perrone

\- W. M. Kelly

\- G. K. Wondbig

Attached is one copy of Site Problem Report No. 185 which was processed on Contract 620-00 06. Future contracts have been reviewed for the potential of a similar problem. This problem ~~is~~/is not considered applicable to other contracts.

REMARKS:

COMPLETED

J. D. Fulcher

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

sh 1004

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER	ORIGINATOR / DATE	DOC. ID.	CONT. NO.	SPR NO.	REV. NO.
Jersey Central	L. Rogers 4/30/78	13	620-0006	185	0

VENDOR	P.A. NO.	PART NO./TASK NO.	GROUP NO.	SEQ. NO.
		21 - 01		01

TITLE (MAX 30 CHARACTERS): Loss of Feedwater Trip on 10 April 1978

PROBLEM CONTACT: J. M. Phelan

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM:

An operator was blowing down the strainer on the operating condensate pump which caused it to trip on loss of suction; this in turn tripped the operating booster pump. This consequently tripped the feedwater pumps which lost feed to the system. The emergency feed pumps came on, but the flow was not sufficient enough to keep the reactor from tripping out on a high pressure. A summary of the analysis on the memory trip review data is attached.

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

W. Spangler and K. Wandling

Work is continuing on the main steam relief valve problem identified.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

Instruct operators not to blow down suction strainers on an operating pump.

RESOLUTION

RESOLUTION:

Concur with recommended action.
SPR concidered 'For Information Only'.

PREPARED BY	DATE	APPROVED BY	DATE
Dennis F. Rice	6/6/78	L R Pletke	6/14/78
REVIEWED BY	DATE		
M R Cathan for H. Baker	6/7/78		

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM OTHER ☐	☐ YES NO ☒	04-	☐ YES NO ☒

COMPLETION

SITE COMPLETION REPORT:

RECOMMENDED ACTION HAS BEEN TAKEN BY THE CUSTOMER. THIS SPR CAN BE CLOSED

DEVIATIONS: ☒ NONE SPR REV NO. ☐

DATE COMPLETED: 6-20-78

COMPLETED BY: S B Schedel DATE: 6/20/78

SL-204

SHEET 1 OF 3

0 6.1T7

JLS

METROPOLITAN EDISON COMPANY Subsidiary of General Public Utilities Corporation

Subject LOSS OF FEEDWATER REACTOR TRIP OF 4-19-78

Location TMI Nuclear Station Middletown, Pa.

Date May 1, 1978

To J. L. SEELINGER

An analysis of the memory trip review data for the subject trip was performed with particular attention paid to OTSG level and feedwater system performance.

In summary the emergency feedwater system appears to have functioned according to design in that EF pumps were actuated on FW-P-1 trip and commenced providing approximately 1200 gpm of emergency feedwater within 6 seconds of main feed pump trip.

OTSG levels began decreasing prior to EF actuation due to the reduced condensate flow resulting from the opening of condensate pump suction strainer blowdown valves and continued to decrease after EF actuation due to reactor power remaining at approximately 15%. OTSG pressure began decreasing with EF actuation due to the lower temperature of emergency feedwater but turned and began increasing prior to reactor trip at 6:01:30.

Concurrent with reactor trip, OTSG levels began recovering while OTSG pressure continued to increase until at 6:03 a "B" OTSG MS safety valve lifted at ≈ 1000 psig some 50 psig below minimum setpoint. "B" OTSG level again decreased to zero while blowdown continued for 1½ minutes to a pressure of 600 psig.

A similar reduction in OTSG level and pressure was observed for the "A" OTSG when its MS safety valve lifted at 1055 psig. After holding OTSG pressure at this setpoint for > 1 minute, rapid blowdown to 600 psig was commenced.

It is evident from the trip data that with OTSG levels on low level limits at a reactor power level of 15% the emergency feedwater system is unable to maintain OTSG level unless reactor power is immediately reduced. Had the unit been operating at a higher power level with ICS stations in auto, OTSG levels would have been considerably higher and reactor power would have been decreased concurrent with the initiation of emergency feedwater, thus preventing OTSG levels from reaching zero.

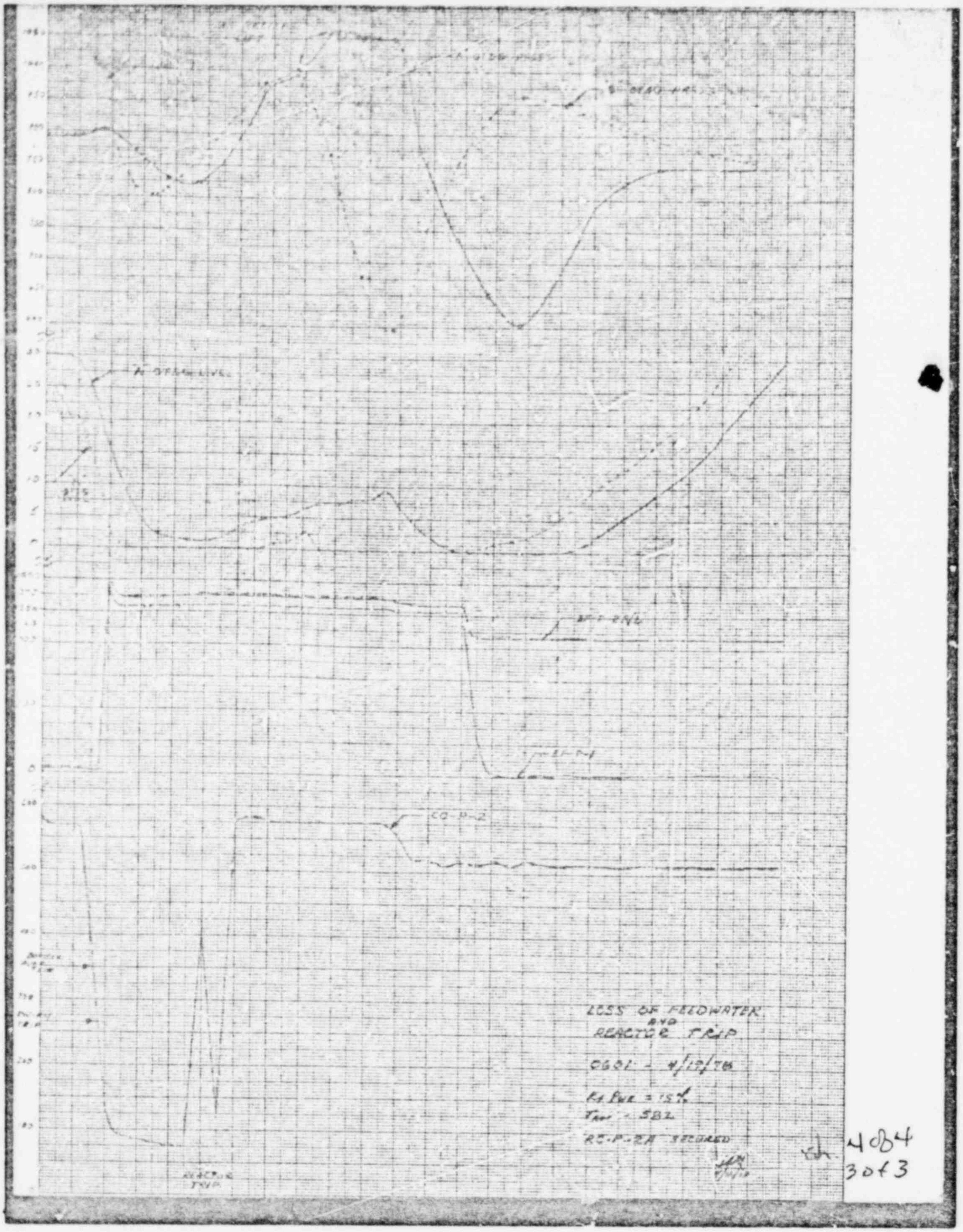
It is also evident from OTSG pressure data that MS safety valves performed in a manner other than expected. The premature lifting of the "B" OTSG relief, the delayed blowdown of the "A" OTSG relief and the extent of blowdown of both reliefs are matters of concern that will be resolved as a result of the continuing investigation into expansion joint liner failures on main steam reliefs.

T A Mackey Jr

TAM:pls
cc: J. R. Floyd
G. P. Miller

INTER-OFFICE MEMORANDUM

sh 384
2 of 3


CO-P-2
LOSS OF FEEDWATER AND REACTOR TRIP
0601 - 4/12/78
Rx Pwr = 15%
Tave = 582
RC-P-2A SECURED
REACTOR TRIP

4 of 4
3 of 3

SPR - 8 2

TITLE Quench Tank over pressurization

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS-______. The following is the status and/or resolution of this SPR on other contracts.

REMARKS

No SPR in check file 10/16/79 EZO

10/25/79 - This SPR rec'd closed from the site & is not generic since engineering reviewed it & did not even consider it necessary to be done on the originating contract.

R. Pittman 10-25/79

Closed

NSS-

CLEARED

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

**** CLEARED ****

FILE: 1242

TO: ______________ For Information

CONTRACT NO: 620-00 09

Central Engineering Files

SPR 62

C. C. Plunkett - Contract Admin.

TITLE Quench Tank Overpressurization

C. M. Fletcher - Quality Assurance

J.F. Cuvelier - Task Engineer

C.A. Creacy - Sr. Proj. Manager

DATE: ______

The attached, cleared SPR is submitted for your information.

TO: ______ J. N. Kaelin - ARKANSAS ______

______ E. L. Logan - SMUD ______

______ B. L. Day - OCONEE ______

______ L. C. Rogers - MET ED ______

R.E. Kosiba

Attached is one copy of Site Problem Report No. 62 which was processed on Contract 620-00 09.

REMARKS: Engineering considered this to be a nice to have item and not a requisit for operation

cc:

Earl H. Davis

NUCLEAR SERVICE SUPPORT ENGINEER
Earl H. Davis

CLEARED

PDS-21091-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO. 620-0009	SPR NO. 62	REV. NO. 0
VENDOR B. & W. P.O. NO.	TASK NO. 22	GROUP NO. 401	SEQ. NO. 1
SITE ENGINEER J. R. Albert	REQ'D. RESOL. DATE	REQ'D. COMP. DATE	

TITLE
QUENCH TANK OVER-PRESSURIZATION

DESCRIPTION OF PROBLEM

SEE ATTACHED:

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

Duke Instrument People repaired leak, filled reference leg, and checked calibration. Calibration on both level and pressure transmitters checked out.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

NPGD to determine if a second level transmitter is required to provide added personnel safety; and, to minimize the possibility of overpressurizing the Quench Tank and causing equipment damage.

SIGNATURE	DATE	S.O.M./CONSTR. REP. SIGNATURE	DATE
Jim R. Albert	6/18/74	B. L. Day	6/20/74

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	Carl H. Davis	10/15/74
TASK ENGINEER		
PROJECT MANAGER	C. A. Creasy	10-15-74

COST CATEGORY ☐ NJRM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH CHARGE NO ☐ FIELD CHANGE REQ FC NO

SITE COMPLETION REPORT

Eng. does not feel second level transmitter is necessary.

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO.

DATE COMPLETED 10/21/74 SIGNED BY R.W. Bentz[illegible]

S.O.M. CONSTR. REP. APPROVAL B. L. Day DATE 10/21/74

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 12M.2

Babcock & Wilcox

SPR # 62 - Unit III
June 18, 1974
Oconee

DESCRIPTION OF PROBLEM:

While conducting Quench Tank Operational Test (TP/230/10), the level in the tank was maintained above a minimum level of 85" as required by operating procedure. When the Pressurizer Relief Valve (RC-V3) was opened the pressure in the tank very rapidly increased. The reason for the pressure increase was that the nozzle to the tank was not submerged, therefore there was very little quenching effect to reduce the pressure.

3WD-LT 1 and 3WD-PT3 share a common tap, which is the level transmitter reference leg. (Water leaked out of the reference leg due to a leaking manifold fitting.) The cause of the leaking was that a gasket in the fitting was not in place, and the fitting was only hand-tightened.

Due to the loss of the wet reference leg, the level as read was higher than the actual water level. Also, the pressure as read, was lower than the actual tank pressure. The error would be equal to the static head of the water normally in the reference leg.

As a result of level in the Quench Tank being low, when the pressurizer relief (RC-V3) discharged into the quench tank; the quench tank pressure increased to an indicated pressure of about 57 psi.

The Brush Recorder which was reading tank pressure at th time shows pressure reached 55.5 psi. If the error introduced by a dry refe ce leg were added, pressure would be 55.5 psi (READ) + 4.37 psi (static head) = 59.87 psi.

The rupture disc on the Quench Tank is supposed to blow-out at 55 $\pm$ 4 psi. It did not during the subject Quench Tank High-Pressure condition. This was possibly due to the fact that tank pressure was not as high as calculated. Second possibility is that since tank pressure was over 50 psi for only about 2-4 seconds, the rupture disc did not blow out due to the short duration of the pressure increase.

The reference leg was filled after the cause of the leak was repaired. The calibration of 3WD-LT1 and 3WD-PT3 was checked. Both transmitters were within allowable tolerances.

This is the second time that this problem has occurred during Hot Functional Testir

PLANT STARTUP SERVICE

SITE PROBLEM REPORT TRANSMITTAL

FILE - 12M2

TO: ______________________ For Action

CONTRACT 620-00 09

SPR 62

TITLE Quench Tank over-pressurization

TO: C.A. Creacy
J.F. Cuvelier
For Information

DATE OCT 15 1974

Date Final Resolution Required by Nuclear Service Support Engineer

Action Requested: This SPR is considered by engineering as a nice to have item. Since engineering does not feel this item is significant the site is requested to clear this SPR.

cc: Central Engineering Files
C. C. Plunkett - Contract Admin.
C. M. Fletcher - NPG Quality Assurance
E. L. Logan - SMUD
J. N. Kaelin - ARKANSAS
B. L. Day - OCONEE
L. C. Rogers - MET ED

Direct reply in writing to N.S. Support Engineer. Please reply immediately whether answer is final or preliminary.

Earl H. Davis

Nuclear Service Support Engineer

MANHOUR LIMITS ______

COST LIMITS ______

CHARGE NO. ______

APPROVED: ______
Project Manager

NSS- 1
SPR 304

TITLE Electromatic Relief Solenoid Sticking.

RELATED SARs ______

This SPR has been reviewed by the Engineering Groups and is applicable to NSS- OD ______. The following is the status and/or resolution of this SPR on other contracts.

______

REMARKS

Not Considered Generic To Contracts NSS-3→14. However, SPR Sent To G.M. Jacks For Review On Future Contracts For Better Long-Time Site Storage.

[signature] 11/12/75

NSS- ______

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

FILE: 12M2

CONTRACT NO: 620-00 07

SPR 304

TITLE Electromatic Relief Solenoid Sticking

DATE: 11/02/75

TO: ______________________ For Information

Central Engineering Files

C. C. Plunkett - Contract Admin.

S. H. Klein - Quality Assurance

R.G. Barnley - Task Engineer

C.E. Borkslove - Project Manager

The attached, cleared SPR is submitted for your information.

TO: ______ K. L. Logan - FLORIDA ______ J.W. Stawski - Purch.

______ L. C. Rogers - MET.ED. ______

______ R. J. Baker - TOLEDO ______

______ h. L. Day - Intl. Support ______

______ P.E. Perrone - OFR ______

Attached is one copy of Site Problem Report No. 304 which was processed on Contract 620-00 07. Future contracts have been reviewed for the potential of a similar problem. This problem is not considered applicable to other contracts ______________________.

REMARKS: * Not Considered Generic To Contracts NSS-3→14. However G. M. Jacks Should Review for Future Contracts.

cc: * G. H. Jacks - Plant Integration

This SPR has been reviewed IAW NPC-1707-01

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

SITE PROBLEM REPORT 60 BABCOCK & WILCOX

CUSTOMER Florida Power Corp.	CONTRACT NO. 620-0000	SPR NO. 304	REV. NO. 0
VENDOR Dresser P.O. NO. 8	309715 TASK NO. 28	GROUP NO. 40	SEQ. NO. 6
SITE ENGINEER F. Grisbaum	REQ'D RESOL DATE	REQ'D COMP. DATE Info Only	

TITLE STICKING SOLENOID ON ELECTROMATIC RELIEF VALVE

DESCRIPTION OF PROBLEM

During electrical checks it was found that the solenoid hung in the down (ported) position. Inspection indicated binding between Pt. 35 (spring bracket) and Pt. 320 (spring guide). Readjustment and light lubrication cleared problem and successive Electrical Operations (6-8) showed no sign of problem return.

Ref: B & W Drawing 28-41-002-01

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

NONE

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

In cases of long site storage better protection against dust contamination and rough handling must be made.

SITE ENGINEER SIGNATURE E.H. Grisbaum	DATE 11-5-75	S.O. [illegible] SIGNATURE E.K. Bozel	DATE 11/5/75

RESOLUTION

RESOLUTION

Readjustment of Guide/Bracket, clean-up, and lub. to obtain free motion.

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[signature]	11/5/75
TASK ENGINEER /N.S. UNIT MANAGER	[signature]	11/5/75
PLT. START-UP MGR/SERV. & MAINT. MGR.	[signature]	11/24/75
PROJECT MANAGER/ CONTRACT ENGINEER	E. [signature]	11/25/75

COST CATEGORY ☐ NORD ☐ C ☐ D ☐ E ☐ F ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO.

COMPLETION

SITE COMPLETION REPORT

INFORMATION ONLY

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO.

DATE COMPLETED 11/5/75 SIGNED BY E.K. Bozel

S.B.M./CONST. DEP. APPROVAL E.K. Bozel DATE 11/5/75

SHEET 1 OF

INSTRUCTIONS FOR PBS-21091 - SITE PROBLEM REPORT

Initiated by B&W Construction or NPGD Nuclear Service

(1) Originator - Fill in: Customer; Contract Number; Vendor; Purchase Order Number; Task Number; Group Number; Sequence Number; Name; Title; Description of Problem; Status; Further Action Recommended by Site Personnel; Originator Signature and Date; Vendor Claim (NPGD only - if applicable)

(2) Senior B&W Construction Co. Site Representative or Site Operations Manager - Fill in: SPR Number; Revision Number; Req'd. Resol. Date; Req'd. Comp. Date; Approval Signature; Date.

(3) Nuclear Service Support Engineer - Fill in: Cost Category; Authorized Charge Number.

(4) Nuclear Service Unit Manager and/or Task Engineer - Fill in: Resolution; FC Req. and FC Number; Signature and Date.

(5) Plant Start-up Section Manager or Service and Maintenance Unit Manager - Approve Resolution; Signature; Date.

(6) Project Manager or Contract Engineer - Verify Charge Number; Approve Resolution; Signature and Date.

(7) Senior B&W Construction Co. Site Representative or Field Engineer - Implement resolution; upon completion, fill in: Completion Report; Date Completed and Signature.

(8) Site Operations Manager or Senior B&W Construction Co. Site Representative - Approve completion; sign.

DEC 2 1977

BOP

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

TO: Change Control For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

W. M. Kelly - Task Engineer

J.T. Janis - Project Manager

Jim Shetler - SMUD

FILE: 13-11-324

CONTRACT NO: 620-00 11

SPR 324

TITLE PZR VENT ISOLATION VALVE PACKING LEAK.

DATE: Nov. 18, 1977

INFORMATION ONLY

BOP LOST CAPACITY

REMARKS:

David H. Culbertson

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

182

PDS-21091-4 (2-75)

DEC 2 1977

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER SMUD	CONTRACT NO. 620-0011	SPR NO. 324	REV. NO. 00
VENDOR N/A P.O. NO. N/A	TASK NO. 01	GROUP NO. 001	SEQ. NO 001
SITE ENGINEER J.T. JANIS	REQ'D RESOL DATE 11/17/77	REQ'D COMP. DATE 11/17/77	

TITLE PZR VENT ISOLATION VALVE PACKING LEAK

DESCRIPTION OF PROBLEM

UNIT RCS UNACCOUNTED FOR LEAKAGE EXCEEDED 1.0 GPM (1.5 GPM REPORTED) BY TECH SPECS. UNIT WAS SHUT DOWN TO HOT STANDBY AT 1617 HRS ON 11/17/77. PRESSURIZER VENT ISOLATION VALVE (HV 21515 - NOT B&W SCOPE OF SUPPLY) PACKING WAS LEAKING. PACKING LEAK WAS REPAIRED AND UNIT RETURNED TO POWER OPERATION AT 2000 HRS 11/17/77.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

ABOVE INFORMATION PROVIDED BY SMUD CONTROL ROOM FROM OPERATORS LOG.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

NONE - PROBLEM IS APPARENTLY RESOLVED - SPR FOR INFORMATION ONLY.

BOP LOST CAPACITY

SITE ENGINEER	DATE	SITE MANAGER	DATE
Joel T. Janis	11/18/77	Joel T. Janis	11/18/77

RESOLUTION

INFORMATION ONLY

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER		
TASK ENGINEER N.S. UNIT MANAGER		
PLT START-UP MGR/SERV. & MAINT. MGR.		
PROJECT MANAGER/CONTRACT ENGINEER	Joel T. Janis	11/18/77

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ NO FC NO. NA

SITE COMPLETION REPORT

INFORMATION ONLY

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED SIGNED BY

S.O.M./CONST. REP. APPROVAL Joel T. Janis DATE 11/18/77

SHEET 1 OF

2 082

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by B&W Construction or NPGD Nuclear Service

(1) Originator - Fill in: Customer; Contract Number; Vendor; Purchase Order Number; Task Number; Group Number; Sequence Number; Name; Title; Description of Problem; Status; Further Action Recommended by Site Personnel; Originator Signature and Date; Vendor Claim (NPGD only - if applicable)

(2) Senior B&W Construction Co. Site Representative or Site Operations Manager - Fill in: SPR Number; Revision Number; Req'd. Resol. Date; Req'd. Comp. Date; Approval Signature; Date.

(3) Nuclear Service Support Engineer - Fill in: Cost Category; Authorized Charge Number.

(4) Nuclear Service Unit Manager and/or Task Engineer - Fill in: Resolution; FC Req. and FC Number; Signature and Date.

(5) Plant Start-up Section Manager or Service and Maintenance Unit Manager - Approve Resolution; Signature; Date.

(6) Project Manager or Contract Engineer - Verify Charge Number; Approve Resolution; Signature and Date.

(7) Senior B&W Construction Co. Site Representative or Field Engineer - Implement resolution; upon completion, fill in: Completion Report; Date Completed and Signature.

(8) Site Operations Manager or Senior B&W Construction Co. Site Representative - Approve completion; sign.

SEP 1 4 1977

BOP

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

TO: Change Control For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

W. M. Kelly - Task Engineer

C. D. Russell - Project Manager

FILE: 13-9-136

CONTRACT NO: 620-00 09

SPR 136

TITLE Operator Error - Improper FW lineup.

DATE: 9/7/77

BOP LOST CAPACITY

BOP INFORMATION ONLY

CLOSED

REMARKS:

David Culberson

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

1 of 3

PDS-21091-5(8-76)

SITE PROBLEM REPORT SEP 14 1977 BABCOCK & WILCOX

CUSTOMER: Duke Power Co.	ORIGINATOR: H.W. Pollack DATE: 8/23/77	DOC. ID. CONT. NO.: 13-620-0009 SPR NO.: 136 REV. NO.: 00
VENDOR:	P.A. NO.:	PART NO./TASK NO.: 01 GROUP NO.: 01 SEQ. NO.: 01
TITLE (MAX 30 CHARACTERS): Op Error - Improper FW Lineup		PROBLEM CONTACT: H.W. Pollack

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM:

At 2318 on 8/21/77, during Rx startup following replacement of failed CRD stator, a high pressure reactor trip resulted from an improper FW lineup. Operators had inadvertantly left FDW block valves shut. When noticed, the valves were opened, and the resulting surge into the OTSG and surge in reactor power caused a high pressure reactor trip. (The high pressure resulted from RC-3 being throttled such that PZR spray flow was insufficient to control the accompanying pressure increase.)

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

Blocking valves were opened and startup commenced at 0212 8/22/77.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

None

BOP LOST CAPACITY

RESOLUTION

RESOLUTION:

INFORMATION ONLY

CLOSED

PREPARED BY: David G. Culbreson	DATE: 9/7/77	APPROVED BY:	DATE:
REVIEWED BY:	DATE:		

COST CATEGORY: ☐ NORM OTHER ☐	FIELD CHANGE REQ: ☐ YES NO ☒	F.C.A. NO.: 04- NA	SIGNIF. DEFICIENCY: ☐ YES NO ☒

COMPLETION

SITE COMPLETION REPORT:

INFORMATION ONLY

DEVIATIONS: ☐ NONE	SPR REV NO. ☐
DATE COMPLETED: 8/22/77	
COMPLETED BY: David G. Culbreson	DATE: 9/7/77
SHEET 1 OF 1	

2 of 3

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER	ORIGINATOR / DATE	DOC. ID. CONT. NO. SPR NO. REV NO.
CNS - 3	[illegible] 8/23	13 -
VENDOR: B/W	P.O. NO.	PART NO./TASK NO. GROUP NO. SEQ. NO.
TITLE (MAX 30 CHARACTERS) [illegible] stator		PROBLEM CONTACT

DESCRIPTION OF PROBLEM:

8/20 1100 Rod #, Group 3 dropped during PT in preparation for Rx. Reducing power to borate rods out. Received runback to ~55%. Shutdown Rx to replace stator.

PROBLEM IDENTIFICATION

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

Replaced stator
1435 Rx startup.
2318 Rx trip on High Pressure.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

Trip caused by FDW block valves being left closed, when opened surge into S/G's caused Rx super. RC-3 throttled

RESOLUTION:

not allowing RCS to reduce pressure rapidly enough.
Rx startup @ 0214 8/22
Gen on line @ 0452

PREPARED BY	DATE	APPROVED BY	DATE
[illegible]	8/23		
REVIEWED BY	DATE		

COST CATEGORY ☐ NORM OTHER ☐ | FIELD CHANGE REQ ☐ YES NO ☐ | F.C.A. NO. 04- | SIGNIF. DEFICIENCY ☐ YES NO ☐

RESOLUTION

SITE COMPLETION REPORT:

DEVIATIONS: ☐ NONE SPR REV NO. ☐

DATE COMPLETED:

COMPLETED BY DATE

COMPLETION

SHEET 3 OF 3

SITE PROBLEM REPORT — J. A. LAUER — BABCOCK & WILCOX-NPG

CUSTOMER Toledo Edison Co. CONTRACT NO. NSS 14 SPR NO. 14 SPR REV. NO. 0

VENDOR Flexitallic P.O. NO. 020183 LA COMP. NO. ~~2~~ 43 GROUP NO. ~~57~~ 53 SEQ. NO.

PRIMARY DOCUMENTS: SPEC NOS. PRIORITY

DWG NO. EQUIP CODE/LEVEL/DATE

QA LEVEL QA SPEC NO.

SITE ENGINEER | EARLY START DATE | ACTUAL START DATE | REQ'D COMP. DATE

TITLE (MAX. 30 SPACES)

DESCRIPTION OF PROBLEM

No Q.A. release.
No Purchase Order.
No mat'l listing or information on drawing.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

None

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

N.P.G. Q.A. to release.

RECOMMENDED ACTION

N.P.G. projects to expedite. J. A. L.

NO QA RELEASE REQ'D

APR 30 1973

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	C.R. Helling	4-23-73
SITE CONSTR. REP.	W.C. Klinger	
SITE OPER. MGR.		
NS SUPPORT ENGR.		
PROJECT MANAGER	J.A. Lauer	5-15-73

DOCUMENTS AFFECTED: ☐ Drawings ☐ Proc. Specs ☐ Instr. Books ☐ Operating Procedures ☐ Tech. Specs ☐ PSAR/FSAR ☐ ☐ Recommended Site Change

ACTION TAKEN

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M.2 ____

Cost Category ☐ Norm ☐ C ☐ D ☐ G ☐ L

Auth Charge No. ____

RESPONSIBILITY ASSIGN.

Date Completed 5-15-73

By J MARSHALL

OTHER CONTRACTS AFFECTED

DEVIATIONS #96
☐ NONE
☐ SEE REF. ____

Field Change Req'd ☐

Field Change No ____

NSS- 14
SPR 14

TITLE ?. Q A RELEASE PROBLEM

RELATED SPRs NSS-14 SPR(s) 10, 11, 12, & 13

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- 00. The following is the status and/or resolution of this SPR on other contracts.

REMARKS

11/20/74 - REVIEWED WITH J. A. LAUER: NOT APPLICABLE TO OTHER CONTRACTS [signature]

ACTION COMPLETE
ON ALL CONTRACTS

NSS-

CUSTOMER Toledo Edison Co. CONTRACT NO. 1153 14 SPR NO. 14 SPR REV. NO. 0

VENDOR Flexitallic P.O. NO. GROUP 6A COMP. NO. 55 GROUP NO. 97 SEQ.

PRIMARY DOCUMENTS, SPEC NOS.

DWG NO. BUILD CODE/LEVEL DATE

LEVEL NO SPEC NO.

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE

TITLE

DESCRIPTION OF PROBLEM

No Q.A. release.
No Purchase Order.
No mat'l listing or information on drawing.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

None

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

N.P.G. Q.A. to release.

RECOMMENDED ACTION

N.P.G. projects to expedite.

J. A. L.

APR 30 1973

No QA release req'd

APPROVALS TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR		4-25-73
SITE CONSTR. REP.		
SITE OPER. MGR.		
US SUPPORT ENGR.		
PROJECT MANAGER		5-15-73

☐ Drawings
☐ Proc. Specs
☐ Instr. Books
☐ Operating Procedures
☐ Tech. Specs
☐ PSAR/FSAR
☐
☐ Recommended Field Change

DISTRIBUTION
SITE OP. MANAGER
PROJECT MANAGER
U.S. SUPPORT ENGR.
CONSULTANT ENGR.
CONTRACT ADMIN.
SERVICE
FILE

Category ☐ ☐ ☐ ☐ ☐

Change No.

RESPONSIBILITY ASSIGN.

Date Complete

By

OTHER CONTRACTS AFFECTED

☐ None

☐ See Rev.

Field Change Req'd ☐

Field Change No.

LONGHAND MEMORANDUM THE BABCOCK & WILCOX COMPANY

TO

J. A. LAUER

FROM

T. D. STABLES

CUST.

FILE NO. OR REF.

SUBJ.

DATE

T. D. STABLES

I thought we didn't want these!
Please advise.

Ted

YOU'RE RIGHT — WE DON'T WANT THEM
& DB SITE (J. MANNING) HAS AGREED NOT TO ISSUE
ANY MORE SAR'S DUE TO LACK OF
QA DOCUMENTATION. HOWEVER, WE PROCESSED
3 OR 4, JUST TO GET RID OF THEM SINCE
THEY WERE ALREADY ISSUED.

JOE LAUER
6-5-73

SITE PROBLEM REPORT — J. R. Lauer — BABCOCK & WILCOX-NPG

CUSTOMER Toledo Edison Co. CONTRACT NO. [illegible] SPR NO. [illegible] SPR REV. NO. 0

VENDOR Flexitallic P.O. NO. [illegible] GROUP NO. 97 SEQ NO.

PRIMARY DOCUMENTS: PORE NOS. [illegible]

SITE ENGINEER — SCHED START DATE — ACTUAL START DATE — SCHED COMPL DATE

TITLE [illegible]

DESCRIPTION OF PROBLEM

No Q.A. release.
No Purchase Order.
No mat'l listing or information on drawing.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

None

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

N.P.G. Q.A. to release.

RECOMMENDED ACTION

N.P.G. projects to expedite. J. R. L.

No QA release req'd

APR 30 1973

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	[signature]	5-15-73
SITE CONSTR. REP.	[signature]	
SITE OPER. MGR.		
NS SUPPORT ENGR.		
PROJECT MANAGER	J. R. Lauer	5-15-73

APPLIES TO: Drawings; Proc. Specs; Instr. Books; Operating Procedures; Tech. Specs; PSAR/FSAR; Recommended Field Change

Field Change Req. — Field Change No.

DISTRIBUTION: SITE OPS MANAGER; PROJECT MANAGER; N.S. SUPPORT ENGR.; COGNIZANT ENGR.; CONTRACT ADMIN.; [illegible]; FILE 12M2

Category: Hardware, C, D, E — Work Charge No.

RESPONSIBILITY ASSIGN. — Date Completed — By

OTHER CONTRACTS AFFECTED — [illegible] 96

SITE PROBLEM REPORT

J. B. LAUER

BABCOCK & WILCOX NPS

CUSTOMER Toledo Edison Co. CONTRACT NO. NSS 14 SPR NO. 14 SPR REV NO. 0

VENDOR Flexitallic P.O. NO. 028183 LA COMP. NO. 43 GROUP NO. 58

PRIMARY DOCUMENTS: SPEC NOS. SEQ NO.

DWG NO.

QA LEVEL EQUIP CODE/LEVEL DATE PRIORITY

QA SPEC NO.

SITE ENGINEER

EARLY START DATE	ACTUAL START DATE	REQ'D CMPL. DATE

TITLE (MAX. 30 SPACES)

DESCRIPTION OF PROBLEM

No Q.A. release.
No Purchase Order.
No mat'l listing or information on drawing.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

None

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

N.P.G. Q.A. to release.

RECOMMENDED ACTION

N.P.G. projects to expedite.

No QA RELEASE REQ'D

APR 30 1973

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR		
SITE CONSTR. REP.	[signature]	4-25-73
SITE OPER. MGT.	[signature]	
NS SUPPORT ENGR.		
PROJECT MANAGER	J. B. Lauer	5-15-73

DOCUMENTS AFFECTED: ☐ Drawings ☐ Proc. Specs ☐ Instr. Books ☐ Operating Procedures ☐ Tech. Specs ☐ PSAR/FSAR ☐ ☐ Recommended Side Change

ACTION TAKEN

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
CONSULTANT ENGR.
CONTRACT ADMIN.
NPS QA
FILE SPR 2 ____

Cost Category ☐ Norm ☐ C ☐ D ☐ O ☐ E

Auth Charge No. ______

RESPONSIBILITY ASSIGN.

Date Completed 5-15-73

By: J MARSHALL

OTHER CONTRACTS AFFECTED

DEVIATIONS ☐ NONE ☐ SEE REV. ____

Field Change Req ☐

Field Change No ____

GRAND MEMORANDUM THE BABCOCK & WILCOX CO.

J. A. LAUER

T. D. STABLES

FILE NO. OR REF.

DATE

I thought we didn't want these!
Please advise.

Ted

YOU'RE RIGHT — WE DON'T WANT THEM
(& MARK)
+ DB [illegible] HAS AGREED NOT TO ISSUE
[illegible] SAR'S DUE TO LACK OF
[illegible] INFORMATION. HOWEVER, WE PROCESSED
[illegible] 4, JUST TO GET RID OF THEM SINCE
THEY WERE ALREADY ISSUED.

Joe [illegible]

6-5-73

NSS- 04
SPR 196

TITLE HPI Valve position for operation

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- RO RGTB. The following is the status and/or resolution of this SPR on other contracts.

REMARKS

ORIGINAL

NSS-

NSS-

(3)

CLEARED

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

**** CLEARED ****

ORIGINAL

FILE: 12M2

CONTRACT NO: 620-00 04

SPR 196

TITLE Questionable HPI Valve Position - Open or Closed?

DATE: 1/13/75

TO: ____________ For Information

Central Engineering Files

C. C. Plunkett - Contract Admin.

C. M. Fletcher - Quality Assurance

R. G. Burnley - Task Engineer

W. A. Cobb - Sr. Proj. Manager

The attached, cleared SPR is submitted for your information.

TO: J. A. Bailey - ARKANSAS

E. L. Logan - SMUD

B. L. Day - Toledo

L. C. Rogers - MET ED

J. L. Hollis - FLORIDA

R. J. Baker - Oconee

Attached is one copy of Site Problem Report No. 196 which was processed on Contract 620-00 04. Future contracts have been reviewed for the potential of a similar problem. This problem is/is not considered applicable to other contracts ______________.

REMARKS: This Should Not Have Been Written Up As A Problem! (R.G. Burnley)

cc: R. E. Kosiba

G. K. WANDLING

NUCLEAR SERVICE SUPPORT ENGINEER

NSSE

PDS-21091-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO. 620-0004	SPR NO. 196	REV. NO. 00
VENDOR N/A P.O. NO N/A	TASK NO 35	GROUP NO. 01	SEQ. NO. 01
SITE ENGINEER G. Glei	REQ'D. RESOL. DATE	REQ'D. COMP. DATE	

TITLE HIGH PRESSURE INJECTION VALVE POSITION FOR OPERATION (2HP-V24B)

DESCRIPTION OF PROBLEM

SEE ATTACHED:

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

SEE ATTACHED:

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

SEE ATTACHED:

ORIGINATOR SIGNATURE	DATE	S.O.M. CONSTR. REP. SIGNATURE	DATE
G. Glei	6/4/74	R.J. Baker for	6/5/74

RESOLUTION As long as the two manual valves in the line between "B" and "C" HPI pumps are normally closed. R.G.B. 1/13/75

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[signature]	1/13/75
TASK ENGINEER	Robert G Kumley	1/27/75
PROJECT MANAGER	C. A. Creasy	1-27-75

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO

SITE COMPLETION REPORT

Bob Burnley stated on telcon with RJ Baker that if Duke wants to operate with subject valve open it up to Duke. No problem operating with valve open.

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☒ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED 12/12/74 SIGNED BY RJ Baker

S.O.M. CONSTR. REP. APPROVAL [signature] DATE 12/13/74

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 124.2

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by NPG Nuclear Service

(1) Originator - Fill in: Customer; Contract Number; Vendor; Purchase Order Number; Task Number; Group Number; Sequence Number; Name; Title; Description of Problem; Status; Further Action Recommended by Site Personnel; Originator Signature and Date; Vendor Claim (if applicable).

(2) Site Operations Manager - Fill in: SPR Number; Revision Number; Req'd. Resol. Date; Req'd. Comp. Date; Approval Signature; Date.

(3) Nuclear Service Support Engineer - Fill in: Cost Category; Authorized Charge Number.

(4) Task Engineer - Fill in: Resolution; Recommended Std.'s Change*; (if applicable, FC Req. and FC Number); Signature and Date.

*If recommended standard's change, transmit a copy to cognizant Standard Task Engineer to resolve with Standard Plant Manager.

(5) Field Engineer - Implement resolution; upon completion, fill in: Completion Report; Date Completed and Signature.

NOTE: If necessary to deviate from the approved SPR, note deviation and submit revised SPR to the Site Operations Manager.

(6) Site Operations Manager - Approve completion; sign.

Initiated by B&W Construction Company

(1) Originator - (Same as (1) above)

(2) Construction Co. Site Representative - (Same as (2) above)

(3) Project Manager - (Same as (3) above)

(4) Task Engineer - (Same as (4) above)

(5) Construction Co. Site Representative - (Same as (5) and (6) above)

Babcock & Wilcox

SPR # 196 Rev. 0
June 4, 1974
Oconee - Unit II

Title: HIGH PRESSURE INJECTION VALVE POSITION FOR OPERATION

DESCRIPTION OF PROBLEM:

The B. & W. HPI/Makeup and Purification drawing (P & ID) for Oconee Unit II shows the HPI isolation valve (valve # 2HP-V24B in the HPI line that connects to the reactor inlet line loop A) as normally closed. This same valve is also shown on Duke Power Company drawings as normally closed. However, paragraph 3.2.35 of Oconee OP/2/A/1102/01 indicates that this valve is opened during unit startup and remains open during plant operation. Question: Are there potential or operational problems associated with continued "normally open" operation of this valve? If not, why does B. & W. recommend that this valve be normally closed?

STATUS -ACTION TO DAT INCLUDING PERSONS NOTIFIED:

Briefly discussed problem with John Merchent on 5/31/74, and he felt that the "normally open" operation of this valve would cause no difficulties (assuming that the two manual valves in the line between the "B" and "C" HPI pumps are normally closed).

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

Answer questions noted above and notify Duke Power Company if continued operation with this valve "normally open" is not recommended by B. & W. Engineering.

GG/bh

SPR File

SITE PROBLEM REPORT TRANSMITTAL

To J.R. Shetler For Action
R.G. Burnley

To J.W. Merchant For Information

File 12M2
CONTRACT 620-00 04
SPR 196
TITLE HPI valve position for operation (2HP-V24B)
DATE JUN 14 1974

Date Final Resolution Required by Nuclear Service Support Engineer

Action Requested: J.R. Shetler & R.G. Burnley are requested to give their opinion of the consequences encountered if this valve is left open during operation. Answers to be forwarded through the NSSE.

Direct reply in writing to N.S. Support Engineer. Please reply immediately whether answer is final or preliminary.

Earl R. Davis
Nuclear Service Support Engineer

cc:
C. C. Plunkett-Contract Admin.
Central Engineering Files
C.M. Fletcher -NPG Quality Assurance
B. L. Day
J. N. Kaelin
E. L. Logan
L. C. Rogers
C.A. Creasy

MANHOUR LIMITS
COST LIMITS
CHARGE No.
APPROVED:
Project Manager

NSS- 4
SPR 113

TITLE Excessive RCS Cooldown Rate

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- All. The following is the status and/or resolution of this SPR on other contracts.

REMARKS

The Rx coolant system was cooled down from 532° to 410° in ≈ 57 Minutes = a cooldown rate of 128°F/hr. Component Eng. has determined that there is no reason for concern with respect to the structural adequacy of the Rx vessel or S.G. if the transient is counted as one of the 240 cycles by the equipment specification. This is applicable to all contracts per B.A. Karache & Xmitted for info. only.

Applicable for info in case ~~[illegible]~~ problem reoccurs.

NSS- This ~~may re-occur but~~ it will be a different occurrence or value each time & will require a separate review. This will be closed for generic following.

RLP 10-9-74

ACTION COMPLETE
ON ALL CONTRACTS

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

To R. J. McConnell (2) For Information

G. E. Kulynych - Sr. Project Manager

C. C. Plunkett - Contract Admin.

Central Engineering Files

E. V. DeCarli - Quality Assurance

FILE: 12M2
Contract 620-00 -04

SPR 113

TITLE Excessive RCS Cooldown Rate

DATE 11-1-73

The attached, cleared SPR is submitted for your information.

TO:
- J. N. Kaelin-Arkansas
- J. P. Kennedy-SMUD
- K. E. Suhrke
- ~~H. J. Worsham~~
- J. D. Phinney-Met Ed

Attached is one copy of Site Problem Report No. 113 which has been processed on Contract 620-00-04. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: Justification letters for acceptance of this transient is on file in NUC Service

cc:

R. Pitt[illegible]
NUCLEAR SERVICE SUPPORT ENGINEER

PDS-21031-1

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power CONTRACT NO. 620-0004 SPR NO 113 SPR REV NO 0

VENDOR P.O. NO. COMP NO. 51 GROUP NO 10 SEQ NO. 01

PRIMARY DOCUMENTS: SPEC NOS. PRIORITY

DWG NO EQUIP CODE/LEVEL/DATE

QA LEVEL QA SPEC NO.

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
E. L. Logan			

TITLE (MAX. 30 SPACES) Excessive RCS Cooldown Rate

DESCRIPTION OF PROBLEM

~~[illegible]~~ Following the Quench Tank Rupture Disc incident (STP 2-012) the Reactor Coolant System was cooled down from 532°F to 410°F in approximately 57 minutes. This is a cooldown rate of approximately 128 °F/hr.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

Engr to review for any action and/or determine if an RCS design cycle has been used.

RECOMMENDED ACTION

APPROVALS — TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	E. L. Logan	10-1-73
SITE CONSTR. REP.		
SITE OPER. MGR.	R. J. McConnell	10/3/73
NS SUPPORT ENGR.	R. L. Pittman	10/8/73
PROJECT MANAGER		

DOCUMENTS AFFECTED: Drawings; Proc. Specs; Instr. Books; Operating Procedures; Tech Specs; PSAR/FSAR; ☐; Recommended Stds. Change

ACTION TAKEN

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 NSS 4
SPR 113

Cost Category ☐ Nonr. ☐ C ☐ D ☐ O ☐ L

Auth Charge No.

RESPONSIBILITY ASSIGN.

Date Completed

By:

OTHER CONTRACTS AFFECTED

DEVIATIONS ☐ NONE ☐ SEE REV

Field Change Req'd ☐

Field Change No.

Cleared
R. J. McConnell
10/29/73

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	G.E. Kulynych, Senior Project Manager		
From	AHL A.H. Lazar, Manager, Component Engineering (Ext. 2315)		BDS 663.5
Cust.		File No. or Ref.	NSS-4/12E51&12E55
Subj.	Component Engineering Analysis of 130°F Per Hour Cooldown Transient at Oconee II	Date	September 24, 1973

This letter to cover one customer and one subject only

Component Engineering has evaluated the subject transient and has determined that there is no reason for concern with respect to the structural adequacy of the reactor vessel or steam generator. This statement is made provided that this transient is counted as one of the 240 cycles by the equipment specification.

A summary of the evaluation for the steam generator is attached in a memo from D.A. McKinley to B.N. McDonald dated September 17, 1973.

A summary of the evaluation for the reactor vessel is attached in a memo from H.W. Behnke to B.N. McDonald dated September 21, 1973.

AHL/jk
Attachments

cc: (with attach)
R.N. Bottorf
C.A. Creacy
J.C. Deddens
R.M. Douglass
B.N. McDonald

OR19

File NSS- 4

12M2-SPR- 113

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To ______________________ For Action

CONTRACT 620-00 -04

SPR 113

TITLE Excessive RCS Cooldown Rate

To R. J. McConnell ______________________ For Information

J. N. Kielin

J. P. Kennedy

J. D. Phinney

K. Suhrke

DATE 10-8-73

Date Reply to Be Submitted To Nuclear Service Support Engineer

Action Requested: THE attached Analysis provides the basis for accepting this transient. THE site is requested to clear this SPR

R. L. Pittman

Nuclear Service Support Engineer

MANHOUR LIMITS ______________________

COST LIMITS ______________________

CHARGE No. ______________________

APPROVED: ______________________ Project Manager

cc: G. E. Kulynych
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance
R.N. Bothof
B.N. McDonald
R.N. Douglass

SPR 113

AH LAZAR

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

A. H. LAZAR
SEP 20 1973

To: B. N. MC DONALD - NPGD - COMPONENT ENGINEERING, LYNCHBURG

From: MECHANICAL DESIGN
D. A. MC KINLEY - NPGD - WEST BARBERTON ENGINEERING

2.5.2

Cust.: DUKE POWER

File No. or Ref.: 620-0004-08-05

Subj.: COOLDOWN DUE TO QUENCH TANK TESTING

Date: SEPTEMBER 17, 1973

This letter to cover one customer and one subject only.

Reference: B. N. McDonald to R. M. Douglass & R. N. Bottorf dated 8/22/73, contract 620-0004-08-05 & attached "Summary Test Report 2-012".

Mechanical Design has just completed its review of the 130°F/Hr. cooldown transient caused by a rupture disc blow out on the quench tank as transmitted in the above reference.

The attached pages are a summary of the review.

All critical areas on the OTSG are covered by the review.

The results show the transient is acceptable, provided it is considered to be one of the 240 allowable cooldowns.

It should be noted that the main reason the transient is acceptable is that it only lasted for one hour, and as such, limited the temperature drop. If the transient had lasted to the normal starting point for the decay heat system of 280°F, the transient would not have been acceptable.

If you have questions, please contact me.

D.A. McKinley
D. A. McKinley

DAMc:jav
Attachment
cc: With attachment
G. A. Creacy
R. M. Douglass
E. M. Livingston
R. N. Tornow

FAST COOLDOWN TRANSIENT

Transient: (Primary Side)

[illegible] hr., [illegible]°F to 10.77 hr., 400°F or 123°F in [illegible] hr., or [illegible]°F/hr.

Temperature drop stabilizes at 10.77 hr.

Pressure: (Primary Side)

2150 psi, 9.28 hr. to [illegible]0 psi, 9.57 hr.

Pressure stabilizes at 9.57 hr.

Initial Conditions: Zero percent power

Feedwater: 1[illegible]°F @ 206 GPM/OTSG

Initial Flow @ 0% Pwr.

Areas of Concern:

1) Support skirt analysis

2) Tubesheet analysis (upper & lower)

3) Tubes

The primary nozzles are not an area of concern due to their low stressed condition.

The fast cooldown transient will not affect the secondary shell, because it is isolated from the fast changing primary fluid by the thick tubesheet ring. Any changes in the feedwater conditions will have little affect, as the flow conditions used in the shell analysis are for a much greater flow (2000 GPM). Also, the bleed steam in the feedwater annulus will quickly bring the cold feedwater up to saturation temperature.

The feedwater nozzle will not be affected, as it is analyzed for 180°F feedwater at full flow. Any feedwater flow changes will result in a less severe condition than those analyzed in the Design Report.

9/12/73

Support Skirt

The worst time for the fast cooldown transient will be end of ramp, or the time the fluid reaches 402°F (0.94 hr.) At this time the fluid has dropped 123°F in 0.94 hours at a rate of 131°F/hr.

For something as massive as a support skirt, the gradient will depend on the ability of the skirt to conduct heat down its length. As the ramp rate for the fast cooldown is only 31% greater than the normal cooldown, we can equate the conditions at time 0.94 hours to a time in the support skirt analysis when the primary fluid has dropped approximately 131°F or about 1.3 hours. The closest time greater than this is 2.0 hours. For the skirt, the worst stress location is 1.6 inches from the top of the skirt taper at the bottom of segment two. At this point the range of primary plus secondary stress is +76. ksi for heatup, and -4. ksi for cooldown at time 3.2 hours. At 2.0 hours, the cooldown stress drops to -31.2 ksi. This means that the fast cooldown transient will not cause stresses greater than those in the Design Report. Therefore, the transient is acceptable for the skirt if it is considered to be included in the total of 240 allowable cooldowns. Any feedwater changes will not affect the skirt due to its remote location.

These stresses come from the Design Report Section E, Page B-16-4 & 5.

9/12/73

Tubesheet

From the upper and lower tubesheet analysis, Section F of the Design Report, Page A-2, it can be seen that the maximum primary plus secondary stress intensity range for either of the upper or lower is 35 ksi on the secondary side of the upper tubesheet, versus an allowable of 80 ksi. This occurs at the shell to ring juncture.

As the fast cooldown transient is 131 °F per hour versus the 100 °F per hour as analyzed in the Report, it is conservative to assume the cooldown stresses increase by 31 percent. This is conservative in that the worst time during cooldown occurs at the start of decay heat removal, or three hours into cooldown, which gives the gradients more time to spread, thus giving higher stresses. The fast cooldown transient is equivalent to about 1.3 hours into cooldown based on ramp rate adjustment.

The actual stress intensities involved are -23.0 ksi for heatup and +12.0 ksi for cooldown. If the 12.0 ksi intensity is increased by 31%, we get +15.7 ksi for a range of 38.7 ksi.

This is well within the allowable of 80 ksi, and if considered one of the 240 allowable cooldowns, can be accepted for the tubesheets.

The feedwater side coefficients are based on full flow during cooldown, (15000 GPM) so feedwater changes will have a negligible effect on the final stresses.

9/12/73

Tubes

The fast cooldown transient will have no adverse effects on the tubes. The worst tube to shell ΔT, and thus maximum tube load, occurs right at the point the primary pumps shut down, and the decay heat system is started.

The tubes will cool faster than the secondary shell, so the longer the time involved, the larger the tube to shell ΔT, and tube load.

The start of decay heat removal occurs 9.2 hours after the start of cooldown under normal conditions, and has a primary temperature drop of 557°F at 8% power to 280°, or 277°F in 9.2 hours.

The fast cooldown transient drops from 523°F at 9.83 hours to 400°F at 10.77°F, or a drop of 123°F in 0.94 hours.

From comparing these figures, it can be seen that normal cooldown will develop larger tube to shell ΔT's and loads due to the larger temperature drop, and the longer time involved.

Therefore, the OTSG fast cooldown transient will not adversely affect the steam generator tubes.

9/13/73

A.H LAZAR

SEP 24 1973

AHL

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: Manager
B.H. McDonald - Development - NPGD-CE - Lynchburg

From: Principal Engineer
H.W. Behnke - Mechanical Design -NPGD-CE - Mt. Vernon

Cust.: Duke Power Company

File No. or Ref. ~~215.2~~ 620-0004-51

Subj.: Oconee II Cooldown Transient

Date: September 21, 1973

(This letter to cover one customer and one subject only.)

Mt. Vernon Mechanical Design has reviewed the rapid cool-down experienced by the NSS-4 reactor and offers the following comments.

> A stress report for this type of plant has been prepared considering 240 cycles of 100°/Hr. cool-down. This report also reflects a transient of 200°/Hr. cool-down for 15 minutes. (Rapid Depressurization). Based on this analysis it is concluded that no harmful effects have been initiated by the 128°/hr. cool-down on the NSS-4 reactor and that no specific analysis is required for this particular transient.

HWBehnke
H.W. Behnke

HWB/lab

cc: R.F. Hollander

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

**** CLEARED ****

FILE: 12M2

CONTRACT NO: 620-00 02

SPR 571

TITLE Loss of Feedwater to OTSG

DATE: 11/7/84

TO: ______________ For Information

Central Engineering Files

C. C. Plunkett - Contract Admin.

C. M. Fletcher - Quality Assurance

R.W. Wicks - Task Engineer

H.A. Bailey - Sr. Proj. Manager

The attached, cleared SPR is submitted for your information.

TO: ______ J. N. Kaelin - ARKANSAS ______

______ E. L. Logan - SMUD ______

______ B. L. Day - OCONEE ______

______ L. C. Rogers - MET ED ______

R.E. Kosba

Attached is one copy of Site Problem Report No. 571 which was processed on Contract 620-00 02. Future contracts have been reviewed for the potential of a similar problem. This problem is/is not considered applicable to other contracts ______________.

REMARKS: refer to letter Wicks to Davis 11/7/84 and SMUD letters 451 & 503

cc:

Earl R. Davis

NUCLEAR SERVICE SUPPORT ENGINEER

PDS-21091-2 (9-73) Site

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Arkansas Power & Light	CONTRACT NO. [illegible]	SPR NO. [illegible]	REV. NO. 00
VENDOR B&W	P.O. NO.	TASK NO.	GROUP NO. / SEQ. NO.
SITE ENGINEER D. A. Downtain	REQ'D. RESOL. DATE ASAP	REQ'D. COMP. DATE ASAP	

TITLE LOSS OF FEEDWATER TO OTSGs

DESCRIPTION OF PROBLEM

See Attachments.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

See Attachments.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

See Attachments.

David A. Downtain [illegible] SIGNATURE [illegible]

RESOLUTION SOM letter being drafted to customer explaining action to be taken on Loss of Feedwater and Recovery from Dry OTSG.

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[illegible]	[illegible]
TASK ENGINEER		
PROJECT MANAGER	[illegible]	[illegible]

COST CATEGORY ☐ NORM ☐ ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO.

SITE COMPLETION REPORT

☐ RECOMMENDED STDS. CHANGE

FINAL DISTRIBUTION

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED 11/6/78 SIGNED BY J. A. Barker

S.O.M. CONSTR. REP. APPROVAL 11/6/78 DATE J. A. Barker

COMPLETION

91-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Arkansas Power & Light	CONTRACT NO. 0008	SPR NO. 271	REV. NO. 00
VENDOR TMU	P.O. NO.	TASK NO.	GROUP NO. / SEQ NO.
SITE ENGINEER D. A. Dewitt[illegible]	REQ'D. RESOL. DATE ASAP	REQ'D. COMP. DATE [illegible]	

TITLE LOSS OF FEEDWATER TO OTSGs

DESCRIPTION OF PROBLEM

See Attachments.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

See Attachments.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

See Attachments.

[signature]	10/11/74	[illegible] SIGNATURE	DATE

RESOLUTION Engineering response (letter R Winks to E Davis, Nov 6 1974) "Upon loss of total FW flow, operator is to manually trip reactor as soon as possible", "normally RPS would trip reactor" Therefore auto Reactor trip on loss of FW is not required. Two letters (attached) SPR 241 + 503 written to customer to specify method of recovery from loss of OTSG feed to dry OTSG

APPROVED BY	SIGNATURE	DATE
N S SUPPORT ENGINEER	[signature]	11/20/74
TASK ENGINEER		
PROJECT MANAGER		

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO ☐ FIELD CHANGE REQ FC NO.

SITE COMPLETION REPORT

☐ RECOMMENDED STDS CHANGE

DEVIATIONS ☒ NONE ☐ SEE SPR REV NO. ____

DATE COMPLETED 11/12/74 SIGNED BY [signature]

S.D.M. CONSTR. REP. APPROVAL [signature] DATE [illegible]

FINAL DISTRIBUTION

PROJECT MANAGER
S.D.M. CONST REP
QA DOC. FILE
STAT. ENGR
FILE 12[illegible]

Description of Problem

On October [illegible], [illegible], [illegible] Unit 1 reactor was manually tripped at ~1306. The Sequence of Events which led to the manual tripping of the reactor is as follows:

Time	Event
Prior to ~1304:30	Reactor at ~22% FP (Reactor Power)
Prior to ~1304:30	Turbine rolling at 1800 rpm. Turbine/Generator off line - encountering problems with AUTO SYNC in trying to sync. to the grid.
1304:30	'B' Main Feedwater Pump tripped on high turbine exhaust pressure
1305	Manually tripped Main Turbine
1306	Manually tripped Reactor
1307:15	Main Steam Safety Valve lifted at 1010 psi and reseated at 935 psi

The 'B' Main Feedwater Pump (MFP) trip on high turbine exhaust pressure was caused by an incorrect valve lineup. [illegible] 'B' Main FWP turbine exhaust to condenser, the 60-inch manual butterfly valve, was closed. [illegible], the 12-inch bypass rupture disc, had blown and was the path to the condenser for the turbine exhaust steam. As load was slowly being increased, the 12-inch bypass line could no longer handle the steam flow and the pump turbine tripped on high turbine exhaust pressure.

The Auxiliary Feedwater pump was started within 30 seconds (manual start by operator) and at about the same time the Main Turbine was manually tripped.

From the time of the 'B' MFWP trip until the manual trip of the reactor, about 1½ minutes, no operator action was taken to reduce reactor power. Pressurizer Level increased/upon reaching 250 inches, the reactor was manually tripped per Administrative directive.

Immediately after the Reactor trip, Turbine Header Pressure began to increase above 885 psig because of the 10 psig bias placed on Turbine Header Pressure setpoint. However, as can be seen in Figure 4, Turbine Header Pressure only reached 975 psig before it began decreasing, indicating dry or nearly dry OTSG'S.

For the next several minutes, feedwater flow oscillated back-and-forth between the OTSG'S. Figures 5 and 6 illustrate the back-and-forth feeding of the OTSG'S. An explanation for this is the following:

1) The Auxiliary Feedwater Pump starts filling the OTSG'S, but because of the large amount of recirculation, the discharge pressure is about 900 psig (only a guess).

2) Steam pressure began to increase in the both OTSG'S, but was higher in 'A' OTSG than in 'B' OTSG. When steam pressure in 'A' OTSG reached the discharge pressure on the Aux. Feedwater pump, feed flow to 'A' OTSG stopped but continued to feed 'B' OTSG.

3) Steam pressure in 'B' OTSG continued to increase, but lack of feed flow caused 'A' OTSG steam pressure to decrease. At some point in time, 'B' OTSG steam pressure would prevent Auxiliary Feedwater pump from filling the 'B' OTSG any longer, and at that point where 'A' OTSG steam pressure had decreased below Aux. Feedwater pump discharge pressure, 'A' OTSG would begin to fill again.

From a previous loss of all feedwater flow incident, it was noted that with immediate manual tripping of the reactor and subsequent start of the Auxiliary Feedwater pump, the transient the system went through was very minor; i.e., the OTSG Level was properly maintained at Low Level Setpoint. The Immediate Action Section of TMI Unit 1 Emergency Procedure for Loss of Steam Generator Feed, OP 1202.26, states,

> "Verify that reactor tripped and carry out the reactor trip procedure (OP 1202.24)."

The resulting system transients from lack of immediate operator action to trip the reactor can be greatly worsened if the Auxiliary Feedwater pump fails to start, since there is no automatic initiation of the Emergency Feedwater System at this site at this time. See SU-490, J. N. Kaelin to R. J. McConnell, "Recovery from a Dry OTSG Condition," for a discussion of this situation.

Status - Action to Date Including Persons Contacted

R. J. McConnell, Manager, Plant Startup Service

Further Action Recommended by Site Personnel

1. Evaluate possibility for automatic reactor trip upon loss of all Feedwater Flow to prevent OTSG'S from boiling dry.

2. Resolve, as soon as possible, the questions raised in SU-490.

Babcock & Wilcox

Power Generation Group

P.O. Box 1260, Lynchburg, Va. 24505
Telephone (804) 384-5111

November 11, 1974

SOM-481

Arkansas Power and Light Company
Arkansas Nuclear One, Unit-1
Russellville, AR 72801

Attention: Mr. J. W. Anderson, Jr.

Subject: OTSG LIMITS AND PRECAUTIONS/RECOVERY FROM A DRY OTSG

Dear Mr. Anderson:

Paragraph 1.3.6 of OP 1101 01 (Plant Limits and Precautions) refers to a 25 °F differential temperature limit between the OTSG upper downcomer and the RCS cold leg. This constraint is no longer required and should be deleted from Plant Limits and Precautions.

This differential temperature limit was intended to be used during refilling of a dry Steam Generator. A dry Steam Generator is defined as eight (8) inches (neglecting instrumentation string inaccuracies) or less of level indicated on the startup range instrumentation. Recovery from this condition is accomplished by using the emergency feedwater pump(s) and auxiliary feed nozzles until minimum level is established, at which time the main nozzles and main feedwater pump(s) or auxiliary feedwater pump can be used to maintain normal OTSG level.

Plant Limits and Precautions, OP 1101 01, is presently being updated and will incorporate the above. If I can provide any further details in this matter, please do not hesitate to call.

Very truly yours,

THE BABCOCK AND WILCOX COMPANY

J. A. Bailey

J. A. Bailey
Senior Site Representative

JAB/TRS/sp

cc: R. Culp (AP&L)
W. Cavanaugh III (AP&L)
G. H. Miller (AP&L)
T. Cogburn (AP&L)
R. J. McConnell
G. M. Olds
D. B. Tulodieski
J. F. Walters

Babcock & Wilcox

Power Generation Group

P.O. Box 1260, Lynchburg, Va. 24505

Telephone: (804) 384-5111

November 13, 1974

SOM-503

Arkansas Power and Light Company
Arkansas Nuclear One, Unit-1
Russellville, AR 72801

Attention: Mr. J. W. Anderson, Jr.

Subject: RECOVERY FROM LOSS OF FEEDWATER TO STEAM GENERATORS

References: 1) OP 1202 25 Rev 1, Loss of Steam Generator Feed, April 3, 1974

2) Letter, H. A. Baker to [illegible], "Automatic Turbine Trip on Loss of Both Main Feedwater Pumps," March 19, 1974

3) Bechtel DCN #3, E-141 Sh-1 Rev 9, October 18, 1974
Bechtel DCN #1, [illegible] Rev 4, October 18, 1974
Subject: "Automatic Turbine Trip on Loss of Both Main Feedwater Pumps"

4) Letter, J. A. Bailey to J. W. Anderson, Jr., "OTSG Limits and Precautions/Recovery from a Dry OTSG," SOM-501, 11/[illegible]/74

Dear Mr. Anderson:

During the last few months of reactor power operation, there have been several occasions in which total feed flow to the OTSG's has been lost; that is, both main FW pumps tripped and the auxiliary FW pump not running. On each occasion the immediate response was to start/restart the auxiliary feedwater pump to reinitiate OTSG feed flow through the main feedwater nozzles. The immediate action prescribed in the emergency operating procedure for Loss of Steam Generator Feed (Reference 1) is to trip the reactor and start an emergency feedwater pump. Once relatively stable plant conditions have been established and the OTSG levels are under control at minimum level, normal feed flow through the main feedwater nozzles can be reinitiated and the emergency feedwater system secured.

In view of the fact that OTSG level can be restored by either the emergency feedwater pump(s) using the auxiliary feedwater nozzles or the auxiliary feedwater pump using the main feedwater nozzles, a re-evaluation of the recovery from a loss of feed to the OTSG's has been made with consideration given to the methods presently available.

Babcock & Wilcox

Mr. J. W. [illegible], Jr.
[illegible], 2
November [illegible], 1974

a) Emergency feedwater pump(s) and the auxiliary feedwater nozzles using Condensate Storage Tank (i.e. saturated) water (40-110 °F water depending on ambient air temperature). The emergency feedwater pump(s), as well as OTSG level control valves require operator action.

b) Auxiliary feedwater pump and the main feedwater nozzles using the normal feedwater supply from the hotwell, through the feedwater heaters and condensate demineralizers. Feedwater temperature varies as a function of load; ≈ 270 °F at zero power, ≈ 375 °F at 40% power and ≈ 415 °F at 100% power. Operator action is required to reinitiate feed flow.

After considering the availability of the electric driven auxiliary feedwater pump, the temperature and chemistry of the feedwater being added to the OTSG's and the present requirement for manual reinitiation of any feedwater to the OTSG's, the recommended response to a total loss of feedwater to the OTSG's has not changed from that originally recommended and incorporated in OP 1202 16 (Reference 1). For your information, I have re-emphasized the recommended response to this emergency situation:

1) Upon loss of total feedwater flow, the control room operator is to manually trip the reactor as soon as possible, provided the Reactor Protection System has not already tripped the reactor.

2) As recommended in Reference 2 and subject to incorporation of this recommendation (Reference 3), the turbine should trip automatically upon loss of both main feedwater pumps. The turbine should be tripped immediately if loss of both main feedwater pumps and a reactor trip fails to trip the turbine.

3) The emergency feedwater pump(s) should be started as soon as possible and the emergency feedwater system readied to restore and/or maintain OTSG minimum level. The Integrated Control System will provide an automatic start of the steam driven emergency feedwater pump and automatic OTSG level control upon loss of both main feedwater pumps with the auxiliary feedwater pump not running. However, this automatic ICS function is presently bypassed, therefore requiring operator action to initiate the emergency feedwater equipment. Since feedwater flow must be re-established to both OTSG's within 60 seconds to prevent lifting of pressurizer code relief valves upon loss of all feedwater, this automatic ICS response should be reinstated to minimize the delay in establishing a source of emergency feedwater.

4) Once an emergency feedwater pump has been started and the emergency feedwater system is available to supply emergency feed, the auxiliary feedwater pump can be started and the main feedwater system readied to supply normal feed flow through the main feedwater nozzles. However as indicated in Reference 4, should the OTSG(s) go dry (6 inches or less on the startup level instrumentation),

the emergency feedwater system must be used to restore minimum level. Consequently, prior to initiating feed through the main feedwater nozzles and/or securing the emergency feedwater system, the level in both OTSG's should be under control to assure that a "dry" OTSG condition will not occur.

5) RCS letdown flow should be secured and RCS makeup flow increased until the RCS pressure and pressurizer level have turned around and started to increase or until the pressurizer heaters are covered and operational.

The methods of recovery from loss of feed to the steam generators available at ANO-1 have been re-evaluated by our engineering department. The recommended method of recovery is by feeding the OTSG's through the auxiliary feedwater nozzles with the emergency feedwater system and reverting to the main feedwater nozzles when OTSG level is under control.

Although our recommendation has not changed from that originally specified and included in CP 1202 26, if I can provide any further details in this matter, please do not hesitate to call.

Sincerely,

THE BABCOCK AND WILCOX COMPANY

J. A. Bailey

J. A. Bailey
Senior Site Representative

JAB/FRF/tp

cc: R. Culp (AP&L)
W. Cavanaugh III (AP&L)
G. H. Miller (AP&L)
T. Cogburn (AP&L)
R. J. McConnell
G. M. Olds
D. B. Tulodieski
J. F. Walters

E. M. Davis
Page two
November 6, 197[illegible]

The evaluation of the transient data plotted by Mr. David Downtain revealed that turbine header pressure did not decrease significantly (to about 700 psig) nor did OTSG startup level drop below the 10 inch level. The combination of these two events constitute a dry OTSG.

RAW:ihr
cc: N. A. Baker
R. J. McDonald
D. B. [illegible]
E. J. Coppola
D. H. Roy
R. F. Ryan
A. F. McBride
B. A. Karrasch

PLANT STARTUP SERVICE

SITE PROBLEM REPORT TRANSMITTAL

FILE - 1282

TO: R.W. White ______ For Action

CONTRACT 620-03 03

SPR 571

TITLE Loss of Feedwater to OTSG's

H.A. Bailey ______ For Information

DATE OCT 29 1974

Date Final Resolution Required by Nuclear Service Support Engineer

Action Requested: R.W. White is requested to Evaluate the possibility for automatic reactor trip upon loss of all Feedwater flow to prevent OTSG's from boiling dry.

cc: Central Engineering File
C. C. Plunkett - Contract Admin.
C. M. Fletcher - NPD Quality Assurance
E. L. Logan - SMUD
J. N. Koelin - ARKANSAS
B. L. Day - DUKE
L. C. Rogers - MET ED
R. E. Kosiba

Direct reply in writing to N.S.Support Engineer. Please reply immediately whether answer is final or preliminary.

Earl H. Davis

Nuclear Service Support Engineer
Earl H. Davis/jr.

MANHOUR LIMITS	
COST LIMITS	
CHARGE NO.	
APPROVED:	
	Project Manager

191-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER [illegible]	CONTRACT NO. [illegible]	SPR NO. [illegible]	REV. NO. [illegible]
VENDOR [illegible] P.O. NO.	TASK NO.	GROUP NO.	SEQ. NO.
SITE ENGINEER [illegible]	REQ'D. RESOL. DATE [illegible]	REQ'D. COMP. DATE [illegible]	

TITLE [illegible]

DESCRIPTION OF PROBLEM

See Attachments.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

See Attachments.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

See Attachments.

[illegible signature] [illegible] SIGNATURE [illegible]

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[signature]	10/[illegible]
TASK ENGINEER		
PROJECT MANAGER		

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ. FC NO.

COMPLETION

SITE COMPLETION REPORT

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED | SIGNED BY

S.O.M. CONSTR. REP. APPROVAL | DATE

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M. CONST. REP.
QA DOC. FILE
CONT. ENGR.
FILE 1211.2

Ba

Babcock & Wilcox

[illegible] #571

Description of Problem

On October [illegible], 1974, [illegible] Unit 1 reactor was manually tripped at ~1306. The Sequence of Events which led to the manual tripping of the reactor is as follows:

Time	Event
Prior to ~1304:30	Reactor at ~[illegible] FP (Reactor Power)
Prior to ~1304:30	Turbine rolling at 1800 rpm. Turbine/Generator off line - encountering problems with AUTO [illegible] in trying to Sync. to the grid.
1304:30	'B' Main Feedwater Pump tripped on high turbine exhaust pressure
1305	Manually tripped Main Turbine
1306	Manually tripped Reactor
1307:15	Main Steam Safety Valve lifted at 1010 psi and reseated at 935 psi

The 'B' Main Feedwater Pump (FWP) trip on high turbine exhaust pressure was caused by an incorrect valve lineup. [illegible] 'B' Main FWP turbine exhaust to condenser, the [illegible]-inch manual butterfly valve, was closed. [illegible], the 12-inch bypass rupture disc, had blown and was the path to the condenser for the turbine exhaust steam. As load was slowly being increased, the 12-inch bypass line could no longer handle the steam flow and the pump turbine tripped on high turbine exhaust pressure.

The Auxiliary Feedwater pump was started within 30 seconds (manual start by operator) and at about the same time the Main Turbine was manually tripped.

From the time of the 'B' MFWP trip until the manual trip of the reactor, about 1½ minutes, no operator action was taken to reduce reactor power. Pressurizer level increased; upon reaching 290 inches, the reactor was manually tripped per Administrative directive.

Immediately after the Reactor trip, Turbine Header Pressure began to increase above 8[illegible]0 psig because of the 125 psig bias placed on Turbine Header Pressure setpoint. However, as can be seen in Figure 4, Turbine Header Pressure only reached 975 psig before it began decreasing, indicating dry or nearly dry OTSG'S.

For the next several minutes, feedwater flow oscillated back-and-forth between the OTSG'S. Figures 5 and 6 illustrate the back-and-forth feeding of the OTSG'S. An explanation for this is the following:

1) The Auxiliary Feedwater Pump starts filling the OTSG'S, but because of the large amount of recirculation, the discharge pressure is about 900 psig (only a guess).

Babcock & Wilcox

2) Steam pressure began to increase in the OTSG'S, but was higher in 'A' OTSG than in 'B' OTSG. When steam pressure in 'A' OTSG reached the discharge pressure on the Aux. Feedwater pump, feed flow to 'A' OTSG stopped but continued to feed 'B' OTSG.

3) Steam pressure in 'B' OTSG continued to increase, but lack of feed flow caused 'A' OTSG steam pressure to decrease. At some point in time, 'B' OTSG steam pressure would prevent Auxiliary Feedwater pump from filling the 'B' OTSG any longer, and at that point where 'A' OTSG steam pressure had decreased below Aux. Feedwater pump discharge pressure, 'A' OTSG would begin to fill again.

From a previous loss of all feedwater flow incident, it was noted that with immediate manual tripping of the reactor and subsequent start of the Auxiliary Feedwater pump, the transient the system went through was very minor; i.e., the OTSG Level was promptly maintained at Low Level Setpoint. The Immediate Action Section of [illegible] Unit 1 Emergency Procedure for Loss of Steam Generator Feed, OP 1202.26, states,

> "Verify that reactor tripped and carry out the reactor trip procedure (OP 1202.24)."

The resulting system transients from lack of immediate operator action to trip the reactor can be greatly worsened if the Auxiliary Feedwater pump fails to start, since there is no automatic initiation of the Emergency Feedwater System at this site at this time. See SCM-[illegible], [illegible] to R. J. McConnell, "Recovery from a Dry OTSG Condition," for a discussion of this situation.

Status - Action to Date Including Persons Contacted

R. J. McConnell, Manager, Plant Startup Service

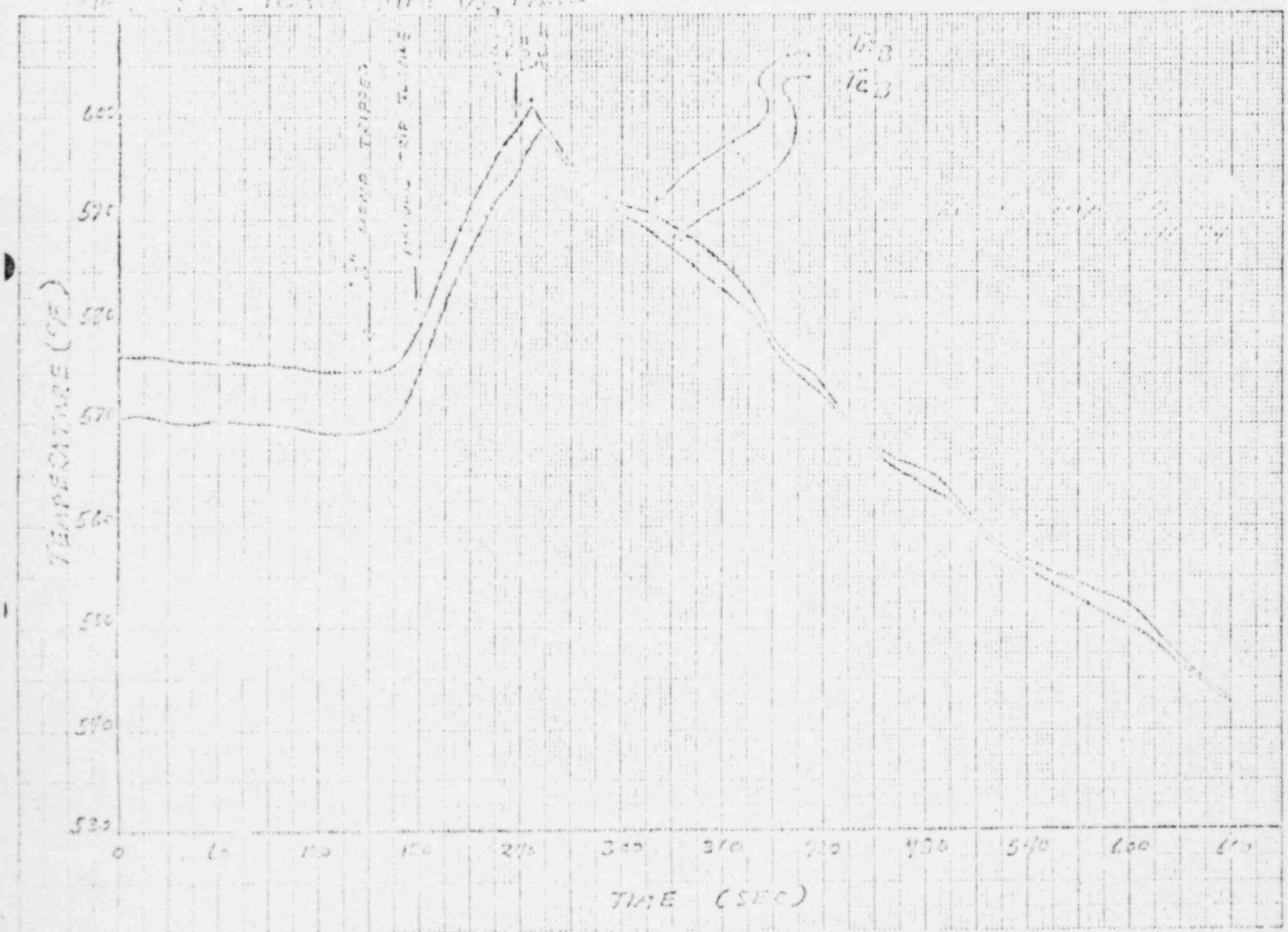
Further Action Recommended by Site Personnel

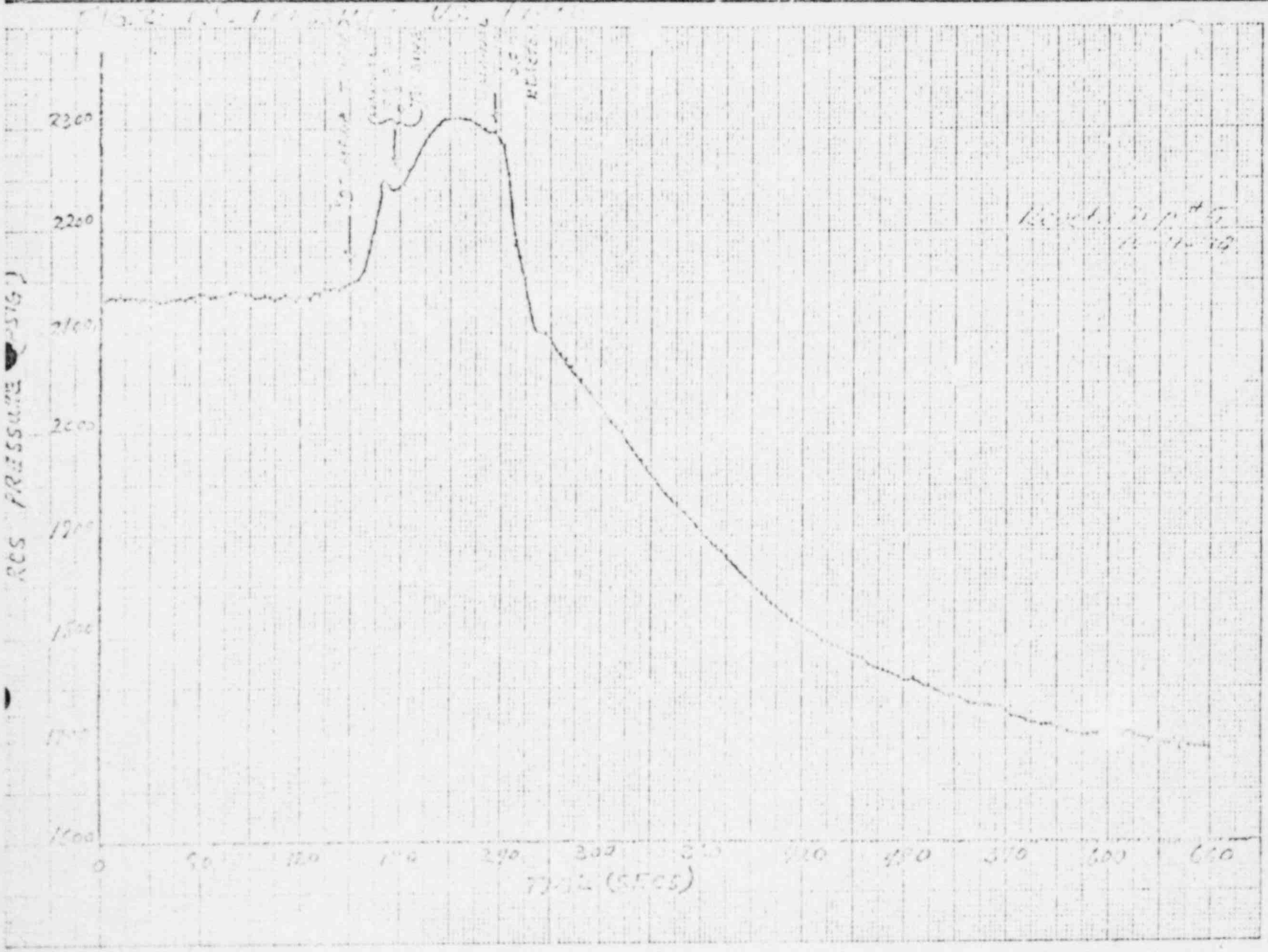
1. Evaluate possibility for automatic reactor trip upon loss of all Feedwater Flow to prevent OTSG'S from boiling dry.

2. Resolve, as soon as possible, the questions raised in SCM-[illegible].

46 1516

Fig. : RC Temperature vs. Time

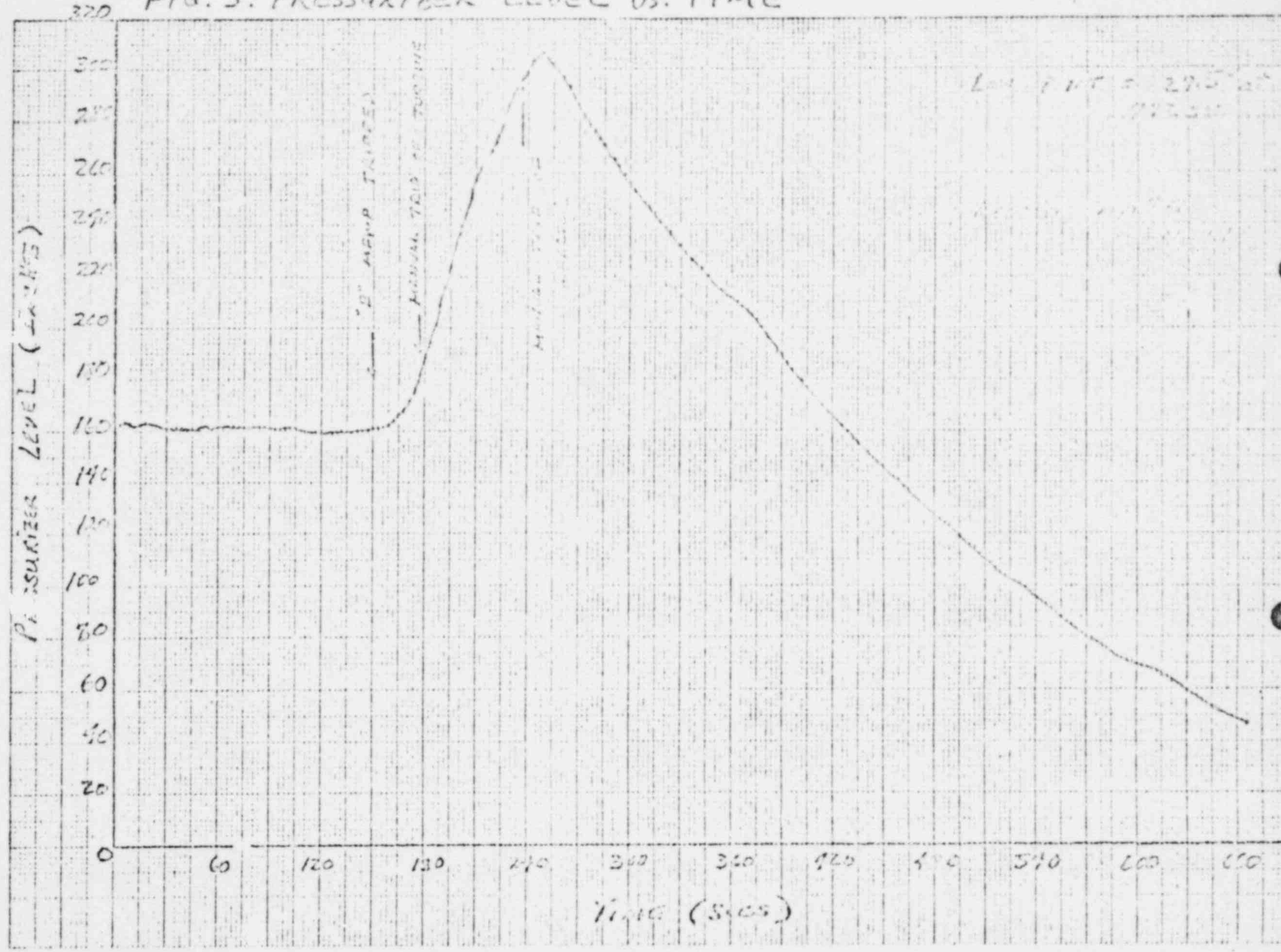




RCS PRESSURE (PSIG)
2300
2200
2100
2000
1900
1800
1700
1600
0
60
120
180
240
300
360
420
480
540
600
660
TIME (SECS)

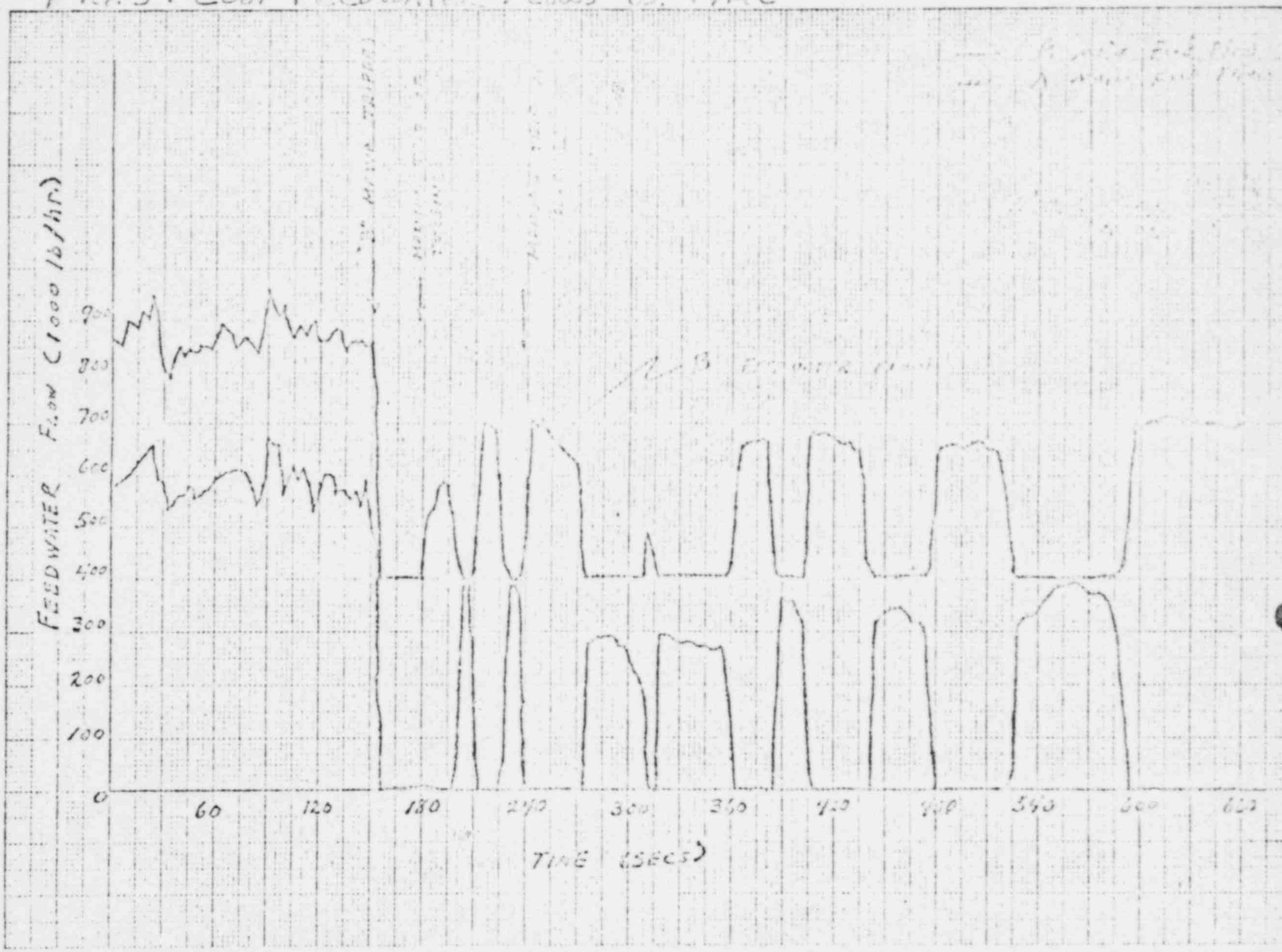
K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM. KEUFFEL & ESSER CO. 46 1516

FIG. 3: PRESSURIZER LEVEL VS. TIME



K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM KEUFFEL & ESSER CO. MADE IN U.S.A. 46 1516

FIG. 5: LOOP FEEDWATER FLOWS VS. TIME



K+E 10 X 10 TO THE CENTIMETER 18 X 25 CM 46 1516

FIG. 4: TURBINE HEADER PRESSURE VS. TIME

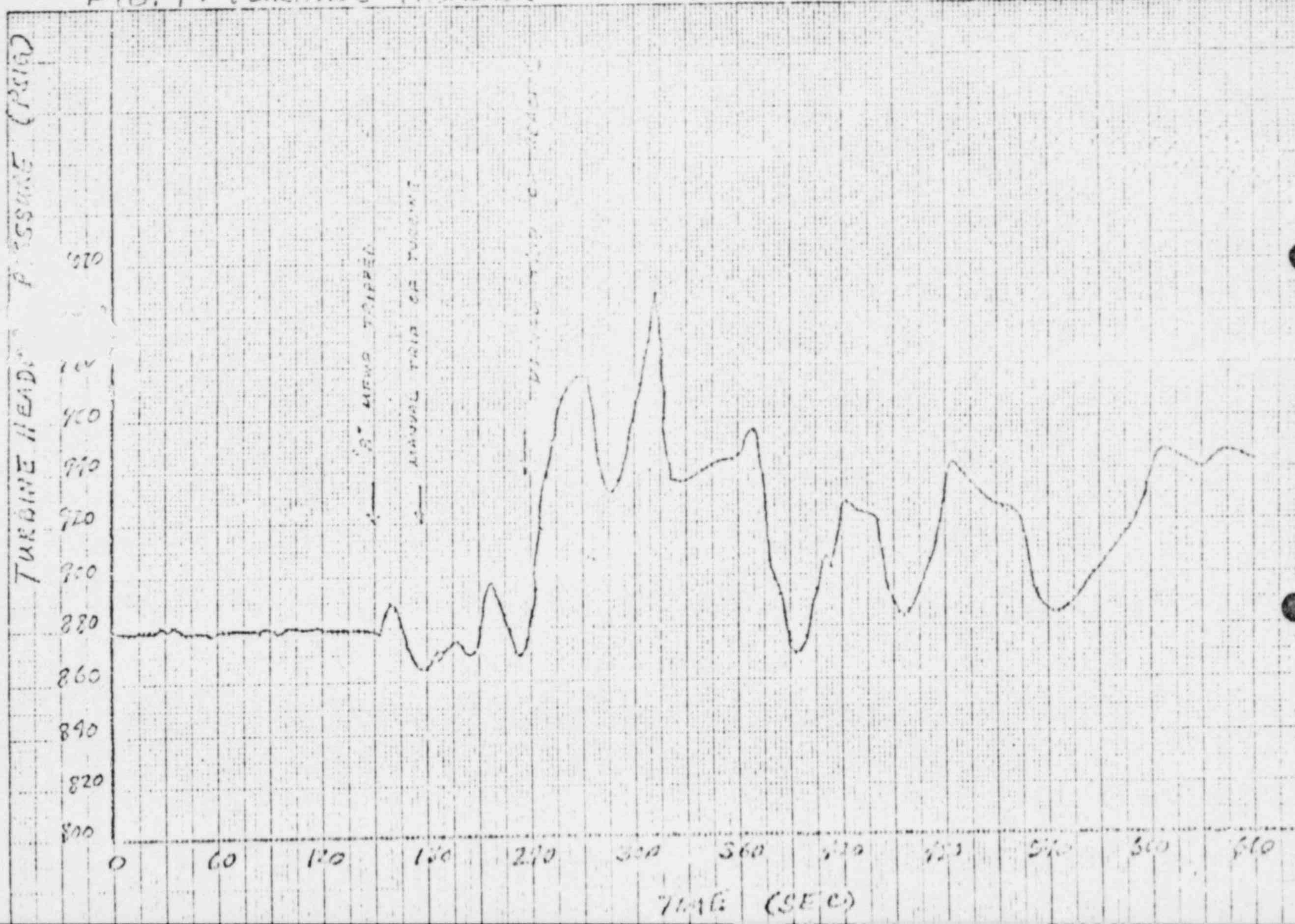
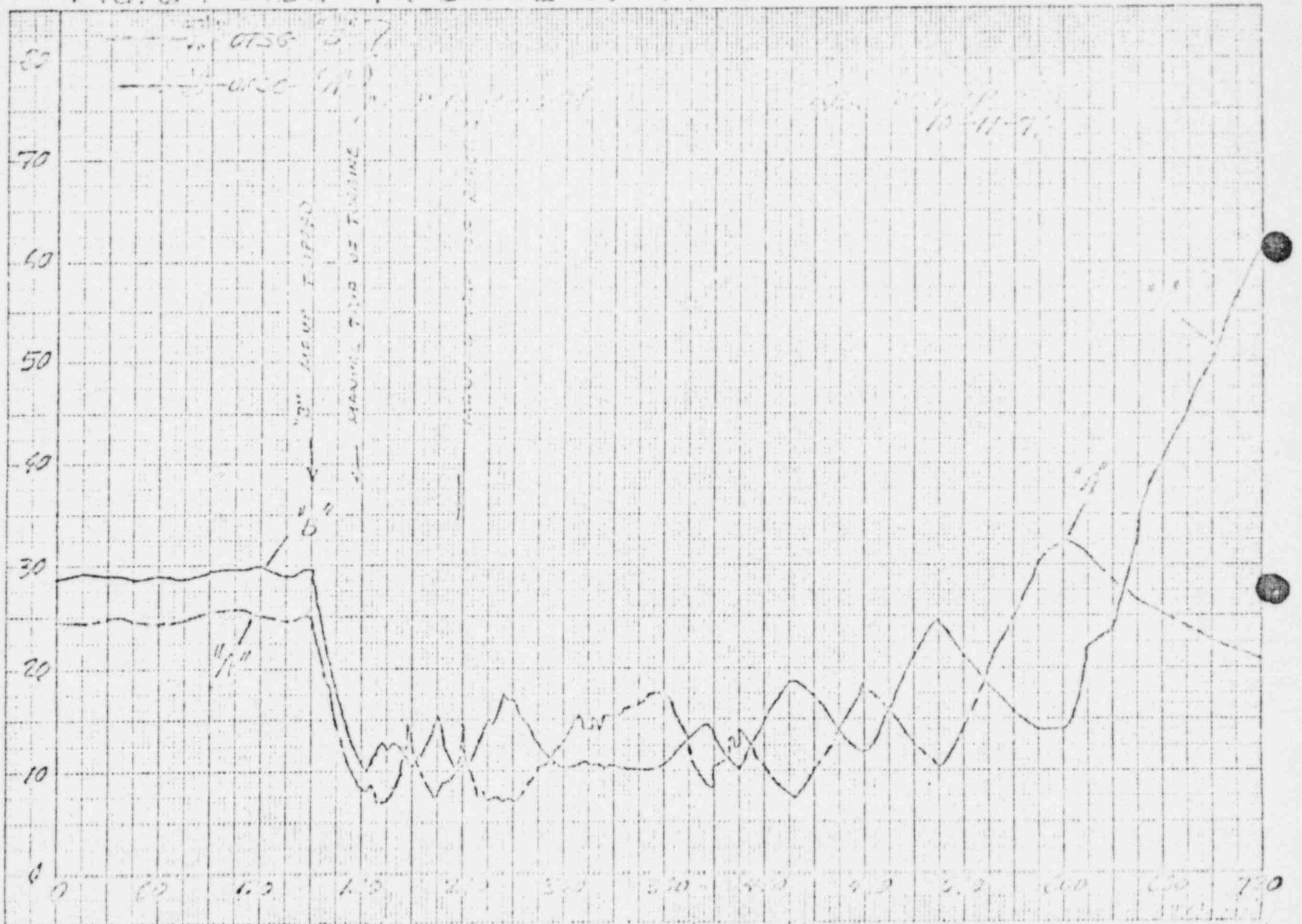


FIG. 6 : OTSG S/U LEVEL VS. TIME



```
01 -0000 +0000
04 -0000 +5000 Turbine Trips
05 +0000 +2500 RCS Press 'B'
07 +0000 +0000 RCS Th 'B'
09 +0000 +0100 RCS Tc 'B'
11 +0000 +0300 Prz Lvl
12 +0000 +0100 MU Tank Lvl
17 +0000 +1000 Turbine Header Press
18 +0000 +0250 'A' OTSG S/U Lvl
20 +0000 +0000 'A' Main FW Flow
21 +0000 +6000 'B' Main FW Flow
22 +0000 +0250 'B' OTSG S/U Lvl
99
TEST NO. NOW I5 = 0002
TEST NO. DESIRED I4 = 0002
BLOCK NO. NOW I3 = 0001
BLOCK NO. DESIRED I4 = 0001
STARTING RECORD NO. I5 = 00216
STARTING DATA CHN NO. I2 = 01
DELOGGING INTERVAL I5 = 00001
PLAYBACK CHANNELS I2 =
 01 04 05 07 09 11 12 17 18 20 21 22 99        7     9     11
                                       RCS     THB   TCB   Prz Lvl
"SWITCH 0 IS QUIT SWITCH"              Press
 0000216    3 +2000.0 -2100.3 +2132.0 +0576.8 +0570.8 +0163.6
+0090.0 +0579.0 +0029.6 +0515.0 +0904.8 +0024.5
 0000216    3 +2000.0 -2100.1 +2135.2 +0576.8 +0570.8 +0163.9
+0090.5 +0579.2 +0029.9 +0570.6 +0955.0 +0024.3
 0000216    3 +2000.0 -2100.3 +2132.9 +0576.8 +0570.8 +0163.1
+0090.4 +0579.9 +0029.6 +0512.7 +0899.0 +0023.8
 0000216    3 +2000.0 -2107.2 +2133.4 +0573.8 +0570.7 +0162.9
+0090.2 +0579.0 +0028.9 +0511.3 +0925.1 +0025.5
 0000216    3 +2000.0 -2101.1 -2133.0 +0576.7 +0570.7 +0162.6
+0090.1 +0579.1 +0029.4 +0500.0 +0965.1 +0023.5
 0000216    3 +2000.0 -2101.2 -2134.3 +0576.7 +0570.6 +0163.0
+0090.0 +0579.4 +0029.1 +0533.6 +0914.7 +0024.4
 0000216    3 +2000.0 -2106.6 +2134.1 +0576.6 +0570.5 +0163.1
+0089.9 +0579.6 +0029.4 +0545.9 +0905.4 +0024.9
 0000216    3 +2000.0 -2103.0 +2131.1 +0576.6 +0570.4 +0162.5
+0089.8 +0579.8 +0028.8 +0553.7 +0946.0 +0024.0
 0000216    3 +2000.0 -2100.0 +2133.7 +0576.5 +0570.3 +0161.6
+0089.7 +0580.5 +0029.6 +0523.1 +0907.4 +0025.1
 0000216    3 +2000.0 -2103.0 +2123.6 +0576.4 +0570.3 +0161.4
+0089.5 +0579.8 +0029.2 +0534.7 +0805.6 +0025.4
 0000216    3 +2000.0 -2104.5 +2131.3 +0576.4 +0570.1 +0161.4
+0089.5 +0581.0 +0028.0 +0537.1 +07[illegible].3 +0024.8
 0000216    3 +2000.0 -2105.0 +2130.9 +0576.3 +0570.1 +0161.8
+0089.3 +0580.2 +0028.8 +0543.4 +0522.8 +0025.0
 0000216    3 +2000.0 -2107.8 +2131.3 +0576.2 +0570.1 +0161.5
+0089.1 +0579.0 +0028.5 +0500.6 +0849.9 +0024.1
 0000216    3 +2000.0 -2100.0 +2133.6 +0576.2 +0570.2 +0160.9
+0088.9 +0578.6 +0028.9 +0559.5 +0833.7 +0025.0
 0000216    3 +2000.0 -2106.0 +2134.5 +0576.2 +0570.2 +0160.8
+0088.8 +0578.3 +0028.4 +0551.4 +0845.1 +0024.1
 0000216    3 +2000.0 -2107.5 -2135.6 +0576.2 +0570.2 +0161.1
+0088.6 +0578.8 +0028.4 +0555.5 +0840.5 +0024.4
 0000216    3 +2000.0 -2107.2 +2133.8 +0576.1 +0570.2 +0161.6
+0088.4 +0578.5 +0028.7 +0559.8 +0858.6 +0024.9
 0000216    3 +2000.0 -2105.4 +2136.0 +0576.2 +0570.2 +0161.2
```

```
 0000216    3 +20[illegible].0  -2105.4  +2136.0  +05[illegible].2  +0570.2  +0161.8
+0038.3  +0378.4  +[illegible]3.6  +0570.6  +0352.7  [illegible]4.2
 0000216    3 +2000.0  -2106.6  +2133.7  +0576.2  +0570.2  +0161.3
+0038.1  +0377.9  +0028.4  +0573.9  +0349.5  +0024.8
 0000216    3 +2000.0  -2106.0  +2135.3  +0576.2  +0570.2  +0161.2
+0037.9  +0373.7  +0028.9  +0594.3  +0371.9  +0023.9
 0000217    3 +2000.0  -2105.7  +2137.6  +0576.1  +0570.2  +0161.3
+0037.7  +0378.7  +0028.9  +0604.3  +0390.4  +0024.2
 0000217    3 +2000.0  -2106.0  +2136.2  +0576.1  +0570.2  +0161.9
+0037.7  +0373.8  +0029.1  +0606.5  +0381.0  +0024.8
 0000217    3 +2000.0  -2105.6  +2136.7  +0576.2  +0570.2  +0162.0
+0037.6  +0379.3  +0028.5  -0605.4  +0373.4  +0024.5
 0000217    3 +2000.0  -2106.3  +2133.8  +0576.1  +0570.1  +0161.6
+0037.4  +0379.5  +0028.5  +0611.5  +0349.5  +0024.9
 0000217    3 +2000.0  -2106.0  +2137.2  +0576.0  +0570.1  +0161.0
+[illegible]38.5  +0379.4  +0029.2  +0610.0  +0365.3  +0025.1
 [illegible]00217    3 +2000.0  -2106.6  +2130.5  +0576.0  +0570.0  +0161.1
+0038.5  +0379.4  +0028.6  +0599.4  +0366.2  +0024.7
 0000217    3 +2000.0  -2106.6  -2130.5  +0576.0  +0570.0  +0161.6
+0038.4  +0379.6  +0028.8  +0575.6  +0351.4  +0024.9
 0000217    3 +2000.0  -2157.2  +2139.2  +0576.0  +0570.0  +0161.7
+0038.3  +0379.2  +0028.9  +0548.4  +0337.1  +0024.2
 0000217    3 +2000.0  -2106.0  +2137.7  +0576.0  +0570.0  +0161.5
+0038.1  +0379.9  +0028.9  +0582.0  +0367.1  +0024.7
 0000217    3 +2000.0  -2106.0  +2133.8  +0576.0  +0570.0  +0160.7
+0038.0  +0379.7  +0029.1  +0572.5  +0758.7  +0025.4
 0000217    3 +2000.0  -2107.2  +2135.8  +0575.9  +0570.0  +0160.8
+0037.9  +0378.5  +0029.5  +0664.2  +0931.7  +0025.1
 0000217    3 +2000.0  -2106.6  +2135.1  +0575.9  +0569.9  +0160.2
+0037.8  +0379.1  +0029.9  +0661.1  +0912.5  +0024.9
 0000217    3 +2000.0  -2106.6  +2136.3  +0575.8  +0569.8  +0161.0
+0037.6  +0380.1  +0029.7  +0565.7  +0386.3  +0025.2
 0000217    3 +2000.0  -2106.6  +2135.8  +0575.7  +0569.7  +0160.8
+0037.4  +0380.3  +0029.0  +0597.0  +0387.2  +0025.2
 0000217    3 +2000.0  -2106.6  +2132.6  +0575.7  +0569.6  +0160.0
+0037.3  +0380.4  +0029.9  +0619.9  +0388.0  +0025.1
 0000217    3 +2000.0  -2106.6  +2134.3  +0575.6  +0569.5  +0159.7
+0037.2  +0380.1  +0029.7  +0592.4  +0387.2  +0025.6
 0000217    3 +2000.0  -2106.6  +2137.9  +0575.5  +0569.5  +0159.7
+0037.1  +0380.0  +0030.0  +0612.8  +0377.0  +0025.5
 0000217    3 +2000.0  -2107.2  +2133.6  +0575.4  +0569.4  +0159.9
+0036.9  +0380.2  +0029.9  +0562.7  +0387.6  +0026.1
 0000217    3 +2000.0  -2107.2  +2133.3  +0575.4  +0569.3  +0160.0
+0036.7  +0380.4  +0029.6  +0580.9  +0393.1  +0025.0
 0000217    3 +2000.0  -2107.2  +2137.2  +0575.4  +0569.3  +0159.5
+0036.5  +0379.5  +0029.8  +0565.8  +0361.2  +0024.8
 0000218    3 +2000.0  -2106.6  +2136.3  +0575.3  +0569.2  +0159.3
+0036.3  +0379.1  +0029.9  +0604.9  +0361.2  +0025.1
 0000218    3 +2000.0  -2106.6  +2135.3  +0575.3  +0569.2  +0159.2
+0036.2  +0377.9  +0030.2  +0608.3  +0372.1  +0024.9
 0000218    3 +2000.0  -2106.6  +2139.7  +0575.3  +0569.1  +0159.7
+0036.0  +0379.2  +0029.3  +0571.4  +0351.0  +0025.6
 0000218    3 +2000.0  -2106.0  +2130.0  +0575.3  +0569.2  +0160.0
+0035.8  +0375.9  +0028.7  +0573.8  +0370.2  +0024.4
 0000218    3 +2000.0  -2106.6  +2143.4  +0575.3  +0569.2  +0159.9
+0035.7  +0379.1  +0029.6  +0535.5  +0344.6  +0025.0
 0000218    3 +2000.0  -2105.4  +2143.6  +0575.3  +0569.2  +0159.5
+0035.5  +0379.0  +0028.7  +0556.9  +0366.2  +0024.5
 0000218    3 +2000.0  -2105.1  +2144.9  +0575.3  +0569.2  +0159.9
+0035.4  +0379.0  +0029.2  +0564.0  +0357.6  +0024.5
 0000218    3 +2000.0  -2105.1  +2142.4  +0575.3  +0569.3  +0160.3
+0035.3  +0378.8  +0029.3  +0539.5  +0336.7  +0024.6
 0000218    3 +2000.0  -2104.8  +2146.2  +0575.3  +0569.3  +0160.3
```

+0035.1	+0378.6	+0029.7	+0357.5	+0351.2	+0024.3	
0000218	3	+2000.[illegible]	-2104.3	+2147.5	+0575.[illegible]	+0569.3 +0161.1
+0035.0	+0379.2	+00[illegible]2	+0327.2	+0357.4	+00[illegible].3	
0000218	3	+2000.0	-2104.2	+2151.7	+0575.4	+0569.4 +0160.5
+0036.1	+0377.3	+0029.4	+0439.0	+0741.1	+0025.0	
0000218	3	+2000.0	-2104.6	+2153.6	+0575.4	+0569.4 +0160.8
+0035.0	+0384.9	+0027.1	-0000.1	+0404.9	+0022.6	
0000218	3	+2000.0	-2105.1	+2162.3	+0575.5	+0569.6 +0161.9
+0035.9	+0389.3	+0024.4	-0000.1	+0404.4	+0020.6	
0000218	3	+2000.0	-2105.4	+2182.4	+0575.6	+0570.1 +0164.1
+0035.8	+0387.2	+0022.1	-0000.1	+0403.3	+0018.5	
0000218	3	+2000.0	-2104.5	+2203.5	+0576.0	+0570.7 +0166.1
+0035.6	+0381.2	+0019.3	-0000.1	+0401.6	+0016.4	
0000218	3	+2000.0	-2104.5	+2229.4	+0576.7	+0571.4 +0167.8
+0035.6	+0374.6	+0017.6	-0000.1	+0403.3	+0014.3	
0000218	3	+2000.0	-2103.6	+2249.7	+0577.3	+0572.3 +0170.9
+0035.5	+0369.5	+0015.7	-0000.1	+0401.6	+0012.7	
0000218	3	+2000.0	-2103.6	+2246.3	+0578.1	+0573.3 +0175.8
+0035.4	+0366.6	+0014.1	-0000.1	+0401.6	+0011.0	
0000218	3	+2000.0	-2103.0	+2240.7	+0578.9	+0574.4 +0181.8
+0035.5	+0365.3	+0013.0	-0000.1	+0401.3	+0010.0	
0000218	3	+2000.0	-2101.4	+2242.1	+0579.9	+0575.5 +0187.9
+0035.4	+0365.0	+0011.6	-0000.1	+0401.6	+0009.3	
0000219	3	+2000.0	+0000.9	+2246.4	+0581.0	+0576.7 +0194.1
+0035.5	+0363.7	+0011.1	-0000.1	+0516.3	+0008.2	
0000219	3	+2000.0	+0000.3	+2259.7	+0582.1	+0578.0 +0200.9
+0035.5	+0370.9	+0010.7	-0000.1	+0532.9	+0008.1	
0000219	3	+2000.0	+0000.6	+2267.3	+0583.4	+0579.4 +0208.6
+0035.6	+0370.8	+0010.7	-0000.1	+0370.1	+0008.6	
0000219	3	+2000.0	+0000.3	+2276.6	+0584.7	+0580.6 +0216.5
+0035.6	+0372.6	+0011.7	-0000.1	+0533.3	+0007.0	
0000219	3	+2000.0	+0000.0	+2287.1	+0585.9	+0581.8 +0224.3
+0035.6	+0375.1	+0012.3	-0000.1	+0531.4	+0006.9	
0000219	3	+2000.0	-0000.3	+2296.7	+0587.2	+0582.9 +0231.3
+0035.7	+0375.8	+0012.1	-0000.1	+0533.4	+0007.3	
0000219	3	+2000.0	+0000.0	+2300.2	+0588.3	+0583.9 +0237.1
+0035.7	+0373.6	+0012.7	+0108.7	+0436.3	+0008.4	
0000219	3	+2000.0	+0000.3	+2304.0	+0589.3	+0584.9 +0244.6
+0036.0	+0375.2	+0013.7	+0335.7	+0400.5	+0009.0	
0000219	3	+2000.0	+0000.3	+2309.9	+0590.3	+0586.0 +0250.7
+0035.8	+0371.1	+0011.8	+0399.8	+0402.7	+0009.7	
0000219	3	+2000.0	+0001.8	+2309.3	+0591.3	+0587.1 +0257.3
+0035.7	+0379.2	+0010.8	-0242.7	+0421.3	+0012.0	
0000219	3	+2000.0	+0000.6	+2310.0	+0592.3	+0588.2 +0262.7
+0035.8	+0391.3	+0010.5	-0000.1	+0564.0	+0010.6	
0000219	3	+2000.0	-0000.3	+2310.0	+0593.2	+0589.4 +0266.8
+0035.8	+0397.6	+0011.7	-0000.1	+0700.7	+0010.8	
0000219	3	+2000.0	-0000.3	+2309.9	+0594.2	+0590.5 +0269.2
+0035.9	+0394.7	+0011.5	-0000.1	+0395.3	+0009.7	
0000219	3	+2000.0	+0000.3	+2309.3	+0595.2	+0591.3 +0272.2
+0035.9	+0389.8	+0012.9	-0000.1	+0638.9	+0003.5	
0000219	3	+2000.0	+0000.3	+2306.8	+0596.1	+0592.0 +0277.7
+0036.0	+0385.6	+0013.7	-0000.1	+0534.9	+0007.5	
0000219	3	+2000.0	-0000.3	+2304.2	+0596.9	+0592.5 +0283.6
+0036.0	+0379.1	+0015.3	+0037.8	+0400.9	+0007.4	
0000219	3	+2000.0	+0000.3	+2301.6	+0597.8	+0593.1 +0287.9
+0036.3	+0373.8	+0013.2	+0039.0	+0403.1	+0003.7	
0000219	3	+2000.0	+0000.3	+2295.1	+0598.2	+0593.8 [illegible]
+0036.2	+0369.9	+0011.7	+0335.3	+0403.5	+0009.1	
0000219	3	+2000.0	-0000.3	+2297.7	+0598.8	+0594.7 [illegible]
+0036.4	+0375.0	+0010.3	+0344.3	+0406.2	+0009.4	
0000219	3	+2000.0	+0000.3	+2292.1	+0599.5	+0595.6 +02[illegible].1
+0036.4	+0365.6	+0010.0	+0012.7	+0485.1	+0012.0	
0000220	3	+2000.0	+0000.6	+2285.8	+0600.3	+0596.7 +0303.2

```
+0035.3  +0970.2  +0010.6  -0000.1  +0704.1  +0010.4
 0000220     3  +2000.0  -0000.3  +2243.2  +0600.0  +0597.7  +0305.4
+0036.1  +0913.0  +0010.5  -0000.1  +0693.3  +0008.4
 0000220     3  +2000.0  +0000.3  +2187.8  +0600.4  +0598.3  +0306.1
+0035.6  +0930.1  +0011.6  -0000.1  +0700.3  +0007.6
 0000220     3  +2000.0  +0000.3  +2174.0  +0599.6  +0598.7  +0304.1
+0035.9  +0930.2  +0013.1  -0000.1  +0683.3  +0007.6
 0000220     3  +2000.0  -0000.3  +2141.3  +0599.2  +0598.5  +0301.5
+0035.7  +0951.6  +0014.0  -0000.1  +0673.4  +0007.3
 0000220     3  +2000.0  +0000.0  +2122.0  +0598.6  +0597.7  +0299.0
+0035.5  +0967.9  +0014.3  -0000.1  +0661.5  +0007.4
 0000220     3  +2000.0  +0000.9  +2104.2  +0597.6  +0597.0  +0296.5
+0035.5  +0972.2  +0014.5  -0000.1  +0650.2  +0007.3
 0000220     3  +2000.0  +0000.6  +2100.1  +0596.7  +0596.4  +0293.3
+0035.4  +0974.9  +0015.8  -0000.1  +0630.7  +0007.2
 0000220     3  +2000.0  +0000.3  +2100.1  +0596.1  +0595.6  +0288.7
+0035.2  +0973.1  +0017.3  -0000.1  +0631.4  +0007.2
 0000220     3  +2000.0  +0000.3  +2095.4  +0595.5  +0594.8  +0284.3
+0035.1  +0976.6  +0018.8  -0000.1  +0613.3  +0007.1
 0000220     3  +2000.0  +0000.6  +2088.2  +0594.7  +0594.1  +0281.3
+0035.1  +0976.1  +0018.8  -0000.1  +0459.1  +0007.2
 0000220     3  +2000.0  +0000.9  +2081.3  +0594.3  +0593.6  +0278.7
+0035.0  +0965.1  +0015.0  +0275.0  +0406.0  +0007.9
 0000220     3  +2000.0  +0000.3  +2074.7  +0593.4  +0593.2  +0276.0
+0034.2  +0948.8  +0014.9  +0279.8  -0405.3  +0008.6
 0000220     3  +2000.0  -0000.3  +2067.4  +0592.9  +0592.8  +0273.5
+0034.6  +0937.6  +0014.3  +0291.9  +0404.6  +0009.3
 0000220     3  +2000.0  +0000.3  +2060.5  +0592.5  +0592.6  +0270.3
+0034.5  +0932.6  +0013.4  +0291.8  +0404.0  +0010.4
 0000220     3  +2000.0  +0000.6  +2055.4  +0592.1  +0592.3  +0267.0
+0034.3  +0933.6  +0012.7  +0292.1  +0403.3  +0010.4
 0000220     3  +2000.0  +0000.6  +2047.3  +0591.7  +0592.2  +0264.0
+0034.2  +0930.1  +0012.0  +0289.7  +0404.2  +0011.4
 0000220     3  +2000.0  +0000.0  +2043.4  +0591.4  +0592.0  +0262.5
+0034.1  +0946.1  +0011.3  +0276.4  +0404.1  +0011.7
 0000220     3  +2000.0  +0000.0  +2026.1  +0591.0  +0591.9  +0259.6
+0035.1  +0955.0  +0010.7  +0276.9  +0404.0  +0012.2
 0000220     3  +2000.0  +0000.6  +2027.6  +0590.7  +0591.8  +0256.5
+0035.2  +0962.1  +0010.3  +0247.3  +0404.6  +0012.6
 0000221     3  +2000.0  +0000.6  +2021.6  +0590.4  +0591.6  +0253.4
+0035.1  +0972.8  +0010.3  +0227.6  +0404.2  +0013.7
 0000221     3  +2000.0  +0000.3  +2013.7  +0590.1  +0591.5  +0251.0
+0035.0  +0983.5  +0010.3  +0209.2  +0404.6  +0014.6
 0000221     3  +2000.0  +0000.3  +2008.5  +0589.8  +0591.3  +0249.3
+0034.9  +0994.5  +0010.3  +0170.0  +0403.2  +0015.3
 0000221     3  +2000.0  +0000.3  +2003.0  +0589.5  +0591.1  +0247.3
+0034.8  +1003.0  +0010.5  -0000.1  +0405.3  +0014.1
 0000221     3  +2000.0  +0000.9  +1995.0  +0589.2  +0591.0  +0244.7
+0034.8  +0990.9  +0010.9  -0000.1  +0445.9  +0014.1
 0000221     3  +2000.0  +0000.0  +1987.7  +0588.9  +0590.7  +0241.8
+0034.8  +0951.0  +0010.6  +0237.1  +0405.7  +0015.0
 0000221     3  +2000.0  +0000.6  +1979.9  +0588.6  +0590.4  +0239.1
+0034.9  +0937.2  +0010.7  +0220.2  +0403.1  +0015.9
 0000221     3  +2000.0  +0001.2  +1975.4  +0588.1  +0590.1  +0237.1
+0034.7  +0933.4  +0010.4  +0220.1  +0404.0  +0015.2
 0000221     3  +2000.0  +0000.9  +1967.1  +0587.8  +0589.8  +0235.1
+0034.6  +0930.0  +0010.8  +0233.1  +0404.8  +0015.2
 0000221     3  +2000.0  +0000.3  +1961.3  +0587.4  +0589.5  +0232.7
+0034.6  +0935.1  +0010.6  +0210.3  +0404.6  +0015.2
 0000221     3  +2000.0  +0001.0  +1955.9  +0587.0  +0589.2  +0229.7
+0034.5  +0937.0  +0010.4  +0279.5  +0404.8  +0015.2
 0000221     3  +2000.0  +0000.3  +1947.9  +0586.6  +0588.9  +0227.1
+0034.5  +0932.4  +0010.3  +0201.1  +0403.3  +0016.0
 0000221     3  +2000.0  +0000.3  +1943.9  +0586.1  +0588.5  +0224.5
```

0000221	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
+0034.4	+0939.7	[illegible]	+0277.3	+0402.0	[illegible]		
0000221	3	+2000.0	+0000.2	+1936.2	[illegible]	+0588.2	+0223.2
+0034.3	+0941.0	+0010.1	+0277.1	+0404.2	+0016.3		
0000221	3	+2000.0	+0000.3	+1932.0	+0585.6	+0587.3	+0221.1
+0034.3	+0942.2	+0010.1	+0278.9	+0405.3	+0016.6		
0000221	3	+2000.0	+0000.3	+1926.1	+0584.9	+0587.5	+0215.5
+0034.1	+0943.2	+0010.1	+0268.3	+0404.4	+0016.6		
0000221	3	+2000.0	-0000.3	+1920.5	+0584.5	+0587.2	+0216.3
+0034.2	+0944.1	+0010.0	+0227.9	+0403.0	+0017.4		
0000221	3	+2000.0	+0000.3	+1916.0	+0584.1	+0586.6	+0214.7
+0034.1	+0944.1	+0010.9	+0271.1	+0404.0	+0017.4		
0000221	3	+2000.0	+0000.3	+1910.0	+0583.7	+0586.4	+0213.4
+0034.0	+0944.4	+0009.5	+0228.6	+0405.2	+0017.5		
0000221	3	+2000.0	+0000.3	+1905.2	+0583.2	+0586.0	+0212.2
+0034.3	+0945.4	+0009.9	+0108.2	+0422.1	+0017.3		
0000222	3	+2000.0	+0000.3	+1898.9	+0582.8	+0585.6	+0210.2
+0034.4	+0950.3	+0010.2	-0000.1	+0586.3	+0017.0		
0000222	3	+2000.0	+0000.0	+1893.7	-0582.4	+0585.2	+0208.3
+0034.3	+0954.4	+0011.0	-0000.1	-0364.7	+0015.6		
0000222	3	+2000.0	+0000.3	+1892.1	+0582.0	+0584.8	+0206.8
+0034.3	+0954.7	+0011.2	-0000.1	-0662.0	+0014.5		
0000222	3	+2000.0	+0000.6	+1886.1	+0581.6	+0584.1	+0205.2
+0034.3	+0944.4	+0011.2	-0000.1	+0657.0	+0013.7		
0000222	3	+2000.0	+0000.6	+1879.4	-0581.2	+0583.2	+0203.4
+0034.3	+0929.9	+0011.6	-0000.1	+0165.2	+0012.5		
0000222	3	+2000.0	+0000.6	+1872.4	+0580.6	+0582.4	+0200.6
+0034.2	+0905.6	+0012.4	-0000.1	+0673.2	+0010.3		
0000222	3	+2000.0	+0000.6	+1866.7	+0579.9	+0581.5	+0197.2
+0034.2	+0897.9	+0012.7	-0000.1	+0556.4	+0009.5		
0000222	3	+2000.0	+0000.3	+1862.3	+0579.2	+0580.5	+0194.3
+0034.3	+0891.7	+0013.5	-0000.1	+0540.9	+0009.0		
0000222	3	+2000.0	-0000.3	+1856.5	+0578.5	+0579.6	+0191.7
+0034.2	+0884.6	+0014.0	+0250.7	+0403.0	+0008.4		
0000222	3	+2000.0	+0000.0	+1850.4	+0577.8	+0578.8	+0189.5
+0034.1	+0874.0	+0014.4	+0385.6	+0400.1	+0010.2		
0000222	3	+2000.0	+0000.3	+1845.0	+0577.1	+0578.1	+0187.2
+0034.1	+0860.0	+0013.0	+0360.1	+0403.5	+0010.6		
0000222	3	+2000.0	+0000.6	+1842.6	+0576.5	+0577.5	+0184.1
+0034.2	-0870.9	+0011.7	+0359.9	+0403.5	+0010.8		
0000222	3	+2000.0	+0000.0	+1838.0	+0575.9	+0576.9	+0181.2
+0034.2	-0875.3	+0011.4	+0343.2	+0423.6	+0013.1		
0000222	3	+2000.0	+0000.9	+1831.7	+0575.3	+0576.5	+0178.9
+0034.3	+0883.3	+0010.1	+0317.2	+0435.7	+0012.2		
0000222	3	+2000.0	+0000.3	+1830.5	+0574.9	+0576.2	+0176.8
+0034.3	+0894.6	+0010.2	+0057.0	+0458.5	+0013.9		
0000222	3	+2000.0	+0000.3	+1824.0	+0574.5	+0575.9	+0174.8
+0034.2	+0905.7	+0010.1	-0000.1	+0363.3	+0013.3		
0000222	3	+2000.0	+0000.6	+1821.9	+0574.1	+0575.5	+0172.3
+0034.1	+0905.9	+0011.4	-0000.1	+0360.9	+0012.7		
0000222	3	+2000.0	-0000.3	+1815.1	+0573.7	+0575.1	+0169.7
+0033.9	+0902.3	+0011.9	-0000.1	+0362.5	+0012.1		
0000222	3	+2000.0	+0000.3	+1813.0	+0573.3	+0574.5	+0167.3
+0033.9	+0913.1	+0013.3	-0000.1	+0073.3	+0010.9		
0000222	3	+2000.0	-0000.3	+1811.0	+0572.8	+0573.8	+0165.3
+0033.5	+0924.3	+0014.0	-0000.1	+0374.5	+0010.6		
0000223	3	+2000.0	+0000.0	+1807.7	+0572.2	+0573.1	+0163.8
+0033.1	+0927.0	+0014.0	-0000.1	+0167.1	+0009.7		
0000223	3	+2000.0	+0000.6	+1805.5	+0571.6	+0572.3	+0161.7
+0032.[illegible]	+0935.0	+0015.8	-0000.1	+0153.6	+0009.1		
0000223	3	+2000.0	+0000.3	+1800.3	+0571.1	+0571.6	+0159.2
+0032.7	+0934.7	+0017.7	-0000.1	+0167.1	+0008.6		
0000222	3	+2000.0	+0000.3	+1792.0	+0570.5	+0570.9	+0157.0
+0032.5	+0923.1	+0016.0	-0000.1	+0070.6	+0008.2		

+0080.5	+0923.8	+0010.0	-0000.1	+0649.0	[illegible]		
0000223	3	[illegible]	-0000.0	+1795.6	[illegible]	+0570.2	+0155.1
+0082.1	+0925.1	+0019.7	-0000.1	+0590.5	+0007.5		
0000223	3	+2000.0	-0000.3	+1792.7	+0569.4	+0569.7	+0153.5
+0081.9	+0922.4	+0019.0	-0000.1	+0573.9	+0007.0		
0000223	3	+2000.0	+0000.0	+1791.0	+0568.8	+0569.1	+0152.0
+0081.9	+0920.1	+0019.7	-0000.1	+0483.5	+0007.5		
0000223	3	+2000.0	+0000.3	+1789.7	+0568.0	+0568.6	+0149.7
+0081.7	+0907.7	+0010.2	+0016.7	+0400.9	+0008.3		
0000223	3	+2000.0	+0000.6	+1785.3	+0567.6	+0568.2	+0147.6
+0081.4	+0896.6	+0018.8	+0300.0	+0407.5	+0009.5		
0000223	3	+2000.0	+0000.9	+1783.5	+0567.4	+0567.8	+0145.9
+0081.0	+0880.9	+0017.4	+0330.0	+0405.0	+0010.0		
0000223	3	+2000.0	+0000.9	+1780.6	+0567.0	+0567.4	+0144.2
+0081.0	+0888.0	+0016.5	+0343.0	+0403.6	+0010.5		
0000223	3	+2000.0	+0000.3	+1780.4	+0566.6	+0567.2	+0142.7
+0080.3	+0884.2	+0015.6	+0344.7	+0406.2	+0012.6		
0000223	3	+2000.0	+0000.3	+1773.6	+0566.2	+0567.0	+0140.4
+0080.5	+0885.8	+0014.0	+0347.6	+0406.4	+0012.9		
0000223	3	+2000.0	+0000.9	+1770.9	+0565.9	+0566.7	+0138.0
+0079.8	+0899.8	+0014.0	-0000.1	+0407.1	+0014.1		
0000223	3	+2000.0	-0000.3	+1769.2	+0565.6	+0566.5	+0136.0
+0079.9	+0894.0	+0013.5	+0321.6	+0407.1	+0014.1		
0000223	3	+2000.0	+0000.6	+1767.5	+0565.2	+0566.4	+0134.2
+0079.5	+0899.7	+0012.0	+0321.8	+0407.0	+0016.5		
0000223	3	+2000.0	-0000.3	+1764.9	+0564.9	+0566.2	+0132.7
+0079.4	+0905.6	+0012.2	+0311.5	+0403.8	+0017.6		
0000223	3	+2000.0	+0000.6	+1764.1	+0564.6	+0566.0	+0130.8
+0079.1	+0911.7	+0011.8	+0233.7	+0403.3	+0018.4		
0000223	3	+2000.0	+0000.6	+1761.2	+0564.3	+0565.8	+0128.6
+0078.9	+0919.4	+0011.4	+0116.9	+0429.1	+0018.4		
0000223	3	+2000.0	-0000.3	+1757.7	+0564.0	+0565.6	+0127.0
+0078.7	+0930.6	+0011.3	-0000.1	+0543.9	+0018.5		
0000224	3	+2000.0	+0000.3	+1757.9	+0563.7	+0565.4	+0125.6
+0078.3	+0941.4	+0011.0	-0000.1	+0652.3	+0018.1		
0000224	3	+2000.0	+0000.9	+1760.8	+0563.5	+0565.1	+0124.6
+0078.1	+0942.2	+0013.0	-0000.1	+0655.7	+0017.7		
0000224	3	+2000.0	+0000.3	+1755.5	+0563.2	+0564.7	+0123.2
+0077.9	+0939.4	+0013.1	-0000.1	+0661.3	+0017.1		
0000224	3	+2000.0	+0000.9	+1753.1	+0562.9	+0564.2	+0121.0
+0077.7	+0936.5	+0016.0	-0000.1	+0661.1	+0016.1		
0000224	3	+2000.0	+0000.3	+1752.5	+0562.5	+0563.6	+0119.2
+0077.4	+0934.2	+0015.7	-0000.1	+0654.0	+0015.6		
0000224	3	+2000.0	+0000.0	+1748.4	+0562.0	+0563.0	+0117.6
+0077.0	+0932.0	+0017.0	-0000.1	+0660.2	+0014.8		
0000224	3	+2000.0	+0000.3	+1745.3	+0561.5	+0562.4	+0116.2
+0076.8	+0930.1	+0017.7	-0000.1	+0663.8	+0014.0		
0000224	3	+2000.0	+0000.3	+1743.7	+0561.0	+0561.8	+0114.6
+0076.5	+0928.6	+0018.6	-0000.1	+0662.4	+0013.4		
0000224	3	+2000.0	+0000.6	+1742.0	+0560.5	+0561.2	+0112.3
+0076.3	+0927.1	+0020.3	-0000.1	+0661.1	+0012.9		
0000224	3	+2000.0	+0000.3	+1742.6	+0559.9	+0560.6	+0110.4
+0075.6	+0926.0	+0021.1	-0000.1	+0650.7	+0012.2		
0000224	3	+2000.0	+0001.2	+1741.7	+0559.4	+0560.1	+0108.9
+0075.7	+0925.2	+0021.5	-0000.1	+0651.0	+0011.7		
0000224	3	+2000.0	+0000.3	+1737.6	+0558.9	+0559.5	+0107.4
+0075.3	+0924.5	+0022.2	-0000.1	+0648.8	+0011.2		
0000224	3	+2000.0	+0000.6	+1736.6	+0558.5	+0559.0	+0106.3
+0075.3	+0924.1	+0023.6	-0000.1	+0607.1	+0010.7		
0000224	3	+2000.0	+0000.3	+1734.6	+0558.0	+0558.5	+0104.4
+0075.0	+0923.2	+0024.5	-0000.1	+0540.1	+0010.6		
0000224	3	+2000.0	+0000.3	+1733.6	+0557.5	+0558.0	+0102.8
+0074.7	+0919.3	+0027.4	+0254.3	+0415.7	+0010.3		
0000224	3	+2000.0	+0000.3	+1730.8	+0557.1	+0557.7	+0101.4

[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
+0073.2	+0392.6	+0[illegible].7	+0336.8	+0405.7	+0[illegible]1.6		
0000224	3	+2000.[illegible]	+0000.0	+1731.9	+035[illegible]	+0556.9	+0097.3
+0073.5	+0383.3	+0021.9	+0337.5	+0405.2	+0014.0		
0000224	3	+2000.0	+0001.2	+1727.9	+0555.9	+0556.7	+0096.0
+0073.3	+0386.0	+0021.1	+0343.3	+0405.7	+0015.7		
0000225	3	+2000.0	+0000.3	+1725.7	+0555.6	+0556.5	+0094.6
+0073.[illegible]	+0385.2	+0020.8	+0354.7	+0405.7	+0016.8		
0000225	3	+2000.0	+0000.3	+1723.5	+0555.3	+0556.2	+0093.2
+0072.3	+0385.4	+0020.1	+0370.1	+0404.8	+0017.4		
0000225	3	+2000.0	+0000.3	+1721.6	+0555.0	+0556.0	+0091.8
+0072.5	+0386.3	+0019.5	+0383.2	+0404.6	+0018.9		
0000225	3	+2000.0	+0000.6	+1721.2	+0554.7	+0555.8	+0089.9
+0072.2	+0387.3	+0018.3	+0390.8	+0404.9	+0020.2		
0000225	3	+2000.0	-0000.3	+1718.3	+0554.3	+0555.6	+0088.0
+0071.3	+0389.7	+0018.2	+0398.3	+0405.7	+0021.3		
0000225	3	+2000.0	+0000.9	+1714.6	+0554.0	+0555.4	+0086.5
+0071.5	+0391.2	+0017.5	+0395.0	+0404.7	+0022.2		
0000225	3	+2000.0	+0000.3	+1714.2	+0553.8	+0555.2	+0085.0
+0071.1	+0394.7	+0017.0	+0390.7	+0405.7	+0023.1		
0000225	3	+2000.0	+0000.3	+1713.6	+0553.5	+0555.0	+0083.6
+0071.0	+0397.5	+0016.5	+0395.2	+0405.5	+0023.6		
0000225	3	+2000.0	+0000.0	+1714.5	+0553.2	+0554.8	+0082.2
+0070.7	+0900.0	+0016.0	+0385.3	+0406.0	+0024.8		
0000225	3	+2000.0	+0000.3	+1713.0	+0552.9	+0554.6	+0080.6
+0070.4	+0902.6	+0015.6	+0378.7	+0406.1	+0026.3		
0000225	3	+2000.0	+0000.6	+1711.1	+0552.6	+0554.4	+0079.3
+0070.4	+0903.4	+0015.3	+0374.3	+0405.3	+0027.3		
0000225	3	+2000.0	-0000.3	+1710.9	+0552.4	+0554.1	+0078.2
+0070.0	+0903.1	+0014.8	+0376.2	+0405.7	+0028.3		
0000225	3	+2000.0	+0000.3	+1707.4	+0552.1	+0553.9	+0077.0
+0069.6	+0910.5	+0014.6	+0369.0	+0406.0	+0029.6		
0000225	3	+2000.0	+0000.3	+1705.6	+0551.8	+0553.7	+0075.7
+0069.4	+0913.6	+0014.3	+0349.6	+0403.2	+0030.3		
0000225	3	+2000.0	-0000.3	+1704.9	+0551.5	+0553.5	+0074.3
+0069.0	+0915.2	+0013.9	+0309.5	+0407.9	+0031.0		
0000225	3	+2000.0	+0000.3	+1703.9	+0551.3	+0553.3	+0073.1
+0068.7	+0918.0	+0013.5	+0235.9	+0414.3	+0031.6		
0000225	3	+2000.0	+0000.3	+1705.6	+0551.0	+0553.1	+0072.4
+0068.5	+0921.4	+0013.6	+0110.9	+0440.3	+0032.5		
0000225	3	+2000.0	+0000.6	+1705.5	+0550.8	+0552.9	+0071.7
+0068.2	+0926.2	+0013.5	-0000.1	+0513.0	+0032.8		
0000225	3	+2000.0	+0000.3	+1701.9	+0550.6	+0552.6	+0070.7
+0067.9	+0933.7	+0014.0	-0000.1	+0703.9	+0032.5		
0000225	3	+2000.0	+0000.3	+1707.5	+0550.3	+0552.3	+0069.8
+0067 6	+0940.1	+0014.0	-0000.1	+0697.7	+0032.5		
0000226	3	+2000.0	-0000.3	+1707.9	+0550.1	+0551.9	+0069.1
+0067.4	+0944.7	+0016.8	-0000.1	+0701.2	+0032.2		
0000226	3	+2000.0	+0000.3	+1704.3	+0549.8	+0551.4	+0068.5
+0067.1	+0947.2	+0017.9	-0000.1	+0703.0	+0031.8		
0000226	3	+2000.0	+0000.3	+1704.6	+0549.5	+0550.9	+0067.8
+0066.3	+0947.4	+0019.6	-0000.1	+0706.0	+0031.4		
0000226	3	+2000.0	+0000.3	+1706.7	+0549.1	+0550.4	+0066.6
+0066.5	+0946.3	+0020.6	-0000.1	+0711.6	+0031.1		
0000226	3	+2000.0	+0000.3	+1701.1	+0548.7	+0549.8	+0065.4
+0066.2	+0945.3	+0022.0	-0000.1	+0715.1	+0030.5		
0000226	3	+2000.0	-0000.3	+1701.7	+0548.3	+0549.3	+0064.3
+0065.9	+0944.2	+0023.2	-0000.1	+0713.3	+0030.1		
0000226	3	+2000.0	+0000.3	+1699.9	+0547.8	+0548.7	+0063.3
+0065.7	+0943.2	+0024.5	-0000.1	+0712.8	+0029.4		
0000226	3	+2000.0	+0000.0	+1697.3	+0547.4	+0548.2	+0062.3
+0065.3	+0942.1	+0025.5	-0000.1	+0706.0	+0028.9		
0000226	3	+2000.0	+0000.0	+1695.6	+0546.9	+0547.7	+0060.8
+0065.1	+0941.[illegible]	[illegible]	-0000.1	[illegible]	[illegible]		

+0065.1	+0941.2	+0037.2	-0000.1	+0712.2	+002[illegible].4		
0000226	3	+2000.[illegible]	+0000.3	+1695.5	+0546.[illegible]	+0547.2	+0059.3
+0064.7	+0940.4	+0029.4	-0000.1	+0705.2	+0028.0		
0000226	3	+2000.0	+0000.3	+1694.3	+0546.1	+0546.7	+0058.2
+0064.4	+0940.7	+0030.5	-0000.1	+0700.5	+0027.5		
0000226	3	+2000.0	+0000.6	+1699.0	+0545.7	+0546.2	+0057.1
+0064.3	+0943.2	+0030.9	-0000.1	+0706.0	+0027.4		
0000226	3	+2000.0	+0001.2	+1693.2	+0545.2	+0545.7	+0056.1
+0063.9	+0944.2	+0031.5	-0000.1	+0702.9	+0026.9		
0000226	3	+2000.0	+0000.3	+1690.1	+0544.8	+0545.2	+0054.8
+0063.7	+0945.2	+0033.0	-0000.1	+0701.9	+0026.5		
0000226	3	+2000.0	+0000.3	+1696.0	+0544.5	+0544.8	+0053.6
+0063.4	+0945.9	+0034.3	-0000.1	+0701.6	+0026.3		
0000226	3	+2000.0	+0000.3	+1692.3	+0544.1	+0544.4	+0052.7
+0063.1	+0946.2	+0035.3	-0000.1	+0697.0	+0026.0		
0000226	3	+2000.0	+0000.6	+1692.2	+0543.7	+0544.1	+0051.8
+0062.7	+0945.2	+0036.5	-0000.1	+0695.2	+0025.		
0000226	3	+2000.0	+0000.3	+1690.6	+0543.4	+0543.7	+0051.0
+0062.4	+0945.0	+0037.3	-0000.1	+0697.7	+0025.5		
0000226	3	+2000.0	+0000.3	+1693.3	+0543.1	+0543.4	+0050.0
+0062.1	+0944.3	+0038.8	-0000.1	+0690.4	+0025.2		
0000226	3	+2000.0	+0000.3	+1692.7	+0542.8	+0543.1	+0049.1
+0061.5	+0943.5	+0040.0	-0000.1	+0700.1	+0024.9		
0000227	3	+2000.0	+0000.6	+1688.8	+0542.5	+0542.8	+0048.2
+0061.3	+0942.5	+0040.8	-0000.1	+0703.4	+0024.7		
0000227	3	+2000.0	+0000.3	+1696.7	+0542.2	+0542.5	+0047.6
+0061.2	+0941.4	+0041.5	-0000.1	+0695.7	+0024.7		
0000227	3	+2000.0	+0000.3	+1694.1	+0541.9	+0542.2	+0046.9
+0061.0	+0940.2	+0043.0	-0000.1	+0697.9	+0024.4		
0000227	3	+2000.0	+0000.3	+1690.1	+0541.6	+0542.0	+0045.9
+0060.7	+0939.9	+0044.2	-0000.1	+0699.2	+0024.2		
0000227	3	+2000.0	+0000.3	+1693.7	+0541.4	+0541.7	+0045.1
+0060.3	+0937.5	+0045.2	-0000.1	+0692.0	+0023.9		
0000227	3	+2000.0	+0000.3	+1690.5	+0541.1	+0541.4	+0044.5
+0059.9	+0936.0	+0046.4	-0000.1	+0698.3	+0023.5		
0000227	3	+2000.0	+0000.3	+1693.3	+0540.9	+0541.2	+0044.0
+0059.6	+0934.5	+0047.4	-0000.1	+0699.4	+0023.5		
0000227	3	+2000.0	+0000.3	+1693.0	+0540.6	+0540.9	+0043.3
+0059.2	+0933.0	+0048.8	-0000.1	+0701.0	+0023.2		
0000227	3	+2000.0	+0000.3	+1697.1	+0540.4	+0540.6	+0042.5
+0058.8	+0931.4	+0049.5	-0000.1	+0701.2	+0022.9		
0000227	3	+2000.0	-0000.3	+1690.4	+0540.1	+0540.4	+0041.9
+0058.4	+0929.7	+0050.9	-0000.1	+0703.2	+0022.7		
0000227	3	+2000.0	+0000.3	+1694.3	+0539.9	+0540.1	+0041.3
+0058.0	+0928.0	+0051.9	-0000.1	+0706.5	+0022.6		
0000227	3	+2000.0	-0000.5	+1692.9	+0539.6	+0539.9	+0040.9
+0057.7	+0926.3	+0053.0	-0000.1	+0703.0	+0022.4		
0000227	3	+2000.0	+0000.3	+1700.2	+0539.4	+0539.7	+0040.3
+0057.4	+0924.0	+0054.5	-0000.1	+0699.7	+0022.3		
0000227	3	+2000.0	+0000.3	+1695.1	+0539.1	+0539.4	+0039.6
+0056.9	+0922.3	+0055.5	-0000.1	+0701.8	+0022.0		
0000227	3	+2000.0	+0000.3	+1695.9	+0538.9	+0539.2	+0039.1
+0056.5	+0921.0	+0056.5	-0000.1	+0701.6	+0021.7		
0000227	3	+2000.0	+0000.6	+1692.4	+0538.7	+0538.9	+0038.7
+0056.2	+0919.1	+0057.7	-0000.1	+0705.0	+0021.8		
0000227	3	+2000.0	+0000.3	+1692.1	+0538.4	+0538.7	+0038.4
+0055.7	+0917.2	+0059.1	-0000.1	+0703.7	+0021.6		
0000227	3	+2000.0	+0000.3	+1692.3	+0538.2	+0538.5	+0037.8
+0055.3	+0915.3	+0060.1	-0000.1	+0706.2	+0021.4		
0000227	3	+2000.0	+0000.6	+1693.0	+0537.9	+0538.2	+0037.2
+0055.0	+0913.4	+0060.9	-0000.1	+0706.7	+0021.1		
0000227	3	+2000.0	+0000.9	+1693.0	+0537.7	+0538.0	+0036.8
+0054.5	+0911.5	+0061.9	-0000.1	+0704.0	+0021.0		
[illegible]	3	[illegible]	+0000.3	[illegible]	+0537.4	+0537.8	+0036.4

+0054.0	+0909.5	+0063.2	-0000.1	+0697.5	+0020.7		
0000228	3	+200[illegible]	+0000.6	+1685.9	+053[illegible]	+0537.5	+0036.1
+0053.7	+0907.6	+0064.4	-0000.1	+0700.1	+00[illegible].6		
0000228	3	+2000.0	+0000.0	+1690.4	+0537.0	+0537.3	+0035.6
+0053.3	+0905.7	+0065.6	-0000.1	+0703.3	+0020.2		
0000228	3	+2000.0	+0000.6	+1691.7	+0536.7	+0537.1	+0035.1
+0052.9	+0903.8	+0066.7	-0000.1	+0683.9	+0020.0		
0000228	3	+2000.0	+0000.9	+1690.1	+0536.5	+0536.9	+0034.7
+0052.5	+0901.9	+0067.7	-0000.1	+0691.1	+0019.9		
0000228	3	+2000.0	+0000.3	+1687.3	+0536.3	+0536.7	+0034.5
+0052.1	+0900.0	+0069.2	-0000.1	+0673.9	+0019.8		
0000228	3	+2000.0	-0000.3	+1687.1	+0536.1	+0536.4	+0034.3
+0051.7	+08[illegible].3	+0070.3	-0000.1	+0649.0	+0019.6		
0000228	3	+2000.0	+0000.3	+1685.9	+0535.9	+0536.2	+0033.8
+0051.3	+08[illegible].6	+0070.9	-0000.1	+0629.5	+0019.4		
0000228	3	+2000.0	+0000.6	+1687.0	+0535.6	+0536.1	+0033.5
+0050.9	+0893.7	+0072.0	-0000.1	+0591.5	+0019.5		
0000228	3	+2000.0	+0000.3	+1687.0	+0535.4	+0535.9	+0033.[illegible]
+0050.5	+0889.0	+0072.3	-0000.1	+0550.2	+0019.6		
0000228	3	+2000.0	+0000.0	+1690.1	+0535.2	+0535.6	+0033.2
+0050.0	+0884.2	+0072.9	-0000.1	-0511.5	+0019.6		
0000228	3	+2000.0	+0001.5	+1687.4	+0535.0	+0535.7	+0033.2
+0049.5	+0876.3	+0073.3	-0000.1	+0430.4	+0020.0		
0000228	3	+2000.0	+0000.0	+1686.4	+0534.9	+0535.6	+0032.9
+0049.0	+0867.6	+0073.2	+0231.4	+0415.2	+0021.0		
0000228	3	+2000.0	+0000.3	+1687.3	+0534.8	+0535.6	+0032.7
+0049.0	+0855.5	+0073.2	+0427.4	+0404.7	+0022.0		
0000228	3	+2000.0	+0000.3	+1687.5	+0534.6	+0535.6	+0032.7
+0048.4	+0840.7	+0073.0	+0441.5	+0406.4	+0023.4		
0000228	3	+2000.0	+0000.9	+1684.7	+0534.6	+0535.7	+0032.6
+0048.4	+0830.3	+0072.[illegible]	+0460.6	+0405.3	+0025.1		
0000228	3	+2000.0	+0000.3	+1685.2	+0534.5	+0535.7	+0032.4
+0048.3	+0832.6	+0073.0	+0450.2	+0405.5	+0027.1		
0000228	3	+2000.0	+0000.6	+1688.2	+0534.4	+0535.7	+0032.0
+0048.7	+0823.1	+0072.4	+0457.1	+0405.7	+0028.7		
0000228	3	+2000.0	+0000.3	+1682.3	+0534.3	+0535.7	+0031.6
+0048.9	+0824.6	+0072.2	+046[illegible]	+0404.8	+0030.0		
0000228	3	+2000.0	+0000.6	+1687.0	+0534.2	+0535.7	+0031.3
+0049.2	+0822.1	+0072.2	+0455.5	+0405.3	+0031.3		
0000229	3	+2000.0	+0000.3	+1685.0	+0534.0	+0535.7	+0030.9
+0049.3	+0820.8	+0071.9	+0457.3	+0405.1	+0033.4		
0000229	3	+2000.0	-0000.3	+1683.1	+0533.9	+0535.6	+0030.5
+0049.6	+0818.7	+0071.5	+0453.4	+0404.6	+0034.5		
0000229	3	+2000.0	+0000.3	+1681.4	+0533.7	+0535.5	+0029.9
+0049.8	+0817.6	+0071.4	+0465.3	+0404.9	+0036.6		
0000229	3	+2000.0	-0000.3	+1678.9	+0533.6	+0535.4	+0029.5
+0050.0	+0816.7	+0071.2	+0466.3	+0404.9	+0037.1		
0000229	3	+2000.0	+0000.6	+1679.2	+0533.4	+0535.3	+0029.5
+0050.0	+0815.9	+00[illegible].9	+0473.1	+0404.9	+0038.6		
0000229	3	+2000.0	-0000.3	+1685.3	+0533.1	+0535.2	+0029.8
+0050.0	+0815.3	+0070.4	+0457.7	+0404.6	+0039.7		
0000229	3	+2000.0	+0000.3	+1682.0	+0532.7	+0535.0	+0030.1
+0050.3	+0814.7	+0070.3	+0470.7	+0404.6	+0040.8		
0000229	3	+2000.0	+0000.6	+1680.0	+0532.4	+0534.9	+0030.2
+0050.5	+0813.8	+0070.1	+0470.5	+0404.2	+0042.3		
0000229	3	+2000.0	+0000.3	+1686.0	+0532.1	+0534.6	+0030.5
+0050.7	+0812.9	+0070.0	+0459.9	+0404.7	+0044.0		
0000229	3	+2000.0	+0000.3	+1693.0	+0531.8	+0534.3	+0030.9
+0050.9	+0812.1	+0069.6	+0469.7	+0404.2	+0045.0		
0000229	3	+2000.0	+0001.5	+1692.5	+0531.5	+0534.1	+0031.3
+0051.2	+0811.2	+0069.5	+0468.6	+0404.4	+0046.4		
0000229	3	+2000.0	+0000.3	+1693.8	+0531.2	+0533.8	+0031.5
+0051.4	+0810.3	+0069.2	+0467.7	+0404.6	+0047.7		
0000229	3	+2000.0	+0000.6	+1696.[illegible]	+0530.9	+0533.5	+0031.7

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+0051.9  +0806.1  +0063.5  +0472.9  +0404.8  +0053.1
 0000229      3  +2000.0  -0000.3  +1701.8  +0529.[illegible]  +0532.3  +0032.9
+0052.0  +0805.0  +0066.2  +0475.6  +0404.9  +0054.5
 0000229      3  +2000.0  +0000.6  +1707.1  +0529.3  +0532.0  +0033.2
+0052.2  +0803.9  +0068.0  +0480.0  +0404.7  +0055.3
 0000229      3  +2000.0  +0000.6  +1703.1  +0529.0  +0531.7  +0033.7
+0052.5  +0802.3  +0067.9  +0480.5  +0404.7  +0057.1
 0000229      3  +2000.0  +0000.3  +1709.9  +0528.7  +0531.4  +0034.1
+0052.7  +0801.6  +0067.7  +0456.0  +0405.3  +0058.2
 0000230      3  +2000.0  +0000.3  +1709.2  +0528.4  +0531.1  +0034.6
+0052.9  +0800.5  +0067.6  +0476.5  +0404.9  +0059.4
 0000230      3  +2000.0  +0000.3  +1715.3  +0528.1  +0530.8  +0034.8
+0053.2  +0799.3  +0067.4  +0465.9  +0405.5  +0060.6
 0000230      3  +2000.0  +0000.3  +1718.0  +0527.8  +0530.5  +0035.1
+0053.3  +0798.2  +0067.3  +0441.2  +0406.6  +0062.3
 0000230      3  +2000.0  +0000.6  +1715.6  +0527.5  +0530.2  +0035.6
+0053.5  +0797.1  +0067.0  +0447.3  +0406.6  +0063.3
 0000230      3  +2000.0  +0000.3  +1724.7  +0527.2  +0529.9  +0036.1
+0053.8  +0796.0  +0066.8  +0408.2  +0409.1  +0064.9
 0000230      3  +2000.0  +0000.0  +1724.9  +0526.9  +0529.6  +0036.6
+0053.[illegible]  +0795.0  +0066.6  +0300.4  +0417.6  +0066.0
 0000230      3  +2000.0  +0000.6  +1729.6  +0526.6  +0529.3  +0036.9
+0054.[illegible]  +0796.1  +0066.5  +0202.4  +0429.3  +0066.9
 0000230      3  +2000.0  +0000.[illegible]  +1733.5  +0526.3  +0529.0  +0037.4
+0054.1  +0796.4  +0066.4  +0134.1  +0445.6  +0067.5
 0000230      3  +2000.0  +0000.6  +1734.0  +0526.0  +0528.7  +0038.0
+0054.2  +0796.[illegible]  +0066.5  +0100.8  +0466.1  +0068.3
 0000230      3  +2000.0  -0000.3  +1735.3  +0525.7  +0528.4  +0038.7
+0054.4  +0797.4  +0066.7  -0000.1  +0485.7  +0068.6
 0000230      3  +2000.0  +0000.3  +1741.0  +0525.5  +0528.0  +0039.3
+0054.[illegible]  +0798.0  +0067.0  -0000.1  +0502.9  +0069.2
 0000230      3  +2000.0  +0000.9  +1741.0  +0525.2  +0527.6  +0039.7
+0055.0  +0798.5  +0067.9  -0000.1  +0523.9  +0069.3
 0000230      3  +2000.0  +0000.[illegible]  +1747.2  +0524.9  +0527.2  +0040.2
+0055.[illegible]  +0799.0  +0068.5  -0000.1  +0543.2  +0070.2
 0000230      3  +2000.[illegible]  +0000.9  +1748.5  +0524.6  +0526.8  +0040.9
+0055.2  +0799.4  +0069.5  -0000.1  +0550.2  +0070.6
 0000230      3  +2000.0  -0000.3  +1753.3  +0524.2  +0526.4  +0041.5
+0055.5  +0799.7  +0070.4  -0000.1  +0565.0  +0070.3
 0000230      3  +2000.0  +0000.0  +1753.6  +0523.8  +0526.0  +0042.0
+0055.6  +0799.9  +0070.9  -0000.1  +0578.7  +0071.1
 0000230      3  +2000.0  -0000.3  +1758.9  +0523.5  +0525.6  +0042.4
+0055.7  +0799.9  +0071.9  -0000.1  +0586.6  +0071.2
 0000230      3  +2000.0  +0000.3  +1763.0  +0523.2  +0525.2  +0042.6
+0055.8  +0799.7  +0072.7  -0000.1  +0601.2  +0071.8
 0000230      3  +2000.0  +0000.0  +1762.8  +0522.9  +0524.7  +0043.4
+0056.1  +0799.7  +0074.0  -0000.1  +0620.8  +0071.6
 0000230      3  +2000.0  +0000.3  +1770.5  +0522.5  +0524.3  +0043.5
+0056.0  +0799.5  +0075.2  -0000.1  +0632.7  +0071.7
 0000231      3  +2000.0  +0000.3  +1755.2  +0522.3  +0523.9  +0043.2
+0056.4  +0799.1  +0076.1  -0000.1  +0611.3  +0071.3
 0000231      3  +2000.0  +0000.6  +1764.2  +0522.3  +0523.6  +0043.0
+0056.5  +0798.[illegible]  +0077.0  -0000.1  +0587.5  +0071.5
RECORDER IS ON READ MODE
PUT SW. 0 DOWN

DO YOU WISH TO CHANGE VALUES,0=NO,1=YES 0
TEST NO. NOW IS = 0002
TEST NO. DESIRED I4 = 0002
BLOCK NO. NOW IS = 0001
BLOCK NO. DESIRED I4 = 0001
STARTING RECORD NO. I5 = 00200
STARTING DATA SET NO. I2 = 01
[illegible] I4 = [illegible]
```

033.2
033.7
034.1
034.6
034.3
035.1
035.6
035.1
036.6
036.9
037.4
038.0
038.7
039.3
039.7
040.2
040.9
041.5
042.0
042.4
042.8
043.4
043.5
043.2
043.0

STARTING DATA SET NO. [illegible] = 01
SAMPLING INTERVAL IS 00010
PLAYBACK CHANNELS IS =
04 05 17 20 21 99

"SWITCH 0 IS OUT SWITCH"

	TURB. HDR TEMP	RCS PRESS	TURB HDR PRESS	'A' MAIN FW FLOW	'B' MAIN FW FLOW
0000200	-2150.3	+2161.4	+0879.4	+0587.3	+0540.9
0000200	-2148.4	+2154.3	+0879.4	+0574.5	-0540.0
0000201	-2144.5	+2155.9	+0879.6	+0614.0	+0556.9
0000201	-2144.5	+2158.4	+0879.1	+0593.[illegible]	+0559.1
0000202	-2142.6	+2167.4	+0879.8	+0509.0	+0563.1
0000202	-2141.4	+2163.2	+0879.4	+0609.3	+0546.8
0000203	-2139.6	+2161.8	+0879.7	+0609.3	-0560.3
0000203	-2137.1	+2158.7	+0879.4	+0577.6	+0547.7
0000204	-2137.1	+2152.9	+0879.6	+0555.7	+0553.9
0000204	-2135.3	+2151.9	+0878.9	+0595.0	+0555.9
0000205	-2136.0	+2150.1	+0879.4	+0596.6	+0554.2
0000205	-2133.5	+2149.3	+0878.9	+0584.[illegible]	+0554.3
0000206	-2132.6	+2144.7	+0879.3	-0554.4	+0568.6
0000206	-2128.6	+2146.0	+0879.6	+0515.1	+0559.6
0000207	-2127.4	+2146.4	+0877.2	+0569.1	+0553.6
0000207	-2124.0	+2142.9	+0879.3	+0570.6	+0541.8
0000208	-2124.3	+2143.0	+0879.2	+0581.8	+0567.3
0000208	-2122.5	+2141.6	+0879.3	+0600.7	+0541.7
0000209	-2121.3	+2139.4	+0879.5	+0580.8	+0547.1
0000209	-2121.3	+2135.4	+0879.3	+0564.8	+0555.4
0000210	-2121.3	+2139.1	+0879.7	+0570.1	+0557.6
0000210	-2118.8	+2139.8	+0879.2	+0582.9	+0550.3
0000211	-2117.3	+2137.5	+0879.3	+0572.5	+0556.9
0000211	-2114.6	+2141.9	+0879.1	-0501.0	+0553.5
0000212	-2114.9	+2140.4	+0879.4	+0587.9	+0560.6
0000212	-2113.3	+2137.0	+0877.6	+0100.5	+0561.6
0000213	-2111.5	+2134.5	+0879.3	+0573.9	+0547.0
0000213	-2108.5	+2133.4	+0879.3	+0593.8	+0555.9
0000214	-2108.5	+2130.3	+0878.6	+0587.5	+0505.8
0000214	-2107.3	+2135.3	+0879.5	+0609.8	+0553.3
0000215	-2107.6	+2132.[illegible]	+0879.5	+0502.6	+0537.4
0000215	-2103.5	+2132.5	+0878.0	+0590.2	+0570.2

RECORDER IS ON READ MODE
PUT SW. 0 DOWN

DO YOU WISH TO CHANGE VALUES,0=NO,1=YES 1
CHANNEL NO.=I2, MIN.=+CN-I4, MAX.=+CN-I4
03 +0520 +0620 RCS TC 'A'
~~[illegible]~~
16 +0100 +0650 OTSG 'A' OUT STM ~~PRESS~~ TEMP
23 +0000 +0500 'A' FW TEMP
24 +0100 +0650 OTSG 'B' OUT STM ~~PRESS~~ TEMP
99
TEST NO. NOW IS = 0002
TEST NO. DESIRED I4 = 0002
BLOCK NO. NOW I4 = 0001
BLOCK NO. DESIRED I4 = 0001
STARTING RECORD NO. I5 = 00216
STARTING DATA SET NO. I2 = 01
SAMPLING INTERVAL I5 = 00005
PLAYBACK CHANNELS IS =
03 16 23 24 99

"SWITCH 0 IS OUT SWITCH"

0000216	+0557.[illegible]	+0[illegible]	+0130.0	+0576.3
0000216	+0560.7	+0[illegible]	+0138.9	+0573.3
0000216	+0[illegible].4	+0[illegible].5	+0128.9	+0576.3

0000216	+0569.2	+0576.4	+0188.9	[illegible]
0000217	[illegible]	[illegible]	+0188.9	+0576.0
0000217	[illegible]	[illegible]	+0189.0	+0575.8
0000217	[illegible]	+0572.0	+0188.2	+0575.8
0000217	[illegible]	+0576.0	+0188.9	+0575.7
0000218	[illegible]	+0575.5	+0188.8	+0575.6
0000218	+0583.3	+0575.7	+0188.7	+0575.5
0000218	+0583.0	+0575.6	+0188.7	+0575.3
0000218	+0580.0	+0575.4	+0188.7	+0575.0
0000219	+0578.8	+0575.8	+0188.4	+0575.1
0000219	+0579.8	+0574.7	+0188.5	+0574.4
0000219	+0584.5	+0574.8	+0188.6	+0574.8
0000219	+0588.9	+0575.8	+0188.7	+0575.5
0000220	+0593.8	+0576.7	+0188.6	+0577.3
0000220	+0596.0	+0578.5	+0189.0	+0577.3
0000220	+0598.1	+0580.6	+0189.0	+0582.9
0000220	+0594.3	+0588.3	+0189.0	+0586.7
0000221	+0590.6	+0591.4	+0189.4	+0588.7
0000221	+0587.0	+0594.0	+0190.4	+0590.6
0000221	+0583.4	+0592.4	+0191.2	+0590.9
0000221	+0580.3	+0589.9	+0191.3	+0587.7
0000222	+0577.5	+0587.4	+0192.4	+0585.4
0000222	+0575.7	+0585.1	+0193.3	+0584.4
0000222	+0574.9	+0581.3	+0194.1	+0581.6
0000222	+0572.2	+0577.8	+0195.1	+0577.8
0000223	+0571.0	+0574.6	+0195.9	+0575.8
0000223	+0570.0	+0573.8	+0196.1	+0576.4
0000223	+0568.6	+0574.9	+0196.3	+0577.6
0000223	+0565.7	+0577.2	+0197.9	+0577.4
0000224	+0562.3	+0577.7	+0200.7	+0576.4
0000224	+0562.9	+0576.5	+0203.5	+0576.4
0000224	+0560.6	+0574.6	+0205.5	+0576.5
0000224	+0558.5	+0573.4	+0206.0	+0575.3
0000225	+0556.0	+0573.0	+0206.6	+0573.4
0000225	+0552.0	+0572.3	+0207.1	+0570.9
0000225	+0551.2	+0571.7	+0209.2	+0568.6
0000225	+0548.2	+0570.5	+0211.5	+0567.3
0000226	+0547.9	+0569.6	+0211.3	+0566.9
0000226	+0547.4	+0568.2	+0213.2	+0567.3
0000226	+0546.7	+0566.2	+0213.4	+0568.9
0000226	+0545.9	+0564.3	+0210.5	+0568.9
0000227	+0545.0	+0563.1	+0210.4	+0566.3
0000227	+0544.0	+0562.4	+0213.2	+0567.1
0000227	+0542.2	+0562.0	+0213.1	+0565.8
0000227	+0541.5	+0561.9	+0213.0	+0564.4
0000228	+0540.4	+0561.8	+0212.9	+0562.7
0000228	+0539.2	+0561.7	+0212.9	+0560.9
0000228	+0538.1	+0561.3	+0212.8	+0559.1
0000228	+0535.5	+0560.8	+0212.9	+0557.3
0000229	+0534.3	+0560.5	+0214.4	+0555.2
0000229	+0532.2	+0560.2	+0219.2	+0552.5
0000229	+0530.2	+0559.9	+0223.0	+0549.5
0000229	+0528.4	+0559.0	+0224.0	+0547.1
0000230	+0526.7	+0558.0	+0223.3	+0545.8
0000230	+0525.1	+0556.8	+0221.9	+0544.2
0000230	+0524.0	+0555.5	+0220.4	+0543.7
0000230	+0523.3	+0553.8	+0219.5	+0543.5
0000231	+0522.7	+0551.8	+0218.4	+0543.7
0000231	+0522.2	+0549.9	+0218.1	+0544.2
0000231	+0521.7	+0547.9	+0217.8	+0544.6
0000231	+0521.3	+0546.2	+0217.7	+0545.0
0000232	+0521.0	+0545.0	+0217.6	+0545.1
0000232	+0520.7	+0544.9	+0217.6	+0545.1
0000232	+0520.5	+0544.9	+0217.5	+0545.1

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0000229	+0526.4	+05[illegible].0	+0224.0	+0547.1
0000230	+0526.7	+0[illegible].0	+0223.3	+0545.2
0000230	+0525.1	+05[illegible]	+0221.9	+0544.2
0000230	+0524.0	+0555.5	+0220.4	+0543.7
0000230	+0523.2	+0553.8	+0219.3	+0543.5
0000231	+0522.7	+0551.3	+0218.4	+0543.7
0000231	+0522.2	+0549.9	+0218.1	+0544.2
0000231	+0521.7	+05[illegible]7.9	+0217.8	+0544.6
0000231	+0521.3	+0546.2	+0217.7	+0545.0
0000232	+0521.0	+0545.3	+0217.6	+0545.1
0000232	+0520.7	+0544.9	+0217.6	+0545.1
0000232	+0520.5	+054[illegible].9	+0217.5	+0545.1

RECORDER IS IN READ MODE
PUT SW. 0 LOW

DO YOU WISH TO CHANGE VALUES,0=NO,1=YES

WORTH	WORTH	WORTH	WORTH	WORTH AFTER SHUTDOWN	REACT	XENON
13.42	7.62	20.19	4.05	13.17	-4.99	8.11

12:04:30 GROUP TREND
OPERATOR GROUP D

	0509	0739	0435	0434	0433	0426	0427	0424	0429	0430	0425	0515	0376	1265
12:05:28	16.9	2173.	203.2	195.2	125.3	569.4	569.4	576.7	570.5	569.4	576.6	2164.	91.9	30.25
12:13:32	17.3	2171.	203.8	195.4	125.1	570.5	570.4	577.9	571.5	570.1	577.7	2166.	91.8	30.25

GROUP 4

12:22:31 GROUP TREND
OPERATOR GROUP D

	0509	0739	0435	0434	0433	0426	0427	0424	0429	0430	0425	0515	0376	1265
12:23:42	16.9	2168.	204.3	195.6	124.8	569.6	569.5	576.7	570.5	569.3	576.4	2143.	92.1	30.25
12:31:33	17.0	2153.	204.3	195.2	125.1	568.8	569.0	577.1	570.8	569.6	576.5	2142.	92.1	30.25
12:40:32	17.1	2179.	204.5	195.6	125.0	569.9	569.8	577.2	570.9	569.6	577.0	2152.	92.2	30.26
12:49:32	17.2	2185.	204.3	195.7	124.6	570.1	570.0	577.5	571.2	569.9	577.3	2160.	92.3	30.27

GROUP 33
12:56:11
10/11/74

REACTIVITY BALANCE 12:56:07 10/11/74

BORON WORTH	XENON WORTH	FUEL SM WORTH	LBP WORTH	PEAK XENON WORTH AFTER SHUTDOWN	NET CORE REACT	TIME TO PEAK XENON
13.39	8.04	20.15	4.06	13.10	-6.13	7.04

12:58:30 GROUP TREND
OPERATOR GROUP D

	0509	0739	0435	0434	0433	0426	0427	0424	0429	0430	0425	0515	0376	1265
12:59:42	17.2	2150.	204.2	195.4	125.2	570.4	570.3	577.9	571.5	570.1	577.5	2137.	92.3	30.26
13:07:33	.1	2079.	361.3	207.9	125.7	592.6	591.2	586.3	590.2	588.9	588.1	1965.	92.6	30.26

GROUP 4
13:11:59
10/11/74

SEQUENCE OF EVENTS REVIEW

13:05:49:009	2958	SCAN SPARE	
13:05:51:959	2937	TURBINE EXHAUST HOOD 250 F TRIP	TRBL
13:05:52:229	2941	TURBINE SOLENOID TRIP	TRBL
13:05:52:239	2994	GENERATOR EXCITER FIELD ACB TRIP	TRBL
13:05:52:243	2994	GENERATOR EXCITER FIELD ACB TRIP	TRBL
[illegible]	[illegible]	STOP THROTTLE VALVES CLOSED	TRBL

	0509	0739	0435	0434	0433	0426	0427	0424	0429	0430	0425	0515	0376	1265
12:23:42	16.9	2158.	204.3	195.6	124.3	569.6	569.5	576.7	570.5	569.3	576.4	2143.	92.1	30.25
12:31:33	17.0	2153.	204.3	195.2	125.1	569.	569.0	577.1	570.8	569.6	576.8	2142.	92.1	30.25
12:40:32	17.1	2170.	204.5	194.6	125.0	569.9	569.8	577.2	570.9	569.6	577.0	2152.	92.2	30.26
12:49:32	17.2	2185.	204.3	195.7	124.6	570.1	570.0	577.5	571.2	569.9	577.3	2160.	92.3	30.27

GROUP 33
12:56:11
10/11/74

REACTIVITY BALANCE 12:56:07 10/11/74

BORON WORTH	XENON WORTH	FUEL SM WORTH	LBP WORTH	PEAK XENON WORTH AFTER SHUTDOWN	NET CORE REACT	TIME TO PEAK XENON
13.39	8.34	20.15	4.06	13.10	-6.13	7.04

12:58:30 GROUP TREND
OPERATOR GROUP D

	0509	0739	0435	0434	0433	0426	0427	0424	0429	0430	0425	0515	0376	1265
12:59:42	17.2	2150.	204.2	195.4	125.2	570.4	570.3	577.9	571.5	570.1	577.5	2137.	92.3	30.26
13:07:33	.1	2079.	361.3	207.0	125.7	592.6	591.2	586.3	590.2	588.9	588.1	1965.	92.6	30.26

GROUP 4
13:11:59
10/11/74

SEQUENCE OF EVENTS REVIEW

13:05:49:000	2958	SCAN SPARE	
13:05:51:950	2937	TURBINE EXHAUST HOOD 250 F TRIP	TRBL
13:05:52:229	2941	TURBINE SOLENOID TRIP	TRBL
13:05:52:239	2994	GENERATOR EXCITER FIELD ACB TRIP	TRBL
13:05:52:243	2994	GENERATOR EXCITER FIELD ACB TRIP	TRBL
13:05:52:336	2931	STOP THROTTLE VALVES CLOSED	TRBL
13:05:59:385	2959	SCAN SPARE	
13:07:37:025	2959	SCAN SPARE	
13:07:42:284	2959	SCAN SPARE	
13:10:00:530	2872	RP CH D PC LO PRESS	TRIP
13:10:00:533	2892	RP REACTOR PROTECTION CH D	TRIP
13:10:00:712	2871	RP CH C PC LO PRESS	TRIP
13:10:00:713	2891	RP REACTOR PROTECTION CH C	TRIP
13:10:05:689	2869	RP CH A PC LO PRESS	TRIP
13:10:05:691	2889	RP REACTOR PROTECTION CH A	TRIP
13:10:18:268	2870	RP CH B PC LO PRESS	TRIP
13:10:18:271	2890	RP REACTOR PROTECTION CH B	TRIP

13:16:31 GROUP TREND
OPERATOR GROUP D

13:16:51 [illegible]
[illegible] GROUP 0

GROUP 3
13:22:23
10/11/74

13:05:52 Turbine Trip

13:06:52 Rx Trip Confirm

Rx Trip ~1302 ? 10-11-74 FW Pump Trip

POST TRIP REVIEW

	ϕ NI-5 507	NI-6 508	NI-7 509	NI-8 510	Δϕ NI-5 511	NI-6 512	NI-7 513	NI-8 514	A Tc 426	B Tc 429	A Th 519	B Th 521	A Press 515	B Press 517	A Press 739
12:52:00	17.1	17.0	17.0	17.0-	5.92-	6.17-	5.92-	5.83	570.0	571.0	577.5	577.4	2153.	2151.	2150.
12:53:00	17.0	17.0	17.0	16.9-	5.92-	6.17-	5.92-	5.83	569.8	570.9	577.3	577.2	2151.	2148.	2155.
12:54:00	17.0	16.9	17.0	16.8-	5.92-	6.17-	5.86-	5.79	569.7	570.7	577.1	577.1	2148.	2147.	2155.
12:55:00	16.9	16.9	16.9	16.8-	5.92-	6.14-	5.86-	5.79	569.6	570.6	577.1	577.0	2147.	2145.	2155.
12:56:00	16.9	16.8	16.9	16.7-	5.89-	6.11-	5.86-	5.79	569.7	570.7	577.1	577.0	2144.	2141.	2153.
12:57:00	17.2	17.1	17.2	17.1-	6.01-	6.29-	6.01-	5.89	569.7	570.7	577.3	577.1	2143.	2141.	2157.
12:58:00	17.2	17.2	17.2	17.1-	6.02-	6.26-	6.01-	5.92	570.0	571.1	577.7	577.5	2144.	2142.	2159.
12:59:00	17.2	17.2	17.2	17.1-	6.02-	6.26-	5.98-	5.92	570.4	571.5	578.1	578.0	2145.	2142.	2160.
13:00:00	17.2	17.1	17.2	17.1-	6.08-	6.29-	5.98-	5.89	570.5	571.6	578.1	578.0	2140.	2138.	2156.
13:01:00	17.1	17.1	17.1	17.0-	6.08-	6.26-	5.98-	5.89	570.4	571.4	577.9	577.8	2137.	2135.	2151.
13:02:00	17.0	17.0	17.1	17.0-	6.02-	6.26-	5.92-	5.89	570.2	571.3	577.7	577.6	2136.	2134.	2151.
13:02:15	17.0	17.0	17.1	17.0-	6.02-	6.26-	5.92-	5.89	570.2	571.3	577.7	577.6	2136.	2134.	2151.
13:02:30	17.0	17.0	17.0	16.9-	5.98-	6.23-	5.92-	5.86	570.1	571.1	577.7	577.5	2137.	2136.	2151.
13:02:45	17.0	17.0	17.0	16.9-	5.98-	6.23-	5.92-	5.86	570.1	571.1	577.7	577.5	2137.	2135.	2152.
13:03:00	17.0	17.0	17.0	16.9-	5.98-	6.20-	5.89-	5.86	570.0	571.0	577.4	577.3	2137.	2135.	2152.
13:03:15	17.0	17.0	17.0	16.9-	5.98-	6.20-	5.89-	5.86	570.0	571.0	577.4	577.3	2137.	2135.	2152.
13:03:30	17.0	16.9	17.0	16.8-	5.95-	6.17-	5.92-	5.83	569.6	570.5	576.8	576.9	2134.	2132.	2152.
13:03:45	17.0	16.9	17.0	16.8-	5.95-	6.17-	5.92-	5.83	569.6	570.5	576.8	576.9	2134.	2132.	2153.
13:04:00	17.0	16.9	16.9	16.8-	5.92-	6.17-	5.92-	5.83	569.2	570.3	576.6	576.6	2141.	2139.	2153.
13:04:15	17.0	16.9	16.9	16.8-	5.92-	6.17-	5.92-	5.83	569.2	570.3	576.6	576.6	2141.	2139.	2156.
13:04:30	16.9	16.8	16.9	16.8-	5.92-	6.17-	5.89-	5.79	569.0	570.1	576.4	576.4	2143.	2140.	2155.
13:04:45	16.9	16.8	16.9	16.8-	5.92-	6.17-	5.89-	5.79	569.0	570.1	576.4	576.4	2143.	2140.	2153.
13:05:00	17.1	17.1	17.1	17.0-	6.02-	6.20-	6.01-	5.89	568.5	569.4	575.9	575.8	2142.	2139.	2153.
13:05:15	17.1	17.1	17.1	17.0-	6.02-	6.20-	6.01-	5.89	568.5	569.4	575.9	575.8	2142.	2139.	2150.
13:05:30	17.2	17.1	17.2	17.0-	6.02-	6.26-	5.92-	5.92	568.4	569.3	575.9	575.8	2152.	2150.	2159.
13:05:45	17.2	17.1	17.2	17.0-	6.02-	6.26-	5.92-	5.92	568.4	569.3	575.9	575.8	2152.	2150.	2231.
13:06:00	17.5	17.5	17.6	17.5-	6.26-	6.48-	6.26-	6.14	571.4	574.0	581.0	580.6	2248.	2247.	2231.
13:06:15	17.5	17.5	17.6	17.5-	6.26-	6.48-	6.26-	6.14	571.4	574.0	581.0	580.6	2248.	2247.	2309.
13:06:30	17.9	17.8	18.0	17.7-	6.45-	6.73-	6.45-	6.36	582.3	585.6	592.6	592.0	2312.	2311.	2309.
13:06:45	17.9	17.8	18.0	17.7-	6.45-	6.73-	6.45-	6.36	582.3	585.6	592.6	592.0	2312.	2311.	2319.

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13:07:00	17.9	17.8	17.9	17.8-	5.61-	5.76-	5.48-	5.51	591.6	596.5	600.7	600.2	2295.	2292.	2319.
13:07:15	17.8	17.8	17.9	17.8-	5.61-	5.76-	5.48-	5.51	591.6	596.5	600.7	600.2	2294.	2292.	2156.

13:07:55	.1	.0	.1	.0-	.15-	.07-	.11-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2040.	2026.	2070.
13:08:00	.0	.0	.0	.0-	.07	.01-	.11-	.04	592.6	592.2	591.3	591.1	2030.	2026.	201[illegible]
13:08:15	.0	.0	.0	.0-	.07	.01-	.11-	.04	592.6	592.2	591.3	591.1	2030.	2026.	201..
13:08:30	.0	.0	.0	.0-	.04	.01-	.04	.01	585.3	590.2	585.3	587.7	1965.	1961.	201..
13:08:45	.0	.0	.0	.0-	.04	.01-	.04	.01	585.3	590.2	585.3	587.7	1965.	1961.	1952.
13:09:00	.0	.0	.0	.0-	.04	.01-	.04-	.04	523.0	586.7	580.0	583.5	1910.	1905.	1952.
13:09:15	.0	.0	.0	.0-	.04	.01-	.04-	.04	579.0	586.7	580.0	583.5	1910.	1905.	1900.
13:09:30	.0-	.0	.0	.0-	.01	.01-	.04-	.01	575.3	580.1	576.4	578.0	1858.	1852.	1900.
13:09:45	.0-	.0	.0	.0-	.01	.01-	.04-	.01	575.3	580.1	576.4	578.0	1858.	1852.	1858.
13:10:00	.0-	.0	.0	.0-	.01	.04-	.07-	.01	571.8	574.8	572.0	573.0	1817.	1811.	1858.
13:10:15	.0-	.0	.0	.0-	.01	.04-	.07-	.01	571.8	574.8	572.0	573.0	1817.	1811.	1816.
13:10:30	.0-	.0	.0	.0-	.01	.01-	.04-	.01	569.5	568.4	568.9	567.7	1789.	1784.	1816.
13:10:45	.0-	.0	.0	.0-	.01	.01-	.04-	.01	569.5	568.4	568.9	567.7	1789.	1784.	1791.
13:11:00	.0-	.0	.0	.0-	.01	.01-	.04-	.01	564.1	565.9	563.6	564.2	1766.	1762.	1791.
13:11:15	.0-	.0	.0	.0-	.01	.01-	.04-	.01	564.1	565.9	563.6	564.2	1766.	1762.	1772.
13:11:30	.0	.0	.0-	.0-	.04	.01-	.04-	.01	560.2	561.5	560.0	560.1	1746.	1742.	1772.
13:11:45	.0	.0	.0-	.0-	.04	.01-	.04-	.01	560.2	561.5	560.0	560.1	1746.	1742.	1757.
13:12:45	.0-	.0	.0	.0-	.04	.04-	.01	.01	552.7	554.0	552.3	553.0	1715.	1713.	1727.
13:13:45	.0	.0	.0-	.0	.01	.01-	.04-	.01	547.1	547.9	547.0	546.6	1701.	1700.	1713.
13:14:45	.0	.0	.0	.0-	.04	.01-	.04-	.01	543.4	540.8	542.0	540.3	1700.	1697.	1715.
13:15:45	.0	.0	.0	.0	.01	.01-	.04-	.01	533.6	536.1	537.2	535.2	1693.	1690.	1707.
13:16:45	.0-	.0	.0-	.0-	.01	.01-	.04-	.01	531.0	534.7	530.6	531.0	1697.	1695.	1721.
13:17:45	.0-	.0	.0	.0-	.01	.04-	.01	.01	524.3	528.7	524.5	525.0	1745.	1742.	1776.
13:18:45	.0-	.0	.0-	.0-	.01	.01-	.01	.01	521.7	522.0	521.5	521.2	1774.	1769.	17[illegible]
13:19:45	.0	.0	.0-	.0-	.01	.01-	.04	.01	520.5	522.1	520.8	520.9	1825.	1820.	1853.
13:20:45	.0-	.0	.0	.0	.01	.01-	.04-	.01	521.4	523.3	521.8	522.0	1895.	1891.	1928.
13:21:45	.0-	.0	.0-	.0-	.01	.04-	.07	.01	522.3	524.2	522.7	522.0	1959.	1955.	1989.

	Pzr	Δ Full	Range	Flow A	Flow B	A	B	A	B	A	C	A	B		
	419	468	469	490	492	436	437	482	483	144	145	33	34	19	28
12:52:00	197.6	35.6	34.2	594.	849.	880.	877.	577.3	577.1	28.05	27.61	873.	885.-	2.2	580.
12:53:00	198.0	35.7	34.5	594.	845.	880.	876.	577.1	577.1	28.05	27.62	873.	885.-	2.2	579.
12:54:00	198.3	36.0	34.2	567.	851.	880.	877.	577.1	577.0	28.05	27.62	872.	885.-	2.2	579.
12:55:00	198.6	36.0	34.0	577.	843.	880.	877.	576.9	576.9	28.05	27.63	873.	886.-	2.1	580.
12:56:00	199.6	35.7	34.0	577.	849.	880.	877.	576.9	576.9	28.05	27.61	873.	886.-	2.3	580.
12:57:00	200.4	36.0	33.9	570.	848.	880.	877.	576.9	576.9	28.05	27.63	873.	885.-	2.1	579.
12:58:00	200.4	35.4	33.9	585.	844.	880.	877.	577.0	577.0	28.05	27.62	873.	886.-	2.1	580.
12:59:00	200.4	35.6	33.7	572.	847.	880.	877.	577.3	577.3	28.05	27.61	873.	885.-	2.2	580.
13:00:00	201.3	35.7	33.9	598.	847.	880.	877.	577.5	577.5	28.05	27.61	873.	885.-	2.2	579.
13:01:00	202.7	35.7	34.0	589.	854.	880.	877.	577.6	577.6	28.05	27.63	870.	883.-	1.6	577.
13:02:00	204.2	35.7	34.0	600.	844.	880.	877.	577.6	577.5	28.05	27.63	872.	885.-	2.3	578.
13:02:15	204.2	35.7	34.0	600.	844.	880.	877.	577.6	577.5	28.05	27.63	872.	885.-	2.1	578.
13:02:30	205.0	35.8	33.8	575.	874.	880.	877.	577.5	577.4	28.05	27.63	872.	885.-	2.2	578.
13:02:45	205.0	35.8	33.8	575.	874.	879.	877.	577.5	577.4	28.05	27.62	873.	886.-	2.2	577.
13:03:00	205.7	35.7	34.3	588.	865.	879.	876.	577.4	577.4	28.06	27.62	873.	885.-	2.1	577.
13:03:15	205.7	35.7	34.3	588.	865.	879.	876.	577.4	577.4	28.05	27.63	873.	886.-	2.1	577.
13:03:30	206.5	36.3	35.4	579.	839.	881.	878.	577.3	577.4	28.05	27.60	873.	885.-	2.2	581.
13:03:45	206.5	36.3	35.4	579.	839.	881.	878.	577.3	577.4	28.05	27.62	872.	885.-	2.2	580.
13:04:00	206.8	35.7	34.2	588.	853.	879.	876.	577.1	577.1	28.05	27.64	872.	885.-	2.1	577.
13:04:15	206.8	35.7	34.2	588.	853.	879.	876.	577.1	577.1	28.05	27.63	873.	885.-	2.1	575.
13:04:30	206.9	36.3	34.7	[illegible]	910.	880.	877.	576.9	576.9	28.06	27.63	873.	885.-	2.1	574.

13:04:30	207.9	36.3	34.7	560.	910.	880.	877.	576.9	576.9	28.05	27.47	873.	835.-	2.1	579.
13:04:45	206.9	36.3	34.7	560.	910.	880.	877.	576.9	576.9	28.05	27.47	873.	835.-	2.1	58[illegible]
13:05:00	207.9	36.6	35.5	560.	858.	880.	7.	576.7	576.7	28.05	27.53	872.	835.-	2.1	58[illegible]
13:05:15	207.9	36.6	35.5	560.	858.	880.	877.	576.7	576.7	28.05	27.53	872.	835.-	2.1	58[illegible]
13:05:30	207.5	36.4	34.8	532.	858.	880.	877.	576.4	576.4	28.05	27.50	880.	893.-	1.5	616.
13:05:45	207.5	36.4	34.8	532.	858.	880.	877.	575.4	575.4	28.05	27.60	863.	875.-	2.1	616.
13:06:00	190.1	19.6	16.5-????	399.	866.	863.	576.3	576.3	28.11	27.66	853.	876.-	1.4	616.
13:06:15	190.1	19.6	16.5-????	399.	866.	863.	576.3	576.3	28.11	27.05	877.	875.-	.4	614.
13:06:30	162.8	20.2	15.1	263.	417.	879.	880.	575.9	575.4	28.10	27.97	862.	963.	.0	578.
13:06:45	162.8	20.2	15.1	263.	417.	879.	880.	575.9	575.4	28.09	27.90	805.	876.	.1	578.
13:07:00	131.8	19.8	24.1	61.	479.	885.	876.	577.9	578.0	28.10	28.08	854.	932.	.0	585.
13:07:15	131.8	19.8	24.1	61.	479.	885.	876.	577.0	578.0	28.10	28.07	919.	959.	.1	586.
13:07:30	127.3	17.2	20.7-????	600.	978.	963.	580.7	583.1	28.11	28.00-????	956.	.3	585.
13:07:45	127.3	17.2	20.7-????	600.	978.	963.	580.7	583.1	28.10	28.00	899.	945.	.5	582.
13:08:00	144.0	23.0	15.3	240.	397.	962.	1000.	591.1	589.4	28.10	28.05	993.	935.	.6	582.
13:08:15	144.0	23.0	15.3	240.	397.	962.	1000.	591.1	589.4	28.11	28.00	938.	945.	.5	578.
13:08:30	159.5	25.5	14.6	221.	396.	937.	979.	594.6	592.3	28.10	28.11	979.	945.	.6	577.
13:08:45	159.5	25.5	14.6	221.	396.	937.	979.	595.6	592.3	28.10	28.13	953.	951.	.6	577.
13:09:00	174.6	28.1	13.5	73.	423.	947.	945.	588.8	586.8	28.11	28.13	998.	962.	.6	574.
13:09:15	174.6	28.1	13.5	73.	423.	947.	945.	588.8	586.8	28.10	27.96	880.	903.	.5	572.
13:09:30	188.9	18.2	18.4	348.	399.	875.	896.	583.5	583.6	28.09	27.90	882.	879.	.5	579.
13:09:45	188.9	18.2	18.4	348.	399.	875.	896.	583.5	583.6	28.07	27.88	866.	912.	.3	579.
13:10:00	202.7	20.9	17.2-????	663.	923.	867.	575.8	577.1	28.45	28.01	879.	932.	.4	566.
13:10:15	202.7	20.9	17.2-????	668.	923.	867.	575.8	577.1	28.43	28.05	923.	922.	.3	567.
13:10:30	214.2	19.2	22.5	334.	399.	890.	929.	575.3	578.5	28.39	27.94	922.	891.	.3	565.
13:10:45	214.2	19.2	22.5	334.	399.	890.	929.	575.3	578.5	28.45	27.98	915.	914.	.3	566.
13:11:00	225.3	28.8	15.5-	0	546.	931.	915.	578.5	577.6	28.43	27.98	889.	958.	.4	564.
13:11:15	225.3	28.8	15.5-	0	546.	931.	915.	578.5	577.6	28.42	28.01	884.	936.	.3	564.
13:11:30	234.9	23.1	24.7-????	646.	927.	898.	576.0	577.6	28.43	28.05	995.	941.	.3	566.
13:11:45	234.9	23.1	24.7-????	646.	927.	898.	575.0	577.6	28.41	28.09	910.	993.	.3	564.
13:12:45	252.8	35.8	29.4	377.	397.	903.	919.	572.8	579.1	28.42	28.10	916.	930.	1.2	627.
13:13:45	265.7	39.0	32.2-????	709.	951.	865.	567.4	569.7	28.41	28.15	873.	952.	1.8	621.
13:14:45	276.7	33.2	55.3-????	697.	930.	889.	563.9	567.2	28.40	28.20	873.	923.	2.7	622.
13:15:45	282.2	29.9	77.3-????	546.	898.	870.	562.2	560.4	28.39	28.19	879.	836.	3.3	619.
13:16:45	284.3	54.0	74.9	464.	397.	812.	875.	550.7	551.0	28.38	28.23	856.	819.	3.7	619.
13:17:45	279.9	72.1	71.2	0	479.	797.	826.	556.5	544.8	28.33	28.21	792.	806.	4.2	632.
13:18:45	276.8	80.2	85.6-????	417.	796.	782.	548.9	545.6	28.38	28.20	783.	799.	4.7	645.
13:19:45	273.0	77.7	83.1-????	399.	798.	796.	545.6	546.1	28.37	28.20	797.	807.	4.6	645.
13:20:45	266.4	76.9	81.4-????	391.	805.	805.	547.1	547.2	28.38	28.18	804.	814.	3.8	645.
13:21:45	260.3	76.3	79.9-????	399.	811.	811.	549.6	549.5	28.50	28.29	810.	820.	2.8	637.

	32	73	74	50	63	56	62	1257	1258	17	18	19	1227	1228	1229
12:52:00	937.	189.8	189.3	358.6	358.3	341.5	340.1	102.7	99.0-	.63-	.20	1003.	2.	-252.4	12.69
12:53:00	938.	189.6	189.0	358.3	358.2	341.5	340.1	102.8	99.0-	.63-	.26	1004.	3.	-256.4	12.69
12:54:00	938.	189.5	188.3	357.9	358.2	341.2	340.4	102.7	99.0-	.58-	.24	1003.	3.	-251.6	12.69
12:55:00	939.	189.2	187.6	357.1	358.2	341.2	340.4	102.7	99.0-	.58-	.24	1004.	4.	-253.8	12.66
12:56:00	938.	188.7	187.1	356.5	358.2	340.9	340.4	102.6	99.0-	.63-	.26	1003.-	1.	-274.2	12.69
12:57:00	938.	188.6	186.4	356.2	358.0	340.9	340.4	102.5	99.0-	.63-	.26	1003.	1.	-256.6	12.69

12:4[illegible]:00	9[illegible].	18[illegible].7	187.1	354.6	358.2	340.9	340.4	102.6	98.9-	.63-	.8[illegible]	1303.	1.-274.2	18.[illegible]
12:47:00	93[illegible].	188.6	185.4	356.2	358.0	340.9	340.4	102.5	98.9-	.63-	.85	1303.	1.-274.8	18.69
12:48:00	932.	188.5	185.8	355.9	358.2	341.0	.7	102.6	98.9-	.60-	.84	1304.	4.-250.8	18.[illegible]
12:59:00	937.	188.5	189.0	355.3	358.2	340.9	340.7	102.7	98.9-	.58-	.84	1303.-	1.-273.0	18.68
13:00:00	936.	188.0	187.3	355.0	357.9	340.7	340.6	102.6	98.9-	.58-	.84	1306.	4.-255.6	18.68
13:01:00	936.	188.9	187.4	354.7	357.9	340.6	340.3	102.6	98.9-	.65-	1.59	1300.-	0-274.0	18.69
13:02:00	936.	188.0	188.5	354.4	357.6	340.6	340.1	102.6	98.8-	.60-	.82	1303.	4.-251.8	18.67
13:02:15	936.	188.0	188.5	354.2	357.4	340.6	340.1	102.6	98.9-	.60-	.82	1303.	1.-257.8	18.69
13:02:30	938.	188.3	188.3	354.2	357.3	340.6	340.1	102.6	98.9-	.60-	.82	1302.	1.-257.8	18.69
13:02:45	939.	188.2	188.5	354.2	357.1	340.6	340.0	102.6	98.9-	.60-	.82	1303.	1.-257.8	18.69
13:03:00	940.	188.0	188.3	354.1	357.3	340.6	340.1	102.6	98.9-	.60-	.82	1303.	1.-257.8	18.69
13:03:15	944.	187.9	188.3	354.2	357.1	340.6	339.8	102.7	98.9-	.60-	.82	1304.	1.-265.8	18.68
13:03:30	949.	188.9	188.5	354.2	356.9	340.6	339.8	102.7	98.9-	.60-	.82	1302.	1.-265.8	18.68
13:03:45	939.	187.9	188.6	354.2	357.1	340.7	339.8	102.7	98.9-	.63-	.82	1303.	1.-265.8	18.68
13:04:00	944.	187.7	188.6	354.1	357.1	340.4	339.8	102.7	98.9-	.60-	.82	1304.	1.-265.8	18.68
13:04:15	951.	187.9	188.5	353.9	356.9	340.6	339.7	102.5	98.9-	.60-	.82	1304.	4.-250.8	18.67
13:04:30	963.	187.7	188.3	353.8	356.9	340.4	339.7	102.5	98.9-	.60-	.79	1304.	4.-250.8	18.67
13:04:45	965.	187.7	188.3	353.6	356.9	340.4	339.5	102.5	98.9-	.60-	.82	1304.	4.-250.8	18.67
13:05:00	967.	187.7	188.3	353.5	356.9	340.4	339.5	102.5	98.9-	.60-	.79	1303.	4.-250.8	18.67
13:05:15	970.	187.6	188.0	353.3	356.7	340.4	339.5	102.6	98.9-	.60-	.79	1303.	0-260.6	18.69
13:05:30	931.	187.4	187.7	353.3	356.8	340.4	339.5	102.6	98.9-	.60-	1.38	1309.	0-260.6	18.69
13:05:45	695.	187.3	187.1	353.3	356.9	340.6	339.7	102.6	98.9-	.58-	.75	1310.	0-260.6	18.69
13:06:00	639.	187.7	186.8	353.2	356.5	340.6	339.5	102.6	98.9-	.58-	1.73	1796.	0-260.6	18.69
13:06:15	594.	187.9	187.0	352.9	356.4	340.3	339.1	101.6	98.8-	.79-	1.21	1752.	0-290.8	2.64
13:06:30	597.	187.7	187.9	352.1	356.6	339.2	338.2	101.6	98.8-	.68-	1.95	1721.	0-290.8	2.64
13:06:45	587.	187.6	187.7	351.3	356.2	339.2	337.6	101.6	98.8-	1.95-	.98	1685.	0-290.8	2.64
******	******	******	******	******	******	******	******	******	******	******	******	******	******	******
13:07:00	593.	187.7	187.1	350.8	354.1	337.2	337.0	101.6	98.8-	1.97-	.93	1650.	0-290.8	2.64
13:07:15	581.	187.4	188.3	350.1	353.5	337.5	336.1	97.1	96.9-	.42-	.93	1620.	0-300.0	.05
13:07:30	582.	187.7	188.3	349.7	352.6	338.2	335.6	97.1	96.9-	1.97-	.97	1591.	0-300.0	.05
13:07:45	576.	188.9	187.7	349.4	352.4	337.9	335.2	97.1	96.9-	1.05-	.96	1561.	0-300.0	.05
13:08:00	582.	190.4	187.9	349.1	352.0	337.7	334.8	97.1	96.9-	.91-	.63	1531.	0-300.0	.05
13:08:15	593.	190.9	187.9	349.1	352.3	337.9	334.7	93.2	94.2-	.72	.37	1505.	0-300.0	.02
13:08:30	605.	193.3	188.6	349.4	351.8	337.9	334.5	93.2	94.2-	.70	.75	1478.	0-300.0	.02
13:08:45	615.	193.4	189.2	349.8	351.8	338.0	334.7	93.2	94.2-	.70	1.35	1452.	0-300.0	.02
13:09:00	622.	196.7	190.8	350.8	351.7	338.0	334.7	93.2	94.2-	.70	2.62	1426.	0-300.0	.02
13:09:15	624.	197.4	201.0	351.7	351.8	338.3	334.8	91.3	93.6-	.72	2.74	1400.	0-300.0	.01
13:09:30	627.	197.3	200.1	352.6	352.0	338.6	335.0	91.8	93.6-	.70	3.44	1375.	0-300.0	.01
13:09:45	635.	198.6	199.3	353.6	352.0	338.9	335.3	91.2	93.6-	.70	.32	1350.	0-300.0	.01
13:10:00	717.	199.0	206.2	354.4	352.4	339.2	335.6	91.2	93.6-	.70-	.91	1326.	0-300.0	.01
13:10:15	715.	199.3	210.9	354.5	352.6	339.4	335.9	91.2	91.7-	.72-	.91	1303.	0-300.0	.00
13:10:30	714.	205.4	212.0	354.7	352.7	339.7	335.9	91.2	91.7-	.70-	.89	1280.	0-300.0	.00
13:10:45	724.	211.8	209.0	354.2	353.0	340.0	336.4	91.2	91.7-	.70-	.89	1258.	0-300.0	.00
13:11:00	753.	215.5	208.7	355.0	353.3	340.3	336.8	91.2	91.7-	.70-	.89	1236.	0-300.0	.00
13:11:15	742.	210.9	218.0	355.1	353.5	340.6	337.1	91.6	91.5-	.68-	.89	1216.	0-300.0	.00
13:11:30	712.	202.9	222.0	355.3	353.9	341.0	337.6	91.6	91.5-	.70-	.89	1196.	0-300.0	.00
13:11:45	734.	209.6	220.4	355.5	354.1	341.3	338.0	91.6	91.5-	.72-	.89	1177.	0-300.0	.00
13:12:45	851.	219.1	207.7	356.8	356.3	343.5	340.1	91.3	91.3-	.68-	1.09	1106.	0-300.0	.00
13:14:45	643.	214.5	224.7	360.7	357.0	346.9	343.6	90.6	90.9-	.79-	.89	1043.	0-300.0	.00

13:13:45	643.	216.5	226.7	362.7	357.9	366.2	351.6	90.1	90.9-	.79-	[illegible]	1043.	0-300.0	[illegible]
13:14:45	634.	216.3	220.3	366.4	361.4	360.4	[illegible]	90.0	91.1-	.77-	.89	988.	0-300.0	.08
13:15:45	619.	223.4	218.5	368.8	365.9	358.6	[illegible]	88.7	89.7-	.70-	.91	935.	0-300.0	.C
13:16:45	618.	223.2	208.0	372.8	360.4	356.5	355.0	87.9	89.3-	.68-	.89	887.	0-300.0	.00
13:17:45	621.	217.5	223.8	370.0	372.8	359.7	355.0	87.4	88.5-	.79-	.84	842.	0-300.0	.01
13:18:45	634.	216.8	224.3	379.2	375.5	362.7	362.0	87.0	88.2-	.72-	.89	800.	0-300.0	.00
13:19:45	644.	217.0	223.6	381.6	377.6	365.4	364.1	86.6	87.9-	.79-	.84	761.	0-300.0	.00
13:20:45	644.	217.6	223.1	383.9	379.6	367.6	365.2	85.9	87.7-	.68-	.79	725.	0-300.0	.00
13:21:45	625.	218.0	223.2	384.7	380.5	368.8	366.8	86.1	87.2-	.72-	.79	692.	0-300.0	.00

14:04:13 GROUP TREND
OPERATOR GROUP D

	0509	0739	0435	0434	0433	0426	0427	0424	0429	0430	0425	0515	0376	1265
14:04:25	.0	2167.	199.7	192.9	125.1	535.1	534.7	534.9	536.4	535.3	534.8	2151.	87.6	30.22

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	C. A. Creacy - Service Manager
From	D. J. Morris - Plant Equipment Services Section (Ext. 2657) DJ Morris
Cust.	Duke Power Company
File No. or Ref.	NSS-3,4, & 9
Subj.	Trip Report PZR Code Safety Valves Meeting
Date	May 25, 1976

BDS 663-5

This letter to cover one customer and one subject only

ATTENDEES

B&W

C. A. Creacy
J. C. Simonis
D. J. Morris

Duke Power Company

C. D. Hatley
G. W. Hallman
Bill Keisler
Mike Alexander
S. A. Holland
W. E. Martin
Harry Lipe-McGuire
Ray Rider-McGuire

PURPOSE OF MEETING

To present to Duke the results of B&W's effort toward improving performance of pressurizer code safety valves . The meeting was conducted in accordance with the meeting agenda (Attachment 1).

MEETING MINUTES

Introduction - Presented an outline of the joint effort between B&W, Duke Power, and Dresser (Attachment 2).

Instrumentation on Oconee Unit 2 - Technical presentations by Jack Simonis on the PIPING LOADS/STRAIN GAUGE STUDY and the VIBRATION/ACCELEROMETER STUDY were very well received. These presentations readily demonstrated both the time and effort expended on these studies and the high degree of technical competence of the personnel involved. Due to his direct involvement in this program, he was also able to correlate his findings with other areas of the overall program. Following each technical presentation, a discussion of both specific and general conclusions which could be drawn from these studies as a result of both data analysis AND visual observations/common sense approach to all data presented.

DISCUSSION

Operating Plant Survey - Discussed the extensive nationwide PWR survey on operating pla t. These included plants from coast to coast with several on-site visits. th B&W and non-B&W plants were included in this survey. Specific areas f Maintenance, Handling, Testing, Piping arrangements, and Operating History were covered. A multitude of correlations were made which complemented the theories and results of the presentations by Jack Simonis.

Several questions were raised by the customer during this discussion in each of the areas covered, indicating a high degree of enthusiasm toward the information presented. At the conclusion of the Survey discussion, handouts were presented on the information obtained (Attachment 3), and a sample of the Survey questionnaire (Attachment 4).

Present Status at TMI and Crystal River - A brief discussion of recent events at these plants was conducted which primarily emphasized the high degree of correlation between those events and previously discussed theories and information.

Conclusions and recommendations were then presented, along with the schedule for implementing the action plan (Attachments 5 and 6). Duke agreed to the action plan and as a result of the discussions, decided to implement vertical handling of these valves as soon as possible. The agreement was made to have detailed maintenance, handling and testing procedures available for use and an on-site test facility constructed in time for the Unit 3 refueling in September.

The meeting was highly successful and more than adequately accomplished its purpose.

Duke Power was impressed with the work that was required to retrieve the information and well pleased with B&W's interpretation and analysis which provided a logical/common sense set of recommendations.

DJM:NF
Attachments

cc: K. R. Ellison
J. A. Middleton
R. L. Pittman
H. Honig
J. M. Neilson (ARC)
J. C. Simonis

DUKE POWER COMPANY

PRESSURIZER CODE SAFETY VALVES

MEETING 5/19/76

AGENDA

INTRODUCTION	DuWayne Morris
PIPING LOADS/STRAIN GAUGE STUDY	Jack Simonis
VIBRATION/ACCELEROMETER STUDY	Jack Simonis
DISCUSSION	DuWayne Morris
OPERATING PLANT SURVEY (INCLUDES MAINTENANCE, HANDLING, AND TESTING)	
PRESENT STATUS AT TMI AND CRYSTAL RIVER	
SUMMARY OF CONCLUSIONS	
RECOMMENDATIONS FOR OCONEE NUCLEAR STATION	
ACTION PLAN AND SCHEDULE	

INTRODUCTION

Efforts were initiated by B&W toward improving performance of pressurizer code safety valves as a direct result of B&W and customer concern over recurring problems with excessive valve leakage. This concern was expressed to Dresser which resulted in a joint effort between B&W and Dresser.

The first step taken was to determine, by joint discussion, the probable causes for excessive leakage based upon all information available at the time. The following items were determined to be the most probable causes for excessive leakage:

PROBABLE CAUSES

A. Ambient temperature and associated thermal profile effects.

B. External piping loads created by thermal growth during Rx heatup resulting in excessive mechanical strain on valve internals.

C. Vibration of sufficient magnitude may result in relative seat/disc movement and associated surface degradation.

D. Maintenance techniques may need to be more stringent to insure proper seating.

E. Handling and installation should be closely scrutinized to insure that the seating surfaces are not damaged during these processes.

F. Valve testing, specifically hot vs. cold setting of these valves, needs closer analysis to determine set point drift associated with the thermal growth of valve internals.

Subsequent to determination of the most probable causes listed above, a course of action was established to facilitate assignment of relative magnitudes and/or eliminate each of the aforementioned probable causes as follows:

ACTION TAKEN

A. An extensive nationwide PWR survey was undertaken on operating plants to provide additional information, both general and specific. This included several on-site visits coast to coast and lengthy survey questionnaires at both B&W and non-B&W plants.

B. Determine external piping loads at Duke Power Company's Oconee Unit II through both visual observations and installation of strain gauge instrumentation.

C. Determine effects of vibration at Oconee Unit II by installation of accelerometer instrumentation on the valve body.

D. Installation of thermocouple instrumentation to provide valve and piping thermal profile information at Oconee Unit II.

E. Discuss the results of the above listed actions with Dr ser.

F. Formulate a new plan.

With regard to the action plan, tremendous cooperation, effort, and technical assistance was obtained from all personnel involved in the instrumentation and data retrieval on the Oconee Unit II valves. The efforts of Olie Bradham, Bill Keisler, Mike Alexander, John Neilson (ARC), Bill Crawford (ARC), and Jack Simonis (OFR) were particularly outstanding and greatly appreciated.

PRESSURIZER CODE SAFETY RELIEF VALVES GENERAL INFORMATION

PLANT	REACTOR SUPPLIER	ARCHITECT ENGINEER	VALVE VENDOR	LOOP SEAL	INLET SIZE	NET MWe	COMMERCIAL DATE	LCD = LAST CAPACITY DAYS PROBLEMS	OPERATING PRESSURE	OPER. PRESS. / SET PRESS. %	FINAL POLISH GRIT #	WHO PERFORMS LAPPING?	LOCATION OF TESTING	TEST METHOD	HANDLING
ARKANSAS 1	B+W	BECHTEL	DRESSER	NO	3"	810	10/74	-0- LCD	2155	86.2	1000	VENDOR	IN PLACE	HYDRO-SET	
CALVERT CLIFFS 1	COMBUSTION	BECHTEL	DRESSER	NO	2½"	800	10/75	YES	2250	90	1000	UTILITY	HOT SHOP	N_2 + HYDRO ASSIST	[illegible]
MAINE YANKEE	COMBUSTION	STONE/WEBSTER	DRESSER	NO	3"	790	11/72	NO(1)	2235	89.9	8000	UTILITY	WYLE LAB.	STEAM + HOUSE	TRUCK
MILSTONE 2	COMBUSTION	BECHTEL	DRESSER	YES* SEE NOTE BELOW	2½"	830	^10/75	NO							
OCONEE I-II-III	B+W	UTILITY	DRESSER	NO	2½"	887	I-7/73 II-9/74 III-12/74	10,75 LCD	2155	86.2	1000	VENDOR	WYLE LAB.	STEAM + HYDRO	TRUCK
PALISADES	COMBUSTION	BECHTEL	DRESSER	NO	3"	700	12/71	YES - [illegible]	1800	72	1200	UTILITY	HOT SHOP	N_2 + HYDRO ASSIST	VERTICAL
SAN ONOFRE 1	WESTINGHOUSE	BECHTEL	CROSBY	NO	3"	430	1/68	45,891 LCD SINCE 1/68	2085	83.9	8000	UTILITY	CONTAINMENT	N_2 + HYDRO ASSIST	VERTICAL
SMUD	B+W	BECHTEL	DRESSER	NO	3"	913	4/75	-0- LCD(3)	2155	86.2	1000	UTILITY	MAIN. SHOP	N_2 @ 2500	VERTICAL
TMI-1	B+W	GILBERT	DRESSER	YES	2½"	818	9/74	20 LCD	~~2166~~ 2155	~~83.9~~ 83.5	1000	VENDOR	CONTAINMENT	N_2 + HYDRO ASSIST	VERTICAL

NOTES: CALVERT CLIFFS 1 - HAS ~6FT INLET EXPANSION LOOP - SET POINT CHANGES NOTED BETWEEN FIRST & SECOND LIFT CHECK SEE QUESTION #27
MAINE YANKEE - SUMMER OF '75 UPGRADED PRIMARY PRESS FROM 1800 TO 2235 PSIG NO CHANGES NOTED THUS FAR. - UP UNTIL LAST PUSHING [illegible] TESTING WAS CONDUCTED ON SITE WITH N_2.
PALISADES - 1973 DE-RATED PRIMARY PRESS. FROM 2100 TO 1800 PSI NORMAL OPERATING

FIELD REPRESENTATIVES - SMUD - WERNER STELZ
TMI-1 - ROLAND PRUETT - Tom CASSIDY
OCONEE - Tom CASSIDY
PALISADES - WERNER STELZ

(1) [illegible]
(3) [illegible] A.R. [illegible]

*MILSTONE 2 - LOOP SEAL IS ELECTRICALLY HEATED TO ~350°F

PRESSURIZER CODE SAFETY RELIEF VALVES APPL. ARRANGEMENT

PLANT	GIMBAL TAP JOINTS	BELLOWS	SPRING HANGERS	HYDRAULIC SNUBBERS	INLET LAP LOOP	INLET LOOP SEAL	(CUSTOMER COMMENT) ELIMINATES ... OTHERS								
ARKANSAS 1	No	No	YES	YES	No	No	YES	SEE TEST RESULTS BY BECHTEL TP 800.29							
CALVERT CLIFFS 1				YES	YES	NO									
MAINE YANKEE					No	No	YES								
MILLSTONE 2				YES	N/A	YES									
OCONEE I/II/III	YES-1EA	No	No	YES	No	No	YES								
PALISADES					No	No	No								
SAN ONOFRE 1	No	No	YES	No	No	No	COULD BE IMPROVED								
SMUD	YES-2EA	YES	No	No	No	No	OK								
TMI-1	No	No	YES	No	N/A	YES	YES								

PRESSURIZER CODE SAFETY RELIEF VALVES — CRAFTSMANSHIP

PLANT	WHO PERFORMS LAPPING?	FINAL POLISH GRIT #	OPTICAL FLATNESS CHECKS: LAPPING BLOCKS BEFORE USE	LAPPING BLOCKS AFTER USE	VALVE SEAT	VALVE DISK	VISUAL INSPECTION: BEFORE & AFTER LAPPING BLOCKS	VALVE SEAT	VALVE DISK	CONDITION OF OPTICAL FLATS	OPTICAL FLATS CALIBRATED?	MECHANICAL AIDES USED FOR UNIFORMITY IN LAPPING?	CLEANING FLUID USED	WHO PERFORMS ASSEMBLY?	IS [illegible] MATTER A PROBLEM?
Arkansas 1	VENDOR	[illegible]	No	No	No	No	MAG. GLASS	EYEBALL	EYEBALL	NOT USED	NOT USED	No	ACETONE	UTILITY	NO
Calvert Cliffs 1	UTILITY	1[illegible]	No	No	No	No	EYEBALL	EYEBALL	DRY LAP AND EYEBALL	NOT USED	NOT USED	No	ACETONE	UTILITY	NO
Maine Yankee	UTILITY	8000	No	No	No	No	EYEBALL	BLUING + EYEBALL	BLUING + EYEBALL	NOT USED	NOT USED	No	SOLVENT	UTILITY	NO
Millstone 2															
[illegible] I & II	VENDOR	1000	No	No	No	No	EYEBALL	EYEBALL	EYEBALL	NOT USED	NOT USED	No	[illegible]	UTILITY & VENDOR	NO
Palisades	UTILITY	1200	No	No	No	No	EYEBALL	EYEBALL	EYEBALL	NOT USED	NOT USED	No	ACETONE	UTILITY	YES - DURING LAPPING
San Onofre I	UTILITY	8000	YES	YES	± light band	No	EYEBALL	EYEBALL WITH HIGH INTENSITY LIGHT		GOOD	YES	NOZZLE GUIDE	ALCOHOL & CHEM WIPES	UTILITY	YES
SMUD	UTILITY	1000	± light band	No	± light band	NO	MAG. GLASS	MAG. GLASS	MAG. GLASS	GOOD	YES	NO	A. [illegible]	UTILITY	NO
TMI-I	VENDOR	1000	SEE VENDOR					EYEBALL	EYEBALL	GOOD	NO			CONTRACTOR	NO

ATTACHMENT 3

PRESSURIZER CODE SAFETY RELIEF VALVES TESTING & HANDLING

	LIFT TESTING					LEAKAGE TESTING				IN PLACE TESTING			HANDLING		SUPERVISION	
PLANT	LOCATION OF TESTING	AMBIENT TEST TEMPERATURE	TEST MEDIUM	(FOR LOWEST SET VALVE) SET POINT	SET POINT DEVIATION NOTED?	LEAK TEST PRESSURE	LEAK TEST MEDIUM	LEAK TEST TIME	LEAK TEST SPECIFICATION	HAVE VALVES EVER BEEN TESTED IN PLACE?	PRESSURIZER PRESSURE	SUCCESS OF IN PLACE TESTING	ARE VALVES HANDLED VERTICALLY AT ALL TIMES?	ARE VALVES EVER TRANSPORTED FROM OFF-SITE AFTER TESTING?	TESTING	HANDLING
ARKANSAS 1	IN PLACE		STEAM	2500						YES		GOOD	HANDLED VERY CAREFULLY?	NO	UTILITY	UTILITY
CALVERT CLIFFS 1	HOT SHOP	AMBIENT	N_2 + HYDRO ASSIST	2485 ±1%	YES - SEE NOTE BELOW	2350 PSI	N_2 + HYDRO ASSIST	5 MIN	< 10 BUBBLES/MIN	NO	N/A	N/A	YES - BUT SEE NOTE BELOW	NO	UTILITY	UTILITY
MAINE YANKEE	WYLE LAB	SPRING TEMP 125°F ± 5°	1200 LB STEAM & HYDRO-SET	2485 ±3%	NO COMMENT	2200 EQUIVALENT	STEAM	3 HRS.	SEE DETAILS BELOW	NO	N/A	N/A	NO	YES	UTILITY	UTILITY
MILLSTONE 2																
OCONEE I II III	WYLE LAB	150°F	1200 LB STEAM + HYDRO-SET	2485	NO	2250 EQUIVALENT	STEAM	3 HRS.	SEE DETAILS BELOW	NO	N/A	N/A	NO	YES	VENDOR	UTILITY
PALISADES	HOT SHOP	AMBIENT	N_2	2450 ±10 LBS	NO	2100	N_2	NOT SPECIFIED	< 5 BUBBLES/MIN	NO	N/A	N/A	YES	NO	UTILITY	UTILITY
SAN ONOFRE 1	CONTAINMENT	AMBIENT	N_2 + HYDRO ASSIST	2485 ±1%	NO	2100?	N_2 + HYDRO ASSIST	15 MIN	ZERO	YES	2055	FAILED SAFETY AFTER TEST	YES	NO	UTILITY	UTILITY
SMUD	MAIN. SHOP	250°F	N_2	2500 ±25 PSI	COLD TO HOT - YES	2300 PSI	N_2	10 MIN	ZERO	YES	1500	GOOD	YES	NO	UTILITY	UTILITY
TMI-1	CONTAINMENT	AMBIENT	N_2	2435	NO	2290 PSIG	N_2	NO SPEC	ZERO BUBBLES	NO	N/A	N/A	YES	NO	VENDOR	VENDOR

NOTES: CALVERT CLIFFS 1 - SET POINT DEVIATION IS NOTED ON FIRST LIFT CHECK - IN ONE CASE, MANUAL ACTUATION REQUIRED, HOWEVER, SUBSEQUENT LIFT CHECKS ARE OK. VALVES ARE NOT COMPLETELY VERTICAL AT ALL TIMES DUE TO PIPING ARRANGEMENT OBSTRUCTIONS DURING INSTALLATION

OCONEE & MAINE YANKEE - LEAK TEST SPECIFICATIONS: ZERO CONDENSATION ON MIRROR HELD AT DISCHARGE. NO VISIBLE CHANGE IN MANOMETER WATER LEVEL AFTER 3 HRS AS A CLOSED SYSTEM DISCHARGE.

H. Hoeig
October 24, 1975

PRESSURIZER CODE SAFETY RELIEF VALVES QUESTIONNAIRE

OPERATING HISTORY:

1. Do you have machinery history on the valves?
   If yes, may I obtain a copy?

2. Can you discuss the operating history and any items which may not appear in machinery history?
   Include:

   A.) Description of malfunction:

   1. Downstream temperatures
   2. Quench tank temperature
   3. Time from installation to malfunction
   4. Calculated or known leak rates
   5. Plant conditions or transients which may have contributed to malfunction such as lifting of the electromagnetic relief valve.

   B.) Any opinion on cause of malfunction?

   C.) Any unusual conditions noted on disassembly or subsequent testing?
   Including:

   1. Wire drawing, cutting, visual appearance + ability to lap clean.
   2. Foreign matter in seat area?
   3. Internal misalignment?
   4. Scratches and/or cracks in seat or disk?
      Description and size.
   5. Set point OK on re-assembly?
   6. Leak test OK after testing?
   7. Have valves been cause for plant shutdown?

3. What model Number valve do you have?
   Inlet size: Outlet size:

4. Has there been a difference in performance between one valve installation and the other? If so, what do you attribute this performance to? Briefly describe any difference in downstream piping arrangements.

PLANT OPERATIONS:

5. Have the code safety valves ever lifted as protective action (overpressurization)? If so, describe plant conditions and results.

6. What is plant operating pressure?
Electromagnetic relief set press? Code relief set press?

7. Has there ever been a change in the specified normal plant operating pressure? If so, state the approximate date of change; state what the change was, and any noted change in code valve performance.

CRAFTSMANSHIP:

8. Who actually performs valve lapping? (Utility - Vendor)

9. What type and grit number of lapping compound is used for final polish?

10. Are any mechanical aides used to provide uniformity in lapping? If yes, please describe.

11. Are lapping blocks checked for optical flatness prior to use? If yes, what is the required specification for acceptable use?

12. Are lapping blocks re-used? Do you change lapping blocks when changing from a low to a higher grit number lapping compound?

13. Are lapping blocks visually inspected prior to use? If yes, is a magnifying glass used?

14. Describe your cleanliness procedures and lapping compound removal techniques.

15. Are lapping blocks checked for flatness after lapping. If yes, what is acceptable? Is a visual inspection of lapping blocks conducted after final polishing?

16. Is the valve seat and/or disk checked for optical flatness after lapping? If yes, what is the flatness required?

17. Do you conduct a visual inspection of the valve seat and disk after final polish? Describe the technique used.

18. Who supervises lapping assembly? (Utility - Vendor)

19. Who performs the assembly and adjustment of the valves? (Utility - Vendor)

20. Is dirt or other foreign matter a problem?

21. Are any special techniques used for assembly? Is verticality maintained throughout assembly?

22. Are the optical flats used for maintenance of these valves in good conditions and calibrated?

TESTING:

23. Where are the valves tested? (Containment, shop, off-site).

24. How often are valves disassembled and tested?

25. How are the valves tested? (Hydro-assist, N_2 Press, steam, in place etc.)

26. Lift pressure specification?

27. Are the valves heated during testing?
State temperature. Any set-point drift noted?

28. Leak testing pressure: Temp:
Medium (H_2O, N_2, steam): Leakage specification:
Success?

29. Have the valves ever been tested in place?
Primary press: Temperature: Success?

30. Are there any decontamination problems with these valves?

31. Who supervises the testing?

HANDLING:

32. Are the valves ever shipped by air or freight?
Opinion of handling? Re-work requried?

33. What method of handling is used on site?
(Sling, verticality maintained, crate to fork lift used, preventio
of bumping and jolting).

34. Who supervises handling? (Utility - Vendor - supervisory personnel)

PROCEDURE:

35. Do you have a written maintenance procedure for these valves? If yes, may I obtain a copy?

PIPING ARRANGEMENT:

36. May I obtain a copy of code valve discharge piping drawings including isometrics?

27. Describe your discharge piping arrangement including the following:

A.) Bellow expansion
B.) Spring hangers
C.) Hydraulic snubbers
D.) Gimbal expansion joints
E.) Distance from inlet flange to pressurizer?
F.) Describe any cold spring noted during installation or removal.

38. Have you ever installed:

    A.) Thermocouples

    B.) Strain measuring equipment

    C.) Vibration monitoring equipment

    D.) Pipe displacement measuring equipment

    If yes, what were the results and what is the opinion with regard to data reliability?

39. State your opinion of your code valve piping arrangement including the following:

    A.) Designed well?

    B.) Eliminates excessive stress?

    C.) Has valve Vendor commented on it?

    D.) Opinion of A/E who designed + installed system?

40. Have there been changes in discharge piping and/or support system since initial installation? If so, when? Why? What is your opinion of before and after such modifications?

41. What is your opinion on the H_2 erosion theory?

42. What is your opinion of inlet loop seals?

QUESTIONS ABOUT THE VALVE VENDOR:

43. What is your opinion of valve performance?

44. Do you receive good parts support?

45. What Vendor representatives have you been associated with?

46. What is your opinon of their craftsmanship and technical competance?

47. What is your opinion of their availability and co-operation?

48. Has the Vendor made any modifications or material changes? Why? Did this affect performance? Did you agree with the changes made?

49. What is your opinion of the other Vendor? (Crosby-Dresser) What experience have you had with Crosby-Dresser?

50. Have you ever requested or acquisitioned new valves as spares or replacements? If so, why? What time-lag resulted from such requests?

H. Honig
October 24,1975

51. Do you notify the Vendor each time you have a problem? If yes, what are the results of such notification?

MISCELLANEOUS

52. Have you discussed code valve problems with other utilities? Who? Problems? Co-operation? Scope of discussion?

53. If you have discussed code valve problems with other utilities, do you believe such discussion and/or visits are usefull?

HH:me

ATTACHMENT 6

SCHEDULE OF EVENTS

ACTIVITY	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.& DEC.
1. Inst. & Maint. Man. Draft to B&W Review by B&W	Dresser will be late Plant on Strike							
2. Testing Recomm. Draft to B&W Review to Dresser								
3. Temp Amb & Profile to Dresser ASAP	Complete 3/3/76							
4. CK Power Ramps for Press Trans on B&W Op. Plants ASAP	Complete 3/3/76							
5. Method for Early Leak Detection Pre. Info. to Dresser								

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

ORIGINAL

**** CLEARED ****

FILE: 12M2

TO: ______________ For Information

CONTRACT NO: 620-00 04

Central Engineering Files

SPR 222

C. C. Plunkett - Contract Admin.

TITLE Leaking Pressurizer Reliefs & Block Valves

C. M. Fletcher - Quality Assurance

R. G. Burnley - Task Engineer

W. A. Cobb - Sr. Proj. Manager

DATE: 1/29/75

The attached, cleared SPR is submitted for your information.

TO: ______ J. L. Hollis - FLORIDA ______

______ F. L. Logan - SMUD ______

______ B. L. Day - TOLEDO ______

______ R. J. Baker - Oconee ______

______ L. C. Rogers - Met Ed ______

J. A. Bailey - Arkansas

Attached is one copy of Site Problem Report No. 222 which was processed on Contract 620-00 04. Future contracts have been reviewed for the potential of a similar problem. This problem is/is not considered applicable to other contracts NSS-3 → 14.

REMARKS: ______________________________

cc: R. E. Kosiba

G. K. WANDLING

G. K. Wandling

NUCLEAR SERVICE SUPPORT ENGINEER

NSSE

CLEARED

PDS-21091-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Co.	CONTRACT NO 620-0004	SPR NO. 222	REV. NO. 0
VENDOR Dresser P.O. NO.	TASK NO. 28	GROUP NO. 41	SEQ. NO. 2-5
SITE ENGINEER R J Baker, Jr.	REQ'D. RESOL. DATE NA	REQ'D. COMP. DATE NA	

TITLE Leaking Pressurizer Reliefs and Block Valves

DESCRIPTION OF PROBLEM

See attached

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

See attached

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

Duke is handling this problem - No B&W action required at this time.

ORIGINATOR SIGNATURE | DATE | S.O.M. REP. SIGNATURE R M Baker Jr | 1/20/75

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[signature]	1-27-75
TASK ENGINEER	— No Eng. Action Required	—
PROJECT MANAGER	C. A. Creasy	1-30-75

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO | ☐ FIELD CHANGE REQ | FC NO

COMPLETION

SITE COMPLETION REPORT

See attached

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☒ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED | SIGNED BY

S.O.M./CONSTR. REP. APPROVAL R M Baker Jr | DATE 1/24/75

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 12M.2

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by NPG Nuclear Service

(1) Originator - Fill in: Customer; Contract Number; Vendor; Purchase Order Number; Task Number; Group Number; Sequence Number; Name; Title; Description of Problem; Status; Further Action Recommended by Site Personnel; Originator Signature and Date; Vendor Claim (if applicable).

(2) Site Operations Manager - Fill in: SPR Number; Revision Number; Req'd. Resol. Date; Req'd. Comp. Date; Approval Signature; Date.

(3) Nuclear Service Support Engineer - Fill in: Cost Category; Authorized Charge Number.

(4) Task Engineer - Fill in: Resolution; Recommended Std.'s Change*; (if applicable, FC Req. and FC Number); Signature and Date.

*If recommended standard's change, transmit a copy to cognizant Standard Task Engineer to resolve with Standard Plant Manager.

(5) Field Engineer - Implement resolution; upon completion, fill in: Completion Report; Date Completed and Signature.

NOTE: If necessary to deviate from the approved SPR, note deviation and submit revised SPR to the Site Operations Manager.

(6) Site Operations Manager - Approve completion; sign.

Initiated by B&W Construction Company

(1) Originator - (Same as (1) above)

(2) Construction Co. Site Representative - (Same as (2) above)

(3) Project Manager - (Same as (3) above)

(4) Task Engineer - (Same as (4) above)

(5) Construction Co. Site Representative - (Same as (5) and (6) above)

BABCOCK & WILCOX

NSS-4/SPR-222

Description of Problem

With reactor power at about 100% from the first of the year, the plant had to be shutdown and cooled down on 1/18/75 due to the quench tank temperature being at 230°F.

On 1/7/75 the temperature was at about 200°F and so Duke about the electromatic relief valve block (2RC-V2). the tank temperature dropped to 195°F by the next day but slowly started increasing again. Between 1/9/75 and 1/18/75, Duke succeeded in keeping the tank temperature below 215°F (DP-1101-01 limit) by using the Unit 1 and 2 A bleed hold up tank as a source of water to bleed and feed with. this cooled the quench tank to about 205°F but raised the "A" BHUT temperature to about 195°F on Unit 1 and 2. On 1/18/75 the quench tank temperature went to 230°F dispite all efforts and the plant had to be shut down.

NSS-4 / SPR - 222

Status - Action to Date

Nuclear Service in Lynchburg (R.B. McConnell, J.P. Kennedy) informed on morning phone call each day from 1/7/75 until 5/10 on 1/18/75.

Duke made a complete check of all piping leading to the quench tank while the plant was still at hot condition and the following is the results:

1. the thermocouples mounted on the discharge piping of the three pressurizer relief valves were not reading correctly due to not being installed properly or not installed at all.
2. One or both of the pressurizer code reliefs was/were leaking through the seat (s).
3. The electromatic relief (2RC-RV3) was also leaking through the seat.
4. 2RC-V2 was also leaking through seat because it was not shut completely tight.

Site Completion Report

Since Unit I was shutdown and Duke's spare code reliefs are at the factory, the Oconee I code reliefs (RC-RV4 A+B) were removed and installed on Oconee II. The spare reliefs are to be shipped back to the site before Oconee I needs them.

The electromatic relief (2RC-RV3) was inspected and found to have two steam cuts on the discs of the valve. Duke replaced the discs with spares.

The electromatic relief valve block valve (2RC-V2) would not shut tightly because of the old continuing problem of this valve on all B&W units sticking shut at hot conditions (See NSS-9/SPR-91). In an attempt to prevent this valve from sticking in the shut position, Duke, sometime in the past, reduced the torque switch setting. Because of this the valve did not shut tightly enough to prevent leakage. Duke is

BABCOCK & WILCOX

NSS-4/SFR-222

increasing the torque switch setting on this valve and writing a letter to B&W outlining all the problems they are having with this valve and Limitorque.

The thermocouples have been installed properly on the discharge piping of the relief and the plant is presently heating up with no leakage past the relief noted yet.

SPR 260/1

TITLE RC-V4 (RC-V2) Motor Burnout #2

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- None. The following is the status and/or resolution of this SPR on other contracts.

REMARKS Per R.G. Brumley this problem is Not Applicable to any other contract. Damage was caused by operator error. (overriding overloads)

NSS-

NSS-

ACTION COMPLETE
ON ALL CONTRACTS

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

**** CLEARED ****

FILE: 1242

CONTRACT NO: 620 00 03

SPR 560 (Rev 0 #1)

TITLE RC-P2 Motor Burnout

DATE: 11/4/74

TO: ____________ For Information

Central Engineering Files

C. C. Plunkett - Contract Admin.

C. M. Fletcher - Quality Assurance

R. G. Burnley - Task Engineer

W. A. Cobb - Srg-Proj. Manager

The attached, cleared SPR is submitted for your information.

TO: _____ J. N. Kaelin - ARKANSAS _____ R. E. Kosiba

_____ E. L. Logan - SMUD _____

_____ B. L. Day - OCONEE _____

_____ L. C. Rogers - MET ED _____

Attached is one copy of Site Problem Report No. 560 which was processed on Contract 620-00 03. Future contracts have been reviewed for the potential of a similar problem. This problem is not considered applicable to other contracts ____________.

REMARKS: ____________

cc:

G. F. Wahling

NUCLEAR SERVICE SUPPORT ENGINEER

TECHNICAL SUPPORT SUPERVISOR

CLEARED

-21091-1 (9-73)

TWX - Rogers Plummer 10/9/73

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO 620-0003	SPR NO. 560	REV. NO. 0
VENDOR B. & W. P.O. NO.	TASK NO. 28	GROUP NO. 41	SEQ. NO. 02
SITE ENGINEER E. L. Logan	REQ'D. RESOL. DATE	REQ'D. COMP. DATE	

TITLE RC-4 (RC-V2) MOTOR BURNOUT

DESCRIPTION OF PROBLEM On 10-5-73 RC-4 overloads had been over-ridden at A.E.C.'s direction. During dropped rod incident (See SPR 558), reactor operator attempted to open RC-4. The valve would not open and attempts resulted in a burned out actuator motor. Valve actuator was replaced on 10/7/73. Valve is now in service with overloads still bypassed.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL
ENGR SHOULD RE-EVALUATE NEED FOR EQUALIZATION VALVE - GATE VALVES NORMALLY HAVE THIS FEATURE. ALSO PRESSR INST MANUAL SHOWS EQUALIZATION VALVE. BOTH UNIT 1 & 2 VALVES HAVE STUCK SHUT WHILE HAVING HIGH DIFFERENTIAL PRESS. ACROSS GATE

ORIGINATOR SIGNATURE	DATE	SOM/CONSTR. REP. SIGNATURE	
E. L. Logan	10-9-73	[signature]	10/9/73

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	R. E. Pittman	10-17-73
TASK ENGINEER		
PROJECT MANAGER	C. E. Cracy	11-7-74

COST CATEGORY ☐ NORM ☐ C ☐ D ☒ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO. 276

COMPLETION

SITE COMPLETION REPORT
FC-276 changes motor from a 15 ft lb to a 25 ft lb motor.

☐ RECOMMENDED STDS. CHANGE

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 12M.2

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO. ____

DATE COMPLETED 10/28/74 SIGNED BY R T Babcock

S.O.M./CONSTR. REP. APPROVAL [signature] DATE 10/30/74

10/9/73
R. P. Tillman

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by NPG Nuclear Service

RPM

(1) Originator - Fill in: Customer; Contract Number; Vendor; Purchase Order Number; Task Number; Group Number; Sequence Number; Name; Title; Description of Problem; Status; Further Action Recommended by Site Personnel; Originator Signature and Date; Vendor Claim (if applicable).

(2) Site Operations Manager - Fill in: SPR Number; Revision Number; Req'd. Resol. Date; Req'd. Comp. Date; Approval Signature; Date.

(3) Nuclear Service Support Engineer - Fill in: Cost Category; Authorized Charge Number.

(4) Task Engineer - Fill in: Resolution; Recommended Std.'s Change*; (If applicable, FC Req. and FC Number); Signature and Date.

*If recommended standard's change, transmit a copy to cognizant Standard Task Engineer to resolve with Standard Plant Manager.

(5) Field Engineer - Implement resolution; upon completion, fill in: Completion Report; Date Completed and Signature.

NOTE: If necessary to deviate from the approved SPR, note deviation and submit revised SPR to the Site Operations Manager.

(6) Site Operations Manager - Approve completion; sign.

Initiated by B&W Construction Company

(1) Originator - (Same as (1) above)

(2) Construction Co. Site Representative - (Same as (2) above)

(3) Project Manager - (Same as (3) above)

(4) Task Engineer - (Same as (4) above)

(5) Construction Co. Site Representative - (Same as (5) and (6) above)

PDG 21098-1 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO 620-0003	SPR NO. 560	REV. NO. 1
VENDOR B & W P.O. NO.	TASK NO. 28	GROUP NO.	SEQ. NO.
SITE ENGINEER E. L. Logan	REQ'D. RESOL. DATE	REQ'D. COMP. DATE	

TITLE
RC-4 (RC-V2) MOTOR BURNOUT # 2

DESCRIPTION OF PROBLEM

Same as reported on Revision 0-
On 10-9-73 motor was again burned out when an attempt was made to open the valve with the overloads bypassed.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

Same as recommended on Revision 0.

ORIGINATOR SIGNATURE	DATE	S.O.M./CONSTR. REP. SIGNATURE	DATE
[illegible]	10-12-73	[illegible]	10/12/73

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	R F Pittman	10/18/73
TASK ENGINEER		
PROJECT MANAGER		

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO 276

COMPLETION

SITE COMPLETION REPORT
FC-276 changes motor from a 15 ft-lb to a 25 ft-lb motor

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO.

DATE COMPLETED 10/23/74 SIGNED BY [illegible]

S.O.M./CONSTR. REP. APPROVAL [illegible] DATE 10/23/74

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 12M.2

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by NPG Nuclear Service

(1) Originator - Fill in: Customer; Contract Number; Vendor; Purchase Order Number; Task Number; Group Number; Sequence Number; Name; Title; Description of Problem; Status; Further Action Recommended by Site Personnel; Originator Signature and Date; Vendor Claim (if applicable).

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(3) Nuclear Service Support Engineer - Fill in: Cost Category; Authorized Charge Number.

(4) Task Engineer - Fill in: Resolution; Recommended Std.'s Change*; (if applicable, FC Req. and FC Number); Signature and Date.

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(5) Field Engineer - Implement resolution; upon completion, fill in: Completion Report; Date Completed and Signature.

NOTE: If necessary to deviate from the approved SPR, note deviation and submit revised SPR to the Site Operations Manager.

(6) Site Operations Manager - Approve completion; sign.

Initiated by B&W Construction Company

(1) Originator - (Same as (1) above)

(2) Construction Co. Site Representative - (Same as (2) above)

(3) Project Manager - (Same as (3) above)

(4) Task Engineer - (Same as (4) above)

(5) Construction Co. Site Representative - (Same as (5) and (6) above)

File NSS- 3
TRANSMITTAL SLIP
NM2-SPR- 560/1

FIELD OPERATIONS SITE PROBLEM REPORT

To W.C. Butt - NSE For Action
R.G. Burnley - NSE

CONTRACT 620-00 03

SPR 560/1

TITLE RC-4 (RC-V2) MOTOR BURNOUT #2

To R. J. McConnell (2) For Information
J. N. Kaelin
J. P. Kennedy
J. D. Phinney
K. Suhrke

DATE 10/16/73

Date Reply to Be Submitted To Nuclear Service Support Engineer

Action Requested: Attached is Rev 1 of SPR 560 documenting a 2nd motor burn-out when Duke operations by passed the motor overloads. THE motor has been rewound by DUKE and re-installed. The actuator is now set for torque closing (setting of 1) and torque opening of 2¼. The valve operated with these values at lower temperatures but will not open at NOP, NOT R.G. Burnley is investigating whether there is a temp differential problem.

[signature]
Nuclear Service Support Engineer

cc: G. E. Kulynych
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance

MANHOUR LIMITS ——
COST LIMITS ——
CHARGE No. ——
APPROVED: [signature]
Project Manager

File NSS- 3
M2-SPR- 560

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To W.C. BUTT - NSE For Action

CONTRACT 620-00 -03

SPR 560

TITLE RC-4 (RC-V2) Motor Burnout

DATE 10-12-73

To R. J. McConnell For Information

J. N Kaelin

J. P. Kennedy

J. D. Phinney

K Suhrke

Date Reply to Be Submitted To Nuclear Service Support Engineer

Action Requested: W.C. BUTT states that the valve does not need the equalization feature. However he is investigating the use of the solid wedge vs the split wedge in this application. Site is requested to provide the torque switch setting on this actuator

R L Pittman
Nuclear Service Support Engineer

cc: G. E. Kulynych
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance

MANHOUR LIMITS CC 358 10 MHS / CC 350 16 MHS

COST LIMITS

CHARGE No. 620-0003-08-47

APPROVED: C. R. Creacy
Project Manager

BABCOCK & WILCOX COMPANY

DOMESTIC WIRE MESSAGE

[illegible] to any point in continental U. S., Canada and Mexico

WESTERN UNION

DRESSER INDUSTRIES
P.O. BOX [illegible]
ALEXANDRIA, LA. 71301
ATTENTION: JACK COX

File No. [illegible]

AGREES TO INSTALL, AT NO CHARGE TO DRESSER, REPLACEMENT ELECTROMATIC MOTORS FOR DUKE I, II, AND III. UNIT [illegible] AND FLORIDA ON ELECTROMATIC ISOLATION VALVE.

DRESSER TO FURNISH REPLACEMENT ELECTROMATIC MOTOR AND TORQUE SPRING PACK PER TELECON DECEMBER 21, 1973 .. COX OF DRESSER AND L.T. SUND OF B&W.

ADVISE SHIPPING SCHEDULE ASAP.

6/14/74 These arrived - were at Lynchburg Jim Albert took two of them to Oconee in his car RJP

BCC: R.C. Burnley
R.V. Straub
H.I. Pittman
W.S. Dolicate
C.E. Barksdale
E.H. Davis

L.T. SUND - SR. BUYER - PURCHASING DEPT. | Date DECEMBER 21, 1973

Do not type below this line.

B. Valve Body Stress Analysis

AEC's concern was whether or not the Weld Zone was analyzed in the response of January 22,1974. Dr. Lai and Tom Conlon discussed the analysis and it was finally understood that AEC interpreted the Joint Design as a Cylinder and Flat Head whereas Dressers analysis is for a Hub and Flange. It was agreed that the following would be done and included in the revision of the report:

1. Dresser will do Stress analysis of Cylinder and Flat Head as it applies to Electromatic Design.
2. AEC wants to see that someone else has reviewed the Stress Analysis in addition to Dr. Lai. Dresser will do. Dr. Lai will also apply his PE stamp to the analysis.

C. Effects of Hydrostatic Over-Pressurization

AEC doesn't understand the response included in the January 22, 1974 revision. There is a statement in Appendix E1 and a Computer Printout included as Appendix E2 but no explanation as to what the printout is or how to use it. AEC suggested that Appendix E should be expanded to explain the printout or amplify the statements in App.E1. Dresser will expand the statements in App. E1 to explain in words that the valve was not overstressed due to the cold Hydrostatic Test. The printout will be deleted.

Dresser committed to having their work complete in one week and will send to Mr. Thielsch who will revise the report for re-submittal by Duke to AEC.

It is fully expected that this will resolve all AEC questions and the valve Design will be acceptable to AEC.

The final report to be submitted for NSS-3,4,9 will be used as a generic answer with specific references on a contract basis as may be required for NSS-5,6,7,8 &11.

cc: K. Schroeder
G. E. Kulynych
R. V. Straub
H. A. Baker
C. E. Barksdale
W. S. Delicate
W. A. Cobb
J. T. Janis
G. F. Clei
G. T. Sund

R. B. Barnley

ELECTROMATIC RELIEF VALVE 1-RV-67, DUKE POWER COMPANY, OCONEE NUCLEAR STATION 1-2-3

RE: Report No. 1158, dated November 4, 1973, "Evaluation of Weld Joint Design on Soundness and Integrity of Weld and Base Metal in Electromatic Relief Valves RV-67 (RC-66) Dresser Industrial Valve & Instrument Division, Units 1, 2, 3 Oconee Nuclear Power Station, Duke Power Company" and Report No. 1143, dated November 3, 1973, "Resolution of Acceptance of Electromatic Relief Valve, 1RV-67 (RC-66) from Dresser Industrial Valve & Instrument Division, Units 1, 2, 3 Oconee Nuclear Power Station, Duke Power Company transmitted by Duke Power Company letter of November 30, 1973.

The above named reports have been reviewed in the RO:II offices. This review disclosed deficiencies in the following areas:

1. Weld documentation
2. Valve body analysis
3. Effects of hydrostatic overpressurization
4. Purchase specification
5. Past performance of valves

The following paragraphs describe these deficiencies and list additional information that should be provided by the licensee.

1. Weld Documentation

There are variations in the welding procedures used on the valve and those used for the mockup, particularly in the area of post-weld heat treatment.

Welding procedure qualification data conflicts with the welding procedure since the procedure requires no post weld heat treatment while the procedure qualification (WS-97, Rev 2, dated October 16, 1973, and WS-65, Rev 3, dated October 17, 1973) indicates post weld heat treatment. Moreover, these procedure qualifications do not provide material thickness nor thickness range qualified.

Drawing 418463 indicates that the welding procedures to be used for the lower base to top flange weld joint are WS-345 and WS-304. Documentation indicates that WS-65 and WS-97 were used on both the mockup and the production valves.

The licensee should furnish documented evidence that qualified welding procedures, with continuity, were used throughout fabrication of the valves and in accordance with appropriate codes and specifications.

2. Valve Body Stress Analysis

Review of the Dresser stress analysis for valve body as outlined in Duke Power Company report No. 1143, Appendix E, revealed no specific stress analysis of the weld joint between the top flange and the lower base as shown on Dresser Dwg 418463. In addition to the structural discontinuity at the weld joint, there appears to be a possible stress concentration

Attachment #1
[illegible]

POWER GENERATION GROUP

To
W. C. Bt , Unit Manager

From
R. C. Burnley, Aux. Systems (2281)

Cust.
Duke, MET-ED, JCP&L, FPC, AP&L SMUD

Subj.
Meeting with Duke, Dresser & AEC on Electromatic Relief Valve

MAR 11 1974

BDS 663-5

File No. or Ref. NSS-3,4,9,5,6,7,8,1 8A30,41 Dresser

Date 3/5/74

This letter to cover one customer and one subject only

I attended the subject meeting held at DP Co. in Charlotte N. C. on Friday March 1,1974. The following personnel were present:

Duke	AEC (RO II)	Dresser	B&W
S. K. Blackley, Jr.	A. Herdt	T. R. Bordèlon	R. Burnley
L. R. Davison	T. Conlon	Y. S. Lai	
Tom Cotton	J. C. Bryant		
K. C. Canady	Frank Jape		
Dan Gardner			
Helmut Thielsch (Duke Consultant)			

The meeting was held to discuss additional AEC concerns in response to the revised report that was submitted by Duke on January 22,1974. There were five (5) areas where AEC had asked for additional information (See Attachment #1) and they felt the responses submitted to items A, B, & C were not adequate or their questions had been mis-interpreted. AEC has no additional questions; however, replies to A, B, & C must be expanded as follows:

A. Weld Documentation

A modified Appendix B-6 to the report should be included to show the Thickness Range for which the Weld Procedure was qualified.

B31.7, which was referenced in the specification, requires all NDT to be performed after Heat Treating. Mr. Thielsch stated that in this case it wouldn't make any difference whether NDT was before or after Heat Treating. It was agreed that Dresser would try to establish the sequence in Manufacturing to determine at what point NDT was performed. If no records are available Mr. Thielsch will add a statement in the report to the effect that it makes no difference with the materials and design of the Electromatic Relief Valves.

Apparently, either one or both of the above responses are acceptable.

existing at the edge of the weld zone and the interface formed by the mating parts.

The licensee should evaluate this stress concentration and the possible effect that it could have on the calculated stress levels in the welded joint. In addition, the licensee should take into consideration the stress due to structural discontinuities at the welded joint as evidenced by Dresser Dwg #18463.

C. Effects of Hydrostatic Overpressurization

The hydrostatic records indicate that the valves were tested to 9000 psig for three minutes. This is considerably above the hydro test requirements of ASME Section III, 1968 Edition.

The licensee should evaluate the possible damage caused by the excess pressurization.

D. Purchase Specification

The reports list several codes and editions.

The licensee should state the code and specifications under which the valves were purchased.

E. Past Performance of Valves

Report No. 1143 states that this particular Dresser design has been confirmed by satisfactory service of similar valves, some in nuclear plants.

If this is being used as supporting evidence for a basis of valve acceptance, the licensee should furnish documented history providing the locations, dates in service, conditions of service, etc.

Attachment #1

Tom Bordelon
318-640-2250

SPR 560

BABCOCK & WILCOX
Nuclear Power Generation Department

Contract No. NS349
File No. 8A30.41

Record of Telephone Call

To Tom Bordelon et al
From T. Snead / RG Buesley
Date
Subject Dresser Gate Valve RC-V2

Route To:
C. Cracy
R. Pittman
T. Snead

I Discussed possible fixes for RC-V2 problems

1. Insulate valve body up to bonnet yoke joint
2. Possibly use flexible wedge; Dresser is investigating
   a. Rework existing - need to define special tools needed.
   b. New flex. wedge different material by Dresser; investigating materials availability
3. Possibility of using 25 ft-lb motor; need to test and would like to use class B motor for testing.

Can some testing be done on Unit II if Oss done and item 2 and for these purposes?

II Electromatic
Proto-type of welded unit went out to Duke consultant Saturday 10-20-73.

RG Buesley

To RPB/RVS/CAC

QLP — R.R. Beach

JPT

Babcock & Wilcox

Power Generation Group
P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (804) 384-5111

At best this should be considered a temporary fix. An engineering assessment addresses the following questions:
1) Why does the valve torque out?
2) What torque margin does the 25 ft lb motor provide?
3) What is the range of packing loads (in torque)?
4) Is the valve suitable for this service?
Failure of this valve in either the open or closed position can and has had serious implications. R

February 5, 1974

E74-26

Mr. S. K. Blackley
Duke Power Company
Post Office Box 2178
Charlotte, North Carolina 28201

ATTENTION: T. L. Overcash

SUBJECT: Oconee 1, 2, and 3
Dresser Shutoff Valve RCV2

REFERENCE:
1. Duke letter to B&W dated February 1, 1974, same subject (OS-18)
2. B&W letter to Duke dated November 13, 1973, same subject

Gentlemen:

After further review of the operating data on 2 RC-V2 with the 25 ft./lb. motor, Dresser has stated that the larger motor is a satisfactory resolution of the operator problem. As you are aware, the present motor on 2 RC-V2 does not meet insulation specification for service in that area. Dresser has ordered replacement motors for all three Oconee units, and they should be available for installation about June 1974.

If you have any further questions, please advise.

Very truly yours,

C. A. Creacy

C. A. Creacy
Associate Project Manager

CAC/www

cc: R. J. McConnell
G. M. Baccich
W. Faasse

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To

R. B. Beach

From

E. L. Logan ELL

BDS 663-5

Cust.

Duke Power

File No. or Ref.

Subj.

MORE ON 1 RC-4 (RC-V2) and 1 RC-1 (RC-V1)

Date

12/18/73

This letter to cover one customer and one subject only

Limit Switch LS-9 was added to the 1 RC-V2 circuit on 12/12/73. (See Fig. 1) The switch was set to stop valve travel at 4 turns of the handwheel from the full closed position. This appears to have solved the opening problem as this valve was opened on 12/16/73 at full temperature and pressure. Now the valve cannot be closed. Two attempts were made on 12/17/73 and both times the overloads tripped. The 15 ft # motor is evidently not strong enough to start the valve toward the closed position.

As you know Duke replaced the yoke bushing on 1 RC-1 (1 RC-V1) on 11/23/73 (SPR # 570). The replacement bushing was not the correct one as Rockwell had shipped the wrong replacement part to Duke. Duke had planned to replace this bushing during the December outage. The valve became inoperable on 12/16/73. The valve indicates open when commanded open, but system conditions indicate the valve stays closed. If the bushing is stripped as before, it seems the valve would be hung open rather than closed. This problem will have to be investigated during the next Unit I shutdown. Duke has closed 1 RC-3 (1 RC-V) to preclude an open failure of 1 RC-1 causing a plant shutdown as occurred on 11/20/73.

The Unit I pressurizer valve line-up is as follows:

Spray Valve (RC-1) - Closed and Inoperable
Spray Block (RC-3) - Closed
Electromatic Relief (RC-66)- Operable
Elec. Block (RC-4) - Open and Inoperable

Since 12/15/73 we have been able to obtain comparative RCS and pressurizer boron concentrations. This is in response to SPR-557 and R. A. Karrasch's memo of 11/19/73. Figures 2 and 3 are plots of these values for both Units I and II. The Unit I continuous vent (.1 to .4 gpm) was secured on 12/17/73. Before the system is cooled down, we will investigate for leaking valves, etc. Unit II is indicative of normal operation since a conscious effort has been made to maintain RCS boron concentration constant with only the spray valve bypass flow into the pressurizer.

ELL/bh

cc: J. P. Ittner
R. V. Straub
C. A. Creacy
R. L. Pittman ✓
R. C. Burnley
E. L. Logan
W. C. Butt
B. Karrasch
R. J. McConnell

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To
R. J. McConnell, Site Operations Manager

From
R. L. Pittman, Nuclear Service (2805)

BDS 663.5

Cust.
Duke Power Company

File No. or Ref. NSS-3 SPR 560

Subj.
RC-V2

Date November 1, 1973

This letter to cover one customer and one subject only

NSS-3 SPR 560 reported that two motors had burned out while attempting to open the subject valve at normal operating temperatures and pressure, with the thermal overloads on the motor bypassed.

NSS-4 SPR 110 reported that the valve was cycled (on Unit II) during several temperature increments while the plant was being heated up. The valve operated satisfactorily at lower temperatures but when the system was approximately 500°F the valve would not operate, even though it had been cycled every 100°F while heating up.

Several contacts have been made with the Dresser Valve Company, and it is now felt that the problem may be due to differential expansion between the valve gate and the valve body, since there are different metals involved.

NSS-4 Field Change 126 changed the operator motor on this valve from a 15 ft/lb to a 25 ft/lb motor. The valve body was also insulated by the Dresser field service representative at this time.

When this system (NSS-4) is heated up RC-V2 should be cycled open and closed every 50°F increase in the pressurizer temperature. Once the unit has reached normal operating temperature the valve should be opened and closed every hour for at least four hours to determine if the larger motor will continue to operate the valve. The valve should then be opened and closed after approximately 24 hours at normal operating temperature. If operation is then satisfactory, new motors (25 ft/lb) will be requested from Dresser to replace the present 15 ft/lb motors on Units I and III. If, however, the larger motor is not satisfactory a modification to the solid gate will be initiated by Dresser.

In the interim while a final resolution is pending, the Unit I valve (which is now closed) should be made operable especially fo plant transients. In order to accomp ish this you should make the following recommendations to the customer.

1) When the reactor is shutdown, open the valve by hand and set the operator to close the valve on position vice torque. (Even though the valve wouldn't close off completely, it would preclude jamming the gate into the seat.)

2) The valve should then be tested to insure operability.

It is believed that with the operator set up in this manner the valve can be utilized if necessary for plant transients, and will serve as a temporary resolution to the problem.

With the 25 ft/lb motor installed on 2 RC-V2 a torque switch setting of 2½ (open direction) should not be exceeded without further consultations with Dresser.

RLP/cs

cc: J. P. Ittner
R. V. Straub
C. A. Creacy
R. R. Beach
R. G. Burnley
E. L. Logan
W. C. Butt

R L Pittman

DRESSER

DRESSER INDUSTRIAL VALVE & INSTRUMENT DIVISION

DRESSER INDUSTRIES, INC.
P. O. BOX 1430
ALEXANDRIA, LOUISIANA 71301

TEL (318) 445-2210
TELEX 058-6422
TWX (318) 445-3322
CABLE MANNING

November 1, 1973

cc
C.A. Creacy
R.L. Pittman

Mssrs: Bob Bernley
Tom Sund
Babcock & Wilcox
P.O. Box 1260
Lynchburg, Va. 24505

Subject: 7900 Gate Valve,
Oconee Units 1,2 & 3

Gentlemen:

Realizing the manner in which we have been trying to expedite resolution of the Gate Valve problem, I felt that it was necessary that we establish Dresser recommendations relative to this project. These recommendations have previously been submitted to you over the telephone.

1. The Gate Valve body should be completely insulated up to the joint where the body and yoke are bolted.

2. Although calculations indicated a 15 ft.-lb. operator would be adequate, it is felt that the heavier hammer blow of a 25 ft.-lb. operator along with the insulation previously recommended may resolve the problem.

3. Should either or both of the recommendations above prove to be inadequate, then the next suggested fix would be of a flexible wedge design. We have set up a prototype wedge and successfully cut through the sections as required to make the wedge flexible. The next step if required, would be to prepare new wedges with appropriate NDT or attempt to cut existing wedges installed in the valve during a plant shutdown.

-Continued-

November 1, 1973

Additionally, I think I need to summarize my personal evaluation of all the facts to insure that we are all properly working towards the same goals.

1. The Gate Valve on Oconee #1 is inoperative at this time.

2. Tests conducted on Oconee #1 and #2 indicated that the valve operated adequately up to 500°F. At that point, the wedge became locked and the valve could not be opened. Two motors were subsequently burned out by shorting out the motor thermal over load and the limit switches in an attempt to open the valve. Although calculations indicate the motor to be adequate and because of the test results we have gained, it is theorized that thermal expansion is a major factor.

3. In following our suggestions, you have insulation on Oconee #2. Although we cannot presently conduct tests. In addition, we have arranged this past weekend for our Mr. McCormack and a Limit Torque Service Representative along with the B & W Representative to install a 25 ft.-lb. motor for temporary usage. Presently Dresser has bought the motor and is absorbing other cost, however, this is being done only in an effort to expedite resolution of the problem. Upon a field fix for the problem, we can then negotiate cost, etc.

4. Although we have purchased the operator and it is currently installed, to my knowledge this operator is not adequate since it is not provided with a heater nor any of the special seals required.

-Continued-

DRESSER

DRESSER INDUSTRIAL VALVE & INSTRUMENT DIVISION
DRESSER INDUSTRIES, INC.
P. O. BOX 1430
ALEXANDRIA, LOUISIANA 71301

November 1, 1973

5. I am currently waiting for information relative to our new field fix as it is transmitted to Dresser by B & W.

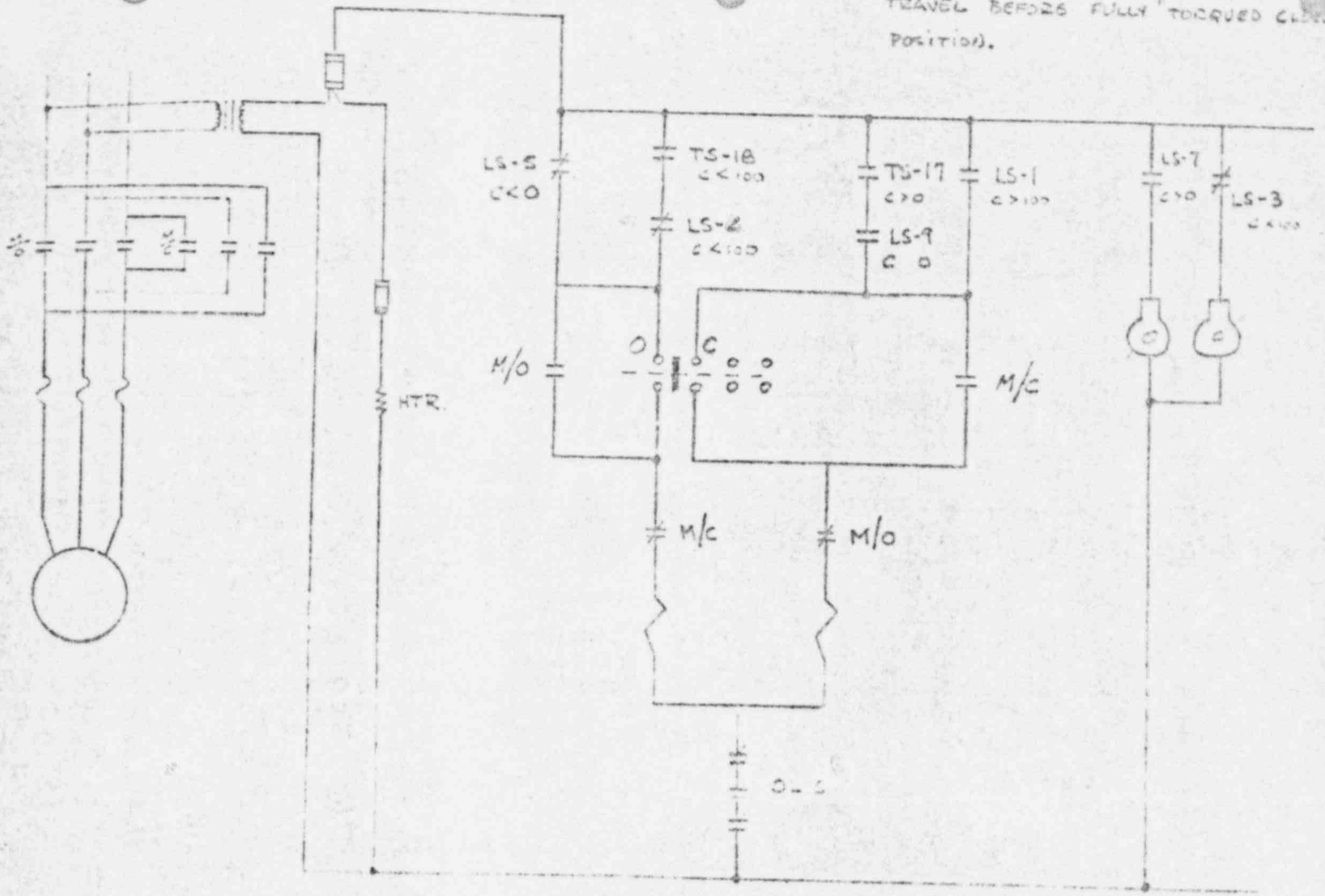
Very truly yours,

DRESSER INDUSTRIAL VALVE
& INSTRUMENT DIVISION

T.R. Bordelon

TRB/es

NOTE: LS-9 ADDED 12/17/73 TO STOP VALVE TRAVEL BEFORE FULLY 'TORQUED CLOSED' POSITION.



VALVE SHOWN CLOSED

1RC-4 CONTROL WIRING
(B&W 2RC-V2)

FIGURE 1

LOGAN

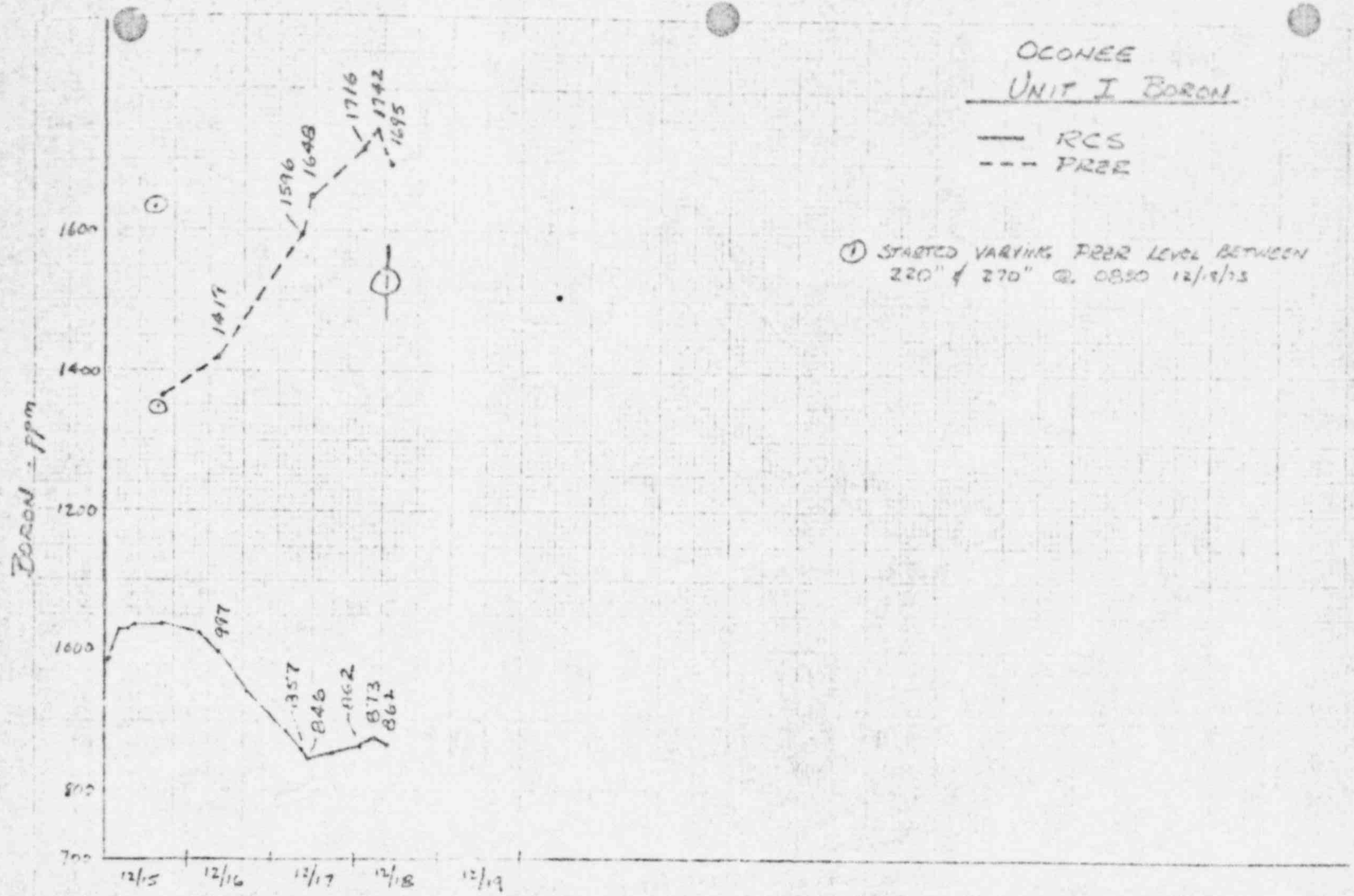


FIGURE 2

LOGAN

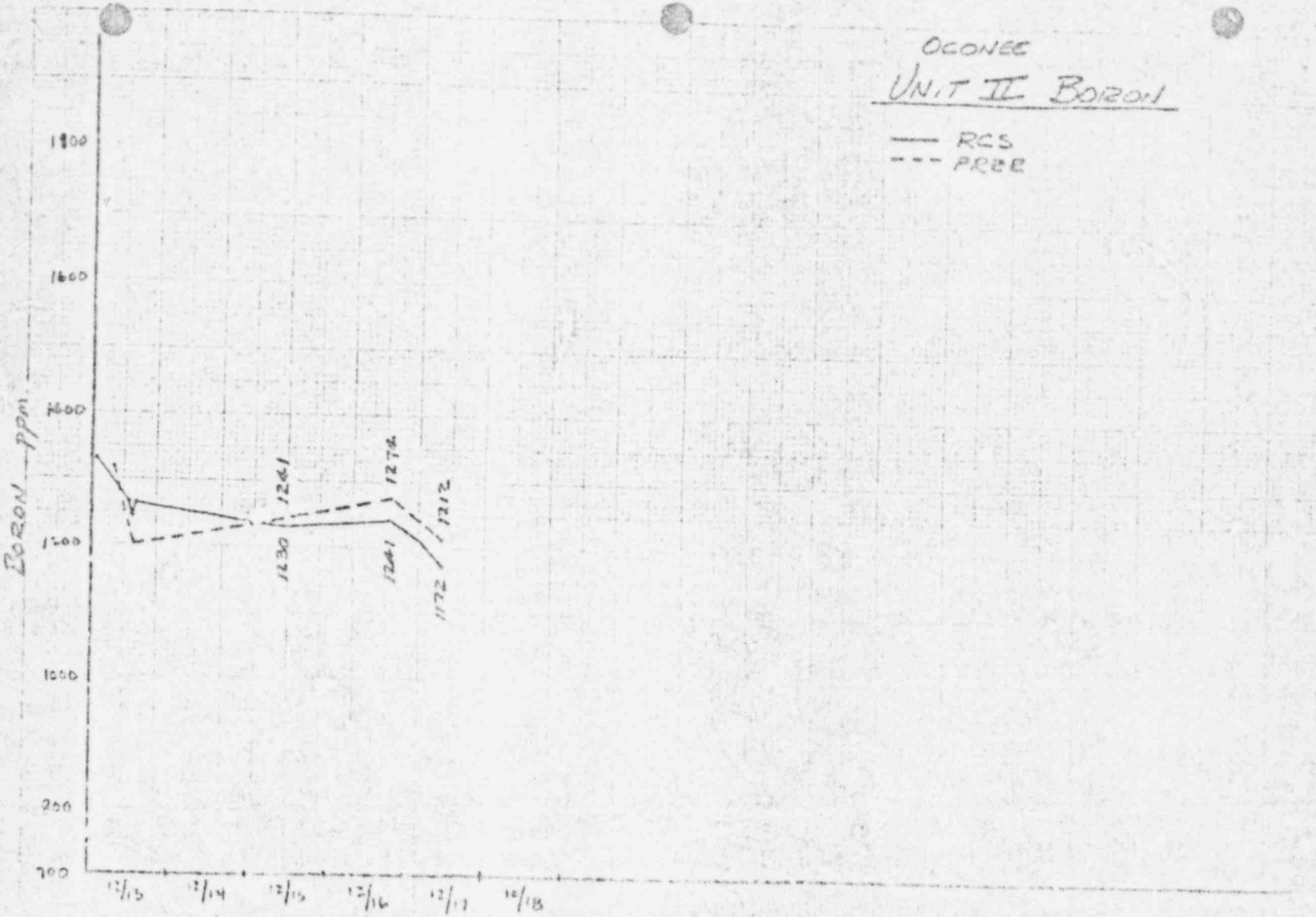
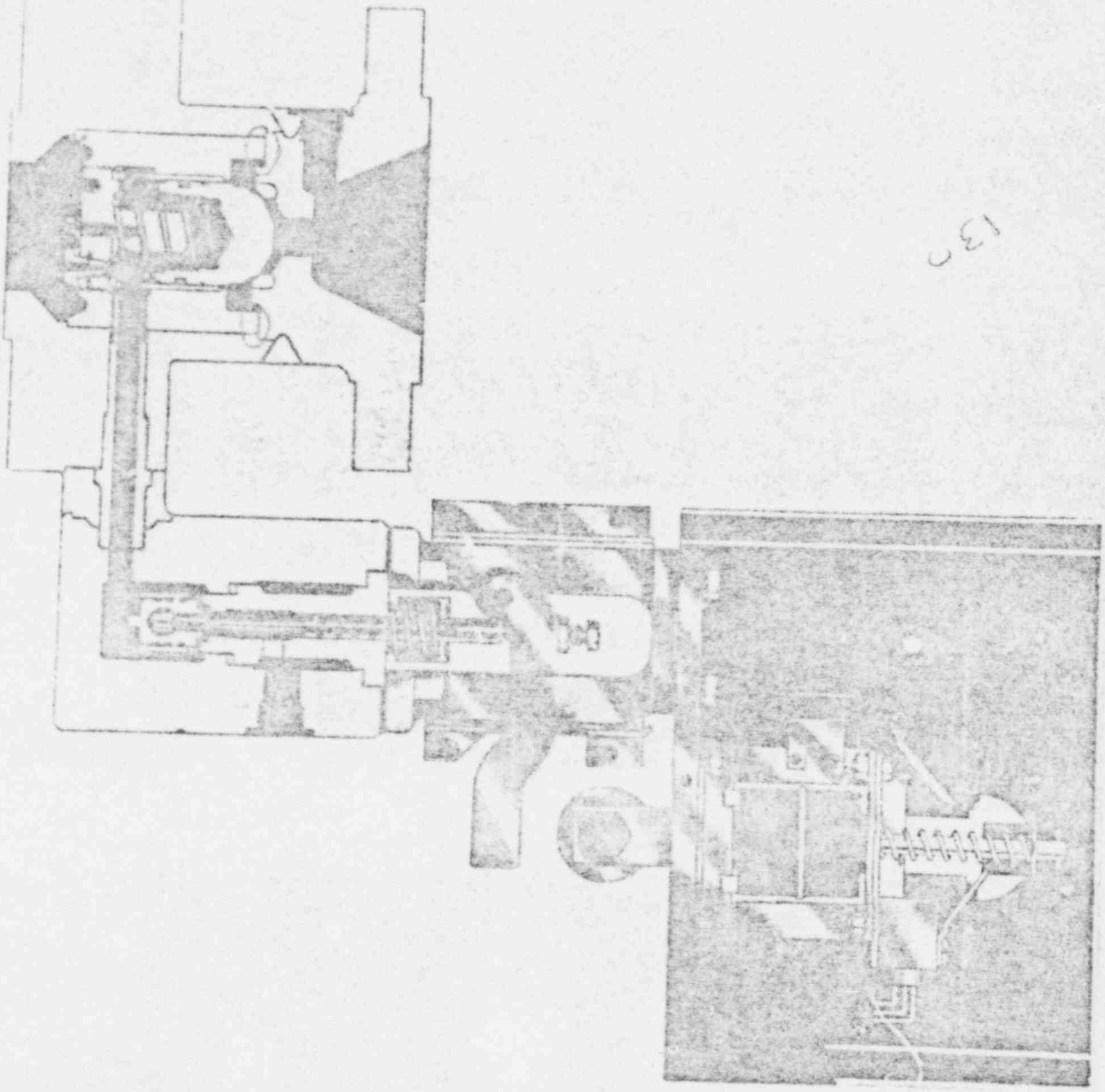


FIGURE 3

LOGAN



130

LONGHAND MEMORANDUM THE BABCOCK & WILCOX COMPANY

TO R. L. PITTMAN ✓

FROM E. L. LOGAN

CUST. DUKE

FILE NO. OR REF.

SUBJ. 1RC-4 (1RC-V2)

DATE 12/14/73

I FOUND OUT TODAY THAT THE LIMIT SWITCH MOD WAS MADE TO THIS VALVE ON 12/12/73. THE VALVE WAS CLOSED AND THEN THE HANDWHEEL WAS CRANKED <u>4</u> TURNS TOWARD THE OPEN POSITION. THE CLOSE LIMIT SWITCH WAS THEN SET TO STOP VALVE CLOSING TRAVEL AT THIS POSITION. SOME WIRING MODS WERE NECESSARY. WILL SEND A SKETCH AS SOON AS I CAN DIG IT OUT.

Ed.

CC: BOB BURNLEY, SYS. ENG., OFR

RLB R.B. Bcek JAE

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: FILE

From: L. R. ALLEN, ASSOCIATE PROJECT MANAGER EXT. 2310

BDS 663-5

Cust.: DUKE POWER COMPANY

File No. or Ref.: 8A30.41 Dresser

Subj.: DRESSER ELECTROMATIC RELIEF VALVE MEETING MINUTES

Date: 10-11-73

This letter to cover one customer and one subject only.

A meeting was held at Oconee on October 10, 1973, to discuss AEC's concerns on the subject valve.

Attendees

DUKE POWER	AEC	DRESSER	B&W
L. R. Dawson	C. E. Murphy	T. R. Bordelon	E. L. Logan
L. R. Barnes	W. D. Kelley	Y. S. Lai	L. R. Allen
A. R. Hollins			W. C. Butt
T. F. Wyke			
D. G. Gardner			
J. W. Hampton			
T. L. Cotton			
R. E. Dickens			
D. L. Freeze			

The following summarizes discussions which took place during this meeting:

Murphy: I talked to Washington last week and asked that they accept the latest stress analysis which included cyclic analysis however they would not accept the weld joint. Therefore, this meeting was required.

Wyke: We have had H. Thielsch prepare a report on this valve which addresses this weld joint. Please, at this time, review this draft report and determine whether it answers your concerns on this weld joint. (Draft of report attached)

Kelley: Reference page 4, paragraph 1. Solid wedge valve in service such as this block valve could cause problems. Friction factor extremely high for solid wedge valves. Im concerned with operator's ability to close valve with extremely high flow through valve.

Bordelon: The operator was sized to close & open the valve against full 2500 pis differential pressure.

Kelley: Questioned fit up of top and bottom pieces prior to welding. Looked at drawings and welding procedures. Questioned the definition of "seal pass" i.e., with or without filler metal. (It was pointed out that the assembly drawing specifies weld rod for the seal pass). In spite of what the drawing specifies, he would guess that seal pass was fused without filler metal. Also expressed concern over size of the remaining passes and the heat input. Stated that this type weld, unlike a butt weld, since it is bottomed out prior to welding does not allow for weld shrinkage. Since base material strength properties were used in the stress analysis & it can't be proven that cracking did not occur in the heat affected zone, the stress analysis is not adequate. Stated that shop radiograph was meaningless from the standpoint of locations the type cracks with which he is concerned. Stated that if Dresser could show that heat input during welding is sufficiently low such that cracking would not occur during cool-down there would be no problem or if there were some way to NDT weld and heat affected zone to prove that cracks did not exist then previously submitted stress analysis would be acceptable.

Murphy: Basis of our concern is heat input & weld pass size. If heat input is not "high" and weld pass size is not "heavy" then this valve design should be ok.

Allen: Could you quantify "high" & "heavy"?

Kelley: Not really. Had hoped that the weld procedure would have been more specific. Meeting the code from a weld procedure standpoint is really not enough. You could do an engineering analysis which includes cracks and shows that there is no problem if they exist. Radiograph will most likely not show type of cracks which concern me. We could not find this type crack on Hatch vessel with radiograph.

Murphy: We have identified questions which need to be addressed. We will review any analysis which is submitted.

Kelley: You may want to submit a weld mock up.

Bordelon: If I made a mock up and it showed no cracks, would that be an acceptable answer.

Kelley: It would be a better position. The simplest out would be to find a way to NDT this joint and show no cracks exist, then your stress analysis is ok. I would think a mock up and destructive testing would put you on very firm ground. Cracks can exist so long as the stress analysis backs up that the crack will not grow. Also, Duke must submit documentation to show that isolation valve will close under most adverse operating condition.

Lai: If we assume 1/4" crack exists and will not grow over design life, is that acceptable?

Wyke: Would like to submit Thielsch's report for evaluation.

Kelley: We will forward any analysis or report for evaluation. In Summary: Weld joint and welding process should be addressed. Also the stress analysis should take into account cracking which could occur in the heat affected zone during solidifiation. Keep in mind that you may have 4 valves with no cracks and the 5th one may have cracks.

At this point the meeting broke up. Duke contacted H. Thielsch by telephone. Wyke and Thielsch had a private conversation at the end of which Wyke stated that Duke wanted Dresser to make a mock up and send it to Thielsch for evaluation and analysis. Bordelon agreed but said he would need to clear it with his management. At this point Duke, B&W, and Dresser talked to Thielsch relative to how the mock up should be made. The mock up should be made as follows:

1. Should be cylindrical
2. Same material as in valve (will need physicals and chemicals)
3. Same welding procedures, conditions and post weld heat treatment

Thielsch stated that he could submit his report to Duke within 3 days of receipt of the mock up. Assuming this justification is acceptable, we intend to use it across our other plants.

LR Allen

LRA:ch
cc: CE Thomas w/attachs.
RR Beach
SPMs
K Schroeder
WC Butt
RG Burnley
GT Sund
KW Whittaker

REPORT No. 1143

10/9/72

H. THIELSCH

DRAFT

FOR REVIEW AND DISCUSSION

INTRODUCTION

In Units 1, 2 and 3, one Dresser pilot-operated electromatic relief valve No. IRV-67 (EC-66) each was installed. One additional relief valve of the same type had been purchased as a spare.

Photographs of the spare relief valve are shown in Figs. 1 and 2.

The valve is a 2½" size. The gaseous waste disposal piping systems (57), in which the three valves are installed, are Class C piping systems. They are subject to the following service conditions - 2500 psi and 670°F. The maximum operating pressure is 2155 psi. The valves are normally subject to a system pressure of 2155 psi from the pressurizer tanks.

The valve shells were tested by the manufacturer at 9000 psig for three minutes. The valve seats were subsequently tested at ~~6000~~ 2700 psig for three minutes (saturation temperature)

After erection, the piping systems in which the valves are installed are tested hydrostatically at a pressure of 3125 psi. However, since this valve was preset to open, it was isolated by isolation valve RC-4.

The documentation applicable to each valve, and identified by the Units (1, 2 or 3) in which they are installed, are included in Appendices A to D.

Weld Assembly

The valves are assembled by welding previously machined Type 304 stainless steel components.

The weld assembly is shown in Fig. 3. One of the welds involved represents a circumferential butt type weld identified by the letter "A" between the flange and lower base sections. It represents a "sleeve-type" of butt joint where one member also serves as a back-up for the other member.

The flanged member of the body is generally seated tightly against the lower base member as detailed in Fig. 4. Since this represents a "socket-type" of weld joint, the tight seating can be subject to questioning since Section ANSI B31.7 shows in Fig. 1-727.4.4(c) a gap in the root of socket joints of approximately 1/16", Fig. 5. Similar requirements are shown in other piping and pressure vessel codes. These, however, generally refer to fillet type of socket welds normally involving one light wall member such as a small diameter pipe (usually $2\frac{1}{2}$" or smaller nominal outside diameter). In these socket fillet-type of weld joints, illustrated in Fig. 5, the pipe member may heat up more rapidly and thus expand to a somewhat greater extent than the adjacent heavier mass of base metal whenever hot gas or steam flows suddenly through the pipe. Frequent temperature cycling may in time result in cracking across the fillet weld.

The susceptability to cracking depends upon factors such as temperature shock, the number of temperature cycles, principally the heating cycles, the length of the leg below the fillet weld, the size of the fillet weld, the materials, etc.

The socket type leg on the Dresser pressure relief valve, shown at "B" in Fig. 4, depending upon machining, may vary from nearly 0" to approximately 1/8". It will probably average 1/16". Because of the mass of metal involving the flange and the cage, ~~this construction,~~ even if measuring 1/8" will not be subject to uneven heating or thermal fatigue - even if subject to severe temperature cycling, as the large metal mass, including the cage will equalize the metal temperatures in the flange and lower base sections at the weld location. The tight seating at "C" and the 1/16 average socket length at "B" thus will be of no significance.

Moreover, this valve, functioning as a pressure relief valve, will not even be subject to frequent actuation.

Mwp'
state
could
misle

Don't know whether block valve was tested at condition req'd to operate - have experienced failure to operate at Oconee - 3pi. ... velocity thru valve ... relief valve failure -

Murphy: failure of motor operated valves to perform on demand - M.O. valves reliability very low

Furthermore, this valve can be readily isolated by the isolation valves located between the pressure relief valves and the pressurizer tanks.

The extensive experience with valve and component failures in fossil fuel, nuclear and chemical plants, also supports the conclusions that the specific weld joint design applicable to this Dresser valve in the operating conditions involved, should not result in failure.

The entirely satisfactory service of this particular Dresser design has also been confirmed by the entirely satisfactory service of 99 valves from A182 forgings operating in ~~fossil fuel power~~ commercial plants at pressures as high as 2250 psi and temperatures as high as 1000°F. In addition, 14 of these valves to date have been installed in nuclear power plants.

Even when a socket weld of more conventional long socket leg design has failed because of tight "bottom" positioning, the occasional failure encountered in fossil fuel power plants or chemical plants have almost always occurred as localized cracking over part of the joint circumference rather than involving a complete system.

<u>Radiographic Examination</u>

To verify that the "modified socket" was less than 1/8", the valve was radiographed by multiple exposures as detailed in the shooting sketch shown in Fig. 6. Prints of the several exposures are shown in Figs. 7 to 9. They indicate that the socket is likely to be approximately 1/16" and may even be less.

CONCLUSIONS

On the basis of the following criteria, the 2500 lb. class Dresser Consolidated Electromatic Pressure Relief Valves type 2½-31533VX-30(25)x2-XMYI-US126, as detailed on Dresser Drawings No. CP-1549 and 418453 are considered acceptable.

(1) The wall thicknesses shown in Appendix E and evaluations confirm compliance with the requirements of Section, III 1971 edition of the ASME Boiler and Pressure Vessel Code.

(2) The socket type weld joint with a socket leg length of less than 1/8" is not subject to significant localized stress levels even under the most severe conditions of thermal cycling to which this valve might be subjected.

(3) The valve, and weld assembly conditions, as detailed on Dresser Sketch No. 418453, have been verified by supplementary final radiography.

(4) The acceptability of the flange and lower body materials have been confirmed by Dresser responsible for the verification of the supplier's mill test certificates and ultrasonic and liquid penetrant inspection reports.

(5) The soundness of the weld assembled flanged body was further confirmed by Dresser Industries by a hydrostatic pressure test of the "shell" performed at a pressure of 9000 psig for 5 min., which involves more than three times the maximum working pressure.

(6) Verification of these test results and compliance with the Section III requirements of the ASME Boiler and Pressure Vessel Code was done by Babcock and Wilcox Company.

(7) Confirmation by Dresser that weld failures have not occurred in the Electromatic Pressure Relief Valves of identical "modified socket" weld joint design and tight seating, and that these valves have been produced for over five years and operate in service environments considered equivalent to or more severe than conditions applicable to the specific operations of the gaseous waste disposal piping systems of Units 1, 2 and 3 at the Oconee Nuclear Power Station.

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

**** CLEARED ****

FILE: 1242

TO: ______________________ For Information

CONTRACT NO: 620-00 03

Central Engineering Files

SPR 560

C. C. Plunkett - Contract Admin.

TITLE Motor Burnout RCU2

C. M. Fletcher - Quality Assurance

R. G. Bornley - Task Engineer

W. A. Cobb - Sr. Proj. Manager

DATE: SEP 6 1974

The attached, cleared SPR is submitted for your information.

TO: ______ J. N. Kaelin - ARKANSAS ______

______ E. L. Logan - SMUD ______

______ B. L. Day - OCONEE ______

______ L. C. Rogers - MET ED ______

Attached is one copy of Site Problem Report No. 560 which was processed on Contract 620-00 03. Future contracts have been reviewed for the potential of a similar problem. This problem is/is not considered applicable to other contracts 4,5,7,9.

REMARKS: New motor is on site & will be installed next outtage per EC 276.

cc:

Earl H. Davis

NUCLEAR SERVICE SUPPORT ENGINEER

Earl H. Davis, Jr.

EHD

TECHNICAL SUPPORT SUPERVISOR

CLEARED

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO. 620-0003	SPR NO. 560	REV. NO. 1	
VENDOR B & W	P.O. NO.	TASK NO. 28	GROUP NO. 47	SEQ. NO. 02
SITE ENGINEER E. L. Logan	REQ'D. RESOL. DATE	REQ'D. COMP. DATE		

TITLE
RC-4 (RC-V2) MOTOR BURNOUT # 2

DESCRIPTION OF PROBLEM

Same as reported on Revision O-
On 10-9-73 motor was again burned out when an attempt was made to open the valve with the overloads bypassed.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

Same as recommended on Revision O.

ORIGINATOR SIGNATURE	DATE	REP. SIGNATURE	DATE
[signature]	10-17-73	[signature]	10/12/73

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[signature]	[illegible]
TASK ENGINEER		
PROJECT MANAGER	C. A. Creasy	8-6-74

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHANGE NO. ☐ FIELD CHANGE REQ FC NO.

SITE COMPLETION REPORT New operator motor (25 ft lb) is on site and will be installed the next time plant conditions permit as per FC-276.
This valve is presently open and the 15 ft lb motor installed now is operational. This also clears Rev. O

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☒ NONE ☐ SEE SPR REV. NO. ____

DATE COMPLETED 8/28/74 SIGNED BY [signature]

S.O.M./CONSTR. REP. APPROVAL [signature] DATE 8/28/74

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 12M.2

FDS-21091-1 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO. 620-0003	SPR NO. 560	REV. NO. 0
VENDOR B. & W.	P.O. NO.	TASK NO.	GROUP NO. / SEQ. NO.
SITE ENGINEER E. L. Logan	REQ'D. RESOL. DATE	REQ'D CJR. DATE	

TITLE RC-4 (RC-V2) MOTOR BURNOUT

DESCRIPTION OF PROBLEM On 10-5-73 RC-4 overloads had been over-ridden at A.E.C.'s direction. During dropped rod incident (See SPR 558), reactor operator attempted to open RC-4. The valve would not open and attempts resulted in a burned out actuator motor. Valve actuator was replaced on 10/7/73. Valve is now in service with overloads still bypassed.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL
ENGR SHOULD RE-EVALUATE NEED FOR EQUALIZATION VALVE - GATE VALVES NORMALLY HAVE THIS FEATURE. ALSO PRESSURE INST MANUAL SHOWS EQUALIZATION VALVE. BOTH UNIT 1 & 2 VALVES HAVE STUCK SHUT WHILE HAVING HIGH DIFFERENTIAL PRESS. ACROSS GATE.

ORIGINATOR SIGNATURE	DATE	COMM./CONST. REP. SIGNATURE	DATE
E. L. Logan	10-9-73	[illegible]	10/9/73

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER		
TASK ENGINEER		
PROJECT MANAGER		

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO.

SITE COMPLETION REPORT

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED | SIGNED BY

S.O.M./CONSTR. REP. APPROVAL | DATE

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 12M.2

R.J.M.

File SPR-560 Unit I

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	R. R. Beach
From	R. J. McConnell / E. L. Logan
Cust.	Duke Power
Subj.	Another chapter in the continuing SAGA of: RC-V2 (RC-4) ELECTROMATIC RELIEF BLOCK VALVE
File No. or Ref.	
Date	12/14/73

BDS 663.5

Reference: 1. NSS-3 SPR-560, 11-1-73, (R. L. Pittman to R. J. McConnell)
2. B73-290, 11-13-73 (C. A. Creacy to S. K. Blackley)

I. Problem

As of this date neither the Unit 1 or 2 Pressurizers are being operated as they were designed. The electromatic relief valves (RC-V5) are essentially isolated from the systems for the following reasons:

1. An AEC requirement that the block valves (RC-V2)be closed except during plant transients (concern over electromatic valve wall thickness).

2. The inability to open 1RC-V2 (This valve has not been remotely operable since 10-5-73 and was highly unreliable prior to that time).

3. Failure of the Reactor Operators to open 2RC-V2 during an unexpected plant transient.

The first two trips during the Unit 2 Power Escalation Series resulted from high RCS pressure due to reason 3 above. We are unable to complete the Unit 1 Test Program (turbine trip test and unit loss of electrical load both from 95% power) due to reasons 1 and 2 above.

II. Corrective Action Taken

On Dresser Industries recommendation, the following corrective actions have been taken:

1. The bodies of both 1 RC-V2 and 2 RC-V2 have been insulated.

2. The 15 ft # actuator motor on 2 RC-V2 was changed to a 25 ft # (Class B insulation) motor by Mr. O. L. Padgett of Limitorque on 10-27-73. Mr. [illegible] A. McCormick of Dresser Industries was on-site for this modification. A heavier torque spring was also installed. (See Field Change 126)

III. Results

Since the motor changeout on 2 RC-V2, the valve has been cycled eighteen (18) times. Eleven of these cycles were at full temperature and pressure of 565° F and 2250 psig. The other seven (7) cycles were at approximately 505° F and 1000 psig. On the first cycle at full power conditions, the valve failed to close. The closing torque switch was bypassed until the valve started to move. After removing the jumper, the valve continued to the closed position. All subsequent operation has been normal.

1 RC-V2 still will not operate.

It seems from the results that insulating the valve does not solve the problem, but that a bigger motor plus valve insulation does give satisfactory operation.

IV. Recommendations

We were informed on 11-8-73 that Dresser would order replacement motors (25 ft #, class H insulation) for these valves. The customer was notified of this both here at the site and by letter (Ref. 2). R. L. Pittman now informs us that Dresser has not ordered the larger motors and is requesting more test data. It seems to us that operation of 2 RC-V2 since 11-27-73 has shown that the larger motor is the solution to the problem. Duke Power personnel also feel this way and continue to ask when the new motors will be delivered.

It is imperative that Purchasing pursue this situation with Dresser.

ELL/th

cc: J. P. Ittner
R. C. Pittman
J. C. Deddens
G. E. Kulynych
R. V. Straub
C. A. Creasy

Babcock & Wilcox

Power Generation Group
P.O. Box 1260, Lynchburg, Va. 24505
Telephone (703) 384-5111

November 13, 1973

B73-[illegible]

Mr. C. K. Blackley
Duke Power Company
P. O. Box 2178
Charlotte, N. C. 28201

Attention: Mr. T. L. Overcash

Subject: Oconee 2 R-75748 FC-126
Dresser Shutoff Valve 2RC-V2

Dear Mr. Blackley:

The motor installation covered by FC-126 has been accomplished and 2RC-V2 has been operated at full temperature and pressure.

Based on incomplete test results it appears that the 25 foot pound motor will be a satisfactory resolution to the valve operation problem. As you are aware the present motor does not meet all the specifications for this service, thus new 25 foot pound motors meeting all specifications for this service have been ordered by Dresser for Oconee 1, 2 and 3. The insulation for the motors will be Class H rather than Class F as requested in your letter of November 2, 1973 in that B&W considers Class H a superior insulation to Class F for this service. The final conclusion as to whether the new motors will be a satisfactory resolution of the problem awaits further test data.

Very truly yours,

C. A. Creacy

C. A. Creacy
Associate Project Manager

CAC:vw
cc: G. M. Baccich
R. J. McConnell
W. Fannse

SPR 193

TITLE RCV-1 failed open

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- 3, 4, 9 & *5. The following is the status and/or resolution of this SPR on other contracts.

CHECKING

ORIGINAL

REMARKS

New operators are being supplied by Rockwell Mfg. Due to ship in Dec. 1974.

RGB.

* NOTE: GPU DECIDED TO CUT THIS VALVE OF OF LINE @ TMI-1 & USED A UNIT II VALVE. UNKNOWN WHETHER GPU PLANS TO PUT THIS ROCKWELL VALVE IN UNIT II.

RGB

NSS-8 Fred R Faust says no problem on ark

Sandy R Clark ENTD NOV 1974

Dec 14th at ANO both the spray & the spray block valve failed to close.

EHP 1-21-75

These valves have had problems and the problems are carried on the Top Generic problem

NSS- list They are being tracked generically on another SPR (See 496 NSS-3)

ARED

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

**** CLEARED ****

FILE: 12M2

TO: ____________ For Information

CONTRACT NO: 620-00 04

SPR 193

TITLE RCV-2 Failed in open position

DATE: AUG 28 1974

Central Engineering Files

C. C. Plunkett - Contract Admin.

C. M. Fletcher - Quality Assurance

R.G. Bernley - Task Engineer

W.A. Cobb - Sr. Proj. Manager

The attached, cleared SPR is submitted for your information.

TO: ______ J. N. Kaelin - ARKANSAS ______

______ E. L. Logan - SMUD ______

______ B. L. Day - OCONEE ______

______ L. C. Rogers - MET ED ______

Attached is one copy of Site Problem Report No. 193 which was processed on Contract 620-00 04. Future contracts have been reviewed for the potential of a similar problem. This problem is [redacted] considered applicable to other contracts , 03, 09, 05.

REMARKS: operation has been OK after replacing stripped yoke bushing: presently operating with rewound motor until new motor operator arrives ... scheduled for December 74 maintaining Rcv 2 open

cc:

Earl H. Davis Jr.

NUCLEAR SERVICE SUPPORT ENGINEER

RLP

TECHNICAL SUPPORT SUPERVISOR

CLEARED

PDS-21091-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO. 620-0004	SPR NO. 193	REV. NO. 0
VENDOR Rockwell P.O. NO.	TASK NO. 28	GROUP NO. 41	SEQ. NO. 01
SITE ENGINEER K. H. Fischer	REQ'D. RESOL. DATE	REQ'D. COMP. DATE	

TITLE RC-1 FAILED IN OPEN POSITION

DESCRIPTION OF PROBLEM

SEE ATTACHED

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

SEE ATTACHED

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

Lynchburg inform site as to when the smaller operators for this valve will be shipped, and how many cycles the spray nozzle is designed for.

ORIGINATOR SIGNATURE	DATE	SIGNATURE	DATE
K. H. Fischer	6/3/74		6/3/74

RESOLUTION

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER		
TASK ENGINEER		6/4/74
PROJECT MANAGER	C. A. Creacy	8-29-74

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO

COMPLETION

SITE COMPLETION REPORT

V.R. Miller's letter to R.B. Reynolds letter dated 7/19/74 states that no damage occurred to spray nozzle. Duke will change operator when it arrives on site. Duke repaired existing operator with the speed motor. Valve checked out OK after replacing stripped yoke bushing

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED 8/14/74 SIGNED BY

S.O.M. CONSTR. REP. APPROVAL DATE 8/19/74

FINAL DISTRIBUTION

PROJECT MANAGER

S.O.M. CONST. REP.

QA DOC. FILE

CENT. ENGR

FILE 12M.2

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by NPC Nuclear Service

(1) Originator - Fill in: Customer; Contract Number; Vendor; Purchase Order Number; Task Number; Group Number; Sequence Number; Name; Title; Description of Problem; Status; Further Action Recommended by Site Personnel; Originator Signature and Date; Vendor Claim (if applicable).

(2) Site Operations Manager - Fill in: SPR Number; Revision Number; Req'd. Resol. Date; Req'd. Comp. Date; Approval Signature; Date.

(3) Nuclear Service Support Engineer - Fill in: Cost Category; Authorized Charge Number.

(4) Task Engineer - Fill in: Resolution; Recommended Std.'s Change*; (if applicable, FC Req. and FC Number); Signature and Date.

*If recommended standard's change, transmit a copy to cognizant Standard Task Engineer to resolve with Standard Plant Manager.

(5) Field Engineer - Implement resolution; upon completion, fill in: Completion Report; Date Completed and Signature.

NOTE: If necessary to deviate from the approved SPR, note deviation and submit revised SPR to the Site Operations Manager.

(6) Site Operations Manager - Approve completion; sign.

Initiated by B&W Construction Company

(1) Originator - (Same as (1) above)

(2) Construction Co. Site Representative - (Same as (2) above)

(3) Project Manager - (Same as (3) above)

(4) Task Engineer - (Same as (4) above)

(5) Construction Co. Site Representative - (Same as (5) and (6) above)

Babcock & Wilcox

SPR # 193 Rev. 0
June 3, 1974
Oconee - Unit II

DESCRIPTION OF PROBLEM:

After the last reactor trip on Unit II on May 30 1974, it was impossible to keep the normal operating pressure in the pressurizer with all heater banks on.

It appeared that the yoke bushing threads of the motor-operated valve 2RC-1 are stripped because the shaft does not move in and out of the valve, although the motor runs and indicates closed or open position of 2RC-1 in the control room.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED:

To maintain the pressure in the pressurizer 2RC-3 was closed after the Reactor trip.

With 2RC-3 closed a minimum bypass spray flow of 0.75 gpm is not maintained as per LP 1101-01 section 1.2-5.

Stan Holland and Jim Hampton were informed that keeping RC-3 shut violates limits and precautions and that if they continue to operate, RC-3 should not be opened unless absolutely necessary to minimize the number of cycles on the spray nozzle. Duke was also asked to rewire RC-3 so that it could be throttled to maintain some small continuous spray flow. As yet this has not been done, but Duke is checking into it.

At this time, Duke is sampling the pressurizer for Boron every 8 hrs, and opening RC-3 only if the pressurizer boron concentration is not within ± 50 ppm of the RC System Boron Concentration.

Duke has been asked to keep a log of the number of times RC-3 is opened and the spray line temperature just before RC-3 is opened.

Ted Stables has been informed about this problem.
See Oconee I, SPR - 570 for same problem.

RJB/KHF/bh

MODIFICATION REQUEST		DATE: 1 6/4/74
STATION: 2 Oconee	APPLICABLE TO: 3 UNIT 1 - YES ( ) NO (X) UNIT 2 - YES (X) NO ( ) UNIT 3 - YES ( ) NO (X)	REV: 4 MR # [illegible] - 2[illegible] - S 5 STRUCTURE, SYSTEM OF COMPONENT AFFECTED: 6 Re[illegible]r Coolant

7

DESCRIPTION OF MODIFICATION:

Modify valve 2RC-3 breaker seal in circuit such that the valve can be operated as a throttle valve rather than open-closed type.

REFERENCES: 8	ATTACHMENTS: 9
1. PO 100A-2 H-5	1. SAFETY ANALYSIS ATTACHED ( ) YES (X) NO
2.	2.
3.	3.

10

JUSTIFICATION FOR MODIFICATION: With normal pressurizer spray valve 2RC-1 inoperable we need the capability of maintaining a small, continuous spray flow to the pressurizer for the following reasons.

1. Prevent B^{10} concentration buildup in pressurizer.
2. Prevent excessive thermal cycle of the pressurizer spray nozzle.
3. Allow continuation of certain protions of the 75% power test program.

REQUEST ORIGINATED BY: 11	PRESENT STATUS 12
NAME: S. A. Holland DEPARTMENT: Oconee-Operations ASSIGNMENT: Assistant Operating Engineer	(ACTION TO DATE. PERSONS CONTACTED ETC.) None

PRIORITY: 13

1. ( ) REQUIRED PRIOR TO soon as possible , FOR THE FOLLOWING REASONS:
2. (X) REQUIRED FOR PROPER SYSTEM OR UNIT OPERATION.
3. ( ) DESIRABLE FOR PROPER SYSTEM OR UNIT OPERATION.

AUTHORIZATION FOR REQUEST 14	SAFETY-RELATED MODIFICATION ( ) YES (X) NO 15 Per Policy Definition
APPROVED: [signature] DATE: 6/14/74	This Modification involves an unreviewed safety question or a change in technical specifications ( ) YES (X) NO 16

C.A. CREASY

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	Pressurizer Task Engineer R.B. Reynolds - Component Management - NPGD-CE - Mt. Vernon
From	Lead Engineer (Ext. 319) U.R. Miller - Mechanical Design, NPGD-CE - Mt. Vernon
Cust.	Duke Power Company
File No. or Ref.	2.5.2 620-0004-59
Subj.	SPR 193 Rev. 1
Date	July 19, 1974

This letter to cover one customer and one subject only.

The subject Site Problem Report described a condition where the spray valve was shut and opened periodically. When the valve was shut, the fluid in the spray line lost heat to the atmosphere and, thus, the fluid temperature decreased. When the valve was opened, the cooler water in the spray line came in contact with the pressurizer spray nozzle. Mechanical Design has conducted a simplified, yet conservative, analysis that shows that the fatigue life of the pressurizer spray nozzle has not been significantly affected by the conditions presented in the subject SPR.

If you have any questions and/or comments, please call.

U. R. Miller

lab

Attachments

C.A. CREASY:
THIS SHOULD RESOLVE SPR 193 REV. 1. IF THERE ARE ANY QUESTION, PLEASE CALL.
R.B. Reynolds

JUSTIFICATION FOR SPR 1093 REV 1 CONTRACT 620-0004-59

WHEN THE SPRAY VALVE WAS SHUT, THE FLUID IN THE SPRAY LINE COOLED. WHEN THE SPRAY VALVE WAS OPENED, THE COOLER WATER WAS FORCED THRU THE PRESSURIZER SPRAY NOZZLE. THE FOLLOWING CALCULATIONS INDICATE THAT THE RESULTING THERMAL STRESSES IN THE SPRAY NOZZLE HAD NO APPRECIABLE EFFECT ON THE FATIGUE LIFE OF THE NOZZLE.

ASSUMPTIONS:

1. THE INITIAL SPRAY NOZZLE TEMPERATURE IS 650°F
2. THE NOZZLE IS SHOCKED WITH 375°F WATER
3. THE DURATION OF TIME THE COOL WATER IS IN CONTACT WITH THE PRESSURIZER SPRAY NOZZLE IS SMALL.

ANALYSIS

THE EFFECT OF THE COLD WATER IS TO PRODUCE THERMAL SKIN STRESSES IN THE NOZZLE. SINCE THE CARBON STEEL PART OF THE NOZZLE IS PROTECTED BY A THERMAL SLEEVE, IT WILL NOT EXPERIENCE A TEMPERATURE CHANGE. THE SKIN STRESS FOR THE STAINLESS SECTION MAY BE CONSERVATIVELY ESTIMATED BY

$$\sigma_H = \sigma_L = 1.43\, E \alpha \Delta T$$

WHERE $E = 26 \times 10^6$ PSI
$\alpha = 9.96 \times 10^{-6}$ /°F ISTANTANEOUS VALUE AT 400°F
$\Delta T = 650 - 375 = 275$ °F

BABCOCK & WILCOX
DEPARTMENT NSS - CE DATE 7-19-74 BY CJMM

REVISION

$\therefore \quad \sigma_H = \sigma_L = 1.43(26)(9.96)(275) = 101836$ psi

$S = 102$ KSI

ALTERNATING STRESS = 51 KSI

FROM FIG N-415(B) ALLOWABLE CYCLES = 20,000

$$\text{USAGE FACTOR} = \frac{\text{TOTAL CYCLES}}{\text{ALL. CYCLES}} = \frac{150}{20{,}000} = 0.0$$

CONCLUSION

THE DESCRIBED CONDITION HAD NO SIGNIFICANT EFFECT ON THE FATIGUE LIFE OF THE SPRAY NOZZLE.

PROBLEM REPORT TRANSMITTAL

File 12M2
CONTRACT 620-00 04
SPR 193
TITLE RCV-1 Failed in OPEN position
JUN 14 1974
DATE

For Action

C. A. Creacy For Information
Q. G. Burnley

Date Final Resolution Required by Nuclear Service Support Engineer

on Requested: The smaller operator will be available
ly 26, 1974

Direct reply in writing to N.S. Support Engineer. Please reply immediately whether answer is final or preliminary.

C. C. Plunkett-Contract Admin.
Central Engineering Files
C. M. Fletcher -NPG Quality Assurance
B. L. Day
J. N. Kaelin
E. L. Logan
L. C. Rogers
T. D. Stables

Earl W. Davis
Nuclear Service Support Engineer
Earl W. Davis Jr.

MANHOUR LIMITS
COST LIMITS
CHARGE No.
APPROVED:
Project Manager

CLEARED

TRANSMITTAL SLIP

PLANT STARTUP SERVICE SITE PROBLEM REPORT

**** CLEARED ****

FILE: 1.M2

CONTRACT NO.: 620-00 04

SPR 193 (Rev. 1)

TITLE 2 RC-1 FAILED IN OPEN POSITION

DATE: 12/10/74

TO: ______________________ For Information

Central Engineering Files

C. C. Plunkett - Contract Admin.

C. M. Fletcher - Quality Assurance

R. B. Reynolds - Task Engineer

W. A. Cobb - Sr. Proj. Manager

The attached, cleared SPR is submitted for your information.

TO: ______ J. N. Kaelin - ARKANSAS ______ R. E. Kosiba

______ E. L. Logan - SMUD ______

______ B. L. Day - OCONEE ______

______ L. C. Rogers - MET ED ______

J. L. Hollis - Florida

Attached is one copy of Site Problem Report No. 193 which was processed on Contract 620-00 04. Future contracts have been reviewed for the potential of a similar problem. This problem is/is not considered applicable to other contracts 3, 5 & 9.

REMARKS:

cc:

G. A. Wahling

NUCLEAR SERVICE SUPPORT ENGINEER

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company		CONTRACT NO 620-0004	SPR NO. 193	REV. NO. 01
VENDOR Rockwell	P. O. NO.	TASK NO. 28	GROUP NO. 41	SEQ. NO. 01
SITE ENGINEER R. J. Ba... ~~J. J. Ward~~		REQ'D RESOL. DATE	REQ'D. COMP. DATE	

TITLE

2RC – 1 FAILED IN OPEN POSITION

DESCRIPTION OF PROBLEM

See Attached:

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

See Attached:

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

See attached:

ORIGINATOR SIGNATURE	DATE	S.O.M. CONSTR. REP. SIGNATURE	DATE
J. J. Ward RB	6/12/74	[signature]	6/17/74

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[signature] 12/10/74	
TASK ENGINEER	Carl H. Davis	12/10/74
PROJECT MANAGER	C. A. Creasy	12-12-74

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO 155

COMPLETION

SITE COMPLETION REPORT

FC-281(NSS-3), FC-155(NSS-4), FC-102(NSS-9) will be issued to install ~~V...~~ reduced speed operator on valve.

This clears all revs. of this SPR.

☐ RECOMMENDED STDS. CHANGE

FINAL DISTRIBUTION

PROJECT MANAGER

S.O.M./CONST. REP.

CA DOC. FILE

CENT. ENGR

FILE 12N.2

DEVIATIONS ☒ NONE ☐ SEE SPR REV. NO. ______

DATE COMPLETED 12/5/74 SIGNED BY [signature]

S.O.M. CONSTR. REP. APPROVAL [signature] DATE 12/6/74

Babcock & Wilcox

SPR # 193 Rev.0
June 12, 1974
Oconee - Unit II

DESCRIPTION OF PROBLEM:

After ~~the last~~ reactor trip on Unit II on May 30, 1974, it was impossible to keep the normal operating pressure in the pressurizer with all heater banks on.

It appeared that the yoke bushing threads of the motor-operated valve 2RC-1 are stripped because the shaft does not move in and out of the valve, although the motor runs and indicates closed or open position of 2RC-1 in the control room.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED:

To maintain the pressure in the pressurizer, 2RC-3 was closed after the Reactor trip.

With 2RC-3 closed a minimum bypass spray flow of 0.75 gpm is not maintained as per DP 1101-01 section 1.2-5.

Stan Holland and Jim Hampton were informed that keeping RC-3 shut violates limits and precautions and that if they continue to operate, RC-3 should not be opened unless absolutely necessary to minimize the number of cycles on the spray nozzle. Duke was also asked to rewire RC-3 so that it could be throttled to maintain some small continuous spray flow.

Additionally, Mr. V. Miller and Mr. R. Reynolds of Mt. Vernon were contacted in an effort to determine what the effects of frequent cycling of 2RC-3 would be on the pressurizer spray nozzle. Mr. Miller could not provide an absolute number as to the allowable number of cyles, or even what constitutes a cycle; however, he did state that with the pressurizer at normal operating temperature, spray line temperatures as low as 522° F had been analyzed. The results of these analysis indicated that the expected nozzle lifetime was not significantly reduced.

Based on this additional information, Mr. Stan Holland and Duke Power operating personnel were informed that if they were going to cycle 2RC-3 in order to maintain pressurizer boron concentration, then they should cycle the valve at a frequency such that spray line temperature did not decrease to below 522° F. This information was also provided to Duke Power Company in a letter. (Encl. #1)

By June 11, Duke Power Co. had completed electrical modifications to the 2RC-3 operator to allow this valve to be stopped at intermediate positions, thus a allowing it to be used as a throttle valve to maintain continuous spray line flow. The valve is now being operated to maintain continuous spray line flow. The data requested by the letter of Enclosure #1 is here included as Enclosure #2. This data is highly suspect, since a brief examination of it will reveal gross discrepancies between time-between cycles, and spray line temperature prior to cycling the valve. These are unexplained at this time.

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by NPG Nuclear Service

(1) Originator - Fill in: Customer; Contract Number; Vendor; Purchase Order Number; Task Number; Group Number; Sequence Number; Name; Title; Description of Problem; Status; Further Action Recommended by Site Personnel; Originator Signature and Date; Vendor Claim (if applicable).

(2) Site Operations Manager - Fill in: SPR Number; Revision Number; Req'd. Resol. Date; Req'd. Comp. Date; Approval Signature; Date.

(3) Nuclear Service Support Engineer - Fill in: Cost Category; Authorized Charge Number.

(4) Task Engineer - Fill in: Resolution; Recommended Std.'s Change*; (if applicable, FC Req. and FC Number); Signature and Date.

*If recommended standard's change, transmit a copy to cognizant Standard Task Engineer to resolve with Standard Plant Manager.

(5) Field Engineer - Implement resolution; upon completion, fill in: Completion Report; Date Completed and Signature.

NOTE: If necessary to deviate from the approved SPR, note deviation and submit revised SPR to the Site Operations Manager.

(6) Site Operations Manager - Approve completion; sign.

Initiated by B&W Construction Company

(1) Originator - (Same as (1) above)

(2) Construction Co. Site Representative - (Same as (2) above)

(3) Project Manager - (Same as (3) above)

(4) Task Engineer - (Same as (4) above)

(5) Construction Co. Site Representative - (Same as (5) and (6) above)

Babcock & Wilcox

SPR # 193 Rev.1
June 12, 1974
Oconee - Unit 1

With 2RC-3 in a throttling position, the following data was obtained from Unit II:

Tave = 579° F
Tc = 558° F
Prcs = 2155
T (spray line) = 473.5 °F
Rx. Power = 75%

By comparison, Unit I parameters are shown below:

Tave = 579° F
Tc = 556° F
Prcs = 2155
T (spray line) = 482.8
Rx. Power = 99 + %

The above data should be compared with the transient data of enclosure #2 to determine the validity of RC Spray line temperatures as listed. Note: Spray line termocouples are on the exterior of the pipe and therefore do not measure true fluid temperature.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

It is recommended that the data of enclosure 2 be forwarded to Mr. R. Reynolds for analysis of the thermal shocks to which the spray nozzle was subjected. It is further recommended that more definitive information concerning the following be generated for all contracts:

1) What temperature differential constitutes a spray nozzle cycle?

2) How many cycles are available?

and 3) Given the same situation repeats itself, what is the best way to operate the system while continuing plant operations?

File
Encl. (1)

Babcock & Wilcox

Power Generation Group
P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (804) 384-5111

June 5, 1974

SCM 2081

Duke Power Company
Oconee Nuclear Station
P. O. Box 1175
Seneca, South Carolina 29678

Subject: Unit II Spray Line Stop Valve (2RC-3)

Attention: Mr. J. Ed Smith

Dear Mr. Smith:

Recent failure of the spray line valve (2RC-1) in an intermediate position has required that the spray line isolation valve (2RC-3) be shut and opened only as necessary to maintain pressurizer boron concentration.

Mr. Sten Holland and Mr. Jim Hampton were informed by B. & W. personnel that operating with 2RC-3 shut violates limits and precautions, OP 1101-01, in that the minimum required spray flow of 0.75 gpm is not maintained. B. & W. has further recommended that if this method of operation is continued, 2RC-3 should not be operated unless absolutely necessary to minimize the number of temperature transients on the spray nozzle.

An additional factor to consider is the severity of the thermal shock suffered by the spray nozzle each time the valve is cycled. Analysis of temperature transients has been previously performed with 522° F as the limiting minimum spray flow temperature. Thus, it is further recommended that if it is anticipated that continuous cycling of 2RC-3 will be required to prevent excessive boron concentration buildup in the pressurizer, then the valve should be cycled at a frequency such that spray line temperature does not decrease to below 522° F.

While operating the pressurizer in this configuration, it is requested that you log the following data each time 2RC-3 is cycled:

1) time at which the valve is opened
2) time at which the valve is closed
3) temperature in the spray line just prior to opening the valve.

Babcock & Wilcox

SOM Letter # 2081
June 5, 1974
Oconee - Unit II

Based on conversations with Unit II operating personnel and Mr. Stan Holland of Duke Power Company, this data is now being logged. It is additionally recommended that you consider re-wiring the controller for 2 PC-3 such that the valve may be partially opened in order to maintain a small continuous spray flow.

Yours truly,

B. L. Day by R. Baker, Jr.

B. L. Day
Site Operations Manager

JJW/bh

cc: H. J. McConnell
W. A. Cobb
R. L. Pittman
Stan Holland (DPC)
Loyd Schmid (DPC)
W. O. Parker (DPC)

Babcock & Wilcox

2RC-3 Cycling

Date	Start	Stop	Temp.
6/11/74	0029	0030	412
	0128	0130	---
	0201	0202	427
	0258	0259	422
	0407	0408	410
	0500	0501	420
	0607	0608	408
	0700	0701	417
	0857	0858	393
	0922	0923	443
	1025	1025	425
	1046	1046	450
	1245	1248	400
	1416	1419	450
	1522	1524	460
6/11/74	1630	1633	560.9
	1801	1802	566.6
	1901	1903	564.0
	2006	2007	562.9 ?
	2126	2128	565.5
	2305	2307	561.7
	0100	0103	394.7
	0243	0244	428.2
	0317	0318	442.8
	0406	0407	424.8
	0501	0503	419.5
	0624	0625	428.5
	0705	0707	431.9
6/9/74	2203	2204	414.6
	2301	2302	416.4
6/10/74	0101	0102	394
	0204	0205	411
	0303	0304	412
	0402	0403	414
	0505	0506	412
	0606	0607	413
	0701	0702	417
	0805	0806	413
	0925	0926	406
	1103	1104	399
	1206	1207	424
	1304	1305	427
	1401	1402	421
	1503	1504	424

Babcock & Wilcox

Date	Start	Stop	Temp.
6/10/74 (cont'd)			
	1602	1603	417.2
	1703	1704	417
	1759	1800	415.4
	1903	1904	413.0
	2015	2016	405.6
	2046	2047	434.9
	2207	2208	418.8
6/10/74	2301	2302	412.4

Date	Time Open	Time Shut	Spray Line Temperature
6/8/74	1237	1238	374.8
	1333	1334	421.7
	1433	1434	416.2
	1534	1535	418.3
	1623	1624	425.3
	1807	1808	400.9
	1902	1903	425.2
	2002	2003	415.8
	2124	2125	407.7
	2202	2203	430.6
6/8/74	2300	2301	425.3
6/9/74	0014	0015	452.8
	0118	0119	414.3
	0205	0206	425.7
	0303	0304	418.7
	0405	0406	421.3
	0528	0529	407.8
	0603	0603	437.9
	0702	0703	423.2
6/9/74	0822	0823	408.1
	0929	0931	413
	1018	1019	432.9
	1109	1110	424.2
	1220	1220	430.1
	1329	1329	561.4
	1555	1556	412.4
	1741	1742	397.5
	1809	1810	438.7
	1902	1903	420.9
	2008	2009	413.5
	2104	2105	416.4
6/4/74	0619	0620	371.9
	1030	1031	564.5 after ?
	1144	1145	560.3
	1229	1250	560.4
	1342	1343	561.1

Babcock & Wilcox

Date	Time Open	Time Shut	Spray Line Temperature
6/4/74	1430	1431	564.5
	1529	1530	561.3
	1710	1711	566
	1915	1916	566.7
	2041	2041	564.7 ?
	2145	2145	558.5
	2239	2240	558.2
	2348	2349	555.3
6/5/74	0150	0153	395
	0258	0259	422
	0353	0354	429
6/6/74	0322	0323	426
6/7/74	0055	0056	---
	0900	0901	566 ?
	1008	1009	566

JJW/bh

Between 5/30 and 6/4 no records were kept on cycling RC-3, but I don't feel that the valve was cycled more than 40 times during this time.

R. Baker

(9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER Duke Power Company	CONTRACT NO 620-0004	SPR NO 93	REV. NO 0
VENDOR Rockwell [illegible] NO.	TASK NO 28	GROUP NO [illegible]	SEQ NO 01
SITE ENGINEER K. H. Fischer	REQ'D RESOL DATE	REQ'D COMP DATE	

TITLE RC-1 FAILED IN OPEN POSITION

DESCRIPTION OF PROBLEM

SEE ATTACHED

Will close 12/5/74

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

SEE ATTACHED

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

Lynchburg inform site as to when the smaller operators for this valve will be shipped, and how many cycles the spray nozzle is designed for.

K. H. Fischer [illegible] 6/3/74 R. Baker 6/3/74

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	[signature]	[illegible]
TASK ENGINEER		
PROJECT MANAGER		

[illegible] CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

[illegible] CHANGE NO ☐ FIELD CHANGE REQ FC NO

[illegible] REPORT

[illegible] letter to R.B. Reynolds ~~letter [illegible]~~ FC 221 [illegible] that no damage occurred to spray nozzle. [illegible] change operator when it arrives on site. Duke [illegible] existing operator with 1/2 speed motor. Valve [illegible]

☐ RECOMMENDED STDS CHANGE

FINAL DISTRIBUTION

[illegible] ☐ SEE SPR REV. NO SEE Rev 1

[illegible] SIGNED BY R Baker

[illegible] APPROVAL [signature] DATE [illegible]

QA [illegible] EMP

Babcock & Wilcox

SPR # 193 Rev. 0
June 3, 1974
Oconee - Unit II

DESCRIPTION OF PROBLEM:

After the last reactor trip on Unit II on May 30, 1974. It was impossible to keep the normal operating pressure in the pressurizer with all heater banks on.

It appeared that the yoke bushing threads of the motor-operated valve 2RC-1 are stripped because the shaft does not move in and out of the valve, although the motor runs and indicates closed or open position of 2RC-1 in the control room.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED:

To maintain the pressure in the pressurizer 2RC-3 was closed after the Reactor trip.

With 2RC-3 closed a minimum bypass spray flow of 0.75 gpm is not maintained as per DP 1101-01 section 1.2-5.

Stan Holland and Jim Hampton were informed that keeping RC-3 shut violates limits and precautions and that if they continue to operate, RC-3 should not be opened unless absolutely necessary to minimize the number of cycles on the spray nozzle. Duke was also asked to rewire RC-3 so that it could be throttled to maintain some small continuous spray flow. As yet this has not been done, but Duke is checking into it.

At this time, Duke is sampling the pressurizer for Boron every 8 hrs, and opening RC-3 only if the pressurizer boron concentration is not within ± 10 ppm of the RC System Boron Concentration.

Duke has been asked to keep a log of the number of times RC-3 is opened and the spray line temperature just before RC-3 is opened.

Ted Stables has been informed about this problem.
See Oconee I, SPR - 570 for same problem.

RJB/KHF/th

(Side 1)

MODIFICATION REQUEST

DATE: [3] 6/[illegible]	
STATION: [2] Oconee	APPLICABLE TO: [3] UNIT 1 - YES ( ) NO (X) UNIT 2 - YES (X) NO ( ) UNIT 3 - YES ( ) NO (X)
REV: [4]	ID # [illegible] [5]
STRUCTURE, SYSTEM OR COMPONENT AFFECTED: [6] Reactor Coolant	

DESCRIPTION OF MODIFICATION: [7]

Modify valve 2RC-3 breaker seal in circuit such that the valve can be operated as a throttle valve rather than open-closed type.

REFERENCES: [8]	ATTACHMENTS: [9]
1. PO 100A-2 H-5	1. SAFETY ANALYSIS ATTACHED ( ) YES (X) NO
2.	2.
3.	3.

JUSTIFICATION FOR MODIFICATION: [10] With normal pressurizer spray valve 2RC-1 inoperable we need the capability of maintaining a small, continuous spray flow to the pressurizer for the following reasons.

1. Prevent B^{10} concentration buildup in pressurizer.

2. Prevent excessive thermal cycle of the pressurizer spray nozzle.

3. Allow continuation of certain protions of the 75% power test program.

REQUEST ORIGINATED BY: [11]	PRESENT STATUS [12]
NAME: S. A. Holland	(ACTION TO DATE, PERCENT COMPLETED ETC.)
DEPARTMENT: Oconee-Operations	None
ASSIGNMENT: Assistant Operating Engineer	

PRIORITY: [13]

1. ( ) REQUIRED PRIOR TO soon as possible , FOR THE FOLLOWING REASONS:

2. (X) REQUIRED FOR PROPER SYSTEM OR UNIT OPERATION.
3. ( ) DESIRABLE FOR PROPER SYSTEM OR UNIT OPERATION.

AUTHORIZATION [illegible] [14]	SAFETY-RELATED [illegible] ( ) [illegible] (X) NO [15] For Follow [illegible]
APPROVED: [signature]	This Modification involves an unreviewed safety question or a change in technical specifications ( ) [illegible] [16]
DATE: [illegible]	

C.A CREASY

B. BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	Pressurizer Task Engineer R.B. Reynolds - Component Management - NPGD-CE -Mt. Vernon	
From	Lead Engineer (Ext. 319) U.R. Miller - Mechanical Design, NPGD-CE - Mt. Vernon	BDS 663-5
Cust.	Duke Power Company	File No. or Ref. 2.5.2 620-0004-59
Subj.	SPR 193 Rev. 1	Date July 19, 1974

This letter to cover one customer and one subject only.

The subject Site Problem Report described a condition where the spray valve was shut and opened periodically. When the valve was shut, the fluid in the spray line lost heat to the atmosphere and, thus, the fluid temperature decreased. When the valve was opened, the cooler water in the spray line came in contact with the pressurizer spray nozzle. Mechanical Design has conducted a simplified, yet conservative, analysis that shows that the fatigue life of the pressurizer spray nozzle has not been significantly affected by the conditions presented in the subject SPR.

If you have any questions and/or comments, please call.

U.R.M.

U. R. Miller

C.A. CREASY.

lab

Attachments

THIS SHOULD RESOLVE SPR 193 Rev. 1. IF THERE ARE ANY QUESTION, PLEASE CALL.

RBReynolds

JUSTIFICATION FOR SPR 1993 REV 1 CONTRACT 620-0004-59

WHEN THE SPRAY VALVE WAS SHUT, THE FLUID IN THE SPRAY LINE COOLED. WHEN THE SPRAY VALVE WAS OPENED, THE COOLER WATER WAS FORCED THRU THE PRESSURIZER SPRAY NOZZLE. THE FOLLOWING CALCULATIONS INDICATE THAT THE RESULTING THERMAL STRESSES IN THE SPRAY NOZZLE HAD NO APPRECIABLE EFFECT ON THE FATIGUE LIFE OF THE NOZZLE.

ASSUMPTIONS.

1. THE INITIAL SPRAY NOZZLE TEMPERATURE IS 650°F
2. THE NOZZLE IS SHOCKED WITH 375°F WATER
3. THE DURATION OF TIME THE COOL WATER IS IN CONTACT WITH THE PRESSURIZER SPRAY NOZZLE IS SMALL.

ANALYSIS

THE EFFECT OF THE COLD WATER IS TO PRODUCE THERMAL SKIN STRESSES IN THE NOZZLE. SINCE THE CARBON STEEL PART OF THE NOZZLE IS PROTECTED BY A THERMAL SLEEVE, IT WILL NOT EXPERIENCE A TEMPERATURE CHANGE. THE SKIN STRESS FOR THE STAINLESS SECTION MAY BE CONSERVATIVELY ESTIMATED BY

$$\sigma_H = \sigma_L = 1.43\, E \alpha \Delta T$$

WHERE $E = 26 \times 10^6$ PSI

$\alpha = 9.96 \times 10^{-6}$ /°F ISTANTANEOUS VALUE AT 400°F

$\Delta T = 650 - 375 = 275$ °F

BABCOCK & WILCOX	REVISION
DEPARTMENT NFPA - CE DATE 7-19-74 BY CWM	

$\therefore \quad \sigma_H = \sigma_L = 1.43(26)(9.06)(275) = 101836$ psi

$S = 102$ KSI

ALTERNATING STRESS = 51 KSI

FROM FIG N-415(B) ALLOWABLE CYCLES = 20,000

$$\text{USAGE FACTOR} = \frac{\text{TOTAL CYCLES}}{\text{ALL. CYCLES}} = \frac{150}{20{,}000} = 0.0$$

CONCLUSION

THE DESCRIBED CONDITION HAD NO SIGNIFICANT EFFECT ON THE FATIGUE LIFE OF THE SPRAY NOZZLE.

(1)

SITE PROBLEM REPORT TRANSMITTAL

To P. F. SHELTON For Action

To W. A. COBB For Information
C. A. CREACY

File 1242
CONTRACT 620-00 04
SPR 193 (REV 1)
TITLE 2 RC-1 FAILED IN OPEN POSITION

DATE 7/30/74

Date Final Resolution Required by Nuclear Service Support Engineer

Action Requested: P. F. SHELTON IS REQUESTED TO REVIEW THIS SPR AND PROVIDE NSSE WITH AN ANSWER TO SITES' QUESTION: "GIVEN THE SAME SITUATION REPEATS ITSELF, WHAT IS THE BEST WAY TO OPERATE THE SYSTEM WHILE CONTINUING PLANT OPERATIONS?"

Direct reply in writing to N.S. Support Engineer. Please reply immediately whether answer is final or preliminary.

[signature]
Nuclear Service Support Engineer

cc:
C. C. Plunkett-Contract Admin.
Central Engineering Files

J. N. Kaelin

L. C. ROGERS
B. L. DAY

E. L. LOGAN
-QUALITY ASSURANCE

MANHOUR LIMITS ______
COST LIMITS ______
CHARGE No. ______
APPROVED: ______
Project Manager

SITE PROBLEM REPORT TRANSMITTAL

File 1242

CONTRACT 620-00 04

SPR 193 Rev 1

TITLE 2RC-1 Failed In Open Position

DATE 7/15/74

To R.B. Reynolds For Action

To C.A. Creacy For Information

Date Final Resolution Required by Nuclear Service Support Engineer

Action Requested: R. B. Reynolds Is Requested To Evaluate The Transient Effects On The Spray Nozzle And Respond To NSSE As Requested By This SPR. (Reply Memo Attached)

Direct reply in writing to N.S. Support Engineer. Please reply immediately whether answer is final or preliminary.

Nuclear Service Support Engineer

cc: ~~D. L. Aldton~~
C. C. Plunkett-Contract Admin.
~~Central Engineering Files~~
~~B. V. ... NPG Quality Assurance~~
~~J. F. Kennedy~~
~~J. N. Kuelin~~
~~R. J. McConnell~~
~~J. D. Phinney~~
B. L. DAY

MANHOUR LIMITS 40 Hrs CC 314

COST LIMITS —

CHARGE No. 620-0004-08-07

APPROVED: See Attached Page
Project Manager

SITE PROBLEM REPORT TRANSMITTAL

To E.B. Rinaldo [illegible] For Action

File 1282
CONTRACT 620-00 04
SPR 193 Rev 1
TITLE [illegible] Valve
In Open Position

To C.A. Cracy For Information
[illegible]

DATE 6/20/79

Date Final Resolution Required by Nuclear Service Support Engineer

Action Requested: E.B. Rinaldo is requested to evaluate the cause of [illegible] and report to NSSE as requested by this SPR. Rigging memo attached

[illegible]

ANSWERED

40

Direct reply in writing to N.S. Support Engineer. Please reply immediately whether answer is final or preliminary.

cc:
C. C. Plunkett-Contract Admin.
Central Engineering Files
E. V. DeCarli-NPG Quality Assurance
E. Logan
J. N. Kaelin
J. D. Phinney

[signature]
Nuclear Service Support Engineer
[signature]

MANHOUR LIMITS 40 Hr ea 314
COST LIMITS —
CHARGE No. 620-0004-08-07
APPROVED: C.A. Cracy
Project Manager

SITE PROBLEM REPORT REPLY MEMO

NSS- 1

FILE [illegible]

SPR- 172 1

To: T.D. STABLES
Support Engineer

From: R.B. REYNOLDS
Task Engineer

RECOMMENDED ACTION: [illegible]

CORRECT

☐ Final and Complete.

☐ An estimate only. Complete Resolution available ________. Date

☐ Field Change Necessary

Manhours Charged ________

Charge No.: ________

Signature ________ Task Engineer

APPLICABILITY TO OTHER NSS CONTRACTS

Check applicable statements.

☐ 1. This Site Problem is definitely not applicable to the following NSS contracts: ________

Reason: ________

☐ 2. This Site Problem Report is suspected as having effect on the following NSS contracts: NSS- ________

☐ 3. This Problem could occur on other contracts but could be prevented simply by informing site personnel and the customer of the potential problem.

☐ 4. This Site Problem could be prevented on NSS-______ and subsequent contracts by changing Standard ________. No. or Title

Signature ________ Task Engineer

Babcock & Wilcox

SPR # 193 Rev.0
June 12, 1974
Oconee - Unit II

With 2RC-3 in a throttling position, the following data was obtained from Unit II:

WHAT IS T_c & Tave

T_c = RCS COLD LEG TEMP. (REACTOR INLET)

TAVE = AVERAGE OF RCS COLD LEG & HOT LEG TEMP.'s

?
Tave = 579° F
Tc = 558° F
Pres = 2155
T (spray line) = 473.5°F
Rx. Power = 75%

By comparison, Unit I parameters are shown below:

WHAT IS T_c & Tave

?
Tave = 579° F
Tc = 556° F
Pres = 2155
T (spray line) = 482.8
Rx. Power = 99 + %

The above data should be compared with the transient data of enclosure #2 to determine the validity of RC Spray line temperatures as listed. Note: Spray line termocouples are on the exterior of the pipe and therefore do not measure true fluid temperature. IS THE SPRAY LINE [illegible] YES... ~ 2" MIRROR INSULATION

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

It is recommended that the data of enclosure 2 be forwarded to Mr. R. Reynolds for analysis of the thermal shocks to which the spray nozzle was subjected. It is further recommended that more definitive information concerning the following be generated for all contracts:

1) What temperature differential constitutes a spray nozzle cycle? 100°F

2) How many cycles are available? ∞ [illegible]

and 3) Given the same situation repeats itself, what is the best way to operate the system while continuing plant operations?

LYNCH.

Babcock & Wilcox

Enclosure #2
SPR 193 [illegible] II
June 14, 1974
Page 1 of 3

2RC-3 Cycling

Date	Start	Stop	Temp.
6/11/74	0029	0030	412
	0128	0130	---
	0201	0202	427
	0258	0259	422
	0407	0408	410
	0500	0501	420
	0607	0608	408
	0700	0701	417
	0857	0858	393
	0922	0923	443
	1025	1025	425
	1046	1046	450
	1245	1248	400
	1416	1419	450
	1522	1524	460
6/11/74	1630	1633	560.9
	1801	1802	566.6
	1901	1903	564.0
	2006	2007	562.9 ?
	2126	2128	565.5
	2305	2307	561.7
	0100	0103	394.7
	0243	0244	428.2
	0317	0318	442.8
	0406	0407	424.8
	0501	0503	419.5
	0624	0625	428.5
	0705	0707	431.9
6/9/74	2203	2204	414.6
	2301	2302	416.4
6/10/74	0101	0102	394
	0204	0205	411
	0303	0304	412
	0402	0403	414
	0505	0506	412
	0606	0607	413
	0701	0702	417
	0805	0806	413
	0925	0926	406
	1103	1104	399
	1206	1207	424
	1304	1305	427
	1401	1402	421
	1503	1504	424

1. [illegible] : ~ 648°F (SAT. TEMP. FOR 2155 PSIG)

SPRAY NOZZLE ~ 648°F

THEREFORE, TEMP. @ NOZZLE WOULD DECREASE. THE AMOUNT DEPENDING UPON SPRAY LINE TEMP. PRIOR TO OPENING VALVE.

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Date	Start	Stop	Temp.
6/10/74 (cont'd)			
	1602	1603	417.2
	1703	1704	417
	1759	1800	415.4
	1903	1904	413.0
	2015	2016	405.6
	2046	2047	434.9
	2207	2208	418.8
6/10/74	2301	2302	412.4

Date	Time Open	Time Shut	Spray Line Temperature
6/8/74	1237	1238	374.8
	1333	1334	421.7
	1433	1434	416.2
	1534	1535	418.3
	1623	1624	425.3
	1807	1808	400.9
	1902	1903	425.2
	2002	2003	415.8
	2124	2125	407.7
	2202	2203	430.6
6/8/74	2300	2301	425.3
6/9/74	0014	0015	452.8
	0118	0119	414.3
	0205	0206	425.7
	0303	0304	418.7
	0405	0406	421.3
	0528	0529	407.8
	0603	0603	437.9
	0702	0703	423.2
6/9/74	0822	0823	408.1
	0929	0931	413
	1018	1019	432.9
	1109	1110	424.2
	1220	1220	430.1
	1329	1329	561.4
	1555	1556	412.4
	1741	1742	397.5
	1809	1810	438.7
	1902	1903	420.9
	2008	2009	413.5
	2104	2105	416.4
6/4/74	0619	0620	371.9
	1030	1031	564.5 after
	1144	1145	560.3 ?
	1229	1250	560.4
	1342	1343	561.1

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

To W.C. BUTT - NSE For Information

R.G. BURNLEY - NSE

G. KULYNYCH - Sr. Project Manager

C. C. Plunkett - Contract Admin.

Central Engineering Files

E. V. DeCarli - Quality Assurance

R.J. McCONNELL - S.O.M. (2)

FILE: 12M2

Contract 620-00 03

SPR 444

TITLE RC V1 STEAM LEAK

DATE 6-4-73

The attached, cleared SPR is submitted for your information.

TO: ✓ A. S. Embrey

C. E. Kulynych

✓ J. McFarland

✓ C. M. Olds

✓ R. T. Schomer

✓ E. G. Ward

✓ J. Kaelin - Arkansas

✓ J. Kennedy - SMUD

✓ K. Suhrke

✓ H. Worsham

✓ J. Phinney - MET ED

Attached is one copy of Site Problem Report No. 444 which has been processed on Contract 620-00 03. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: Refer also to SPR 461 for related problems

cc:

R. J. Maggi

NUCLEAR SERVICE SUPPORT ENGINEER

PDS-21091-1

SITE PROBLEM REPORT — BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company	CONTRACT NO. NSS 3	SPR NO. 444	SPR REV. NO. 2
VENDOR Rockwell	P.O. NO. 031480	COMP. NO. 28 GROUP NO. 41	SEQ NO. 2

PRIMARY DOCUMENTS: SPEC NOS. ______

DWG NO. ______ EQUIP CODE/LEVEL/DATE ______

QA LEVEL ______ QA SPEC NO. ______

PRIORITY

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
H. Hennicke			

TITLE (MAX. 30 SPACES) SCV Steam Leak

DESCRIPTION OF PROBLEM

In addition to the problems described in Rev. 1, the design of the back seal does not seem to be adequate. (refer to SPR 461).

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

[redacted] ACTION [redacted] Recommended BY [redacted] SITE PERSONNEL

(1) Re-design back seat.

RECOMMENDED ACTION

APPROVALS — TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	H. Hennicke	1/12/73
SITE CONSTR. REP.		
SITE OPER. MGR.	R.M. McConnell	1/19/73
NS SUPPORT ENGR.	R. L. Pattman	1-22-73
PROJECT MANAGER		

DOCUMENTS AFFECTED / ACTION TAKEN

- ☐ Drawings
- ☐ Proc. Specs
- ☐ Instr. Books
- ☐ Operating Procedures
- ☐ Tech. Specs
- ☐ PSAR/FSAR
- ☐
- ☐ Recommended Stds. Change

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 SPR 444

Cost Category ☐ Norm ☐ C ☐ D ☐ O ☐ L

Auth. Charge No.

RESPONSIBILITY ASSIGN.

Date Completed ______

By: ______

OTHER CONTRACTS AFFECTED

DEVIATIONS
☐ NONE
☐ SEE REV. ______

Field Change Rcd. ☐

Field Change No. ______

INSTRUCTIONS FOR FDS-21091 - SITE PROBLEM REPORT

Initiated by Nuclear Service

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No., Component No.; Group No.; Sequence No.; Drawing No., Title, Description of Problem, Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SITE OPERATIONS MANAGER - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer; Early Start Date; Required Completion Date; Approval Signature; Date.

   Note: Assign priority No. 1 or 2 defined as follows:

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. NUCLEAR SERVICE SUPPORT ENGINEER - FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No.; Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal nuclear service expenditures) are not to be incurred, take the following steps: (a) Approve SPR, (b) Indicate "Not Required" in space provided for project manager's approval, and (c) Distribute as indicated in step 5 below.

   If field change is not required but additional costs (over and above normal nuclear service expenditures) are to be incurred, approve SPR and forward to project manager for approval (step 4).

   If field change is required, see procedure No. NPG-0402-07; obtain field change No. from project manager, and indicate field change No. on SPR.

4. PROJECT MANAGER - Approve SPR and Return to Nuclear Service Support Engineer.

5. NUCLEAR SERVICE SUPPORT ENGINEER - Distribute in Accordance With Procedure No. NPG-0402-04; Initial Action Taken Box (on Support Engineer's File Copy) When Documents Affected Have Been Corrected.

6. SITE OPERATIONS MANAGER - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-04. Return completed SPR to nuclear service support engineer.

Initiated by B&W Construction Company

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title; Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SENIOR CONSTR. CO. SITE REPRESENTATIVE - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer. Early Start Date, Required Completion Date; Approval Signature, Date.

   Note: Assign priority No. 1 or 2 defined as follows.

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. PROJECT MANAGER - FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No.; Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal construction Co. expenditures) are not to be incurred, take the following steps: (a) Approve SPR, and (b) Distribute in accordance with procedure No. NPG-0402-05.

   If field change is not required but additional costs (over and above normal construction Co. expenditures) are to be incurred, obtain abnormal cost charge No. from contract administration; approve and distribute in accordance with procedure No. NPG-0402-05.

   If field change is required, see procedure No. NPG-0402-07; assign field change No., have approved and distribute in accordance with procedure No. NPG-0402-05.

4. SENIOR CONSTR. CO. SITE REPRESENTATIVE - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-05. Return completed SPR to the project manager.

PDS-21091-1

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company CONTRACT NO. 620-0003 SPR NO. 444 SPR REV. NO. 1

VENDOR Rockwell P.O. NO. 081480 COMP. NO. 28 GROUP NO. 41 SEQ NO. 1

PRIMARY DOCUMENTS: SPEC NOS. ______
DWG NO. ______ EQUIP CODE/LEVEL/DATE ______
QA LEVEL ______ QA SPEC NO. ______

PRIORITY 1

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
J. L. Hollis			

TITLE (MAX. 30 SPACES) RCV1 Steam Leak

DESCRIPTION OF PROBLEM

1. Valve has excessive travel and yoke bushing threads were cut by stem.
2. During Replacement of yoke bushing, steam was leaking past RC 3.
3. Valve could not be packed without removal of operator and yoke bushing.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

See Attached Sheet

~~FURTHER~~ ACTION ~~REQUIRED~~ BY ~~OTHER THAN~~ SITE PERSONNEL Rockwell to inspect valve disk, ~~Recommended~~ disk nut, and stem to determine reason for failure. Rockwell to bring Service engineer from Raleigh Plant and limitorque Service rep. to inspect RC-3 and RC-1 after HFT.

~~RECOMMENDED ACTION~~

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE	DOCUMENTS AFFECTED	ACTION TAKEN
ORIGINATOR	JLHollis	1-4-73	☐ Drawings	
SITE CONSTR. REP.			☐ Proc. Specs	
SITE OPER. MGR.	AMcConnell	1-4-73	☐ Instr Books	
NS SUPPORT ENGR.	R.L. Pittman	1-9-73	☐ Operating Procedures	
			☐ Tech. Specs	
			☐ PSAR/FSAR	
PROJECT MANAGER			☐	
			☐ Recommended Stds. Change	

DISTRIBUTION
SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2.5 SPR 444

Cost Category ☐ Norm ☐ C ☐ D ☐ O ☐ E

Auth. Charge No.

RESPONSIBILITY ASSIGN.

Date Completed ______

By: ______

Field Change Req. ☐

Field Change No. ______

OTHER CONTRACTS AFFECTED

DEVIATIONS
☐ NONE
☒ SEE REV. 0

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by Nuclear Service

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title, Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SITE OPERATIONS MANAGER - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer; Early Start Date; Required Completion Date; Approval Signature; Date.

   Note: Assign priority No. 1 or 2 defined as follows:

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. NUCLEAR SERVICE SUPPORT ENGINEER - FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No.; Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal nuclear service expenditures) are not to be incurred, take the following steps: (a) Approve SPR, (b) Indicate "Not Required" in space provided for project manager's approval, and (c) Distribute as indicated in step 5 below.

   If field change is not required but additional costs (over and above normal nuclear service expenditures) are to be incurred, approve SPR and forward to project manager for approval (step 4).

   If field change is required, see procedure No. NPG-0402-07; obtain field change No. from project manager, and indicate field change No. on SPR.

4. PROJECT MANAGER - Approve SPR and Return to Nuclear Service Support Engineer.

5. NUCLEAR SERVICE SUPPORT ENGINEER - Distribute in Accordance With Procedure No. NPG-0402-04; Initial Action Taken Box (on Support Engineer's File Copy) When Documents Affected Have Been Corrected.

6. SITE OPERATIONS MANAGER - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-04. Return completed SPR to nuclear service support engineer.

Initiated by B&W Construction Company

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title; Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SENIOR CONSTR. CO. SITE REPRESENTATIVE - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer. Early Start Date; Required Completion Date; Approval Signature, Date.

   Note: Assign priority No. 1 or 2 defined as follows:

   1. Implementation must be complete by required completion date to avoid delay in project completion.
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   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal construction Co. expenditures) are not to be incurred, take the following steps: (a) Approve SPR, and (b) Distribute in accordance with procedure No. NPG-0402-05.

   If field change is not required but additional costs (over and above normal construction Co. expenditures) are to be incurred, obtain abnormal cost charge No. from contract administration; approve and distribute in accordance with procedure No. NPG-0402-05.

   If field change is required, see procedure No. NPG-0402-07, assign field change No., have approved and distribute in accordance with procedure No. NPG-0402-05.

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STATUS - ACTION TO DATE

1. Status - valve bonnet, stem, disk assembly, gland assy's replaced with RC-1 parts from Unit II. Spline gear which connects stem to limitorque operator also replaced. Valve placed back in limited service until completion of HFT. i.e. not to be used except during cooldown.

2. Action - Inspected valve internals with Clinton L. Sumrall (Sales Representative) of the Atlanta sales office of Rockwell.

   Mr. Sumrall took valve internals with him to ship to the Raleigh, NC plant for analysis and expects to have an answer/analysis for reason of failure by 1/4/73.

   He also agreed to try and have a service representative from the Raleigh, NC Rockwell Plant and a Limitorque representative here on site on 1/8/73 for RC-1 and RC-3 removal and inspection.

   Mr. Sumrall said that this valve is designed to back seat to a limit switch - not a torque switch, and that this is set in the Raleigh Plant prior to shipment. He agreed that the limit switch apparently failed or was improperly set.

   Upon inspection of the stem Mr. Sumrall said that we probably had a bad stem, i.e. the flanged end which keeps the stem attached to the disk and disk nut assembly was too thin. The stem should be = 3/8 inches thich and appears to have been = 1/16 inch at most.

   * During replacement of yoke bushing by DPC they found that the valve cannot be repacked without removing the valve operator and yoke bushing. This is due to the size of the bonnet being so small that the gland seal and latern gland, when pulled back for packing prohibit the insertion of packing below the latern gland. Mr. Sumrall agrees that this is an unsatisfactory design and stated that Rockwell has extended bonnets which would allow packing with operator in place. He agreed to investigate the possibility of supplying these longer bonnets (this would also require a longer stem) but, was not sure what the delivery date would be or who would pay. See photo # 3

   NOTE: Mr. P. Burnley, B & W Engineering, indicates that the following 83 valves at this site are of the same design. We do not know which, if any, have the longer bonnet and valve stem.

   B & W valve #'s for Oconee I, II, & III.

#	SIZE
RCV-1, 5	(2 1/2")
CFV-2A, 2B, & 3A, 3B	(1")
CAV-1, 2, 3, 4A, 4B, 5A, 5B	(1" or 1/2")
HPV-1A, 1B, 2A, 2B, 3	(2 1/2")
HPV-4, 43A, 43B, 43C, 43D	(1 1/2")
HPV-12, 13, 24A, 24B	(4")

Oconee I only (Westinghouse Pumps)

#	SIZE
HPV-48, 49	(1")

2. Inspection of valve shows the following: See photo #1

Stem - End of stem has seperated below disk nut! Stem shows evidence of excessive wear at disk end for = 2 inches and is marked on the entire lenth.
See photo #1

Disk - Disk back seat (on disk nut) is heavily scored while main seat remains in good condition. The inner surface of the disk nut is heavily scored with material deposited on it, possibly from stem.

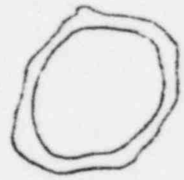
Question: Should the contack area on the end of the stem and the disk nut be of a bearing material? When the valve is back seated this area has force and twist applied and will therefore, have a cutting action if limit switch fails.

The disk nut tack weld was drilled out and the disk & disk nut were inspected.

a. The bottom of the disk nut shows evidence of wear on the inside diameter surface. See photo #2

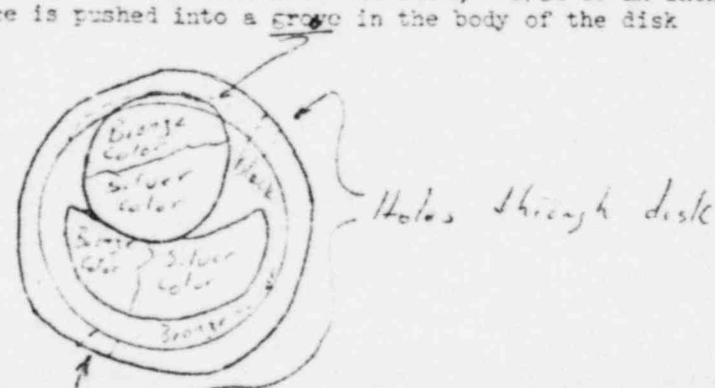
b. A bronze colored ring was found lose under the disk nut. Thickness was .017 to .030 inches

See photo #2



c. Under stem there is an area which could be the stellite bearing pushed and broken, or it could be the bottom of the stem, = 1/32 of an inch thick. This piece is pushed into a grove in the body of the disk

See photo #2

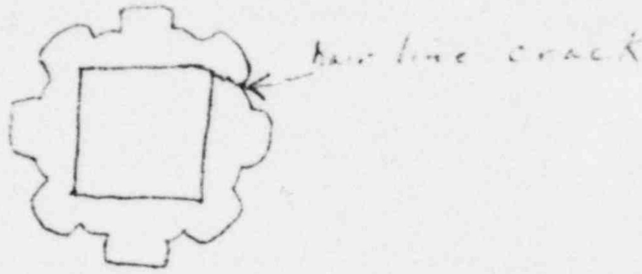


Yoke Bushing - Inner threads stripped out in a coil when the unthreaded portion of the stem was torqued through the bushing.

Junk Ring - Outer surface shows evidence of galling and wear.

Bonnet - Back seat area shown excessive wear as does back seat area of disk nut.

spline - Connects valve stem to operator - shows evidence of excessive wear and has a hair line crack.



PDS-21091-1

SITE PROBLEM REPORT — BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company	CONTRACT NO. 620-0003	SPR NO. 444	SPR REV. NO. 0
VENDOR	P.O. NO.	COMP. NO. 59 / GROUP NO. 10	SEQ NO. 01

PRIMARY DOCUMENTS: SPEC NOS. ______

DWG NO. ______ EQUIP CODE/LEVEL/DATE ______

QA LEVEL ______ QA SPEC NO. ______

PRIORITY

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
R. J. Baker			

TITLE (MAX. 30 SPACES) RC - V1 Steam Leak

DESCRIPTION OF PROBLEM

See Attachment

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

None

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

Yes, Lynchburg Engineering investigate to see if any damage may have occured to the spray nozzle.

~~RECOMMENDED ACTION~~ Resolution

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	R. J. Baker Jr	12/20/72
SITE CONSTR. REP.		
SITE OPER. MGR.	for BJ McConnell	12/22/72
NS SUPPORT ENGR.	B. Walker	12/29/72
PROJECT MANAGER		

DOCUMENTS AFFECTED: ☐ Drawings ☐ Proc Specs ☐ Instr Books ☐ Operating Procedures ☐ Tech Specs ☐ PSAR/FSAR ☐ ☐ Recommended Site Change

ACTION TAKEN

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 ____

Cost Category ☐ Norm ☐ C ☐ D ☐ O ☐ L

Auth. Charge No. ______

RESPONSIBILITY ASSIGN.

Date Completed ______

By: ______

OTHER CONTRACTS AFFECTED

All

DEVIATIONS
☐ NONE
☐ SEE REV ______

Field Change Req. ☐

Field Change No ______

Closed BJ McConnell 5-23-73

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by N[illegible] Nuclear Service

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DESCRIPTION OF PROBLEM

RC - V1 developed a steam leak out of the stem leak off connection on 12/18/72. This leak lasted for about 0.5 hours at a rate of about 6 gpm. Plant conditions during this time were as follows:

R. C. Temperature 532°F
R. C. Pressure 2150 psig
Pressurizer temperature 645°F
4 R. C. Pumps running.

To repair the leak, spray flow was secured for 10 minutes by shutting RC 3 and RC 9. Since RC 1 was shut during the leak, and RC 2 was throttled to maintain minimum required spray flow, there probably was no spray flow to the pressurizer for the entire duration of the leak. Instead, the flow probably was out of the pressurizer through the spray nozzle and out RC - V1 to the R. B. atmosphere. With RC-V1 shut the leak was located on the pressurizer side of RC-V1.

This was in violation of OP 1101 01, section 1.2-6 which requires 0.75 gpm spray flow at all time when RC Temperature is greater than 200°F.

After RC-V1 was repaired, spray flow was reinstated very slowly to minimize the thermal shock to the spray nozzle.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

BL [illegible]

To LR ALLEN - PROJECT MANAGEMENT

From RG BURNLEY - AUX. SYSTEMS (2281)

BDS 663.5

Cust. DUKE POWER Co.

File No. NSS-3/1242
or Ref. NSS-3.4.9/8A30.41

Subj. ROCKWELL VALVES SPR-444 & 461

Date FEBRUARY 2, 1973

This letter to cover one customer and one subject only

Ref: 1. SPR - 444 File 1242
2. SPR - 461 " "
3. Memo AL Lowe, Jr. to LR Allen 1-23-73, SPR-444 File 1242
4. Ltr., DPCo. to GE Kulynych, 1-12-73, Subj. Rockwell Valves

The writer and GT Sund (Purchasing) met with Rockwell personnel, Jan. 31, 1973, at their plant in Raleigh N.C. The Following Rockwell personnel attended:

Harry O Crane, Product Reliability Manager
RL Lawson, Chief Product Design Engineer
JC Morris, Mgr. Customer Service & Sales Orders

The following items were discussed with the objective of formulating resolutions to the problems and questions described in the references noted above:

1. Backseating Problem

The design and effectiviness of the Univalve backseat is questioned by 1 or more of the referenced above. Rockwell disassembled and examined the component parts of HC-V5. We also visually examined these parts and discussed the problem.

Rockwell personnel do not believe that a cause for this backseat leaking can be fixed. They did state that they have thousands of the Univalves in service since 1963. and the design and effectiveness are proven. They also stated that their valves are given a backseat test at shell hydro pressure (540psig for these valves) with packing in but with the gland loose.

examined

SPR-444 also questioned the backseat design in the stem to disk nut area; the assumption made that the SS stem shoulder rotated against the SS disk nut. Rockwell advises the lower end of the disk nut is in fact stellited (see attachment #1).

Rockwell does not believe it credible that the stem shoulder was only 1/16" thick as was reported in SPR-444. The attached sketch shows the actual size of the component parts and the entire stem is machined from a single piece of bar stock. Based on visual observations by the writer, it appears that the end of the stem was worn away be the grinding action due to repeated cycling of the valve after initial damage occurred. The two holes in the disk are to prevent pressure buildup in the cavity inside the disk.

2. RC-V3 Cracked Seat & Scored Stem

A dye check was performed on the seat of this valve while we were at Rockwell's plant. There is a small crack across the Stellite seat.

Rockwell feels it is not possible to determine the cause. Although it does not occur with any great frequency, cracks in stellite seats does happen occasionally. Rockwell will either repair this unit or furnish a new one.

The scored stem was visually observed and compared with an actual size detailed drawing. Considering the location of the scored portion, the relative locations of junk ring, lantern gland and travel distance of stem, the scoring had to occur in the lantern ring zone. Again, cause is indeterminate, but it is highly probable that the scoring is the result of the lantern ring being cocked in the stuffing box. Rockwell stated they have never before seen or had reports of this type of damage. If the valve was repacked at the site the lantern ring could have been slightly cocked and subsequent cycling of the valve could have caused the scoring of the stem. There is no evidence or indications on the lantern ring of this, but since the lantern ring is stellite it probably wouldn't show. Rockwell also feels that it is possible the lantern ring could have been slightly cocked when initially installed at the factory. Regardless of how or when the problem occurred, Rockwell will replace this stem-disk assembly.

It was further stated by Rockwell that the inconel wire insert in the John Crane 187-I packing could not have caused the scoring on the stem.

3. Lantern Ring - Repacking Problem

Without question Rockwell agrees that the arrangement as furnished does not allow repacking the lower stuffing box without removing the operators. It is a design error by Rockwell. They have designed a four piece lantern gland to solve this problem. The new Lantern Glands will consist of 2 pieces of the part shown on Rockwell dwg. B-182952 and the split cylinders part shown on dwg. B182953.

Two sets of these are finished and Rockwell will have the rest completed the week of Feb. 5 for the eleven (11) Oconee I valves.

4. Grafoil Packing

Grafoil packing was discussed with the Rockwell Raleigh personnel and also with Mr. Roger Norden, Rockwell Pittsburgh. Rockwell has not formally stated their corporate position regarding the use of Grafoil. They pointed out that the test work was performed to establish some data on use of grafoil in valves. They have not done further work than that described in their report V REP 72-1. A portion of Rockwell's report showing their conclusions is reproduced and included as attachment #2. After the conference call with Mr. Norden it was concluded that Rockwell feels that their Univalve is suitable for use with Grafoil packing provided the following items are done properly:

a. Tolerances are critical. The interference fit recommended by the makers of Grafoil (Union Carbide) must be used - that is a diametrical interference of 0.005" to 0.010 relative to the stuffing box and 0.002" to 0.005" with the stem.

b. The rings of packing should be inserted two (2) max. at a time and compressed 25 to 35% and the steps repeated for each additional set of two rings.

c. The user must assure himself that he has obtained the highest quality, low chloride content Grafoil, TYPE GTK.

d. Some type of special tooling will be required for the Univalve with deep stuffing box such as we have. Rockwell has not developed any tooling or procedures since they feel it is the user's decision, at this point in time, whether or not to use Grafoil.

Please note that with respect to item C above, Rockwell is aware of a report from some plant where Grafoil was installed in various valves. Subsequently, it was found that there was severe pitting of valve stems and it was later confirmed that the Grafoil used had 1200 ppm leachable chlorides. It is reported today that Union Carbide now designates the grafoil for nuclear use as GTK. It is more expensive and the manufacture performs additional work to assure that chlorides are 200 ppm or less. It is also reported that this designated packing is being supplied with sacrifical metal wafers for insertion between rings of packing to prevent corrosion attack on the valve stems.

5. Rockwell will submit failure analysis reports on both RC-V1 and RC-V5.

Summation and Recommendations:

1. The Univalue backseat design is considered more than adequate and effective by Rockwell.

2. Replacement parts for RC-V1 are being manufactured. Rockwell will not assume responsibility since the damage was not due to design or faulty components.

3. Replacement parts for RC-V5 are being supplied by Rockwell at their expense since the damage is of indeterminate cause.

4. New lantern glands to allow repacking without removing operators are being supplied by Rockwell at their expense.

5. B&W should advise the customer that if they choose to use Grafoil it should be their responsibility because there are too many unknowns about Grafoil. Also, at the time B&W purchased these valves, Grafoil was unknown; therefore B&W should not be expected to retro fit. There could be additional problems such as extrusions of the Grafoil in valves which do not have the junk ring and close tolerances that are characteristic of the Rockwell Univalve.

6. The stem material used in the Rockwell valves is not the 400 series stainless steel referred to in the DPCo letter, reference 4. The stems were to ASTM Spec 461 grade 630 17-4 PH. Mr. AL Lowe's memo. Ref. 3, covers this subject.

Based on this writing, SPR's 444 & 461 should be cleared.

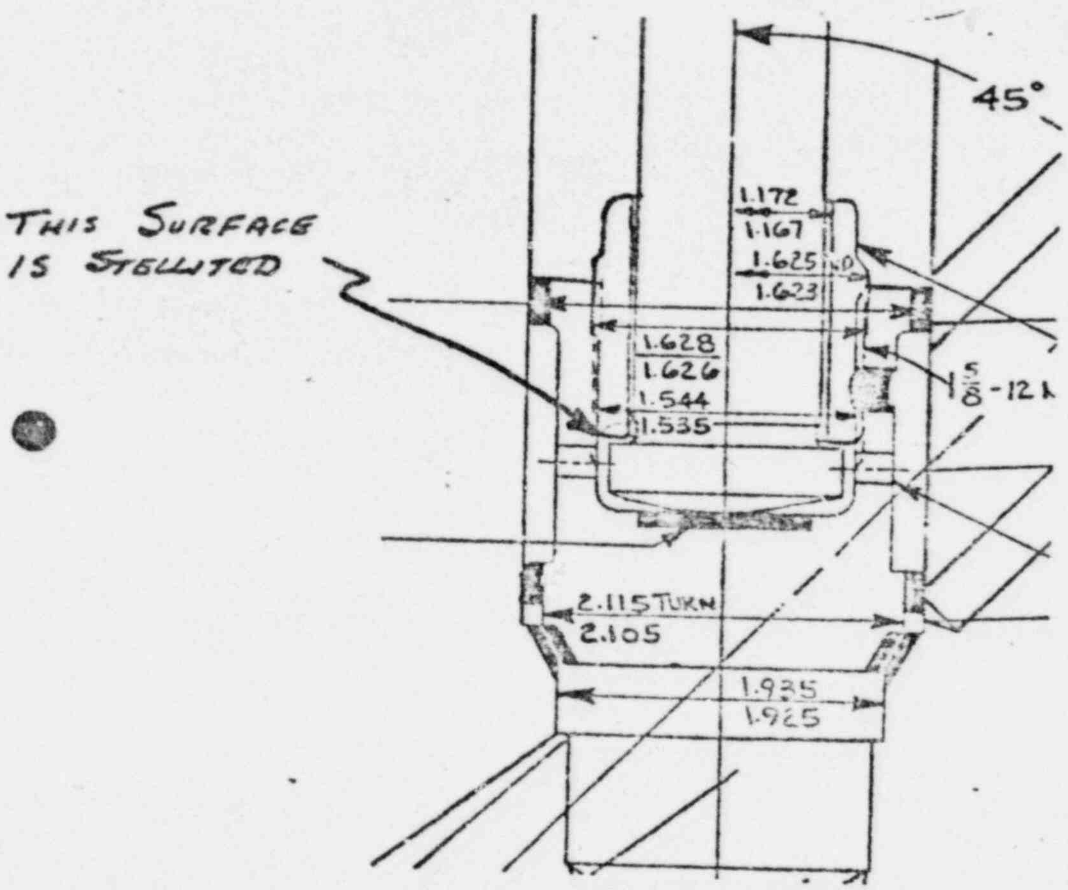
RGB: jgc

R. G. Burnley

CC: WC Butt w/att
TA Mong w/att
RL Pittman w/att
O Putzgruber w/att
K Schroeder w/att
T Stables w/att
GT Sund w/att

DETAIL OF UNIVALVE DISK ARRANGEMENT

OBTAINED FROM ROCKWELL MFG. RALEIGH, N.C. 1-31-73



ATTACHMENT #1

RGB 2-1-73

FIGURE 5 – Grafoil Packing, Test Nos. 1 thru 5, Bonnet No. 17. This is one of the original Grafoil stuffing boxes. Note the almost complete absence of crystal deposits around the stem and gland.

Grafoil is essentially expanded graphite produced by subjecting flake, powder or chip graphite particles, with a high degree of atom orientation, to an oxidizing medium such as sulfuric acid and nitric acid. The oxidizing agent forms openings between the layers of carbon networks in the graphite. When removed from the acid and then rapidly heated, the gas trapped within the graphite layers expands, in turn expanding the graphite. This expanded mass is then compressed or compacted to the desired density by mechanically rolling, producing a sheet material. An expansion of 80 to 200 times the original thickness is preferred because this will produce a cohesive sheet material without the need for binders, leaving the product virtually pure graphite.

Graphite has excellent mechanical properties at elevated temperatures, good friction properties, is radiation resistant and chemically inert, and possesses the necessary basic properties of a good compression packing material for nuclear service. Other packing materials possess many of these same properties, particularly the graphite filament packings, but one important property all the others lack is a high resistance to compression set. It is this characteristic, the ability to maintain its preload on the valve stem and stuffing box walls despite thermal and pressure cycling, that makes *Grafoil* an exceptional packing material.

While most packings lose weight from temperature exposure (due to a loss of volatiles), *Grafoil* does not, and in fact, weighed samples showed an increase due to probable moisture absorption. Sets removed from bonnets 5, 15 and 17 averaged a 27 percent weight increase. By comparison, *J-C 1871X* lost an average four percent. *J-C 1625GF* was not evaluated but it should not show significant change.

In regard to the second question, the reason for the two *Grafoil* failures: it was concluded that these resulted from the fact that the rings were not tailored dimensionally for the Univalve stuffing box. That is, the manufacturer recommends a diametrical interference of 0.005 to 0.010" relative to the stuffing box and 0.002 to 0.005" with the stem. For unknown reasons, the rings used apparently did not provide these fits. A review of the valve dimensions and the probable packing dimensions, based on unused rings, shows that the two failed *Grafoil* packings, bonnets 3 and 15, probably had clearances of several thousandths around the bottom rings. The top rings probably ranged from zero to 0.002" interference, still less than half the minimum 0.005". Performing a similar analysis on the other five sets, all of which performed very well with minimum crystal deposits only, all had *some interference* on both or either of the top and bottom rings, ranging from a probable minimum of 0.00[illegible] to 0.004" maximum. This is still not the optimum five to ten thousandths, but does support the "improper fit" theory.

A review of the leakage of the *Grafoil* sets shows that all but one of the seven had fewer deposits around the stem compared to the gland O.D., suggesting the fit with the stuffing box was not perfect. (This was an anomaly at first, because static seals are normally superior to a stem, or moving seal.) It is, therefore, most important that *Grafoil* rings are designed to fit the specific dimensional range (i.e., including normal manufacturing tolerances) of the valve stuffing box. It may not be possible to use "off the shelf" rings, and communication with the *Grafoil* supplier must be adequate to assure that the proper rings are manufactured.

Comments on the appearances of the packings observed during the post-test examinations may also be of interest. *Grafoil* was essentially unchanged, except that it could not be removed easily as whole rings and would break into layers. The *J-C 1625GF* graphite filament packings varied considerably, some being intact as when installed and others breaking down into very short fibers. Some rings were much like new, still soft and resilient, while others were hard and stiff. Some were rather wet, others very dry. It would appear that high mechanical loading causes the fibers of *J-C 1625GF* to fracture. The *J-C 1871X* packing was generally somewhat harder and less resilient than when new. In summary, the greatest change was shown by *J-C 1625GF*, the least by *Grafoil*.

Operating torques of the valve stems were never excessive, except for packing *E-1* in Tests 1 and 2. *Grafoil* in particular had rather low stem operating torques at full operating pressures.

CONCLUSIONS

1. Traditional braided asbestos-graphite impregnated packings are not recommended for critical nuclear services where high pressure borated water is encountered and periodic gland adjustments cannot be performed.

2. Most packings fail by compression set, or a loss of resiliency, thereby removing the preload necessary for an effective, maintenance-free stem seal.

3. Union Carbide *Grafoil* packing is superior to all other types examined in this project in terms of sealability and minimal maintenance, due to its inherent properties of inertness, temperature and radiation resistance, and freedom from compression set.

4. *Grafoil* packing can be satisfactorily installed in valves now in service with standard dimensions and finishes without extraordinary cleaning procedures.

5. When installing *Grafoil* in new or used valves, the manufacturer's specifications for interference fits with both the stuffing box bore and stem diameter must be followed for low leakage performance.

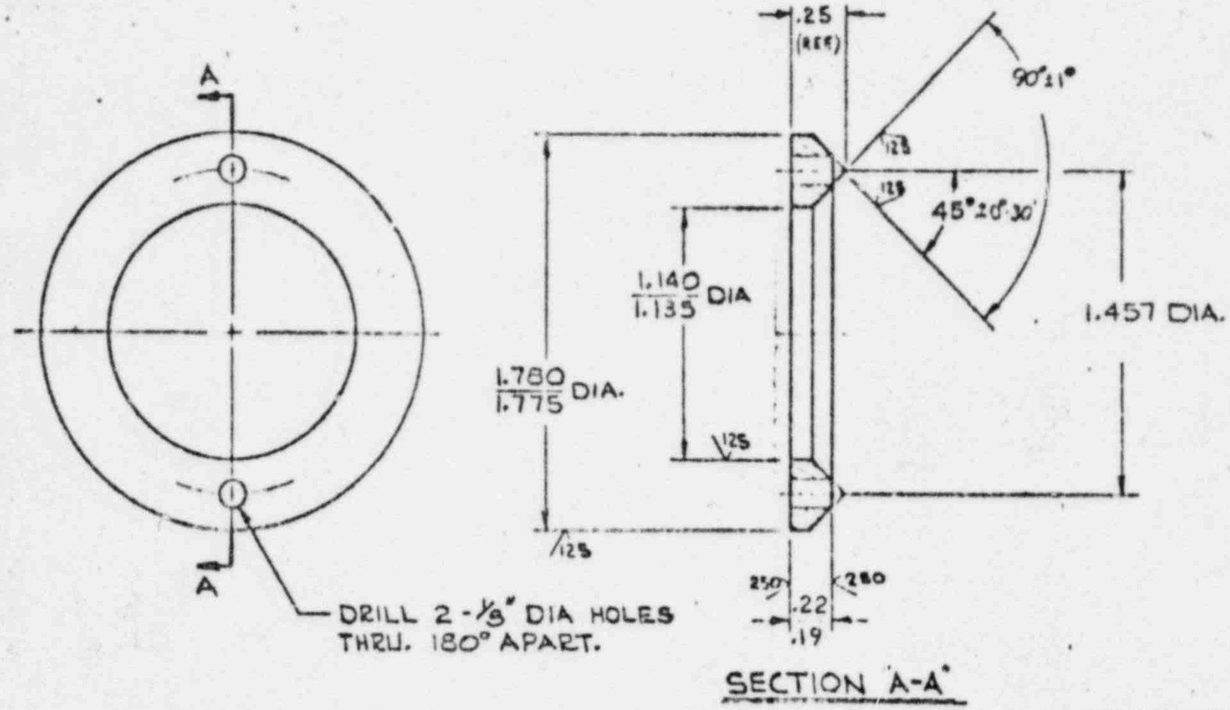
6. A composite packing using one *Grafoil* ring and *J-C 1625GF* for the other rings will greatly reduce the cost of a full *Grafoil* system, but at the probable expense of higher leakage and shorter service life.

The author wishes to thank the packing manufacturers for their assistance in conducting these tests. In particular, the cooperation of the Crane Packing Company and the Union Carbide Corporation is acknowledged, which enabled testing to proceed with minimum delay in several instances when additional test samples were needed.

ATTACHMENT #2

B-1[illegible]952

R | A B E G H IT K N | P R S T BA ME



GENERAL TOLERANCES

MACH. FINISH ✓

REMOVE SHARP EDGES

CHAMFER 1ST THREAD

Rockwell

2½" - 3628 J

FLG., LANTERN GLAND

SCALE 2X

B-182952

REV	CHG. NO.	DATE	BY	PART NO.	MAKE FROM	MATERIAL	REMARKS
				182952	—	04821	

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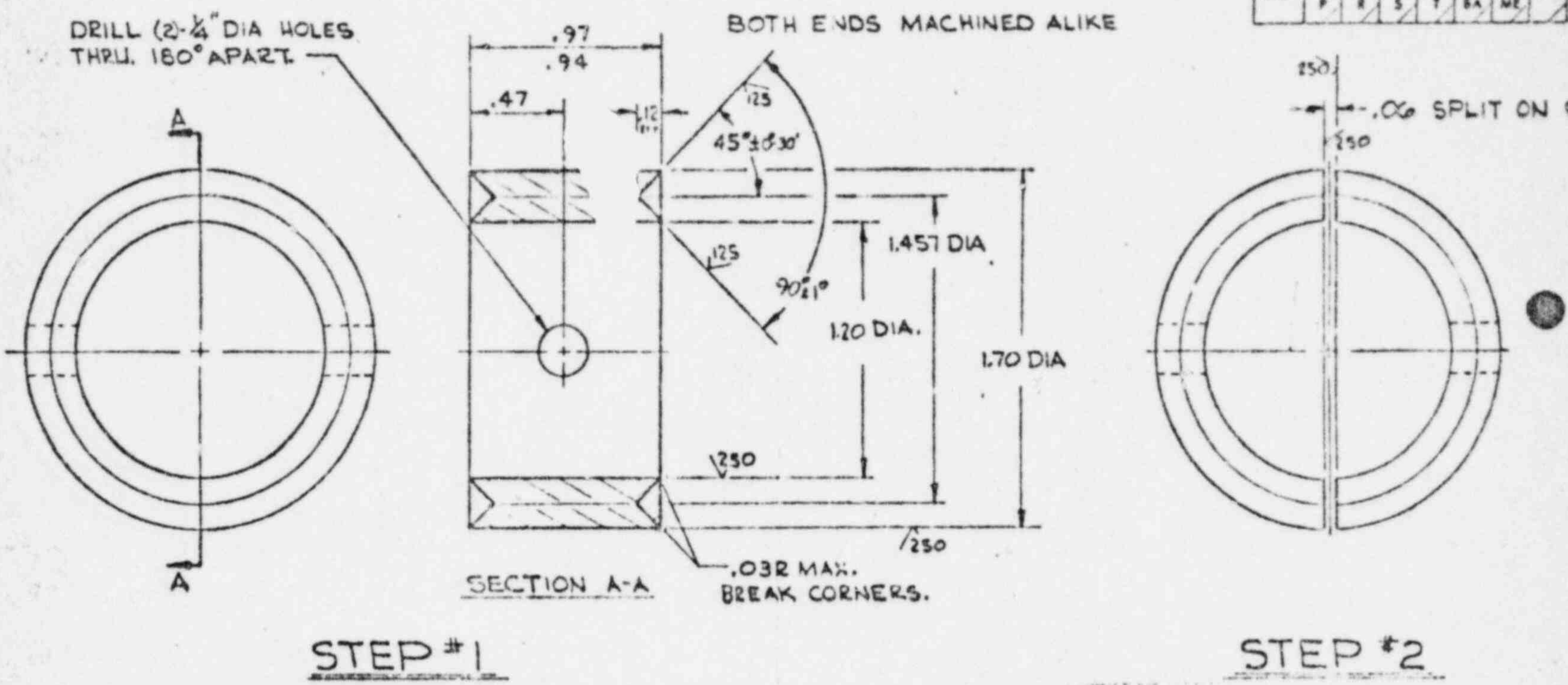
B-182953



REV	CHG. NO	DATE	BY	PART NO.	MAKE FROM	MATERIAL	REMARKS
				182954	———	02820	
				182953	———	02710	

GENERAL TOLERANCES

Rockwell

2 1/2" 3628 J

WEB, LANTERN GLAND

SCALE 2X

B-182953

PRINTED IN U.S.A.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: K. SCHROEDER - MANAGER - AUXILIARY SYSTEMS	
From: L. R. ALLEN, ASSOCIATE PROJECT MANAGER (EXT. 2310)	EDS 665-5
Cust.: DUKE POWER COMPANY	File No. or Ref.: 12E28
Subj.: PRESSURIZER - SPRAY VALVE	Date: 3/29/73

This letter to cover one customer and one subject only.

Reference: Memo R.G. Burnley to K. Schroeder dated March 16, 1973,
Subject : Pressurizer Spray Line Valve Leakage Problems
(RC-V1 & RC-V5)

The referenced memo summarized the observations made and the conclusions drawn during the site visit made by Messrs. Butt, Burnley, and Putzgruber. I feel that this visit was helpful and that this memo provides badly needed documentation to this problem.

I am attaching for your information, Product Specification M202 which describes Belfab's nuclear valve stem bellows. During a recent visit to Belfab I discussed this product with Chuck Turcotte and Bob Rhein. Belfab is currently fabricating several of these bellows, Model B150, for Copes-Vulcan. These valves will be installed in a Westinghouse plant. I was not able to determine the exact service of these valves, only that it was high pressure, high temperature, borated water service. I understand that these are globe valves in the 2 1/2" to 4" size range.

It may be worthwhile to pursue this with Copes-Vulcan in the event we continue to experience problems with the Rockwell valve.

L. R. Allen
L. R. Allen

LRA:ch
cc: W. C. Butt
R. G. Burnley
O. Putzgruber
R. L. Pittman
R. V. Straub

Attachment

9 Ittrs
RB
KEB
RLP

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

BDS 663-5

To	K. SCHROFLER - MANAGER - AUXILIARY SYSTEMS
From	R. G. BURNLEY - AUXILIARY SYSTEMS (2281)
Cust.	DUKE POWER COMPANY
File No. or Ref.	NSS-3/12M2 & NSS-3,4,9/8A30.41 Rockwell
Subj.	PRESSURIZER SPRAY LINE VALVE LEAKAGE PROBLEMS (RC-V1 & RC-V5)
Date	MARCH 16, 1973

This letter to cover one customer and one subject only

References:
1. SPR-444 File 12M2
2. SPR-461 File 12M2
3. SPR-496 File 12M2
4. Ltr. DPCo. to G.E. Kulynych 1-12-73 - Rockwell Valves
5. Memo R.G. Burnley to L.R. Allen 2-12-73, File 12M2
6. Telecopy Memo B.L. Day to L.R. Allen 3-12-73

The writer, W.C. Butt, and O. Putzgruber were at the Oconee Site Tuesday afternoon March 13 and most of Wednesday March 14 to assist in assessing the application of the two B&W valves in the Pressurizer Spray Line and to formulate a resolution to the latest leakage problem covered by SPR-496 Rev. 1.

Briefly summarized, the references above have covered numerous problems including broken stem/disc assemblies, cracked seat, damaged operator parts, repacking problems and excessive stuffing box leakage. The latest problem was excessive leakage through the stuffing box and out the stem leakoff connection.

In addition to the Auxiliary Systems personnel, the following personnel were involved in several discussions at different times to come up with a resolution:

- Clint Summerall - Rockwell Sales
- Neil West - Rockwell Service Engr.
- James Sigman - DPCo Maintenance
- R.J. McConnell - B&W Site Service
- B.L. Day - B&W Site Service
- Bob Baker - B&W Site Service

Upon arrival at the site, we went to the area where the valves are mounted. The two Rockwell people, two Duke Maintenance workers and B. Day were already there removing the Grafoil packing. B. Day had already checked the accessible area of the valve stem with a dial indicator by manually actuating the operator. In the area checked, there was one point of .001" runout detected and this could have been some grease or foreign matter on the stem. It was concluded that the stem is not bowed or out of alignment in the area checked.

One interesting observation made by both Duke and B&W site per nel is that prior to and during the first hot functional test, there were no leakage problems. During this time, the stem leakoff connections were either capped or welded closed. The leakage began after the leakoff connections were hooked up. This may or may not be significant. To speculate, it could be that during the first tests the additional packing above the lantern gland was sufficient even though there was some leakage up through the first set of packing rings. It may be that the lantern gland and stem leakoff are not necessary. As previously discussed, the letdown cooler valves have not leaked excessively and the stem leakoff is plugged. Mr. Sigman has suggested to Duke Engineering that a small manual valve be added in the leakoff line for isolation to find out if the packing will hold without stem leakoff open.

A verbal report has just been received from B. Baker, B&W Site (3-16-73, 0800 hrs) that the repacking and testing has been completed. There is no leakage @ 1000 psig applied on the stuffing box. RC-V5 will be checked in the same manner and if there is leakage, it will be repacked using the same procedure as used for RC-V1.

RGB:ebc

R. G. Brumley

cc: LR Allen
WC Butt
BL Day/B Baker
J Ittner
GE Kulynych
R Pittman
O Putzgruber

As far as possible, the stem area in the stuffing box was visually inspected and no scoring of the stem was observed. Note that it is not possible to see the stem area in the lower stuffing box. We later tried to observe this area with a Fibrescope, but this was not successful. There is no reason to suspect stem scoring in the lower stuffing box since it was previously concluded that scoring occurred in the lantern ring zone.

During several discussions Wednesday, March 14, it was confirmed by Mr. Sigman that Grafoil had been installed, but no procedure was used to assure conformance with the recommendations of Union Carbide, the manufacturers of this packing. Without some special tools for compressing this material, it is not possible to install properly in valves with deep stuffing boxes, lantern gland, and gland nut arrangement such as we have. It was concluded that the valve had been packed improperly and this was the cause of excessive leakage.

The plan of corrective action is as follows:

1. Duke will make necessary tools as required to pack valves using Grafoil.

   NOTE: It is Duke's decision to use Grafoil packing.

2. Valve is to be packed in the prescribed manner as recommended by packing manufacturer.

3. Check torque to assure each gland nut is tightened equally.

4. Cycle valve by hand and check stem alignment using dial indicator.

5. Pressurize packing chamber through stem leakoff connection with portable hydro pump:

   a. Pressurize to 500 psig, hold and cycle. Check for leakage.

   b. Increase pressure to 1000 psig, cycle and check for leakage.

   After each cycle, it may be necessary to further tighten gland nuts. This should be done in accordance with packing manufacturer's recommendations.

This procedure and testing are to be observed by B&W with the results documented and reported upon completion. The real proof of the packing efficiency cannot be checked on this valve until the system is back to temperature and pressure.

We do not believe there is any reason for disqualifying the Univalve for service in the spray line. The inlet and outlet valves for the letdown coolers are identical with the exception of a smaller Limitorque, and there are no reports of excessive leakage. The operation of RC-V1 is slightly different in that it goes to 40% open whereas the letdown valves are either fully open or fully closed. However, the 40% travel should not be of concern because the stem moves only about 3/4" of its total stroke of 1 7/8."

LONGHAND MEMORANDUM — THE BABCOCK & WILCOX COMPANY

Bob Burnly — R L PITTMAN

R.J. Baker

CUST. Duke ~~Power~~ Co.

SUBJ. SPR-444

Packing RC-V1 with Grafoil packing

FILE NO. OR REF.

DATE 3/16/77

The following is the procedure actually used to pack and test RC-V1.

1. The valve was packed using the attached recommended procedure. The thickness of each ring of packing was 1/4" before being compressed. The valve after being packed has 11 rings below and 3 rings above the lantern ring. The lantern ring is lined up with leak off hole. This was verified by inserting a stainless steel wire into the leak off line and having contact with metal. The torque on the packing gland nuts after packing was 40 ft lb.

2. A hydro pump (manual) was connected to the leak off line and using demin water, the lantern ring space was pressurized to 500 psi and 1000 psi and held at each pressure for 5 min. No leakage was observed and no decrease in hydro pressure was seen.

3. The pressure was reduced to 500 psi and the valve was cycled two times electrically. No leakage was observed and the gage remained at 500 psi.

4. The pressure was increased to 1000 psi and again the valve was cycled fully two times electrically. After 10 min, no leakage or pressure drop was observed.

LONGHAND MEMORANDUM THE BABCOCK & WILCOX COMPANY

TO

FROM

CUST.

FILE NO. OR REF.

SUBJ.

DATE 3/11/73

5. The pressure was dropped to 0 psi and the hydro pump disconnected. Today, Duke ~~plans~~ plans to insert a small piece of tubing into the leak off line and blow the water out with filtered air. This should prevent the water from corroding the stem.

6. The packing gland nuts were rechecked and found to be at about 20 ft.lbs torque after the hydro, so the nuts were retorqued to 40 ft.lbs.

The actual time required to repack this valve with two men was about 45 hours (15 hrs to remove the old packing and 30 hrs to install new packing).

Because this packing procedure takes so long, it requires near constant supervision to prevent short cuts from being taken.

CC SPK
RLP

RECOMMENDED PROCEDURE

Installation of Preformed Laminated GRAFOIL Rings For Nuclear Valve Packing

GRAFOIL is a new, flexible and resilient form of graphite produced by Union Carbide Corporation. When laminated and machined in ring form, it has been found to be an exceptionally high performance valve packing material. This type of packing is unlike any other packing material; therefore, to achieve optimum valve sealing, these instructions must be carefully followed.

Inspection of the Valve Chamber and Valve Before Packing.

1. The housing must be clean and free from extraneous material before packing with GRAFOIL. If packing a new valve, wiping with a clean rag should be sufficient. If repacking a previously packed valve, care should be used to remove all old packing. The use of corkscrew types of packing tools to remove old packing is not recommended since it is likely to result in scored stems. Hook pick types of packing removal tools are preferred. An air blast may be advantageously used to remove all loose material. Inspection should be made of all packing surfaces in the valve, especially the stem finish.

2. Recommended finishes on the stem are 32 RMS or better for hand operated valves and 16 RMS or better for control type valves. Scratches and pits on the stem will considerably increase the probability of leakage, since the GRAFOIL will [illegible] to these non-smooth surfaces and be torn in subsequent valve operations.

3. Recommended finishes for the valve housing I.D. are [illegible] RMS or better. Although the contact of GRAFOIL with this surface does not require a moving seal, the packing must mold into the [illegible] and be compressed there. Too rough a housing finish will [illegible] excessive gland pressure for correct compressive [illegible] to prevent leakage around the outside of the packing.

4. Radial clearances in the packing box from stem to wall must not exceed 0.020" radially. This applies to the bottom of the packing chamber and also to any lantern ring clearances. Radial clearances greater than the recommended 0.020" can result in extrusion of the GRAFOIL into the annular space under compression with destruction of the lamellar structure of the packing ring. Correction of excessive radial clearances in existing valves may be made by the use of an anti-extrusion washer (junk ring) made from a compatible metal or carbon. The use of a carbon ring will remove any chance of the washer welding to or galling the stem finish. Care must be taken in the case of metal washers with respect to thermal expansion of the stem and housing under service temperature conditions. The use of asbestos types of anti-extrusion rings are

not recommended since with aging this type of material can form particles of asbestos which may work [illegible] between the packing and stem. This condition [illegible] result in abrasion of the stem and progressive [illegible].

Inspection of GRAFOIL Packing Rings.

1. Rings of packing are generally shipped in [illegible]. Split rings are sealed in the bags [illegible] and should be installed in the valve chamber [illegible].

2. Packing rings are designed dimensionally for interference fits to both valve stem and box I.D. [illegible] for proper sealing. If the ring drops loosely into the box [illegible] the application of pressure, poor sealing will result and the ring should not be used.

3. The number of GRAFOIL packing rings supplied in a packing set are sufficient to more than fill the packing housing as designed by the valve manufacturer. The use of anti-extrusion rings at the bottom of the packing housing and at either side of the lantern rings (if any) may result in spare packing rings. These may be collected and used on other valves of the same dimensions.

Packing Procedure.

1. Back-seat valve or bleed off all line pressure.

2. Remove gland nuts, flange, gland, and any lantern rings.

3. Remove all old packing (if repacking) and blow out chamber with compressed air.

4. Inspect chamber as recommended above for scratches and pits.

5. Install anti-extrusion ring if necessary (see above, Inspection of Valve Chamber, Step 4).

6. Gently ease one packing ring (or one set of matching halves if a split ring is used) into the entrance chamber. The gland ring or equivalent must be used at this point. Do not poke or prod the packing ring with pointed tools. The interference fit of the ring into the chamber requires that care be taken at this point to uniformly press the packing ring to prevent cracking and [illegible] damage to the ring. If the ring is split, place the first ring in the chamber with the beveled ends facing up. Place the second split ring into the chamber with the beveled ends facing down. Make sure the split in each packing ring is staggered 45° to 90° so that the splits on succeeding rings are not aligned.

7. Using a split ring follower (for example, a piece of [illegible] radial dimensions cut lengthwise), press the rings to the [illegible] of the chamber. Do not attempt to [illegible] more than two [illegible] at one time as the pressure applied may [illegible] the lower rings and to densify them.

8. With the split ring follower (or the gland if [illegible]) in place, replace the gland flange and gland [illegible] set of two rings to at least a unit load of [illegible] lbs. torque for most packings) uniformly. [illegible] molds the rings to the stem, chamber wall and uniformly [illegible] all rings.

9. Remove gland nuts, gland, and split follower (if used) and repeat Steps 6, 7, and 8 until housing is completely packed. [illegible] rings and anti-extrusion rings must be installed in such a manner to assure that drain location in chamber wall ends up opposite the lantern.

10. When packing chamber housing is totally full and gland and gland nuts are in place, compress the packing to such a [illegible] that the final height of the packing in the gland is 60 to 75% of the original uncompressed height. (Corrected for any anti-extrusion rings and lantern rings used.) This last compression [illegible] that a load has been placed on the rings to [illegible] density into the elastic region, assuring a good seal.

11. One or two additional rings of packing may be added if the final compression step seats the gland flange to the chamber [illegible]. The gland flange should be free from seating by 1/8" or more.

12. Operate the valve two full cycles (open to close to open or closed to open to closed is considered a cycle). [illegible] fly type valves operate a complete [illegible] packing and reverse 360° to effect a cycle.

13. Pressurize the packing and check for leakage. If necessary, tighten by turning each gland nut one-fourth (1/4) turn and recheck for leakage. Repeat if necessary until leakage is stopped. If it is necessary to tighten the packing after Step 12 [illegible] the valve one cycle after each tightening.

The above torque values, 30-40 ft. lbs., are based on well lubricated threads.

The above procedure is based on normal expected conditions and may have to be modified. The basic sealing properties of preformed [illegible] packing rings depend on interference fit, stem and chamber wall, followed by sufficient [illegible] compression to densify, reform and hold the ring in the [illegible]. [illegible] gland pressure, working the packing material in the elastic condition, then affords the sealing action.

I.copy to:
Larry Allen
3-12-73

Supplementary Information to SPR's 444
447
496

RC-V1

1. First Failure

Symptom - Gross leakage through packing - excessive travel.

Inspection: Button sheared from end of stem - stem no longer connected to plug. Stem scored by lantern gland ring. Yoke nut stripped.

Action: Replaced valve internals, yoke and yoke nut.

Evaluation: Limitorque improperly set up. Backseating on torque switch. Reset to shutoff on limit switch so as not to coast into back seat. Backseating to be done by hand. Some cycles on new internals prior to resetting operator.

Comments: Both yokes were loose in the threads on the valve body. Stem scoring attributed by Rockwell (Ray Green) to mis - alignment.

2. Second Failure

Symptom - Valve stuck shut.

Inspection: Stem had to be cut to permit dis-assembly. Seat in body and on plug damaged. Stellite gone on one side of plug. Stem scored by lantern gland. Backseat damaged. Limitorque gears damaged.

Motor side of clutch in close direction per sketch. Hand wheel side of clutch in open direction (no heat marks) in similar condition. Handwheel damage probably occured during attempts to backseat valve during 1st failure. Yoke nut destroyed during disassembly.

Action: Lapped in seat. Replaced plug & stem. Refaced limitorque operator mounting plate to improve alignment. Repacked with "Graffoil". and installed split lantern ring. Repaired operator.

Evaluation: Possibly partial engagement of clutch on motor gear allowed slippage and repeated hammer blows to drive valve into seat without opening torque switch. Heat marks and damage to limitorque gears suggest this. Operator would eventually stop on thermal overloads.

Comments: Ray Green (Rockwell Engineer) stated that he still suspects mis-alignment. No way to measure with valve installed. Operate and inspect stem for repeated scoring. Stem scoring & loss of stellite are symptoms of mis-alignment. Fix is to replace yoke if mis-alignment confirmed. Yoke has already been replaced once. DPC. maintenance personnel report that both yokes were loose in the threads and the threads would not provide alignment. Top of yoke was bowed due to excessive stem thrust. New yoke nut would not screw in until threads were partially machined away.

3. Third Failure

Symptom: Gross packing leak (1st Set Only)

Inspection: To begin Tuesday 3/13 with Rockwell service man. Observation of operation gives impression (no quantitative measurement) that stem is whipping as it rotates and is moving lateraly at the valve seats.

BLD/elc

cc: E. R. Kane
B. L. Day

Telecopy to Larry Allen.

Copy to each SPR involving RC-V1

Copy to Nuclear Service Support Engineer.

L. F. Pittman

Babcock & Wilcox

Power Generation Division
P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (703) 384-5111

February 6, 1973

B73-034

Mr. S. K. Blackley
DUKE POWER COMPANY
P. O. Box 2178
Charlotte, N. C. 28201

Attention: Mr. T. F. Wyke

Subject: Oconee 1, 2 & 3
Rockwell Valves

Reference: Duke letter dated January 12, 1973, Sbj: Rockwell Valves

Gentlemen:

The following is submitted to comments made on the subject valves in the referenced letter:

1. Stem Material: The stem material of valves supplied by Rockwell is ASTM-A461, Grade 630. This material is not a ferritic stainless steel. It is, however, a precipitation hardened 17-4 pH material. This type material is used in numerous other places in the reactor coolant system and is considered to be completely compatible with boric acid solutions at high temperatures. For this reason we see no reason to pursue stem placement on the subject valves.

   In addition, Rockwell is supplying a replacement for the damaged stem from 1 RC-V1. The replacement stem will be ASTM-A638, Grade 660. We have reviewed this material for this application and find it to be acceptable.

2. Scored Stem: The scored stem from 1RC-V5 was visually examined by B&W and Rockwell personnel at Rockwell's Raleigh Plant. The stem was compared with a full sized detail drawing. Considering the location of the scored portion, the relative locations of the junk ring, the lantern gland, and the travel distance of the stem, the scoring had to occur in the lantern ring zone. The exact cause of the scoring is not known, however, it is highly probable that it was the result of the stellite lantern ring being cocked in the stuffing box. Rockwell personnel stated that they had not seen this type of damage before. They further stated that the lantern ring could have been installed in a cocked position at the factory or after repacking in the field. There was no evidence of wear or indications on

Pittman

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: L. R. Allen - Associate Project Manager - Reactor Contracts	
From: A. L. Lowe, Jr. - Materials-Development - Component Engr.	(2170) BDS 663.5
Cust.: Duke Power Company	File No. or Ref. NSS-3 SPR444/1 12H2
Subj.: Rockwell Valve Stem Material	Date: January 23, 1973

This letter to cover one customer and one subject only.

Reference: Memo From R. L. Pittman To L. R. Allen, Subject: Rockwell Valves, File No. As Above, Dated 1/22/73.

I would like to clarify the statement in the above referenced memo concerning valve stem material.

The currently used material is 17-4 PH which is a precipitation-hardening stainless steel that was probably purchased to ASTM A-461, Grade 630. Although a stainless steel, it is only a distant cousin to Type 304 stainless steel. The 17-4 PH is considered compatible with the borated water environment of PWR's provided it is in the proper heat treated condition, (i.e., Condition H1150).

The ASTM dropped the A-461 specification and replaced it with a new specification for 17-4 PH. This new specification is A-564 but is so new that it did not make the 1972 Edition of the ASTM Standards. Because of this change in specifications, the vendor apparently has chosen a readily available new alloy for the stem. This new alloy is included in ASTM A-638 as Grade 660. The material is known commercially as A-286 Alloy which we use for several applications in our nuclear systems. The alloy is a stainless alloy, but its only similarity to 17-4 PH is the fact it is precipitation-hardening.

Please keep Duke Power Company correctly informed.

ALL,Jr./ja

cc: R. R. Beach
R. G. Burnley
J. C. Deddens
H. Hennicke
J. P. Ittner
G. E. Kulynych
R. J. McConnell
R. L. Pittman
R. V. Straub
G. T. Fund
S. S. Walker
Files

File NSS- 3

1212-SFR- 444/2

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To W.C. BUTT - NSE For Action
R.G. Burnley - NSE

CONTRACT 620-00 03

SFR 444/2

TITLE RCV STEAM LEAK

To R.J. McConnell - S.C.M. For Information
J. Kaelin
J. Kennedy
K. Suhrke
H. Worsham
T. Sund - Purch

DATE 1-23-73

Date Reply to Be Submitted To Nuclear Service Support Engineer
Feb 1, 73

Action Requested: W.C. Butt IS REQUESTED TO Review this SFR and advise Nuclear Service on what action will be taken to resolve this problem.

R. L. Pittman Jr.
Nuclear Service Support Engineer

cc: G. E. Kulynych
E. G. Ward
G. M. Olds
R. T. Schomer
N. S. Embrey
J. McFarland
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance
STEVE DEW
O. Puttsgruber

MANHOUR LIMITS ~~SFR~~
COST LIMITS ~~See SFR~~
CHARGE No. ~~461~~
APPROVED: J. R. Allen
Project Manager

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To
L. B. ALLEN, ASSOCIATE PROJECT MANAGER

From
F. L. PITTMAN, NUCLEAR SERVICE (2805)

BCS 663-5

Cust.
DUKE POWER COMPANY

File No. NSS-3 SFR 444/1
or Ref. 12M2

Subj.
ROCKWELL VALVES

Date
JANUARY 22, 1973

This letter to cover one customer and one subject only

Reports from the B&W site office have indicated that doubts are being expressed by some parties, concerning the compatibility of the stem material in our RC-V5 and RC-V1 with borated water.

Since this question has arisen, a complete review of these materials has been conducted.

These valve stems were manufactured from a 304 stainless steel; precipitation hardened to further enhance its strength characteristics. Upon completion of this hardening process, this material met all requirements of the ASTM 461, Grade 630. In summary, this material is a 17-4 pH stainless steel, which is considered compatible with high temperatures and borated water.

An order has already been placed with the Rockwell Corporation to furnish a replacement stem for RC-V1 which was damaged during hot functional testing. Since the original stem material is no longer available, it will be necessary to furnish a similar grade of 17-4 pH stainless steel, which meets the requirements of ASTM 638, Grade 660, and is considered by our Materials personnel as being acceptable for its proposed application.

Preliminary failure analysis to determine reasons for failure on 1-RC-V1 is that it was caused by a faulty limit switch setting. I have been advised by our Engineering Department that this is a setting performed in the field by the customer, which should alleviate B&W of any liability for this problem (SFR 444/1).

Please advise Duke Power Company of this matter.

FLP:mw

cc: B.B. Beach
P.G. Burnley
J.C. Deddens
E. Hennicke
J.F. Ittner
G.E. Kulynych
A.L. Lowe
E.J. McConnell
E.W. Straub
G.T. Sund
S.B. Walker

Pittman

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: R. G. Burnley - Auxiliary Systems	
From: A. L. Lowe, Jr. - Materials-Development - Component Engr.	(-.73) BDS 663-3
Cust.: Duke	File No. or Ref. NSS-3/8m30.41 Rockwell
Subj.: Valve Stem Materials-Spray Line Valve RC-V1	Date: January 17, 1973

This letter to cover one customer and one subject only

I have reviewed Rockwell Manufacturing Company's proposed replacement stem material ASTM A638 Gr. 660 and find it acceptable for the proposed application.

Should they wish to continue to use this replacement stem material, I would recommend that it be specified in accordance with ASTM A564-72, "Hot-Rolled And Cold-Finished Age-Hardening Stainless And Heat-Resisting Steel Bars And Shapes."

I expect that one of their reasons for wanting to change this material is that they were not aware of the new specification covering Gr. 630 alloy.

ALL, Jr./ja
cc: L. R. Allen
D. F. Levstek
B. N. McDonald
R. L. Pittman
K. Schroeder
Files

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To A. L. Lowe - Principal Materials Engineer

From R. G. Burnley - Auxiliary Systems (2251)

Cust. Duke

Subj. Valve Stem Material - Spray Line Valve RC-V1

This letter to cover one customer and one subject only

File No. or Ref. Rockwell NSS-3/8A30.41

Date January 16, 1973

Due to damage that occurred to the original stem due to an improper set limit switch, the stem for the subject valve must be replaced.

The original stem material was furnished to ASTM A461 Grade 630. This ASTM spec was discontinued in 1971 and was replaced by A637, A638 and A639.

Rockwell Mfg. Co. proposes to furnish a replacement stem to ASTM A638 Gr 660. Maximum design conditions for the location of this valve (spray line to pressurizer) as 2500 psig @ 670F. Normal operation will be ~2200 psig @ 555 to 580F.

Please review this proposed valve stem material and let us have your recommendations, Per Al Manual, procedure NPG-0408-08.

Mr. Larry Allen, Proj. Mgmt., has given verbal approval for time required to be charged to 620-0003-98-05.

RGB:ebc

R. G. Burnley

cc: LR Allen
K Schroeder/WC Butt
RL Pittman

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: Distribution	
From: R. L. Pittman, Nuclear Service (2805) RLP	BDS 663-5
Cust.: Duke Power Company	File No. or Ref. NSS-3 SPR 444 12M2
Subj.: Rockwell Valves (SPR 444- NSS 3)	Date: January 15, 1973

This letter to cover one customer and one subject only

Distribution

R. R. Beach
J. P. Ittner
G. E. Kulynych
L. R. Allen
R. V. Straub
R. G. Burnley
R. J. McConnell
H. Hennicke
G. T. Sund
S. S. Walker
J. C. Deddens

On 1-12-73 a conference call was placed to the Rockwell Corporation in Raleigh, North Carolina to discuss the problems which have been recently experienced at the Oconee site.

The following personnel participated in the call from B&W:

L. Allen
R. Burnley
T. Sund
S. Walker
R. Pittman

The call was placed to Harry Crane, Dick Lawson and Jim Morris, all assigned to the Rockwell plant in Raleigh.

Among the several items discussed, Mr. Crane was informed of the immediate requirement for replacement parts to repair RC-V1 on Unit II, since parts had been removed from this valve during HFT to repair the damaged valve on Unit 1. Dick Lawson replied that spare parts for this valve were not stocked and it would require 3-4 months for machining and delivery unless it was of such urgency as to necessitate hand carrying them through the shop. Since these parts shall be used on 2 RC-V1, a target of one month was requested. Mr. Crane was advised that a Rockwell Service Engineer is requested to be at the Oconee site to re-assemble 2 RC-V1 when the parts are ready for shipment. Mr. Crane stated that the cause for failure on 1 RC-V1 was determined to be a faulty limit switch on the operator and that since this is a setting made by the customer, Rockwell is considered relieved of the financial responsibilities associated with this incident. This point was mutually agreed upon by both parties and a written report of this failure analysis was requested and promised for immediate delivery.

Mr. Crane was then reminded that there are at least 83 Rockwell valves at the Oconee job site that cannot be repacked with the operator in place and B&W is awaiting a solution to this apparent design discrepancy. It was explained to us that a lantern ring similar to the existing one shall be utilized except that it will be in four pieces so it may be lifted up and removed from the valve allowing easy access to the lower packing rings. Mr. Crane was advised that this was considered by B&W as a Rockwell responsibility, and we needed an estimate of time involved before the correction will be made. He also agreed that the responsibility associated with this problem belonged to Rockwell and that they will make every effort to have these lantern rings machined and delivered to the job site during the first week of February, 1973. However, this is the plan for only 12 of the 83 valves concerned (the 2½" valves) because the remaining 1" valves were produced at the Rockwell plant in Sulphur Springs, Texas. Tom Sund agreed that he will contact the local Rockwell sales representative to coordinate the same solution for this problem on the remaining Rockwell valves, as agreed upon for the 2½" valves.

The next item presented to Rockwell was "that we question the ability to repack these valves in service by back seating them" as was specified by B&W when they were ordered. They were informed that two holes are in each disc plug which will seemingly allow system pressure inside the plug and into the area of the packing thus preventing packing removal under pressure. Dick Larsen explained that this valve has two backseats; one in its usual location and the second on the end of the stem, seating against the underside of the disc nut which prevents system pressure on the packing gland when the valve is backseated. According to the drawing of this valve it appears that this would indeed perform as Mr. Larsen had stated. Hart Hennicke has now informed me that when 1 RC-V5 was disassembled, that the backseat apparently would not seat because there was a sufficient amount of steam coming from the packing gland cavity to cause concern. If it is determined that other valves of this type are also leaking past the backseat, then it must be resolved with Rockwell. This should be established by the site if probable, considering other scheduled committments.

Mr. Crane was advised that as soon as 1 RC-V5 is cut from the system it shall be returned to him for repairs to the cracked seat. It is his opinion that this valve can be readied for return to the site within 3-4 months. Meanwhile, the valve from Unit III will be borrowed and installed in Unit I. It was mutually agreed that responsibility for this valve belongs to Rockwell.

Finally, Jim Morris stated that the stem material originally used to machine RC-V1 was no longer available (ASTM 461, grade 630). He stated that this material was a 316 SS, precipitation hardened, further enhancing its strength characteristics and meets the specifications of ASTM 461, grade 630. The new stem will be made from a similar material that is also considered acceptable for use with high temperatures and high concentrations of boric acid. The orginial material is a 17-4 ph SS, thus suitable for its application.

RLP/cs

LONGHAND MEMORANDUM THE BABCOCK & WILCOX COMPANY

TO
SPR #44/1 File

FROM
R. Pittman

CUST.
DUKE Power Co.

SUBJ.
RCV-1

FILE NO. OR REF.
NSS3 SPR #44/1

DATE
1-12-73

Internals from RCV-1 (Unit 2) was used to replace the damaged ones on Unit I. Parts are being made to reassemble the Unit II valve.

R. Pittman

File NSS- 3
1242 - SPR - 444

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To R.G. Burnley - NSE For Action
T. Sund - Purch.

To R.J. McConnell - S.D.M. (2) For Information
J. Kaelin - ARK
J. Kennedy - SMUD
K. Suhrke
H. Worsham
G.E. Kulynych
E.G. Ward
G.M. Olds
R.T. Schomer
J. McFarland
C.C. Plunkett - Contract Admin.
Central Engineering Files
H.F. Dobel - Quality Assurance

CONTRACT 620-00 -03
SPR 444
TITLE RCV STEAM Leak and DAMAGE
MANHOUR LIMITS
COST LIMITS
DATE 1-9-73
CHARGE NO.

ACTION REQUIRED Bob Burnley and T. Sund are requested to review the initial specs required by B&W and determine if B&W received the valves as they were specified i.e (cannot repack w/o removing the operator) A meeting shall then be arranged to decide what course of action will be taken to resolve the problem on this "and" the other valves listed in this SPR with the same problem. Rockwell Rep is on site.

DATE FOR ACTION TO BE COMPLETED ASAP

RECOMMENDED R. L. Pittman
Nuclear Service Support Engineer

cc:
STEVE DEW
O. Puttsgruber

APPROVED [signature]
Project Manager

MAN HRS	CHARGE NO.
16	620-0003-28-41

File NSS-3
12M2-SPR-444

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To R.E. Ham - C.E. ~~For Action~~

To R.V. Straub - PM For Information
J.N. Kaelin - SOM
J.P. Kennedy - SOM
R.J. McConnell - SOM
K.E. Suhrke - Mgr. Field Eng.
G.E. Kulynych
E.G. Ward
G.M. Olds
R.T. Schomer
J. McFarland
C.C. Plunkett - Contract Admin.
Central Engineering Files
E.F. Dobel - Quality Assurance

CONTRACT 620-00 03
SPR 444
TITLE RC-V1 Steam Leak
MANHOUR LIMITS
COST LIMITS
DATE 1/3/73
CHARGE NO.

ACTION REQUIRED

After discussion with Bob Ham concerning possible damage to the spray nozzle, it was resolved that no damage was done considering the ΔT existing at the time. This should resolve this SPR and the Site should clear SPR-444 REV 00 upon reciept of this transmittal.

DATE FOR ACTION TO BE COMPLETED

cc: R.G. Burnley - S.E.

Stanley S. Walker
Nuclear Service Support Engineer

File NSS-3
1242-SPR-444

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To R.E. Ham - C.E. For Action

To R.U. Straub - PM For Information
J.N. Kaelin - SOM
J.P. Kennedy - SOM
R.J. McConnell - SOM
K.E. Suhrke - Mgr Field Eng
G.E. Kulynych
E.G. Ward
G.M. Olds
R.T. Schomer
J. McFarland
C.C. Plunkett - Contract Admin.
Central Engineering Files
H.F. Dobel - Quality Assurance

CONTRACT 620-00 03
SPR 444
TITLE RC-V1 Steam Leak
MANHOUR LIMITS
COST LIMITS
DATE 12/29/72
CHARGE NO.

ACTION REQUIRED

R.E. Ham is requested to investigate the possibility of damage to the spray nozzle as a result of the operations performed to stop the steam leak on RC-V1.

DATE FOR ACTION TO BE COMPLETED ASAP after HFT

cc: R.G. Burnley

Stanley S. Walker
Nuclear Service Support Engineer
J.R. Allen

FD71007-4 (6-72)

REQUISITION -- EQUIPMENT & SERVICES — BABCOCK & WILCOX NPGD

TO: Purchasing	Date: 1/12/73	Serial No. NS33/435-00

FROM: Contract [x] FDO [ ] Proposition [ ] Other [ ]

Contract, FDO or Proposition No.	Comp No.	Group No.	Seq No.	
Contract	28	41	1	[ ] Normal Cost [x] Abnormal Cost

If Abnormal Cost: Charge No. 620-00003-98-05

Customer: Duke Power Company

Req. for Quotation [ ] Placement of Order [ ] Change Order [ ] Mfg Release [x] Other [ ]	Attachments SPR 444/1

Please issue a purchase order to Rockwell Corp. to manufacture the following parts to be used as replacements for the ones removed from RCV-1 on Duke Unit II.

1. disc
2. disc nut
3. stem
4. lantern gland
5. Junk ring
6. gland
7. yoke bushing
8. stem adaptor
9. set of packing

When these parts are ready for installation we shall require a service engineer from Rockwell at the site for rebuilding this valve as well as making the proper operator limit switch adjustments.

Any charges which have accrued up to this date as a result of Neil West's site visit and the failure analysis which is being forwarded by Rockwell should be included in this P.O.

Preliminary indications (telecon) has indicated that the reason for this failure is attributed to a faulty limit switch setting. Since this is a setting made by the customer, all charges associated with this problem should be back charged to Duke Power Company.

THIS MUST BE ESTABLISHED MORE FIRMLY BEFORE WE DROP CHARGES AGAINST VENDOR.

Page 1 of 1

Distribution	
Originator	R. L. Pittman
Unit Mgr.	R. R. Beach
Proj. Mgr	R. W. Straub
NPGD QA	E. W. Polwell
Mgr. Contract Admin. (NSS Only)	C. C. Plummer
Mgr. Fuel Contract (NSC Only)	
Contract File NSS-3	SPR 444/1 12M2 1283-98-05

Approvals		Date
Originator	R L Pittman	1-12-73
Mgr.	R R B	1/12/73
Proj. Mgr.	[illegible]	[illegible]

PDE-21063-

BABCOCK & WILCOX
POWER GENERATION GROUP - NPGD

REQUEST FOR C.D.G.L ORDER

DATE: 1/11/73 | CUSTOMER: Oconee I | CONTRACT NO: 620-0003

SCOPE OF WORK AND REASON:

Procure replacement internals for RC-V1 which were damaged as a result of incorrect limit switch setting by Duke.

REFERENCE: SPR 441-1

REQUIRED START DATE Jan. '73 REQUIRED COMPLETION DATE Jan. '73

OPINION OF RESPONSIBILITY:

VENDOR [ ] ______ VENDOR ______ P.O. NO.

B&W [ ] ______ RESPONSIBLE ORGANIZATION

OTHER [X] Duke Power Co. SPECIFY

WORK CATEGORY:

C (CORRECTIVE) [ ]
D (DESIGN CHANGE) [ ]
G (GUARANTEE) [ ]
L (LICENSING) [ ]
S (Suspense) X

ESTIMATED COST:

		MATERIALS	LABOR & EXP.	OTHER	TOTAL
ERECTION					
MANUFACTURING					
ENGINEERING	20 hrs. CC 350				300.00
VENDOR	Rockwell Mfg.				1,700.00
OTHER					
TOTAL					$2,000.00

DISTRIBUTION:

PROJECT MANAGER	G. E. Kulynych
MGR. CONTRACT ADM.	C. C. Plunkett
CONTROLLER, NPG	G. F. Boatright
MANAGER, NPG QA	E. V. DeCarli
UNIT MGR., NPG	K. Schroeder
*MGR., NUCLEAR SERVICE	J. C. Deddens
*PLANT MANAGER	
*SHOP MANAGER	
*QC MANAGER	
*MGR., SITE OPERATIONS	
*MGR., REACTOR CONTRACTS	
*GEN. MGR., FUEL DEPT.	
*PURCHASING MANAGER	R. A. Beal
*DEPARTMENT MANAGER	

*AS APPLICABLE

REQUESTED BY: R. L. Pitman 1/11/73

PREPARED BY: J. T. Williams 1/11/73

APPROVALS	SIGNATURE	DATE
PROJ. MGR.	[signature]	1/15/73
MGR. REAC. CONTRACTS		
MGR. NUC. SERV.		
GEN. MGR. REAC. DEPT.		
VICE PRES. NPG		

UPON APPROVAL OF THIS ORDER, CHARGE AUTHORIZED WORK AND COSTS TO THE FOLLOWING: 620-0003-08-05

MGR. CONTRACT ADM. [signature: J. T. Williams] SIGNATURE 1-15-73 DATE

REV. NO. -0-
REV. DATE

BOX 1795 6/72 3202

REQUISITIONER'S COPY

THE BABCOCK & WILCOX COMPANY

POWER GENERATION GROUP

P.O. Box 1260, Lynchburg, Va. 24505

ADDRESS

B63-1/435-00

REQUISITIONED BY & DATE

R. Pittman | 012273

PURCHASE ORDER

DATE	NUMBER
022773	B25966LR

TO

Rockwell Mfg. Company
400 N. Lexington Ave.
Pittsburgh, Pa. 15208

Attention: Mr. R. Boyle

SHIP TO

VENDOR NUMBER	CONTRACT NUMBER
	B20D0032581

THE REQUIRED DATE LISTED BELOW IS THE DATE MATERIALS/ITEMS ORDERED ARE REQUIRED AT DESTINATION IN U.S.A.

SHIP VIA | F.O.B. | TERMS OF PAYMENT

ITEM | QUANTITY | U/M | DESCRIPTION | FOLIO | REQ. DATE MO DA YR | SHOP | CWT | COMM CODE | UNIT PRICE | U/M | U/M

CONFIRMING PURCHASE ORDER TO J. C. MORRIS
RALEIGH PLANT.

Furnish the following replacement parts for valve mark RC-V1 furnished on B&W P.O. 614601S, subject to original terms & conditions.

1	Disc, disc nut & stem assembly	$523.00
1	Junk ring	31.35
1	Gland	32.75
1	Yoke bushing	22.55
1	Stem adapter	43.35
1	Set packing (9 rings)	17.45
1	Canopy ring	62.50
1	Lantern gland	N/C

Furnish sufficient amount of lantern glands, split design, for replacement of one (1) piece lantern glands on 2½" RV size valves. There is to be no additional charges to B&W for these lantern glands.

The above parts were received at the Duke Power job-site Thursday February 8, 1973.

Material Certs. for the disc and stem assembly are to be forwarded to B&W Lynchburg.

Furnish service representative to job-site for disassembly and reassembly of valve RC-V1. This was performed starting Fri. night February 16, 1973.

---continued on next page

PLEASE FURNISH THE ITEMS ABOVE TO THE TERMS & CONDITIONS ON BACK HEREOF.
ACKNOWLEDGE THIS ORDER PROMPTLY AND STATE DEFINITELY WHEN SHIPMENT WILL BE MADE.

SALES TAX STATUS [X] EXEMPT [ ] NON EXEMPT STATE N.C. NO. 1082

PURCHASE ORDER, CONTRACT, ITEM AND FOLIO NO. MUST BE SHOWN ON ALL PACKAGES, INVOICES, PAPERS AND DRAWINGS.

INVOICE IN QUADRUPLICATE SHOWING OUR PURCHASE ORDER NO., CONTRACT NO., ITEM NO., FOLIO NO., WHETHER PARTIAL OR FINAL BILLING AND MAIL TO THE ACCOUNTS PAYABLE DEPARTMENT AT THE ABOVE ADDRESS.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

BY ______________________
AUTHORIZED SIGNATURE

FOR INFORMATION REGARDING THIS ORDER PLEASE COMMUNICATE WITH OUR BUYER

REQUISITIONER'S COPY

THE BABCOCK & WILCOX COMPANY

POWER GENERATION GROUP

PURCHASE ORDER

DATE: 022773 NUMBER: 02596613

REQUISITIONED BY & DATE

VENDOR NUMBER CONTRACT NUMBER

ADDRESS

TO

Rockwell Mfg. Company
Page 2

SHIP TO

THE REQUIRED DATE LISTED BELOW IS THE DATE MATERIALS/ITEMS ORDERED ARE REQUIRED AT DESTINATION IN U.S.A.

SHIP VIA | F.O.B. | TERMS OF PAYMENT

ITEM | QUANTITY | U/M | DESCRIPTION | FOLIO | REQ'D DATE MO DA YR | SHOP | C/A | UNIT PRICE PER U/M | U/M

CHARGES FOR FACTORY SERVICEMAN

	Monday thru Friday	Saturday	Sunday and Holidays
Daily Base (8 hours)	$120.00	$180.00	$240.00
Overtime Rate, Per Hour	22.50	22.50	45.00

Minimum charge per day is the eight-hour base for the first day. On any following day when less than eight hours are worked, the charge per hour will be calculated at the overtime rate subject to a minimum charge of four hours and a maximum not to exceed the daily base for that day of the week.

In addition, all transportation and living expenses at actual cost.

PLEASE FURNISH THE ITEMS ABOVE TO THE TERMS & CONDITIONS ON BACK HEREOF.
ACKNOWLEDGE THIS ORDER PROMPTLY AND STATE DEFINITELY WHEN SHIPMENT WILL BE MADE.

SALES TAX STATUS ☐ EXEMPT ☐ NON EXEMPT STATE ______ NO. ______

PURCHASE ORDER, CONTRACT, ITEM AND FOLIO NO. MUST BE SHOWN ON ALL PACKAGES, INVOICES, PAPERS AND DRAWINGS.

INVOICE IN QUADRUPLICATE SHOWING OUR PURCHASE ORDER NO., CONTRACT NO., ITEM NO., FOLIO NO., WHETHER PARTIAL OR FINAL BILLING AND MAIL TO THE ACCOUNTS PAYABLE DEPARTMENT AT THE ABOVE ADDRESS.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

BY ______________________
AUTHORIZED SIGNATURE

FOR INFORMATION REGARDING THIS ORDER PLEASE COMMUNICATE WITH OUR BUYER

BWNP-20345 (6-78)

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

JUL 1 3 1978

To: Change Control For Distribution
S. H. Klein - Quality Assurance
Central Engineering Files
S.P. Lawrence - Task Engineer(s)
R.C. Luken - Project Manager

File: 13- 14 - 446
Contract No.: 620-00 14
SPR: 446 , Rev 0
Title: Upgrade CF Valves Documentation

Date: 6/30/78
Status Code: C

✓ L. C. Rogers - MET. ED.
✓ F. R. Faist - TOLEDO
✓ J. R. Bohart - Intl. Support
✓ B. A. Karrasch - Plant Integration
✓ P. E. Perrone

Attached is one copy of Site Problem Report No. 446 which was processed on Contract 620-00 14 . Future contracts have been reviewed for the potential of a similar problem. This problem ~~is~~/is not considered applicable to other contracts.

REMARKS:

COMPLETED

Joseph H. Seelch
NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

1820

TELECOPY TO TOM SCOTT   Cleared   PDS-21091-5(8-76)

SITE PROBLEM REPORT   FR Faist   BABCOCK & WILCOX   SPR #446

CUSTOMER	ORIGINATOR	DATE	DOC. ID.	CONT. NO.	SPR NO.	REV. NO.
Toledo Edison Company	F. R. Faist	5/15/78	13 -	620-0014	446	0

VENDOR	P.A. NO.	PART NO./TASK NO. GROUP NO. SEQ. NO.
Velan	023168LS	31/041/003-006

TITLE (MAX 30 CHARACTERS)	PROBLEM CONTACT
Upgrade CF Valves Documentation	F. R. Faist FR Faist

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM: See Attachment #1.

Req'd. Resolution Date: ASAP   Req'd. Completion Date: ASAP

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

C. Daft (TECo) advised site office of problem.
T. Scott aware of problem.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

1. Correct QA documentation.
2. Confirm what nameplates go on what valves, old serial number vs new serial number.

RESOLUTION

RESOLUTION:

attached is data package (Pgs 9 thru 17) from Velan which resolves the problems concerning the nameplates & documentation (original to be sent to site via NPGD QA)

PREPARED BY	DATE	APPROVED BY	DATE
J.D. Fulcher	6/8/78	R C Luken	6/9/78
REVIEWED BY: [illegible] for H B [illegible]	DATE 6/9/78		
[illegible] 6/9/78			

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
NONE ☐ NORM OTHER ☐	☐ YES NO ☑	CA- N/A	☐ YES NO ☑

COMPLETION

SITE COMPLETION REPORT: Revised QA documentation given to C. Daft, TECo. Nameplates are installed as noted on Column A, Attachment 1 of SPR.

DEVIATIONS: ☒ NONE   SPR REV NO. ☐

DATE COMPLETED: 6/19/78

COMPLETED BY F. R. Faist FR Faist   DATE 6/19/78

F. R. Faist FR Faist   6/19/78

2020

SHEET 1 OF 17

SFR #446 - Attachment #1
620-0014
5/15/78

Description of Problem:

References: 1. Memo, J. Lauer to C. Armontrout, January 9, 1978, "Upgrading of CF Valves".

2. Memo, J. Lauer to F. Faist, January 9, 1978, "Upgrading of CF Valves".

The CF valves to be upgraded are CF-HV2A, 2B, 5A, & 5B. The Velan Valve Form NPV-1, Manufacturers Data Report for Nuclear Pumps & Valves supplied (for Class II valves, certified November 24, 1977) contains the following information:

(#5) Valve Identification	(8b) Forgings Body Serial No.
A. W5-274-13MS CF-HV2B	1-1 826-1
B. W5-274-13MS CF-HV2A	1-3 825-1
C. W5-274-13MS CF-HV5A	1-4 827-1
D. W5-274-13MS CF-HV5B	1-2 824-1

The new nameplates are all identical, with the exception of the serial numbers, 824-1, 825-1, 826-1, 827-1. However, the following is the QA documentation discrepancies that exist:

Valve No.	A New Nameplate Serial No. to be applied per Ref. 2	B New Nameplate Serial No. to be applied per Velan QA doc.	C Old Nameplate Serial No. as found	D Old Nameplate Serial No. as shown on New QA documentation
CF-HV2A	824-1	825-1	1-2	1-3
CF-HV2B	825-1	826-1	1-3	1-1
CF-HV5A	826-1	827-1	1-1	1-4
CF-HV5B	827-1	824-1	1-4	1-2

3020

Attachment #1 - continued
SPR #446 - 620-0014
5/15/78

TECo has presently installed nameplates per Column A above, which is inconsistent with QA documentation. However, new QA documentation appears to be in error with regard to "Body Serial Number", old number vs new number.

FRF:nlf
5/15/78

4820

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: C. A. ARMONTROUT, QUALITY ASSURANCE

From: J. A. LAUER, PROJECT MANAGER (X 2156)

Cust.: TECO DB-1

Subj.: UPGRADING OF CF VALVES

BDS 663-5

File No. or Ref.: NSS-14 8330.41/14

Date: JANUARY 3, 1978

This letter to cover one customer and one subject only.

At TECO's request, we have asked Velan to upgrade the core flood vent and drain valves CF-HV2A&B and CF-HV6A&B from Class III of 1968 Pump & Valve Code to Class II of the same code. Velan has agreed and forwarded the attached revised data packages and new nameplates.

Will you please review the data packages, and if adequate, forward them directly to TECO QA. In the meantime I will send the replacement nameplates to Fred Faist. After the data packages are forwarded, I'll arrange for a Hartford inspector to witness the replacement of the nameplates.

J. A. Lauer

J. A. LAUER

JAL/hj

Attachment

cc: F. R. Faist

5920 4

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: F. R. FAIST, DAVIS-BESSE SITE

From: J. A. LAUER, PROJECT MANAGER (X2156)

BDS 663-5

Cust.: TECO DB-1

File No. or Ref.: NSS-14 8A30.41/14

Subj.: UPGRADING OF CF VALVES

Date: JANUARY 9, 1978

This letter to cover one customer and one subject only

Attached are replacement nameplates to be applied to Velan core flood valves as follows:

CF-HV2A	824-1
CF-HV2B	825-1
CF-HV5A	826-1
CF-HV5B	827-1

Please hold these nameplates until we verify the adequacy of the new QA data packages and forward them to TECO QA. Then call Mr. Henry in the Cleveland Office of Hartford Steam Boiler (Area 216-228-5200) and arrange a time when he can have an inspector witness the substitution of the new nameplates on the valves. You'll also have to have TECO maintenance available to actually change the nameplates.

Will you also save the old obsolete nameplates and send them to:

Velan Valve Corporation
Beekmantown Road
Plattsburgh, New York 12901

Attention: Mr. J. E. O'Donnell

You should include a letter identifying the valves and telling him the nameplate transfer has been made. If possible, get the Hartford inspector to countersign your letter as additional proof of the proper transfer.

J. A. Lauer
J. A. LAUER

JAL/hj

Attachments (Velan letter
and nameplates)
cc: B. V. Zachariah w/o att
C. A. Armontrout w/o att

6 of 20

VELAN ENGINEERING COMPANIES

FORM NPV-1 MANUFACTURERS' DATA REPORT FOR NUCLEAR PUMPS & VALVES

As required under the Provisions of the ASME Nuclear Pump & Valve Code

1. Manufactured by VELAN ENGINEERING LTD., 2125 Ward Ave., Montreal Order No. P1-0212-N ITEM: 1
2. Manufactured for THE BABCOCK & WILCOX COMPANY Contract No. 0231681S
3. Owner THE BABCOCK & WILCOX COMPANY
4. Location TOLEDO EDISON
5. Valve Identification W5-274-13MS CF-HV2B S/N 825-1 and now 010S/N 1-3
   (a) Shop Drawing No. P1-0212-N-2 Rev. B Prepared by VELAN ENGINEERING LIMITED
6. Design Conditions 700 psi 300 °F Specified by BABCOCK & WILCOX COMPANY (Name of Co. & Rep.)
7. The Design Complies with Class I II III (circle one)
   (a) Design Information on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (b) Design Specification certified by
   Eng. (1) Province Reg. No. Date
   (c) Design Report on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (d) Design Report certified by A. K. VELAN QUEBEC 16453 1965
   Eng. (1) Province Reg. No. Date
8. The Materials comply with Class I II III (circle one)

Mark No.	Mat. Spec.	Manufacturer	Body Ser. No.	Body H. Code	Bonnet H.C.	Disc H.C.
(a) Castings						
1. DISC	STELLITE 6	WESTSHELL INC.				RXI 113-6
2.						
3.						
4.			Doc shows 1-1 826-1			
(b) Forgings						
1. BODY	ASTM-A-182 316	CANFORGE	1-1 826-1	DW		
2.						
3.						
4.						
(c) Bolting						
1.						
2.						
(d) Other Components						
1. STEM	ASTM-A-461 630	FIRTH BROWN ST.				690706
2.						
3.						
4.						

9. The Manufacture and Examination complies with Class I II III. (circle one)
   Shop Hydrostatic Test 2175 psi
   Certificate of Authorization No. N1738
   We certify the statements of items number 8 and 9 in this data report to be correct.
   Date Nov 1st 1971 VELAN ENGINEERING LTD By M. Kolomainly
   (Manager of Inspection)

CERTIFICATE OF SHOP INSPECTION

VALVE MADE BY VELAN ENGINEERING LIMITED at MONTREAL, CANADA

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors of the Province of QUEBEC and employed by the DEPARTMENT OF LABOUR of QUEBEC have inspected the valve described in this manufacturer's data report on 19 , and state that to the best of my knowledge and belief, the manufacturer has constructed this valve in accordance with the ASME Code for Nuclear Pumps and Valves. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Nov 24 1971

Benoit Fréchette
Inspector's Signature

Commissions
National Board or Province and No.

70

VELAN ENGINEERING COMPANIES

FORM NPV-1 MANUFACTURERS' DATA REPORT FOR NUCLEAR PUMPS & VALVES
As required under the Provisions of the ASME Nuclear Pump & Valve Code

1. Manufactured by VELAN ENGINEERING LTD., 2125 Ward Ave., Montreal Order No P1-0212-N ITEM: 1
2. Manufactured for THE BABCOCK & WILCOX COMPANY Contract No. 02316815
3. Owner THE BABCOCK & WILCOX COMPANY
4. Location TOLEDO EDISON
5. Valve Identification W5-274-12MS CF-HV2A old (2) new 824-1
   (a) Shop Drawing No. P1-0212-N-2 Rev. B Prepared by VELAN ENGINEERING LIMITED
6. Design Conditions 700 psi 300 °F Specified by BABCOCK & WILCOX COMPANY (Name of Co. & Rep.)
7. The Design Complies with Class I II III (circle one)
   (a) Design Information on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (b) Design Specification certified by
   Eng. (1) Province Reg. No. Date
   (c) Design Report on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (d) Design Report certified by A. K. VELAN QUEBEC 16413 1965
   Eng. (1) Province Reg. No. Date
8. The Materials comply with Class I II III (circle one)

Mark No.	Mat. Spec.	Manufacturer	Body Ser. No.	Body H. Code	Bonnet H.C.	Disc. H.C.
(a) Castings						
1. DISC	STELLITE 6	VESTSHELL INC.				RXI 113-643
2.						
3.						
4.						
(b) Forgings						
1. BODY	ASTM-A-182 316	CANFORGE	1-3 825-1	BN		
2.						
3.						
4.						
(c) Bolting						
1.						
2.						
(d) Other Components						
1. STEM	ASTM-A-461 630	FIRTH BROWN ST.				690706
2.						
3.						
4.						

9. The Manufacture and Examination complies with Class I II III. (circle one)
   Shop Hydrostatic Test 2175 psi
   Certificate of Authorization No. N1738
   We certify the statements of items number 8 and 9 in this data report to be correct.
   Date Nov 1st 1977 VELAN ENGINEERING LTD. By M. Kobonceively (Manager of Inspection)

CERTIFICATE OF SHOP INSPECTION

VALVE MADE BY VELAN ENGINEERING LIMITED at MONTREAL, CANADA

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors of the Province of QUEBEC and employed by the DEPARTMENT OF LABOUR of QUEBEC have inspected the valve described in this manufacturer's data report on Nov 24 1977, and state that to the best of my knowledge and belief, the manufacturer has constructed this valve in accordance with the ASME Code for Nuclear Pumps and Valves. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Nov. 24 1977

Bernard Goulette
Inspector's Signature

Commissions
National Board or Province and No.

8320

VELAN ENGINEERING COMPANIES

FORM NPV-1 MANUFACTURERS' DATA REPORT FOR NUCLEAR PUMPS & VALVES
As required under the Provisions of the ASME Nuclear Pump & Valve Code

1. Manufactured by VELAN ENGINEERING LTD. 2125 Ward Ave., Montreal Order No. P1-0212-N ITEM: 1
2. Manufactured for THE BABCOCK & WILCOX COMPANY Contract No. 023]6815
3. Owner THE BABCOCK & WILCOX COMPANY
4. Location TOLEDO EDISON
5. Valve Identification W5-274-13MS CF-HV54 1-4 old 827-1 new
   (a) Shop Drawing No. P1-0212-N-2 Rev. B Prepared by VELAN ENGINEERING LIMITED
6. Design Conditions 700 psi 300 °F Specified by BABCOCK & WILCOX COMPANY (Name of Co. & Fig.)
7. The Design Complies with Class I II III (circle one)
   (a) Design Information on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (b) Design Specification certified by
   Eng. (1) Province Reg. No. Date
   (c) Design Report on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (d) Design Report certified by A. K. VELAN QUEBEC 16463 1965
   Eng. (1) Province Reg. No. Date
8. The Materials comply with Class I II III (circle one)

Mark No.	Mat. Spec.	Manufacturer	Body Ser. No.	Body H. Code	Bonnet H.C.	Disc. H.C.
(a) Castings						
1. DISC	STELLITE 6	VESTSHELL INC.				
2.						RXI 113-643
3.						
4.						
(b) Forgings						
1. BODY	ASTM-A-182	CANFORCE	1-4 827-1	BW		
2.	316					
3.						
4.						
(c) Bolting						
1.						
2.						
(d) Other Components						
1. STEM	ASTM-A-461	FIRTH BROWN ST.				
2.	630					690706
3.						
4.						

9. The Manufacture and Examination complies with Class I II III. (circle one)
Shop Hydrostatic Test 2175 psi
Certificate of Authorization No. N1738
We certify the statements of items number 8 and 9 in this data report to be correct.
Date Nov 1st 1977 VELAN ENGINEERING LTD. By [signature] (Manager of Inspection)

CERTIFICATE OF SHOP INSPECTION

VALVE MADE BY VELAN ENGINEERING LIMITED
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors of the Province of QUEBEC at MONTREAL, CANADA and employed by the DEPARTMENT OF LABOUR of QUEBEC

have inspected the valve described in this manufacturer's data report on Nov 24 1977, and state that to the best of my knowledge and belief, the manufacturer has constructed this valve in accordance with the ASME Code for Nuclear Pumps and Valves. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Nov 24 1977

[signature] Inspector's Signature Commissions National Board et Province No.

9002

ENGINEERING COMPANIES

FORM NPV-1 MANUFACTURERS' DATA REPORT FOR NUCLEAR PUMPS & VALVES
As required under the Provisions of the ASME Nuclear Pump & Valve Code

1. Manufactured by VELAN ENGINEERING LTD., 2125 Ward Ave., Montreal Order No. P1-0212-N ITEM: 1
2. Manufactured for THE BABCOCK & WILCOX COMPANY
3. Owner THE BABCOCK & WILCOX COMPANY Contract No. 0231681S
4. Location TOLEDO EDISON
5. Valve Identification WS-274-13NS CF-RV-A 811-1
   (a) Shop Drawing No. P1-0212-N-2 Rev. B Prepared by VELAN ENGINEERING LIMITED
6. Design Conditions 700 psi 300 °F Specified by BABCOCK & WILCOX COMPANY (Name of Co. & Fmt.)
7. The Design Complies with Class I (II) III
   (a) Design Information on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (b) Design Specification certified by
       Eng. (1) Province Reg. No. Date
   (c) Design Report on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (d) Design Report certified by A. K. VELAN QUEBEC 16433 1965
       Eng. (1) Province Reg. No. Date
8. The Materials comply with Class I (II) III (circle one)

Mark No.	Mat. Spec.	Manufacturer	Body Ser. No.	Body H. Code	Bonnet H.C.	Disc. H.C.
(a) Castings						
1. DISC	STELLITE 6	VESTSHELL INC.				
2.						
3.						RXI 113-643
4.						
(b) Forgings						
1. BODY	ASTM-A-182 316	CANFORGE	1-2 824-1	EEAK BW		
2.						
3.						
4.						
(c) Bolting						
1.						
2.						
(d) Other Components						
1. STEM	ASTM-A-461 630	FIRTH BROWN ST.				
2.						
3.						690706
4.						

The Manufacture and Examination complies with Class I (II) III. (circle one)
Shop Hydrostatic Test 2175 psi
Certificate of Authorization No. N1728
We certify the statements of items number 8 and 9 in this data report to be correct.
Date Nov 1st 1977 VELAN ENGINEERING LTD. By [signature] (Manager of Inspection)

CERTIFICATE OF SHOP INSPECTION

VALVE MADE BY VELAN ENGINEERING LIMITED
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors of the Province of QUEBEC at MONTREAL, CANADA and employed by the DEPARTMENT OF LABOUR of QUEBEC have inspected the valve described in this manufacturer's data report on Oct. 24 1977, and state that to the best of my knowledge and belief, the manufacturer has constructed this valve in accordance with the ASME Code for Nuclear Pumps and Valves. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Oct. 24 1977
[signature]
Inspector's Signature Commissions National Board or Province and No.

10820
8

Babcock & Wilcox

Power Generation Group

P.O. Box 1260, Lynchburg, Va. 24505

Telephone: (804) 384-5111

June 9, 1978

B&W/TECO-QA24
File: NSS-14
T1.2

Toledo Edison Company
5501 N. State Route 2
Oak Harbor, OH 43449

Attention: Mr. J.D. Lenardson
QA Director

Subject: Corrected NPV Form for
Core Flood System Valves

Dear Mr. Lenardson:

Attached are corrected NPV Forms and revised Hydro Test Reports for Core Flood System Valves, CF-HV2A & B and CF-HV5A & B. Please insert this documentation into your copies of the QA Data Package for these valves and remove the obsolete documentation.

Very truly yours,

C A Armentrout

C. A. Armentrout
QA Engineer

CAA:pbv
Attachment

cc: w/o
E.C. Novak
J. Fulcher
R. Luken

velan
engineering

PLANTS-USINES
Montreal, Canada
Granby, Que.
Plattsburgh, N.Y., U.S.A.
Leicester, England
Paris, France

Velan Engineering Ltd.
2125 Ward
Montreal, Que. H4M 1T6
Tel.: (514) 748-7743
Telex: 05-825668
TWX 610-421-3673

June 5, 1978.

Babcock & Wilcox
Power Generation Group
P.O. Box 1260
Lychburg, Va. 24505
U. S. A.

JUN 08 1978

Attention: Mr. B.V. Zachariah
Senior Buyer

Subject: Corrected NPV Forms for the
Core Flood System Valves
Your Order: 023168 LS
Velan Order: P1-0212-N Item 1

Gentlemen:

With reference to your dated May 17, 1978, attached please find two copies of each of the corrected NPV Forms and revised Hydro Test Reports for the subject valves.

Valve Tag No.	Data Package No.	Valve S/No.	Body S/No.	New Name Plate S/No.
CF-MV2A	770824	824-1	1-2	824-1
CF-MV2B	770825	825-1	1-3	825-1
CF-MV5A	770826	826-1	1-1	826-1
CF-MV5B	770827	827-1	1-4	827-1

Would you please arrange to insert the revised copies in the related Data Packages and destroy the ones issued previously.

Your cooperation would be greatly appreciated.

Resolution SPR 446 Rev0

Note: Original to B&W (NPGD) QA 6/8/78 JA . QA to forward to site

Yours truly,
VELAN ENGINEERING LIMITED

A.S. Pokomandy
Manager of Quality Control

ASP:jp

12 of 20

Revised: Aug 25 1978 [illegible] 770824

VELAN ENGINEERING COMPANIES

FORM NPV-1 MANUFACTURERS' DATA REPORT FOR NUCLEAR PUMPS & VALVES
As required under the Provisions of the ASME Nuclear Pump & Valve Code

1. Manufactured by VELAN ENGINEERING LTD., 2125 Ward Ave., Montreal Order No. P1-0212-N ITEM: 1
2. Manufactured for THE BABCOCK & WILCOX COMPANY Contract No. 023168LS
3. Owner THE BABCOCK & WILCOX COMPANY
4. Location TOLEDO EDISON
5. Valve Identification WS-274-13MS CF-HV2A
   (a) Shop Drawing No. P1-0212-N-2 Rev. B Prepared by VELAN ENGINEERING LIMITED
6. Design Conditions 700 psi 300 °F Specified by BABCOCK & WILCOX COMPANY (Name of Co. & Rep.)
7. The Design Complies with Class I (II) III (circle one)
   (a) Design Information on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (b) Design Specification certified by
   Eng. (1) Province Reg. No. Date
   (c) Design Report on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (d) Design Report certified by A. K. VELAN QUEBEC 16463 1965
   Eng. (1) Province Reg. No. Date
8. The Materials comply with Class I (II) III (circle one)

Mark No.	Mat. Spec.	Manufacturer	Body Ser. No.	Body H. Code	Bonnet H.C.	Disc. ~~Wedge~~ H.C.
(a) Castings						
1. DISC	STELLITE 6	VESTSHELL INC.				RXI 113-643
2.						
3.						
4.						
(b) Forgings						
1. BODY	ASTM-A-182	CANFORGE	1-2 824-1	BW		
2.	316					
3.						
4.						
(c) Bolting						
(d) Other Components						
1. STEM	ASTM-A-461	FIRTH BROWN ST.				
2.	630					690706
3.						
4.						

9. The Manufacture and Examination complies with Class I (II) III. (circle one)
   Shop Hydrostatic Test 2175 psi
   Certificate of Authorization No. N1738
   We certify the statements of items number 8 and 9 in this data report to be correct.
   Date Nov 1st 1977 VELAN ENGINEERING LTD. By A. Lohomaisky (Manager of Inspection)

CERTIFICATE OF SHOP INSPECTION

VALVE MADE BY VELAN ENGINEERING LIMITED at MONTREAL, CANADA

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors of the Province of QUEBEC and employed by the DEPARTMENT OF LABOUR of QUEBEC have inspected the valve described in this manufacturer's data report on Nov 24 1977, and state that to the best of my knowledge and belief, the manufacturer has constructed this valve in accordance with the ASME Code for Nuclear Pumps and Valves. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Nov. 24 1977

Benoit [illegible]
Inspector's Signature

Commissions National Board or Province and No.

13 of 20

70

77C824

HYDROSTATIC TEST REPORT

VALVES

VELAN P.O. PI-0212-N CUSTOMER P.O. 0231684-E

ITEM 1 QUANTITY 1

DWG. * PI-0212-N-2 Rev 1B SPEC. * 1025-0469

VALVE DESCRIPTION * 1" Bonnetless Globe valve S/W conn - Stainless steel with Limitorque motor operator (SMB-000-2)

VALVES ARE HYDROST. TESTED ACCORDING TO VEL-NDT-640 PROCEDURE.

SHELL		SEAT		BACKSEAT	
TIME	10 Mins.	TIME	5 Mins	TIME	5 Mins
PRESSURE	2175 PSI.	PRESSURE	1500 PSI	PRESSURE	1500 PSI
RESULT	0	RESULT	0 LEAKAGE	RESULT	0 LEAKAGE

MOTOR SERIAL NO.: 158233

MOTOR TAG NO.: CF-HV2A

TORQUE: OPEN 1.5

CLOSE 1.0

TIME: OPEN 6.1 sec

CLOSE 6.1 sec

ALIGNEMENT OF VALVE AND OPERATOR SYSTEM SHOP TESTED AND FOUND SATISFACTORY.

DATE 3/27/73

TESTER [signature]

INSPECTOR [signature]

WITNESSED (CUSTOMER REPRESENTATIVE)
(IF REQUIRED)

* Revised: May 26-1978 indicate: DWG, spec, & Description

1408-20

VELAN ENGINEERING COMPANIES

FORM NPV-1 MANUFACTURERS' DATA REPORT FOR NUCLEAR PUMPS & VALVES
As required under the Provisions of the ASME Nuclear Pump & Valve Code

1. Manufactured by VELAN ENGINEERING LTD., 2125 Ward Ave., Montreal Order No. P1-0212-N ITEM: 1
2. Manufactured for THE BABCOCK & WILCOX COMPANY Contract No. 023168LS
3. Owner THE BABCOCK & WILCOX COMPANY
4. Location TOLEDO EDISON
5. Valve Identification W5-274-13MS CF-HV28
   (a) Shop Drawing No. P1-0212-N-2 Rev. B Prepared by VELAN ENGINEERING LIMITED
6. Design Conditions 700 psi 300 °F Specified by BABCOCK & WILCOX COMPANY (Name of Co. & Rep.)
7. The Design Complies with Class I II III (circle one)
   (a) Design Information on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (b) Design Specification certified by ______ Eng. (1) Province Reg. No. Date
   (c) Design Report on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (d) Design Report certified by A. K. VELAN QUEBEC 16463 1965 — Eng. (1) Province Reg. No. Date
8. The Materials comply with Class I II III (circle one)

Mark No.	Mat. Spec.	Manufacturer	Body Ser. No	Body H. Code	Bonnet H.C.	Disc. ~~Wedge~~ H.C.
(a) Castings						
1. DISC	STELLITE 6	VESTSHELL INC.				RXI 113-643
2.						
3.						
4.						
(b) Forgings						
1. BODY	ASTM-A-182 316	CANFORGE	1-3 825-1	BW		
2.						
3.						
4.						
(c) Bolting						
1.						
2.						
(d) Other Components						
1. STEM	ASTM-A-461 630	FIRTH BROWN ST.				690706
2.						
3.						
4.						

9. The Manufacture and Examination complies with Class I II III. (circle one)

Shop Hydrostatic Test 2175 psi

Certificate of Authorization No. N1738

We certify the statements of items number 8 and 9 in this data report to be correct.

Date Nov 1st 1977 VELAN ENGINEERING LTD. By [signature] (Manager of Inspection)

CERTIFICATE OF SHOP INSPECTION

VALVE MADE BY VELAN ENGINEERING LIMITED at MONTREAL, CANADA

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors of the Province of QUEBEC and employed by the DEPARTMENT OF LABOUR of QUEBEC

have inspected the valve described in this manufacturer's data report on ______ 19__ and state that to the best of my knowledge and belief, the manufacturer has constructed this valve in accordance with the ASME Code for Nuclear Pumps and Valves. By signing this certificate neither the inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Nov 24 1977

[signature] Inspector's Signature

Commissions ______ National Board or Province and No.

1582
12

770825

HYDROSTATIC TEST REPORT

VALVES

VELAN P.O. P1-0212-N

CUSTOMER P.O. 023165LS

ITEM 1

QUANTITY 1

DWG. P1-0212-N-2 Rev:B

SPEC. 1025-0469

VALVE DESCRIPTION 1" Bonnetless Globe valve s/w conn. stainless steel with Limitorque motor operator (SMB-000-2)

VALVES ARE HYDROST. TESTED ACCORDING TO VEL-NPT-640 PROCEDURE.

SHELL		SEAT		BACKSEAT	
TIME	10 Min.	TIME	5 Min.	TIME	5 Min.
PRESSURE	2175 PSI.	PRESSURE	1500 PSI.	PRESSURE	1500 PSI
RESULT	0	RESULT	0 LEAKAGE	RESULT	0 LEAKAGE

MOTOR SERIAL NO.: 155234

MOTOR TAG.NO.: CF-HV2B

TORQUE: OPEN 1.5

CLOSE 1.5

TIME: OPEN 6.2 sec

CLOSE 6.2 sec

ALIGNEMENT OF VALVE AND OPERATOR SYSTEM SHOP TESTED AND FOUND SATISFACTORY.

DATE 3/28/73

VEL 17 INSP

TESTER J. D. Poitras

INSPECTOR G. Saberyan

WITNESSED (CUSTOMER REPRESENTATIVE)
(IF REQUIRED)

* Revised: May 26-1978 Indicate; DWG, Spec & Description

M. Vincent

16 of 20

13.

Revised May 26 77 770826

VELAN ENGINEERING COMPANIES

FORM NPV-1 MANUFACTURERS' DATA REPORT FOR NUCLEAR PUMPS & VALVES
As required under the Provisions of the ASME Nuclear Pump & Valve Code

1. Manufactured by VELAN ENGINEERING LTD., 2125 Ward Ave., Montreal Order No. P1-0212-N ITEM: 1
2. Manufactured for THE BABCOCK & WILCOX COMPANY Contract No. 023168LS
3. Owner THE BABCOCK & WILCOX COMPANY
4. Location TOLEDO EDISON
5. Valve Identification W5-274-13MS CF-HV5A
   (a) Shop Drawing No. P1-0212-N-2 Rev. B Prepared by VELAN ENGINEERING LIMITED
6. Design Conditions 700 psi 300 °F Specified by BABCOCK & WILCOX COMPANY (Name of Co. & Rep.)
7. The Design Complies with Class I II III (circle one) — II circled
   (a) Design Information on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (b) Design Specification certified by
   Eng. (I) Province Reg. No. Date
   (c) Design Report on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (d) Design Report certified by A. K. VELAN QUEBEC 16463 1965
   Eng. (I) Province Reg. No. Date
8. The Materials comply with Class I II III (circle one) — II circled

Mark No.	Mat. Spec.	Manufacturer	Body Ser. No.	Body H. Code	Bonnet H.C.	Disc. H.C.
(a) Castings						
1. DISC	STELLITE 6	VESTSHELL INC.				RXI 113-643
2.						
3.						
4.						
(b) Forgings						
1. BODY	ASTM-A-182	CANFORGE	1-1 826-1	BW		
2.	316					
3.						
4.						
(c) Bolting						
1.						
2.						
(d) Other Components						
1. STEM	ASTM-A-461	FIRTH BROWN ST.				690706
2.	630					
3.						
4.						

9. The Manufacture and Examination complies with Class I II III. (circle one) — II circled
   Shop Hydrostatic Test 2175 psi
   Certificate of Authorization No. N1738
   We certify the statements of items number 8 and 9 in this data report to be correct.
   Date Nov 1st 1977 VELAN ENGINEERING LTD. By [signature] (Manager of Inspection)

CERTIFICATE OF SHOP INSPECTION

VALVE MADE BY VELAN ENGINEERING LIMITED at MONTREAL, CANADA

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors of the Province of QUEBEC and employed by the DEPARTMENT OF LABOUR of QUEBEC have inspected the valve described in this manufacturer's data report on Nov. 24 1977, and state that to the best of my knowledge and belief, the manufacturer has constructed this valve in accordance with the ASME Code for Nuclear Pumps and Valves. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Nov 24 1977

Benoit Tra...cotte
Inspector's Signature

Commissions
National Board or Province and No

1708 20
74

VELAN ENGINEERING COMPANIES

HYDROSTATIC TEST REPORT

770826

VALVES

VELAN P.O. PI-0212-N

CUSTOMER P.O. 0231681.3

ITEM 1

QUANTITY 1

DWG. * PI-0212-N-2 Rev: B

SPEC. * 1025-0469

VALVE DESCRIPTION * 1" Bonnetless Globe S/W connection Stainless Stl with Limitorque motor operator (SMB-000-2)

VALVES ARE HYDROST. TESTED ACCORDING TO VEL-NDT-640 PROCEDURE.

SHELL		SEAT		BACKSEAT	
TIME	10 Mins	TIME	5 Mins	TIME	5 Mins
PRESSURE	2175 PSI	PRESSURE	1500 PSI	PRESSURE	1500 PSI
RESULT	0	RESULT	0 LEAKAGE	RESULT	0 LEAKAGE

MOTOR SERIAL NO.: 158235

MOTOR TAG.NO.: CF-HV5A

TORQUE: OPEN 1.0

CLOSE 1.5

TIME: OPEN 6.0 sec

CLOSE 6.0 sec

ALIGNEMENT OF VALVE AND OPERATOR SYSTEM SHOP TESTED AND FOUND SATISFACTORY.

DATE 3/28/73

TESTER [signature]

INSPECTOR [signature]

WITNESSED (CUSTOMER REPRESENTATIVE)
(IF REQUIRED)

* Revised: May 26-1978 indicate: DWG, Spec & Description

18 of 20

Received [illegible] 770827

VELAN ENGINEERING COMPANIES

FORM NPV-1 MANUFACTURERS' DATA REPORT FOR NUCLEAR PUMPS & VALVES
As required under the Provisions of the ASME Nuclear Pump & Valve Code

1. Manufactured by VELAN ENGINEERING LTD., 2125 Ward Ave., Montreal Order No. P1-0212-N ITEM: 1
2. Manufactured for THE BABCOCK & WILCOX COMPANY Contract No. 025168LS
3. Owner THE BABCOCK & WILCOX COMPANY
4. Location TOLEDO EDISON
5. Valve Identification W5-274-13MS CF-HV5B
   (a) Shop Drawing No. P1-0212-N-2 Rev. B Prepared by VELAN ENGINEERING LIMITED
6. Design Conditions 700 psi 300 °F Specified by BABCOCK & WILCOX COMPANY (Name of Co. & Rep.)
7. The Design Complies with Class I (II) III (circle one)
   (a) Design Information on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (b) Design Specification certified by ______ Eng. (1) Province Reg. No. Date
   (c) Design Report on file at VELAN ENGINEERING LTD. (ENGINEERING DEPT.)
   (d) Design Report certified by A. K. VELAN QUEBEC 16463 1965 Eng. (1) Province Reg. No. Date
8. The Materials comply with Class I (II) III (circle one)

Mark No.	Mat. Spec.	Manufacturer	Body Ser. No.	Body H. Code	Bonnet H.C.	Disc. ~~Wedge~~ H.C.
(a) Castings						
1. DISC	STELLITE 6	VESTSHELL INC.				RXI 113-643
2.						
3.						
4.						
(b) Forgings						
1. BODY	ASTM-A-182	CANFORGE	1-4 827-1	BW		
2.	316					
3.						
4.						
(c) Bolting						
1.						
2.						
(d) Other Components						
1. STEM	ASTM-A-461	FIRTH BROWN ST.				690706
2.	630					
3.						
4.						

9. The Manufacture and Examination complies with Class I (II) III. (circle one)
   Shop Hydrostatic Test 2175 psi
   Certificate of Authorization No. N1738
   We certify the statements of items number 8 and 9 in this data report to be correct
   Date Nov 1st 1977 VELAN ENGINEERING LTD. By [signature] (Manager of Inspection)

CERTIFICATE OF SHOP INSPECTION

VALVE MADE BY VELAN ENGINEERING LIMITED at MONTREAL, CANADA

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors of the Province of QUEBEC and employed by the DEPARTMENT OF LABOUR of QUEBEC have inspected the valve described in this manufacturer's data report on Nov. 24 1977, and state that to the best of my knowledge and belief, the manufacturer has constructed this valve in accordance with the ASME Code for Nuclear Pumps and Valves. By signing this certificate neither the inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Nov. 24 1977

[signature] Inspector's Signature

Commissions ______ National Board or Province and No.

190820

76

VELAN ENGINEERING COMPANIES

770827

HYDROSTATIC TEST REPORT

VALVES

VELAN P.O. PI-0212-N

CUSTOMER P.O. 02316SLS

ITEM 1

QUANTITY 1

DWG. * PI-0212-N-2 Rev: B

SPEC. * 1025-0469

VALVE DESCRIPTION * 1" Bonnetless Globe valve s/w connection (stainless steel) with Limitorque motor operator (SMB-000-2)

VALVES ARE HYDROST. TESTED ACCORDING TO VEL-NDT-640 PROCEDURE.

SHELL		SEAT		BACKSEAT	
TIME	10 min.	TIME	5 min.	TIME	5
PRESSURE	2175 PSI	PRESSURE	1500 PSI	PRESSURE	1500 PSI
RESULT	0	RESULT	0 LEAKAGE	RESULT	0 LEAKAGE

ALIGNEMENT OF VALVE AND OPERATOR SYSTEM SHOP TESTED AND FOUND SATISFACTORY.

MOTOR SERIAL NO.: 158236

MOTOR TAG.NO.: CF-HV5B

TORQUE: OPEN 1.0

CLOSE 1.0

TIME: OPEN 1.2

CLOSE 1.2

DATE 3/28/73

TESTER J. G. [illegible] VEL 17

INSPECTOR [illegible]

WITNESSED (CUSTOMER REPRESENTATIVE)
(IF REQUIRED)

* Revised: May 26-1978 indicate DWG, Spec & Description

AC

020820

21142102	52.6	8	8	1?8.7-777.7	318.6	325.9	376.5	334.9	312.1	311.7	541.3	569.8	542.6	5?2.[illegible]-777.7	.8	140.4
21142108	52.5	8	2	1?8.4-777.7	318.1	325.8	376.3	334.5	312.8	311.4	541.3	569.4	541.9	[illegible]2.4-777.7	.4	151.4
21150102	52.4	8	2	1?8.6-777.7	318.1	325.4	376.0	334.4	311.8	311.4	541.6	569.6	541.8	572.2-777.7	.2	154.9
21151124	52.3	4	8	1?8.5-777.7	317.8	325.1	376.0	334.4	311.8	311.2	541.6	569.4	542.5	571.9-777.7	.8	155.3

SITE PROBLEM

REPORT TRANSMITTAL

CLOSED

**** CLEARED **** MAY 1977

TO: CHANGE CONTROL For Distribution

S. H. Klein - Quality Assurance

Central Engineering Files

R.H. Bonsall - Task Engineer

G. T. ... BURN - Project Manager

S. J. ENGEL

FILE: 13-7-445

CONTRACT NO: 620-0007

SPR 445

TITLE OTSG's Boiled Dry

DATE: 5-19-77

STATUS CODE C

_____ E. L. Logan - FLORIDA _____

_____ L. C. Rogers - MET. ED. _____

_____ F. R. Faist - TOLEDO _____

_____ J. R. Bohart - Int'l. Support _____

_____ J. L. Donnell - OFR _____

_____ B. A. Karrasch - Plant Integration _____

Attached is one copy of Site Problem Report No. 445 which was processed on Contract 620-0007. Future contracts have been reviewed for the potential of a similar problem. This problem ~~is~~/is not considered applicable to other contracts _____.

REMARKS:

Larry A. ...

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED


100
90
Load
Shutdown From
Room
70
60
50
40
30
20
10

MAY 31 1977

PDS-21091(8-76)

SITE PROBLEM REPORT — BABCOCK & WILCOX

CUSTOMER: Florida Power Corp.	ORIGINATOR / DATE: E. Logan 4/29/77	DOC. ID. / CONT. NO. / SPR NO. / REV. NO.: 13 620/0007 445 C
VENDOR: Babcock & Wilcox	P.A. NO.:	PART NO./TASK NO. / GROUP NO. / SEQ. NO.: 55 01 01
TITLE (MAX 30 CHARACTERS): OTSG's Boiled Dry		PROBLEM CONTACT: R. Hamilton

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM:

SEE ATTACHED SHEET

CLOSED

ALSO SEE CR III TRIP REPORTS 12, 13, & 14.

STATUS-ACTION TO DATE. INCLUDING PERSONS CONTACTED:

N/A

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL:

N/A

RESOLUTION

RESOLUTION:

INFORMATION ONLY

PREPARED BY: Larry P. Clome	DATE: 5-5-77	APPROVED BY: E. J. Faulmer	DATE: 5/18/77
REVIEWED BY: [illegible]	DATE: 5/16/77		

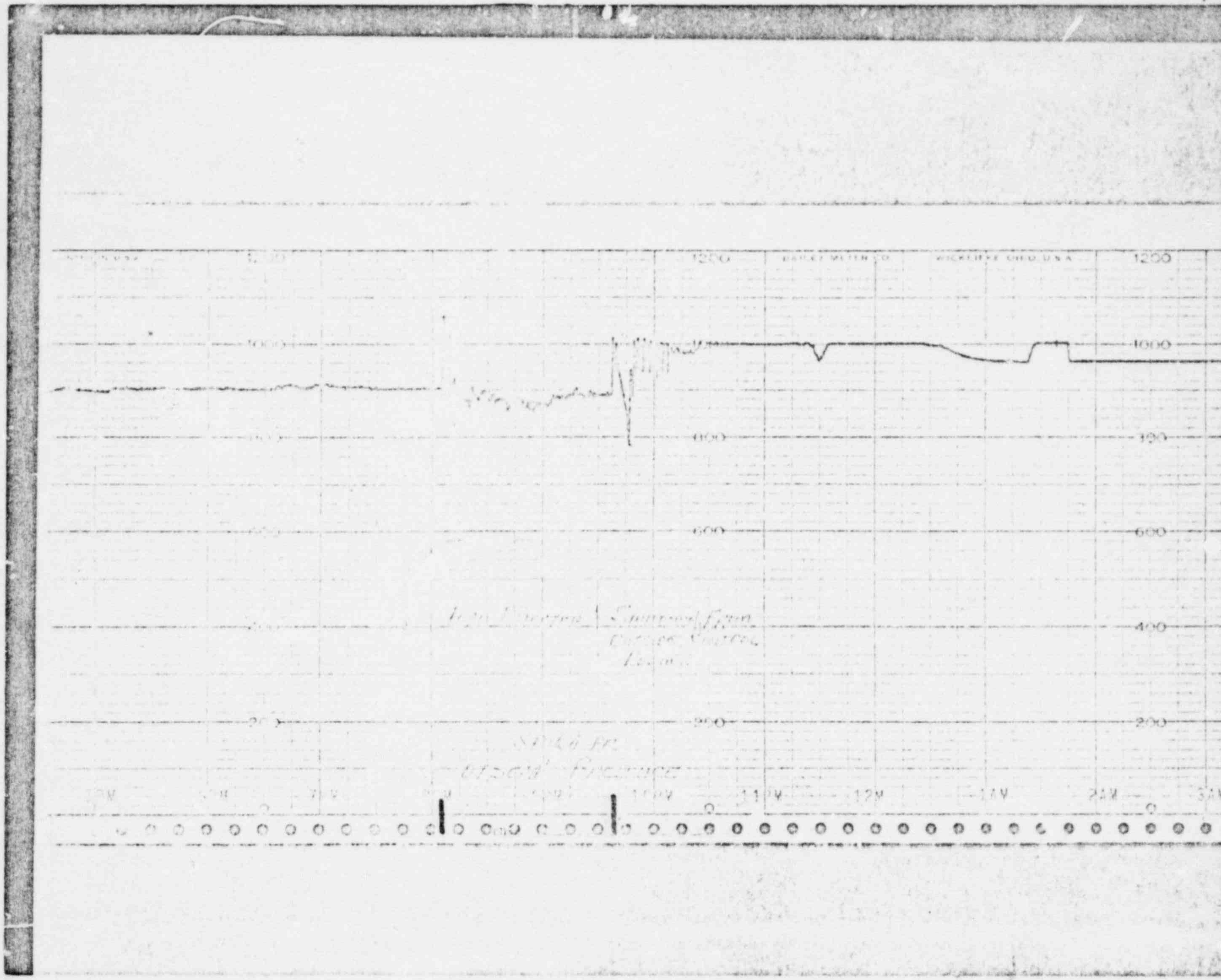
COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM OTHER ☐	☐ YES NO ☐	04-	☐ YES NO ☐

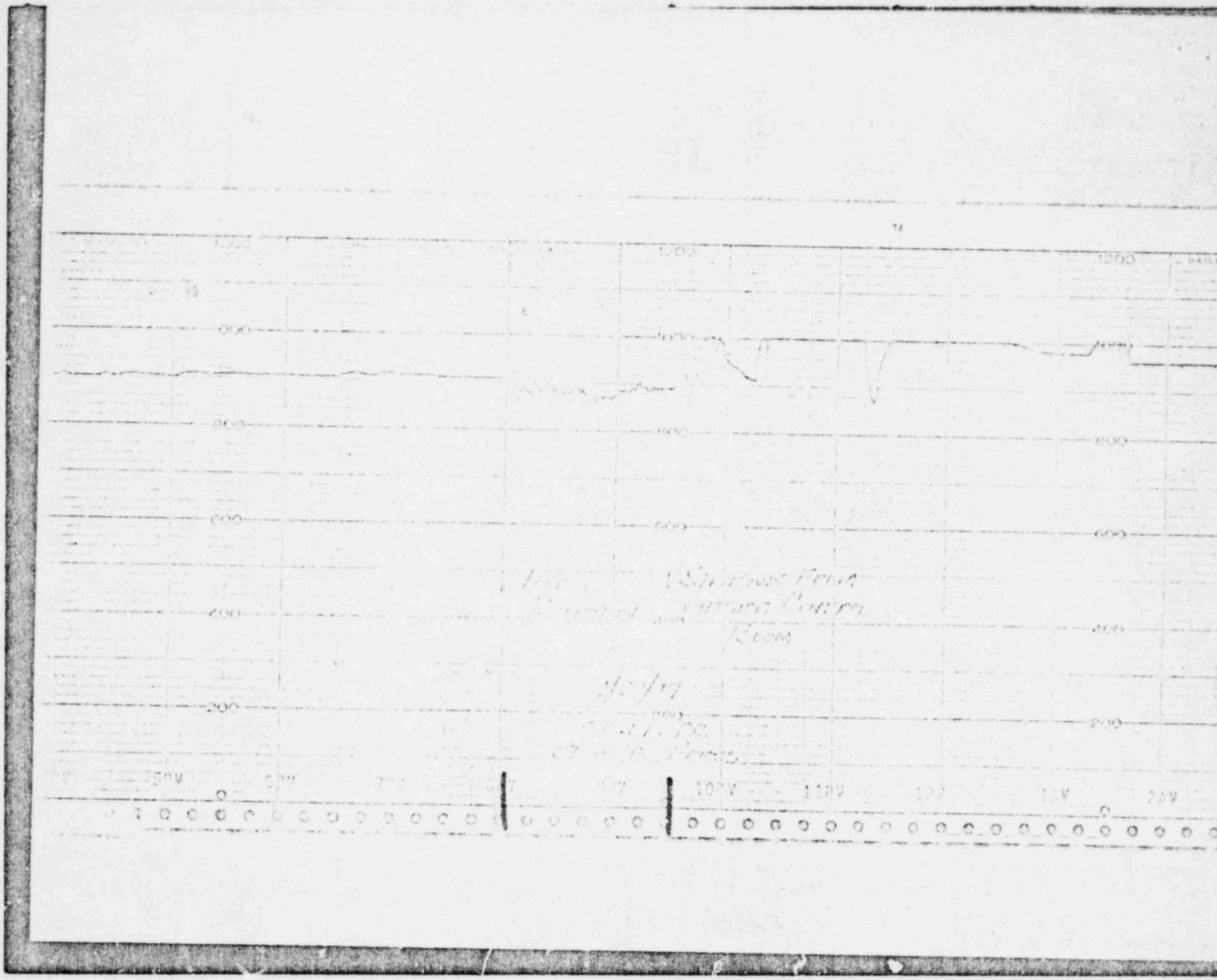
COMPLETION

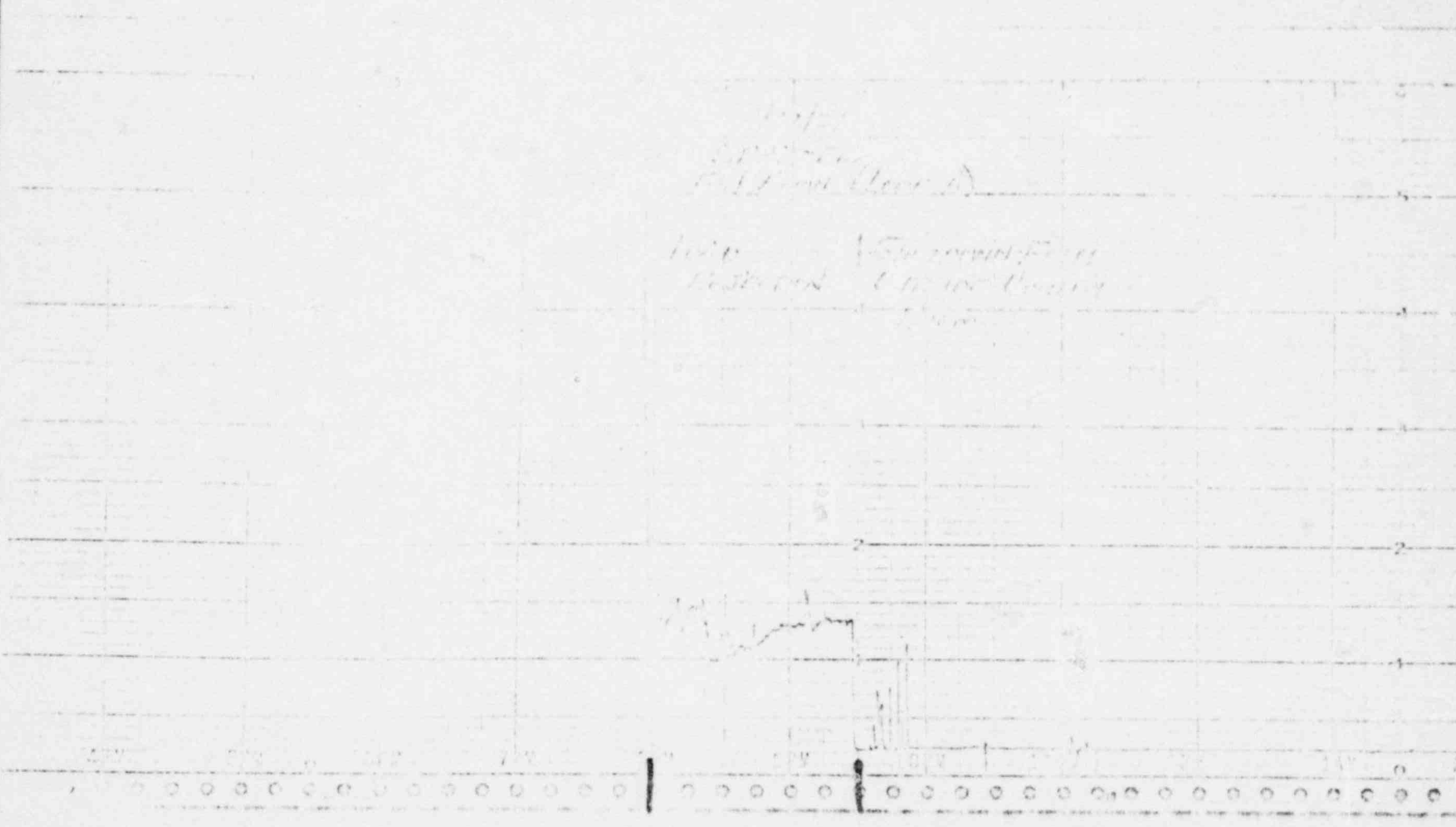
SITE COMPLETION REPORT:

Issued for "Information Only".

DEVIATIONS: ☐ NONE	SPR REV NO. ☐
DATE COMPLETED:	
COMPLETED BY: E. K. Logan	DATE: 4/29/77
SHEET	OF


1200
1000
800
600
400
200
BAILEY METER CO
WICKLIFFE OHIO U.S.A.
11PM
12M
1AM
2AM
3AM
10PM


DAILY
1200
1000
800
600
400
200
5PM
6PM
10PM
11PM
1AM
2AM



[illegible]

[illegible] [illegible] (Lucy?) [illegible]

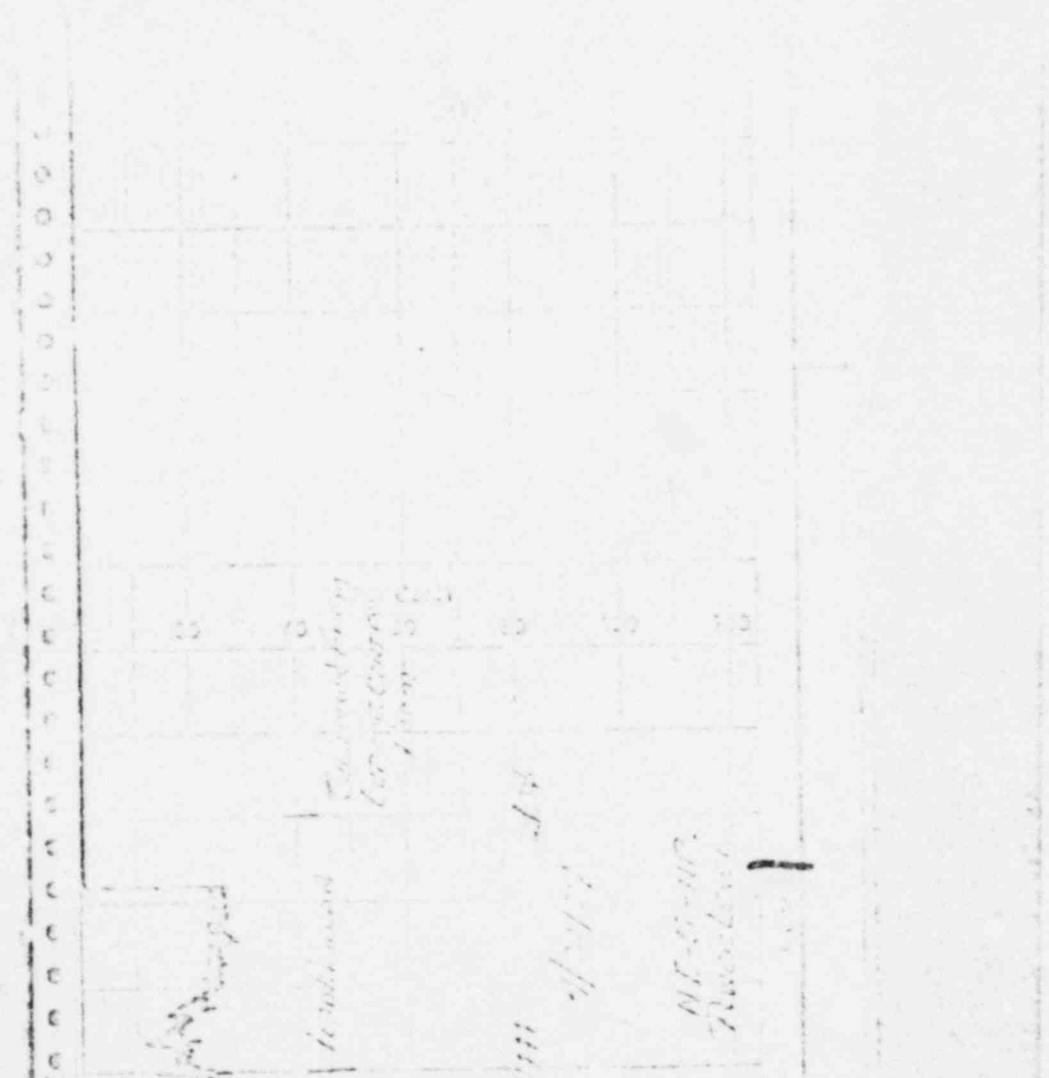
[illegible]

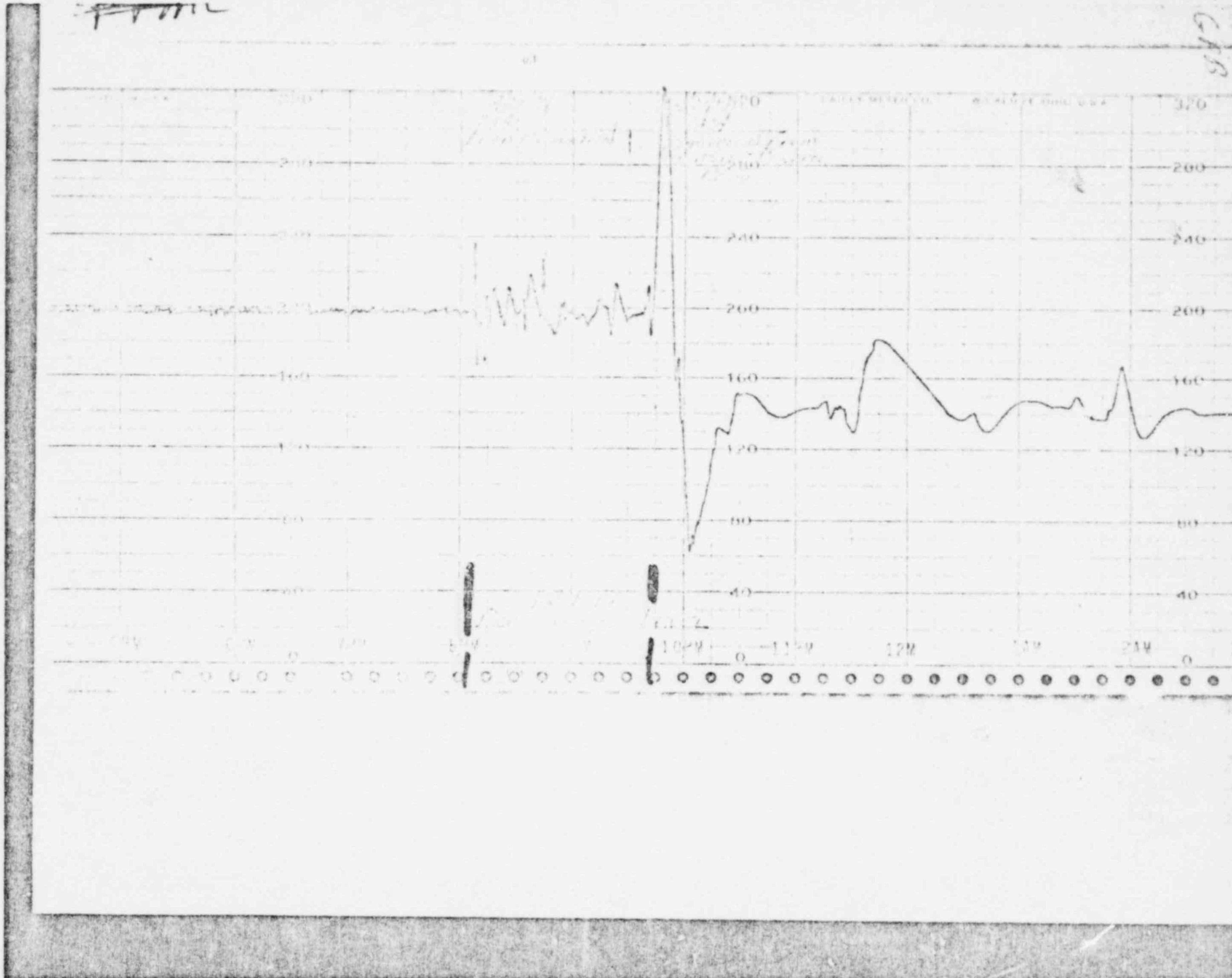
[illegible]

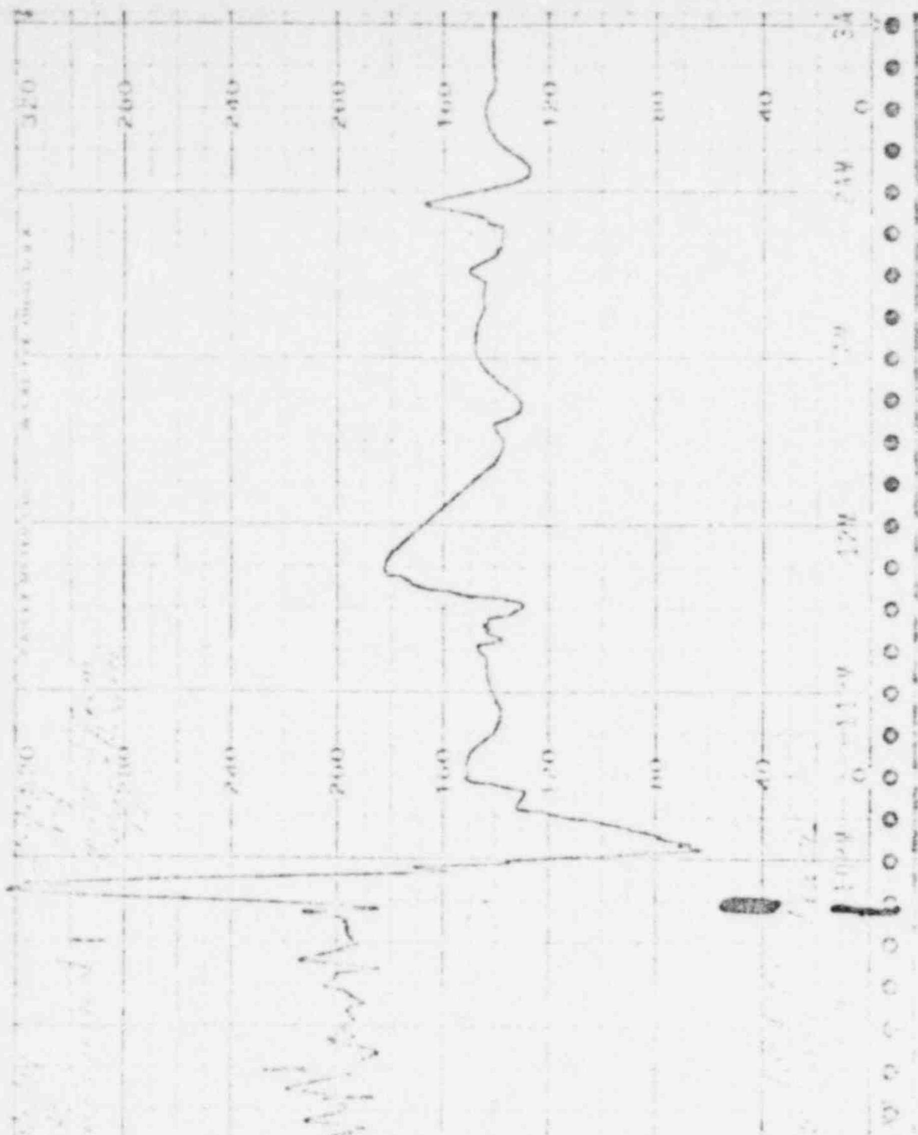
IMAGE EVALUATION
TEST TARGET (MT-3)

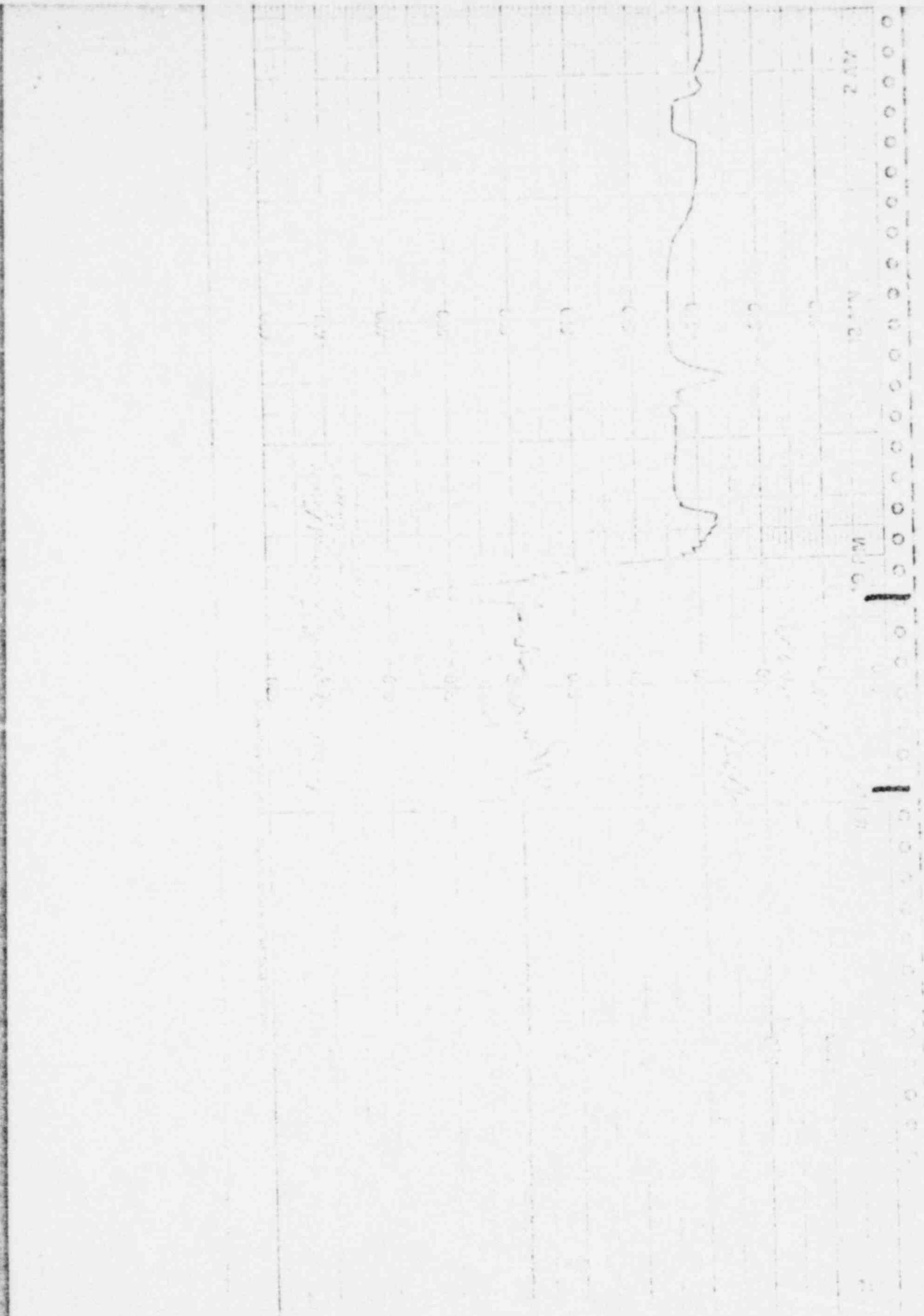
6″

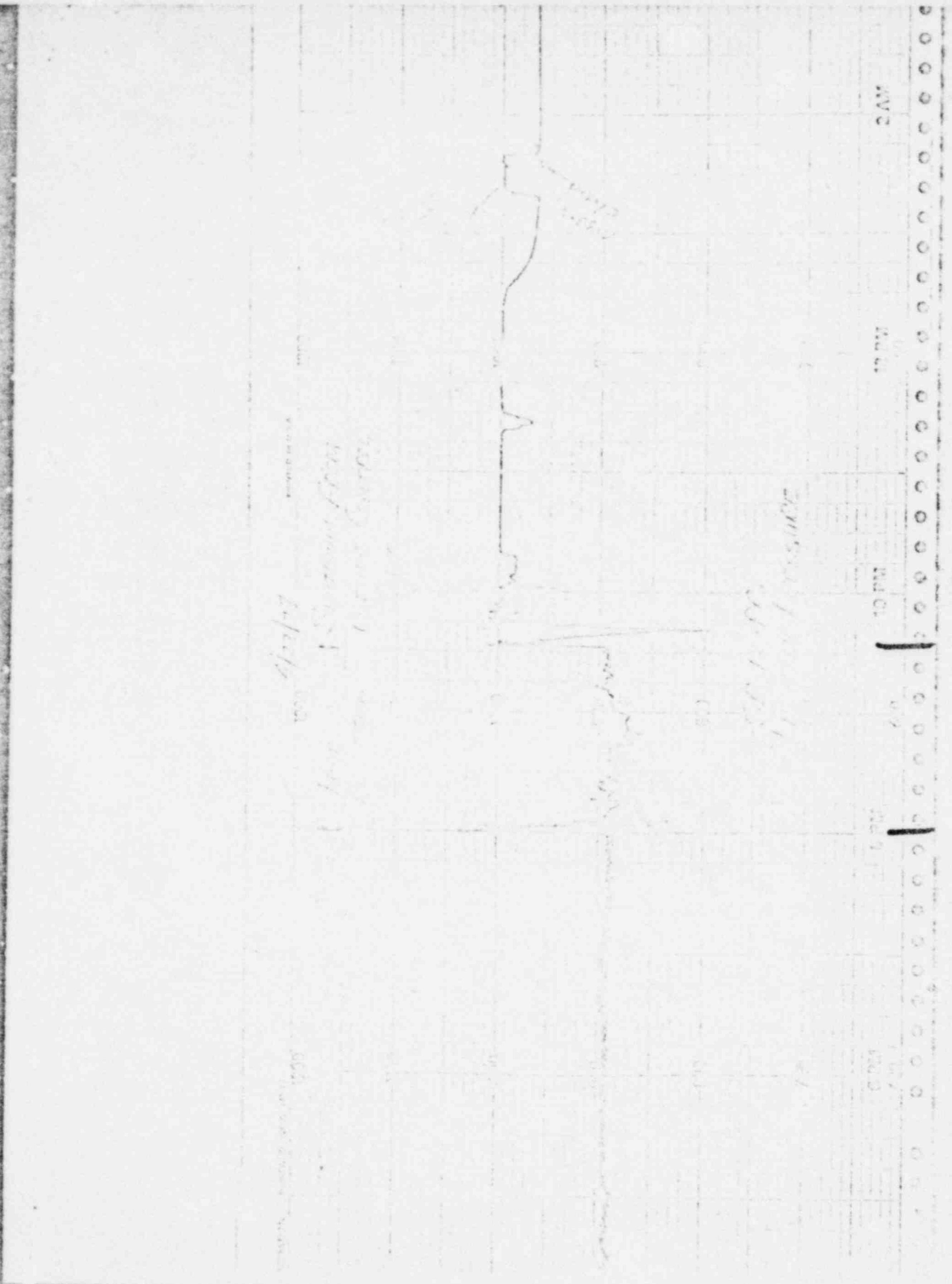
MICROCOPY RESOLUTION TEST CHART




320
280
240
200
160
120
80
40
10PM
11PM
12M
2AM

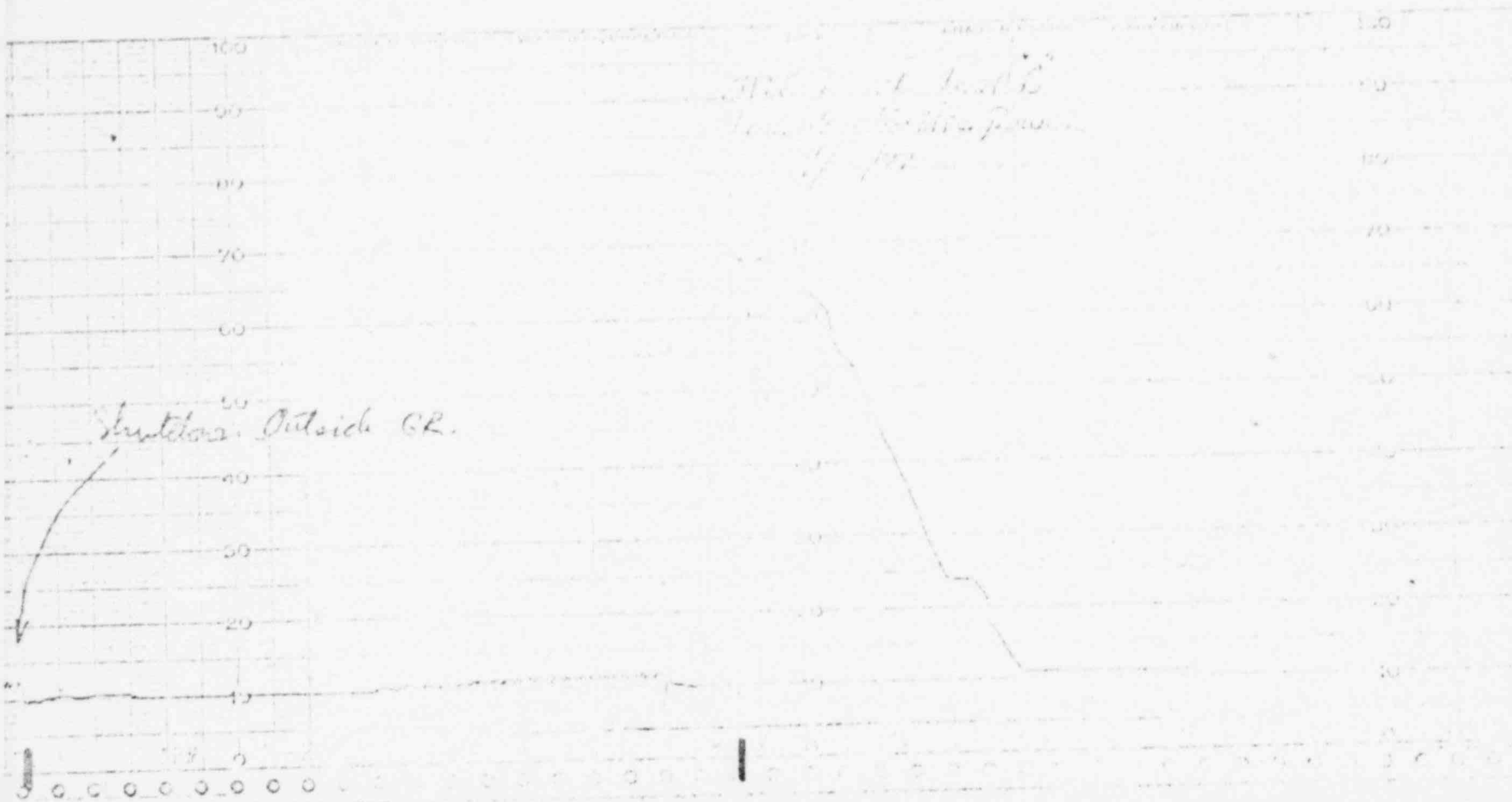


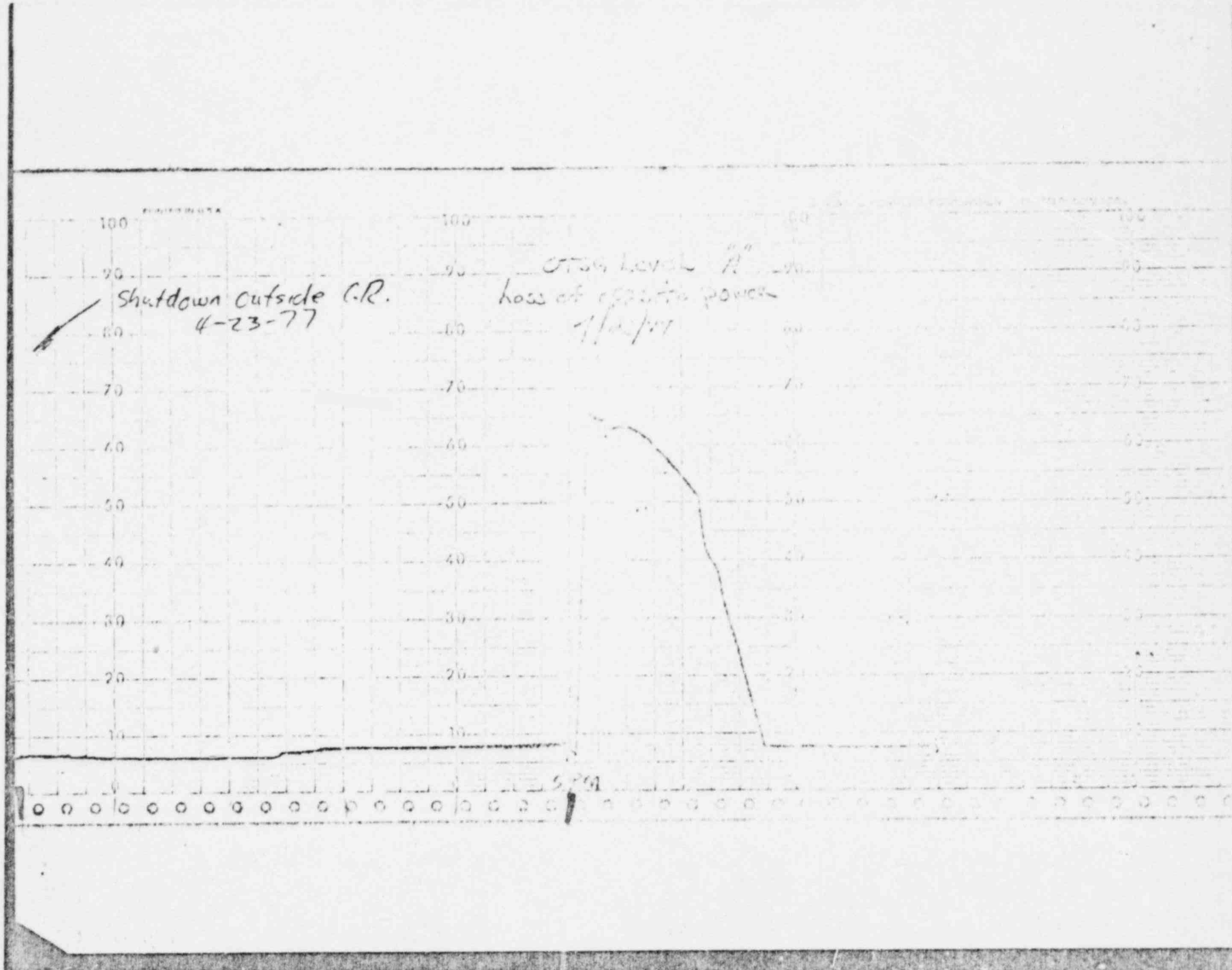


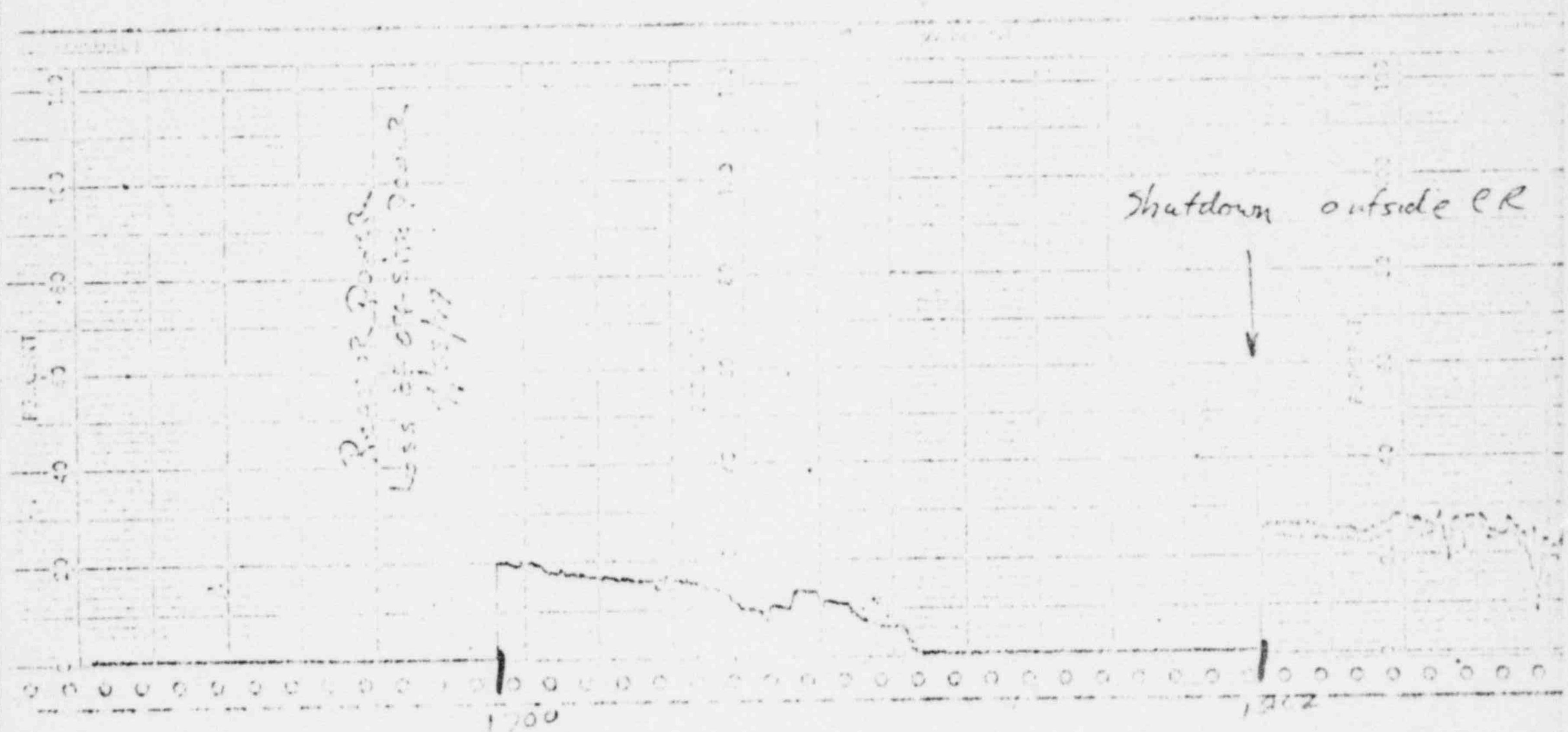


1202
4-23-77
Shutdown outside CR

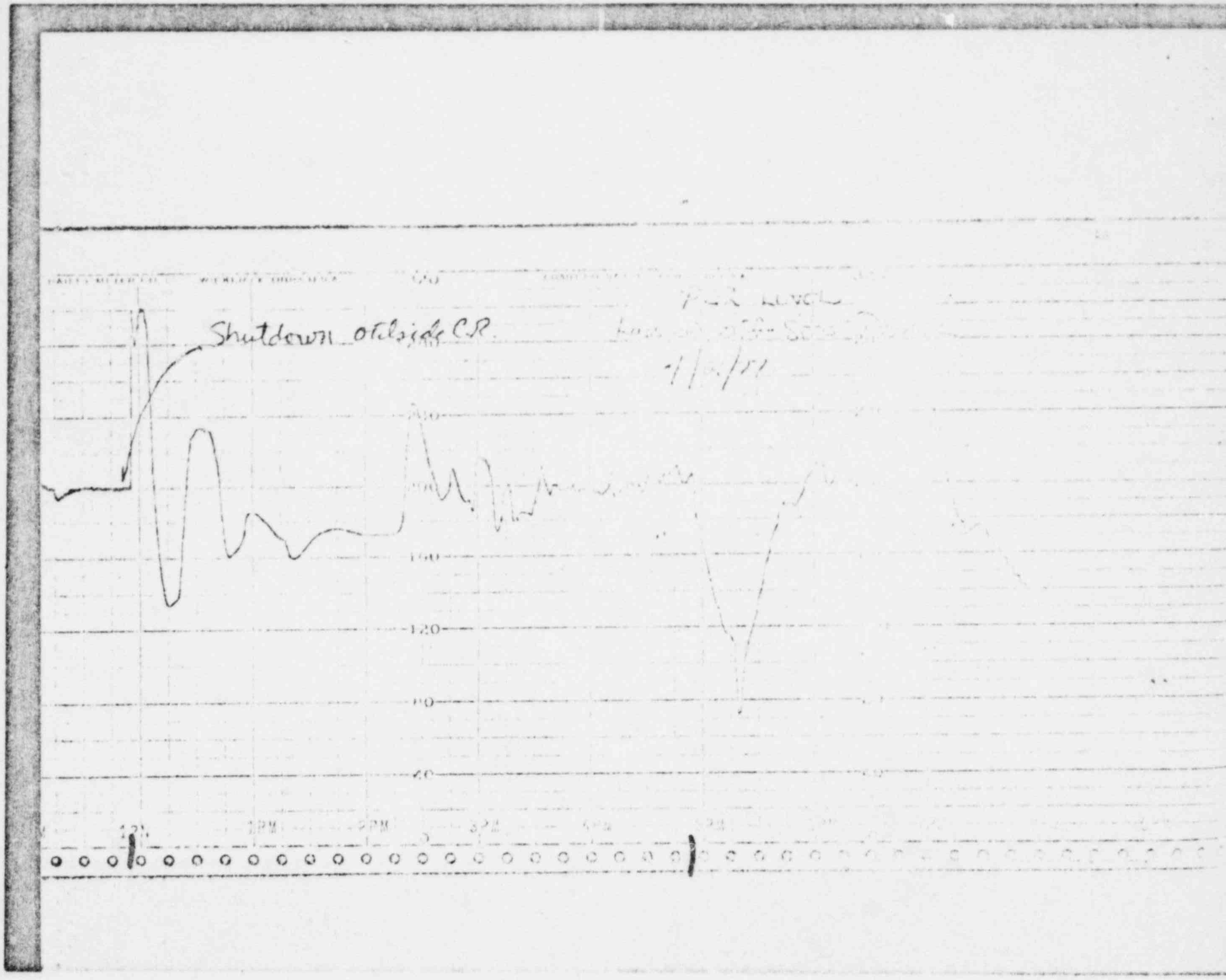
1700
4-23-77
Loss of Offsite power



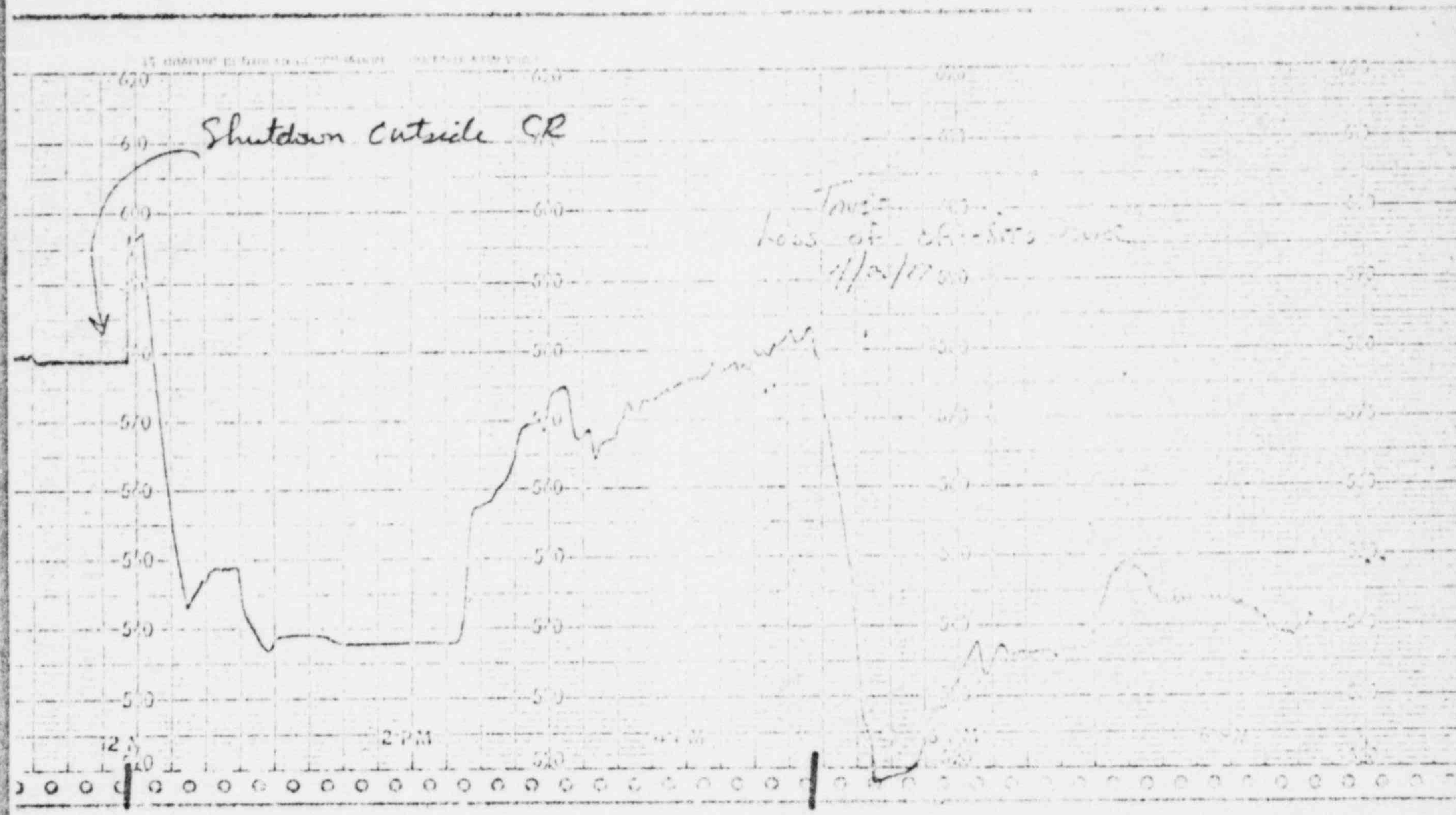

Shutdown Outside C.R.
4-23-77
OTSG Level "A"
Loss of offsite power
100
90
80
70
60
50
40
30
20
10



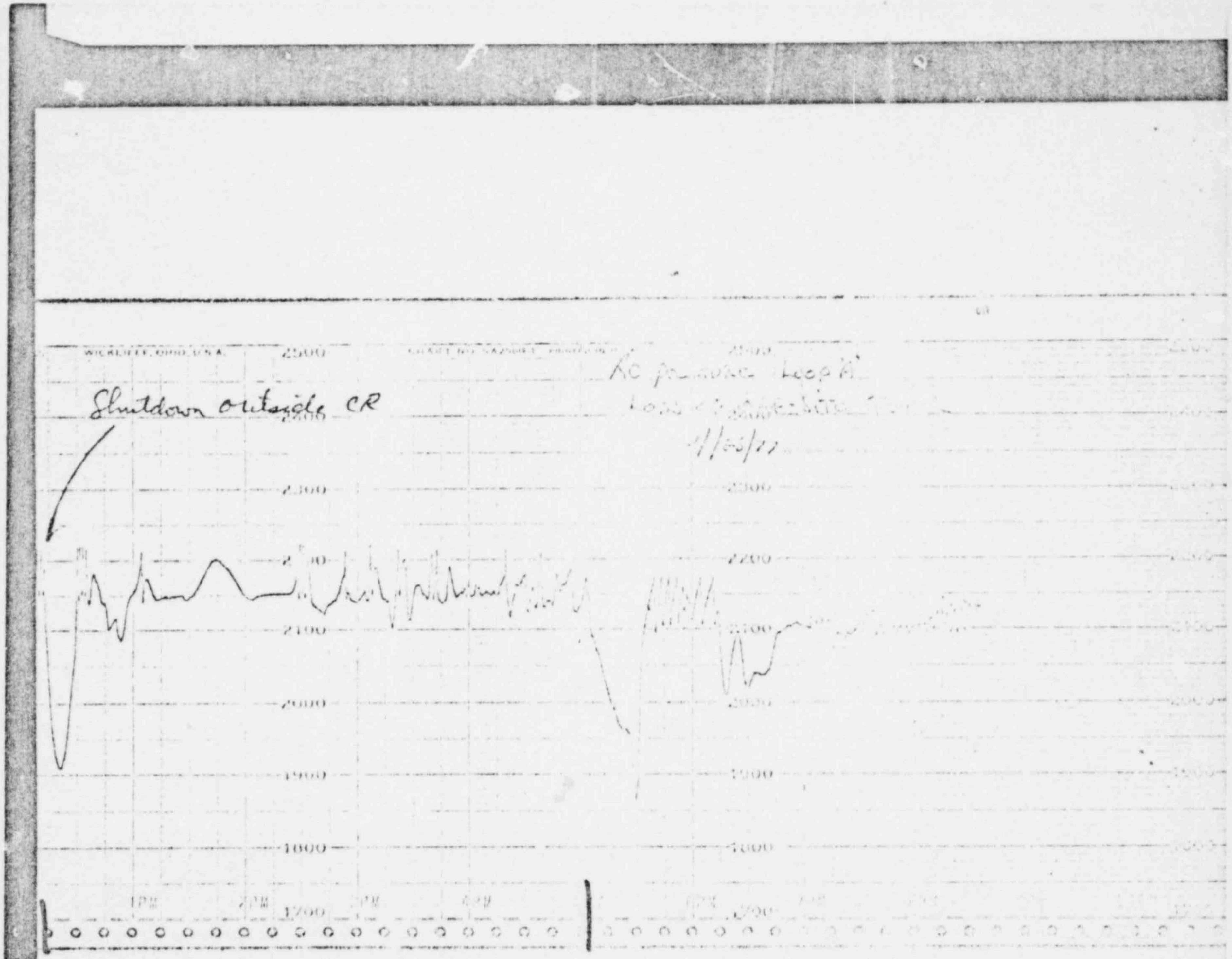
Shutdown outside CR
1700



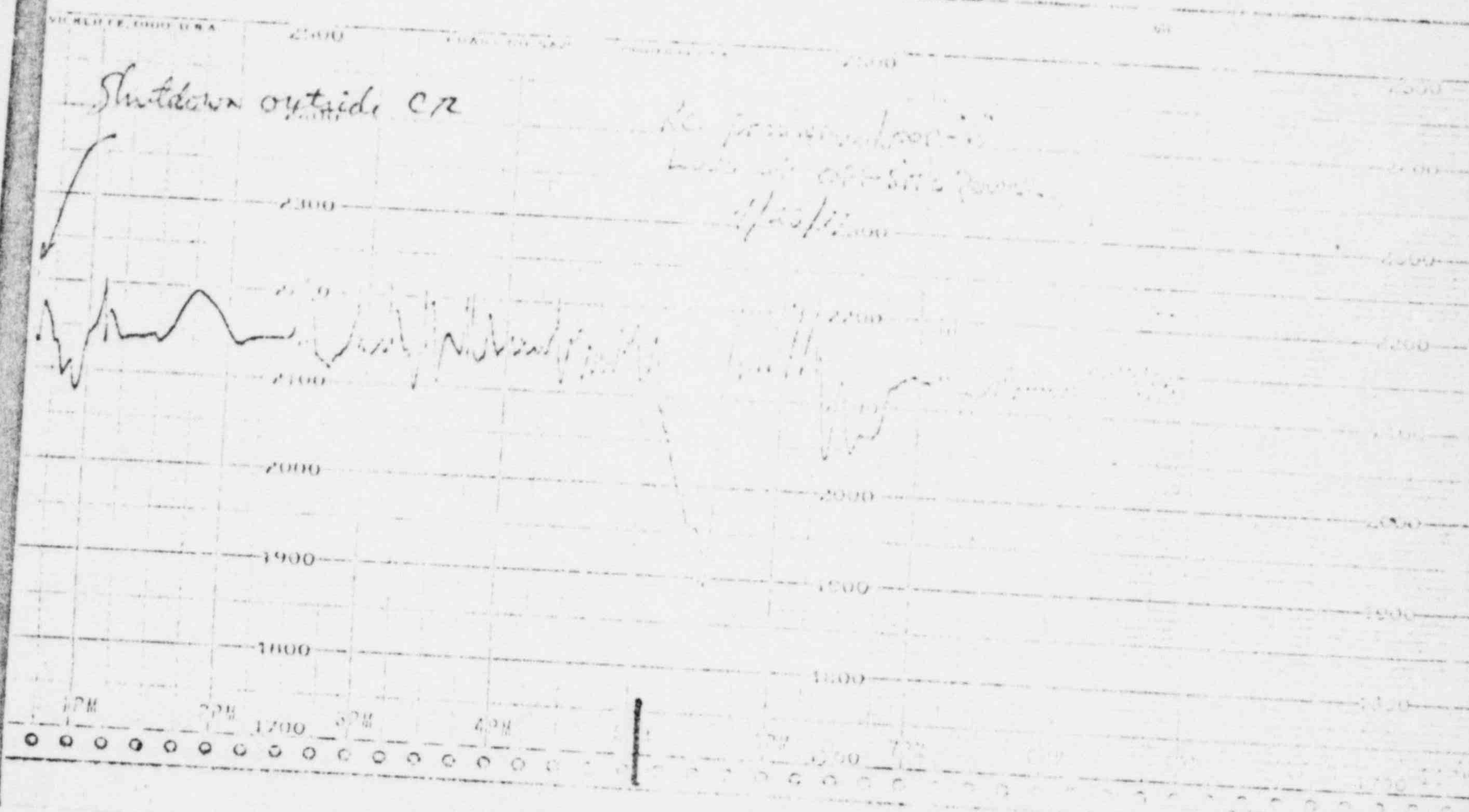
Shutdown outside CR
PZR LEVEL
11/xx/??
120
40
1PM
2PM
3PM
4PM

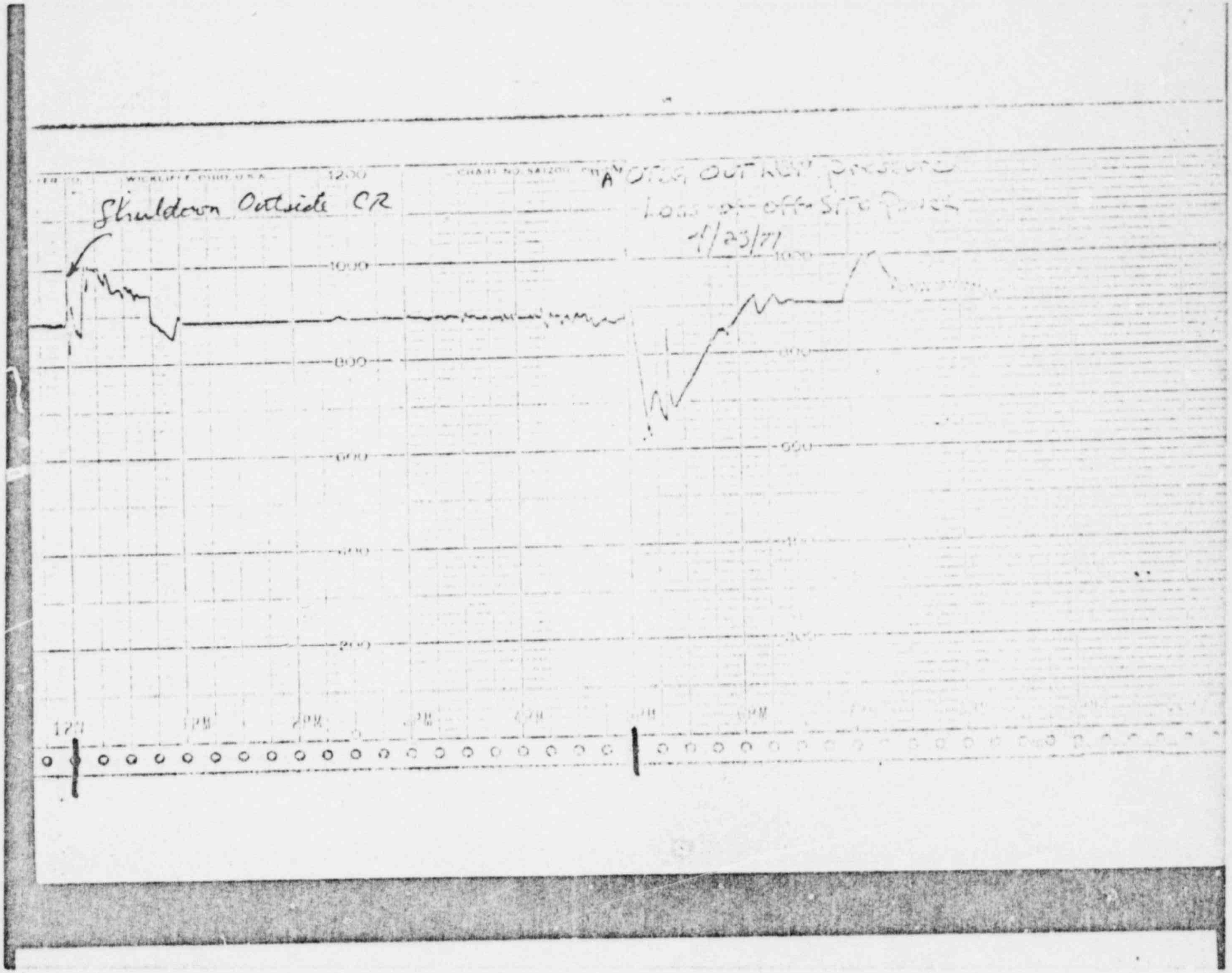


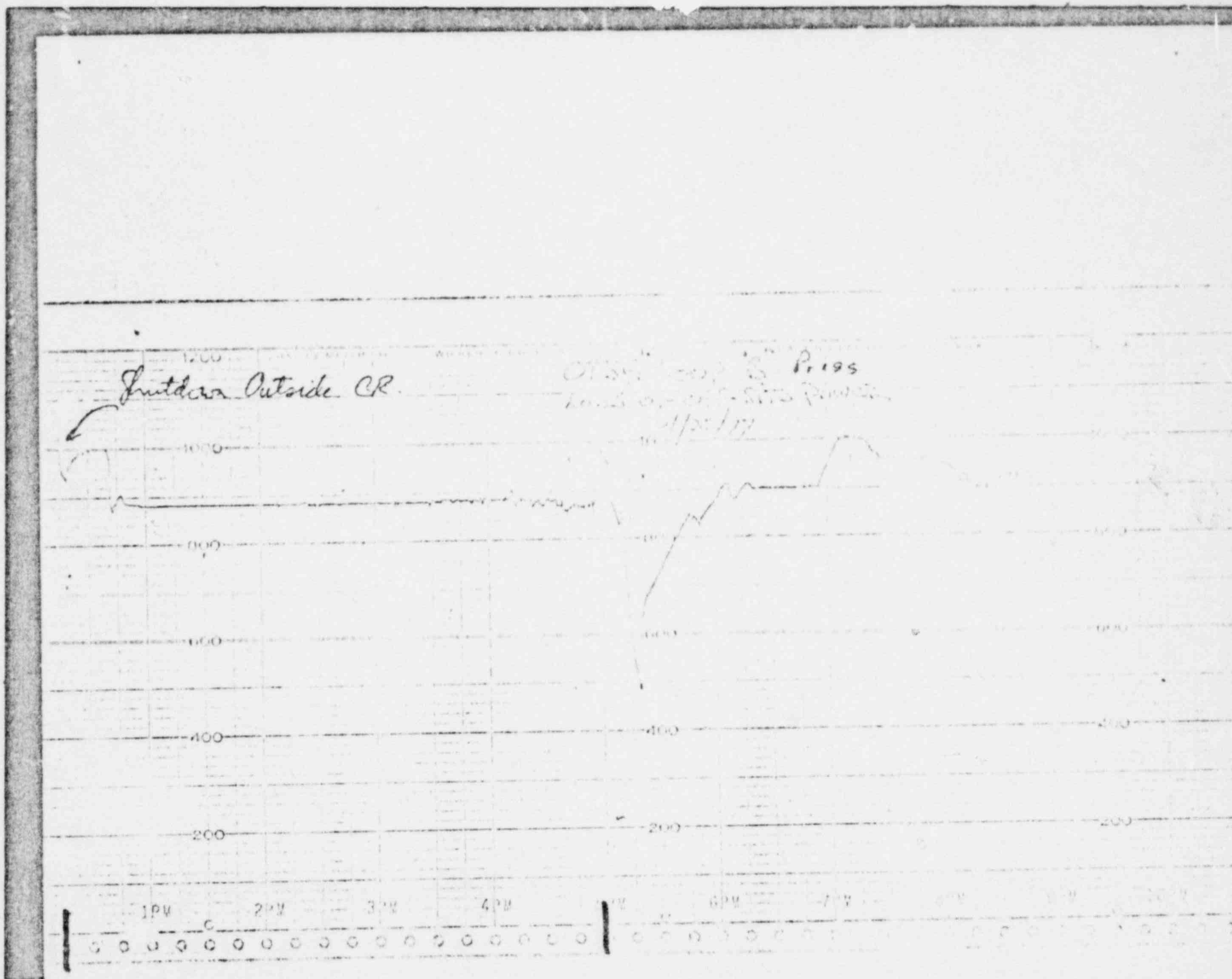
Shutdown Outside CR
Tave
Loss of Off-Site Power
2 PM



WICKLIFFE, OHIO, U.S.A.
Shutdown outside CR
RC pressure Loop A
Loss of offsite power
2500
2400
2300
2200
2100
2000
1900
1800
1700
1PM
2PM
3PM
4PM


Shutdown outside CR
2300
2200
2100
2000
1900
1800
1700


WICKLIFFE OHIO U.S.A.
1200
CHART NO. SA1200
"A" OTSG OUTLET PRESSURE
Loss of off-site Power
4/23/77
Shutdown Outside CR
1000
800
600
400
200
12M
1PM
2PM
3PM
4PM
5PM
6PM



Shutdown Outside CR
Press
1200
1000
800
600
400
200
1PM
2PM
3PM
4PM
6PM

12116120
R4.2377T

Shutdown outside Control Room

POST TRIP REVIEW

	P210	P209	P211	P211	P216	P215	P212	P213	P222	P224	P204	P222	S285	S286	S301	S302	T228	T232	T227	T231
11:44:45	25.7	25.4	25.5	25.4	574.2	574.0	583.9	583.9	2150.	2144.	2149.	134.2	43.0	41.5	913.	937.	891.	888.	582.6	584.0
11:45:45	24.0	23.8	23.9	23.7	574.5	574.3	584.2	584.2	2158.	2152.	2156.	134.7	42.5	41.7	918.	911.	898.	887.	582.8	584.1
11:46:45	23.5	23.2	23.4	23.2	574.6	574.6	584.1	584.1	2148.	2142.	2149.	134.4	42.5	41.4	942.	943.	889.	885.	582.6	584.1
11:47:45	25.6	25.3	25.5	25.3	574.3	574.2	583.8	583.9	2148.	2141.	2147.	134.0	43.2	42.7	937.	945.	891.	888.	582.6	584.0
11:48:45	24.7	24.4	24.5	24.3	574.5	574.6	584.3	584.3	2158.	2154.	2163.	135.0	42.4	41.9	923.	931.	890.	885.	582.5	584.0
11:49:45	23.8	23.5	23.7	23.5	574.6	574.2	584.0	584.1	2149.	2143.	2148.	134.4	42.3	41.2	933.	942.	888.	886.	582.8	584.2
11:50:45	25.8	25.5	25.7	25.5	574.1	574.0	583.9	583.9	2150.	2144.	2149.	134.0	42.7	41.7	927.	953.	890.	886.	582.6	584.0
11:51:45	23.8	23.5	23.7	23.5	574.5	574.5	584.2	584.2	2159.	2153.	2158.	134.8	42.8	42.1	940.	925.	887.	884.	582.6	584.1
11:52:45	23.6	23.3	23.4	23.3	574.5	574.2	584.1	584.2	2151.	2145.	2151.	134.4	42.3	41.0	937.	932.	888.	884.	582.8	584.1
11:53:45	25.0	24.8	25.0	25.0	574.2	574.0	583.9	583.9	2153.	2147.	2151.	134.1	43.0	42.0	940.	934.	885.	885.	582.8	584.0
11:54:45	25.2	24.9	25.0	24.7	574.6	574.1	584.3	584.2	2165.	2159.	2164.	134.9	42.3	41.4	925.	910.	889.	886.	582.8	584.2
11:55:00	25.0	24.6	24.4	24.7	574.5	574.1	584.3	584.2	2165.	2159.	2164.	134.9	42.3	41.4	925.	910.	887.	884.	582.5	584.1
11:55:15	25.0	24.8	24.8	24.7	574.4	574.2	583.8	583.8	2147.	2141.	2146.	134.0	42.3	41.3	943.	943.	887.	884.	582.6	584.0
11:55:30	23.7	23.4	23.5	23.4	574.4	574.2	583.8	583.8	2147.	2141.	2146.	134.0	42.3	41.3	943.	943.	890.	887.	582.6	584.2
11:55:45	23.7	23.4	23.5	23.4	574.5	574.5	584.1	584.2	2158.	2151.	2157.	134.8	42.2	41.7	929.	928.	889.	888.	582.8	584.1
11:56:00	23.5	23.3	23.5	23.3	574.6	574.5	584.1	584.2	2158.	2151.	2157.	134.8	42.2	41.7	929.	928.	887.	888.	582.5	584.1
11:56:15	23.5	23.3	23.5	23.3	574.3	573.7	584.2	584.0	2158.	2152.	2157.	134.5	42.5	41.2	932.	921.	891.	888.	582.5	584.1
11:56:30	23.4	23.1	23.2	23.1	574.3	573.7	584.3	584.2	2158.	2152.	2157.	134.5	42.5	41.2	932.	921.	888.	885.	582.6	584.2
11:56:45	23.4	23.1	23.2	23.1	574.5	57	584.3	584.1	2151.	2145.	2151.	134.6	42.3	40.8	948.	949.	887.	884.	582.6	584.1
11:57:00	24.0	23.7	23.9	23.8	574.5	5	584.8	584.1	2151.	2145.	2151.	134.6	42.3	40.8	948.	940.	892.	887.	582.5	584.0
11:57:15	24.0	23.7	23.9	23.8	574.5	574.1	584.2	584.2	2158.	2152.	2157.	134.8	42.6	42.1	913.	910.	888.	885.	582.7	584.1
11:57:30	25.7	25.4	25.5	25.3	574.5	574.5	584.2	584.2	2158.	2152.	2157.	134.8	42.6	42.1	913.	910.	888.	885.	582.6	584.0
11:57:45	25.7	25.4	25.5	25.3	574.3	574.1	584.2	584.1	2157.	2151.	2156.	134.7	42.9	42.0	924.	928.	889.	885.	582.6	584.0
11:58:00	23.7	23.4	23.6	23.5	574.3	574.1	584.2	584.1	2157.	2151.	2156.	134.7	42.9	42.0	924.	928.	889.	886.	582.6	584.1
11:58:15	23.7	23.4	23.5	23.5	571.4	574.2	583.8	583.9	2143.	2137.	2142.	134.1	42.5	41.4	931.	934.	887.	884.	582.5	584.1
11:58:30	23.8	23.5	23.6	23.5	574.4	574.2	583.9	583.9	2143.	2137.	2142.	134.1	42.5	41.4	931.	934.	889.	886.	582.5	584.0
11:58:45	23.9	23.5	23.6	23.5	574.6	574.4	584.1	584.2	2155.	2149.	2155.	134.8	42.5	41.3	927.	927.	887.	884.	582.7	584.0
11:59:00	25.6	25.1	25.3	25.1	574.5	574.4	584.1	584.2	2155.	2149.	2155.	134.8	42.5	41.3	927.	927.	887.	884.	582.6	584.4
11:59:15	25.5	25.1	25.3	25.1	574.3	574.1	584.3	584.1	2156.	2150.	2155.	134.6	42.1	41.8	926.	929.	890.	887.	582.6	584.3
11:59:30	23.5	23.2	23.4	23.2	574.3	574.1	584.3	584.1	2155.	2154.	2155.	134.6	42.1	41.6	928.	929.	891.	887.	582.7	584.1
11:59:45	23.3	23.2	23.4	23.3	574.4	574.0	583.9	584.0	2146.	2144.	2145.	134.3	41.7	41.9	923.	925.	911.	908.	582.8	584.2
12:00:00	23.3	23.2	24.1	19.9	574.4	574.0	583.9	584.0	2146.	2140.	2145.	134.3	41.7	41.9	925.	925.	989.	958.	583.3	584.7
12:00:15	20.3	22.8	22.1	10.9	541.9	582.3	588.4	586.1	2228.	2213.	2215.	148.8	26.3	25.3	0	10.	913.	937.	586.4	586.3
12:00:30	9.2	9.3	9.8	9.4	582.2	582.3	588.4	588.1	2225.	2218.	2215.	148.0	25.3	25.3	0	10.	883.	876.	587.3	587.2
12:00:45	9.2	9.3	9.0	6.3	583.3	589.4	591.7	591.4	2257.	2249.	2250.	169.9	17.5	15.8	0	9.	878.	863.	586.2	587.1
12:01:00	.3	.3	.2	.4	589.3	582.4	591.7	591.4	2257.	2249.	2258.	169.5	17.8	15.8	0	9.	889.	863.	584.5	586.0
12:01:15	.3	.3	.2	.4	595.5	595.6	595.9	595.7	2231.	2224.	2228.	187.7	16.8	14.4	0	9.	858.	855.	582.8	585.7
12:01:30	.4	.2	.3	.1	595.5	595.6	595.9	595.7	2231.	2224.	2228.	187.7	15.8	14.4	0	9.	841.	840.	581.3	584.8
12:01:45	.2	.2	.3	.1	595.9	596.9	595.9	596.0	2235.	2227.	2231.	192.3	16.1	13.8	0	9.	835.	827.	579.9	584.0
12:02:00	.3	.4	.3	.0	595.0	596.9	595.9	595.4	2235.	2227.	2231.	192.3	16.1	13.8	0	9.	862.	863.	578.8	582.9
12:02:15	.2	.3	.3	.0	595.4	594.4	598.9	597.2	2145.	2140.	2145.	193.0	17.3	15.2	0	9.	921.	929.	577.8	582.3
12:02:30	.3	.2	.3	.0	595.2	594.4	595.9	597.0	2145.	2140.	2145.	193.0	17.3	15.2	0	9.	914.	931.	578.2	582.2
12:02:45	.3	.3	.2	.2	594.7	593.9	594.9	594.9	2137.	2131.	2136.	189.8	18.2	16.2	0	9.	914.	918.	579.3	582.7
12:03:00	.0	.3	.3	.3	594.7	593.0	594.9	594.9	2137.	2131.	2136.	189.8	18.2	16.2	0	9.	904.	915.	580.2	583.3
12:03:15	.2	.3	.2	.3	595.4	594.7	595.4	595.4	2177.	2170.	2175.	191.4	17.8	15.7	0	9.	942.	926.	580.2	583.8
12:03:30	.0	.3	.3	.3	595.4	594.7	595.4	595.4	2177.	2170.	2175.	191.4	17.8	15.7	0	9.	875.	923.	581.3	584.1
12:03:45	.2	.3	.3	.3	595.4	595.7	595.1	596.1	2218.	2209.	2212.	192.5	17.6	15.4	0	9.	869.	971.	581.5	584.3
12:04:00	.0	.3	.0	.2	595.4	595.7	595.1	596.1	2218.	2209.	2212.	192.5	17.6	15.4	0	9.	891.	875.	581.3	584.3
12:04:15	.3	.3	.3	.2	595.9	596.3	595.3	594.5	2184.	2177.	2183.	195.5	17.4	15.2	0	9.	881.	902.	581.4	584.2
12:04:30	.2	.2	.0	.2	595.9	596.3	595.3	596.5	2184.	2177.	2183.	195.5	17.4	15.2	0	9.	887.	886.	581.3	584.1
12:05:34	.2	.2	.4	.3	594.7	595.8	596.8	597.3	2179.	2173.	2178.	200.3	17.1	15.0	0	9.	875.	886.	580.6	583.0
12:06:30	.4	.3	.1	.2	597.3	596.9	597.3	597.6	2193.	2187.	2192.	202.8	16.9	14.8	0	9.	887.	884.	579.8	581.5
12:07:30	.3	.3	.3	.2	597.1	597.3	597.4	597.7	2172.	2166.	2171.	200.9	16.9	14.7	0	9.	887.	878.	579.0	582.2
12:08:30	.0	.2	.3	.2	594.2	593.7	595.6	595.2	2103.	2098.	2104.	197.4	19.2	16.9	0	9.	985.	984.	582.0	582.2
12:09:30	.3	.3	.3	.0	590.1	587.5	591.5	592.3	2048.	2044.	2051.	184.2	20.8	18.5	0	9.	996.	986.	589.0	589.1
12:10:30	.0	.3	.0	.0	587.5	588.2	587.2	594.6	1999.	1994.	2001.	168.8	19.8	18.9	0	9.	974.	973.	591.0	589.9

12:11:30	.2	.3	.2	.2	577.1	579.1	581.9	582.4	1961.	1957.	1964.	152.9	21.4	19.5	0	9.	1889.	1886.	592.6	589.7
12:12:30	.0	.2	.3	.0	577.3	572.7	577.5	575.9	1939.	1934.	1942.	140.4	21.3	20.8	0	9.	1887.	86.	592.8	589.1
12:13:31	.1	.2	.3	.2	571.4	566.9	571.5	572.1	1922.	1917.	1925.	126.7	21.5	24.7	0	9.	1887.	1886.	589.7	587.5
12:14:30	.2	.3	.1	.3	561.1	555.1	560.3	558.1	1914.	1909.	1916.	119.8	21.7	22.7	0	9.	1887.	1886.	589.3	585.9

	T212	T219	T242	T215	T249	G200	T312	T313	T314	T315	T316	T317	G228	G229	G219	T244	T323	T243	T228	T239
11:44:45	130.	-7777.	21.57	1.49	1796.	52.2	.81	1.41	.52	1.46	3.26	2.97	1.97	.63	1.74	772.	422.	-77.77	112.	344.
11:45:45	132.	-7777.	21.57	1.40	1796.	52.2	.85	1.41	.54	1.45	3.30	2.96	1.96	.62	1.74	772.	422.	-77.77	111.	344.
11:46:45	138.	-7777.	21.54	1.43	1796.	52.2	.83	1.41	.52	1.45	3.26	2.48	1.97	.63	1.75	773.	423.	-77.77	111.	344.
11:47:45	134.	-7777.	21.74	1.48	1796.	52.2	.81	1.41	.54	1.46	3.31	2.95	1.97	.62	1.74	773.	422.	-77.77	111.	344.
11:48:45	130.	-7777.	21.71	1.40	1795.	52.2	.72	1.40	.56	1.46	3.32	2.95	1.96	.63	1.74	773.	422.	-77.77	111.	344.
11:49:45	132.	-7777.	21.72	1.42	1796.	52.2	.82	1.41	.55	1.46	3.32	2.95	1.98	.63	1.74	773.	422.	-77.77	111.	344.
11:50:45	130.	-7777.	21.56	1.40	1796.	52.2	.72	1.43	.55	1.47	3.33	2.95	1.98	.63	1.74	773.	423.	-77.77	111.	344.
11:51:45	131.	-7777.	21.56	1.44	1798.	52.2	.83	1.43	.54	1.45	3.38	2.90	1.97	.82	1.74	773.	423.	-77.77	112.	344.
11:52:45	132.	-7777.	21.42	1.48	1798.	52.2	.84	1.42	.55	1.46	3.33	2.90	1.96	.60	1.75	773.	422.	-77.77	112.	344.
11:53:45	130.	-7777.	21.63	1.40	1796.	52.2	.92	1.40	.53	1.45	3.29	2.97	1.97	.62	1.74	773.	423.	-77.77	112.	344.
11:54:45	131.	-7777.	21.74	1.44	1796.	52.2	.81	1.42	.56	1.46	3.34	2.96	1.96	.63	1.74	773.	422.	-77.77	112.	344.
11:55:00	131.	-7777.	21.71	1.47	1796.	52.2	.85	1.42	.57	1.48	3.36	2.95	1.96	.62	1.75	773.	422.	-77.77	112.	344.
11:55:15	130.	-7777.	21.55	1.44	1796.	52.2	.82	1.40	.55	1.45	3.34	2.95	1.98	.52	1.74	773.	422.	-77.77	111.	344.
11:55:30	130.	-7777.	21.64	1.48	1795.	52.2	.45	1.40	.57	1.45	3.35	2.96	1.96	.61	1.74	773.	422.	-77.77	111.	344.
11:55:45	130.	-7777.	21.55	1.49	1796.	52.2	.75	1.40	.54	1.44	3.31	2.97	1.97	.63	1.74	773.	422.	-77.77	111.	344.
11:56:00	130.	-7777.	21.75	1.40	1796.	52.2	.65	1.42	.53	1.45	3.37	2.98	1.97	.63	1.74	774.	423.	-77.77	111.	344.
11:56:15	132.	-7777.	21.74	1.44	1796.	52.2	.74	1.10	.54	1.44	3.32	2.97	1.97	.82	1.74	774.	423.	-77.77	111.	344.
11:56:30	130.	-7777.	21.72	1.39	1796.	52.2	.88	1.40	.56	1.45	3.34	2.96	1.97	.63	1.75	774.	423.	-77.77	111.	344.
11:56:45	129.	-7777.	21.72	1.41	1796.	52.0	.88	1.42	.56	1.45	3.33	2.96	1.97	.82	1.74	774.	423.	-77.77	111.	344.
11:57:00	130.	-7777.	21.85	1.39	1796.	52.2	.70	1.40	.57	1.40	3.34	2.98	1.96	.60	1.74	774.	423.	-77.77	111.	344.
11:57:15	130.	-7777.	21.74	1.39	1796.	52.2	.74	1.41	.58	1.44	3.34	2.95	1.96	.62	1.74	774.	423.	-77.77	111.	344.
11:57:30	129.	-7777.	21.75	1.40	1796.	52.2	.80	1.49	.57	1.46	3.35	2.98	1.96	.83	1.74	774.	423.	-77.77	112.	344.
11:57:45	129.	-7777.	21.75	1.39	1796.	52.2	.82	1.40	.58	1.46	3.34	2.98	1.96	.62	1.74	774.	423.	-77.77	112.	344.
11:58:00	130.	-7777.	21.47	1.42	1796.	52.2	.85	1.42	.50	1.44	3.32	2.97	1.96	.63	1.74	774.	423.	-77.77	111.	343.
11:58:15	132.	-7777.	21.51	1.34	1796.	52.2	.85	1.40	.55	1.43	3.31	2.98	1.97	.62	1.74	774.	423.	-77.77	111.	343.
11:58:30	130.	-7777.	21.47	1.39	1796.	52.2	.85	1.42	.55	1.44	3.34	2.97	1.96	.53	1.75	774.	423.	-77.77	111.	343.
11:58:45	130.	-7777.	21.71	1.39	1796.	52.2	.74	1.40	.57	1.44	3.33	2.96	1.96	.61	1.75	774.	423.	-77.77	111.	343.
11:59:00	130.	-7777.	21.72	1.40	1796.	52.2	.84	1.40	.58	1.44	3.34	2.96	1.96	.62	1.74	774.	423.	-77.77	111.	342.
11:59:15	130.	-7777.	21.68	1.39	1796.	52.2	.81	1.40	.57	1.44	3.35	2.96	1.96	.61	1.74	774.	423.	-77.77	111.	342.
11:59:30	130.	-7777.	21.74	1.37	1796.	52.2	.80	1.40	.58	1.40	3.35	2.96	1.96	.62	1.75	774.	423.	-77.77	111.	342.
....																				
11:59:45	132.	-7777.	21.54	1.39	1796.	52.2	.76	1.38	.62	1.55	3.47	2.94	1.96	.63	1.74	774.	423.	-77.77	32.	342.
12:00:00	[illegible]	-7777.	19.33	1.01	1796.	52.2	.42	1.51	1.15	3.14	3.27	3.08	2.27	.69	1.45	774.	423.	-77.77	22.	342.
12:00:15	-7777.	-7777.	17.38	1.06	1597.	52.4	.61	1.36	2.04	2.84	5.89	4.68	2.81	.54	1.06	774.	423.	-77.77	19.	342.
12:00:30	-7777.	-7777.	15.43	1.18	1597.	52.5	.37	1.45	1.36	2.15	6.18	3.72	1.38	.27	.79	774.	423.	-77.77	18.	342.
12:00:45	-7777.	-7777.	14.82	1.21	1839.	52.5	.29	1.58	1.04	2.24	5.28	2.81	1.36	.13	.63	757.	423.	-77.77	16.	341.
12:01:00	-7777.	-7777.	13.70	1.19	1639.	52.6	.04	1.51	.82	2.09	4.70	2.43	1.01	.18	.45	757.	403.	-77.77	15.	341.
12:01:15	-7777.	-7777.	12.53	1.18	1533.	52.6	.06	1.54	.65	2.27	4.25	2.19	.92	.04	.42	757.	403.	-77.77	14.	341.
12:01:30	-7777.	-7777.	17.15	1.14	1583.	52.7	.14	1.53	.67	2.42	3.98	2.10	.95	.06	.47	757.	403.	-77.77	13.	341.
12:01:45	-7777.	-7777.	15.64	1.13	1457.	52.3	.23	1.32	.58	2.72	3.83	2.28	1.03	.25	.53	746.	388.	-77.77	12.	339.
12:02:00	-7777.	-7777.	15.55	1.13	1457.	52.9	.27	1.28	.76	2.43	3.74	2.12	1.26	.28	.51	745.	388.	-77.77	13.	339.
12:02:15	-7777.	-7777.	15.44	1.15	1405.	53.0	.34	1.24	.64	2.26	3.57	2.31	1.04	.29	.54	746.	368.	-77.77	13.	339.
12:02:30	-7777.	-7777.	17.22	1.14	1392.	53.1	.35	1.18	.60	2.43	3.08	2.82	1.11	.38	.66	741.	388.	-77.77	13.	239.
12:02:45	-7777.	-7777.	17.14	1.14	1347.	53.3	.42	1.27	.86	2.40	4.12	3.10	1.03	.34	.89	739.	378.	-77.77	12.	336.
12:03:00	-7777.	-7777.	17.33	1.15	1347.	53.4	.51	1.12	.86	2.52	4.45	3.54	1.98	.45	1.12	739.	378.	-77.77	11.	336.
12:03:15	-7777.	-7777.	17.43	1.13	1293.	53.5	.59	1.02	.95	2.18	3.97	4.58	1.14	.39	.94	739.	378.	-77.77	11.	335.
12:03:30	-7777.	-7777.	17.53	1.15	1293.	53.6	.72	1.12	1.28	1.04	3.14	4.97	.95	.32	.74	739.	378.	-77.77	10.	336.
12:03:45	-7777.	-7777.	17.59	1.13	1244.	53.7	.79	1.26	1.37	.81	3.30	4.27	.98	.22	.82	733.	380.	-77.77	10.	336.
12:04:00	-7777.	-7777.	17.78	1.14	1243.	53.8	.77	1.32	1.53	1.24	1.85	3.84	1.28	1.98	1.24	733.	359.	-77.77	9.	336.
12:04:15	-7777.	-7777.	17.79	1.14	1197.	53.8	.61	1.29	1.95	1.29	1.79	3.68	1.35	1.05	1.35	733.	369.	-77.77	9.	336.
12:04:30	-7777.	-7777.	17.90	1.14	1197.	53.9	.54	1.16	2.47	.95	1.79	4.02	1.27	.78	.84	733.	369.	-77.77	9.	336.
12:05:30	-7777.	-7777.	15.42	1.10	1112.	53.6	.67	.88	2.26	1.16	.96	4.32	.34	.16	.23	729.	363.	-77.77	7.	334.
12:06:30	-7777.	-7777.	16.54	1.15	1036.	53.8	.57	.92	2.01	1.74	1.67	3.98	.34	.11	.14	728.	357.	-77.77	5.	334.
12:07:30	-7777.	-7777.	18.79	1.17	988.	54.3	.69	.94	2.04	1.72	1.85	2.23	.55	.06	.36	723.	352.	-77.77	5.	335.
12:08:30	-7777.	-7777.	18.58	1.22	936.	54.5	.72	.98	1.38	2.03	2.20	1.67	.84	-77.77	.08	722.	349.	-77.77	4.	332.
12:09:38	-7777.	-7777.	18.49	1.22	849.	54.5	.52	1.04	1.35	1.85	1.96	.95	.54	.18	-77.77	720.	345.	-77.77	3.	332.
12:09:32	-7777.	-7777.	18.96	1.23	797.	54.2	.64	.95	1.27	1.88	1.90	.67	.50	.16	.80	719.	343.	-77.77	2.	332.

2111:30	-7777.	-7777.	18.71	1.22	756.	54.0	.64	.93	1.12	1.88	1.78	.45	.42	.15	.08	719.	340.	-77.77	1.	332.
2112:30	-7777.	-7777.	18.99	1.21	776.	54.4	.65	.93	1.01	1.84	1.64	.31	.38	.17	.08	718.	338.	-77.77	0	332.
2113:30	-7777.	-7777.	19.14	1.24	638.	54.5	.47	.80	.94	1.98	1.53	.26	.34	.15	.08	718.	336.	-77.77	0	338.
2114:30	-7777.	-7777.	19.17	1.25	570.	56.0	.43	.85	.99	1.73	1.44	.17	.31	.11	-77.77	718.	335.	-77.77	-7777.	338.

	T322	T321	T319	T296	T290	T283	T276	T272	T264	T262	T260	T258	T256	T254	T252	T242	T241	T251
1144:45	53.9	0	0	123.7	-777.7	317.7	325.3	369.6	324.7	318.7	317.8	538.1	572.1	538.4	575.3	67.9	21.7	154.3
1145:45	53.7	0	0	123.1	-777.7	316.6	325.4	369.4	324.7	318.7	317.8	538.1	572.3	538.7	575.2	67.7	21.6	154.7
1146:45	53.7	0	0	122.9	-777.7	317.0	325.4	369.4	324.4	318.5	317.1	538.2	572.3	538.5	575.2	67.7	21.7	155.1
1147:45	53.9	0	0	123.2	-777.7	317.2	325.3	369.8	324.7	318.9	317.1	538.2	572.3	538.4	575.2	67.7	21.6	154.8
1148:45	53.7	0	0	123.2	-777.7	316.8	325.5	369.4	324.4	318.5	317.1	537.9	572.1	538.4	575.2	67.5	21.6	152.7
1149:45	53.9	0	0	123.2	-777.7	316.8	325.7	369.8	324.7	318.7	317.0	537.9	572.1	538.4	575.2	67.5	21.5	154.8
1150:45	53.7	0	0	123.1	-777.7	316.0	325.7	369.3	324.4	318.5	317.0	537.9	572.3	538.4	575.2	67.9	21.7	154.9
1151:45	53.7	0	0	123.1	-777.7	316.8	325.9	369.3	324.2	318.5	317.1	537.6	572.1	538.2	575.2	67.7	21.7	152.9
1152:45	53.7	0	0	123.1	-777.7	317.1	325.9	369.6	324.4	318.5	317.0	537.9	572.3	538.2	575.2	68.4	22.0	154.3
1153:45	53.9	0	0	123.2	-777.7	317.1	325.5	369.6	324.4	318.7	317.2	537.9	572.4	538.3	575.1	68.0	21.8	154.8
1154:45	53.7	0	0	123.1	-777.7	316.8	325.4	369.8	324.4	318.7	317.3	538.1	572.4	538.2	575.2	68.3	21.9	152.4
1155:00	53.7	0	0	123.1	-777.7	316.8	325.4	369.6	324.4	318.7	317.3	538.1	572.4	538.2	575.2	67.5	21.8	153.1
1155:15	53.7	0	0	123.1	-777.7	316.8	325.4	369.8	324.4	318.7	317.3	538.1	572.4	538.2	575.2	67.5	21.7	152.4
1155:30	53.7	0	0	123.1	-777.7	316.8	325.4	369.6	324.4	318.7	317.3	538.1	572.4	538.2	575.2	67.3	21.7	152.8
1155:45	53.7	3	0	123.1	-777.7	316.8	325.4	369.8	324.4	318.7	317.3	537.9	572.1	538.3	575.2	67.7	21.7	155.8
1156:00	53.7	0	0	123.1	-777.7	316.8	325.4	369.8	324.4	318.7	317.3	537.9	572.1	538.3	575.2	67.9	21.7	153.1
1156:15	53.7	0	0	123.1	-777.7	316.8	325.4	369.8	324.4	318.7	317.3	537.9	572.1	538.3	575.2	67.7	21.6	155.1
1156:30	53.7	0	0	123.1	-777.7	316.8	325.4	369.8	324.4	318.7	317.3	537.9	572.1	538.3	575.2	67.7	21.7	153.4
1156:45	53.9	0	0	123.2	-777.7	316.8	325.9	369.6	324.4	318.7	317.3	537.9	572.3	538.3	575.2	67.3	21.6	155.1
1157:00	53.9	0	0	123.2	-777.7	316.8	325.7	369.8	324.4	318.7	317.3	537.9	572.3	538.3	575.2	67.5	21.6	154.5
1157:15	53.8	0	0	123.2	-777.7	316.8	325.8	369.9	324.4	318.7	317.3	537.9	572.3	538.3	575.2	66.8	21.5	152.6
1157:30	53.9	0	0	123.2	-777.7	316.6	325.0	369.6	324.4	318.7	317.3	537.9	572.3	538.3	575.2	66.7	21.4	154.7
1157:45	53.7	0	0	123.0	-777.7	316.8	325.2	369.4	324.4	318.5	317.3	537.8	572.3	538.1	575.1	67.3	21.5	152.3
1158:00	53.7	0	0	123.0	-777.7	316.8	325.2	369.4	324.4	318.5	317.3	537.8	572.3	538.1	575.1	67.7	21.8	153.3
1158:15	53.7	0	0	123.1	-777.7	316.8	325.2	369.4	324.4	318.5	317.3	537.8	572.3	538.1	575.1	67.7	21.6	155.6
1158:30	53.7	0	0	123.1	-777.7	316.8	325.2	369.4	324.4	318.5	317.3	537.8	572.3	538.1	575.1	67.9	21.8	154.7
1158:45	53.7	0	0	123.2	-777.7	316.9	325.5	369.6	324.1	318.7	317.2	537.8	572.3	538.1	575.2	67.9	21.7	153.7
1159:00	53.7	0	0	123.2	-777.7	316.9	325.5	369.6	324.1	318.7	317.2	537.8	572.3	538.1	575.2	67.5	21.8	155.8
1159:15	53.7	0	0	123.2	-777.7	316.9	325.5	369.6	324.1	318.7	317.2	537.8	572.3	538.1	575.2	67.7	21.7	153.6
1159:30	53.7	0	0	123.2	-777.7	316.9	325.5	369.6	324.1	318.7	317.2	537.8	572.3	538.1	575.2	67.5	21.6	155.2
1159:45	53.9	0	0	123.1	-777.7	316.3	324.9	369.5	324.1	318.8	317.3	537.8	572.1	538.3	575.2	38.2	21.9	158.3
1200:00	53.9	0	0	123.1	-777.7	316.3	324.9	369.5	324.1	318.8	317.3	537.8	572.1	538.3	575.2	12.7	21.9	152.8
1200:15	53.9	0	0	122.7	-777.7	316.3	324.9	369.5	324.1	318.8	317.3	537.8	572.1	538.3	575.2	11.8	20.8	152.5
1200:30	53.9	0	0	122.7	-777.7	316.3	324.9	369.5	324.1	318.8	317.3	537.8	572.1	538.3	575.2	11.8	19.8	157.0
1200:45	54.4	0	0	122.0	-777.7	312.5	321.5	369.5	324.1	311.7	314.6	537.9	571.6	538.3	575.1	9.8	17.5	152.3
1201:00	54.5	0	0	122.5	-777.7	312.6	321.5	369.5	324.1	311.7	314.6	537.9	571.6	538.3	575.1	8.4	15.9	152.3
1201:15	54.4	0	0	121.5	-777.7	312.6	321.5	369.5	324.1	311.7	314.6	537.9	571.6	538.3	575.1	7.2	14.3	152.3
1201:30	54.6	0	0	121.3	-777.7	312.6	321.6	369.5	324.1	311.7	314.6	537.9	571.6	538.3	575.1	6.4	13.0	152.3
1201:45	54.2	0	0	119.0	-777.7	312.3	321.2	369.3	324.1	308.2	311.0	537.9	570.3	538.1	574.6	5.3	12.1	152.8
1202:00	54.2	0	0	119.3	-777.7	312.3	321.2	369.3	324.1	308.2	311.0	537.9	570.3	538.1	574.6	5.9	12.5	154.8
1202:15	54.2	0	0	117.5	-777.7	312.3	321.2	369.3	324.1	308.2	311.0	537.9	570.3	538.1	574.6	6.8	12.8	155.9
1202:30	54.2	0	0	117.1	-777.7	312.3	321.2	369.3	324.1	308.2	311.0	537.9	570.3	538.1	574.6	5.8	12.4	154.5
1202:45	54.0	0	0	116.1	-777.7	312.4	320.7	369.3	324.1	308.2	309.5	537.9	569.5	538.3	573.9	5.1	11.6	152.9
1203:00	54.0	0	0	116.3	-777.7	312.4	320.7	369.3	324.1	308.2	309.5	537.9	569.5	538.3	573.9	4.4	10.8	152.9
1203:15	54.0	0	0	114.4	-777.7	312.4	320.7	369.3	324.1	308.2	309.5	537.9	569.5	538.3	573.9	3.7	9.9	152.4
1203:30	54.0	0	0	114.4	-777.7	312.4	320.7	369.3	324.1	308.2	309.5	537.9	569.5	538.3	573.9	3.8	9.2	154.2
1203:45	53.8	0	0	113.7	-777.7	311.7	322.2	369.0	324.2	308.5	308.6	538.5	569.4	538.5	573.6	2.4	8.6	154.7
1204:00	53.8	0	0	113.7	-777.7	311.7	322.2	369.0	324.2	308.5	308.6	538.5	569.4	538.5	573.6	2.8	8.1	152.5
1204:15	53.8	0	0	113.3	-777.7	311.7	320.2	369.0	324.2	308.5	308.6	538.5	569.4	538.5	573.6	1.7	7.8	153.0
1204:30	53.8	0	0	113.3	-777.7	311.7	322.2	369.2	324.2	308.5	308.6	538.5	569.4	538.5	573.6	1.7	7.5	155.3
1205:30	53.7	0	0	112.4	-777.7	311.7	319.5	368.5	324.2	308.7	308.3	538.6	569.2	538.8	573.1	.8	5.6	155.5
1206:30	53.5	0	0	111.6	-777.7	311.1	319.1	368.5	324.3	308.9	307.8	538.8	568.9	538.9	572.9	-777.7	3.9	154.8
1207:30	53.4	0	0	111.3	-777.7	310.5	318.4	368.5	324.3	308.5	307.4	538.9	569.1	539.1	572.3	-777.7	3.2	152.3
1208:30	53.3	0	0	110.9	-777.7	310.2	317.5	368.0	324.1	308.5	307.2	539.1	569.0	539.2	572.0	-777.7	2.0	152.3
1209:30	53.3	0	0	110.3	-777.7	309.8	317.0	368.2	324.1	308.5	306.9	539.2	569.2	539.2	571.6	-777.7	.8	152.8
1210:30	53.2	0	0	110.1	-777.7	309.2	316.3	367.9	324.1	308.2	306.8	539.6	568.9	539.4	571.5	-777.7-	.3	156.2

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12:11:30   53.1   2   2 1[illegible]0.8-???.? 3[illegible]8.9 315.1 387.7 324.8 328.8 306.5 539.6 568.6 539.4 571.3-???.?-???.? 152.4
12:12:32   53.[illegible]   2   2 129.8-???.? 308.6 315.4 386.9 323.5 327.9 306.4 539.6 568.6 539.2 571.0-???.?-???.? 155.6
12:13:34   52.9   2   0 129.5-???.? 327.9 314.9 386.9 324.3 327.8 306.3 539.6 568.6 539.4 570.9-???.?-???.? 154.3
12:14:35   52.9   2   2 1[illegible]9.2-???.? 327.4 314.4 386.9 323.1 327.7 306.1 539.9 568.7 539.3 570.7-???.?-???.? 152.4
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04/22/77

Shutdown from Outside Control Room

POST TRIP REVIEW

	P225	P229	P21	P211	P214	R216	RC..	R213	R222	R224	R228	R282	S285	S286	S371	S272	T228	T232	T227	T231
21:21:15	25.2	25.0	25.1	25.3	575.3	574.1	584.8	584.3	2141.	2135.	2142.	137.3	43.1	42.8	955.	985.	888.	885.	583.5	584.0
21:22:15	24.9	24.8	24.8	25.0	574.7	574.4	584.3	584.5	2141.	2135.	2142.	135.6	44.7	43.0	967.	975.	894.	892.	583.7	584.3
21:23:15	23.4	23.3	23.3	23.5	571.5	574.5	584.3	584.2	2142.	2134.	2142.	133.8	44.1	43.1	952.	977.	893.	889.	583.5	584.2
21:24:15	23.8	23.7	23.7	23.9	574.1	573.9	584.2	584.1	2137.	2131.	2138.	132.0	45.6	44.1	1006.	1010.	901.	900.	583.6	584.4
21:25:15	24.2	24.1	24.1	24.3	573.9	573.9	583.8	584.1	2150.	2144.	2150.	131.6	44.7	43.6	963.	1020.	893.	891.	583.4	584.4
21:26:15	24.9	24.7	24.7	25.0	573.7	573.6	583.5	583.9	2146.	2139.	2145.	131.3	44.5	43.4	989.	1012.	892.	897.	583.2	584.2
21:27:15	25.6	25.5	25.5	25.7	574.1	573.7	583.8	584.0	2164.	2154.	2159.	132.8	44.4	43.2	954.	988.	900.	893.	583.3	584.4
21:28:15	25.7	25.6	25.5	25.8	574.2	574.1	584.2	584.3	2170.	2153.	2169.	132.5	44.8	43.8	978.	992.	893.	892.	583.1	584.1
21:29:15	25.7	25.6	25.6	25.9	574.0	574.1	584.2	584.3	2163.	2157.	2163.	132.7	43.9	42.6	954.	967.	896.	892.	583.3	584.3
21:30:15	25.2	24.9	25.0	25.1	574.2	573.6	583.5	584.0	2149.	2143.	2150.	132.8	44.7	43.8	977.	979.	894.	892.	581.3	584.2
21:31:15	25.8	25.7	25.7	25.9	574.1	574.1	584.1	584.2	2165.	2158.	2164.	132.9	44.5	43.1	959.	994.	893.	892.	583.3	584.4
21:31:30	25.8	25.7	25.7	25.9	574.1	574.1	584.1	584.2	2165.	2158.	2164.	132.9	44.5	43.1	969.	994.	895.	892.	583.3	584.2
21:31:45	25.4	25.3	25.4	25.5	574.1	573.4	583.4	584.0	2152.	2148.	2151.	132.2	44.6	43.5	965.	997.	895.	892.	583.3	584.3
21:32:00	25.4	25.3	25.4	25.8	[illegible]	573.4	583.8	584.0	2152.	2148.	2151.	132.2	44.6	43.5	965.	997.	900.	893.	583.3	584.4
21:32:15	23.5	23.4	23.5	23.6	574.	574.1	584.2	584.3	2162.	2156.	2162.	133.8	44.3	44.1	965.	985.	900.	893.	583.3	584.4
21:32:30	23.5	23.4	23.5	23.6	574.5	574.1	584.2	584.3	2162.	2156.	2162.	133.8	44.3	44.1	965.	985.	893.	892.	583.3	584.4
21:32:45	23.4	23.3	23.3	23.4	574.2	574.3	584.3	584.4	2158.	2152.	2158.	133.3	44.5	43.5	978.	967.	895.	891.	583.3	584.2
21:33:00	25.4	25.3	23.3	25.4	574.2	574.3	584.3	584.4	2159.	2152.	2158.	133.3	44.5	43.5	978.	957.	894.	891.	583.3	584.2
21:33:15	25.5	25.5	25.5	25.7	573.9	573.8	583.8	584.0	2155.	2149.	2154.	132.4	44.5	43.2	969.	979.	894.	891.	583.3	584.3
21:33:30	25.6	25.5	25.6	25.7	573.9	573.8	583.8	584.0	2155.	2149.	2154.	132.4	44.5	43.2	969.	979.	896.	892.	583.3	584.2
21:33:45	23.5	23.5	23.6	23.7	574.6	574.3	584.2	584.3	2179.	2173.	2178.	133.9	43.5	42.4	919.	941.	900.	900.	583.3	584.3
21:34:00	23.6	23.5	23.6	23.7	574.6	574.3	584.2	584.3	2179.	2173.	2178.	133.9	43.5	42.4	919.	941.	895.	892.	583.6	58?.6
21:34:15	23.3	23.2	23.3	23.4	574.4	574.1	584.2	584.2	2196.	2189.	2192.	134.8	44.0	42.7	957.	976.	893.	892.	583.3	584.4
21:34:30	23.3	23.2	23.3	23.4	574.4	574.1	584.2	584.2	2196.	2190.	2196.	134.8	44.0	42.7	957.	976.	895.	892.	583.2	584.2
21:34:45	23.2	23.0	23..	23.3	574.8	574.5	584.3	584.3	2208.	2199.	2204.	135.5	44.2	43.1	962.	993.	895.	892.	583.3	584.2
21:35:00	23.2	23.2	23.1	23.3	574.8	574.5	584.3	584.3	2208.	2199.	2204.	135.5	44.2	43.1	962.	993.	895.	892.	583.5	584.4
21:35:15	24.9	24.7	24.9	24.9	571.6	574.2	584.0	584.5	2212.	2205.	2212.	137.1	44.2	43.4	945.	979.	900.	895.	583.4	584.4
21:35:30	24.9	24.7	24.8	24.9	574.6	574.0	584.4	584.5	2212.	2205.	2212.	137.1	44.2	43.4	946.	979.	900.	894.	583.6	584.5
21:35:45	25.7	25.6	25.7	25.8	574.2	574.2	584.2	584.2	2155.	2149.	2155.	139.8	44.2	43.3	976.	985.	895.	892.	583.5	584.4
21:36:00	25.7	25.6	25.7	25.8	574.2	574.0	584.2	584.2	2155.	2149.	2155.	139.8	44.2	43.3	976.	985.	900.	895.	583.5	584.3
********																				
21:36:15	23.7	23.6	23.7	23.8	572.3	574.1	584.0	584.0	2154.	2148	2152.	140.2	38.2	38.0	224.	96.	980.	895.	583.6	584.4
21:36:30	23.7	23.6	23.7	23.8	574.3	574.1	584.3	584.2	2154.	214 .	2152.	144.2	38.2	38.4	224.	96.	1003.	1022.	584.2	584.5
21:36:45	.2	.1	.1	.3	575.7	575.4	575.3	575.4	2187.	2181.	2188.	133.5	25.1	24.5	0	10.	984.	965.	597.7	597.3
21:37:00	.2	.1	.1	.3	575.7	575.4	578.4	578.4	2187.	2181.	2188.	133.5	25.1	24.5	0	10.	982.	952.	592.5	599.2
21:37:15	.1	.0	.0	.1	575.0	574.5	575.4	575.8	2186.	2130.	2186.	126.4	21.3	19.2	0	10.	990.	987.	591.7	590.4
21:37:30	.1	.0	.0	.1	575.0	574.5	575.4	575.8	2186.	2130.	2186.	126.4	21.3	19.2	0	10.	1000.	1003.	592.3	591.2
21:37:45	.1	.0	.0	.2	575.8	575.7	576.3	576.2	2135.	2130.	2135.	128.7	21.7	19.5	0	9.	1000.	1003.	593.2	592.2
21:38:00	.1	.0	.0	.2	575.8	575.7	576.3	576.2	2135.	2130.	2135.	128.7	21.7	19.5	0	9.	1009.	1024.	594.0	593.1
21:38:15	.0	.0	.0	.0	577.2	577.2	577.6	577.5	2192.	2185.	2192.	131.7	21.1	19.3	0	9.	1005.	1003.	594.5	593.3
21:38:30	.1	.0	.0	.0	577.2	577.2	577.6	577.5	2192.	2185.	2190.	131.7	21.1	19.3	0	9.	963.	1002.	594.5	594.5
21:38:45	.1	.0	.0	.0	578.5	578.8	578.9	578.9	2213.	2206.	2211.	135.6	20.5	19.1	0	10.	957.	1002.	593.2	594.9
21:39:00	.1	.0	.0	.2	578.6	578.0	578.9	578.9	2213.	2206.	2211.	135.6	20.5	19.1	0	10.	965.	994.	592.1	595.2
21:39:15	.4	.4	.3	.0	580.1	580.1	580.3	580.2	2212.	2205.	2211.	141.4	20.2	18.8	0	9.	962.	992.	591.0	595.2
21:39:30	.2	.4	.3	.0	580.1	580.1	580.3	580.2	2212.	2205.	2211.	141.4	20.2	18.8	0	9.	955.	985.	590.3	595.0
21:39:45	.0	.3	.3	.0	581.7	581.7	581.8	581.7	2222.	2215.	2220.	147.4	19.8	18.3	0	9.	952.	977.	589.5	594.7
21:40:00	.0	.3	.3	.0	581.7	581.7	581.8	581.7	2222.	2215.	2220.	147.4	19.8	18.3	0	9.	[illegible]	[illegible]	588.7	594.3
21:40:15	.0	.0	.3	.0	583.2	583.3	583.4	583.3	2234.	2226.	2231.	153.4	19.5	17.7	0	9.	930.	951.	587.9	593.6
21:40:30	.2	.0	.3	.2	583.2	583.3	583.4	583.3	2234.	2226.	2231.	153.4	19.5	17.7	0	9.	933.	954.	587.2	593.0
21:40:45	.0	.0	.3	.2	584.8	584.9	584.9	584.9	2245.	2238.	2242.	160.0	19.1	17.2	0	6.	928.	947.	586.4	592.1
21:41:00	.0	.0	.0	.0	584.8	584.9	584.9	584.9	2245.	2238.	2242.	160.0	19.1	17.2	0	9.	923.	940.	585.5	591.2
21:42:00	.3	.0	.0	.2	587.6	587.7	587.7	587.7	2224.	2217.	2221.	172.6	18.5	16.4	0	9.	901.	910.	582.0	587.3
21:43:00	.0	.0	.2	.0	590.6	590.7	590.6	590.6	2244.	2236.	2242.	183.6	17.9	15.4	0	10.	879.	882.	578.8	582.6
21:44:00	.0	.3	.3	.2	593.1	593.2	593.1	593.2	2219.	2212.	2217.	192.1	17.2	14.4	0	9.	857.	849.	575.9	578.8
21:45:00	.3	.0	.0	.2	595.5	595.3	595.3	595.4	2191.	2185.	2192.	196.0	16.3	13.8	0	9.	816.	813.	573.?	574.9
21:46:00	.0	.2	.0	.0	594.4	596.1	597.4	597.5	2121.	2110.	2122.	194.0	17.7	14.6	0	9.	828.	923	570.1	571.3

21147:00	.0	.0	.0	.0	594.4	594.	594.7	594.4	2130.	2124.	2131.	192.9	18.8	17.8	0	9.	923.	924.	577.6	578.1
21148:00	.0	.0	.0	.0	592.4	591.5	593.7	593.9	2092.	2087.	2094.	183.8	21.5	21.5	0	17.	957.	974.	582.7	582.3
21149:00	.0	.0	.0	.0	590.1	585.6	587.6	587.5	2025.	2020.	2028.	168.0	22.1	23.3	152.	221.	971.	997.	588.8	587.5
21150:00	.0	.0	.0	.0	573.0	573.3	581.3	581.3	1981.	1987.	1985.	132.3	24.6	23.5	0	441.	1087.	1025.	589.7	589.2
21151:00	.0	.0	.0	.0	575.5	572.4	575.4	574.8	1924.	1924.	1932.	114.8	21.6	22.9	0	10.	1289.	956.	59..3	586.6

	E202	T219	T242	T215	T240	G222	T312	T313	T314	T315	T316	T317	G208	G209	G210	T244	T323	T243	T226	T239
21121:15	139.	-7777.	22.49	1.25	1745.	52.9	.88	1.44	1.28	1.78	4.09	3.87	1.71	.24	1.74	713.	328.	-77.77	115.	381.
21122:15	140.	-7777.	22.54	1.27	1775.	52.9	.83	1.43	1.28	1.77	4.06	3.87	1.72	.26	1.74	713.	328.	-77.77	115.	378.
21123:15	139.	-7777.	22.55	1.27	1795.	52.9	.88	1.44	1.28	1.78	4.08	3.86	1.72	.25	1.74	713.	328.	-77.77	118.	378.
21124:15	142.	-7777.	22.59	1.28	1795.	52.9	.93	1.43	1.34	1.75	4.07	3.86	1.72	.26	1.74	713.	328.	-77.77	118.	378.
21125:15	140.	-7777.	22.56	1.28	1795.	52.5	.82	1.43	1.30	1.73	4.02	3.85	1.72	.25	1.75	713.	329.	-77.77	121.	374.
21126:15	142.	-7777.	22.54	1.27	1796.	52.9	.84	1.43	1.32	1.72	4.24	3.84	1.73	.26	1.75	713.	330.	-77.77	118.	376.
21127:15	141.	-7777.	22.58	1.30	1796.	53.0	.89	1.44	1.32	1.72	3.99	3.83	1.74	.27	1.75	714.	330.	-77.77	117.	376.
21128:15	141.	-7777.	22.47	1.33	1795.	52.9	.89	1.42	.32	1.74	4.02	3.83	1.73	.26	1.75	714.	330.	-77.77	118.	375.
21129:15	142.	-7777.	22.55	1.35	1795.	52.9	.83	1.43	1.31	1.67	3.95	3.83	1.74	.28	1.75	714.	331.	-77.77	118.	375.
21130:15	140.	-7777.	22.54	1.39	1796.	52.9	.89	1.43	1.24	1.60	3.97	3.82	1.74	.26	1.75	715.	331.	-77.77	117.	374.
21131:15	139.	-7777.	22.58	1.39	1795.	53.0	.92	1.44	1.32	1.63	3.98	3.83	1.75	.27	1.76	715.	332.	-77.77	118.	374.
21131:30	134.	-7777.	22.53	1.39	1795.	53.5	.94	1.43	1.35	1.63	3.93	3.83	1.74	.27	1.75	715.	332.	-77.77	117.	374.
21131:45	138.	-7777.	22.52	1.41	1796.	53.0	.93	1.43	1.35	1.63	3.94	3.82	1.74	.27	1.75	715.	332.	-77.77	117.	374.
21132:00	134.	-7777.	22.55	1.41	1798.	52.9	.85	1.43	1.35	1.63	3.94	3.82	1.74	.28	1.75	716.	333.	-77.77	117.	373.
21132:15	135.	-7777.	22.49	1.42	1795.	53.0	.93	1.43	1.36	1.63	3.95	3.82	1.75	.27	1.74	716.	333.	-77.77	117.	373.
21132:30	136.	-7777.	22.53	1.41	1795.	53.0	.84	1.43	1.36	1.62	3.96	3.82	1.74	.27	1.75	716.	333.	-77.77	117.	373.
21132:45	135.	-7777.	22.55	1.43	1796.	53.0	.88	1.43	1.35	1.63	3.98	3.82	1.74	.27	1.74	716.	333.	-77.77	117.	373.
21133:00	139.	-7777.	22.54	1.43	1796.	53.0	.88	1.43	1.35	1.63	3.97	3.82	1.74	.27	1.75	716.	333.	-77.77	117.	373.
21133:15	13?.	-7777.	22.53	1.44	1796.	52.9	.81	1.43	1.33	1.62	3.92	3.03	1.75	.28	1.75	716.	333.	-77.77	117.	373.
21133:30	131.	-7777.	22.6?	1.44	1796.	53.0	.89	1.43	1.34	1.61	3.92	3.02	1.74	.27	1.75	716.	333.	-77.77	117.	373.
21133:45	134.	-7777.	22.48	1.45	1795.	53.0	.94	1.43	1.36	1.59	3.94	3.02	1.74	.27	1.76	716.	333.	-77.77	118.	373.
21134:00	138.	-7777.	22.63	1.45	1795.	53.0	.93	1.43	1.37	1.59	3.95	3.02	1.74	.27	1.76	717.	334.	-77.77	118.	371.
21134:15	139.	-7777.	22.61	1.45	1795.	52.9	.84	1.42	1.37	1.67	3.96	3.02	1.74	.27	1.76	717.	334.	-77.77	117.	371.
21134:30	139.	-7777.	22.45	1.45	1795.	52.9	.91	1.43	1.37	1.60	3.97	3.02	1.74	.26	1.76	717.	334.	-77.77	117.	371.
21134:45	139.	-7777.	22.88	1.47	1796.	52.9	.90	1.42	1.39	1.60	3.97	3.01	1.74	.27	1.76	717.	334.	-77.77	118.	371.
21135:00	134.	-7777.	22.54	1.47	1795.	52.9	.85	1.42	1.40	1.59	3.98	3.02	1.74	.26	1.76	717.	334.	-77.77	118.	371.
21135:15	141.	-7777.	22.53	1.47	1796.	52.9	.82	1.42	1.39	1.60	3.99	3.02	1.74	.26	1.76	717.	334.	-77.77	118.	371.
21135:30	140.	-7777.	22.56	1.48	1796.	52.9	.85	1.43	1.37	1.56	3.93	3.01	1.74	.25	1.76	717.	334.	-77.77	120.	371.
21135:45	140.	-7777.	22.55	1.48	1796.	52.9	.93	1.43	1.38	1.57	3.93	3.02	1.74	.25	1.76	717.	334.	-77.77	119.	371.
21136:00	140.	-7777.	22.81	1.49	1768.	52.9	.89	1.43	1.38	1.55	3.95	3.01	1.74	.27	1.76	718.	333.	-77.77	119.	371.
********																				
21136:15	-7777.	-7777.	21.55	1.40	1776.	54.5	4.47	5.24	3.02	3.91	6.48	5.07	5.35	3.53	6.38	718.	333.	-77.77	119.	371.
21136:30	-7777.	-7777.	19.93	1.34	1776.	53.2	.82	1.50	.28	2.62	2.60	3.12	1.81	.34	1.56	718.	333.	-77.77	21.	371.
21136:45	-7777.	-7777.	18.42	1.28	1675.	53.1	.68	1.37	3.89	4.81	4.80	4.94	1.98	.31	1.48	718.	335.	-77.77	21.	371.
21137:00	-7777.	-7777.	16.94	1.27	1675.	53.2	.80	1.54	2.28	1.66	6.71	4.80	1.50	.16	1.29	705.	321.	-77.77	20.	368.
21137:15	-7777.	-7777.	15.78	1.24	1543.	53.2	.41	1.62	1.74	1.98	7.00	3.52	.96	.15	.86	705.	321.	-77.77	18.	366.
21137:30	-7777.	-7777.	14.48	1.24	1543.	53.3	.25	1.55	1.51	1.93	6.00	2.92	.80	.12	.64	725.	321.	-77.77	16.	366.
21137:45	-7777.	-7777.	13.10	1.23	1518.	53.3	.12	1.74	1.21	2.04	5.35	2.45	.68	.26	.54	725.	321.	-77.77	15.	366.
21138:00	-7777.	-7777.	12.39	1.21	1518.	53.5	.05	1.75	1.41	2.52	4.89	2.17	.71	.09	.69	693.	335.	-77.77	14.	366.
21138:15	-7777.	-7777.	17.18	1.23	1452.	53.5	.15	1.49	1.36	2.88	4.51	2.28	.81	.21	.72	693.	335.	-77.77	14.	365.
21138:30	-7777.	-7777.	16.53	1.24	1452.	53.7	.33	1.52	1.36	2.53	4.24	1.92	.87	.24	.62	693.	335.	-77.77	14.	365.
21138:45	-7777.	-7777.	1?.53	1.21	1387.	53.8	.44	1.46	1.22	2.39	3.97	1.88	.87	.21	.57	693.	335.	-77.77	15.	365.
21139:00	-7777.	-7777.	15.85	1.21	1387.	54.2	.42	1.41	1.28	2.52	3.85	2.11	.95	.22	.65	685.	294.	-77.77	14.	365.
21139:15	-7777.	-7777.	16.99	1.22	1333.	54.1	.45	1.40	1.15	2.46	3.02	2.51	.86	.15	.88	685.	294.	-77.77	13.	366.
21139:30	-7777.	-7777.	17.15	1.22	1337.	54.2	.57	1.40	1.19	2.57	3.??	2.65	.92	.34	1.22	685.	294.	-77.77	12.	366.
21139:45	-7777.	-7777.	17.34	1.19	1277.	54.3	.74	1.27	1.06	2.55	3.19	3.38	1.94	.25	1.81	685.	294.	-77.77	11.	366.
21140:00	-7777.	-7777.	17.44	1.19	1277.	54.4	.77	1.26	.86	2.29	2.69	3.15	.89	.13	.76	679.	285.	-77.77	11.	364.
21140:15	-7777.	-7777.	17.53	1.19	1227.	54.5	.84	1.25	.34	2.24	1.94	3.46	.86	.31	.79	679.	285.	-77.77	12.	364.
21140:30	-7777.	-7777.	17.67	1.19	1227.	54.5	.93	1.25	.14	2.42	1.55	3.25	1.84	.39	1.18	679.	285.	-77.77	11.	364.
21140:45	-7777.	-7777.	17.75	1.21	1181.	54.6	.92	1.25	.16	2.41	1.34	3.28	.18	.34	1.26	679.	285.	-77.77	11.	364.
21141:00	-7777.	-7777.	17.49	1.19	1181.	54.5	.97	1.19	.34	2.35	.83	3.26	1.13	.21	.78	675.	278.	-77.77	10.	364.
21142:00	-7777.	-7777.	18.42	1.17	1097.	54.5	1.09	.96	.62	2.70	.49	3.41	.46	.83	.26	671.	272.	-77.77	8.	361.
21143:00	-7777.	-7777.	18.58	1.17	1023.	54.6	.81	.92	.82	2.58	1.38	2.83	.48	-77.77	.18	669.	267.	-77.77	6.	361.
21144:00	-7777.	-7777.	18.00	1.17	955.	55.2	.84	.98	1.08	2.31	1.78	1.88	.78	-77.77	.27	667.	264.	-77.77	5.	359.
21145:00	-7777.	-7777.	18.98	1.16	894.	55.2	.89	.98	.93	2.31	1.94	1.48	.97	.12	.01	665.	251.	-77.77	5.	359.
21146:00	-7777.	-7777.	19.14	1.23	842.	55.4	.68	.97	.94	1.82	2.04	.83	.52	.17	.41	665.	250.	-77.77	4.	359.

21:47:00	-????.	-????.	19.22	1.22	742.	55.3	.75	.91	.93	1.79	2.22	.59	.49	.18	.82	664.	257.	-??.??	3.	359.
21:48:00	-????.	-????.	19.21	1.22	742.	54.9	.77	.82	.89	1.78	1.91	.41	.42	.15	.81	664.	255.	-??.??	3.	356.
21:49:00	-????.	-????.	19.32	1.22	7??.	55.3	.74	.85	.83	1.76	1.78	.32	.37	.16	.81	663.	253.	-??.??	3.	356.
21:50:00	-????.	-????.	19.33	1.29	66?.	55.2	.54	.42	.82	1.79	1.66	.31	.35	.14	.82	663.	252.	-??.??	2.	356.
21:51:00	-????.	-????.	19.15	1.25	623.	55.4	.59	.87	.81	1.68	1.57	.22	.32	.10	-??.??	663.	251.	1.35	2.	350.

	T322	T321	T319	T294	T292	T283	T278	T272	T264	T262	T260	T258	T256	T254	T252	T228	T231	T251
21:21:15	53.1	*	*	122.1	-???.?	323.3	332.5	38?.?	342.1	323.4	324.3	539.1	573.1	540.1	576.4	72.6	23.2	152.3
21:22:15	53.1	*	*	122.3	-???.?	322.8	331.7	379.8	342.4	323.1	323.8	539.1	572.9	540.1	576.5	72.1	22.8	155.1
21:23:15	53.1	*	*	122.3	-???.?	323.1	331.4	379.7	342.3	322.8	323.5	539.1	572.8	539.9	576.4	72.1	23.0	154.5
21:24:15	53.1	*	*	122.1	-???.?	322.7	332.9	379.9	341.5	322.3	323.4	538.9	572.7	539.9	576.5	69.8	22.8	152.7
21:25:15	53.2	*	*	122.2	-???.?	323.3	331.8	379.4	341.2	322.2	322.7	538.9	573.1	540.1	576.5	74.7	24.3	151.8
21:26:15	53.1	*	*	122.2	-???.?	323.6	332.1	379.1	340.2	322.7	322.6	538.9	573.2	539.9	576.8	72.9	24.1	154.6
21:27:15	53.1	*	*	122.2	-???.?	323.2	331.6	379.1	339.7	322.7	322.8	538.9	573.1	539.7	576.5	71.6	23.4	152.7
21:28:15	53.1	*	*	122.4	-???.?	322.8	331.4	378.7	339.4	322.8	322.3	538.8	572.9	540.1	576.7	71.6	23.4	153.6
21:29:15	53.2	*	*	122.3	-???.?	322.3	332.9	378.4	338.6	322.3	322.3	538.8	573.1	539.7	576.5	71.3	23.3	153.0
21:30:15	53.3	*	*	122.3	-???.?	322.7	334.9	378.6	338.2	322.3	322.0	538.6	572.9	539.6	576.4	71.6	23.5	154.1
21:31:15	53.3	*	*	122.2	-???.?	322.7	332.9	378.4	337.8	322.3	321.9	538.6	572.8	539.7	576.5	71.1	23.3	151.8
21:31:30	53.3	*	*	122.3	-???.?	322.7	332.9	378.4	337.8	322.3	321.9	538.6	572.8	539.7	576.5	71.5	23.3	153.3
21:31:45	53.3	*	*	122.3	-???.?	322.7	332.9	378.4	337.8	322.3	321.9	538.6	572.8	539.7	576.5	71.5	23.3	154.3
21:32:00	53.2	*	*	122.3	-???.?	322.1	332.5	378.2	337.5	322.1	321.9	538.5	572.9	539.6	576.5	72.8	23.2	153.2
21:32:15	53.2	*	*	122.3	-???.?	322.1	332.5	378.0	337.5	322.1	321.9	538.6	572.9	539.6	576.5	71.1	23.3	153.1
21:32:30	53.2	*	*	122.3	-???.?	322.1	332.5	378.2	337.5	322.1	321.9	538.6	572.9	539.6	576.5	71.1	23.3	152.9
21:32:45	53.2	*	*	122.3	-???.?	322.1	332.5	378.2	337.5	322.1	321.9	538.6	572.9	539.6	576.5	71.3	23.3	152.8
21:33:00	53.4	*	*	122.3	-???.?	321.9	331.1	377.9	336.8	322.0	321.7	538.8	572.8	539.6	576.5	71.3	23.3	153.5
21:33:15	53.4	*	*	122.3	-???.?	321.9	331.1	377.9	336.8	322.0	321.7	538.8	572.8	539.6	576.5	71.1	23.2	155.0
21:33:30	53.4	*	*	122.3	-???.?	321.9	331.1	377.9	336.8	322.0	321.7	538.8	572.8	539.6	576.5	71.3	23.3	154.3
21:33:45	53.4	*	*	122.3	-???.?	321.9	331.1	377.9	336.8	322.0	321.7	538.8	572.8	539.6	576.5	71.6	23.5	132.4
21:34:00	53.4	*	*	122.3	-???.?	322.2	332.9	377.1	336.3	322.2	321.5	538.6	572.8	539.4	576.4	72.2	23.5	113.2
21:34:15	53.4	*	*	122.3	-???.?	322.2	332.9	377.1	336.3	322.2	321.5	538.6	572.8	539.4	576.4	71.6	23.4	115.5
21:34:30	53.4	*	*	122.2	-???.?	322.2	332.9	377.1	336.3	322.2	321.5	538.6	572.8	539.4	576.4	71.8	23.4	119.5
21:34:45	53.4	*	*	122.2	-???.?	322.2	332.9	377.1	336.3	322.2	321.5	538.6	572.8	539.4	576.4	72.2	23.5	124.4
21:35:00	53.4	*	*	122.3	-???.?	322.2	331.8	377.2	335.8	322.1	321.4	538.3	572.8	539.6	576.5	72.2	23.6	128.4
21:35:15	53.4	*	*	122.5	-???.?	322.2	331.8	377.2	335.8	322.1	321.4	538.3	572.8	539.6	576.5	72.5	23.8	131.2
21:35:30	53.4	*	*	122.5	-???.?	322.2	331.8	377.2	335.8	322.1	321.4	538.3	572.8	539.6	576.5	72.9	23.9	133.9
21:35:45	53.4	*	*	122.6	-???.?	322.2	331.8	377.2	335.8	322.1	321.4	538.3	572.8	539.6	576.5	72.2	23.7	135.4
21:36:00	53.4	*	*	122.4	-???.?	321.9	331.8	377.1	335.5	322.2	321.4	538.6	572.8	539.4	576.4	72.5	23.8	138.4
********																		
21:36:15	53.4	*	*	122.4	-???.?	321.9	331.8	377.1	335.5	322.2	321.4	538.6	572.8	539.4	576.4	72.7	23.8	142.7
21:36:30	53.4	*	*	122.6	-???.?	321.9	331.8	377.1	335.5	322.2	321.4	538.6	572.8	539.4	576.4	14.4	22.9	156.1
21:36:45	53.4	*	*	122.6	-???.?	321.9	331.8	377.1	335.5	322.2	321.4	538.6	572.8	539.4	576.4	13.5	21.8	155.3
21:37:00	54.4	*	*	121.9	-???.?	318.5	328.4	377.2	335.2	318.8	323.4	538.6	572.6	539.4	576.5	12.5	22.8	154.8
21:37:15	54.4	*	*	121.5	-???.?	318.5	328.4	377.2	335.2	318.8	322.4	538.6	572.6	539.4	576.5	11.1	19.1	153.3
21:37:30	54.4	*	*	121.2	-???.?	318.5	328.4	377.0	335.2	318.8	322.4	538.6	572.6	539.4	576.5	9.5	17.2	151.9
21:37:45	54.4	*	*	121.2	-???.?	318.5	328.4	377.0	335.2	318.8	320.4	538.6	572.6	539.4	576.5	6.2	15.5	152.1
21:38:00	54.5	*	*	120.3	-???.?	319.6	329.3	377.0	335.0	312.6	316.5	538.4	571.1	539.4	576.0	6.8	14.8	152.2
21:38:15	54.5	*	*	120.3	-???.?	319.6	329.3	377.0	335.0	312.6	316.5	538.4	571.1	539.4	576.0	6.7	13.6	152.2
21:38:30	54.5	*	*	118.2	-???.?	319.6	329.3	377.2	335.2	312.6	316.5	538.4	571.1	539.4	576.0	7.2	14.8	152.3
21:38:45	54.5	*	*	118.2	-???.?	319.6	329.3	377.2	335.0	312.6	316.5	538.4	571.1	539.4	576.0	7.2	14.2	152.3
21:39:00	54.2	*	*	116.4	-???.?	320.1	329.2	376.6	335.3	312.3	314.9	538.6	570.5	539.4	575.5	6.7	13.3	152.3
21:39:15	54.2	*	*	116.4	-???.?	320.1	329.2	376.6	335.3	312.3	314.9	538.5	570.5	539.4	575.5	5.0	12.3	152.3
21:39:30	54.2	*	*	115.2	-???.?	320.1	329.2	376.6	335.3	312.3	314.9	538.6	570.5	539.4	575.5	4.9	11.3	152.9
21:39:45	54.2	*	*	115.2	-???.?	320.1	329.2	376.6	335.3	312.3	314.9	538.6	570.5	539.4	575.5	4.3	10.5	152.4
21:40:00	53.8	*	*	113.9	-???.?	319.7	329.0	376.8	335.3	312.6	313.9	538.9	570.0	539.5	574.9	3.6	9.7	152.5
21:40:15	53.8	*	*	113.9	-???.?	319.7	329.0	376.8	335.3	312.5	313.9	538.9	570.0	539.5	574.9	3.9	9.2	152.7
21:40:30	53.8	*	*	113.2	-???.?	319.7	329.0	376.8	335.3	312.6	313.9	538.9	570.0	539.5	574.9	3.4	9.5	152.9
21:40:45	53.8	*	*	113.2	-???.?	319.7	329.0	376.8	335.3	312.6	313.9	538.9	570.0	539.5	574.9	3.4	9.5	153.4
21:41:00	53.7	*	*	112.5	-???.?	319.7	328.3	376.8	335.5	312.9	313.3	539.2	569.8	539.9	574.4	2.5	8.6	153.6
21:42:00	53.4	*	*	111.5	-???.?	319.7	328.3	376.8	335.3	313.1	312.9	539.5	569.8	540.2	574.1	1.9	6.8	154.1
21:43:00	53.2	*	*	110.7	-???.?	319.6	327.8	376.8	335.8	313.4	312.7	539.9	570.0	540.2	573.9	-???.?	4.8	153.5
21:44:00	53.0	*	*	112.3	-???.?	319.5	327.6	376.7	335.3	312.5	312.6	540.2	570.0	540.5	573.6	-???.?	3.0	153.2
21:45:00	52.9	*	*	109.8	-???.?	319.5	327.6	376.6	335.3	313.0	312.2	540.5	569.8	542.5	573.2	-???.?	2.7	153.4
21:46:00	52.8	*	*	109.2	-???.?	319.2	327.3	376.5	335.1	312.2	312.1	540.7	569.5	540.7	573.1	-???.?	2.1	147.7
21:47:00	52.7	*	*	108.9	-???.?	318.8	328.4	376.5	335.0	312.0	311.9	541.0	569.8	540.7	572.7	-???.?	1.0	138.1

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

FILE: 13-5-322

CONTRACT NO: 620-00 05

SPR 322 REV. 1

TITLE LOW PRESS. LEVEL FOLLOWING REACTOR TRIP

DATE: 6-25-76

TO: ______________ For Information

Central Engineering Files

C. C. Plunkett - Contract Admin.

S. H. Klein - Quality Assurance

BJ SHEPHERD - Task Engineer

RA GOWERS - Project Manager

The attached, cleared SPR is submitted for your information.

TO: ____ E. L. Logan - FLORIDA ____ L.M. KOLONAY

____ L. C. Rogers - MET.ED. ____

____ R. J. Baker - TOLEDO ____

____ B. L. Day - Intl. Support ____

____ P. E. Perrone - OFR ____

____ J. L. Donnell - OFR ____

Attached is one copy of Site Problem Report No. 322 which was processed on Contract 620-00 05. Future contracts have been reviewed for the potential of a similar problem. This problem ~~is~~/is not considered applicable to other contracts ___ oc ___.

REMARKS:

cc: G. M. Jacks - Plant Integration

This SPR has been reviewed IAW NPG-1707-01

Chris C. Lockard

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER MET ED		CONTRACT NO. 620-0002	SPR NO. 322	REV. NO. 1
VENDOR BMCo	P.O. NO.	TASK NO. 21	GROUP NO. 01	SEQ. NO. 01
SITE ENGINEER S. P. KAINGI		REQ'D RESOL. DATE	REQ'D. COMP. DATE	

TITLE
LOW PRESSURIZER LEVEL FOLLOWING REACTOR TRIP

DESCRIPTION OF PROBLEM

SEE ATTACHED SHEET

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

L. M. Kolony of Engineering informed.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

Review and implement Logic modification such that reactor trip should block calibrating integral HC 9.12, to achieve a slower cooldown rate of RC System and a more acceptable pressurizer level.

This problem should be reviewed for all other sites.

SITE ENGINEER SIGNATURE Spkaingi	DATE 10/4/74	SITE REP. SIGNATURE L Rogers	10/4/1974

RESOLUTION

SEE COMPLETION REPORT

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	Chris C. Lockard	6-23-76
TASK ENGINEER/NS UNIT MGR	Leo L. Kolony	6/23/76
OP. PLANT MGR.	[illegible]	6/24/76
PROJECT MANAGER/SERVICE MGR.	RWovers	6/23/76

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO ☐ FIELD CHANGE REQ FC NO

SITE COMPLETION REPORT

FURTHER INVESTIGATION SHOWED THAT OPERATOR PUT FW CONTROL IN MANUAL. THE PROBLEM RESULTED FROM OPERATOR ACTION INSTEAD OF AUTOMATIC ICS ACTION.
RECOMMEND SPR BE CLOSED (R. [illegible]) BMCo 6/23/76

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR/REV NO. ______

DATE COMPLETED | SIGNED BY

S.O.M. CONSTR REP APPROVAL RWovers DATE 6/23/76

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M./CONST. REP.
QA DOC FILE
CENT. ENGR
FILE 12M.2

ATTACHMENT
SPR 322 Rev. 1

DESCRIPTION OF PROBLEM:

Following a reactor trip the pressurizer level goes as low as 40 inches. SPR 322 Rev. 0 pointed out the main reason that pressurizer level goes as low, because the trapped steam pressure in turbine header decays slowly, resulting in turbine bypass remaining open for time longer than is necessary.

Further examination of the reactor trip data revealed that immediately following the reactor trip the feedwater demand actually reduced to 20% instead of reducing to 5% (cross limit value as neutron power following the trip is zero).

This additional feed to steam generators contributes to the excessive cooling of the RC system and hence lower pressurizer level.

See attached BMCo report on the subject.

PRODUCT SYSTEM FILE NO.

FILE NO.

CMO USE ONLY

TMI #1

UNIT ONLY AND TYPE OF SYSTEM PRODUCT

ICS IMPROVEMENT

DATE OF PROBLEM	FROM
9/4/74	R. S. Rand
150L	EMP. NO. 81239 / ACCT. NO. T79
CUST. ORDER NO. 290628	MAIL STA./DO. PO Box 552 Middletown, PA 17057
X / DATE CODE: X	SERIAL NO. AND/OR PART NO. X

Reference: My FPR of 9/23/74

On 9/4/74 Met. Ed. Plant Superintendent, Jack Herbein stated that "On a Reactor Trip the pressurizer level should not drop as low as it does. (to approximately 40 inches) Analysis of the 8/13/74 Generator breaker trip test reveals the cross limits from neutron power error to feedwater flow control did Not perform as expected. The neutron power error cross limit should have reduced the feedwater demand immediately after reactor trip to approximately 5%. The neutron power error cross limit actually reduced the feedwater flow demand to approximately 20%. This additional feed to the steam generators contributed to the excessive rate of cooling of the RC system and the resultant drop in pressurizer level.

The reason for the above undesirable performance is as follows. On a reactor trip the CRD system transfers to manual. When the CRD is in manual the neutron power error is applied to the T_{ave} calibrating integral.

FOR FIELD USE

- DAYS SERVICE: 0
- SERVICE: $ 0
- EXPENSES: $ 0
- MATERIAL: $ 0
- S.E.O. NO.: P72-235

ALLOCATION

- ☐ PRODUCT
- ☐ PRODUCT APPLICATION
- ☒ SYSTEM
- ☐ SYSTEM APPLICATION
- ☐ WARRANTY
- ☐ OTHER

DEFECTIVE PART RETURNED

- ☒ NO
- ☐ YES ON ______ DATE
- RM NO.

FAILURE OCCURRED

- ☐ ON RECEIPT
- ☐ IN SERVICE (WARRANTY)
- ☐ IN SERVICE (NON WARRANTY)
- >2 yrs FIRST TIME IN SERVICE

POSSIBLE CAUSE FOR PROBLEM

- B0 ☐ FAULTY MATERIAL
- B1 ☐ FAULTY MANUFACTURING
- B2 ☒ FAULTY DESIGN
- B3 ☐ PERFORMANCE DEFICIENCY
- B4 ☐ FAULTY PACKAGING
- B5 ☐ COMPONENT FAILURE
- B6 ☐ WEAROUT
- B7 ☐ IMPROPER APPLICATION
- B8 ☐ OPERATING ENVIRONMENT
- B9 ☐ INSUFFICIENT INSTRUCTIONS (DOCUMENTATION)

CUSTOMER ATTITUDE

- ☒ MAJOR CONCERN
- ☐ CONCERNED
- ☐ UNCONCERNED

EFFECT ON SYSTEM (BRIEFLY)

Pressurizer level less than 80 inches cuts off heaters. RC pressure can not be controlled.

☒ CONT'D ON SEPARATE SHEET

DATE SOLUTION REQUIRED 10/14/74 OR ☐ INFO ONLY

SIGNATURE ______ DATE 9/27/74

REPORT OF INVESTIGATION & CORRECTIVE ACTION (BY FIELD IF APPLICABLE)

OPERATING CONDITIONS: NA

- AMBIENT TEMP ______ °F
- ATMOSPHERE: ☐ CLEAN ☐ AVERAGE ☐ DIRTY
- HUMIDITY ☐ HI ☐ LO ☐ AVG.

TIME REQUIRED TO: NA

- REPAIR ______ TROUBLESHOOT ______
- RECALIBRATE ______

FAILURE DETAILS: NA

- BMCO PART NO.
- DESCRIBE (DIODE, CAP., TRANSISTOR, ETC.)
- CIRCUIT SYMBOL (C1, R1, Q1)
- MFG. OF PART (IF KNOWN)

HOW PART FAILED:

- ☐ SHORT ☐ OPEN
- ☐ MECH. DAMAGE
- ☐ ADJUSTMENT
- ☐ DIRTY ☐ UNKNOWN
- ☐ OTHER (DESCRIBE)

(QA USE ONLY)

PROBLEM TYPE	FAILURE CAUSE CODE	PM SYSTEM	ANSWER DUE	ACTION TAKEN BY

COPIES:

- QUALITY ASSURANCE
- PROD. LIABILITY
- PROD. PLANNING
- NPO
- FPO
- CONTRACT OPER.
- WARRANTY REPAIR
- CONSTRUCTION ENGR.
- CONT. SERVICES
- ORDER CENTER
- COMPONENT ENGR.

COPIES

☐ PRELIMINARY ANS.

☐ FINAL SOLUTION

SIGNATURE ______ DATE

FOLLOW UP ON CORRECTIVE ACTION

QTY	NAME	PART NO.	COMMENTS

APPROVAL ______ DATE

DISP. OF R.M.

DATE REC'D.

DATE RETURNED

HOURS SPENT SOLUTION

DEPT	MAN	HRS

FORM 505 - 274

ATTACHMENT

PROBLEM: (Cont'd)

At this time the neutron error is very large and rapidly causes the calibrating integral to travel to its limit. Reference DWG D553732 and D556175B. When the T_{ave} calibrating integral travels to its limit the effective neutron power error to the cross limit is reduced and therefore results in inadequate reduction in feedwater flow.

RECOMMENDATIONS:

On DWG D556175 T1 (Calibrating Integral Operation), Logic [illegible] should be added between RC D3.[illegible] and RC D4.1. This logic block to read "[illegible] REACTOR TRIPPED? (By Diamond)". If YES, Block calibrating Integral R[illegible].14, If NO, Proceed to RC D4.1.

DESIRED ACTION:

Please contact B&W to see if they would like to implement this ICS improvement.

APPLIES TO OTHER NSS CONTRACTS: YES

[illegible]	DATE	CENT. ENGR FILE 12M.2

To NSS-5 SPR 322 File (Pittman)

On 5-12-75 Discussed this with Rob Wich. Bob feels that this particular problem is part of an ongoing evaluation underway at TMI ~~and~~ to maintain the plant on line after a Turbine Trip. He says he's committed to making a final recommendation for the SPR which would be issued for NSS 7, 14, 6 etc once TMI completes additional testing later this year.

7/?/75 - ECR - 174 At BPCo LEO KOLONAY

2-2-76 322 rev. 0 closed this date. 322 rev. 1 was generated based on [illegible] information → Plant in manual during transient. Stan Mangi will review rev. 1 and [illegible] as to whether or not he thinks this SPR should be [illegible].

(2645)
3-16-75 TALK TO STAN MANGI TO SEE IF HE LOOKED INTO THIS - WAS THE PLANT IN MANUAL? SHOULD SPR BE CLOSED? ([illegible])

-21091-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER MET ED	CONTRACT NO. 620-0705	SPR NO. 322	REV. NO.
VENDOR BMCO	P.O. NO.	TASK NO. 21	GROUP NO. 01	--.O. NO. 01
SITE ENGINEER S. P. MAINGI	REQ'D. RESOL. DATE	REQ'D. COMP. DATE	

TITLE
LOW PRESSURIZER LEVEL FOLLOWING REACTOR TRIP

DESCRIPTION OF PROBLEM

SEE ATTACHED SHEET

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED

L. M. Kolony of Engineering informed.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL

Review and implement Logic modification such that reactor trip should block calibrating integral RC 9.12, to achieve a slower cooldown rate of RC System and a more acceptable pressurizer level.

This problem should be reviewed for all other sites.

SITE ENGINEER: S. P. Maingi 10/4/74 | CONSTR. REP. SIGNATURE: [illegible] 10/4/74

RESOLUTION

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER [illegible] 10/4/74		
TASK ENGINEER		
PROJECT MANAGER		

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. | ☐ FIELD CHANGE REQ | FC NO.

COMPLETION

SITE COMPLETION REPORT

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO. ________

DATE COMPLETED | SIGNED BY

S.O.M. CONSTR. REP. APPROVAL | DATE

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M. CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 121.2

ATTACHMENT
SPR 322 Rev. 1

DESCRIPTION OF PROBLEM:

Following a reactor trip the pressurizer level goes as low as 40 inches. SPR 322 Rev. 0 pointed out the main reason that pressurizer level goes as low, because the trapped steam pressure in turbine header decays slowly, resulting in turbine bypass remaining open for time longer than is necessary.

Further examination of the reactor trip data revealed that immediately following the reactor trip the feedwater demand actually reduced to 20% instead of reducing to 5% (cross limit value as neutron power following the trip is zero).

This additional feed to steam generators contributes to the excessive cooling of the RC system and hence lower pressurizer level.

See attached BMCo report on the subject.

PROBLEM REPORT

PRODUCT SYSTEM FILE NO. (CMO) | FILE NO. (BS)

TO PRODUCT SUPPORT
MAIL STA. NO. 408
CMO USE ONLY

DATE OF REPORT: 9/4/74
BWNO. E.C. MK. F.P.: 1502
CUST. ORDER NO.: 290622
NOMENCLATURE/MODEL NO.: X | DATE CODE: X

FROM: R. S. Hand
EMP NO: 81939 | ACCT. NO.: 779
MAIL STA/DO: PO Box 352 Middletown, PA 17057
SERIAL NO. AND/OR PART NO.: X

CUSTOMER & PLANT: MET ED TMI #1
(CUST. USE ONLY) AND TYPE OF SYSTEM/PRODUCT

PROBLEM: POSSIBLE ICS IMPROVEMENT

Reference: My PR#7 of 9/23/74

On 9/4/74 Met. Ed. Plant Superintendent, Jack Herbein stated that "On a Reactor Trip the pressurizer level should not drop as low as it does. (to approximately 40 inches) Analysis of the 8/13/74 Generator breaker trip test reveals the cross limits from neutron power error to feedwater flow control did not perform as expected. The neutron power error cross limit should have reduced the feedwater demand immediately after reactor trip to approximately 5%. The neutron power error cross limit actually reduced the feedwater flow demand to approximately 20%. This additional feed to the steam generators contributed to the excessive rate of cooling of the RC system and the resultant drop in pressurizer level.

The reason for the above undesirable performance is as follows. On a reactor trip the CRD system transfers to manual. When the CRD is in manual the neutron power error is applied to the T_{ave} calibrating integral.

CUSTOMER ATTITUDE
- [x] MAJOR CONCERN
- [ ] CONCERNED
- [ ] UNCONCERNED

EFFECT ON SYSTEM (BRIEFLY): Pressurizer level less than 80 inches cuts off heaters. RC pressure can not be controlled.

- [x] CONT'D ON SEPARATE SHEET

DATE SOLUTION REQUIRED: 10/14/74 OR [ ] INFO ONLY

SIGNATURE | DATE: 9/27/74

FOR FIELD USE
DAYS SERVICE: 0
SERVICE: $ 0
EXPENSES: $ 0
MATERIAL: $ 0
S.E.O. NO.: F72-236

ALLOCATION
- [ ] PRODUCT
- [ ] PRODUCT APPLICATION
- [x] SYSTEM
- [ ] SYSTEM APPLICATION
- [ ] WARRANTY
- [ ] OTHER

DEFECTIVE PART RETURNED
- [x] NO
- [ ] YES ON ______ DATE
RM NO.

FAILURE OCCURRED
- [ ] ON RECEIPT
- [ ] IN SERVICE (WARRANTY)
- [x] IN SERVICE (NON WARRANTY)

>2 YR. EST. TIME IN SERVICE

POSSIBLE CAUSE FOR PROBLEM
- 90 [ ] FAULTY MATERIAL
- 91 [ ] FAULTY MANUFACTURING
- 92 [x] FAULTY DESIGN
- 93 [ ] PERFORMANCE DEFICIENCY
- 94 [ ] FAULTY PACKAGING
- 95 [ ] COMPONENT FAILURE
- 96 [ ] WEAROUT
- 97 [ ] IMPROPER APPLICATION
- 98 [ ] OPERATING ENVIRONMENT
- 99 [ ] INSUFFICIENT INSTRUCTIONS (DOCUMENTATION)

REPORT OF INVESTIGATION & CORRECTIVE ACTION (BY FIELD IF APPLICABLE)

OPERATING CONDITIONS: NA
AMBIENT TEMP. ______ °F
ATMOSPHERE [ ] CLEAN [ ] AVERAGE [ ] DIRTY
HUMIDITY [ ] HI [ ] LO [ ] AVG.

TIME REQUIRED TO: NA
REPAIR ____ TROUBLESHOOT ____
RECALIBRATE ____

FAILURE DETAILS: NA
BWCO PART NO.
DESCRIBE (DIODE, CAP., TRANSISTOR, ETC.)
CIRCUIT SYMBOL (CI, RI, QI)
MFG. OF PART (IF KNOWN)

HOW PART FAILED
- [ ] SHORT
- [ ] OPEN
- [ ] MECH. DAMAGE
- [ ] ADJUSTMENT
- [ ] DIRTY
- [ ] UNKNOWN
- [ ] OTHER (DESCRIBE)

(CA USE ONLY)

PROBLEM TYPE	FAILURE CAUSE CODE	P.M. SYSTEM	ANSWER DUE	ACTION TAKEN BY

COPIES: QUALITY ASSURANCE, PROD. LIABILITY, PROD. PLANNING, NPD, FPD, CONTRACT OPER., WARRANTY REPAIR, CONTINUATION ENGR., COMM. SERVICES, ORDER CENTER, COMPONENT ENGR.

COPY TO

[ ] PRELIMINARY ANS. | SIGNATURE | DATE | APPROVAL | DATE
[ ] FINAL SOLUTION

FOLLOW UP ON CORRECTIVE ACTION

DISP. OF R.M.
DATE REC'D.
DATE RETURNED

HOURS SPENT SOLUTION

DEPT.	MAN	HRS.

QTY	NAME	PART NO.	COMMENTS

FORM SDS 374

ATTACHMENT

PROBLEM: (Cont'd)

At this time the neutron error is very large and rapidly causes the calibrating integral to travel to its limit. Reference DWG D553732 and D556175B. When the T_{ave} calibrating integral travels to its limit the effective neutron power error to the cross limit is reduced and therefore results in inadequate reduction in feedwater flow.

RECOMMENDATIONS:

On DWG D556175 T1 (Calibrating Integral Operation), Logic block should be added between RC D3.1 and RC D4.1. This Logic block to read "IS REACTOR TRIPPED? (By Diamond)". If YES, Block calibrating Integral PC9.12; If NO, Proceed to RC D4.1.

DESIRED ACTION:

Please contact B&W to see if they would like to implement this ICS improvement.

APPLIES TO OTHER NSS CONTRACTS: YES

APR 16 1975

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To
C. A. Creacy, Project Management

From
R. W. Winks, Control Analysis, EXT 2864 RWW

Cust.
Duke Power Company

File No. or Ref.

Subj.
A Feedwater Pump Speed "Kicker" Circuit for Oconee Unit #1 (and #2 and #3)

Date
April 16, 1975

This letter to cover one customer and one subject only

The following information on a modified Feedwater Pump Speed Control Circuit, which has been implemented at the TMI-1 Plant, is being forwarded at this time to allow incorporation prior to any additional load rejection tests scheduled for Units 1, 2, or 3. B&W recommends this as a temporary change to your ICS which will be followed up by a field change package.

The purpose of the Pump Speed "Kicker" Circuit is to enable the feedwater flow control system to continue to deliver a high level of flow to each Steam Generator, even though the steam outlet pressure has suddenly increased approximately 150 psi. The modification originated and implemented at TMI-1 improved the overall plant performance by directly increasing feedwater pump speed more rapidly than could be accomplished by the combined action of the feedwater control valve and pump speed controllers in the ICS.

The modification to the present Unit #1 ICS is the following:

> Route an additional wire from the turbine header pressure error signal (IC/B on Drawing Unit #1) to two summers which are shown on Drawing D80323I3F, The particular summers are FW28.8B(6-1-3) and FW28.''B(6-2-1) and the new signal is to be connected to each summer. In the new line also install a diode and a 100 k ohm resister in a path to ground. Refer to the attached schematic.

The turbine header pressure control error signal has the following effective range:

+ 10 Volts = 300 psi above setpoint.
+ 0.5 Volts = 15 psi above setpoint.
Any signal below 0.5 Volts will be blocked by the diode in the new line.

The gain for the turbine header pressure error signal on each summer will have to be calculated and set by Duke Power Company. The calculation used at TMI-1 is given below:

1. Assume pump discharge pressure varies with the square of pump speed when suction pressure is constant.

2. For two feedwater pump operation find the pump speed (S_o) when the plant is at 100% power.

3. This speed corresponds to a turbine header pressure of 885 psig.

4. For a turbine header pressure of approximately 1050 psi the required pump speed would have to be: $(S_1) = (S_o) \times \sqrt{1050 \div 885}$. The increase in pump speed ($S_1 - S_o$) represents a fraction of the total range of feedwater pump speed (2700 rpm to 5400 rpm at TMI-1) and the output voltage of each summer should be adjusted to cause an increase in feedwater pump speed to (S_1) when the turbine header pressure error signal corresponding to 1050 psi occurs on each summer.

The following numerical calculation is only an example:

Assume (S_0) is 4500 rpm at 100% power. Then (S_1) is 4500 x 1.089 = 4900 rpm and ($S_1 - S_0$) = 400 rpm. Assume total speed range of feedwater pumps is 2700 to 5400 rpm or the total increase in pump speed is 2700 rpm. The gain at each summer is that which will cause a pump speed of 4900 rpm when the error in turbine header pressure is 165 psig.

If you have any questions, I would be happy to discuss them with you.

RWW:lr

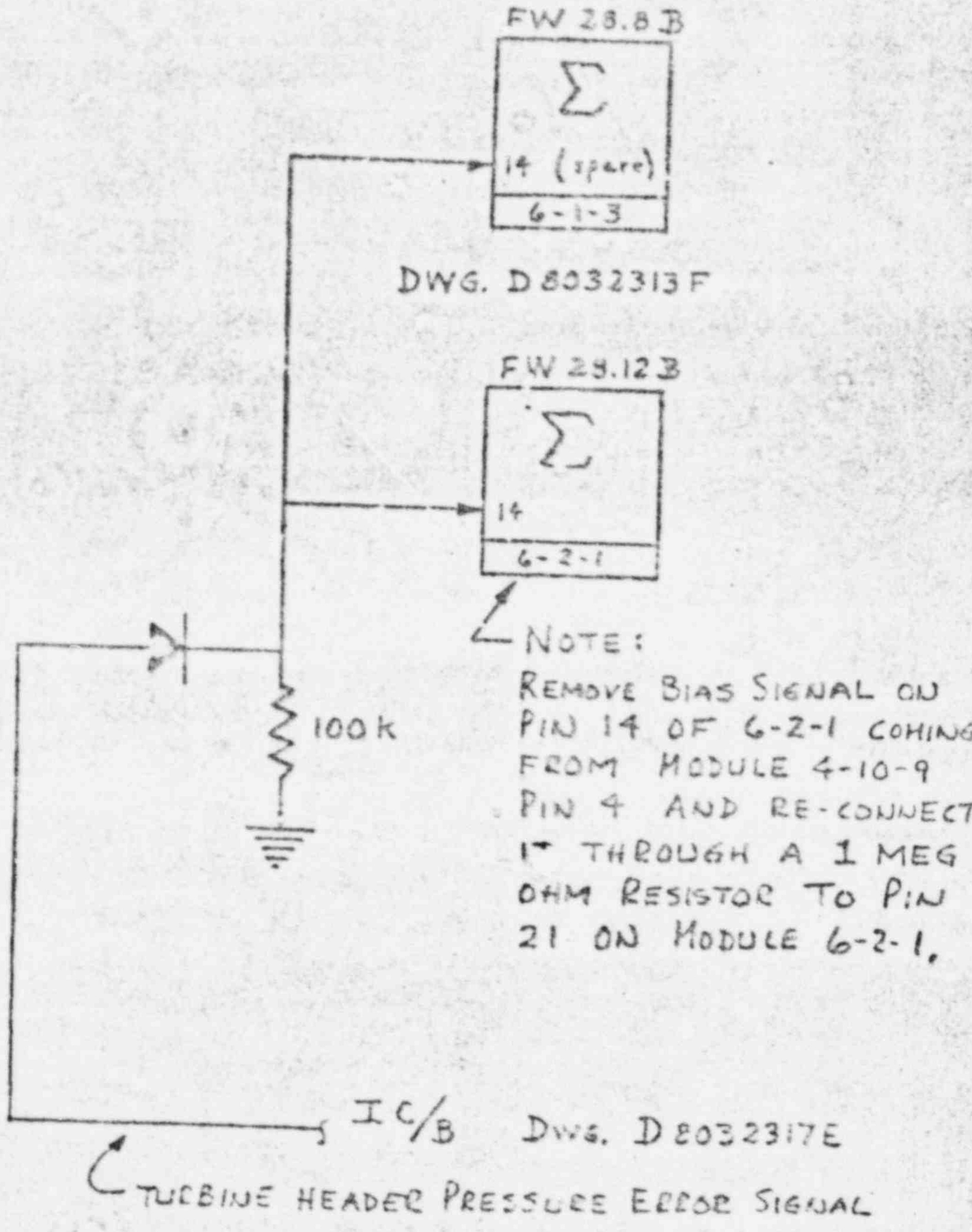
cc: B. A. Karrasch
A. W. Brown
W. Van Scooter
R. F. Ryan
W. E. Wilson
J. T. Janis
Y. J. Galan
R. S. Rand (B&W Co)

Q/A The information contained in this memo has been checked for applicability and completeness.

Signature R D Randall

Date 4/4/75

FEEDWATER PUMP SPEED "KICKER" MODIFICATION TO THE ICS



NOTE:
REMOVE BIAS SIGNAL ON PIN 14 OF 6-2-1 COMING FROM MODULE 4-10-9 PIN 4 AND RE-CONNECT IT THROUGH A 1 MEG OHM RESISTOR TO PIN 21 ON MODULE 6-2-1.

5 2 3 2

PRELIMINARY REPORT [illegible]

9-4-74

1507

290622

B. E. [illegible]

81239 | 773

[illegible] Box

Middletown, Pa. 17057

[illegible] #1

[illegible] ICS SYSTEM IMPROVEMENTS (721)

During a B&W presentation to the customer September 4, 1974, Mr. J. G. Herbein, Plant Superintendent stated that there are two areas of operation that require improvement.

1. On a Reactor trip the pressurizer level should not fall as low as it does. (To approximately 40 inches)

2. On a Turbine trip from 100% power the reactor should not trip.

The following are suggestions based on field observations and study of various parameters from the data available to date at Met. Ed. TMI #1. Attach. A please find revised logic and schematic drawings to show the following suggestions and also charts and table 1 from generator trip test 8/13/74.

EXHIBIT A:

It appears that after a reactor trip the turbine header pressure is considerably greater than Steam Generator pressure, probably due to the check valve action of MSV-1A, 1B, 1C, 1D which are installed in the Main

EFFECT ON SYSTEM/ANALYSIS: 40" overpressure level cut off heaters, If "locked in pressure" stayed high (due to feed pump trip) I.C. System would be further ground [illegible]

CUSTOMER ATTITUDE

- [x] NO CONCERN
- [ ] CONCERNED
- [ ] CONCERNED

[x] CONT'D ON SEPARATE SHEET

DATE [illegible] 10/1/74

SIGNATURE [illegible] DATE [illegible]

[illegible] 9/18/74

INVESTIGATION & CORRECTIVE ACTION (BY FIELD IF APPLICABLE)

PRODUCT APPLICATION

OPERATING CONDITIONS

ALLOCATION

- [ ] PRODUCT
- [ ] PRODUCT APPLICATION
- [ ] SYSTEM
- [x] SYSTEM APPLICATION
- [ ] WARRANTY
- [ ] OTHER

CHARGEABLE [illegible]

COPIES

PRELIMINARY ANS.

FINAL SOLUTION

SIGNATURE DATE

COMPONENT NOR

PROBLEM:

Steam lines between the instrument connections for Turbine Header pressure and Steam Generator pressure.

Attached please find charts recorded during a generator trip test conduct-d 8-13-7- which resulted in a reactor trip. From these charts and table 1 it can be noted that while there was flow through the line there was a pressure drop i.e., SG pressure is 30 psi higher than THP, immediately after the trip with no pressure drop due to flow the pressures equalized. For the next 3.5 min. the SG pressure is less than THP. Also note the waves in the SG pressure recorded during the first minute are not present in the THPressure. These conditions seem to be a good indication that the check valves did close.

The fact that the Turbine Header pressure remains higher for a time holds the Turbine Bypass Valves open longer than necessary. (AFTER The Saftey Valves have closed)

It is believed that this area could be improved by having the turbine bypass valves modulate to control Steam Generator pressure when the reactor is tripped instead of turbine header pressure. Getting these valves closed sooner after a trip should keep the Steam generator pressure from dropping so low which would keep the steam generator temperature higher and therefore TAVE. This should then keep the pressurizer level from dropping so low because it would not have to make up as much volume in the RC system.

PROBLEM 2:

On August 13 the generator breaker trip from 100% power transient was tested. The Reactor tripped on high RC pressure four seconds after the generator trip. After analysis of Reactimeter data it was observed that the system came very close to NOT tripping the reactor. We had previously sustained two turbine trips from 75% power without tripping the reactor. (The reactor did trip on the second turbine trip but not until the reactor had run all the way back to 20% power and this trip was due to operator error.) The most important item to be worked on to prevent reactor trip would be to reduce the maximum steam generator pressure immediately after the generator trip. This might be achieved by lowering the popping pressure on the last two banks of safety valves. In addition, the Emergency Relief Valve control could be modified to utilize the emergency relief valves (atmospheric dump valves) as additional steam relief capability. Presently the BTU limits as specified by B&W call for immediate reduction of feedwater flow demand to approximately 60% due to the rise in steam generator pressure from 910 psig to 1070 psig on a turbine trip. The elimination or delay of the BTU limits in this situation would help to maintain the required feedwater flow which would in turn tend to prevent overheating the primary coolant and to prevent the Reactor tripping on high RC pressure.

The attached logic and schematic drawings reflect a suggested way to utilize the atmospheric relief valves to open for overpressure at any time, whether the turbine bypass valves are available or not.

It must be considered that this change will substantially increase the use of these atmospheric relief valves and might increase their maintenance requirements.

DESIRED ACTION:

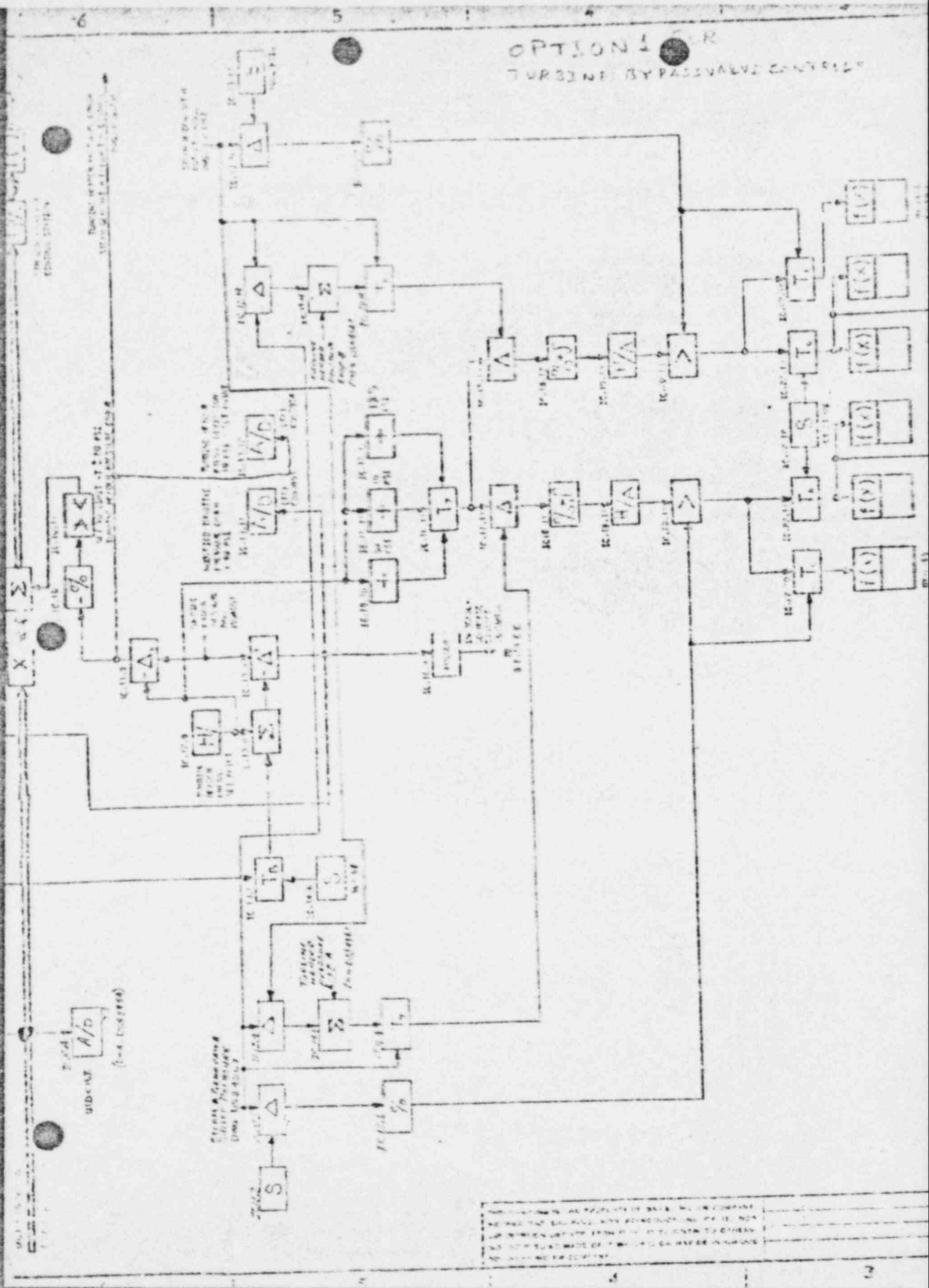
Contact B&W to see if they would like to implement either of these suggestions.

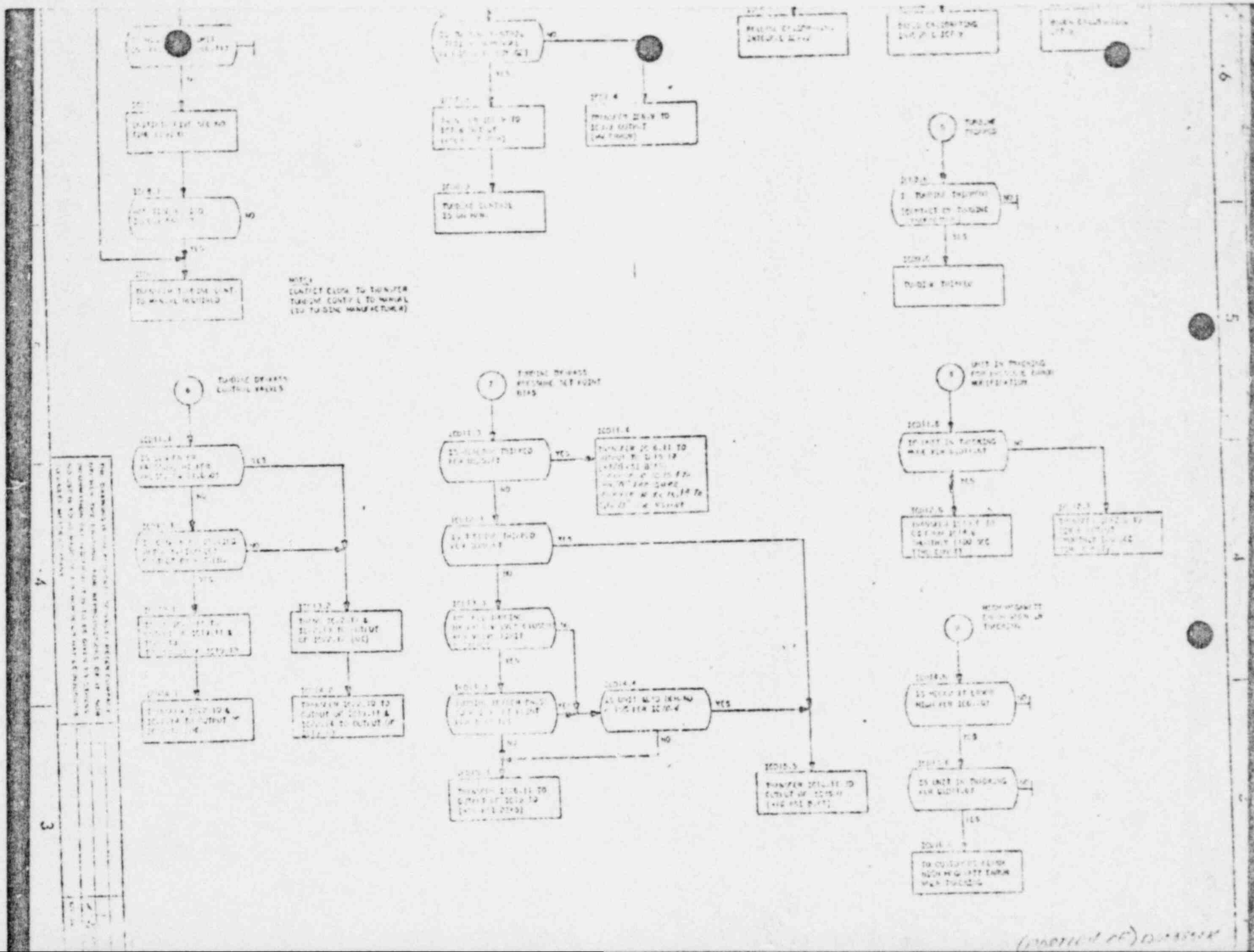
APPLIES TO OTHER NSS CONTRACTS: YES (ITEM 2)

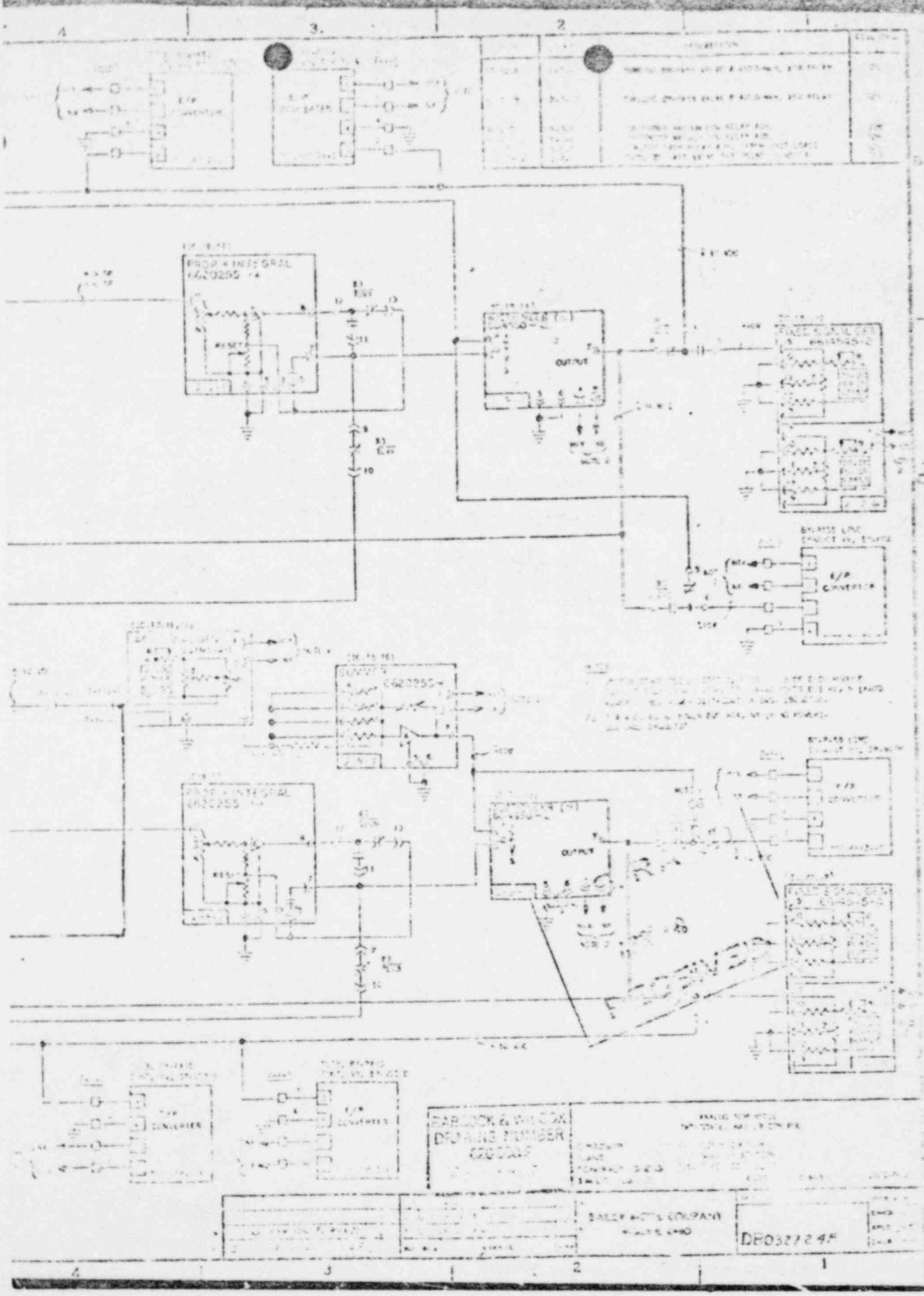
TABLE 1

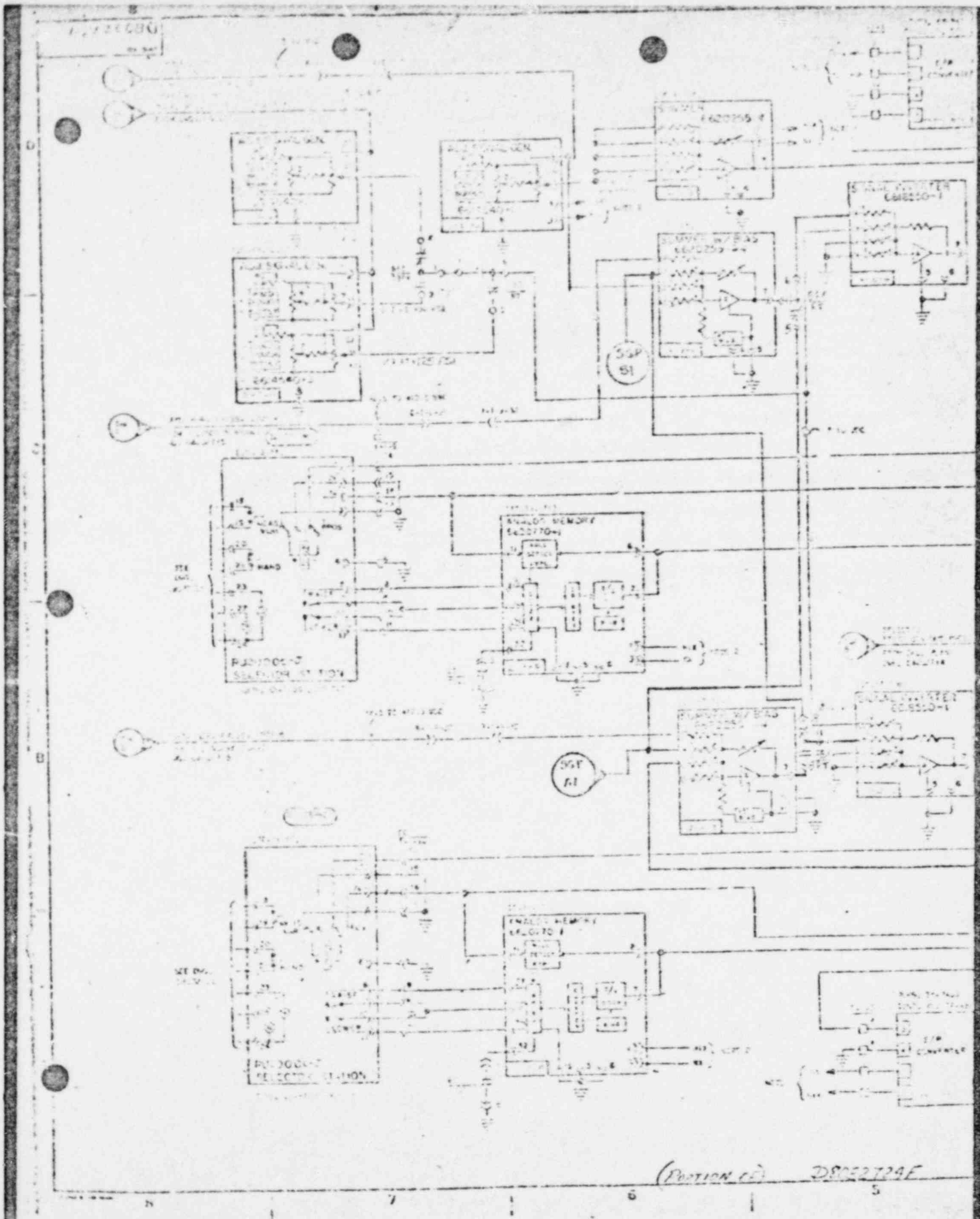
Steam Generator pressure and Turbine Header pressure recorded during generator trip test 8/13/74 at TMI Unit 1.

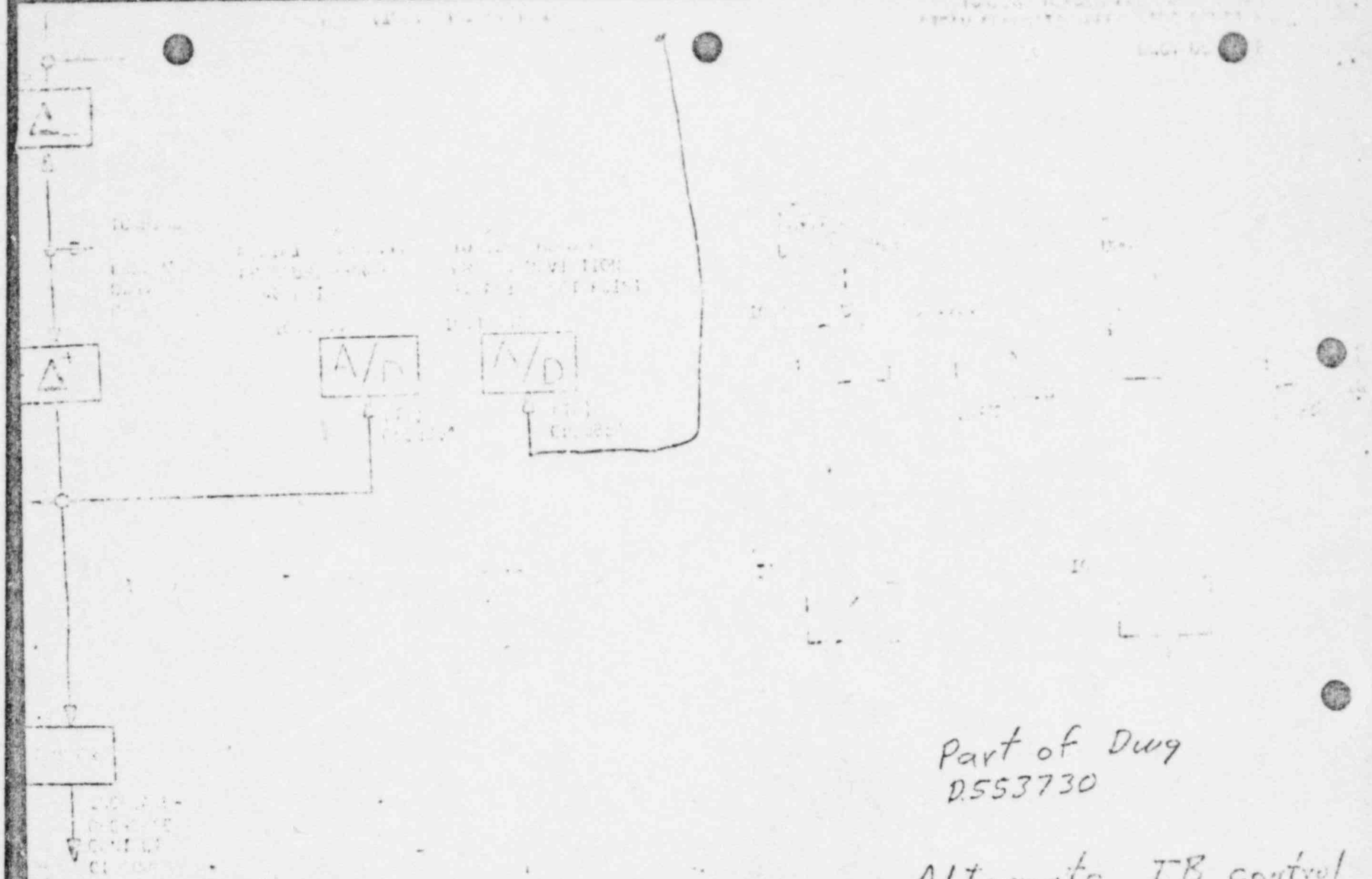
	SG Press.	TH Press.	THP-SG Press.
Before the trip	912 PSI	882 PSI	-30 PSI
peak	1080	1080	0
12 sec.	1063	1074	+6 PSI
24 "	1032	1059	+27
36 "	1008	1046	+38
48 "	984	1038	+54
1 min./60 "	966	1032	+66
12 "	948	1021	+73
24 "	930	1017	+87
36 "	→ 926	1008	+82
48 "	936	1004	+68
2 min./60 "	962	997	+35
12 "	984	994	+10
24 "	986	987	+1
36 "	1002	996	+6
48 "	1008	1005	-3
3 min./60 "	1014	1011	-3
12 "	1032	1020	-12
24 "	1032	1023	-11
36 "	1020	1020	0
48 "	1020	1020	0
4 min./60 "	1020	1020	0


OPTION 1
TURBINE BYPASS VALVE CONTROL



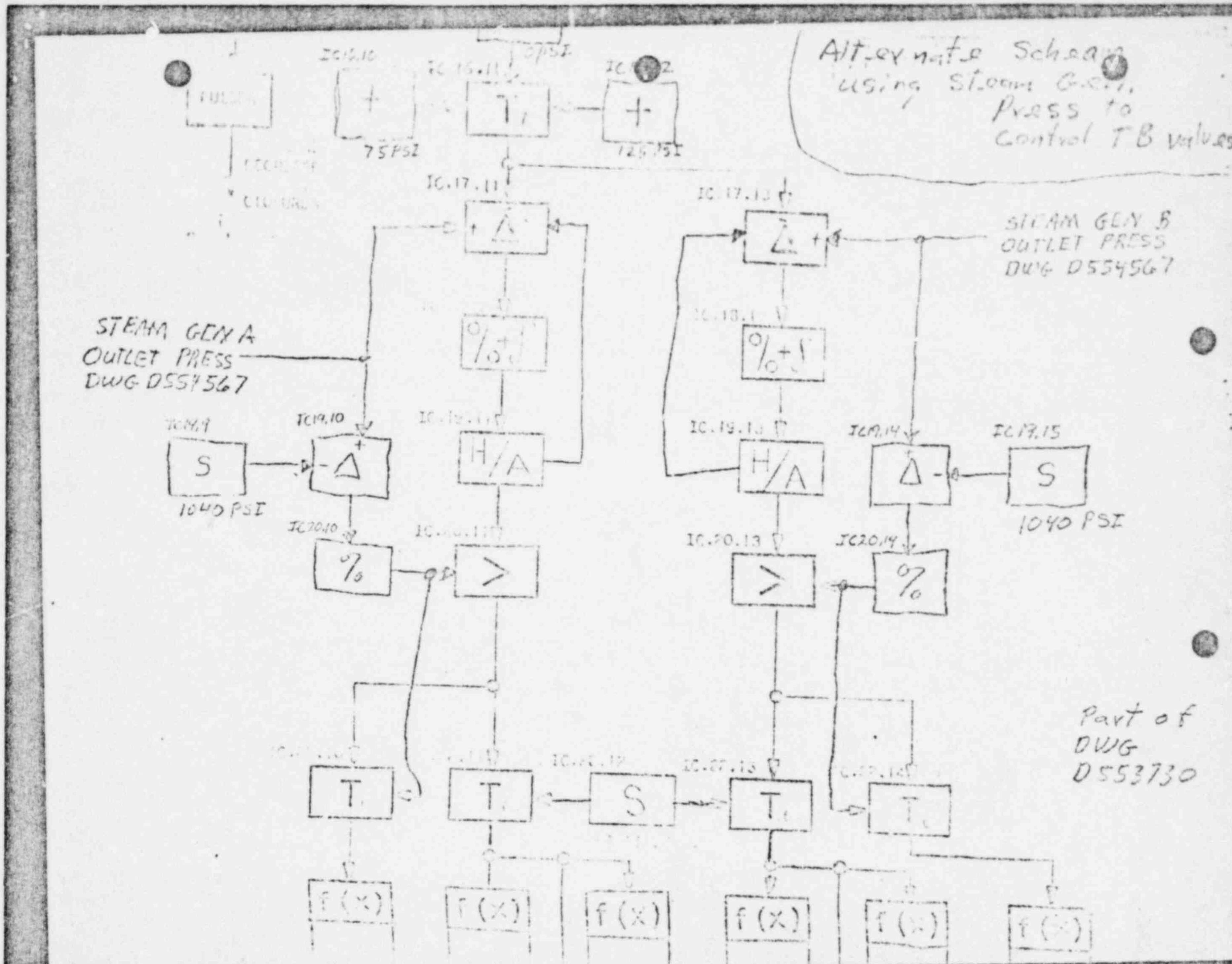

4
3
2
PROP + INTEGRAL
6620255
RESET
OUTPUT
E/P CONVERTER
SUMMER
FIXED SIGNAL GEN
RECEIVED
BABCOCK & WILCOX
DRAWING NUMBER
DB0327 2 4F
1


ANALOG MEMORY
ANALOG MEMORY
SELECTOR STATION
SELECTOR STATION
SUMMER W/BIAS
SUMMER W/BIAS
SIGNAL INVERTER
SIGNAL INVERTER
(PORTION OF)



Part of Dwg
D553730

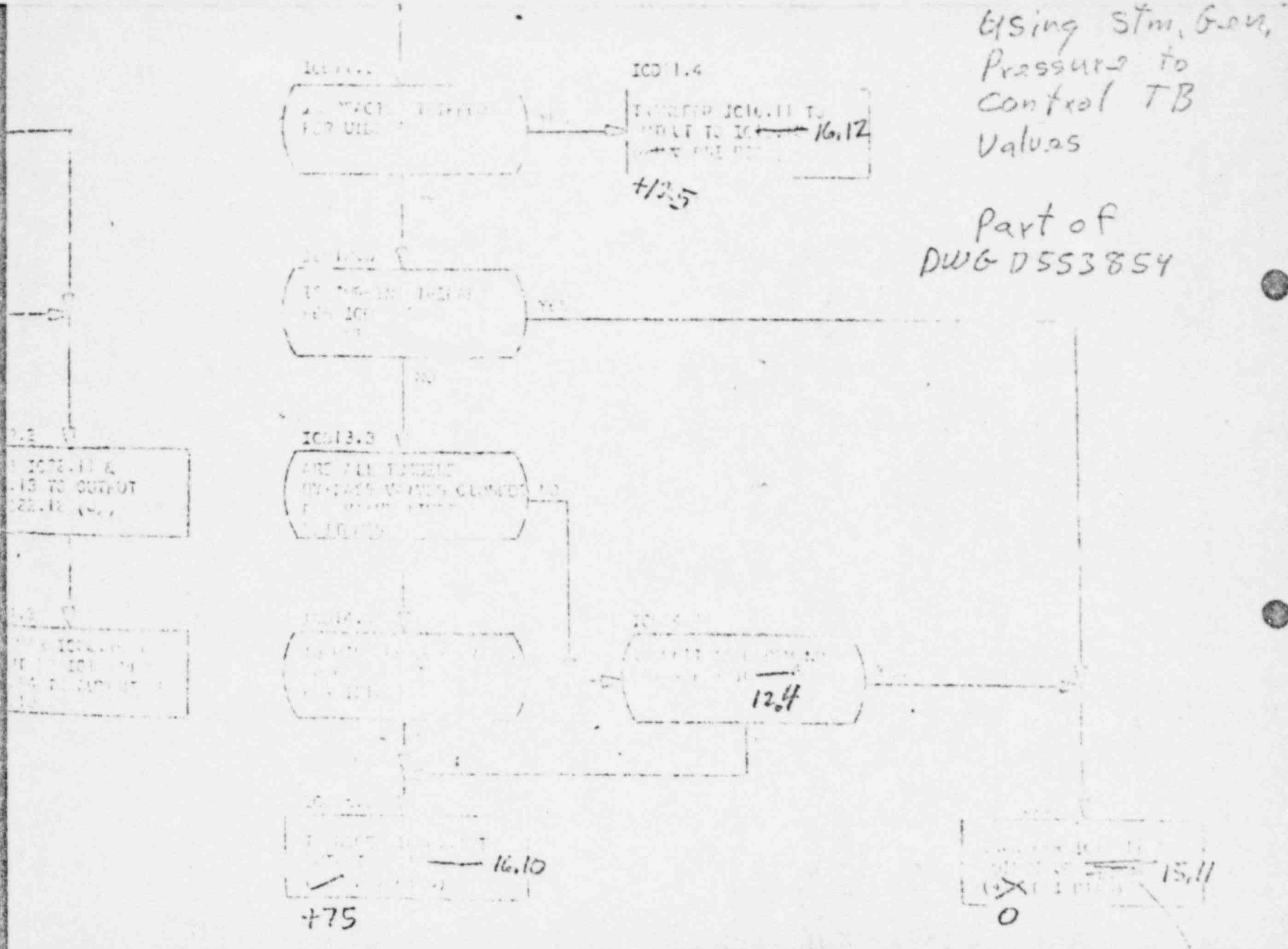
Alternate TB control
using Stm Gen. press.
[illegible]

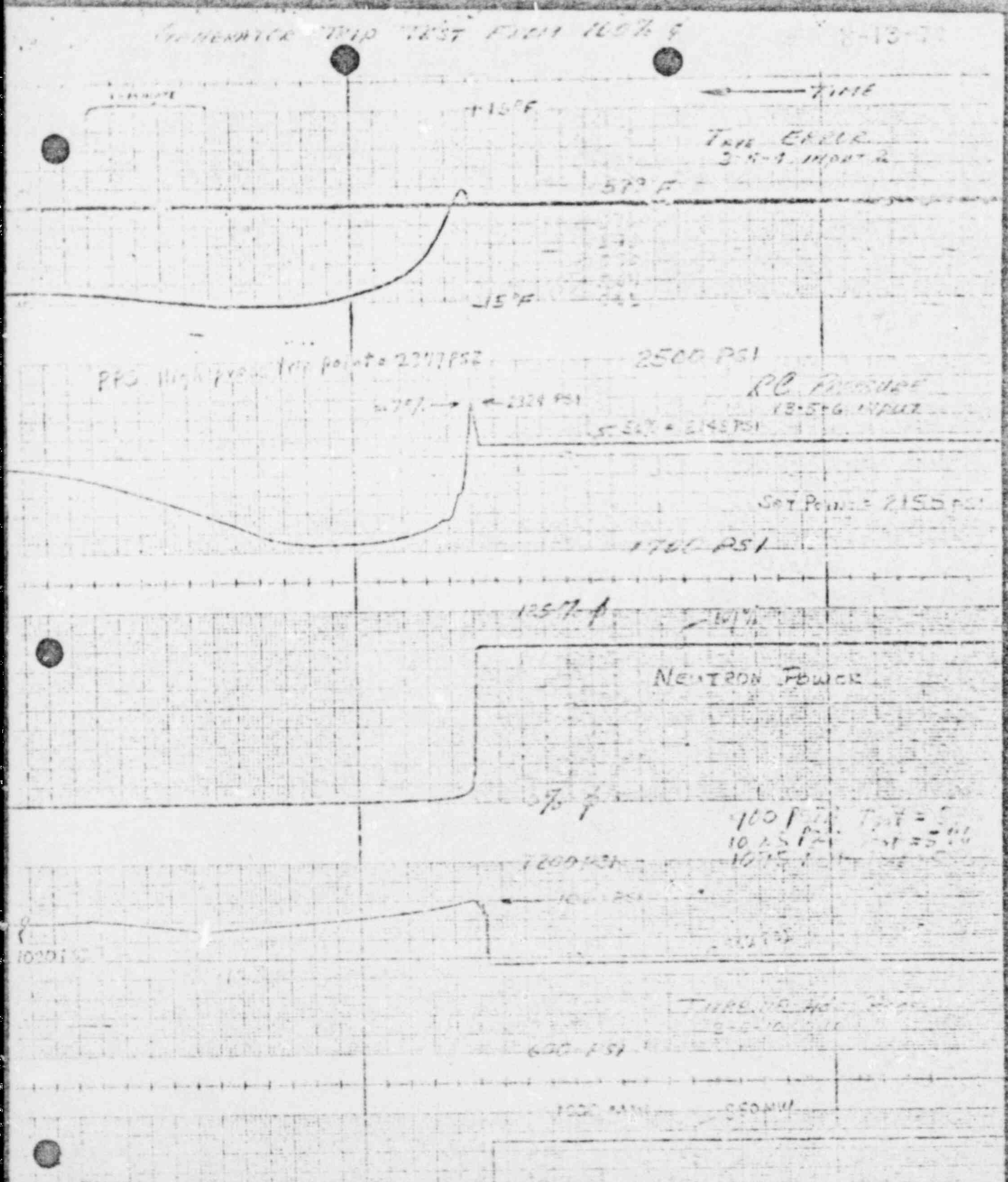


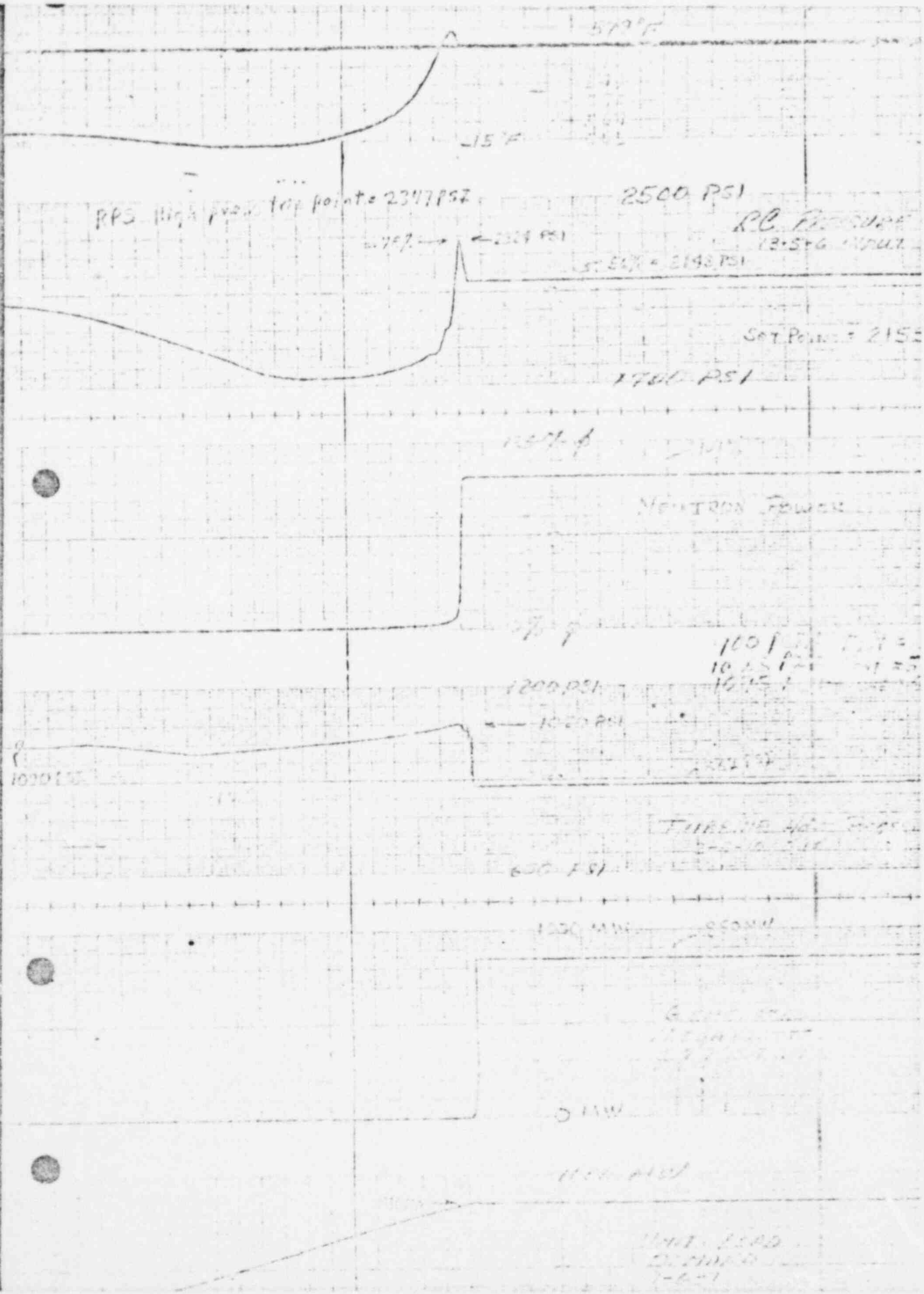
Alternate Scheme using Steam Gen. Press to control TB valves
75 PSI
125 PSI
STEAM GEN A OUTLET PRESS DWG D554567
STEAM GEN B OUTLET PRESS DWG D554567
1040 PSI
1040 PSI
Part of DWG D553730

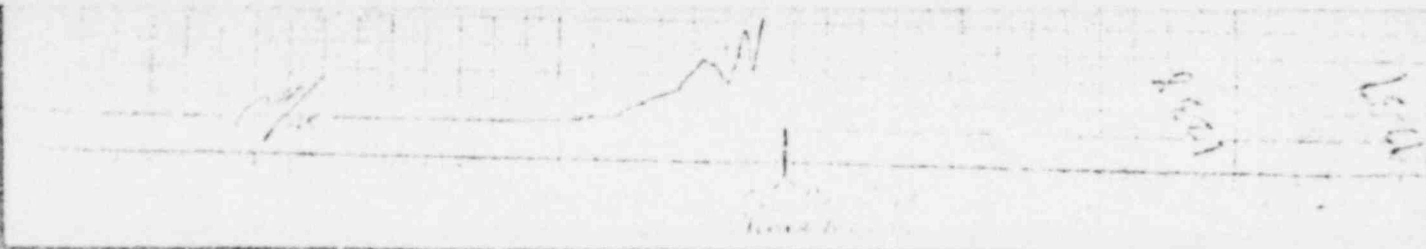
Using Stm. Gen. Pressure to Control TB Valves

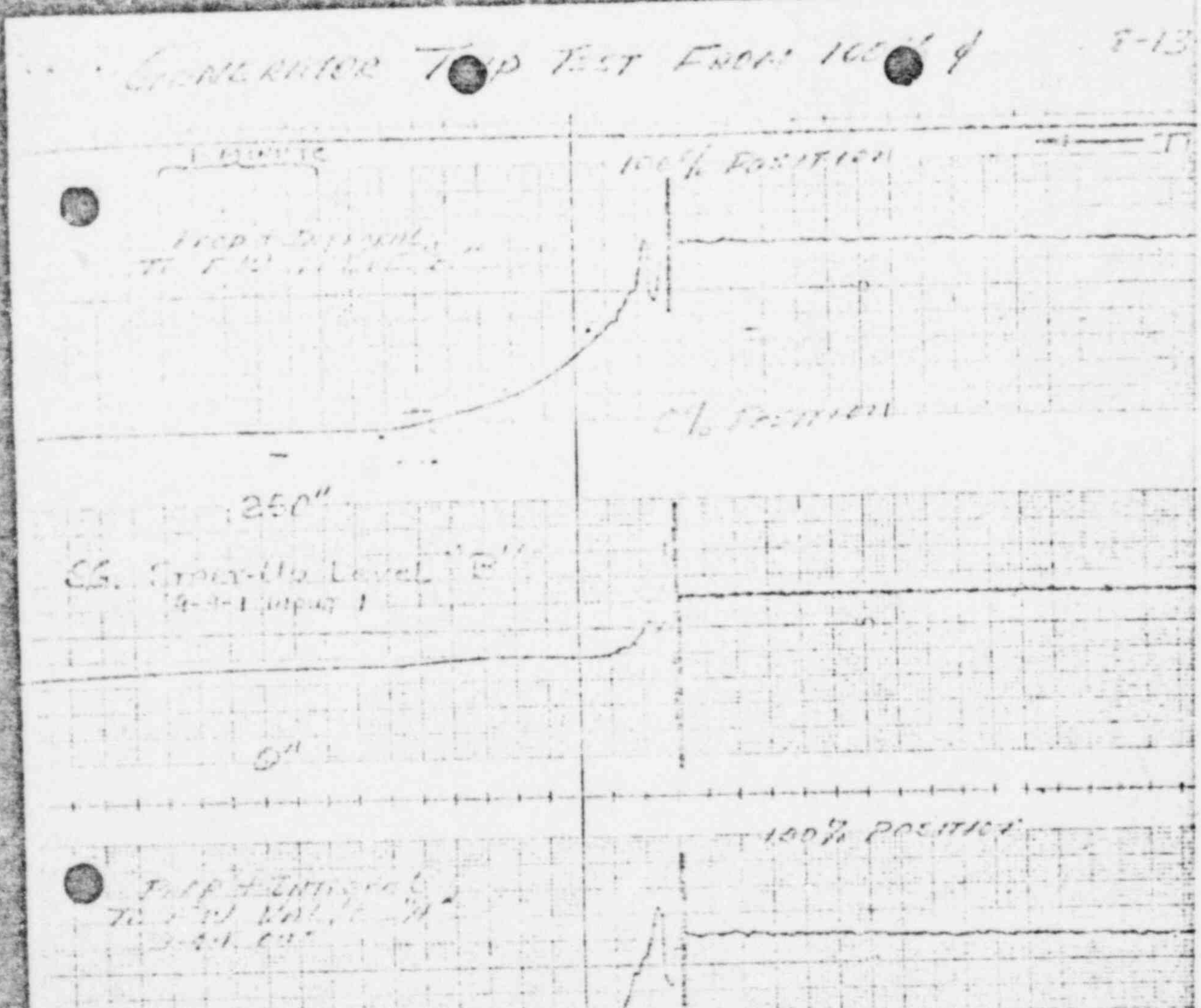
Part of DWG D553854



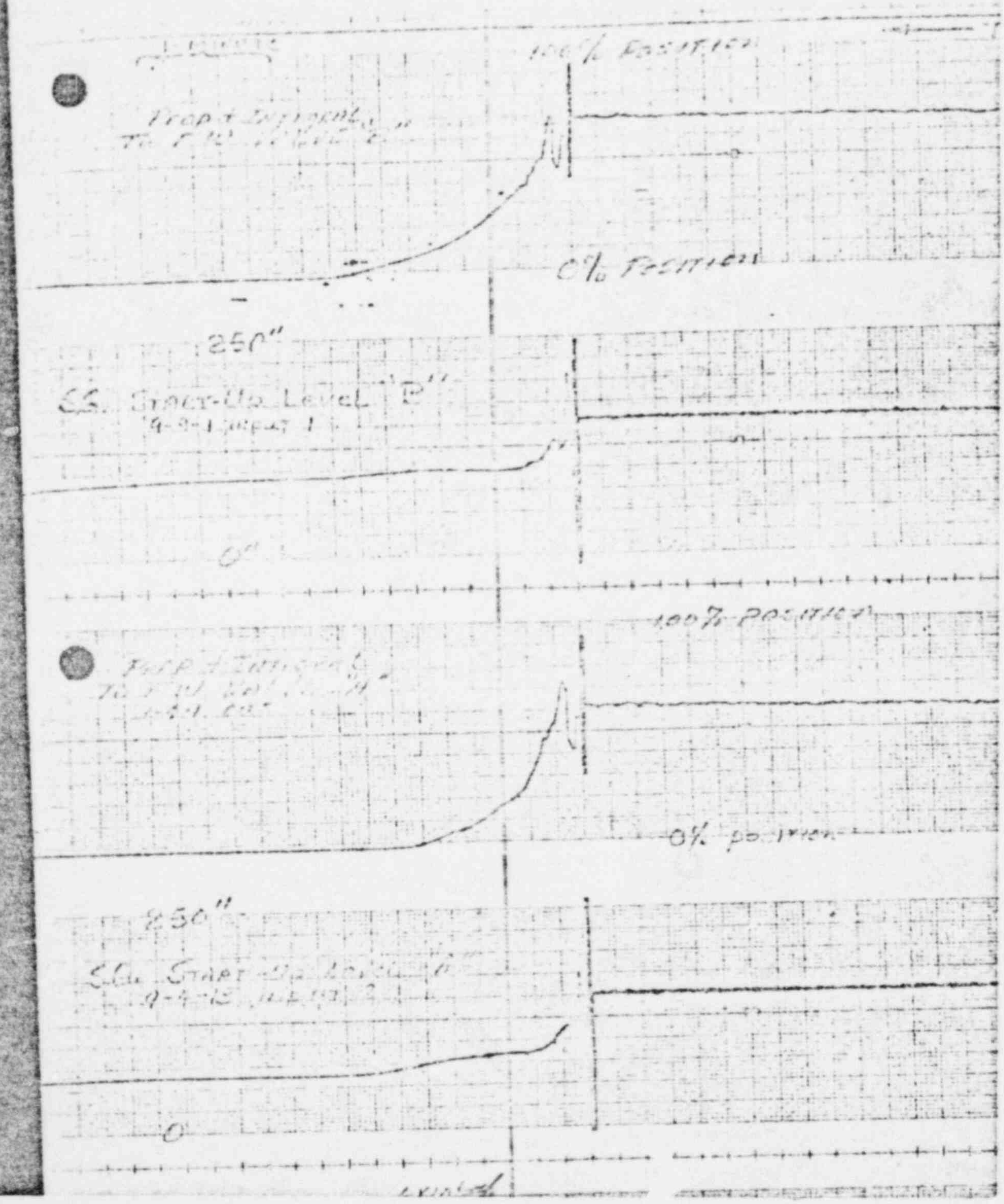

Time
+15°F
Tave Error
-15°F
2500 PSI
RC Pressure
2324 PSI
Set Point 2155 PSI
1700 PSI
125% ϕ
Neutron Power
0% ϕ
1200 PSI
600 PSI
1000 MW
850MW

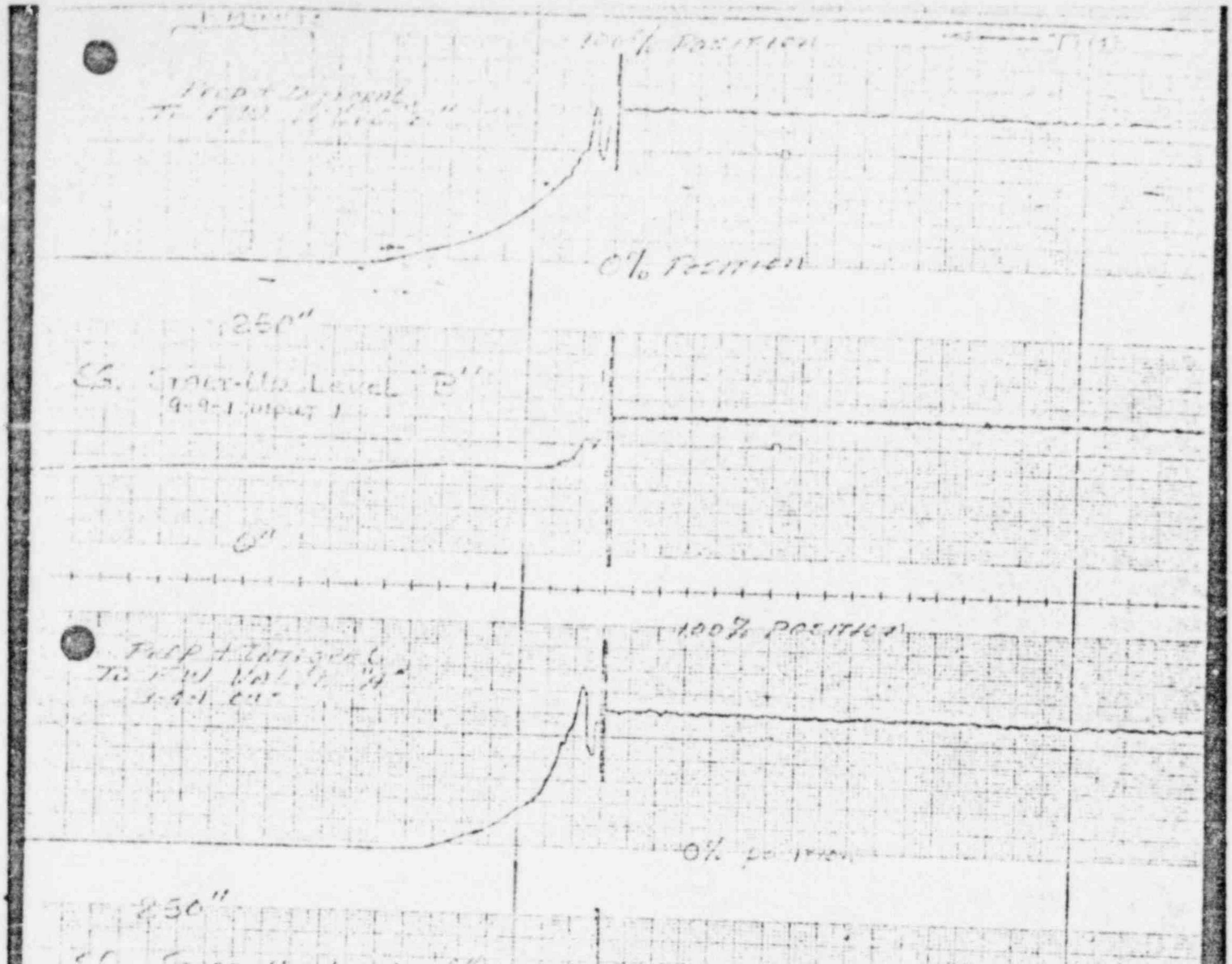

RPS High press trip point = 2347 PSI
2500 PSI
RC Pressure
1700 PSI
Neutron Power
1200 PSI
1020 PSI
Turbine Hdr Press
600 PSI
1000 MW
0 MW
Unit Load Demand



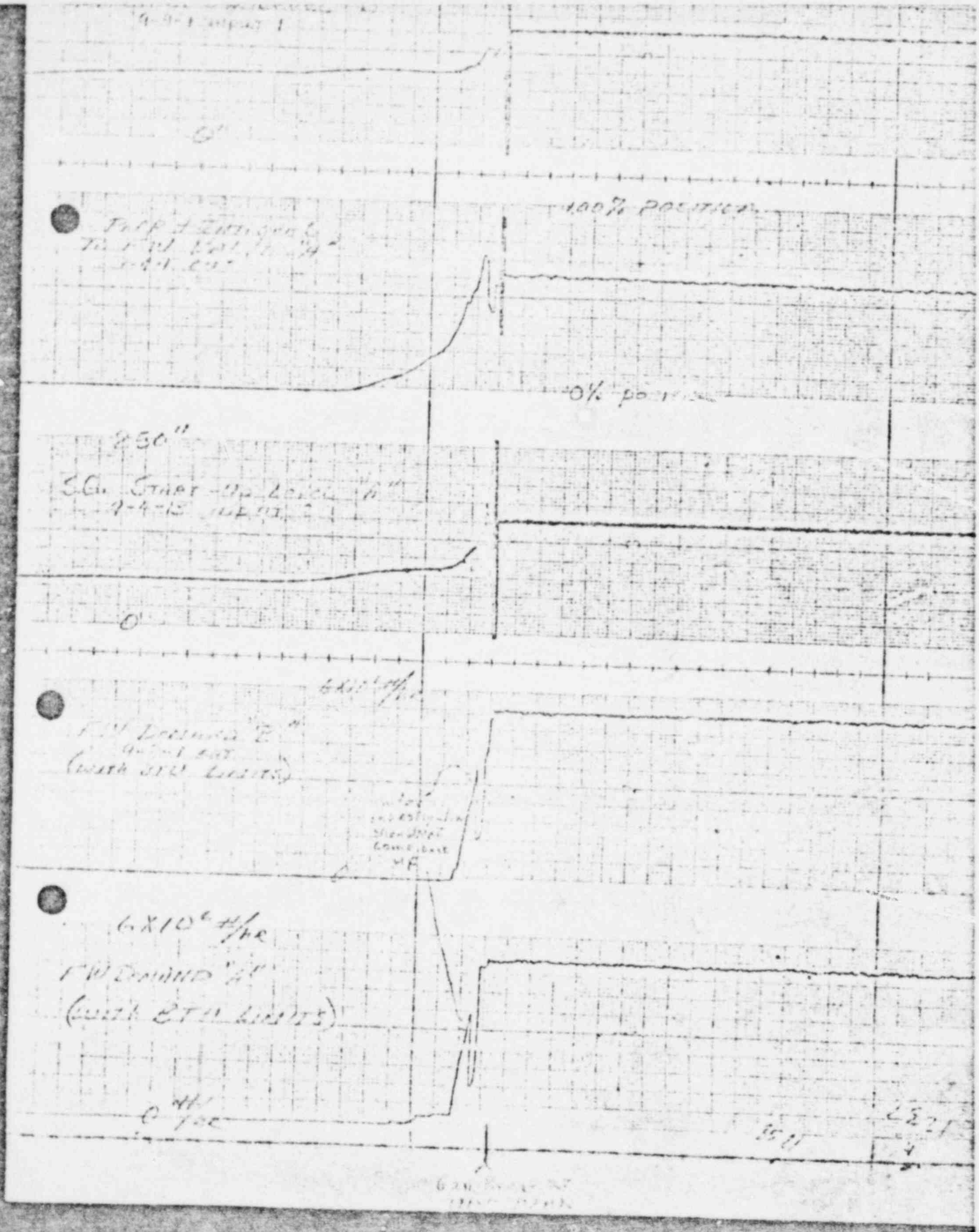

GENERATOR TRIP TEST FROM 100%
100% POSITION
0% POSITION
250"
S.G. ... Level "B"
0"
100% POSITION

Generator Trip Test

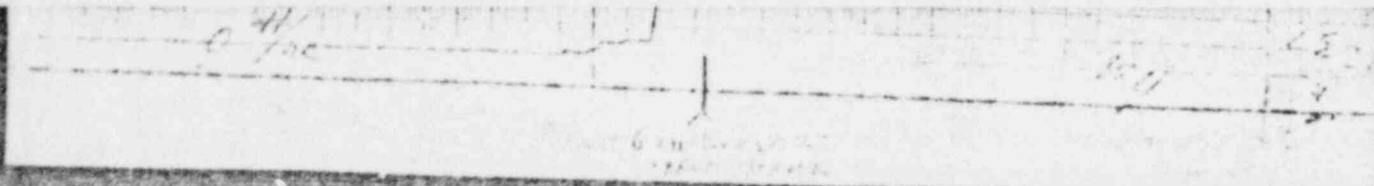




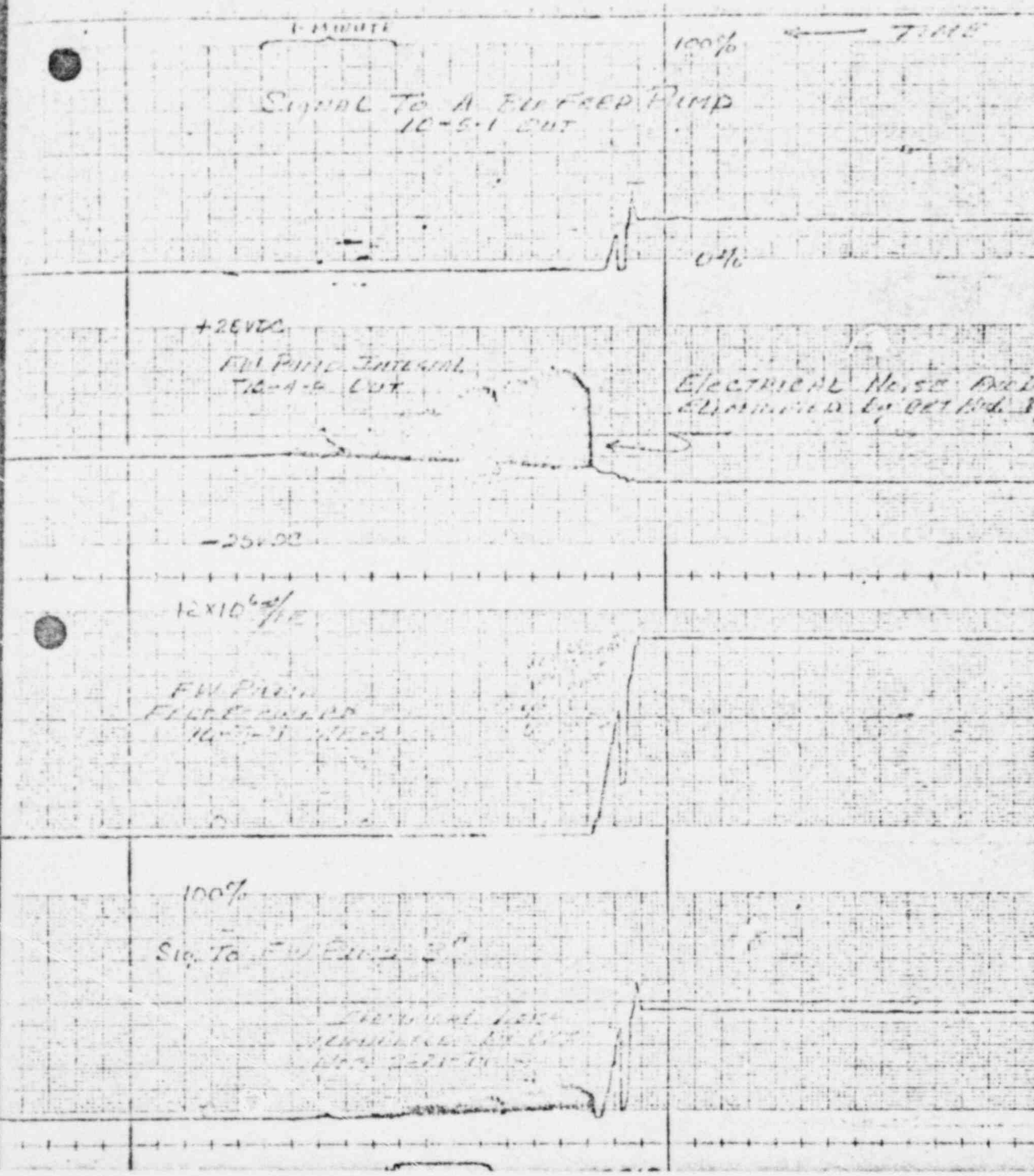
100% POSITION
0% POSITION
250"
S.G. Start-Up Level "B"
0"
100% POSITION
0% POSITION
250"
0
6X10^6 #/HR

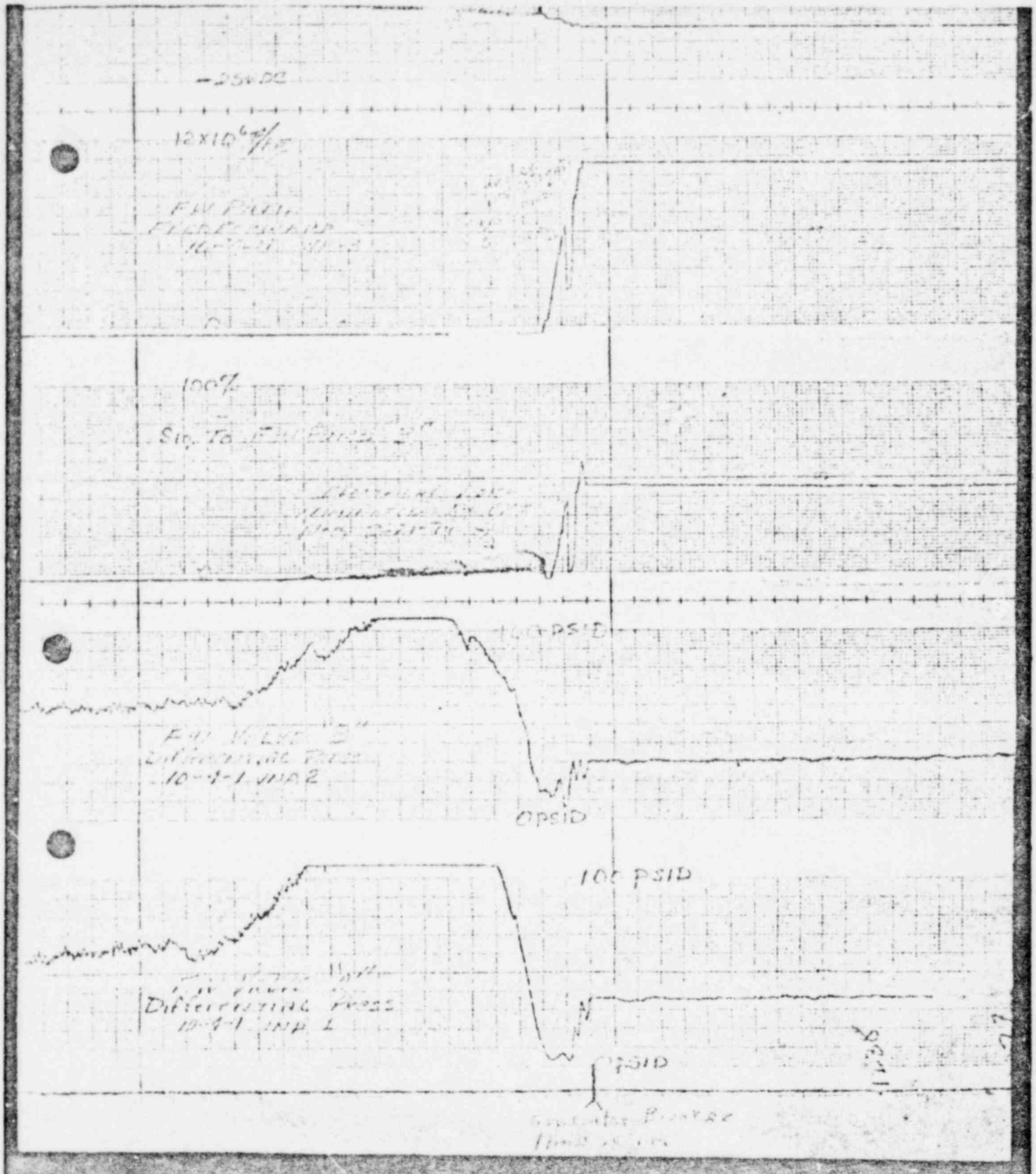


100% POSITION
0% position
850"
0
6X10^6 #/hr
FW DEMAND "A"
(with ETH LIMITS)



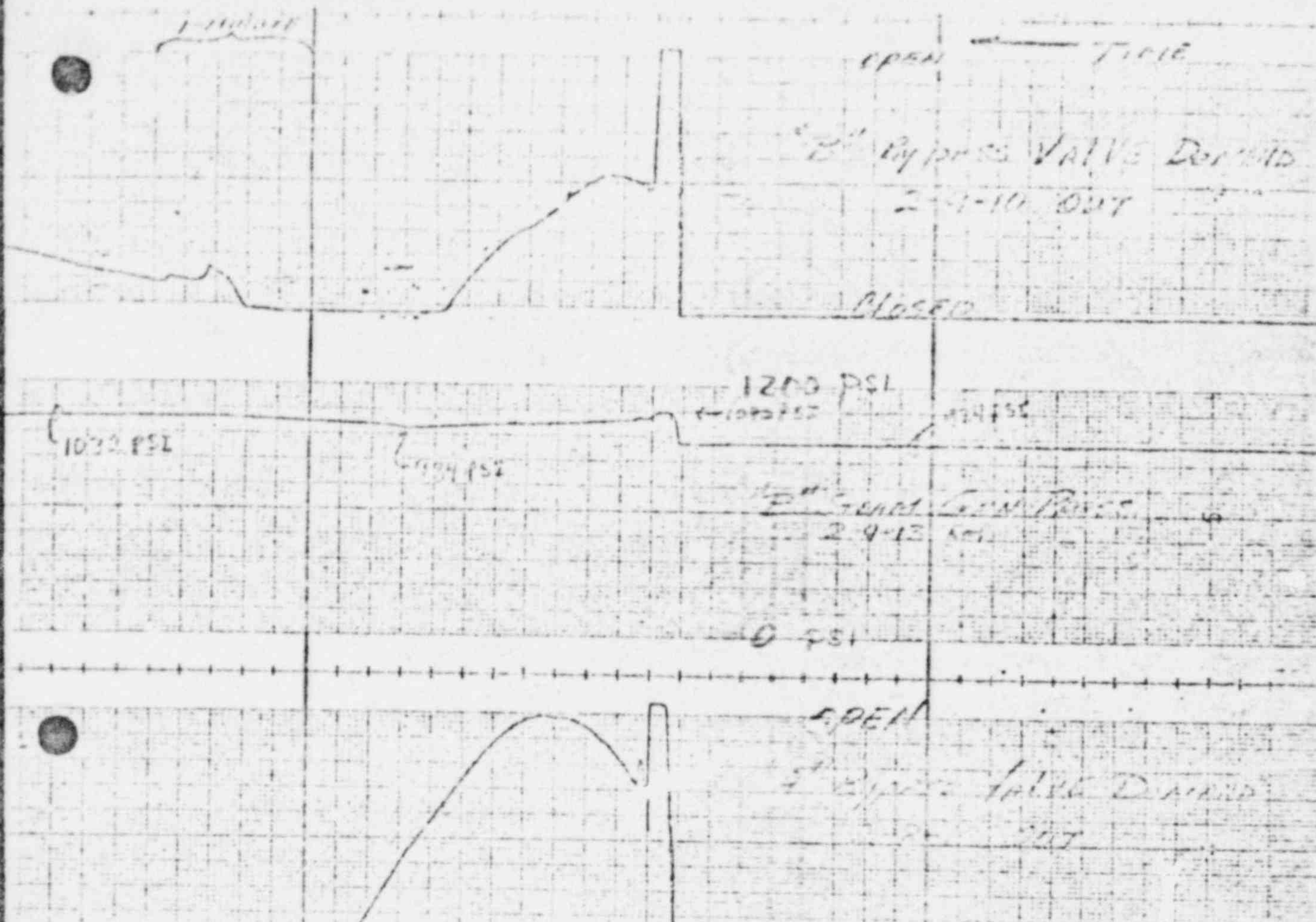
GENERATOR TRIP TEST FROM 100%

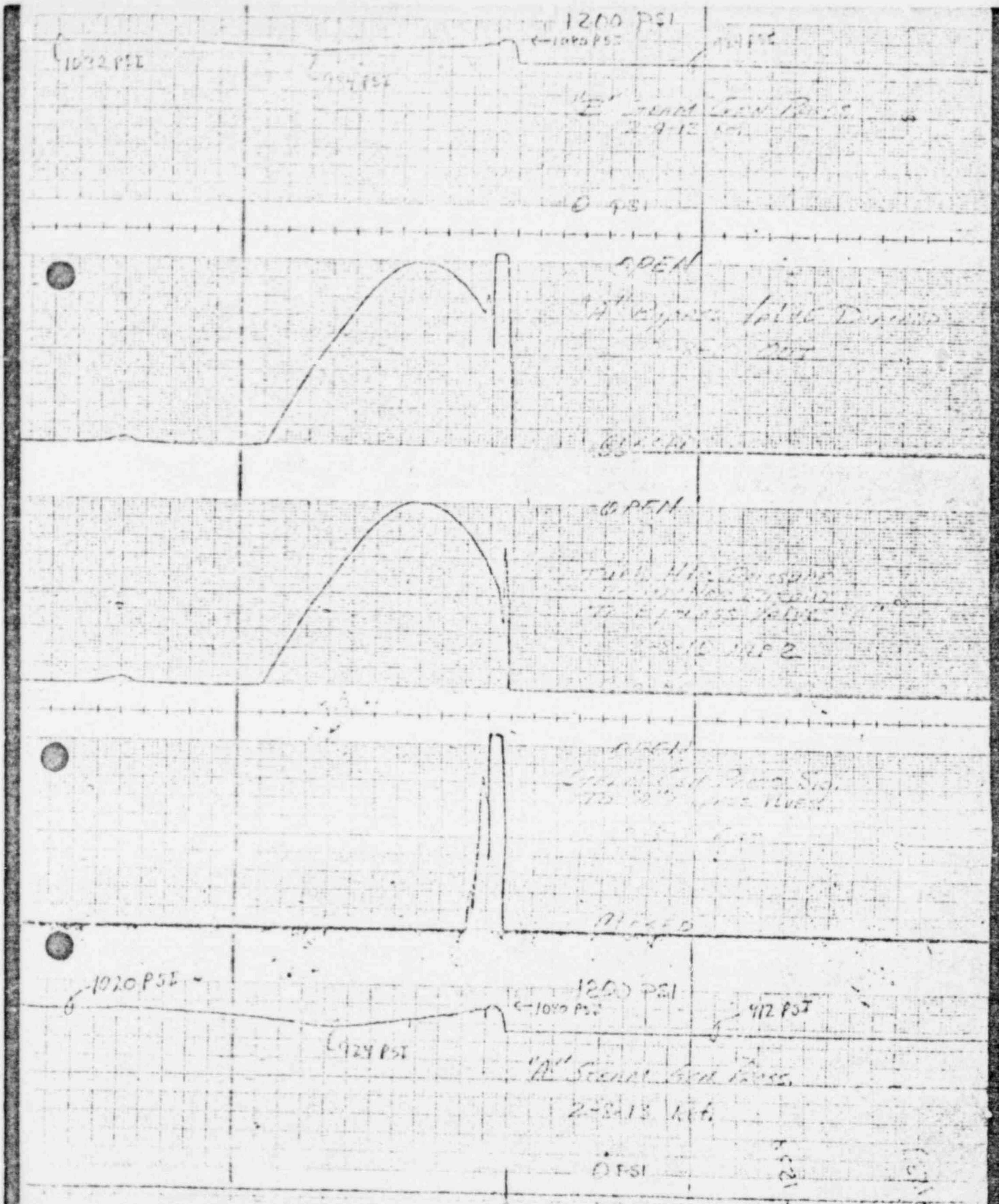




GENERATOR TRIP TEST from 100% ...

Generator Trip Test from 100% ...





1032 PSI
1200 PSI
1040 PSI
0 PSI
OPEN
OPEN
OPEN
1020 PSI
1200 PSI
1040 PSI
924 PSI
912 PSI
0 PSI
TIME MARK

(3)

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

TO: ______________ For Information

Central Engineering Files

C. C. Plunkett - Contract Admin.

S. H. Klein - Quality Assurance

B. J. SHEPHERD - Task Engineer

R. A. GOWERS - Project Manager

FILE: 12M2

CONTRACT NO: 620-00 05

SPR 322 REV. 0

TITLE ICS PERFORMANCE FOLLOWING GENERATOR-REACTOR TRIP

DATE: 3-12-76

The attached, cleared SPR is submitted for your information.

TO: ____ E. L. Logan - FLORIDA ____

____ L. C. Rogers - MET.ED. ____

____ R. J. Baker - TOLEDO ____

____ B. L. Day - Intl. Support ____

____ P. E. Perrone - OFR ____

____ J. L. Donnell - OFR ____

R.W. WINKS

L.M. KOLONAY

Attached is one copy of Site Problem Report No. 322 which was processed on Contract 620-00 05. Future contracts have been reviewed for the potential of a similar problem. This problem is/~~is not~~ considered applicable to other contracts 3 → 14.

REMARKS:

cc: G. M. Jacks - Plant Integration

This SPR has been reviewed IAW NPG-1707-01

Chris C. Lockard

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

S-21091-2 (9-73)

SITE PROBLEM REPORT

BABCOCK & WILCOX

CUSTOMER MET ED	CONTRACT NO. 620-0005	SPR NO. 322	REV. NO. 0
VENDOR BMCo P.O. NO.	TASK NO. 21	GROUP NO. 01	SEQ. NO. 01
SITE ENGINEER S. P. MAINGI	REQ'D. RESOL. DATE	REQ'D. COMP. DATE	

TITLE
ICS PERFORMANCE FOLLOWING GENERATOR-REACTOR TRIP

DESCRIPTION OF PROBLEM
#1 Following a Reactor Trip the pressurizer level goes as low as 40 inches.
#2 The Reactor Trips on high RC pressure within few seconds, following a Generator/Turbine trip at 100% power.
Per customer these situations are unacceptable. See BMCo. problem report attached.

STATUS - ACTION TO DATE INCLUDING PERSONS CONTACTED
R. Winks of Control Analysis and L. H. Kolony of Engineering are made aware of the problem.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL #1 Issue field change covering Turbine Bypass Valves control signals following the reactor trip should be from OTSG's.

#2 To review recommendations in BMCo problem report, specially elimination or relaxation of BTU Limits and lowering settings on last two banks of safety valves.

SITE ENGINEER SIGNATURE	DATE	CONSTR. REP. SIGNATURE	DATE
S. P. Maingi	9/27/74	L. C. Rogers	9/30/74

RESOLUTION 1) FC-174
2) Letter, L.C. Rogers to J.G. Herbein dated 5-27-75 (attached)

APPROVED BY	SIGNATURE	DATE
N.S. SUPPORT ENGINEER	Miles VanSlike	2-2-76
TASK ENGINEER	[illegible] for KBC	2/2/76
OPS manager	[illegible]	2/17/76
PROJECT MANAGER	[illegible]	2/5/76

COST CATEGORY ☐ NORM ☐ C ☐ D ☐ G ☐ L ☐ VENDOR CLAIM

AUTH. CHARGE NO. ☐ FIELD CHANGE REQ FC NO.

SITE COMPLETION REPORT

SEE ATTACHMENT

☐ RECOMMENDED STDS. CHANGE

DEVIATIONS ☐ NONE ☐ SEE SPR REV. NO.

DATE COMPLETED 1/19/76 SIGNED BY S. Maingi

S.O.M. CONSTR. REP. APPROVAL L.C. Rogers DATE 1/19/76

FINAL DISTRIBUTION
PROJECT MANAGER
S.O.M. CONST. REP.
QA DOC. FILE
CENT. ENGR
FILE 131.2

SITE COMPLETION REPORT:

1. Field change 174, changing Turbine Bypass Valve Controls to CTM Pressure rather than Turbine header pressure has been implemented.

2. New relaxed BTU limits have been incorporated.

3. Relief settings on the two main safety valves have been reduced from 1092 PSIG to 1050 PSIG.

All these steps will help run the reactor back to 15% power on a Turbine/Generator Trip, so the SFR is being closed.

J. W. Winks

Babcock & Wilcox

Power Generation Group
P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (804) 384-5111

May 27, 1975

REM-I-104

Mr. J. G. Herbein
Metropolitan Edison Company
Post Office Box 480
Middletown, PA 17057

Subject: Revised BTU Limits for TMI-I
Reference: REM-I-62, L. C. Rogers to J. G. Herbein dated May, 1975

Dear Mr. Herbein:

B&W Engineering has recently completed work on the revised curves for the BTU Limit circuit for TMI-1 in preparation for plant operation and testing associated with the proposed turbine trip or load rejection test at rated power. Attachments include these curves and an appropriate table.

An analysis of plant operational characteristics during the January 23, 1975, power runback transient has led to a revision of the curves comprising the BTU Limit circuit. Figure 1 (attached) shows the revised curves which can be incorporated into the ICS at the first opportunity. Comparison with the curves of Figure 2 which are currently in use reveals that the steam pressure limit is significantly expanded, whereas the T hot curve is more limiting at lower temperatures and power levels. The feedwater temperature curve was changed to properly represent the effect of feedwater temperature on feedwater flow and steam superheat. Also, reactor coolant flow has been changed slightly. These revised curves are to be utilized for all plant operation from now on and are not only associated with the proposed plant runback tests.

The revised BTU Limit curves were tested on the B&W Old Forest Road PWR simulator for several major transients and the TMI-1 type plant with the new BTU Limits performed very well. When compared with the old curves, the new limits provided greater operating margin at full power.

The development of the revised curves was accomplished by using the B&W certified steam generator computer code and determining the limits for the four parameters which comprise the BTU Limits to exceed or maintain 35°F superheat. After incorporating the curves into the simulator ICS, the following operational transients were incorporated:

(a) ramping power up and down with both 3 and 4 RC pumps operating

(b) tripping 1 RC pump at 75% power level

(c) tripping the turbine at 100% power level

All of these transients were performed successfully without a reactor trip. In addition, transients in which the feedwater flow had to be limited were performed and the control of the feedwater flow by the new BTU Limits was excellent. Sufficient testing of the new BTU Limit curves has occurred and fewer operational problems should develop at TMI-1 since the BTU Limits are less restrictive than the curves presently in use.

The accompanying table presents the specific information which defines each of the four curves in the BTU Limit circuit.

Additional information with regard to lowering the setpoint for pressurizer electromagnetic relief valve, is included and has been reviewed by the Control Analysis Group of Babcock & Wilcox.

> The effect of lowering the setpoint of the pressurizer electromatic relief valve from 2255 to 2205 psig has been analyzed and will flow an additional 56 lbs of steam to the Quench Tank during a very severe transient.

If you have any further questions, please contact me.

Very truly yours,

L C Rogers

L. C. Rogers
Resident Engineer Manager

LCR/SPA/car

cc: J. J. Colitz
J. D. Phinney
K. F. Schmidt
D. B. Tulodieski
R. W. Winks
R. S. Rani

TABLE I

Revised BTU Limits for TMI-1

Steam Generator Pressure

Pressure psig	Feedwater Limit - %
Equal to and less than 1000	106
Equal to and more than 1125	50

RC Flow (Temperature compensated - each loop)

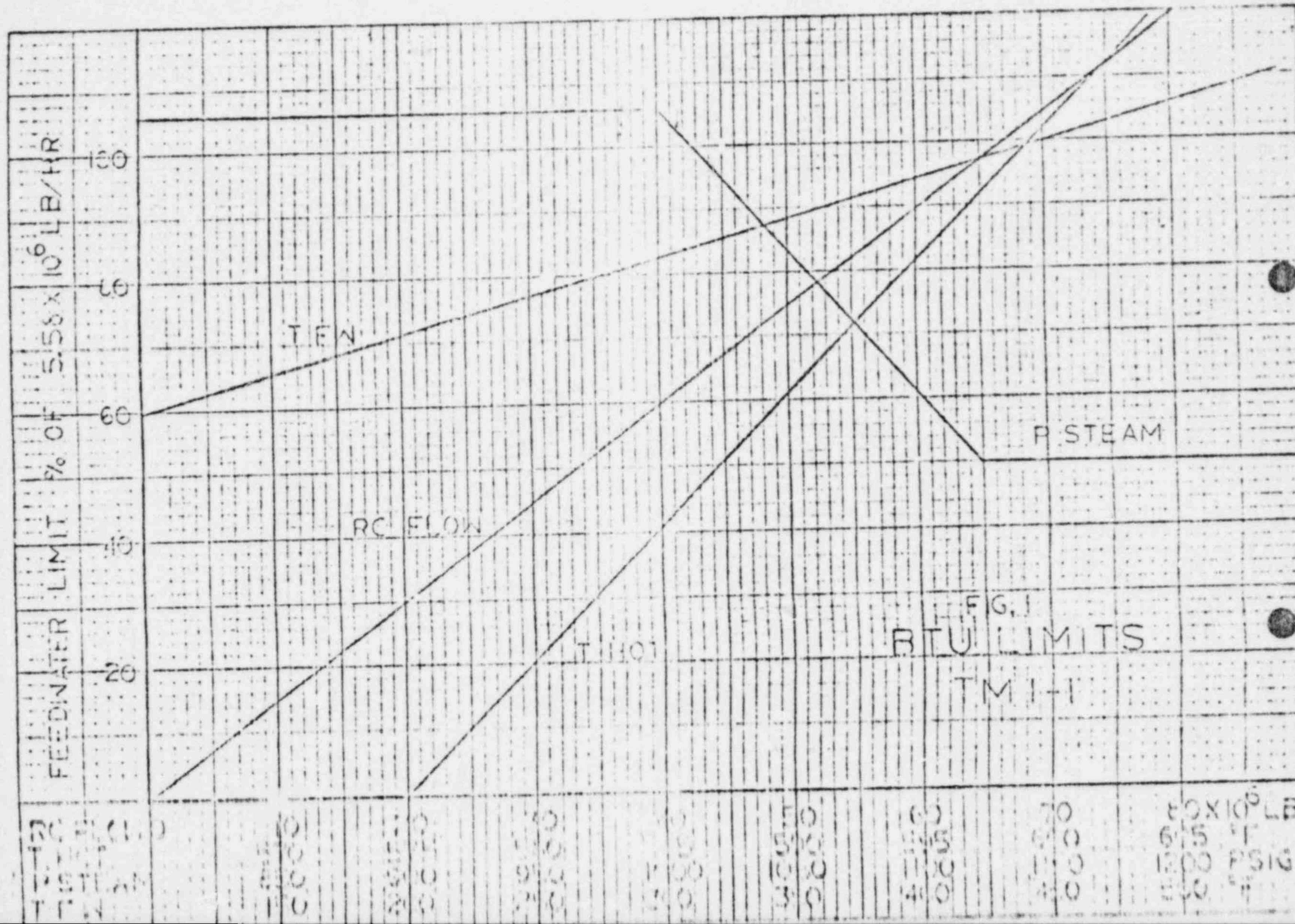
Flow Rate -10^6 lb/hr	Feedwater Limit - %
0	0
80	120

Reactor Outlet Temperature (OTSG Inlet Temperature)

Temperature, F	Feedwater Limit - %
575	0
604	118

Feedwater Temperature

Temperature, F	Feedwater Limit - %
100	60
500	106


FEEDWATER LIMIT % OF 5.58 x 10^6 LB/HR
100
80
60
40
20
TFW
RC FLOW
T HOT
P STEAM
FIG. 1
BTU LIMITS
TMI-1
80 x 10^6 LB/HR
615 °F
1300 PSIG
460 °F

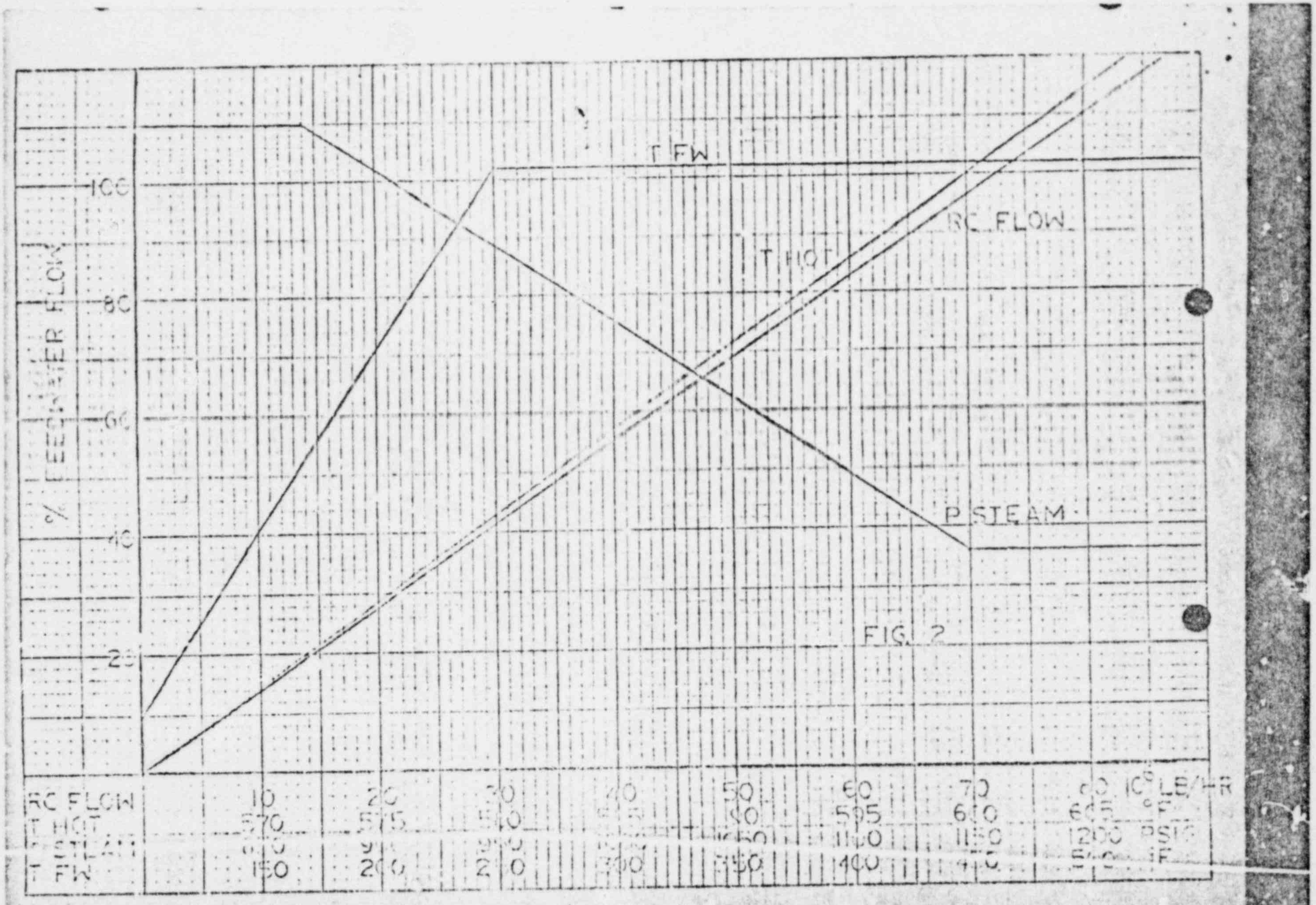

% FEEDWATER FLOW
100
80
60
40
20
T FW
RC FLOW
T HOT
P STEAM
RC FLOW
T HOT
P STEAM
T FW
10
20
30
40
50
60
70
10^6 LB/HR
570
575
505
600
°F
1150
1200
PSIG
150
200
300
400
°F

FIG. 2

(2)

FEB 26 1976

RECEIVED

SITE PROBLEM REPORT

TRANSMITTAL FOR ACTION

TO: L Rogers For Action

_______ For Action

TO: RW Winks For Information

R Cowers For Information

_______ For Information

_______ For Information

Contract: 620-00 05

SPR Number: 322 rev 0

Title: ICS Performance following Gen-Rx Trip

Date of Transmittal: 2-17-76

Reply Required By: _______

Action Requested: L Rogers is requested to complete SPR 322-0 when necessary actions is completed.

Reply and Return This Transmittal to: Mike VanWitbeck
Nuclear Service Support Engineer

Reply: SPR was signed off 1/19/76 and returned to OFR. I'm again closing the SPR now that the original finally was returned to the site. LCR

This problem is/is not considered as applicable to other contracts: NSS-

(Signed)

cc: C. C. Plunkett - Contract Administration
S. H. Klein - NPG Quality Assurance
B. L. Day - Intl. Support
R. J. Baker - Toledo
L. C. Rogers - Met Ed
E. L. Logan - Florida
P. E. Perrone - OFR

SITE PROBLEM

REPORT TRANSMITTAL

**** CLEARED ****

JUL 13 1978

To: Change Control For Distribution
S. H. Klein - Quality Assurance
Central Engineering Files
R.W. WINKS - Task Engineer(s)
J.T. JANIS -- Project Manager

File: 13-11-330
Contract No.: 620-00 11
SPR: 330
Title: RAPID COOLDOWN TRANSIENT
Date: MAY 18, 1978
Status Code: C

(DISTRIBUTION- SEE ATTACHED LIST)

Attached is one copy of Site Problem Report No. 330 which was processed on Contract 620-00 11. Future contracts have been reviewed for the potential of a similar problem. This problem is/~~is not~~ considered applicable to other contracts All operating.

REMARKS:

COMPLETED

David H. Culberson
NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

1 of 27

SITE PROBLEM REPORT — BABCOCK & WILCOX

CUSTOMER	ORIGINATOR / DATE	DOC. ID. CONT. NO.	SPR NO.	REV. NO.
SMUD	D. CULBERSON 5/16/78	13 - 620-0011	330	0

VENDOR	P.A. NO.	PART NO./TASK NO.	GROUP NO.	SEQ. NO.
BAILEY (BMCO)		22	001	001

TITLE (MAX 30 CHARACTERS)	PROBLEM CONTACT
RAPID COOLDOWN TRANSIENT	R. WINKS

PROBLEM IDENTIFICATION

DESCRIPTION OF PROBLEM: 3/20/78 - Plant operating at 70% power (reduced power level due to one main transformer being out of commission).
0425 - While attempting to replace a burned out indicating light on turbine header pressure selector switch, the operator dropped the bulb into the switch causing a short. This short resulted in a loss of power to a portion of NNI System and subsequent loss of many input signals to the control room, computer and ICS. The result was a Reactor trip and rapid cooldown and pressure transient on the primary plant. For details of event, see attached trip report by Bob Winks, March 29, 1978.

STATUS-ACTION TO DATE, INCLUDING PERSONS CONTACTED:

Transient analysis has been performed by B&W Engineering, and SMUD has been given approval to return to power operations. Detailed reports and other correspondence are attached for reference.

FURTHER ACTION RECOMMENDED BY SITE PERSONNEL: Maneuvering limits should be applied for this plant startup; increase surveillance of LPMS for at least one week; perform an operability check of on-line and redundant NNI instrumentation; establish a procedure for restoring NNI power in event of sustained power loss; operator training on loss of NNI power; surveillance of primary and secondary chemistry daily for at least one week.

RESOLUTION:

See attachments. Our other customers will be notified of this transient, by Site Instruction, in the hopes of preventing similar occurrences at other sites. This SPR for information only.

NSS
LOST
CAPACITY

PREPARED BY	DATE	APPROVED BY	DATE
D H Culberson	5/16/78	[signature]	6/5/78
REVIEWED BY	DATE		
R. Calhoun for H. E. [illegible]	5/17/78	Jack G. [illegible]	6/2/78

COST CATEGORY	FIELD CHANGE REQ	F.C.A. NO.	SIGNIF. DEFICIENCY
☐ NORM OTHER ☐	☐ YES NO ☒	04- NA	☐ YES NO ☒

COMPLETION

SITE COMPLETION REPORT:

INFORMATION ONLY

DEVIATIONS: ☐ NONE SPR REV NO. ☐

DATE COMPLETED: 3/24/78

COMPLETED BY: D H Culberson DATE: 5/16/78

SHEET 2 OF 27

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	DISTRIBUTION
From	R.W. WINKS - CONTROL ANALYSIS (EXT. 2864)
Cust.	SMUD
File No. or Ref.	NSS 11/T3.4
Subj.	REPORT OF TRIP TO PLANT REGARDING REACTOR TRIP OF MARCH 20, 1978
Date	MARCH 29, 1978

BDS 663-5

This letter to cover one customer and one subject only.

On Monday, March 21, 1978, SMUD informed B&W of the circumstances of the reactor trip on the day before and requested permission to return to power. An immediate response was initiated and SMUD began to supply B&W plant data recorded during the transient. This reactor and turbine trip transient was more extreme than any others due to cooling the Reactor Coolant System 300 degrees Fahrenheit per hour. With preliminary plant transient data, personnel worked late Monday night in describing the pressures and temperatures of the primary and secondary systems. Late Tuesday afternoon it was decided that B&W would send Mr. Art Brown and the writer to SMUD to assist them in forming a complete description of this transient and validating the data being used in analyses.

We left Lynchburg at 7:15 p.m. and traveled all night to Sacramento, California. We arrived at their plant at 9:30 a.m. and met Mr. Norm Brock, SMUD Instrumentation and Controls supervisor. Art Brown was to delve into the SMUD design of the 24 vdc power distribution system for the nonnuclear instrumentation, and I was to help define the primary and secondary system pressures and temperatures during the entire transient.

We called John Castanes (B&W) from Sacramento at 12 a.m. prior to visiting SMUD to obtain the latest concerns and specific directions. When we arrived at the SMUD plant, we found that SMUD personnel had already determined which NNI channels were valid to the computer, the control room, and to the ICS. Also, Mr. Norm Brock provided us a copy of his notes of the interview with the control room operators following the transient.

I met Mr. Don Blanchley, SMUD, and he provided us a copy of the Post-Trip Review - a record of selected channels for 15 minutes after the reactor trip.

SMUD wanted to know the cause for the instantaneous reduction in Loop A and B feedwater flow. We analyzed the situation and concluded that the single hot leg temperature was below the range

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for the "BTu Limits" circuit,and it drove the feedwater demand signal to zero. With plant performance data in hand, we left to start work back at the motel (and to rest). We called Bruce Karrasch, Plant Integration, and John Castanes again before 5 p.m. (in Lynchburg).

Art Brown and I visited SMUD all day Thursday and continued in the development of the sequence of events and operations which was consistent with the recorded valid data. The twenty pages of the alarm typer printout was scrutinized to provide any extra data points. Details on auxiliary feedwater and turbine bypass valve system operation were also pursued. Another set of control room operator interview notes was provided to me by Don Blanchley. He also showed me the plant hourly log which contained valid data on primary and secondary pressures and temperatures at precisely 5 and 6 a.m. on the day of the reactor trip (~4:26 a.m.). We returned to the motel and I began to write a comprehensive report of the reactor trip transient.

On Friday, March 24, 1978 I arrived at the plant at 8 a.m. and gave my report to Norm Brock and Don Blanchley to review. A copy is included with this report as Attachment #1. Together, we could not resolve why Loop A auxiliary feedwater control valve should have a 100% open demand on it and the Loop B auxiliary feedwater control valve have a 0% open demand (and neither steam generator level was changing). Finally, we hypothesized a set of conditions and decided to go into the control room (plant was at hot shutdown conditions ~ 532 F) and test it.

When the NNI power was lost, both startup level indications to the ICS became zero volt signals. Also, when the 24 vdc powered buffer amplifiers lost power, they decayed either up or down but not together, so Loop A signal dropped to -10 vdc in about six minutes while Loop signal increased to +10 vdc and maintained the 0% demand on the Loop B auxiliary feedwater control valve. That caused the "A" steam generator to start filling before "B". The actual filling of the OTSG's was accomplished by the SFAS system using parallel valves which were motor-operated and wide open.

Before leaving SMUD for Lynchburg, I made schematics of the auxiliary feedwater system, the turbine bypass valve control system,and the main feedwater flow control system. I prepared the appropriate sequence of operations of each of the systems, and it is shown as Attachment #2 of this report.

On Friday I learned that SMUD was able to hold the primary system parameters very nearly constant over a 9-minute period following the reactor trip by a wide-open primary system safety relief valve. As RC pressure dropped it reseated, and the additional decrease in RC pressure was due to H.P. injection and cooling by the Loop A steam generator.

Representatives from NRC, San Francisco office, visited SMUD and asked quite a few questions of the operators. They also received a description of the transient from SMUD. By Friday, March 24, 1978 B&W and NRC had reviewed the transient sufficiently to give SMUD permission to return to power. By Monday morning the SMUD plant was operating at its temporary maximum limit of 72%.

Robert Winks
R.W. Winks

RWW/dmb

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ATTACHMENT #1

EVALUATION OF REACTOR TRIP
TRANSIENT AT RANCHO
SECO ON MARCH 20, 1978

by

Robert Winks, Art Brown
Babcock & Wilcox Co.
Lynchburg, Virginia

March 24, 1978

Introduction:

The NSSS designed by B&W allows a specific number of upset transients over the design life of the plant and each customer maintains an accumulative record of each kind of transient experienced by their plant. On March 20, 1978 SMUD subjected the Rancho Seco plant to the most severe reactor trip transient yet experienced at any of the operating B&W plants. The primary and secondary loops were cooled at an excessive rate of 300 degrees Fahrenheit in one hour and the concerns by B&W included the following:

1) excessive stresses in the reactor vessel
2) excessive stresses in the steam generator tubes
3) Single phase fluid conditions in the primary loop for adequate reactor core cooling
4) proper operation and effect on the RC pumps.

As recorded data could be obtained, both SMUD and B&W personnel evaluated the limited available plant parameter data during the reactor trip transient and resolved the above concerns.

Summary:

The reactor trip transient was initiated by a dropped, burned out lamp bulb causing a short in one of the power supplies for non-nuclear instrumentation. The loss of the particular power supply caused a major portion of the measured plant parameters to indicate improperly. The ~~following~~ plant response following a reactor trip was not the usual transient in that the ICS operation was affected by the erroneous input signals and the Control Room Operators had extreme difficulty in determining the status of the plant and operating systems.

From the transient data supplied by SMUD, B&W was able to ascertain that the last two concerns (satisfactory reactor coolant conditions and proper RC pump operation) were not problems by the morning of March 21, 1978. SMUD transmitted more extensive data which permitted estimates to be made for steam generator and reactor vessel pressure and temperature profiles during the reactor trip transient. The B&W Stress Analysis Group at Mount Vernon, Indiana, determined that the accidental filling of both steam generators with cold water which excessively cooled down both the primary and secondary loops did not cause any major problem with stresses in the reactor vessel or the steam generators. This conclusion was submitted by B&W to SMUD on March 23, 1978.

The severity of the lamp bulb shorting out a power supply is due to a change made by SMUD to the power distribution system design for the non-nuclear instrumentation. Agreement has been reached between SMUD and B&W for an improved redundant power supply design which can cope with the loss of one power supply without affecting the input signals to the Control Room, the ICS, and the plant computer.

Two B&W personnel arrived on site March 22, 1978 to assist SMUD in determining the sequence of events leading to the reactor trip and the resulting behavior of the plant and ICS, and on the validity of the performance data that was recorded. The objectives were accomplished and an interim report was prepared for SMUD on Friday, March 24, 1978.

Recommendations:

1. SMUD should modify the present NNI power distribution system design to a more complete redundant design (agreed upon by SMUD and B&W)

2. SMUD should determine a list of necessary plant parameters for shutting down the plant and ensure that it will be valid and available to the Control Room Operators under unusual or accident conditions. (With SFAS initiated, operators need to know the changing conditions of the plant.)

3. SMUD should increase the usage of the Post Trip Review feature of the plant computer by obtaining the stored plant parameter data and restarting it manually as required during a particular transient.

4. B&W should review operation and controllability of SFAS when initiated for "operational" type transients rather than accident conditions.

BABCOCK & WILCOX

SEQUENCE OF EVENTS

The following description is an abbreviated sequence of events leading to and following an automatic trip of the reactor at Rancho Seco on March 20, 1978.

Plant was steady at 70% power level and four RC pumps running.

Operator decided to replace burned out indication light on turbine header pressure selector switch. He dropped small lamp bulb into switch causing a short.

A 24 vdc power supply was current limited and opened two circuit breakers and there was no backup power supply for this portion of the Non-Nuclear Instrumentation System.

Many input signals to the control room, the plant computer, and the ICS indicated either mid scale or zero, or otherwise improperly.

The Loop A and B BTU Limits developed a zero feedwater limit signal and shut off feed water flow to both steam generators.

As steam generator levels, dropped, the primary side stored more energy and RC pressure increased to the high RC pressure trip setpoint of 2355 psig tripping the reactor. The reactor trip condition tripped the turbine.

Within 100 seconds after tripping the reactor both main feed water pumps were on a minimum speed of 2200 rpm. Both steam generators were at low level and decreasing, and steam pressure was beginning to decrease.

The auxiliary feedwater pump (steam driven) was automatically started due to low feedwater pump discharge pressure.

Operator noticed that Loop A aux. feedwater control valve had a 100% open demand signal while the loop B valve had a 0% open demand.

Loop A Steam Generator had higher level than loop B steam Generator (Full Range levels were only valid indications)

Finally, operator manipulated to gain control of the Loop A feedwater pump and increased speed up to 3500 rpm.

Due to position of feedwater valves, feedwater only entered into A steam generator. Increasing level indication corresponds to rapid cooldown of RC system. B Generator remained "dry".

When RC pressure decreased below 1600 psig initiating SFAS, the electric motor driven auxiliary feedwater pump was started, the motor-operated aux. feedwater valves opened, and feedwater entered both steam generators.

Both steam generators were filled with cold water before the operator stopped feedwater flow to the two generators.

Power was restored to the faulted NNI system and the input signals to the control room, computer and ICS were once again normal. SFAS was bypassed by Operator.

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ANALYSIS OF TRANSIENT DATA

Plant Performance data during the reactor trip transient was obtained from the following sources:

1) plant computer Post Trip Review - 15 minutes of valid and invalid channels

2) Alarm typer printout - operating during period of NNI power outage

3) Selected Control Room recorder traces - those known to be valid

4) plant computer hourly log printouts - particularly two records during the power outage period

5) Estimates of pressure and temperature profiles during transient where insufficient data was available

Figure 1 shows RC pressure and both a hot leg and cold leg temperature for the interval of time (13 minutes) between reactor trip and initiation of SFAS. Data was obtained from the Post Trip Review printout. At nine minutes increased cooldown of the RC system appears to be a result of the operator adding feedwater to the loop A steam generator.

The main concern on RC temperature-induced stresses centered on the 300F decrease starting at the nine minute mark and continuing until RC temperature reached a low value of about 285F (or lower) in about one hour.

ANALYSIS CONTINUED:

Figure 2 describes the Loop B Steam Generator during the initial 15 minutes of the transient. The data was obtained from the Post Trip Review printout and is limited to only the B steam Generator. Since this generator was boiled dry longer than the A generator, one could suppose that the curves in Figure 2 are more extreme than occurred in the Loop A steam generator.

Figure 3 shows a comparison of the levels as measured by the full range level instruments on both the A and B steam generators. At nine minutes the operator was successful in adding feedwater into the A steam generator. ~~through the main feedwater nozzles~~ The status of valves in the Loop B prevented the operator from adding water to the B generator.

Figure 4 displays the primary system pressure and "averaged" pressurizer level indications during the transient before the SFAS was initiated. The primary system was not in trouble during the first 10 minutes of this transient. When the increased cooldown was initiated, then it appears that it was destined to initiate the SFAS.

An Estimate of the change in RC temperature over a 3 hour period is shown in Figure 5. Two data sources were the Post Trip Review and the control room cold leg temperature recorder chart. At 25 minutes after the reactor trip RC temperature was below 520 F and the operator shutdown one RC pump. That is consistent with part of the data obtained from the 5 AM hourly log printout. The actual change in RC ~~pressure~~ temperature is probably less severe than shown as an estimate in Figure 5.

B&W 2

The change in steam pressure and temperature in one of the two steam generators for approximately 90 minutes following the reactor trip is displayed in Figure 6. The Post Trip Review printout was used to describe the two parameters for the initial 15 minutes and the alarm typer printout and the plant computer hourly log printout were used to support the estimated profiles for steam pressure and temperature. This data is similar to that used by the B&W Stress Analysis Group to evaluate the concern for overstressing the tubes in the steam generator. No steam pressure and temperature data exists for the Loop A steam generator and it is possible to conjecture that the higher level indication and the quicker filling rate would lead to less extreme values of steam pressure and temperature for the Loop A steam generator.

Figure 7 exhibits the approximate change in level for both steam generators versus time after the reactor trip. Post trip Review data describes the initial 15 minutes very well. The only data available after that is the alarm typer stating the time each generator becomes full.

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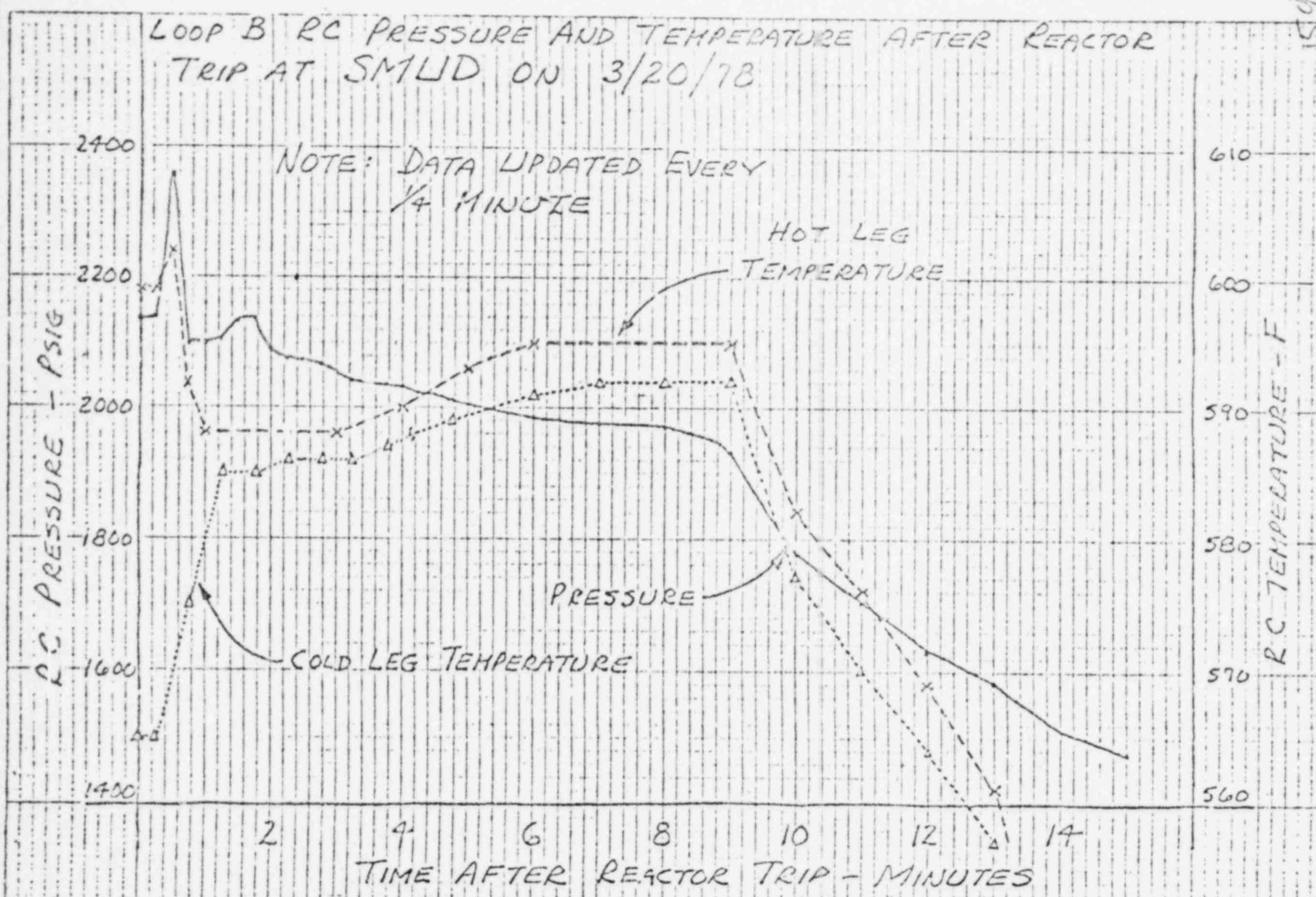

LOOP B RC PRESSURE AND TEMPERATURE AFTER REACTOR TRIP AT SMUD ON 3/20/78
NOTE: DATA UPDATED EVERY 1/4 MINUTE
HOT LEG TEMPERATURE
PRESSURE
COLD LEG TEMPERATURE
RC PRESSURE - PSIG
2400
2200
2000
1800
1600
1400
RC TEMPERATURE - F
610
600
590
580
570
560
2
4
6
8
10
12
14
TIME AFTER REACTOR TRIP - MINUTES

FIG 1

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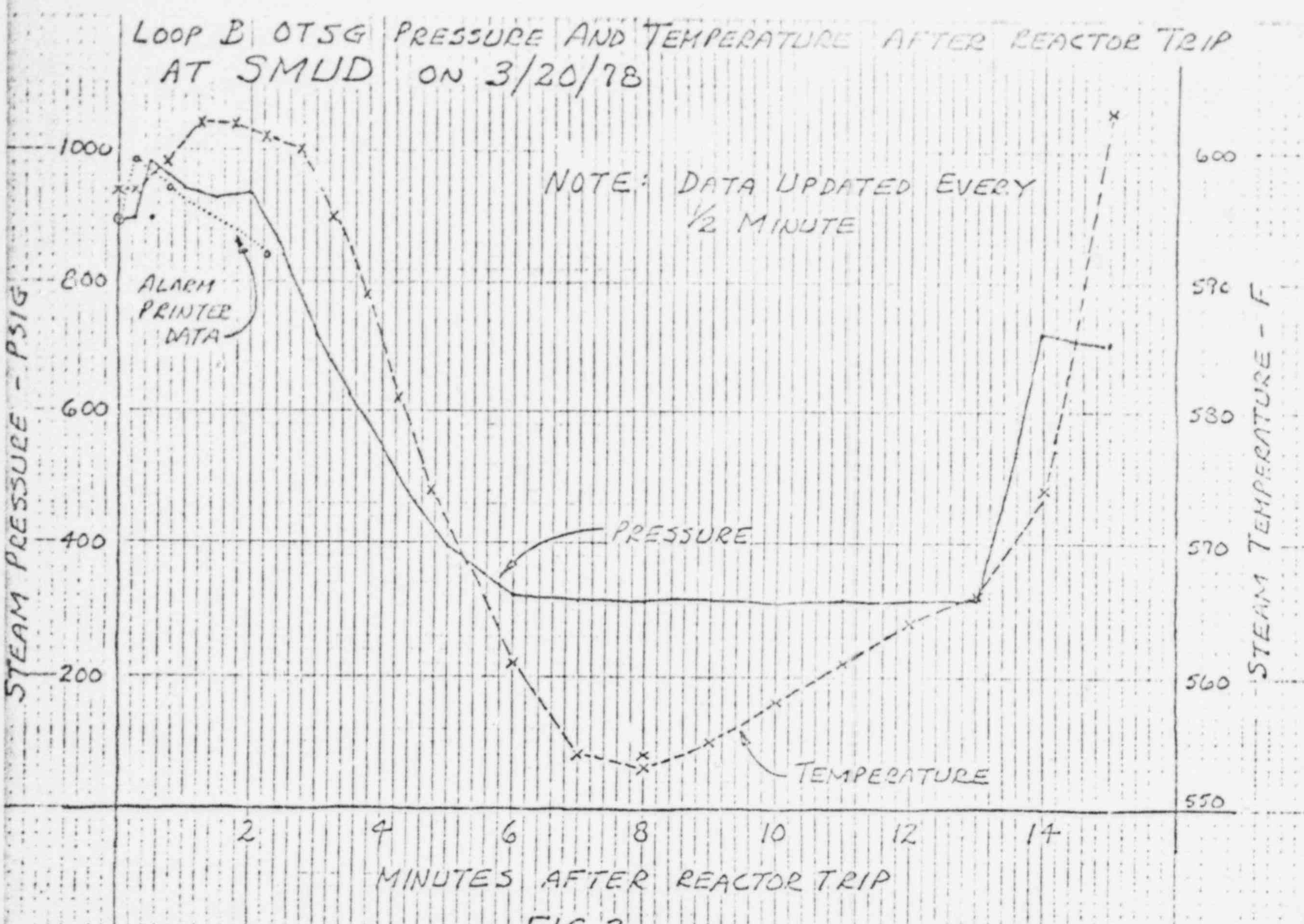

LOOP B OTSG PRESSURE AND TEMPERATURE AFTER REACTOR TRIP
AT SMUD ON 3/20/78
NOTE: DATA UPDATED EVERY
1/2 MINUTE
ALARM
PRINTER
DATA
PRESSURE
TEMPERATURE
STEAM PRESSURE - PSIG
1000
800
600
400
200
STEAM TEMPERATURE - F
600
590
580
570
560
550
2
4
6
8
10
12
14
MINUTES AFTER REACTOR TRIP

FIG 2

1704 10 X 10 TO THE INCH 7 X 10 INCHES KEUFFEL & ESSER CO.

46 0702

1o821

LOOP B OTSG FEEDWATER FLOW AND FULL RANGE LEVEL AFTER REACTOR TRIP AT SMUD ON 3/20/78

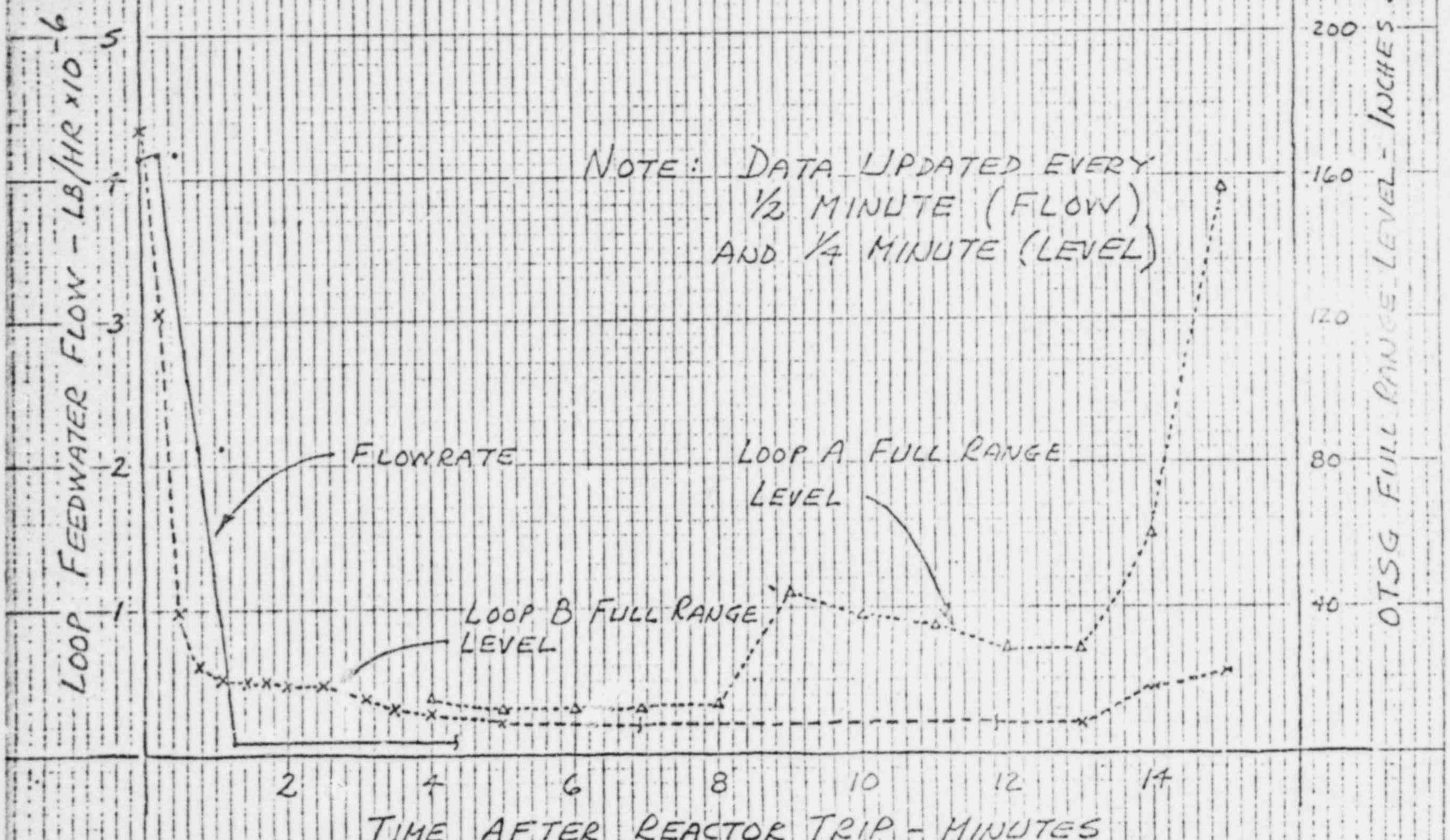

FIG 3

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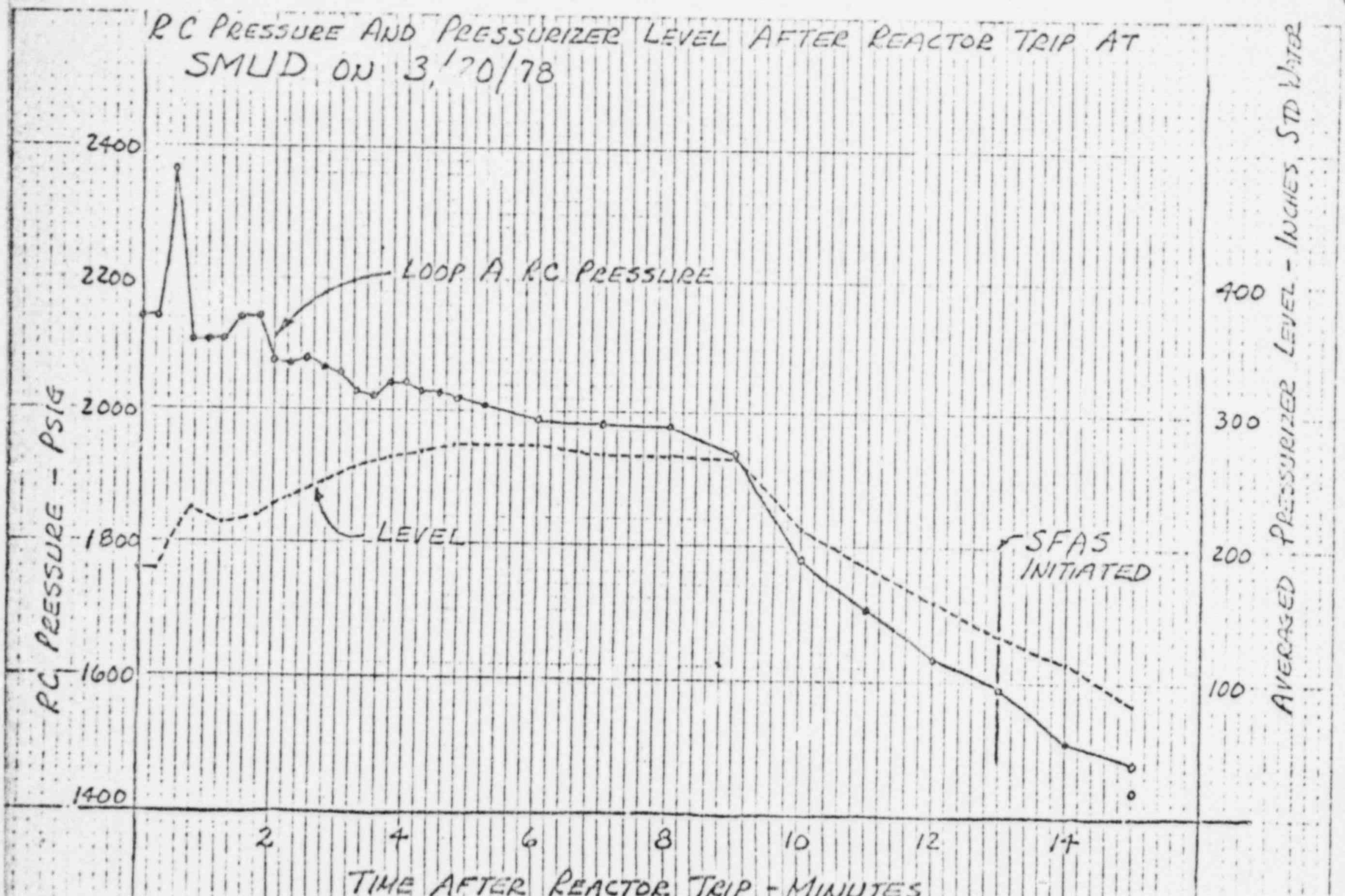

RC PRESSURE AND PRESSURIZER LEVEL AFTER REACTOR TRIP AT
SMUD ON 3/20/78
LOOP A RC PRESSURE
LEVEL
SFAS INITIATED
2400
2200
2000
1800
1600
1400
RC PRESSURE - PSIG
400
300
200
100
AVERAGED PRESSURIZER LEVEL - INCHES, STD WATER
2
4
6
8
10
12
14
TIME AFTER REACTOR TRIP - MINUTES

FIG 4

46 0702

199827

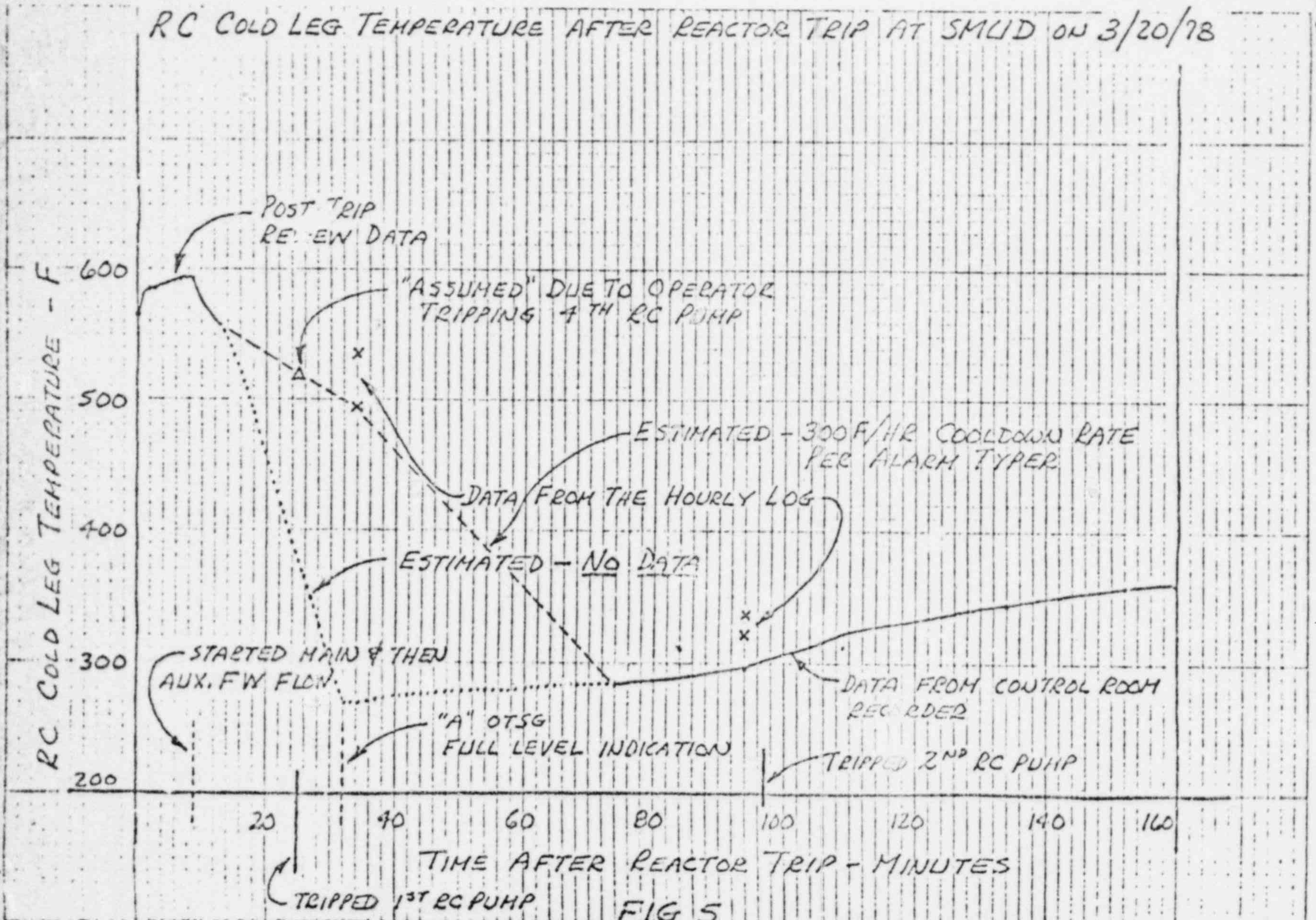

FIG 5

ESTIMATED "B" OTSG STEAM PRESSURE AND TEMPERATURE PROFILES AFTER REACTOR TRIP AT SMUD ON 3/20/78

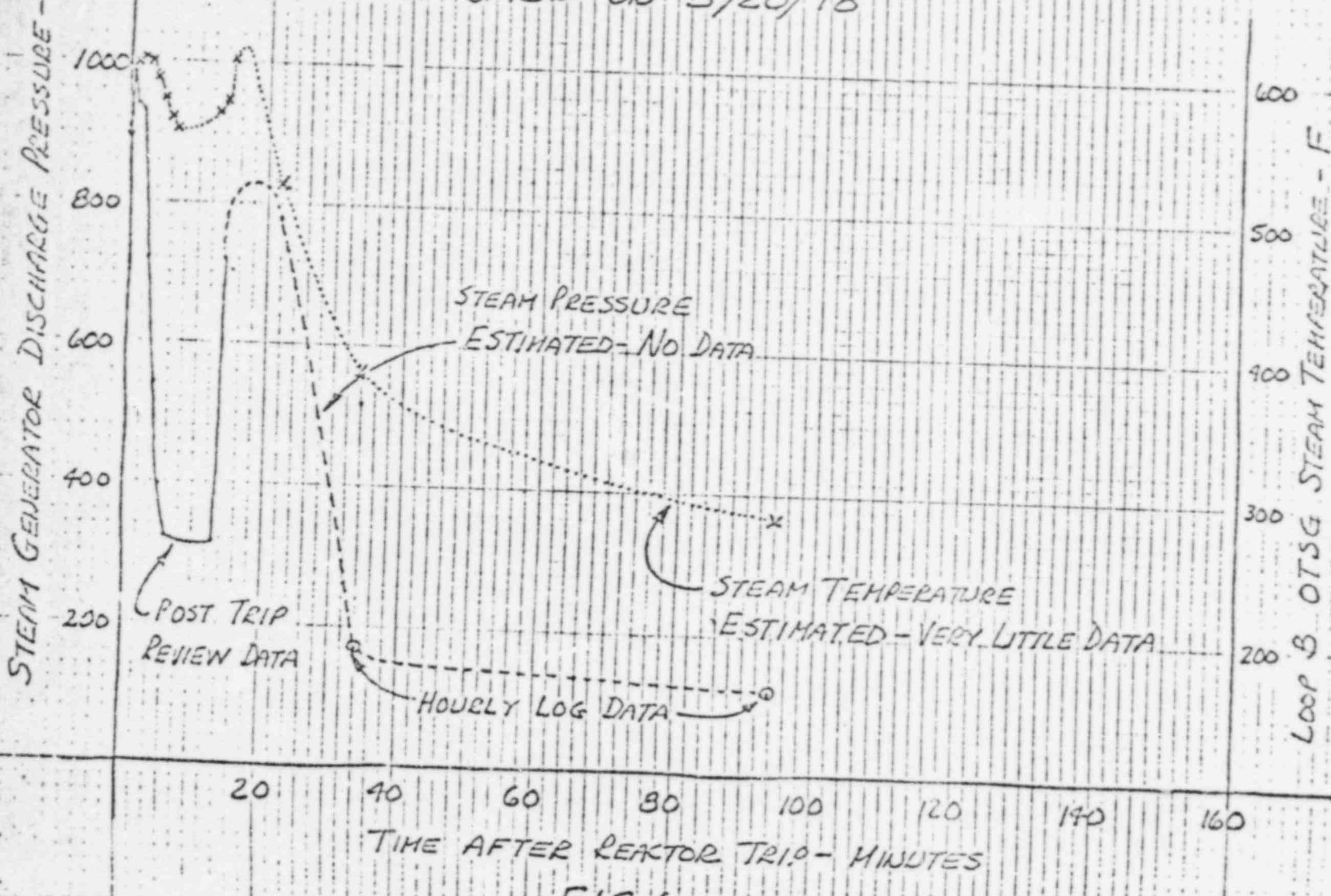

FIG 6

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SCHEMATIC OF MAIN FEEDWATER SYSTEM AT SMUD

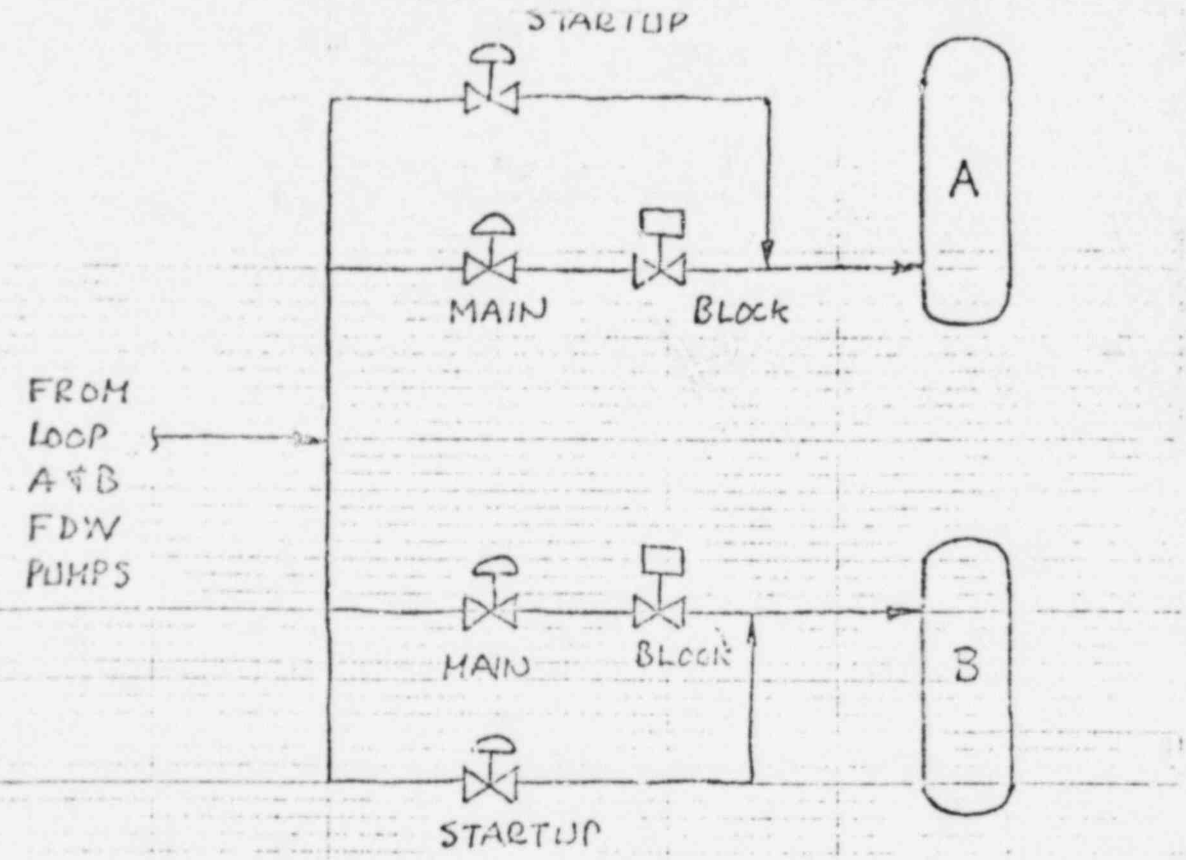

FIG 9

46 0702

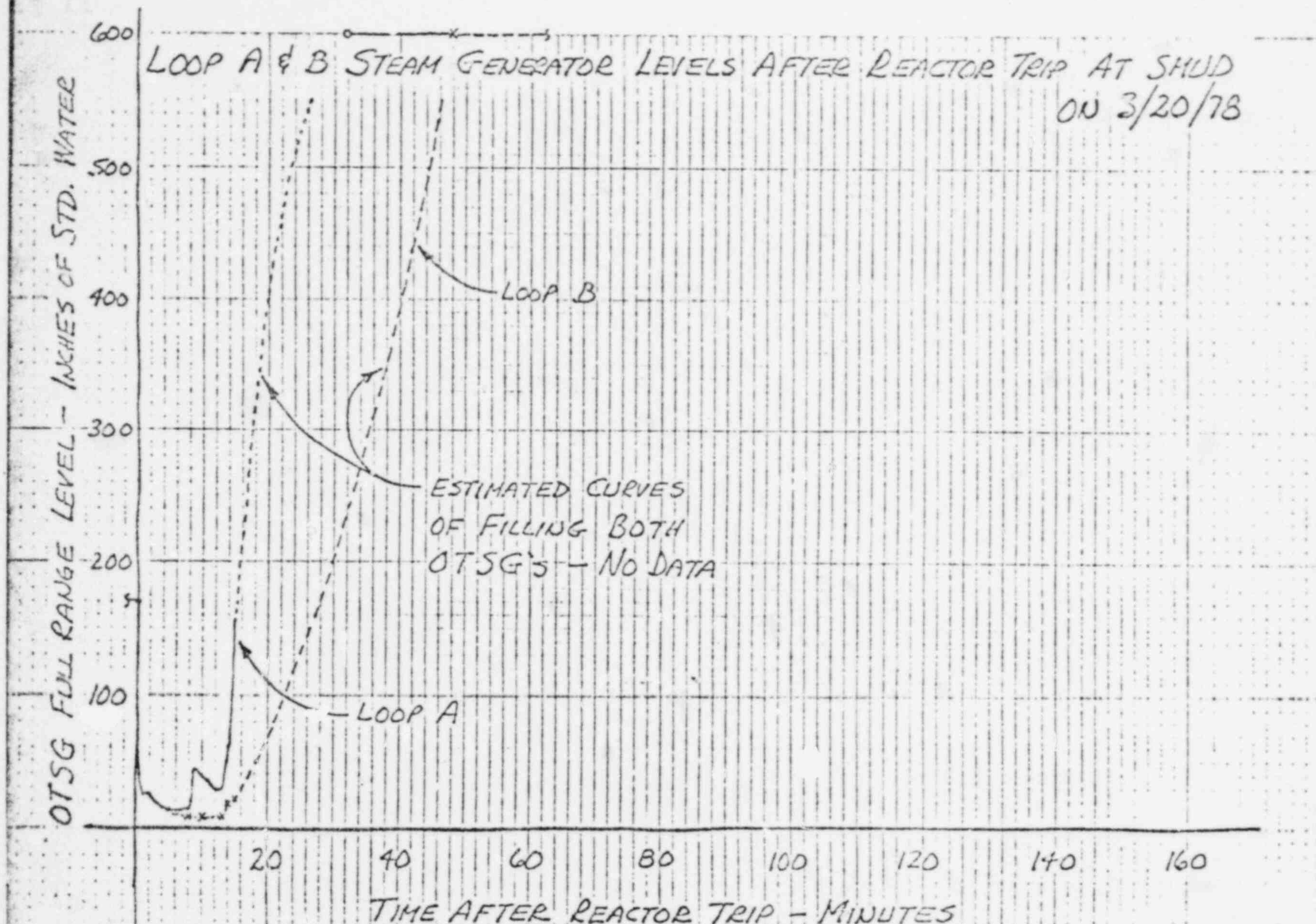

FIG 7

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ATTACHMENT #2

Suggested Operation of the Auxiliary Feedwater System During the Reactor Trip Transient

1. The turbine driven (and the motor driven) Aux. feedwater pumps were started about 2 minutes into the transient when the main feedwater pump discharge pressures were less than 800 psig.

2. The Loop A and B Startup levels were suddenly improper to the ICS but the buffered signal to Each Aux. Feedwater Valve decayed very slowly and neither Aux. Feedwater valve opened. After 6½ minutes the Loop A "startup level" dropped below the setpoint and the Loop A Aux Feedwater Valve had a 100% open demand signal. By this time the Loop B signal had increased toward full scale and thus generated a 0% open demand signal.

3. At 13 minutes after the reactor trip the SFAS was initiated by RC pressure dropping below 1600 psig. It opened both Loop A and B motor operated valves, See Figure 8, and water flowed to both Steam Generators

4. "A" steam generator filled up in 19 minutes but the "B" steam generator filled up in 35 minutes. Reason why is unknown.

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Sequence of Operation of Main Feedwater System During Reactor Trip

1. Upon loss of NNI power supply, selected hot leg temperature signal to ICS dropped to midscale - zero volts or 570°F. Therefore each loop BTU limits demanded 0% feedwater flow.

2. Main feedwater valves, then Startup valves then Block valves went closed.

3. Loop B Block valve stopped midway due to circuit breaker tripping. Valve was then manually closed.

4. At 9 minutes after reactor trip water was supplied to Loop A steam generator either by:
   (a) the Auxiliary feedwater valve opened automatically (pump was running);
   (b) Operator manually increased Loop A main feedwater pump speed from 2200 rpm to 3500 rpm.

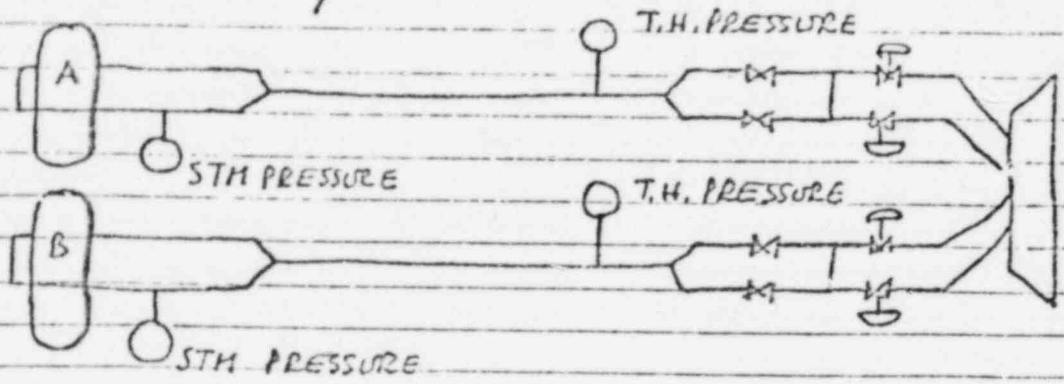
5. All main and auxiliary feedwater valves on Loop B were closed and no water entered the "B" steam generator until the SFAS opened the motor-operated auxiliary feedwater valve at 13 minutes.

Operation of Turbine Bypass System During Reactor Trip

Facts: Steam flow thru the TB Valves was noticeably shorter than other Reactor trips.

When main circuit breakers are opened each loop TB Valve is controlled by the loop Turbine header pressure.

SMUD Steam system schematic:



Loop A T.H. Pressure signal to ICS was Valid.
Loop B T.H. Pressure signal to ICS was bad.

SMUD has 25% steam relief capacity to Condenser.

SMUD has 15% steam relief capacity to atmosphere also.

Loop B steam pressure was measured as high as 984 psig by Post Trip Review.

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SCHEMATIC OF AUXILIARY FEEDWATER SYSTEM AT SMUD

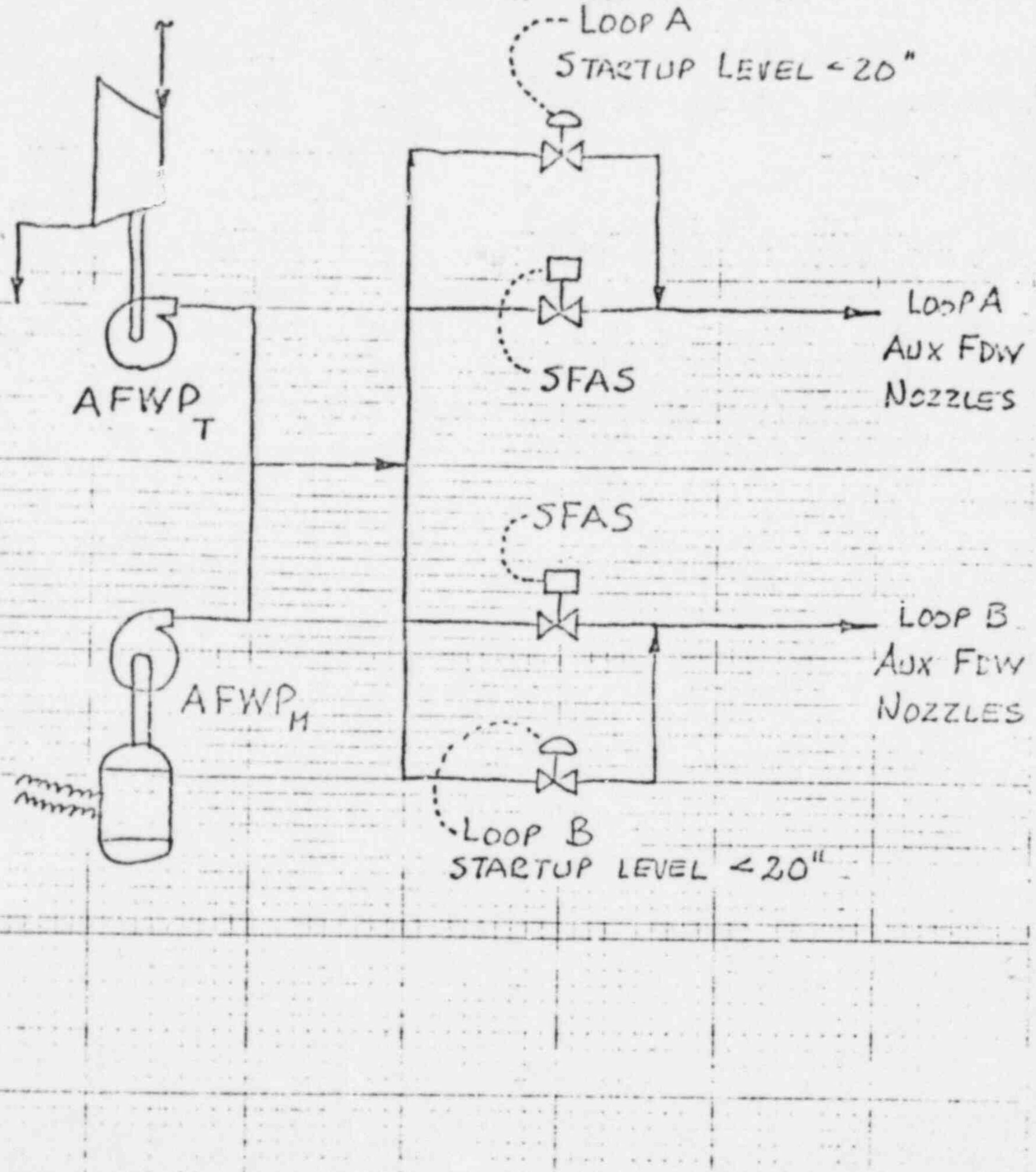

FIG 8

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SCHEMATIC OF MAIN FEEDWATER SYSTEM AT SMUD

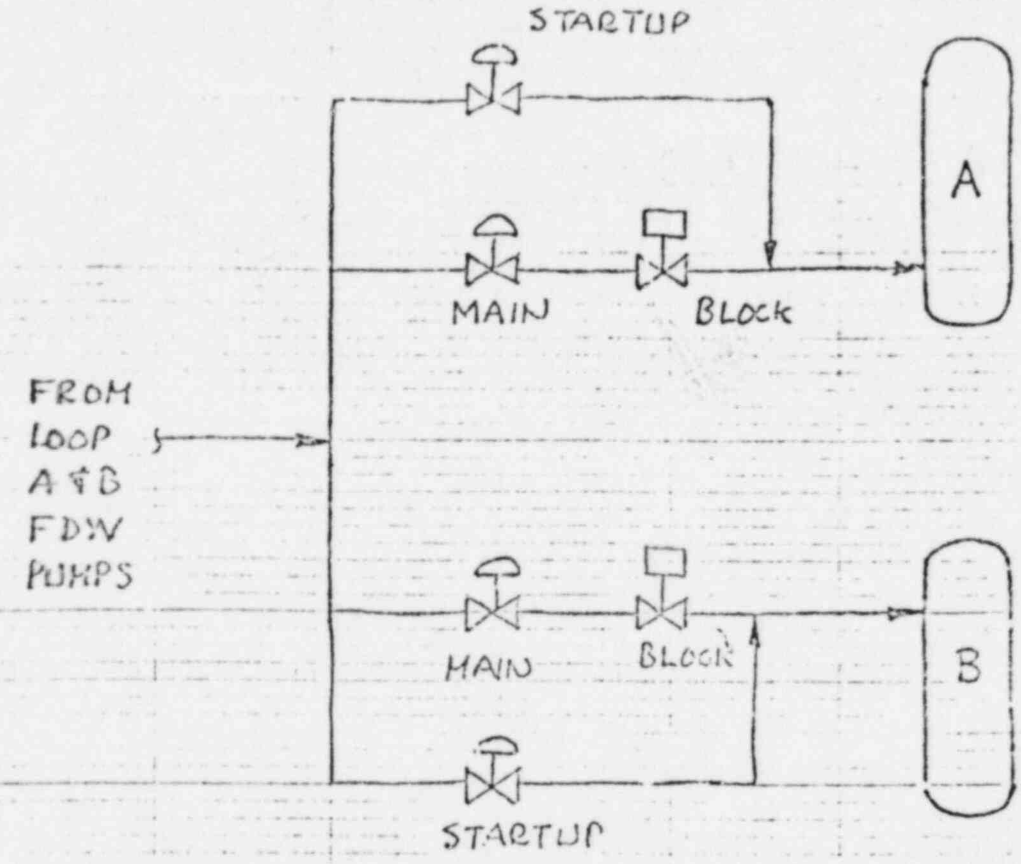
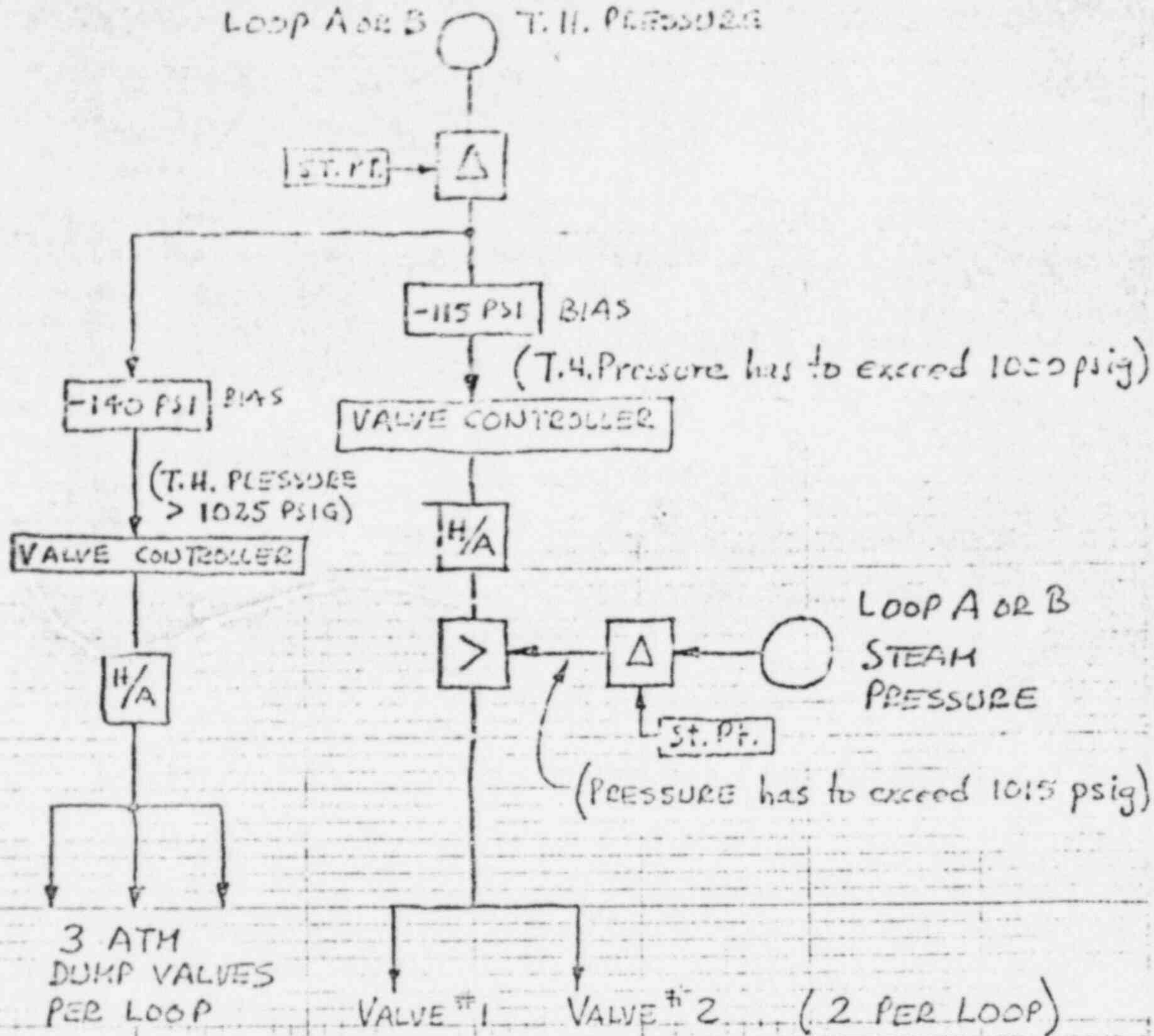


FIG 9

SCHEMATIC OF TURBINE BYPASS VALVE CONTROL SYSTEM AT SMUD



NOTE: ONLY 2 T.B. VALVES COULD HAVE OPENED BRIEFLY (LOOP A) DURING REACTOR TRIP TRANSIENT

FIG 10

NSS- 3
SPR 533

TITLE Loss of FW Incident

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- . The following is the status and/or resolution of this SPR on other contracts.

REMARKS

Action complete. See attached

ACTION COMPLETE
ON ALL CONTRACTS

NSS-

NSS - 03 SAR 533

LOSS OF FW INCIDENT. 5-18-73

ISOLATED PRESSURE SWITCH ON LOSS OF MAIN FEED PUMP - NO EMERGENCY FEED PUMP START -

NSS - 11 - NO PROBLEM
NSS - 03 - CORRECTED -
NSS - 07 16 - 00 - 00347 F07
NSS - 09 10 - 00 - 00779 05
NSS - 08 18 - 00 - 00017 C 15
NSS - 05 18 - 00 - 00751 D02
NSS - 0[illegible] NOT FOUND
NSS - [illegible] 18 - 00 - 00413C01
NSS - 14 - 18 - 00 - 00157F12 (.62F11)
NSS - 12 - 01-001-02 - 5002NC00
NSS - 13 - 01-001-02 - 5005NC00

THE ABOVE IS A LIST OF AE PRINTS THAT WILL REQUIRE REVIEW FOR SENSOR LOCATION TO INSURE NON ISOLATION - I BELIEVE THAT ALL CONTRACTS IN TESTING AROUND THE TIME OF SAR ORIGINATION HAVE SITE CHECKED AND CORRECTED IF REQUIRED. (CONTRACTS LISTED ABOVE HAVE BEEN REVIEWED (AE P&ID DRW.) AND SWITCH/XMITTER LOCATIONS ARE FREE OF ¢CONFE PROBLEM.

F.N. [illegible]

4-15-75

SPR CROSS-CONTRACT IMPLEMENTATION

ORIGINATING CONTRACT NSS ~~533~~ 3 SPR 3 533

TITLE: LOSS OF FEED WATER INCIDENT

FOR IMPLEMENTATION ON NSS ALL

TASK ENGINEER

IMPLEMENT RESOLUTION: X YES ____ NO

IF YES, PRIORITY:
- X DIRECTLY AFFECTS SYSTEM AND PLANT RELIABILITY
- ____ IMPROVES SYSTEM PERFORMANCE
- ____ COULD POSSIBLY AFFECT SYSTEM AND PLANT RELIABILITY

BRIEF DESCRIPTION OF RESOLUTION:

CHECK SECONDARY PLANT P&ID FOR LOCATION OF TAP, RELOCATE IF NECESSARY

IF NO, REASON FOR NOT, IMPLEMENTING:

Must see
ART McBRIDE → TASK ENGINEER'S SIGNATURE

PROJECT MANAGER

IMPLEMENT: ____ YES ____ NO

ESTIMATED DATE FOR IMPLEMENTATION ____

IF NO, REASON FOR NOT IMPLEMENTING:

PROJECT MANAGER'S SIGNATURE

NSS- 3
SPR 533

TITLE Loss of Feed Water Flow incident

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- 04 — D 14. The following is the status and/or resolution of this SPR on other contracts.

REMARKS This is a generic problem. Upon loss of both Fd. pumps with Isolation valves shut there should be a turbine trip.

NSS-3 — Has trip now

Letter sent to all P.M's to inform Cust. of this potential problem by B.A. Karrasch. (He reports all cust. have been notified).

NSS- 4 & 9

has trip.

Generically closed
[illegible]

continued

NSS 3

SPR 533

NSS- 5&6

Per J.D. Phinney Met Ed & Jersey Central has turbine trip

NSS- 7- Informed Clyde Barksdale Letter has not been sent yet. Ernie handling on AP&L report

NSS- 8 - Letters have been sent to cust.
Taken care of by Fred A. Faust says problem not applicable
Sandy Allard 28 NOV 1974

NSS- 11 - Per Roger Maggi cust. has been notified.

NSS- 12&13 E. Coppi - will revise procedures via letter from Wicks on same problem from AP&L.

NSS- 14- Letter has been sent to cust.

Refer to card index for status

NSS 3

SPR 533

SPR APPLICABILITY REVIEW

FEB 14 1974

TO: B A Karrasch

FROM: D. L. Allison

Please review the attached SPR for applicability to other contracts. This is a general review and is intended to eliminate sending commitments to every task engineer in determining applicability.

Task Engineer's Comments:

Bruce, Please return SPR, and include in reply why not or why applicable.

The SPR is applicable to all Contracts. Recommendation has already been made to initiate Turbine trip and Emergency Feed on a positive signal indicating loss of main feedwater. Recent letter to RL Pittman on SPR 158 (NSS-4) also re-emphasizes the need to check out Emergency feed system.

Task Engineer: BAK.

Return to: D L Allison

H. Worsham

-WJN

Return to ESN

File NSS- 3

TRANSMITTAL SLIP

12M2-SPT- 533

FIELD OPERATIONS SITE PROBLEM REPORT

To ________________ For Action

CONTRACT 620-00 - 03

SPR 533

TITLE LOSS OF FW INCIDENT

To R.J. McConnell - S.C.H. (2) For Information

J. Kaelin

J. Kennedy

J. Phinney

K. Suhrke

DATE 6-1-78

Date Reply to Be Submitted To Nuclear Service Support Engineer

Action Requested: DUKE has moved the pressure sensing location upstream (Feed Pump discharge) to preclude any possibility of the check valve interfering with pressure decay. The 1" bypass valve has also been opened.

cc: G. E. Kulynych
E. G. Ward
G. M. Olds
R. T. Schomer
N. S. Embrey
J. McFarland
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance
H. Worsham
J. D. Carlton
G. QUALE

R. L. Pittman
Nuclear Service Support Engineer

MANHOUR LIMITS ________

COST LIMITS ________

CHARGE No. ________

APPROVED: ________
Project Manager

...BLEM REPORT — BABCOCK & WILCOX-NPG

...MER Duke Power Company	CONTRACT NO. NSS-3	SPR NO. 533	SPR REV NO. 0
...ENDOR	P.O. NO.	COMP. NO. 22 GROUP NO. 02	SEQ NO. 01

PRIMARY DOCUMENTS. SPEC NOS. PRIORITY
DWG NO. ______ EQUIP CODE/LEVEL/DATE ______
QA LEVEL ______ QA SPEC NO ______

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
E.R. Richard / J.D. Phinney			

TITLE (MAX. 30 SPACES) Loss of FW Incident (5/16/73)

DESCRIPTION OF PROBLEM

See attachment.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

1. Conducted a ~~t~~ test to establish why the Emergency FW pump did not start.

2. Opened bypass around FW pump discharge valves.

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

Evaluate system transient. (Reactimeter tape sent to Lynchburg.)

RECOMMENDED ACTION

1. Provide positive means of sensing loss of FW pumps to initiate Emergency FW flow and main turbine trip. (Customer)

2. Evaluate the SFM failure and correct. (CUSTOMER)

3. ADVISE OTHER CONTRACTS OF THIS PROBLEM (N.S)

APPROVAL

TITLE	SIGNATURE	DATE	DOCUMENTS AFFECTED	ACTION TAKEN
ORIGINATOR	G.D. Phinney	5/18/73	☐ Drawings	
SITE CONSTR. REP.			☐ Proc. Specs	
SITE OPER. MGR.	J.W. McConnell	5/18/73	☐ Instr. Books	
NS SUPPORT ENGR.	E. Pittman	5/31/73	☐ Operating Procedures	
			☐ Tech. Specs	
			☐ PSAR/FSAR	
PROJECT MANAGER			☐	
			☐ Recommended Stds. Change	

DISTRIBUTION
SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 NSS 3
SPR 533

Cost Category ☐ Warr ☐ C ☐ ☐ ☐
Auth Change No
RESPONSIBILITY ASSIGN.: DUKE
Date Completed ______
By: ______
Field Change Req'd ☐
Field Change No. ______
OTHER CONTRACTS AFFECTED
DEVIATIONS
☐ NONE
☐ SEE REV ______

LOSS OF FW INCIDENT (5/16/73)

Description of Problem

At approximately 1540 hrs. the "A" main FW pump tripped due to loss of suction pressure. Sequence of events as follows:

1. Loss of all condensate booster pumps (operator error).
2. Main FW pump trip.
3. Loss of OTSG water inventory.
4. RCS temperature and pressure high.
5. Electromatic relief valve lifted.
6. Reactor trip on high pressure.
7. Main turbine trip.
8. Emergency FW pump started manually (auto start command not received).

Two automatic actions did not occur. The Emergency FW pump did not start on loss of FW pumps and the main turbine did not trip on loss of FW pumps. The device to initiate these actions is a pressure sensor on the main FW header downstream of the FW pump discharge valves and upstream of the FW line RB penetration check valves. The FW pump discharge valve automatically closed on FW pump trip and isolated the section of FW header that the pressure sensor is located in. The header remained above the 800 psig setpoint which, if reached, would have started the emergency FW pump (Main turbine trip setpoint is 700 psig.) A 1" bypass around the FW pump discharge valves is provided, but the bypass valve was closed.

Analysis of this incident is complicated by the failure of the Sequence of Events Monitor to log real time correctly. At the time of the FW pump trip, an error of ~30 minutes occurred.

Attached are system parameter curves produced from reactimeter data.

JDP/attachment.

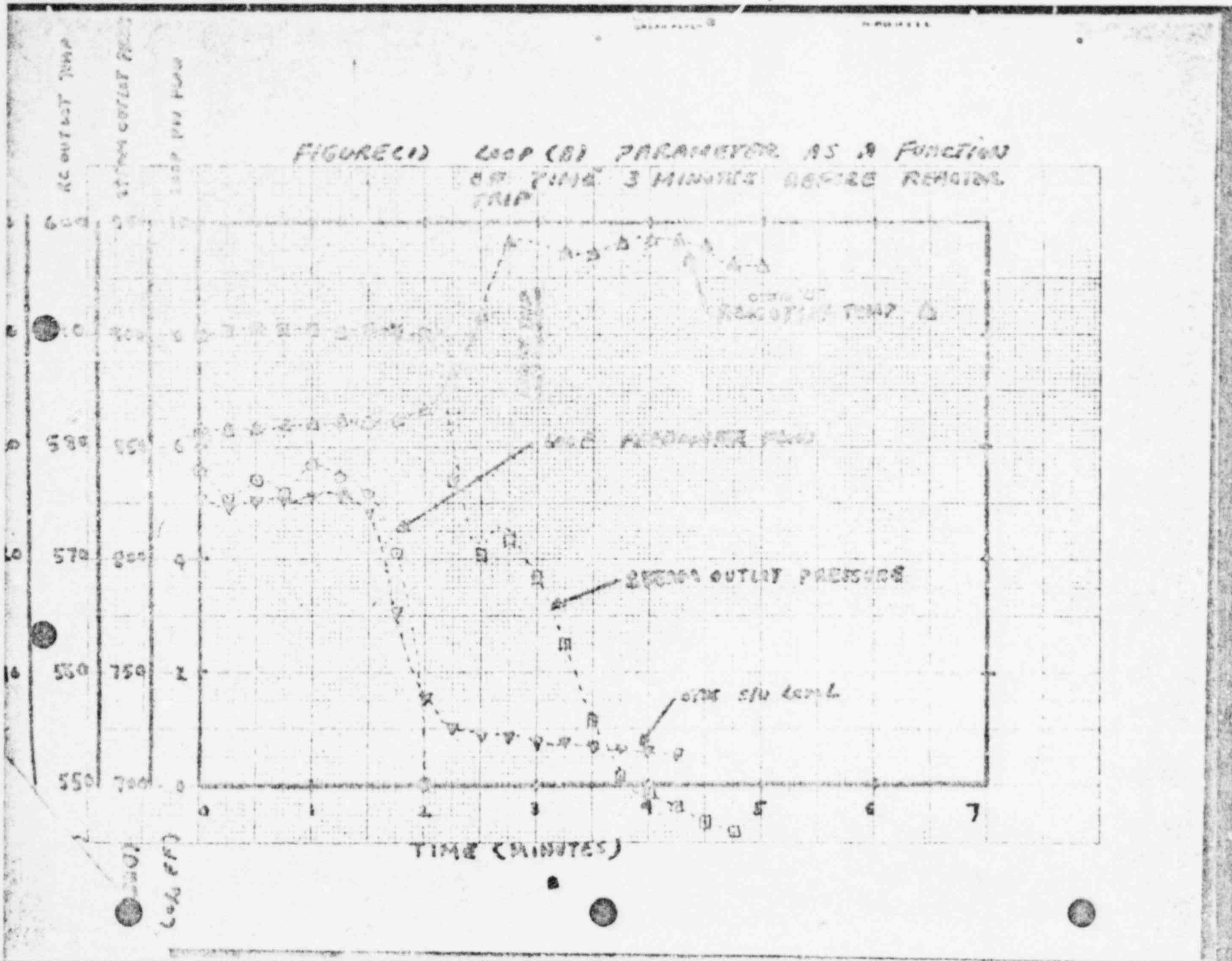
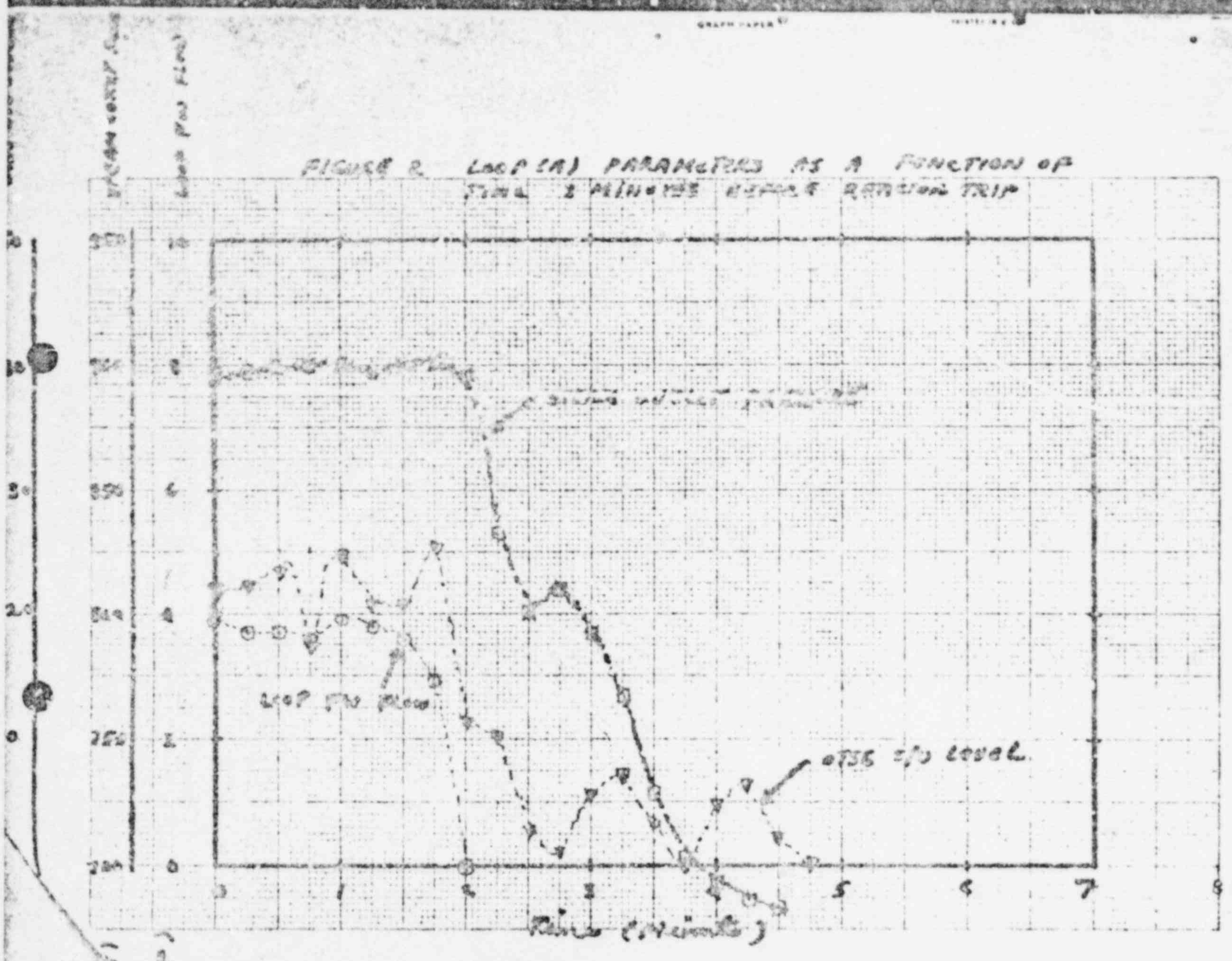


FIGURE (1) LOOP (B) PARAMETER AS A FUNCTION OF TIME 3 MINUTES BEFORE REACTOR TRIP
RC OUTLET TEMP
LOOP FW FLOW
REACTOR TEMP
STEAM OUTLET PRESSURE
TIME (MINUTES)
0
1
2
3
4
5
6
7

FIGURE 2 LOOP (A) PARAMETERS AS A FUNCTION OF TIME 2 MINUTES BEFORE REACTOR TRIP



TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

To R. J. McConnell For Information

J.D CARLTON

G. E. Kulynych - Sr. Project Manager

C. C. Plunkett - Contract Admin.

Central Eng'neering Files

E. V. DeCarli - Quality Assurance

FILE: 12M2
Contract 620-00 -03

SPR 533

TITLE LOSS OF FW INCIDENT

DATE 8/27/73

The attached, cleared SPR is submitted for your information.

TO: ✓ J. N. Kaelin-Arkansas

✓ J. P. Kennedy-SMUD

✓ K. E. Suhrke

~~H. J. Worsham~~

✓ J. D. Phinney-Met Ed

Attached is one copy of Site Problem Report No. 533 which has been processed on Contract 620-00 -03. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: OTHER sites are advised of this problem at Oconee via transmittal of the SPR

cc:
G. QUALE

R. L. Pittman
NUCLEAR SERVICE SUPPORT ENG'NEER

EPORT — B[illegible]COCK & WILCOX-NPG

ower Company	CONTRACT NO. NSS-3	SPR NO. 553	SPR REV NO. C
P.O NO.	COMP NO. 22	GROUP NO. 02	SEQ NO. 01

SPEC NOS. ______
EQUIP CODE/LEVEL/DATE ______
QA SPEC NO. ______

PRIORITY

	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
J.D. Phinney			

D SPACES) Loss of FW Incide (5/16/73)

PROBLEM

achment.

TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

ucted a test to establish why the Emergency FW pump did not start.

hed bypass around FW pump discharge valves.

N REQUIRED BY OTHER THAN SITE PERSONNEL

te system transient. (Reactimeter tape sent to Lynchburg.)

CTION

vide positive means of sensing loss of FW pumps to initiate ergency FW flow and main turbine trip. (Customer)

luate the SEM failure and correct. (CUSTOMER)

Acp. by Customer Still Req'd some write

DVISE OTHER CONTRACTS OF THIS PROBLEM (N.5)
#5 STR #273 ALSO DOCUMENT THIS TRIP.
JLW 5/23

	APPROVAL SIGNATURE	DATE	DOCUMENTS AFFECTED	ACTION TAKEN
	G.O. Dunnell	5/18/73	☐ Drawings	
R. REP.			☐ Proc. Specs	
MGR.	B. J. McConnell	5/18/73	☐ Instr. Books	
ENGR.	R. L. Pittman	5/31/73	☐ Operating Procedures	
			☐ Tech. Specs	
			☐ PSAR/FSAR	
ANAGER			☐	
			☐ Recommended Spec. Change	

UTION
NAGER
AGER
ENGR.
NGR.
MEN.
NSS 3
553

Cost Category ☐ ☐ ☐ ☐ ☐
Auth Charge No

RESPONSIBILITY ASSIGN.
DUKE

Date Completed ______
By: ______

OTHER CONTRACTS AFFECTED

DEVIATIONS
☐ NONE
☐ SEE REV. ______

Field Change Req ☐
Field Change No ______

Complete
BJ McConnell
6/23/73

LOSS OF FW INCIDENT (5/16/73)

Description of Problem

At approximately 15.0 hrs. the "A" main FW pump tripped due to loss of suction pressure. Sequence of events as follows:

1. Loss of all condensate booster pumps (operator error).
2. Main FW pump trip.
3. Loss of OTSG water inventory.
4. RCS temperature and pressure high.
5. Electromatic relief valve lifted.
6. Reactor trip on high pressure.
7. Main turbine trip.
8. Emergency FW pump started manually (auto start command not received).

Two automatic actions did not occur. The Emergency FW pump did not start on loss of FW pumps and the main turbine did not trip on loss of FW pumps. The device to initiate these actions is a pressure sensor on the main FW header downstream of the FW pump discharge valves and upstream of the FW line RB penetration check valves. The FW pump discharge valve automatically closed on FW pump trip and isolated the section of FW header that the pressure sensor is located in. The header remained above the 800 psig setpoint which, if reached, would have started the emergency FW pump (Main turbine trip setpoint is 700 psig.) A 1" bypass around the FW pump discharge valves is provided, but the bypass valve was closed.

Analysis of this incident is complicated by the failure of the Sequence of Events Monitor to log real time correctly. At the time of the FW pump trip, an error of ~30 minutes occurred.

Attached are system parameter curves produced from reactimeter data.

JDP/attachment.

FIGURE(1) LOOP (B) PARAMETER AS A FUNCTION OF TIME 3 MINUTES BEFORE REACTOR TRIP

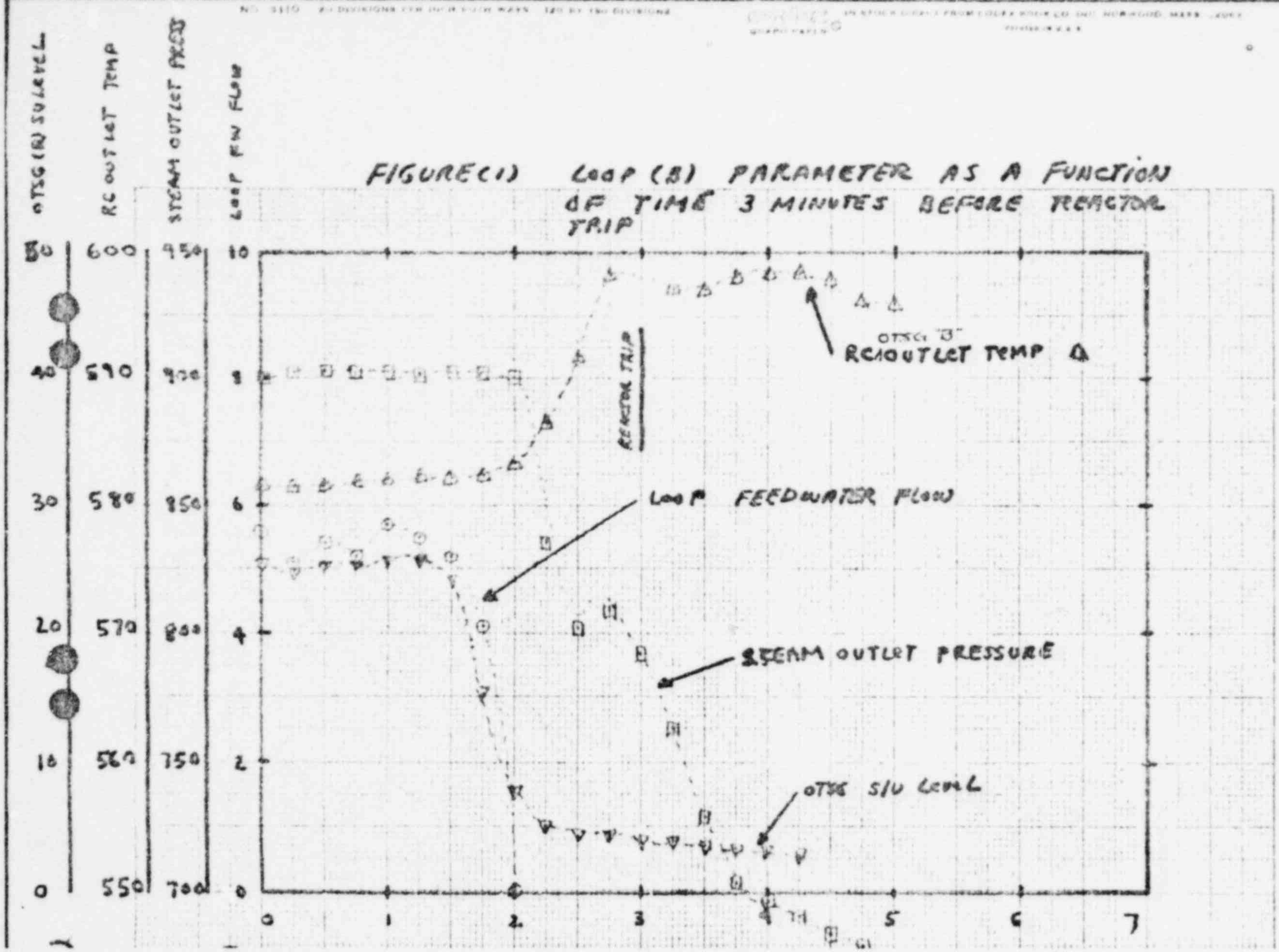
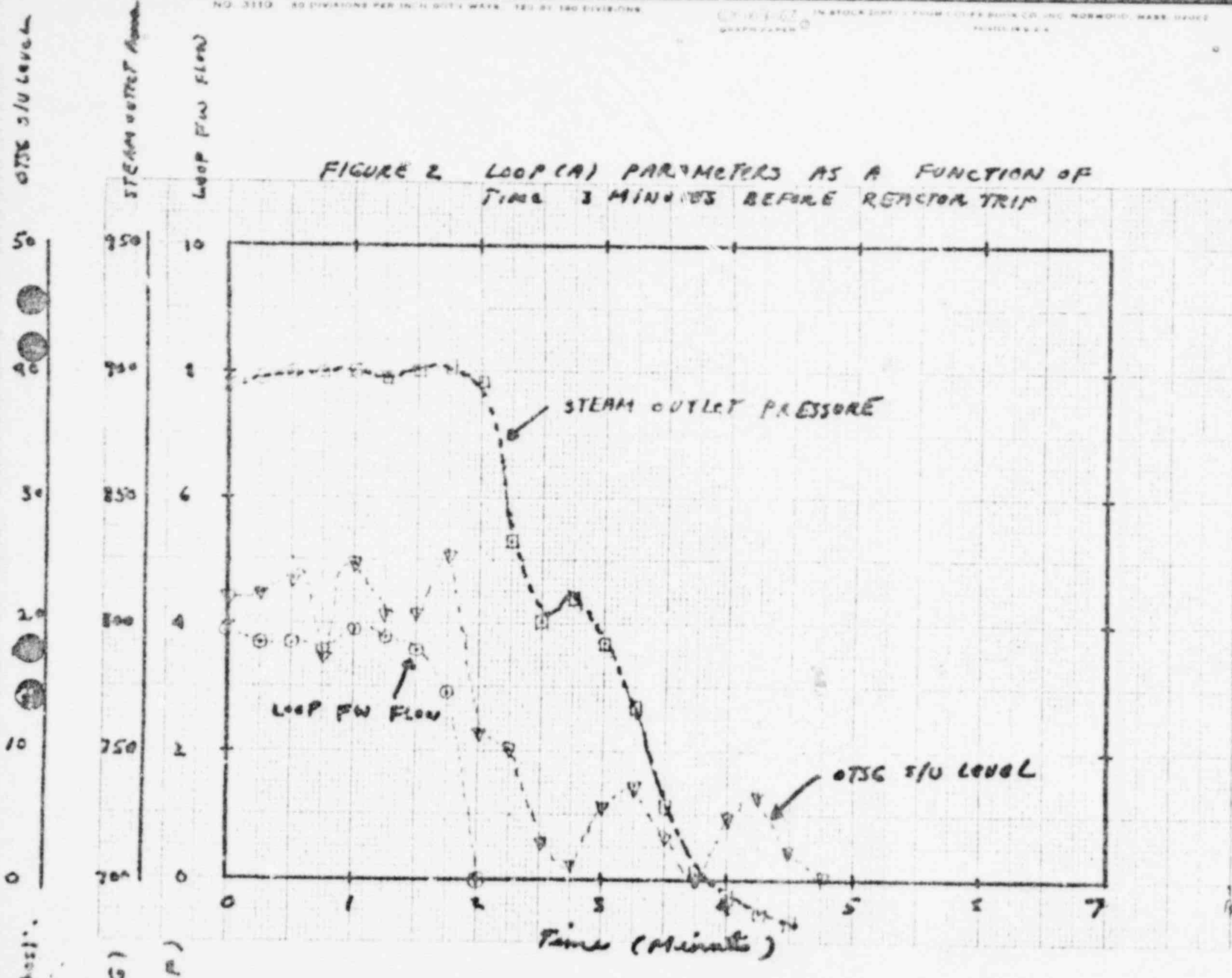


FIGURE 2 LOOP (A) PARAMETERS AS A FUNCTION OF TIME 3 MINUTES BEFORE REACTOR TRIP



File NSS- 3

12M2-SPR- 533

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To ______________________ For Action

CONTRACT 620-00 -03

SPR 533

TITLE LOSS OF FW INCIDENT

DATE 6-1-73

To R.J. McConnell - S.O.H. (2) For Information

J. Kaelin

J. Kennedy

J. Phinney

K. Suhrke

Date Reply to Be Submitted To Nuclear Service Support Engineer
—

Action Requested: Duke has moved the pressure sensing location upstream (Feed Pump discharge) to preclude any possibility of the check valve interfering with pressure decay. The 1" bypass valve has also been opened.

R. L. Pittman

Nuclear Service Support Engineer

cc: G. E. Kulynych
E. G. Ward
G. M. Olds
R. T. Schomer
N. S. Embrey
J. McFarland
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance
H. Worsham
J. D. Carlton
G. Quale

MANHOUR LIMITS ____________

COST LIMITS ____________

CHARGE No. ____________

APPROVED: ____________
Project Manager

PDS-24091-1

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company CONTRACT NO. NSS-3 SPR NO. 533 SPR REV.NO. 0

VENDOR P.O. NO. COMP.NO. 22 GROUP NO. 02 SEQ NO. 01

PRIMARY DOCUMENTS: SPEC NOS. ______ PRIORITY

DWG NO. ______ EQUIP CODE/LEVEL/DATE ______

QA LEVEL ______ QA SPEC NO. ______

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
ER Michaud / J.D. Phinney			

TITLE (MAX. 30 SPACES) Loss of FW Incident (5/16/73)

DESCRIPTION OF PROBLEM

See attachment.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

1. Conducted a ~~t~~ test to establish why the Emergency FW pump did not start.

2. Opened bypass around FW pump discharge valves.

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

Evaluate system transient. (Reactimeter tape sent to Lynchburg.)

RECOMMENDED ACTION

1. Provide positive means of sensing loss of FW pumps to initiate Emergency FW flow and main turbine trip. (Customer)

2. Evaluate the SEM failure and correct. (CUSTOMER)

3. ADVISE OTHER CONTRACTS OF THIS PROBLEM (N.S)

APPROVALS TITLE	APPROVAL SIGNATURE	DATE	DOCUMENTS AFFECTED	ACTION TAKEN
ORIGINATOR	J.D. Phinney	5/18/73	☐ Drawings	
SITE CONSTR. REP.			☐ Proc. Spec.	
SITE OPER. MGR.	J. McConnell	5/18/73	☐ Instr. Books	
NS SUPPORT ENGR.	E. Pittman	5/31/73	☐ Operating Procedures	
			☐ Tech. Specs.	
			☐ PSAR/FSAR	
PROJECT MANAGER			☐	
			☐ Recommended Stds. Change	

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M.2 NSS 3
SPR533

Cost Category ☐ ☐ ☐ ☐ ☐ Auth. Charge No. ______

RESPONSIBILITY ASSIGN. DUKE

Date Completed ______ By: ______

Field Change Rqd. ☐

Field Change No. ______

OTHER CONTRACTS AFFECTED

DEVIATIONS
☐ NONE
☐ SEE REV. ______

INSTRUCTIONS FOR PDG-21091 – SITE PROBLEM REPORT

Initiated by Nuclear Service

1. ORIGINATOR – FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title, Description of Problem, Status, Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SITE OPERATIONS MANAGER – FILL IN: SPR No. and Rev. No.; Priority; Site Engineer; Early Start Date; Required Completion Date, Approval Signature; Date.

   Note: Assign priority No. 1 or 2 defined as follows:

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. NUCLEAR SERVICE SUPPORT ENGINEER – FILL IN: Primary Documents; Documents Affected; Cost Category, Authorized Charge No.; Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal nuclear service expenditures) are not to be incurred, take the following steps: (a) Approve SPR, (b) Indicate "Not Required" in space provided for project manager's approval, and (c) Distribute as indicated in step 5 below.

   If field change is not required but additional costs (over and above normal nuclear service expenditures) are to be incurred, approve SPR and forward to project manager for approval (step 4).

   If field change is required, see procedure No. NPG-0402-07; obtain field change No. from project manager, and indicate field change No. on SPR.

4. PROJECT MANAGER – Approve SPR and Return to Nuclear Service Support Engineer.

5. NUCLEAR SERVICE SUPPORT ENGINEER – Distribute in Accordance With Procedure No. NPG-0402-04; Initial Action Taken Box (on Support Engineer's File Copy) When Documents Affected Have Been Corrected.

6. SITE OPERATIONS MANAGER – Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-04. Return completed SPR to nuclear service support engineer.

Initiated by B&W Construction Company

1. ORIGINATOR – FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title; Description of Problem; Status, Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SENIOR CONSTR. CO. SITE REPRESENTATIVE – FILL IN: SPR No. and Rev. No.; Priority; Site Engineer. Early Start Date; Required Completion Date; Approval Signature, Date.

   Note: Assign priority No. 1 or 2 defined as follows.

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. PROJECT MANAGER – FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No.; Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal construction Co. expenditures) are not to be incurred, take the following steps: (a) Approve SPR, and (b) Distribute in accordance with procedure No. NPG-0402-05.

   If field change is not required but additional costs (over and above normal construction Co. expenditures) are to be incurred, obtain abnormal cost charge No. from contract administration; approve and distribute in accordance with procedure No. NPG-0402-05.

   If field change is required, see procedure No. NPG-0402-07; assign field change No., have approved and distribute in accordance with procedure No. NPG-0402-05.

4. SENIOR CONSTR. CO. SITE REPRESENTATIVE – Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-05. Return completed SPR to the project manager.

LOSS OF FW INCIDENT (5/16/73)

Description of Problem

At approximately 1540 hrs. the "A" main FW pump tripped due to loss of suction pressure. Sequence of events as follows:

1. Loss of all condensate booster pumps (operator error).
2. Main FW pump trip.
3. Loss of OTSG water inventory.
4. RCS temperature and pressure high.
5. Electromatic relief valve lifted.
6. Reactor trip on high pressure.
7. Main turbine trip.
8. Emergency FW pump started manually (auto start command not received).

Two automatic actions did not occur. The Emergency FW pump did not start on loss of FW pumps and the main turbine did not trip on loss of FW pumps. The device to initiate these actions is a pressure sensor on the main FW header downstream of the FW pump discharge valves and upstream of the FW line RB penetration check valves. The FW pump discharge valve automatically closed on FW pump trip and isolated the section of FW header that the pressure sensor is located in. The header remained above the 600 psig setpoint which, if reached, would have started the emergency FW pump (Main turbine trip setpoint is 700 psig.) A 1" bypass around the FW pump discharge valves is provided, but the bypass valve was closed.

nalysis of this incident is complicated by the failure of the Sequence of Events Monitor to log real time correctly. At the time of the FW pump trip, an error of ~30 minutes occurred.

ttached are system parameter curves produced from reactimeter data.

DP/attachment.

FIGURE(1) LOOP (B) PARAMETER AS A FUNCTION OF TIME 3 MINUTES BEFORE REACTOR TRIP

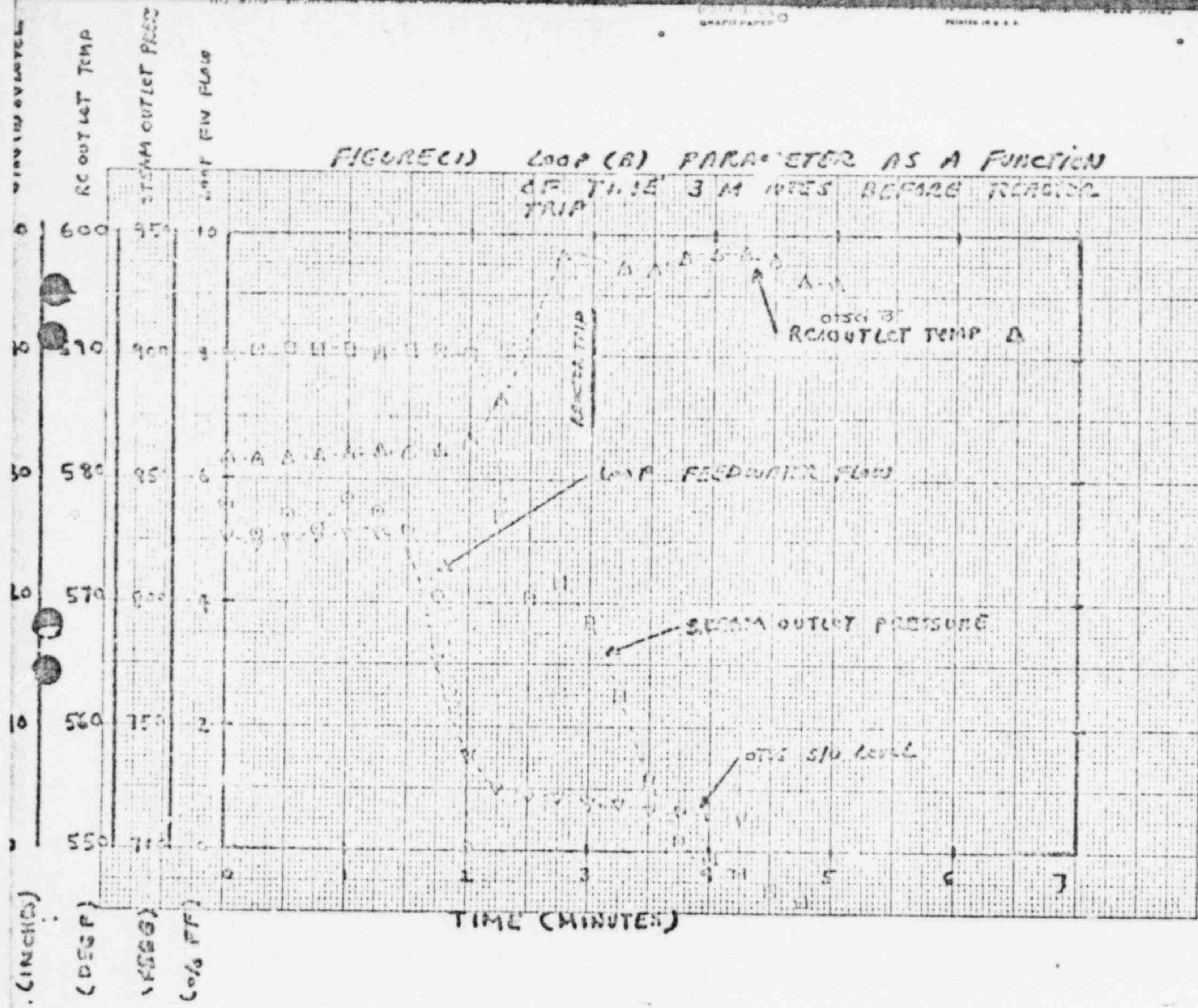
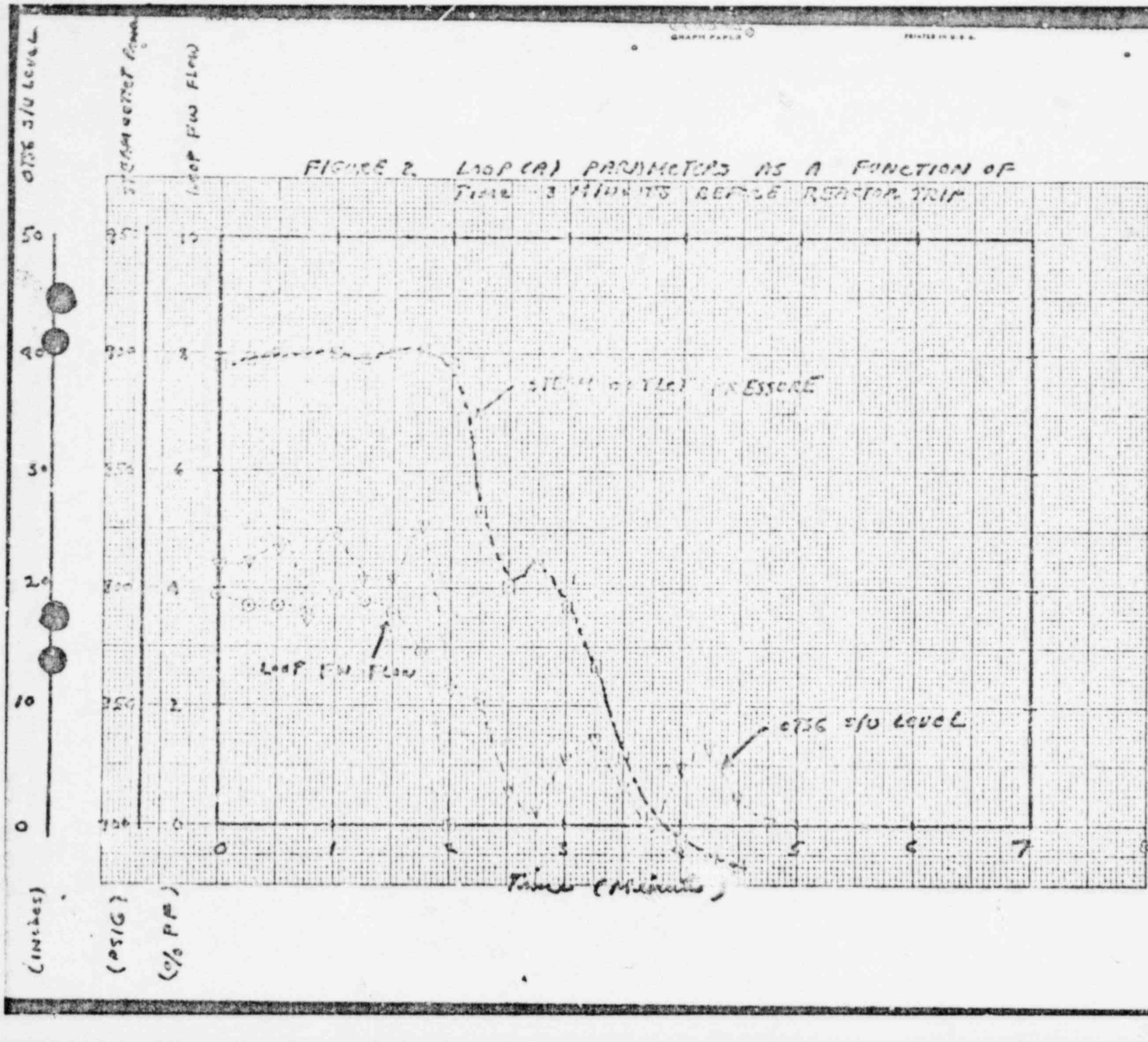


FIGURE 2. LOOP (A) PARAMETERS AS A FUNCTION OF TIME 3 MINUTES BEFORE REACTOR TRIP



THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To	J. H. JOHNSTON, DISTRICT SALES MANAGER
From	J. T. JANIS, SERVICE MANAGER R.W. Williamson for
Cust.	SMUD
Subj.	MASTER SERVICES CONTRACT ADDITION
File No. or Ref.	
Date	MAY 25, 1978

BDS 663 3

This letter to cover one customer and one subject only

Attached is a proposed letter for establishment of Master Services Contract Task 68 for your signature and transmittal to SMUD. If you have any questions or require additional information, please advise.

JTJ/hh
Attachment

cc: GG Anderson
R. Berchin
RP Breeding
JM Burnett
HS Muir
BA Karrasch
GM Olds
JD Phinney
DG Culberson - SPR-330 File

3-11-338

Babcock & Wilcox

Power Generation Division

One California Street, San Francisco, Calif. 94111
Telephone: (415) 421-3484

May 25, 1978

Mr. J. J. Mattimoe
Assistant General Manager & Chief Engineer
Sacramento Municipal Utility District
6201 S. Street
Sacramento, California

Subject: Master Services Contract
SMUD Contract 6367, B&W No. 595-7072
Task 68 - Analysis of March 20, 1978 Reactor Trip and Rapid Cooldown Transient

Reference: 1. B&W letter, JT Janis to RJ Rodriguez, dated March 23, 1978
2. B&W letter, JT Janis to RP Oubre', dated April 5, 1978

Dear Mr. Mattimoe:

As a result of the March 20, 1978 Loss of NNI Power Incident and subsequent rapid cooldown transient, B&W was requested to perform an evaluation of the effects of the transient on the Reactor Coolant System (RCS). The following Task Proposal has been prepared to cover the analysis work performed to date and to obtain your approval for additional analyses to address NRC concerns and determine the long term effect on the life of RCP casings. This task is proposed under the terms and conditions of the subject Master Services Contract.

<u>Task 68 - Analysis of the March 20, 1978 Reactor Trip and Rapid Cooldown Transient</u>

<u>Task 68-01</u> - Evaluation of Transient

<u>Scope</u>

a. The Company will perform an evaluation of the effects of the transient conditions on the major components of the RCS and the nuclear fuel assemblies on an expedited basis and provide SMUD with a letter reporting its recommendations. This evaluation will be performed based on transient data provided by SMUD.

b. The Company will perform a detailed QA review of the calculations and analyses performed, including verification of validity of the input data [illegible]

Babcock & Wilcox

Estimated Cost

Charges will be on a time and material basis at the appropriate Master Services Contract rates in effect at the time work is performed. Item (a) above is completed and item (b) is in the report preperation stage. Through April, 526 MH and 0.5 computer hours have been expended and it is estimated an additional 200 MH will be required to complete the task. Travel and living expenses will be billed at cost.

Schedule

Item (a) has been completed (Reference 1). Item (b) report should be ready for transmittal about July 1, 1978.

Task 68-02 - Follow-on Fracture Mechanics Analysis

Scope

In task 68-01 (a) above, a quick and conservative fracture mechanics analyis of the reactor vessel beltline region and outlet nozzle region was performed. This was an ASME Section III type analysis using a postulated flaw size of 1/4 the vessel thickness. The factors-of-safety calculated for the beltline region and outlet nozzle region are 1.8 and 1.2 respectively.

Since the NRC staff expressed an interest in analysis of factors-of-safety for smaller flaw sizes, B&W proposes to perform additional fracture mechanics analysis for the reactor coolant pressure boundry areas most susceptible to flaw growth. These areas are the reactor vessel beltline region, reactor vessel outlet and inlet nozzle regions, and the lower head of the OTSG just below the tube sheet to shell junction. The analysis will be performed for a series of flaw sizes ranging from the minimum reportable flaw size defined by Section XI to a flaw depth of about 0.5 a/w. The final output of the analysis will be a plot of factors-of-safety versus flaw sizes and plots of factors-of-safety versus time during the transient for several flaw sizes. The application of these curves would be that once the desirable factors-of-safety are established, SMUD would need only to demonstrate that it's NDT technique would have detected the associated flaw size during the baseline inspection.

Estimated Cost

Charges will be on a time and materials basis at the appropriate Master Services Contract rates in effect at the time work is performed. It is estimated that approximately 310 MH will be required to complete this task. Travel and living expenses, if any, will be billed at cost.

Babcock & Wilcox

Schedule

It is estimated that the span time to complete this analysis will be eight (8) weeks from date of task authorization.

Task 68-03 - Effect of Transient on Accumulated Usage Factor of Reactor Coolant Pump

Scope

The effect of the large temperature and pressure transients on the pump casing and cover is best evaluated by the responsible engineer who performed the stress analysis on these pumps. It is believed that these transients could have caused some cyclic type stresses which will increase the lifetime usage factor slightly. B&W will contract with the engineering firm who performed the original stress analysis to perform this additional fatigue evaluation.

Estimated Cost

The cost quotation received from the engineering firm is $8,000. This cost will be billed under the Procurement terms of the Master Services Contract.

Schedule

It is estimated that the span time to complete this analysis will be six (6) weeks.

Work on Task 68-01 was initiated on the verbal authorization of Mr. R. P. Oubre'. Work on Tasks 68-02 and 68-03 will be initiated upon authorization of this task letter.

This proposal is valid until June 30, 1978 except that the Company shall have the right to withdraw or amend this proposal at any time before formal acceptance by the purchaser and subsequent acceptance in writing by an authorized representative of the Company.

If you have any questions or require additional information, please contact me or Joel Janis in Lynchburg. You may authorize this task by signing in the space provided below and returning the copy to us.

Very truly yours,

J. H. Johnston
[illegible]

[illegible]/nh

cc: RP Oubre' RJ Rodriguez
DG Raasch

APPROVED: ______________________________ DATE: ____________
SACRAMENTO MUNICIPAL UTILITY DISTRICT

FRACTURE MECHANICS EVALUATION OF THE REACTOR VESSEL OF THE SMUD UNIT AT RANCHO SECO FOR THE UNANTICIPATED TRANSIENT OF 3/20/78

A fracture mechanics analysis of the reactor vessel has been performed using the conservative approach outlined in the ASME Code, Section III, Appendix G. Specific details of the analytical approach are documented in B&W Topical Report BAW-10046A, Rev. 1.

Analyses were performed on the two most critical areas of the reactor vessel - the beltline region and the outlet nozzle region. At the lowest temperature during the transient the material is still in the upper shelf region (ductile behavior). Due to the low level of radiation, degradation to beltline region materials is not significant enough to produce a shift in the transition reference temperature. Consequently, the beltline region materials are also at the upper shelf toughness region.

Factors-of-safety for the beltline region and outlet nozzles have been calculated as follows:

$$\text{F. of S.} = \frac{K_{IR}}{K_{Im} + K_{It}}$$

where K_{IR} is the reference stress intensity factor

K_{Im} is the stress intensity factor due to pressure

K_{It} is the stress intensity factor due to the thermal gradient through the thickness

The factor-of-safety for the beltline region is 1.8.
The factor-of-safety for the outlet nozzles is 1.2.

Detailed calculations are provided on sheet 3 of 3.

It should be recognized that this is a very conservative analysis. A postulated flaw size of 1/4t is assumed for the beltline region and the 3.0" nozzle corner flaw is assumed for the outlet nozzle. The material fracture toughness (reference stress intensity value) used is 200 ksi√in. Finally, the calculation of the stresses associated with the transient is conservative.

Charles E. Harris

Charles E. Harris, PE
March 23, 1978

Henrik S. Palme

Henrik S. Palme
March 23, 1978

CALCULATIONS: BASIC RELATIONSHIP $2K_{IM} + K_{IT} \leq K_{IR}$

BELTLINE REGION $(2K_{IM} + K_{IT})_{MAX} = 174.366$ ksi$\sqrt{in}$ (M13CCAJ LQ41 3/22/78)*

$K_{IM} = P M_m \frac{r_i^2 + r_o^2}{r_o^2 - r_i^2}$ (BAW-10046A, Rev. 1) Removing the F. of S. of 2

time = 40 mins.
temp$_{1/4T}$ = 468°F

P = 2100 Psi
r_i = 85.5 in.
r_o = 94.0 in.
M_m = 2.9 (ASME Code Appendix G, Fig G-2214.1)

K_{IM} = 64.45 ksi$\sqrt{in}$
K_{It} = 174.366 − 2(64.45) = 45.47 ksi$\sqrt{in}$

$$F. \text{ of } S. = \frac{200 \text{ Ksi}\sqrt{in}}{64.45 + 45.47} = 1.82$$

$\boxed{F. \text{ of } S. = 1.82}$

NOZZLE REGION $(2K_{IM} + K_{It})_{MAX} = 247.286$ ksi$\sqrt{in}$ (M14-CCAH LQ41 3/22/78)*

time = 75 mins
temp$_{1/4T}$ = 392°F

$K_{IM} = P F(a/r_n) \frac{r_i^2 + r_o^2}{r_o^2 - r_i^2} \sqrt{\pi a}$ (BAW-10046A, Rev. 1) Removing F. of S. of 2

Computer runs M13CCAJ and M14CCAH are based on a computer code developed to perform the BAW-10046A, Rev. 1 calculations. It should be noted that the thermal stress intensities are calculated based on a [illegible]

through the vessel thickness that may not be the same as for this transient.

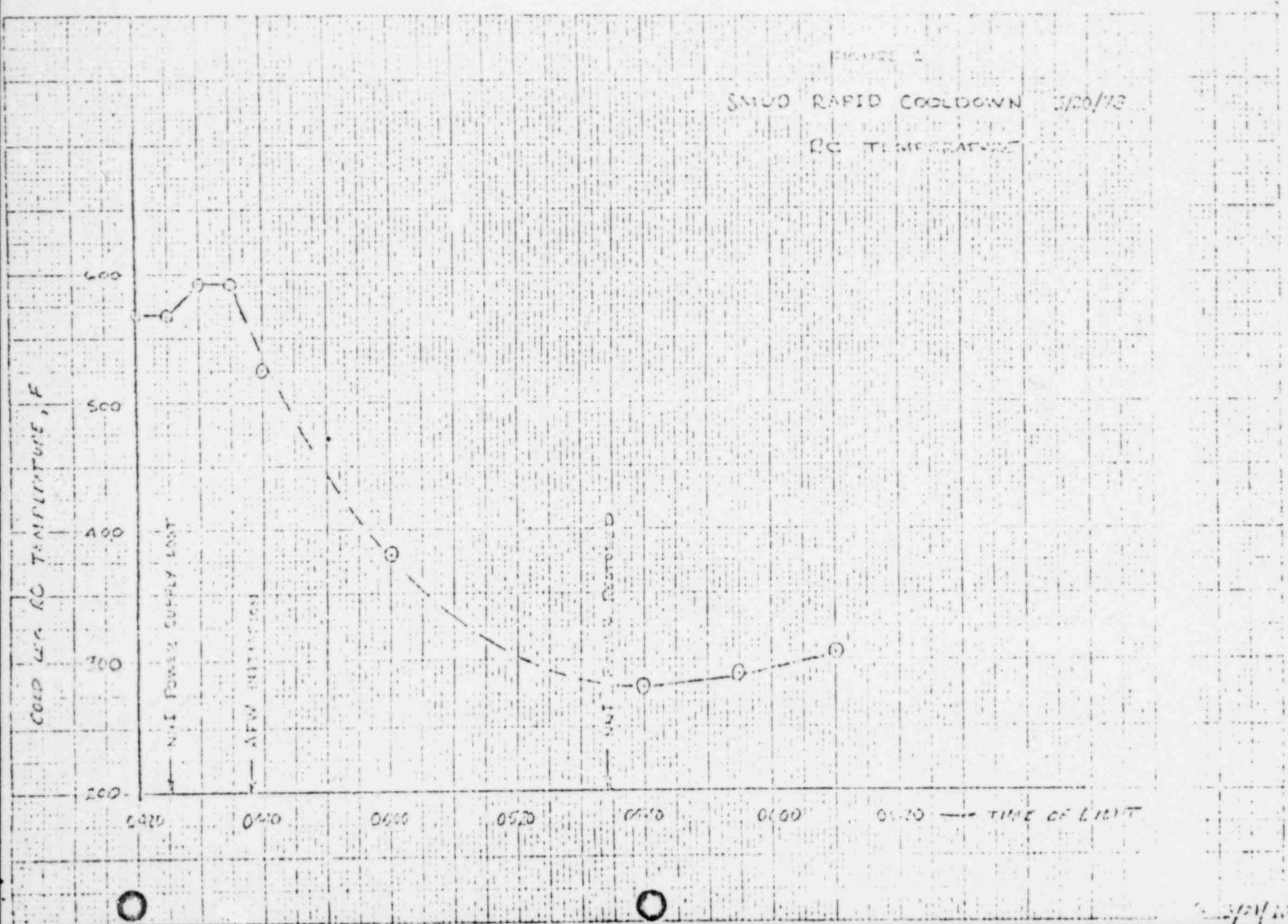
P = 2100 Psi
r_i = 84.1875"
r_o = 93.3150"
$F(a/r_n)$ = 1.74 (WRC Bulletin 175, Fig. A5-1)
a = 3.0" (Appendix G, Section III, ASME Code)

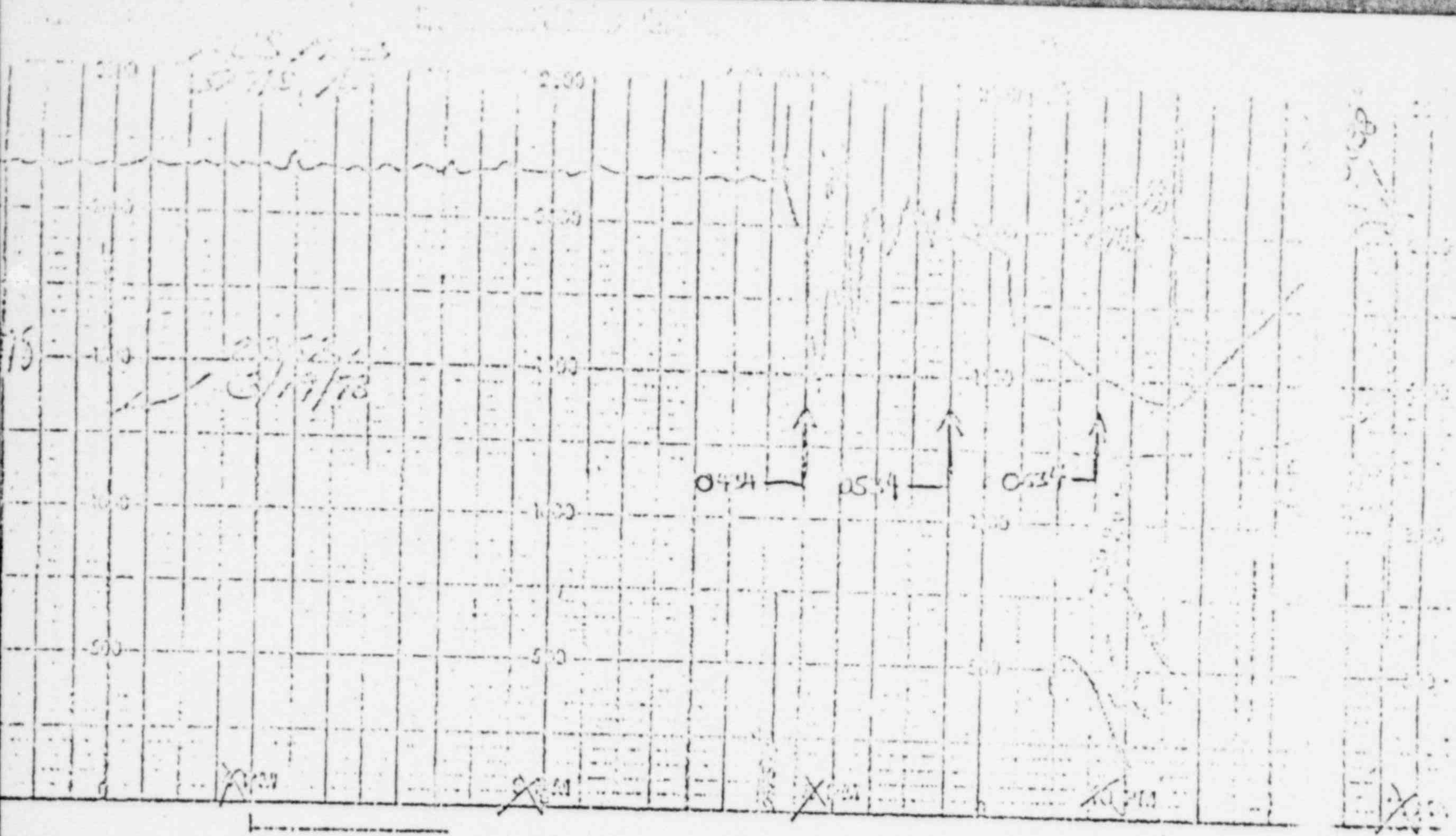
K_{IM} = 83.9 ksi$\sqrt{in}$
K_{It} = 247.286 − 2(83.9) = 79.49 ksi$\sqrt{in}$

$$F. \text{ of } S. = \frac{200 \text{ Ksi}\sqrt{in}}{\ldots} = 1.22$$

$\boxed{F. \text{ of } S. = 1.22}$

Charles E. [illegible]
March 22, 1978


SMUD RAPID COOLDOWN 3/20/78
RC TEMPERATURE
COLD LEG RC TEMPERATURE, F
600
500
400
300
200
NNI POWER SUPPLY LOST
AFW INITIATION
0420
0520



0425

cc: BA Karrasch
JM Burnett
CW Bruny/MRW
JR Burris

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To J. T. JANIS, NUCLEAR SERVICE, NPGD

From P. A. SHERBURNE/L. H. BOHN, STEAM GENERATOR UNIT

BDS 803 5

Cust. SMUD

File No. or Ref.

Subj. SMUD RAPID COOLDOWN--EFFECTS ON OTSG INTEGRITY

Date MARCH 23, 1978

This letter to cover one customer and one subject only

1.0 RECOMMENDATION

Our preliminary assessment of the potential damage to the SMUD steam generator during the 3/20/78 rapid cooldown transient is complete. Based on that assessment, we feel that the steam generators have not been adversely affected and that the SMUD plant can return to power operation with the following qualifications:

(1) Plant operation should be limited to 75% power pending (a) confirmation of transient data supplied by SMUD to date, (b) QA of shell temperature calculations made by B&W, and (c) review and approval of OTSG tube load calculations made by C. W. Bruny (MVW).

(2) Confirmation from SMUD that the Loose Parts Monitoring System is operational, especially in the area of the upper tubesheet.

In addition, SMUD should be informed of B&W's intention to perform an inspection of the steam generators during the next outage.

2.0 DISCUSSION

Figures 1-3 give the histories of RC cold leg temperature, steam pressure, and OTSG water level as reconstructed from data supplied by SMUD. The major concern with the steam generators during this transient is whether the tubes have plastically deformed due to the large axial tensile loads imposed on them. If this is the case, the tube load following return to power operation will be more compressive and tube natural frequencies will be lowered. The consequence of lesser tube frequencies is reduced safety margin for fluid elastic vibration (Conners' mechanism) of the peripheral tubes (upper span).

To assess whether or not the tube yield strength was exceeded during this transient, an estimate of average shell temperature vs. time was made. A plot of the average shell temperature as calculated is shown in Figure 4. From this calculation, the maximum tube-to-shell temperature differential (ΔT) is 170°F at 0515 hours. (Note that average tube temperature is equal to RC cold leg temperature.) This information was transmitted verbally to C. W. Bruny at Mt. Vernon who subsequently determined that 170°F tube-to-shell ΔT does not result in a tube stress greater than yield. Based on this information and on our judgement that the calculated average shell temperature is conservative, we concluded that the tube stress did not exceed yield and that the tubes were not plastically deformed. Due to the preliminary nature of this assessment, however, we advised that plant operation be restricted to 75% power pending QA of the calculations.

Additional effort is required by Mt. Vernon personnel to assess the effect of the rapid cooldown on the OTSG cumulative usage factor. This effect will be determined and forwarded when complete.

3.0 CLOSURE

It is our understanding that the above concerns and restrictions were verbally transmitted to SMUD by B. A. Karrasch on Wednesday afternoon, March 22, 1978.

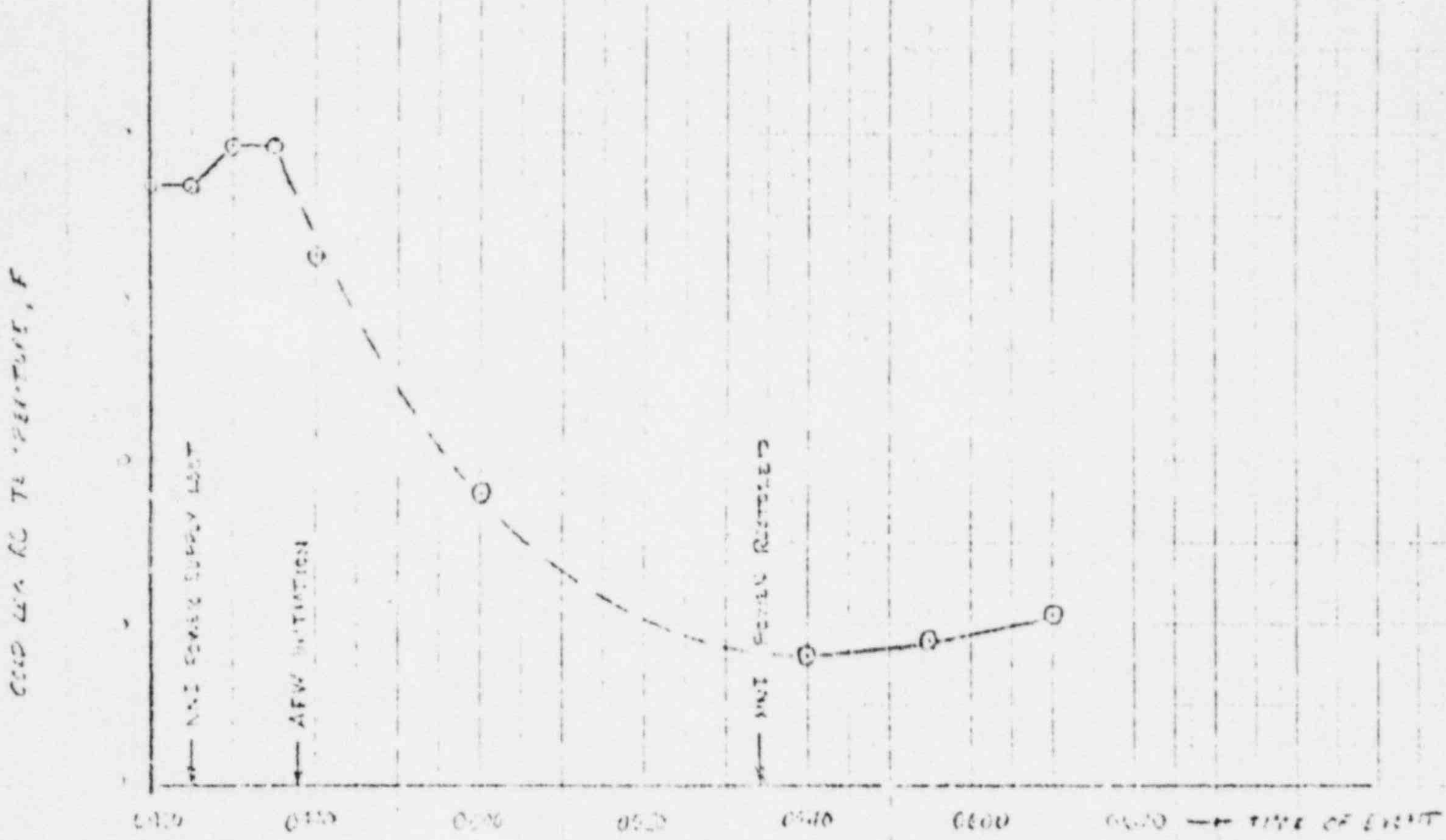
PAS for LH Bohn

PAS/LHB/ef

FIGURE 1

SMUD RAPID COOLDOWN 3/20/78

RC TEMPERATURE



FAS 3/21/78

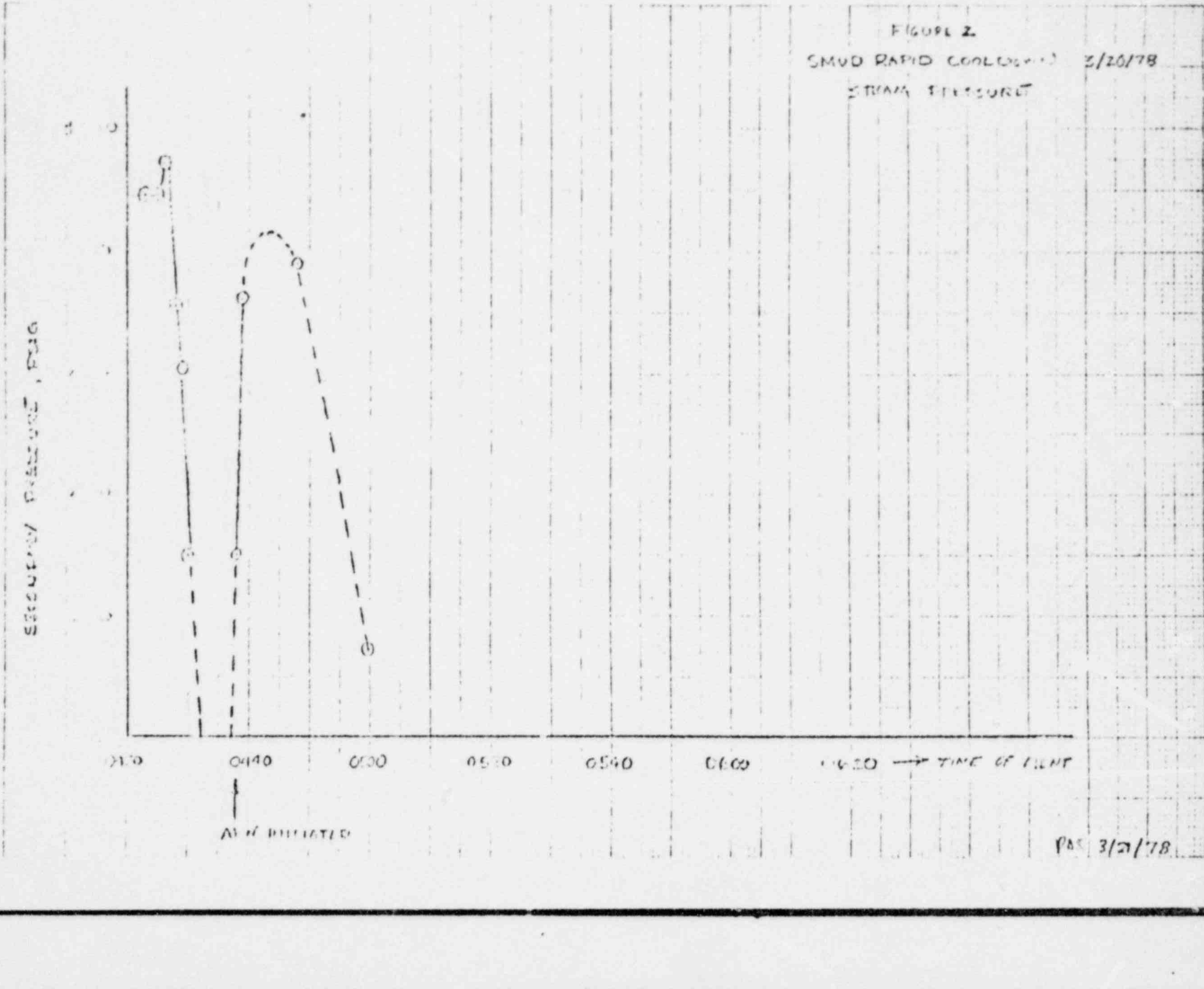
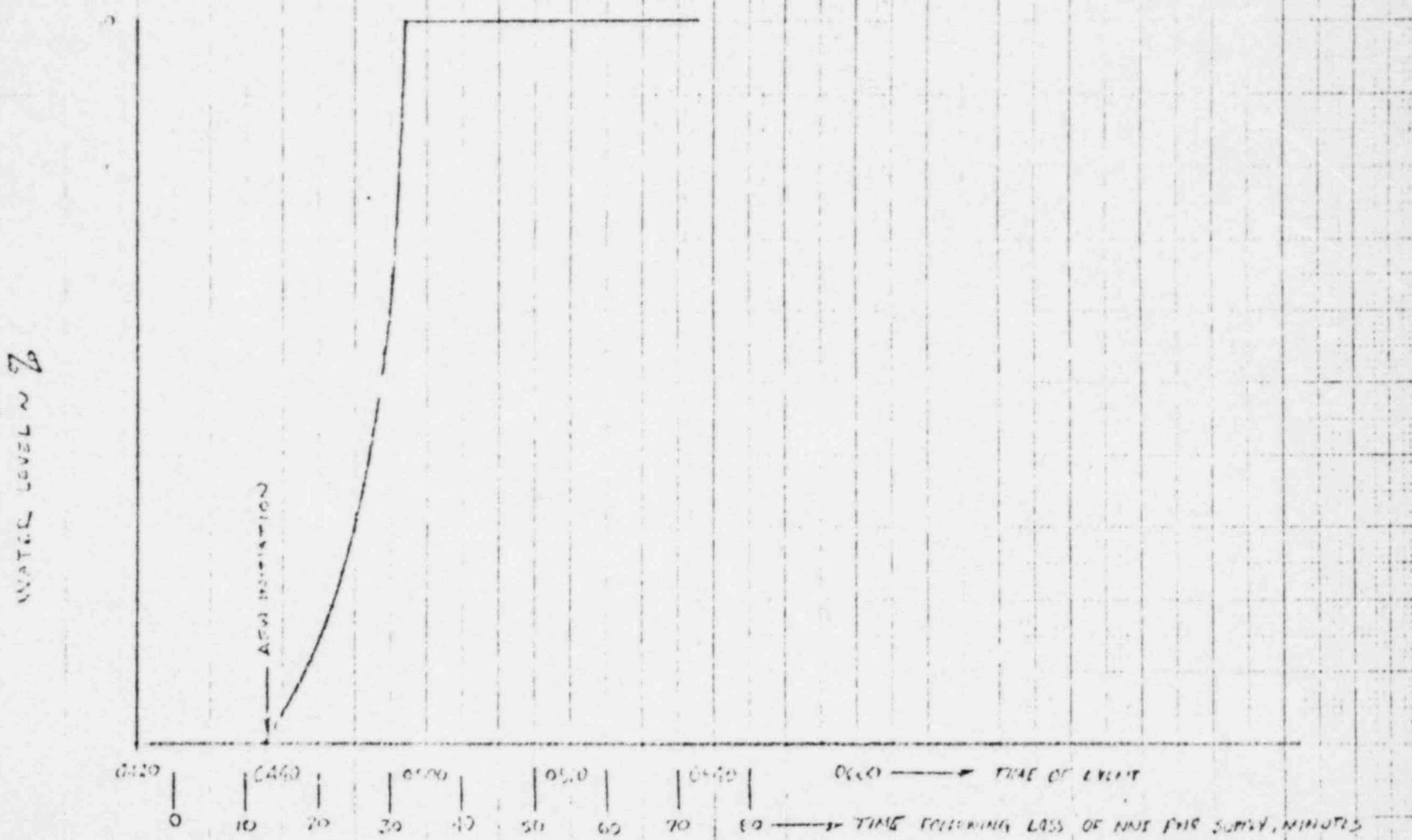


FIGURE 2
SMUD RAPID COOLDOWN 3/20/78
STEAM PRESSURE
SECONDARY PRESSURE, PSIG
0440
0500
0540
0600
→ TIME OF EVENT
AFW INITIATED
PAS 3/21/78

FIGURE 3

SMUD RAPID COOLDOWN 3/20/78

OTSG WATER LEVEL



DAS 3/1/78

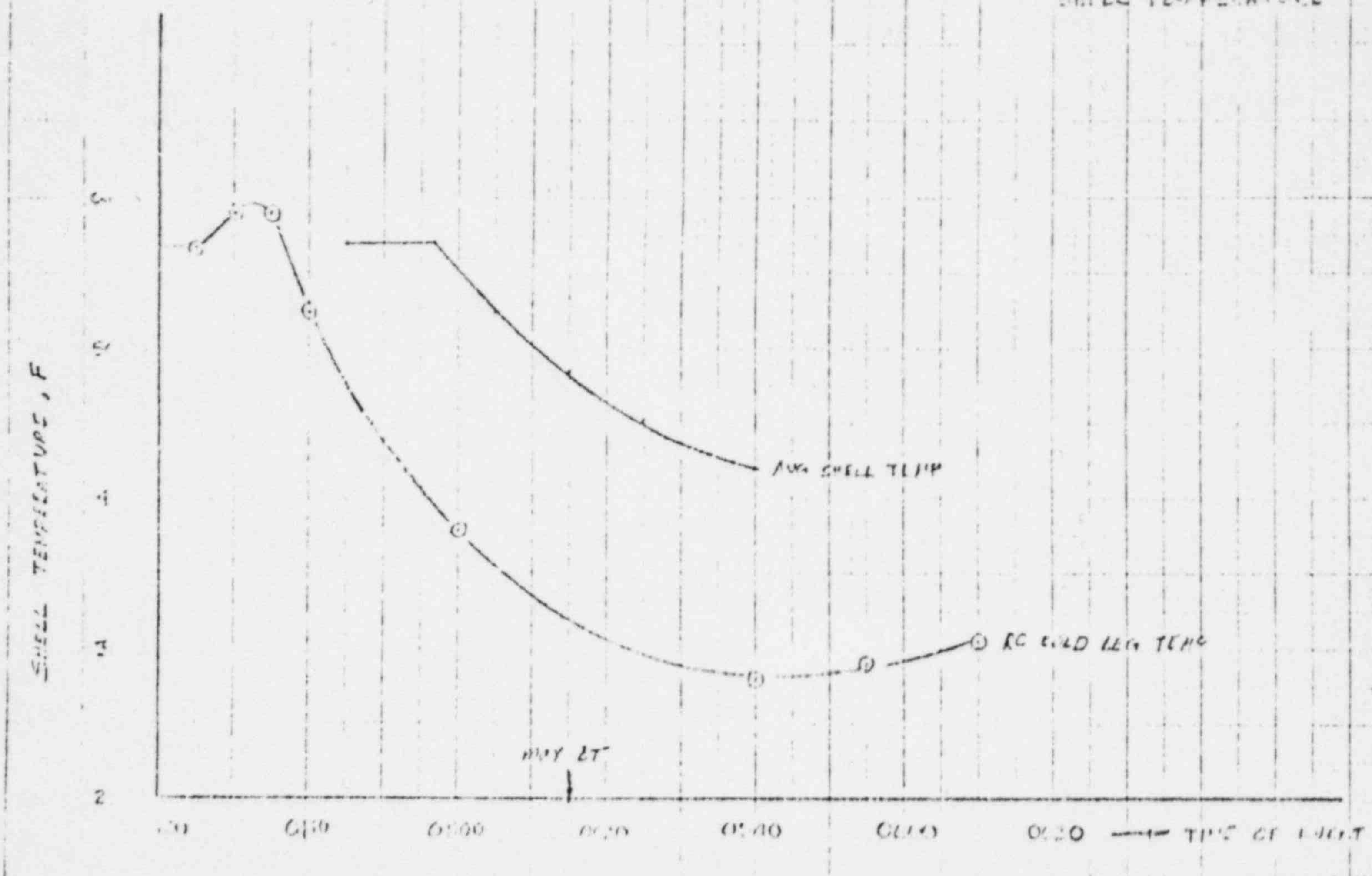


FIGURE 4
SMUD RAPID COOLDOWN (3/20/78)
SHELL TEMPERATURE

FNS 3/22/78

BABCOCK & WILCOX

Bill Garrett 3/20 8:15

RCS Chemistry

AFTER TRANS

I 131 3.88×10^{-2}

I 133 4.52×10^{-2}

I 135 2.32×10^{-2}

gross β 3.16×10^{-1}

I ~ 10X NORMAL

gross β last week ave ~ 2.2×10^{-1}

gross α IN PROGRESS. have in am

SEQUENCE OF EVENTS IN PROG

5 PAGES

1 3 pages - memory trip review
4th RC Pressure Trace
5th RCS TEMP

JOHN MC[illegible]
H (916) 944-2936

9:00

30 min

REGION 5 - BILL JOHNSON

B&W Review & Recommend

[illegible]

No NRC APPL REQ'D

BABCOCK & WILCOX

Bill [illegible]

Don Bletchly

A-Chl [illegible]

PRT workup

Experience! [illegible]
at 2155

04:29:30	588.8
04:30:00	587.9
04:30:30	590.9
04:31:30	593.1
04:32:30	594.9
04:33:30	595.1
04:34:30	594.9
04:35:30	590.4
04:36:30	571.7
04:37:30	573.1
04:38:30	566.6
04:39:30	552.6
40:30	533.3

04:26:45	585.2
	585.2
	586.1
	586.6
	587.1
	587.1
	587.6
	587.6
	588.1
	588.1
	588.8
04:29:30	588.8

PRT Hi Temp 04:25:59 210° on disch. RV-1B

NR 2125, 2119, 2114, 2115
WR 2103, 2107, 2028

04:28:29 201°F High disc. temp.
Electromatic

PRT data

8:01 pumped down
8:15 secured
10:44 Pres. = 118 psi
Added demin. water, down to 20 psi
Incr. P to 2155, PRT press. increased
1900-2000 lbs.

D inverter tie
I inverter
circuit breakers
open upon
trip of one
power supply -

BABCOCK & WILCOX

Gross α

1.11×10^{-8} μCuries/ml ± 7.43×10^{-9}

Gamma Scan

Np 239 - 106.1 KEV

ACTIVITY 9.7×10^{-5} μCuries/ml

2Σ limit ± 3.01×10^{-5}

Gross α 1.11×10^{-8} μCuries/ml ± 7.43×10^{-9}

→ 2000# 532 ONE CODE RELIEF [illegible]

82.9 INCHES IN PZR LOWEST LEVEL

1925 15 MIN
2000 20 MIN [illegible]

HOW MEASURING PZR LEVEL
[illegible] AT 0425
SECURED 4th RCP EARLY (?)
SAFETY / [illegible] ACTUATION [illegible] ALSO [illegible]

[illegible] ← [illegible] HPI

0438 13 →	557	1586
0448 14 →	546.3	1510
[illegible] 15 →	535	1475

FULL RANGE [illegible]

0438 28
0440 156

0425:59

0428:29

BABCOCK & WILCOX

SEQUENCE OF EVENTS

TIME	EVENT
0425:35	LOST NNI PWR SUPPLY
0425:46	TURB TRIP / RX TRIP (HP)
0426:17	HPI "B" ON (MANUAL)
0428:23	" " NORMAL (OFF)
0431:25	RX LOW PRESS TRIP (
0437:56	TRIP "B" SFAS ANALOG
0437:57	" "A" " " WR PRESS
0437:58	HPI MTR ON / C SFAS 1543 1555
0443:	1670, 1665 1662 WR RCS PRESS
04:43:56	A HPI SECURED
04:46:09	B LPI SECURED,
04:46:39	A " "
04:49:54	A HPI INITIATED (MANUAL)
04:51:25	"D" RCP SECURED
04:51:52	A HPI SECURED
04:55:23	A HPI INITIATED
05:05:30	" & B HPI SECURED
05:08:42	B HPI INITIATED
05:23:04	B HPI SECURED
05:33:19	B HPI INITIATED
05:34:04	B HPI SECURED

AT 04:44:16 - CALCULATED HT UP/C/D RATE 550°/HR

AT 04:45:16 " " " 291.1°/HR

XMITTER SWITCH DURING CALC

05:34: RESTORED NNI | X & Y PWR SUPPLIES

AUX FW WITH SFAS

GROUP 3
03:45:55
03/20/78

MW GEN VOLTS B/AUX MW T2 AUX MW #2 S/D MW #1 S/D MW B MAIN STEAM PRESS A MAIN STEAM PRESS S KAN TAVE NT-1 NT-2

POST TRIP REVIEW

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:10:45	671.	21.57	24.56	17.53	.73	.72	4.075	[illegible]	23.20	935.	[illegible]	597.0	[illegible]	[illegible]	[illegible]
04:11:45	680.	21.61	24.38	17.57	.73	.72	3.997	[illegible]	23.19	[illegible]	[illegible]	597.2	[illegible]	[illegible]	[illegible]
04:12:45	681.	21.57	[illegible]	17.14	.73	.72	[illegible]	[illegible]	23.20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:13:45	[illegible]	21.61	[illegible]	[illegible]	.73	.72	4.003	[illegible]	23.20	337.	593.	597.7	[illegible]	[illegible]	[illegible]
04:14:45	675.	21.65	[illegible]	17.27	.73	.72	[illegible]	[illegible]	23.17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:15:45	[illegible]	[illegible]	[illegible]	17.17	.73	[illegible]	[illegible]	[illegible]	23.19	[illegible]	[illegible]	597.2	[illegible]	[illegible]	[illegible]
04:16:45	681.	21.61	[illegible]	17.26	.73	.73	4.027	4.074	23.19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:17:45	661.	21.55	24.57	17.37	.73	.72	3.997	[illegible]	23.19	337.	[illegible]	597.2	[illegible]	[illegible]	[illegible]
04:18:45	[illegible]	21.57	24.55	[illegible]	.73	.72	[illegible]	[illegible]	23.23	332.	595.	597.2	[illegible]	[illegible]	[illegible]
04:19:45	[illegible]	21.57	24.55	17.87	.73	.72	4.029	[illegible]	23.20	[illegible]	557.	597.2	[illegible]	[illegible]	[illegible]
04:20:45	[illegible]	21.63	24.55	17.61	.73	.72	3.997	[illegible]	23.20	[illegible]	597.	597.2	[illegible]	[illegible]	[illegible]
04:21:00	[illegible]	21.61	24.55	17.65	.73	.72	[illegible]	[illegible]	23.20	[illegible]	595.	597.2	[illegible]	[illegible]	[illegible]
04:21:15	627.	21.53	[illegible]	17.71	.73	.72	3.992	[illegible]	23.20	533.	595.	597.2	[illegible]	[illegible]	[illegible]
04:21:30	[illegible]	21.55	[illegible]	17.71	.73	.72	3.995	[illegible]	23.20	535.	[illegible]	597.2	[illegible]	[illegible]	[illegible]
04:21:45	[illegible]	21.57	[illegible]	17.72	.73	.72	4.037	[illegible]	23.20	[illegible]	[illegible]	597.2	[illegible]	[illegible]	[illegible]
04:22:00	631.	21.57	[illegible]	17.65	.73	.72	4.037	[illegible]	23.17	573.	[illegible]	597.2	[illegible]	[illegible]	[illegible]
04:22:15	[illegible]	21.51	[illegible]	17.67	.73	.72	3.992	[illegible]	23.13	[illegible]	[illegible]	597.2	[illegible]	[illegible]	[illegible]
04:22:30	[illegible]	[illegible]	[illegible]	17.61	.73	.72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	597.2	[illegible]	[illegible]	[illegible]
04:22:45	651.	21.63	[illegible]	[illegible]	.73	.72	[illegible]	[illegible]	23.20	834.	[illegible]	597.3	[illegible]	[illegible]	[illegible]
04:23:00	679.	21.59	[illegible]	17.58	.73	.72	[illegible]	[illegible]	23.20	575.	595.	597.3	[illegible]	[illegible]	[illegible]
04:23:15	681.	21.59	[illegible]	[illegible]	.73	.72	[illegible]	[illegible]	23.20	339.	533.	597.3	[illegible]	[illegible]	[illegible]
04:23:30	683.	21.57	24.55	17.74	.73	.72	3.993	[illegible]	23.20	337.	547.	597.3	[illegible]	[illegible]	[illegible]
04:23:45	681.	21.59	24.51	17.69	.73	.73	4.029	[illegible]	23.20	[illegible]	537.	597.3	[illegible]	[illegible]	[illegible]
04:24:00	682.	21.63	24.55	17.57	.73	.72	4.076	[illegible]	23.20	332.	533.	597.3	[illegible]	[illegible]	[illegible]
04:24:15	[illegible]	21.63	24.55	17.61	.73	.72	[illegible]	[illegible]	23.20	595.	599.	597.3	[illegible]	[illegible]	[illegible]
04:24:30	681.	21.63	24.55	17.24	.73	.72	4.025	[illegible]	23.20	590.	593.	597.3	[illegible]	[illegible]	[illegible]
04:24:45	681.	21.57	24.55	17.24	.73	.72	4.023	4.207	23.20	[illegible]	[illegible]	597.3	[illegible]	[illegible]	[illegible]
04:25:00	682.	21.53	24.55	17.23	.73	.72	4.037	4.207	23.20	532.	595.	597.3	[illegible]	[illegible]	[illegible]
04:25:15	672.	21.57	24.57	17.30	.73	.72	3.971	4.173	23.20	332.	595.	597.3	[illegible]	[illegible]	[illegible]
04:25:30	651.	21.59	24.55	17.23	.73	.72	3.971	4.153	23.20	331.	500.	597.3	[illegible]	[illegible]	[illegible]
04:25:45	723.	21.57	24.55	15.51	.73	.72	3.955	[illegible]	23.20	337.	[illegible]	597.1	[illegible]	[illegible]	[illegible]
04:26:00	7.	4.37	.03	.04	18.65	[illegible]	3.955	[illegible]	23.24	[illegible]	[illegible]	597.1	[illegible]	[illegible]	[illegible]
04:26:15	1.	.02	.02	.03	18.65	24.93	[illegible]	[illegible]	23.57	[illegible]	[illegible]	593.9	[illegible]	[illegible]	[illegible]
04:26:30	1.	.35	.03	.03	20.72	24.77	[illegible]	[illegible]	23.61	542.	[illegible]	596.0	[illegible]	[illegible]	[illegible]
04:26:45	1.	.23	.02	.03	20.72	24.57	[illegible]	.037	23.03	542.	[illegible]	602.3	[illegible]	[illegible]	[illegible]
04:27:00	1.	.17	.03	.02	[illegible]	24.90	[illegible]	.037	23.57	333.	[illegible]	602.3	[illegible]	[illegible]	[illegible]
04:27:15	1.	.15	.03	.02	[illegible]	24.90	[illegible]	[illegible]	23.55	530.	[illegible]	602.4	[illegible]	[illegible]	[illegible]
04:27:30	1.	.15	.02	.02	[illegible]	24.55	[illegible]	.015	23.61	737.	570.	602.4	[illegible]	[illegible]	[illegible]
04:27:45	0	.15	.02	.02	[illegible]	24.25	[illegible]	.015	23.61	937.	575.	601.4	[illegible]	[illegible]	[illegible]
04:28:00	0	.14	.03	.02	[illegible]	24.02	[illegible]	.037	23.61	841.	[illegible]	601.4	[illegible]	[illegible]	[illegible]
04:28:15	1.	.13	.02	.02	19.24	24.02	[illegible]	[illegible]	23.60	341.	[illegible]	579.6	[illegible]	[illegible]	[illegible]
04:28:30	1.	.12	.02	.02	18.15	[illegible]	[illegible]	[illegible]	23.51	723.	[illegible]	597.6	[illegible]	[illegible]	[illegible]
04:28:45	0	.12	.02	.02	[illegible]	[illegible]	[illegible]	[illegible]	23.61	723.	[illegible]	595.2	[illegible]	[illegible]	[illegible]
04:29:00	0	.11	.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	725.	[illegible]	595.2	[illegible]	[illegible]	[illegible]
04:29:15	0	.13	.02	.02	[illegible]	[illegible]	[illegible]	[illegible]	23.55	[illegible]	[illegible]	591.6	[illegible]	[illegible]	[illegible]
[illegible]	1.	.13	.02	.02	18.05	24.72	[illegible]	[illegible]	23.61	541.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:29:45	0	.02	.02	.02	[illegible]	[illegible]	[illegible]	[illegible]	23.61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:30:00	0	.07	.02	.02	19.64	[illegible]	[illegible]	.003	23.63	482.	[illegible]	581.3	[illegible]	[illegible]	[illegible]
04:30:15	0	.02	.03	.02	18.04	24.07	4.002	[illegible]	23.62	452.	[illegible]	575.3	[illegible]	[illegible]	[illegible]
04:30:30	0	[illegible]	[illegible]	.02	[illegible]	[illegible]	[illegible]	[illegible]	23.63	375.	[illegible]	573.5	[illegible]	[illegible]	[illegible]
04:31:30	0	.03	.02	.02	18.12	24.01	[illegible]	[illegible]	23.64	322.	[illegible]	541.1	[illegible]	[illegible]	[illegible]
04:32:30	0	.04	.02	.02	[illegible]	24.27	[illegible]	.003	23.64	723.	[illegible]	554.0	[illegible]	[illegible]	[illegible]
04:33:30	1.	.01	[illegible]	.02	17.03	24.27	[illegible]	.003	23.63	[illegible]	[illegible]	551.0	[illegible]	[illegible]	[illegible]
04:34:30	0	.01	.02	.02	18.15	24.37	[illegible]	[illegible]	23.65	916.	[illegible]	535.2	575.3	3.807	[illegible]
04:35:30	1.	.01	.02	.02	[illegible]	24.22	[illegible]	[illegible]	23.61	378.	[illegible]	[illegible]	575.1	[illegible]	4.027
04:36:30	1.	.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:37:30	0	.01	.02	.01	16.75	25.34	[illegible]	[illegible]	[illegible]	325.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:38:30	0	.01	.02	.02	[illegible]	26.76	[illegible]	[illegible]	23.65	777.	[illegible]	546.1	[illegible]	4.350	[illegible]
04:39:30	1.	.01	.02	.02	19.95	27.37	[illegible]	[illegible]	23.67	721.	[illegible]	523.8	575.1	[illegible]	3.703
04:40:30	0	.01	.02	.01	20.53	28.35	[illegible]	.023	23.65	735.	[illegible]	520.7	575.0	3.850	[illegible]

	C212	C213	C214	C215	[illegible]	C217	T211	[illegible]	C113	C114	[illegible]	C121	[illegible]	[illegible]	[illegible]
04:10:45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
04:13:45	- 4.0[illegible]	- 4.05	73.5	72.1	72.6	72.7	577.7	[illegible]	[illegible]	565.2	565.1	567.8	[illegible]	2135.	2141.
04:14:45	- 4.05	- 4.06	72.7	[illegible]	72.2	72.7	[illegible]	[illegible]	567.1	[illegible]	565.1	567.7	[illegible]	2135.	[illegible]
04:15:45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	71.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	567.5	[illegible]	2125.	[illegible]
04:16:45	- 4.05	- 4.05	73.0	71.6	71.9	[illegible]	577.8	[illegible]	565.0	565.3	565.1	567.0	[illegible]	2135.	[illegible]
04:17:45	[illegible]	[illegible]	73.5	72.1	[illegible]	72.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	567.5	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

44

	3	4	5	6	7	8	A hot	B hot	A cold	B cold	C cold	D cold
4:19:45	-4.05	-4.00	72.5	71.3	71.6	71.9	545.7	549.1	564.9	566.1	564.[illegible]	567.5

[illegible] [illegible]

A4

AC[illegible]

04:20:55	- 4.05- 4.05	73.5	72.0	72.4	72.7	573.3	577.2	[illegible]	563.4	565.3	567.7	2127.	[illegible]	2151.
04:21:00	- 4.05- 4.05	73.1	71.5	72.	72.4	577.0	573.1	573.3	566.4	565.0	567.2	[illegible]	[illegible]	2151.
04:21:15	- 4.05- 4.05	72.7	71.7	71.4	71.5	573.4	577.2	555.3	575.3	555.1	577.5	2127.	[illegible]	[illegible]
04:21:30	- 4.05- 4.05	73.2	71.3	72.2	72.5	573.7	570.1	555.3	556.3	555.1	577.4	2125.	[illegible]	[illegible]
04:21:45	- 4.05- 4.05	73.1	71.9	72.5	72.5	573.7	570.1	[illegible]	556.2	555.0	567.2	[illegible]	[illegible]	[illegible]
04:22:00	- 4.05- 4.05	72.2	71.6	71.5	71.5	573.4	572.3	[illegible]	555.3	555.3	577.5	[illegible]	[illegible]	[illegible]
04:22:15	- 4.05- 4.05	72.3	71.6	71.7	72.3	573.3	574.7	575.2	565.3	555.1	[illegible]	[illegible]	[illegible]	[illegible]
04:22:30	- 4.05- 4.05	73.5	72.3	72.6	72.3	573.3	573.2	555.[illegible]	553.3	565.2	[illegible]	2143.	[illegible]	[illegible]
04:22:45	- 4.05- 4.05	72.6	71.3	71.5	71.6	575.0	573.3	555.2	576.4	555.0	572.3	[illegible]	[illegible]	[illegible]
04:23:00	- 4.05- 4.05	72.5	71.3	71.5	71.9	[illegible]	577.2	555.2	565.4	555.0	107.3	2136.	[illegible]	[illegible]
[illegible]	- 4.05- 4.05	73.6	72.2	72.7	72.5	[illegible]	573.2	555.2	555.4	555.1	557.6	[illegible]	[illegible]	[illegible]
04:23:30	- 4.05- 4.05	72.5	71.3	71.2	71.3	573.2	573.2	555.1	565.4	555.1	567.2	[illegible]	[illegible]	[illegible]
04:23:45	- 4.05- 4.05	72.5	71.7	71.4	71.9	[illegible]	573.3	555.7	556.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	- 4.05- 4.05	73.7	72.3	72.3	71.5	[illegible]	573.2	[illegible]	[illegible]	575.2	[illegible]	[illegible]	[illegible]	[illegible]
04:24:15	- 4.05- 4.05	72.6	72.0	71.7	72.3	573.4	573.2	555.5	556.1	555.2	567.8	2136.	[illegible]	[illegible]
04:24:30	- 4.05- 4.05	72.1	71.1	71.4	72.6	573.3	571.4	555.3	576.1	555.2	577.2	2167.	[illegible]	[illegible]
04:24:45	- 4.05- 4.05	73.5	72.0	72.0	72.7	573.3	573.6	575.2	565.3	555.1	577.2	2141.	[illegible]	[illegible]
04:25:00	- 4.05- 4.05	73.3	71.9	72.2	72.1	573.3	[illegible]	575.2	[illegible]	555.1	[illegible]	2145.	[illegible]	[illegible]
04:25:15	- 4.05- 4.05	72.7	72.2	72.3	71.5	[illegible]	573.3	575.2	576.5	555.2	577.2	[illegible]	[illegible]	[illegible]
[illegible]	- 4.05- 4.05	73.3	72.2	72.4	72.7	573.7	573.3	555.2	[illegible]	565.2	577.5	[illegible]	[illegible]	[illegible]
04:25:45	- 4.00- 4.70	64.7	63.1	62.9	63.1	575.4	573.0	575.0	560.2	565.0	577.5	2143.	[illegible]	[illegible]
04:26:00	- 5.02- 5.70	1.8	1.3	1.7	1.0	575.7	572.0	575.0	573.2	565.0	567.5	[illegible]	[illegible]	[illegible]
04:26:15	- 5.32- 5.34	1.0	.3	.3	.5	572.0	537.0	574.3	573.3	575.3	577.5	2135.	[illegible]	[illegible]
04:26:30	- 6.12- 6.13	.5	.5	.5	.5	575.0	532.0	574.5	573.3	575.3	[illegible]	[illegible]	[illegible]	[illegible]
04:26:45	- 6.27- 6.31	.4	.3	.3	.2	572.0	537.5	575.2	[illegible]	555.3	[illegible]	2131.	[illegible]	[illegible]
04:27:00	- 6.35- 6.47	.3	.1	.1	.2	572.3	537.4	575.2	573.2	555.3	570.1	2132.	[illegible]	[illegible]
04:27:15	- 6.61- 6.62	.2	.0	.0	.1	572.6	537.5	575.6	573.0	555.2	570.0	2141.	[illegible]	[illegible]
04:27:30	- 6.75- 6.77	.1	.0	.0	.0	573.0	537.5	575.6	573.0	555.2	[illegible]	[illegible]	2121.	[illegible]
04:27:45	- 6.33- 6.91	.1-	.0	.0	.0	572.0	537.5	567.1	570.8	555.5	571.0	2078.	[illegible]	[illegible]
04:28:00	- 7.02- 7.03	.1-	.1	.0	.0	573.0	537.0	537.1	575.8	555.5	570.0	2071	[illegible]	[illegible]
04:28:15	- 7.24- 7.25	.0-	.1	.0	.0	573.0	533.1	527.6	570.0	515.2	570.0	2082.	[illegible]	[illegible]
04:28:30	- 7.26- 7.27	.0-	.1	.0	.0	573.3	533.3	537.5	573.3	575.0	[illegible]	2045.	[illegible]	[illegible]
04:28:45	- 7.30- 7.35	.0-	.1	.0	.0	[illegible]	535.2	573.1	573.0	506.3	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	- 7.47- 7.43	.0-	.1	.0	.1	573.0	533.3	573.1	573.0	515.3	[illegible]	[illegible]	[illegible]	[illegible]
04:29:15	- 7.37- 7.33	.0-	.1	.0	.0	573.0	539.8	533.1	573.2	515.7	573.0	2047.	[illegible]	[illegible]
04:29:30	- 7.38- 7.33	.0-	.1	.0	.0	573.0	533.3	573.2	573.3	575.7	[illegible]	2037.	[illegible]	[illegible]
04:29:45	- 7.25- 7.23	.0-	.1	.0	.1	[illegible]	573.2	533.3	573.2	537.5	[illegible]	[illegible]	[illegible]	[illegible]
04:30:00	- 7.34- 7.37	.0-	.1	.0	.0	573.0	571.4	533.3	573.0	537.6	573.0	[illegible]	[illegible]	[illegible]
04:30:15	- 7.23- 7.50	.0-	.1	.0	.0	573.5	532.0	533.0	573.0	533.3	573.0	[illegible]	[illegible]	[illegible]
[illegible]	- 8.22- 8.24	.0-	.1	.0	.0	573.0	532.5	533.3	573.0	518.3	573.0	[illegible]	[illegible]	[illegible]
04:31:30	- 8.33- 8.32	.0-	.2	.0	.0	570.0	573.0	533.1	573.0	531.4	577.0	2065.	[illegible]	[illegible]
04:32:30	- 8.63- 8.71	.0-	.1	.0	.0	573.0	535.4	573.3	573.0	532.1	573.0	1977.	[illegible]	[illegible]
04:33:30	- 7.81- 8.34	.0-	.2	.2	.0	573.2	535.7	535.1	522.3	532.3	573.0	1974.	[illegible]	[illegible]
04:34:30	- 9.34- 9.37	.0-	.1	.0	.0	573.0	534.2	573.9	573.0	531.6	573.0	1335.	[illegible]	[illegible]
04:35:30	- 9.61- 9.70	.0-	.1	.0	.0	573.4	532.0	573.4	538.0	573.5	577.0	1777.	[illegible]	[illegible]
[illegible]	-10.02-10.23	.0-	.1	.0	.0	[illegible]	533.3	573.7	[illegible]	533.3	[illegible]	[illegible]	[illegible]	[illegible]
04:37:30	-10.32-10.45	.0-	.2	.0	.0	573.6	509.0	573.1	560.0	564.2	575.0	1675.	[illegible]	[illegible]
04:38:30	-[illegible]	.0-	.2	.0	.1	[illegible]	531.1	[illegible]	[illegible]	532.1	[illegible]	[illegible]	[illegible]	[illegible]
04:39:30	-[illegible]	.0-	.1	.0	.0	[illegible]	533.3	[illegible]	[illegible]	534.1	[illegible]	1377.	[illegible]	[illegible]
04:40:30	-[illegible]	.0-	.2	.0	[illegible]	[illegible]	[illegible]	533.3	[illegible]	433.2	[illegible]	1677.	1575.	[illegible]

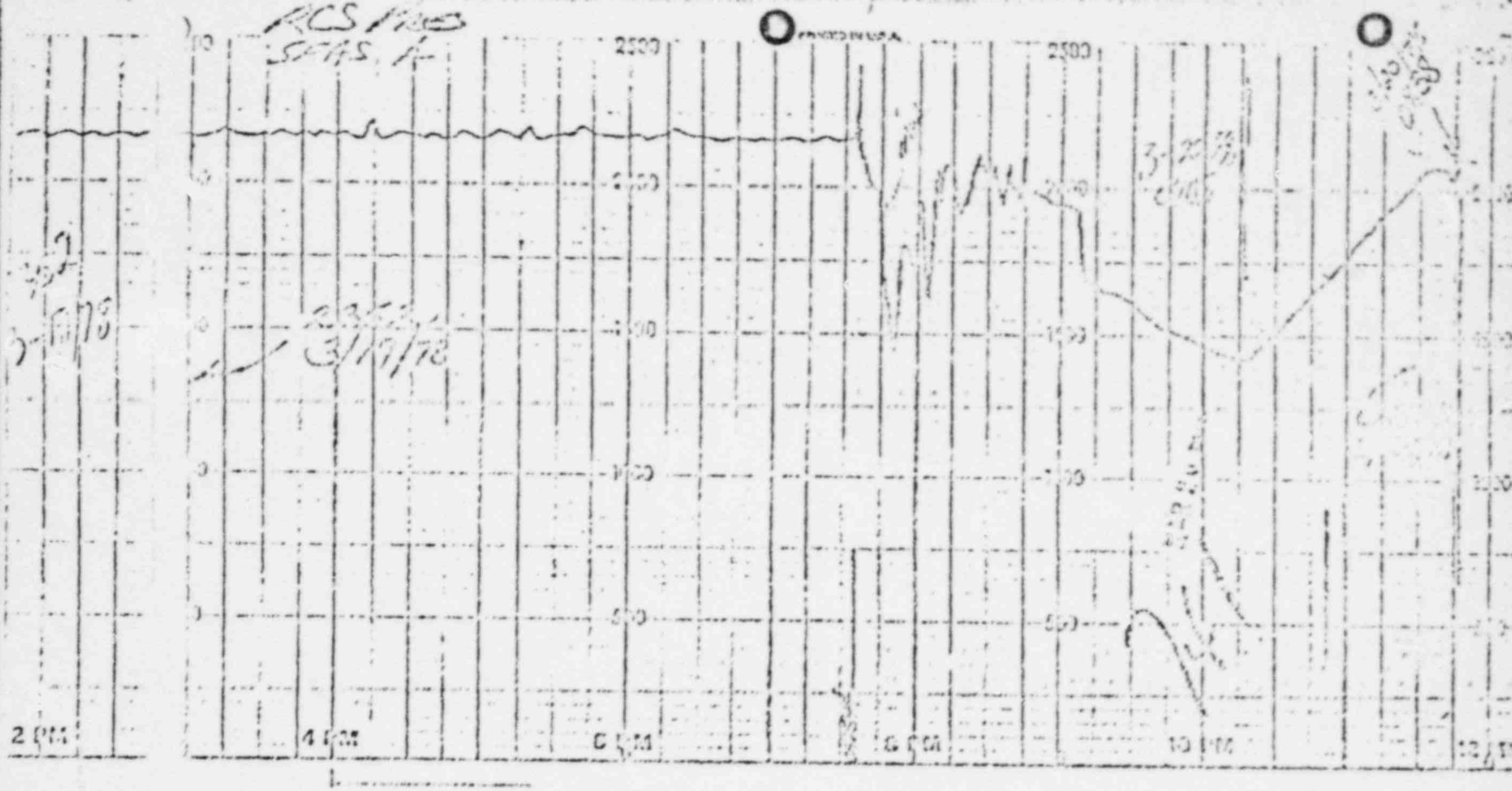
[illegible]

	C140	T[illegible]	C125	[illegible]	T[illegible]	T[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	C123	C124	C125
04:10:45	183.5	643.1	63.13	63.21	432.0	431.9	172.8	173.0	.00				
04:11:45	173.2	643.9	61.23	63.73	432.0	431.3	173.7	173.1	.00				
04:12:45	171.0	643.3	63.23	63.73	432.0	431.9	175.2	175.9	.00				
04:13:45	172.0	645.3	63.34	73.49	432.0	431.3	127.4	175.7	.00				
04:14:45	173.4	643.2	63.23	63.77	432.0	431.5	174.3	180.5	.00				
04:15:45	173.7	643.9	63.24	73.22	432.0	431.3	172.0	177.7	.00				
04:16:45	183.0	647.3	53.35	63.72	432.0	431.9	172.3	172.6	.01				
04:17:45	173.5	647.7	63.43	63.73	432.0	431.3	172.2	177.3	.01				
04:18:45	173.3	647.5	63.75	63.16	432.3	431.3	173.0	173.6	.00				
04:19:45	173.9	647.5	65.23	63.25	432.0	431.5	135.6	175.5	.00				
04:20:45	183.5	647.5	63.23	63.73	432.0	431.2	177.7	174.6	.00				
04:21:00	183.5	647.7	63.33	63.12	432.3	431.9	174.3	183.0	.00				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.00				
04:22:00	180.0	557.3	53.61	63.77	432.0	431.8	171.3	173.5	.00				
04:22:15	178.0	557.3	61.43	63.72	432.0	431.0	174.3	172.6	.00				
04:22:30	178.4	543.3	63.43	[illegible]	432.0	431.9	171.3	177.6	.00				
04:22:45	180.3	642.1	63.23	63.51	432.0	431.9	175.0	171.7	.00				
04:23:00	173.5	642.2	63.23	63.21	431.3	431.3	[illegible]	175.5	.00				
04:23:15	171.3	644.2	67.21	[illegible]	431.3	431.4	[illegible]	177.0	.00				
[illegible]	173.8	642.2	[illegible]	[illegible]	431.3	431.4	174.4	173.5	.00				

G100 - AVE PZR LEVEL
T009 - PZR TEMP
23 - A RCS FLOW
G122 - B " "
T067 - A FW TEMP
T 208 - B FW TEMP
L035 - A OTSG LVL
L036 B " "
G 12 - IMBALANCE

04:24:00 - 179.4 - 648.2 - 69.24 - 65.96 - 437.0 - 431.8 - 170.6 - 176.7 -

[illegible]	[illegible]	63.57	63.23	432.0	431.9	374.1	[illegible]	.03
[illegible]	[illegible]	63.53	63.23	432.0	[illegible]	375.3	373.3	.03
[illegible]	[illegible]	[illegible]	63.73	432.0	[illegible]	377.2	[illegible]	.03
[illegible]	[illegible]	63.20	61.77	432.0	[illegible]	375.2	[illegible]	.03
[illegible]	[illegible]	63.53	63.57	437.0	432.0	373.0	373.6	.03
[illegible]	[illegible]	63.27	63.57	[illegible]	[illegible]	[illegible]	373.2	.03
[illegible]	[illegible]	73.36	68.03	[illegible]	433.4	332.2	[illegible]	.03
[illegible]	[illegible]	[illegible]	67.53	[illegible]	433.9	43.5	[illegible]	.03
[illegible]	243.4	73.24	65.25	[illegible]	434.3	23.3	24.3	.01
[illegible]	[illegible]	[illegible]	66.03	[illegible]	434.3	23.2	20.3	.01
[illegible]	[illegible]	[illegible]	67.73	[illegible]	433.3	24.6	[illegible]	.01
[illegible]	[illegible]	[illegible]	67.73	[illegible]	434.3	[illegible]	[illegible]	[illegible]
[illegible]	347.3	[illegible]	67.53	[illegible]	435.3	23.8	23.7	.03
[illegible]	[illegible]	[illegible]	67.53	[illegible]	[illegible]	23.8	23.3	.03
[illegible]	[illegible]	[illegible]	68.45	[illegible]	[illegible]	23.3	23.5	.03
[illegible]	[illegible]	[illegible]	68.71	[illegible]	[illegible]	23.5	23.7	.03
[illegible]	[illegible]	68.13	67.51	[illegible]	434.2	[illegible]	23.6	.02
[illegible]	[illegible]	68.77	67.91	[illegible]	434.3	23.5	[illegible]	.02
[illegible]	[illegible]	[illegible]	67.[illegible]	[illegible]	434.3	[illegible]	23.3	.03
[illegible]	[illegible]	68.43	67.33	[illegible]	[illegible]	[illegible]	[illegible]	.03
[illegible]	[illegible]	68.27	68.17	[illegible]	[illegible]	23.3	23.3	.02
[illegible]	[illegible]	68.87	71.17	[illegible]	433.0	23.0	23.3	.03
[illegible]	[illegible]	[illegible]	63.63	[illegible]	[illegible]	[illegible]	[illegible]	.03
[illegible]	[illegible]	[illegible]	68.63	[illegible]	434.9	23.8	5.3	.03
[illegible]	637.3	68.73	68.03	[illegible]	434.9	23.1	6.3	.03
[illegible]	[illegible]	67.73	68.33	[illegible]	434.3	[illegible]	6.7	.03
[illegible]	[illegible]	[illegible]	63.33	[illegible]	[illegible]	23.7	7.3	.03
[illegible]	[illegible]	68.23	65.67	[illegible]	[illegible]	23.3	7.6	.03
[illegible]	[illegible]	68.31	67.76	[illegible]	[illegible]	[illegible]	[illegible]	.03
[illegible]	634.3	68.13	67.73	[illegible]	433.3	43.3	7.2	.03
[illegible]	635.2	68.43	67.33	[illegible]	433.9	23.4	7.6	.03
[illegible]	[illegible]	63.67	68.80	220.1	433.7	75.3	[illegible]	.03
[illegible]	633.8	69.22	63.73	[illegible]	433.3	23.4	7.5	.03
[illegible]	631.7	73.13	73.63	[illegible]	433.7	23.2	7.5	.03
[illegible]	634.3	71.73	72.33	233.2	433.3	63.4	23.3	.07
23.4	631.7	71.53	74.23	[illegible]	433.3	135.3	23.9	.05



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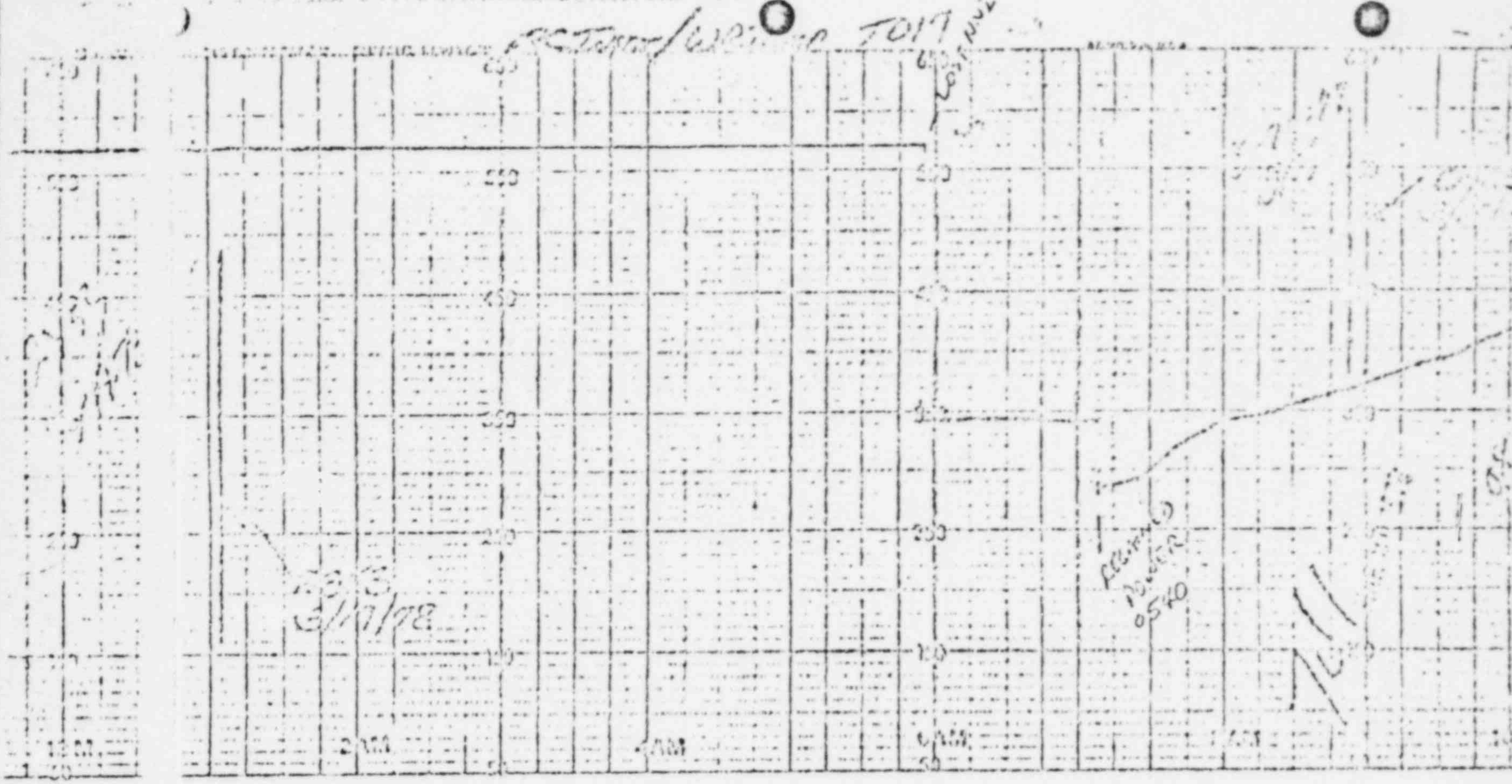

0540

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: Distribution List D	
From: G. M. Olds - Manager, Nuclear Service Department J. C. Deddens - Manager, Engineering Department	BDS 662-5
Cust.	File No. or Ref.
Subj. SMUD NNI Incident Recovery Team	Date March 21, 1978

This letter to cover one customer and one subject only

The Rancho-Seco plant suffered a loss of the NNI System for approximately an hour on 3/20/78. A severe plant transient resulted.

A task force is appointed via this memo to reconstruct the event and to investigate any significant effects on the NSS equipment involved. The task force is expected to derive B&W recommendations to the customer based on their findings. In addition, they will assist SMUD in gaining NRC concurrence with returning the plant to service.

The task force will be headed by B. A. Karrasch, who will work through J. T. Janis with the SMUD organization. Bruce will be assisted by J. J. Kelly.

The Licensing representative will be C. S. Banwarth.

J. M. Burnett will coordinate Component Engineering participation. P. A. Sherburne and J. R. Dumris have started OTSG calculations.

J. A. Castanes will coordinate all activities of the Control and Instrumentation Section.

R. W. Winks and A. W. Brown are proceeding to the plant to assist with the investigation.

Others may be added to the task force as the work proceeds.

Top priority should be assigned to these activities in order to return the plant to service as soon as possible.

GMO:JCD:NF

cc: J. H. MacMillan — J. T. Janis
D. W. Montgomery — C. S. Banwarth
R. H. Ball — J. M. Burnett
J. C. Deddens — P. A. Sherburne
J. H. Taylor — J. R. Dumris
J. D. Phinney — J. A. Castanes
D. H. Roy — K. E. Suhrke

Babcock & Wilcox

Power Generation Group

P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (804) 384 5111

March 23, 1978

Mr. R. J. Rodriguez
Manager, Nuclear Operations
Sacramento Municipal Utility District
6201 S. Street
Sacramento, California

Subject: Rancho Seco Nuclear Generating Station - Unit No. 1
Evaluation of NSS Cooldown Transient

Dear Mr. Rodriguez:

B&W has reviewed the data provided by SMUD regarding the March 20, 1978 reactor trip and resulting cooldown transient, and have performed the following evaluations:

1. Evaluation of RCP seal performance data prior, during and subsequent to the transient.

2. Evaluation of transient conditions with respect to RCP's and CRDM's.

3. Evaluation of transient conditions with respect to fuel assemblies.

4. Evaluation of transient conditions with respect to RV, RC piping, pressurizer, and OTSG's.

As a result of these evaluations, B&W concurs with SMUD's intent to return Rancho Seco to power operation at a power level at or below 75% full power with the following recommendations:

1. The following maneuvering limits be applied for this plant startup:

   a. The maximum rate of power increase below 20% full power shall be 10% per hour.
   b. The maximum rate of power increase between 20% and 40% full power shall be 30% per hour.
   c. Above 40% full power, escalation shall be limited to 3% per hour.

2. Increased surveillance of the loose parts monitoring system for at least a one week period.

3. Performance of an operability check of on-line and redundant NNI instrumentation.

4. Establishment of a procedure for restoring NNI power in the event of a power loss and a commitment to establish by April 7, 1978 operator instructions for immediate action to limit NSS transient if NNI power cannot be immediately restored.

5. Surveillance of primary and secondary radiochemistry on a minimum of a daily basis for at least one week following startup.

B&W NPGD's concurrence with operation of Rancho Seco above 75% full power is contingent upon our QA evaluation of data input provided by SMUD and analyses performed by B&W Engineering, and you will be informed of completion of these activities and our concurrence in a timely manner.

In addition, B&W is performing an evaluation to determine the effects of the transient conditions on the Reactor Coolant System accumulative usage factor and will advise you of these results. As a further measure of verification of OTSG tube integrity, B&W requests additional inspection of the OTSG tubes during your next refueling outage. Those inspection recommendations will be forwarded to SMUD along with B&W's proposed refueling inspection plan prior to the outage.

If you have any questions or require additional information, please advise.

Very truly yours,

Joel T. Janis

Joel T. Janis
Service Manager

JTJ/hh

cc: JJ Mattimoe
DG Raasch
RP Oubre'
JH Johnston

bcc: RM Ball
R. Berchin
JA Castanes
JC Deddens
BA Karrasch
ER Kane
JH MacMillan
GM Olds
JD Phinney

SL Dunike
JH Taylor
Record Center NSS-11 T1.2

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ 6201 S Street, Box 15830, Sacramento, California 95813, (916) 452-3211

RPO 78-28

March 28, 1978

Mr. Joel Jones
Babcock & Wilcox
P. O. Box 1260
Lynchburg, Virginia 24505

Dear Joel:

For discussion with you on Monday, March 27, you requested a chronology of our rise to power over the past weekend. Listed below is that chronology showing the rate of change of power level for the three rises in power.

Criticality @ 1607		3/24/78
0-20%	6%/hr	3/24/78
20-42.5%	6%/hr	3/24/78
Turbine/Reactor Trip at 2230		3/24/78
Criticality @ 0112		3/25/78
0-20%	6%/hr	3/25/78
20-40%	26%/hr	3/25/78
40-55%	3%/hr	3/25/78
55-61%	essentially 0%/hr over a 20-hour period extending into 3/26/78	
Reactor reduced to 10^{-8} intermediate range amps		3/26/78
0-20%	10%/hr	3/26/78
20-50%	17%/hr	3/27/78
50-55%	3%/hr	3/27/78
55-72%	12%/hr	3/27/78

You will note that on the rise to power from 55 to 72% on Monday, March 27, the rate of change was at 12% per hour. This exceeded the recommended rate of change given to SMUD in your letter of March 23, 1978. I request B&W review this rate of change and respond to SMUD on any effect which it may have had. I would appreciate your response as soon as possible.

Respectfully,

R.P. Oubre'

RPO:bal

LONGHAND MEMORANDUM THE BABCOCK & WILCOX COMPANY

TO: Geo. Meyer

FROM: DeMars

CUST.

FILE NO. OR REF.

SUBJ. SMUD SER

DATE 3-21-78

BACKGROUND

FOLLOWING A TRIP THE REACTOR COOLANT TEMPERATURE AND PRESSURE DROPPED. GEO. MEYER HAS DETAILS. THE CHANGE IN TEMPERATURE AND PRESSURE AND ITS EFFECT OF FUEL ROD CLADDING STRESS APPEARS INSIGNIFICANT AND CAN BE TREATED IN A MANNER SIMILAR TO TOLEDO DETERMINATION. THERE IS A HIGH PROBABILITY THE SOME FUEL ASSEMBLIES LIFTED SINCE 4 PUMPS WERE OPERATING AT A TEMPERATURE DOWN TO 400F FOR A PERIOD UP TO 10-12 MINUTES. THIS IS NOT A SAFETY PROBLEM (SEE OCONEE

ACTION LIFT RESOLUTION). HOWEVER AS A PRUDENT PRECAUTION, STARTUP SHOULD BE IN ACCORDANCE WITH MMR'S ASSUMING THAT FA HAS BEEN HANDLED, I.E. 3%/HOUR ABOVE 75% POWER WITH FOUR HOUR HOLD AT POWER LEVEL CUT OFF.

COOLANT ACTIVITY SHOULD BE MONITORED CAREFULLY AND PARTICULAR ATTENTION SHOULD BE PAID TO LOOSE PARTS MONITORING SYSTEM.

MECHANICAL MANEUVERING RECOMMENDATIONS

RANCHO SECO

CONTRACT SMUD

REVISION 0

DATE JUNE 3, 1977

The following are the recommended maneuvering limits for SMUD, Cycle 2:

1. The maximum rate of power increase below 20% full power shall be 10% per hour.

2. Above 20% power, normal operating procedures (Tech. Spec Limits) will apply unless the reactor has operated at less than 20% power for more than 48 hours.

3. If the power level has been below 20% full power for greater than forty-eight (48) hours, the maximum rate of power increase above 20% full power shall be 30% per hour with a five (5) hour hold at 20% full power below the power level cutoff and a five (5) hour hold at the power level cutoff. These holds can run concurrently with holds required by the Technical Specification.

4. During the initial power escalation at cycle startup or immediately following a control rod interchange, the initial escalation above the 40 75% full power shall be limited to 3% per hour, with a five (5) hour hold at the power level cutoff. This hold can run concurrently with Technical Specification holds where applicable.

5. With the exception of item 4 above, no restrictions are placed on required physics startup tests.

[signature]

FUEL ENGINEERING SECTION MANAGER

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: C. M. Olds, Manager, Nuclear Service	
From: B. A. Karrasch, Manager, Plant Integration	BDS 653.3
Cust.: 177 - All	File No. or Ref.
Subj.: SMUD Cooldown Incident	Date: March 29, 1978

This letter to cover one customer and one subject only.

On March 20, 1978, SMUD experienced a loss of power to a substantial portion of the non-nuclear instrumentation (see details - Attachment 3). Although the Reactor Protection System (RPS) and Safety Features Actuation System (SFAS) functioned properly, SMUD still experienced the most severe thermal transient on any B&W plant to date. The subsequent investigation pointed out that additional guidance to our operating customers in the area of limiting potential events of this nature is warranted. Accordingly, the Engineering Department recommends that our operating plant customers be informed of this incident, and suggestions be made on how to minimize the plant thermal transient for loss of NNI and other similar events. Attachment 1, a sequence of events, and Attachment 2, a series of descriptive curves, are provided to assist you in preparation of a customer letter.

In addition, the following recommendations should be made to assure proper operator action for events of this nature:

1. Operators should be trained to recognize a loss of power to all or a majority of their NNI (indicators fail to mid-range, automatic or manual transfer to alternate instrument strings brings no response, etc.). The loss of power is emphasized here rather than the failure of any one instrument or control signal. These minor events are adequately covered in our present simulator course.

2. Given that the operator can determine that he has lost power to all or most of the NNI, he should know the location of the power supplies and power supply breakers and have a procedure available to regain power.

3. If the fault cannot be cleared (e.g., the breakers to the power supplies reopen), he should have a list of alternate instrumentation available to him. Some possibilities are:

   a) ESFAS panels

   b) RPS panels

   c) ICI

   d) SRCI

e) Remote shutdown panels

f) Local gages

g) Plant Computer

Note that each plant will be different in detail, but the list should be developed in advance and the operators thoroughly trained in its usage.

4. The above instrumentation sources should also be keyed to certain critical variables to help the operator select his priorities during the emergency condition. It is recognized that no procedure can cover all the possible combinations of non-nuclear instrumentation failures, however, if the operator knows he has an instrument problem (as opposed to a LOCA or steam line break, for example), he can limit the transient by controlling only a few variables. These are:

   a) Pressurizer level (via HPI or normal makeup pumps)

   b) RCS pressure (via pressurizer heaters, spray, E/M relief valve)

   c) Steam generator level (via feed flow, feedwater valves)

   d) Steam generator pressure (via turbine bypass system)

   The pressurizer level and RCS pressure assure that the Reactor Coolant System is filled and the steam generator level and pressure assure adequate decay heat removal.

In our opinion, the preferred solution is to install safety grade steam generator level instrumentation, start auxiliary feedwater on a low level steam generator signal, and control steam generator level automatically, as is required on our IEOTSG plants. This may not be a practical backfit solution for the operating plants, however, this solution should be suggested as a possible way to assure minimal lost capacity days due to equipment failure. Plant Integration will be happy to assist you in the preparation of the customer letter.

B A Karrasch

BAK:jl

cc:	J. C. Deddens	J. A. Castanes
	D. H. Roy	P. A. Sherburne
	R. M. Ball	J. R. Burris
	T. M. Schuler	R. W. Moore
	C. W. Pryor	R. W. Winks
	L. J. Stanek	J. T. Janis
	K. E. Suhrke	A. W. Brown
	J. S. Tulenko	B. J. Shepherd
	[illegible]	[illegible]
	[illegible]	[illegible]
	J. J. Kelly	H. S. Palme
	J. D. Phinney	J. M. Burnette
	D. F. Hallman	G. A. Meyer

Attachments

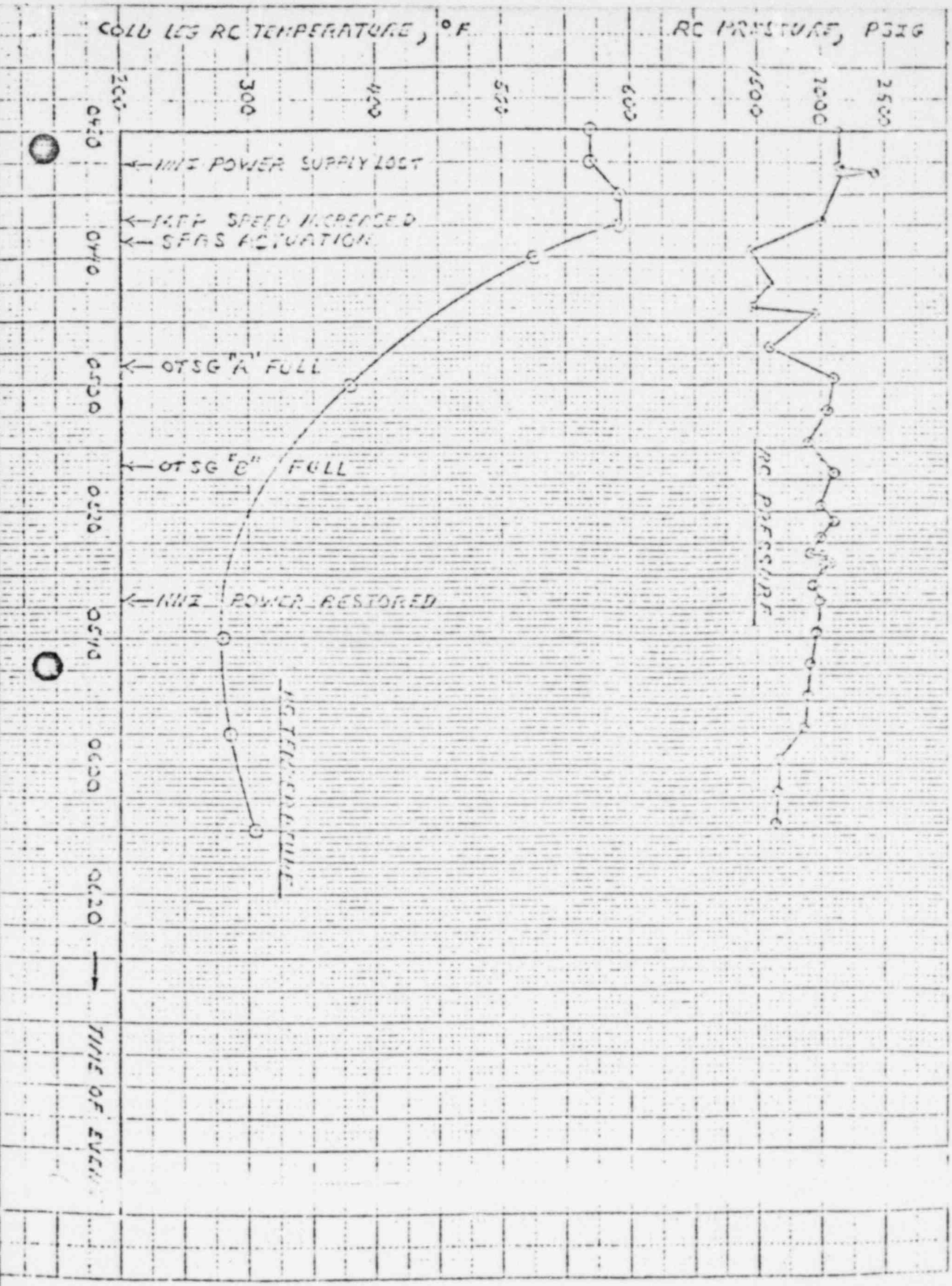
ATTACHMENT III

The operator was in the process of changing a light bulb in a turbine header pressure transfer switch when he dropped the bulb into the switch and shorted the switch to grou[illegible] A protective fuse in the circuit had no chance to blow before the power [illegible]ly monitor circuit sensed the short on the bus and opened the breakers to the "Y" and "Z" power supplies. This resulted in the loss of approximately half the NNI signals ("X" power supply remained energized) and the ability to transfer from "bad" to "good" signals. It should be pointed out that the utility changed the original B&W design in the area of the power supplies. If the original B&W design were installed, the incident would have resulted in the loss of the ability to <u>transfer</u> (select) signals only. No active signal would have lost power.

SEQUENCE OF EVENTS - 04:25(AM) to 05:34(AM)

TIME	EVENT
4:25:35	- Lost NNI power supply cabinets 5,6, & 7 (B&W Channel "Y")
	- This caused a loss of T_H signals to the ICS. BTU limits ran back feedwater, resulting in a loss of feedwater (actual Rx power was 72%).
4:25:46	- Reactor trip on high pressure, turbine trip on interlock.
	- Pressurizer code relief setting was known to be low (≈2225 psig). The electromatic relief was isolated due to previous leakage problems. The data indicates primary pressure went ≈2400 psig =>code relief valve lifted.
4:26:17	- Operator starts HPI pump "B" to maintain pzr. level.
4:28:23	- Operator stops HPI pump "B".
4:30	- OTSG "B" goes dry. Data indicates that "A" OTSG probably also went dry.
4:34:25	- RC pressure ≈1900 PSI (low pressure trip setpoint.
4:34	- Operator increases speed of a MFP and feeds "A" OTSG. This starts RCS on pressure and temperature decrease.
4:37:16	- SFAS actuation at 1600 psig This starts HPI, LPI and initiates aux. feed. Aux. FW valves are opened to full open position. The system makes no automatic attempt to control steam generator water level.
4:40	- RC pressure at 1475 psig. It starts to recover from this point due to HPI. T_{ave} = 528°F.
4:43:56	- "A" HPI pump secured.
4:46:09	- LPI secured.
4:49:54	- "A" HPI initiated. From his point on, the operator started and stopped HPI pumps as necessary to maintain pressurized level.

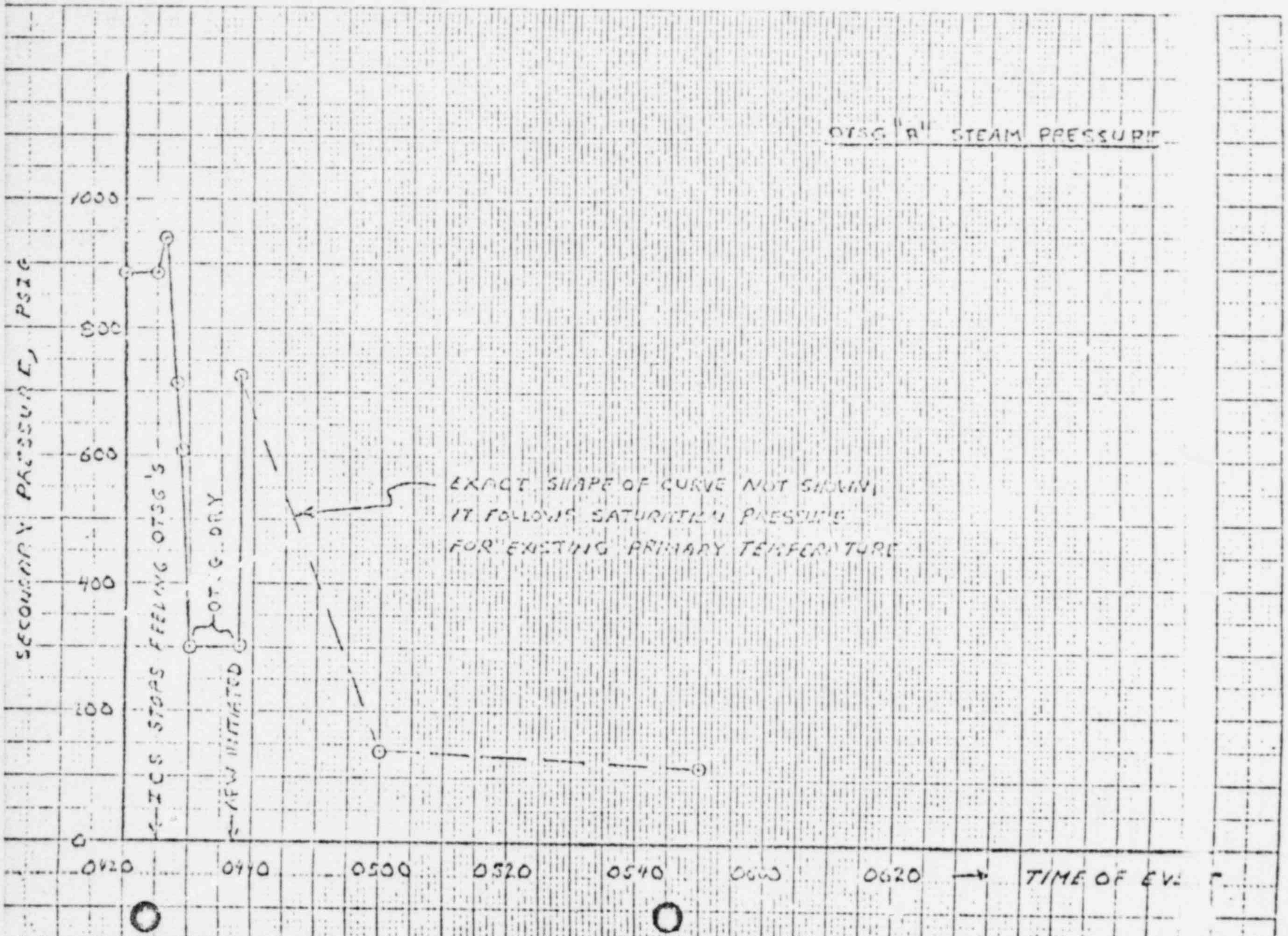
TIME	EVENT
4:51:25	- Secured RCP-D (T_{ave} ≈435°F) This reduced #RCP's to three
4:47:27	- OTSG "A" water level - 599.7" Speculate that ≈2 ft of tubes are not flooded (at top) due to steam line arrangement.
5:00:00	- Hourly computer log printout Steam temp 380°F (OTSG "B") Steam pressure 171 psig (OTSG "B") Assuming $T_{ave} = T_{sat} \Rightarrow T_{ave} = 380°F$
5:13:47	- Power restored to NNI cabinets 5,6, & 7 T_{ave} = 285°F RCS Pressure ≈2000 psig Both OTSG full level ranges pegged high Operator begins to reduce RC pressure using pzr. spray. Operator stops aux. FW pump.



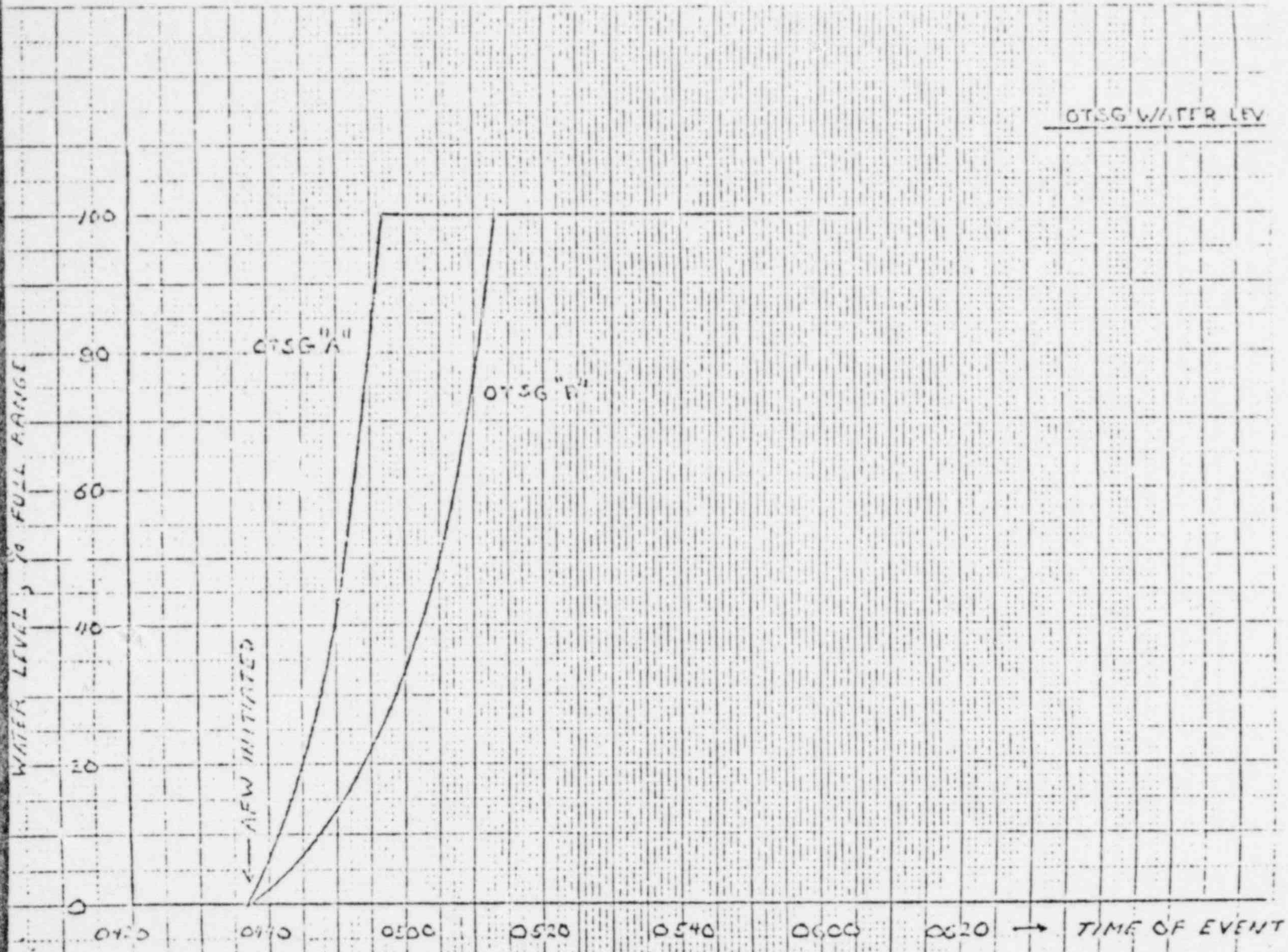
46 1470

ATTACHMENT 2, SH 1 of 3

46 1470



ATTACHMENT 2 SH 2 of 3



ATTACHMENT 2, SH 3 of 3

NSS- 3
SPR 546

TITLE RCV-1 Shaft Scored

RELATED SPRs SPR (1-4LT) 496, 461

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS-________________. The following is the status and/or resolution of this SPR on other contracts.

REMARKS R6 Brumley

03, 04, 05, 9, 12, 13.

This problem will be closed out on generic basis because 1) it's been assigned to the Top Generic Problem list 2) There are other SPR's associated with the problems of this valve (SPR 570) and 3) There is nothing on this particular problem (scored shaft) that can be done or has been seen elsewhere on this valve. The problem has been ~~SPR~~ properly identified ~~as~~ to engineering and Nuclear Services dissatisfaction with the rotating stem valve as a spray valve has been expressed.

RSP 12/26/74

NSS-

NSS-

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

FILE: 1342
Contract 620-00 -03

SPR 546

TITLE RC-V1 Shaft Scored

DATE 2-19-74

To R. J. McConnell (2) For Information

R.C. Buckley - NSE

G. E. Kulynych - Sr. Project Manager

C. C. Plunkett - Contract Admin.

Central Engineering Files

E. V. DeCarli - Quality Assurance

The attached, cleared SPR is submitted for your information.

TO: J. N. Kaelin-Arkansas

J. P. Kennedy-SMUD

K. E. Suhrke

~~R. J. Worsham~~

J. D. Phinney-Met Ed

Attached is one copy of Site Problem Report No. ________ which has been processed on Contract 620-00________. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: No maintenance report written

cc:

R.F. Pittman
NUCLEAR SERVICE SUPPORT ENGINEER

FORMS SS- 3

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

LMP-SPR- 546

To W. C. BUTT - NSE For Action
R. J. McConnell - S.D.M.
L. Allen - A.P.M.

To J. Kaelin - ARK For Information
J. Kennedy - SMUD
J. Phinney - Met Ed
K. Suhrke
H. J. Worsham

CONTRACT 620-00 - 03

SPR 546

TITLE RC-V1 Shaft Scored

DATE 7-18-73

Date Reply to Be Submitted To Nuclear Service Support Engineer

Action Requested: Upon receipt of the DUKE maintenance report the feasibility of exchanging the present bonnet with a new bonnet (possibly from Unit III) will be determined. W.C. BUTT IS investigating other types of valves which are suitable for spray valves i.e (Copes Vulcan, non rotating stem, bellows). Site is requested to fwd DUKE'S maintenance report when its available.

R. L. Pittman
Nuclear Service Support Engineer

cc: G. E. Kulynych
E. G. Ward
G. M. Olds
R. T. Schomer
N. S. Embrey
J. McFarland
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance
R. G. BURNLEY
O. Pettengruber

MANHOUR LIMITS
COST LIMITS
CHARGE No.
APPROVED: L R Allen
Project Manager

FO3-21091-1

SITE PROBLEM REPORT — BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Co CONTRACT NO. 620-0003 SPR NO. 546 SPR REV NO. 0

VENDOR Rockwell P.O. NO. 081480 COMP. NO. 28 GROUP NO. 41 SEQ NO.

PRIORITY 1

PRIMARY DOCUMENTS: SPEC NOS.
DWG NO. EQUIP CODE/LEVEL/DATE
QA LEVEL QA SPEC NO.

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
E. L. Logan			

TITLE (MAX. 30 SPACES) RC-V1

DESCRIPTION OF PROBLEM Reference: SPR's 444, 447 & 496.

VALVE OPERATION ERRATIC ON 7/6/73. SHAFT FOUND TO BE GALLED. SHAFT DRESSED-UP IN PLACE WITH EMERY CLOTH AND VALVE RE-PACKED ON 7/7/73. DURING CHECKOUT ON 7/8/73 THE KEY HOLDING THE GEAR ON THE MOTOR SHAFT WAS FOUND TO BE SHEARED. THE KEY & GEAR WERE REPLACED. OPERATION AT HOT CONDITIONS ON 7/9/73 AM WAS SATISFACTORY. NO PACKING LEAKS.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

VALVE REPAIRED BY DUKE MAINTENANCE AND RETURNED TO SERVICE. DUKE PREPARING FULL REPORT. WILL TRY TO OBTAIN COPY FOR B&W.

~~FURTHER~~ ACTION ~~REQUIRED~~ Recommended BY ~~OTHER THAN~~ SITE PERSONNEL -

Consider replacing Lantern Ring w/packing. Box in yoke for leakage Collection

RECOMMENDED ACTION

Duke never wrote report - Other SPR(s) cover the valve ∴ closing this SPR

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	E L Logan	7/9/73
SITE CONSTR. REP.		
SITE OPER. MGR.	by RDM for R.M. McConnell	7/10/73
NS SUPPORT ENGR.	R L Pittman	7/18/73
PROJECT MANAGER		

DOCUMENTS AFFECTED / ACTION TAKEN

- ☐ Drawings
- ☐ Proc. Specs
- ☐ Instr. Books
- ☐ Operating Procedures
- ☐ Tech. Specs
- ☐ PSAR/FSAR
- ☐
- ☐ Recommended Site Change

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 655-3
SPR 546

Cost Category ☐ None ☐ C ☐ D ☐ O ☐ I

Auth Charge No.

RESPONSIBILITY ASSIGN.

Date Completed ____

By: ____

Field Change Req. ☐

Field Change No. ____

OTHER CONTRACTS AFFECTED

DEVIATIONS
☐ NONE
☐ SEE REV. ____

Closed R.M. McConnell 1/29/74

File
SPR546

~~Program Director~~

J. P. Ittner
RLP

SPR —

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

BDS 663-5

To: R. R. Beach	
From: E. L. Logan ELL	
Cust.: Duke Power	File No. or Ref.
Subj.: MORE ON 1 RC-4 (RC-V2) and 1 RC-1 (RC-V1)	Date 12/18/73

This letter to cover one customer and one subject only

Limit Switch LS-9 was added to the 1 RC-V2 circuit on 12/12/73. (See Fig. 1) The switch was set to stop valve travel at <u>4 turns</u> of the handwheel from the full closed position. This appears to have solved the opening problem as this valve was opened on 12/16/73 at full temperature and pressure. Now the valve cannot be closed. Two attempts were made on 12/17/73 and both times the overloads tripped. The 15 ft # motor is evidently not strong enough to start the valve toward the closed position.

As you know Duke replaced the yoke bushing on 1 RC-1 (1 RC-V1) on 11/23/73 (SPR # 570). The replacement bushing was not the correct one as Rockwell had shipped the wrong replacement part to Duke. Duke had planned to replace this bushing during the December outage. The valve became inoperable on 12/16/73. The valve indicates open when commanded open, but system conditions indicate the valve stays closed. If the bushing is stripped as before, it seems the valve would be hung open rather than closed. This problem will have to be investigated during the next Unit I shutdown. Duke has closed 1 RC-3 (1 RC-V) to preclude an open failure of 1 RC-1 causing a plant shutdown as occurred on 11/20/73.

The Unit I pressurizer valve line-up is as follows:

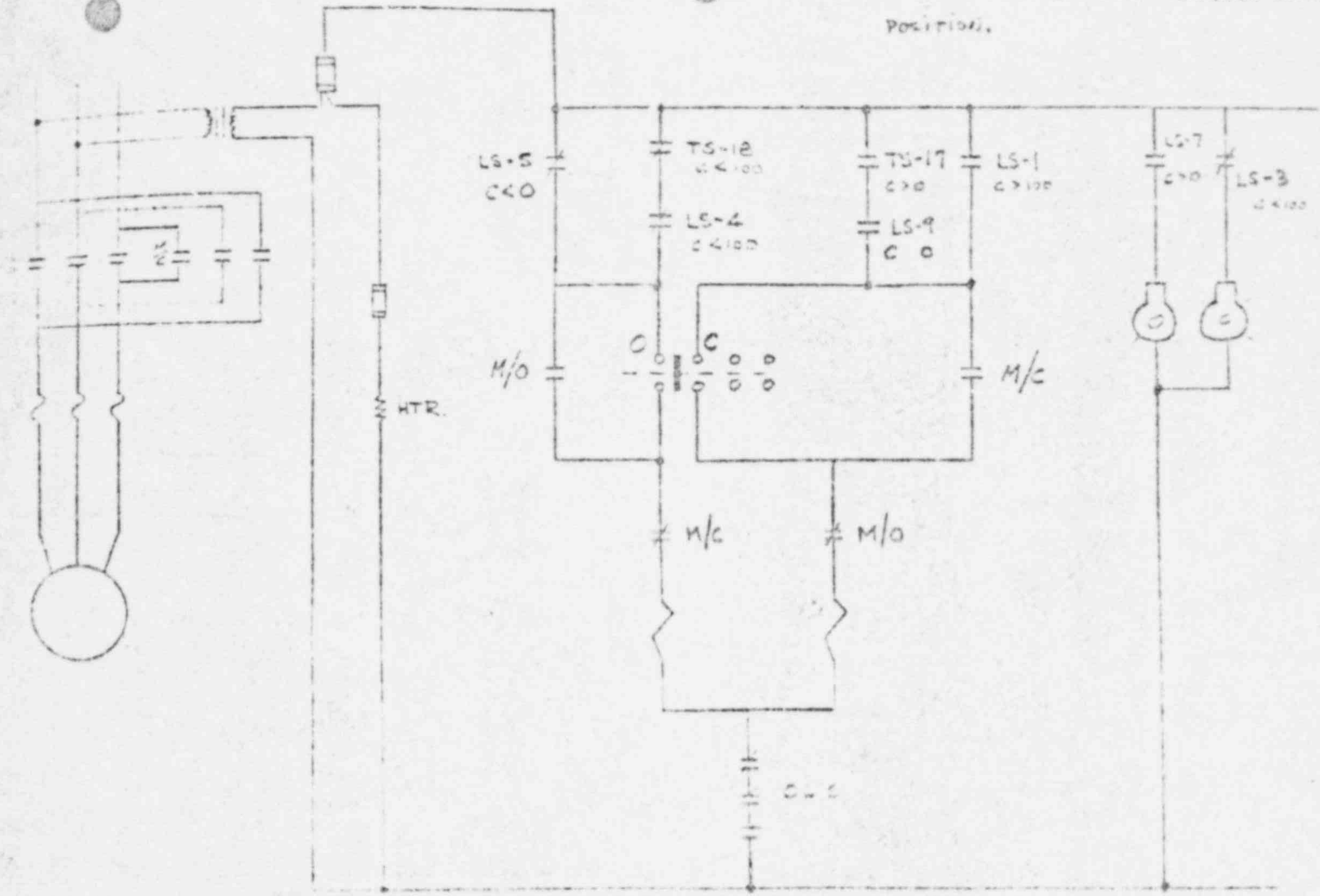
Spray Valve (RC-1)	- Closed and Inoperable
Spray Block (RC-3)	- Closed
Electromatic Relief (RC-66)	- Operable
Elec. Block (RC-4)	- Open and Inoperable

Since 12/15/73 we have been able to obtain comparative RCS and pressurizer boron concentrations. This is in response to SPR-557 and B. A. Karrasch's memo of 11/19/73. Figures 2 and 3 are plots of these values for both Units I and II. The Unit I continuous vent (.1 to .4 gpm) was secured on 12/17/73. Before the system is cooled down, we will investigate for leaking valves, etc. Unit II is indicative of normal operation since a conscious effort has been made to maintain RCS boron concentration constant with only the spray valve bypass flow into the pressurizer.

ELL/bh

cc: J. P. Ittner ✓
R. V. Straub
C. A. Creacy
R. L. Pittman
R. G. Burnley
E. L. Logan
W. C. Butt
B. Karrasch
R. J. McConnell

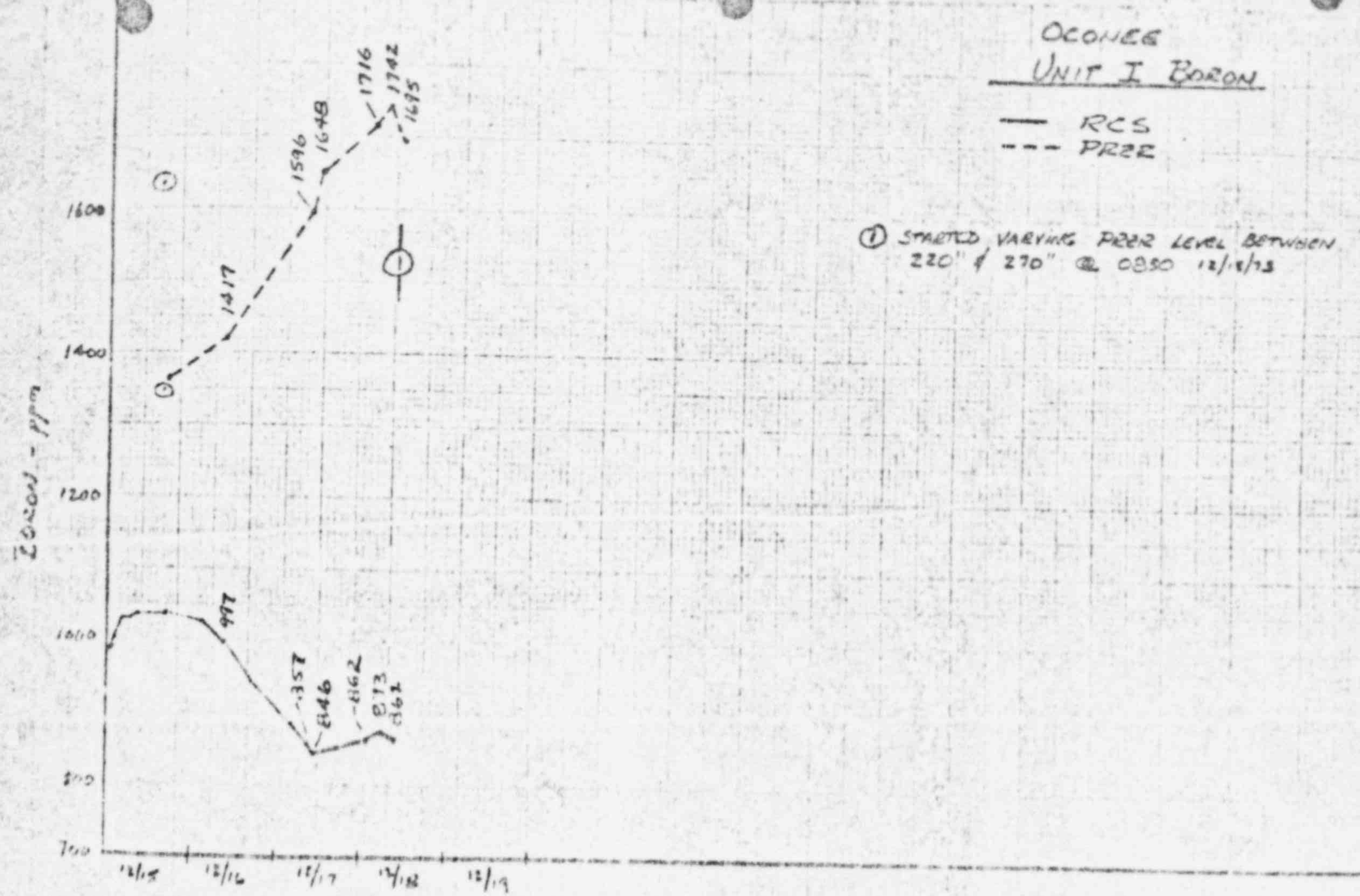
NOTE: LS-9 ADDED 12/13/73 TO STOP VALVE TRAVEL BEFORE FULLY "TORQUED CLOSED" POSITION.



1 RC-4 CONTROL WIRING
(REV. 2R2-V2)

FIGURE 1

LOGAN



OCONEE
UNIT I BORON
RCS
PRZR
① STARTED VARYING PRZR LEVEL BETWEEN 220" & 270" @ 0850 12/18/73
BORON - ppm
1600
1400
1200
1000
800
700
12/15
12/16
12/17
12/18
12/19
1417
1596
1648
1716
1742
1695
997
857
846
862
873
861

FIGURE 2

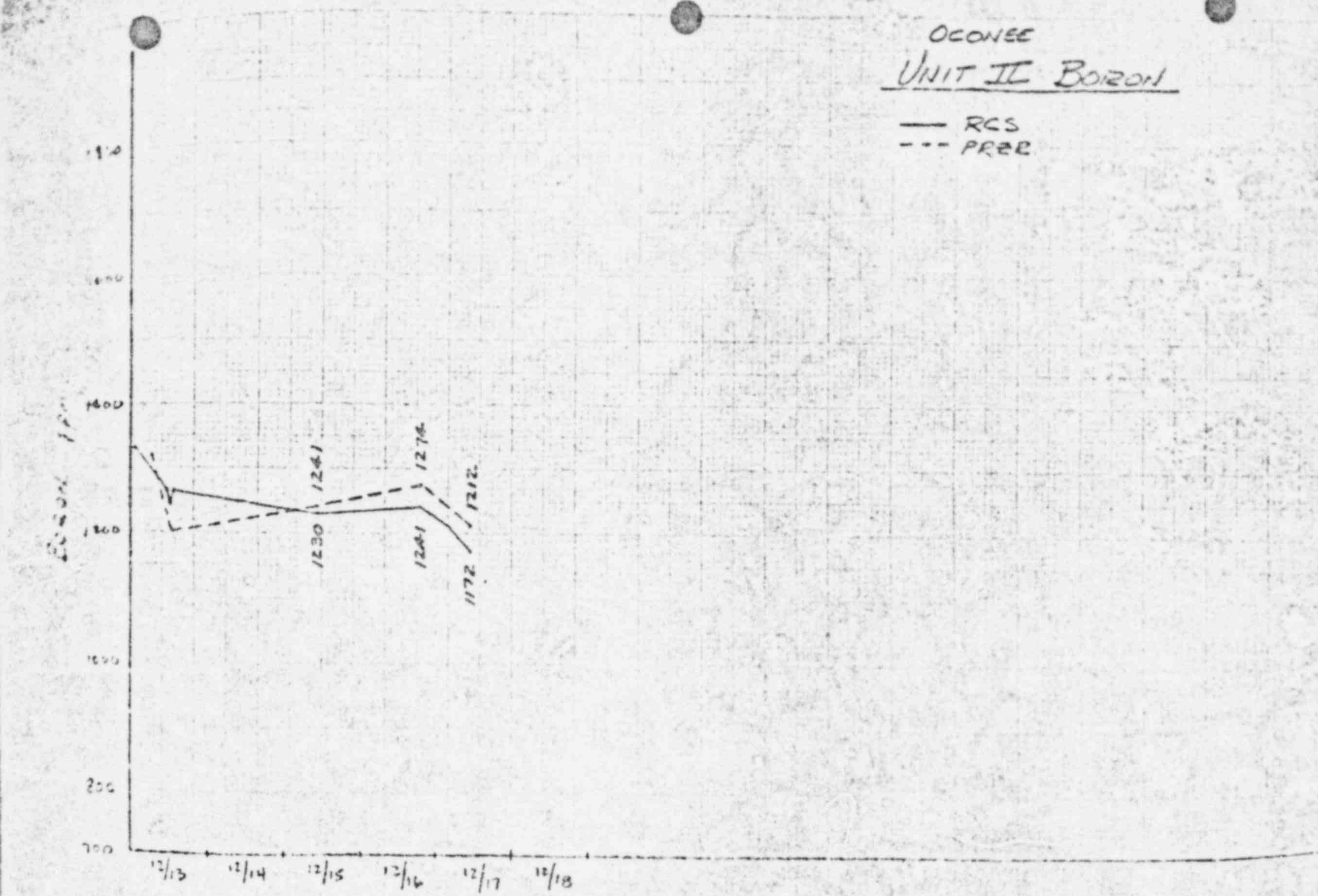


FIGURE 3

LOGAN

K. PITTMAN

LIMITORQUE CORPORATION

AFFILIATED WITH PHILADELPHIA GEAR CORPORATION
181 South Gulph Road, King of Prussia, Pa. 19406
Telephone (215) 265-3000 Telex-84-6321

Reply to:
4610 Old Pineville Road
Charlotte, North Carolina 28210
Phone: (704) 527-2618

COPY

January 2, 1974

Babcock & Wilcox
c/o Duke Power Company
Oconee Nuclear Station
P. O. Box 1175
Seneca, South Carolina 29678

Attention: Mr. Roy Mc Connel

Subject: Pressurizer Spray Valve, Tag RCVI,
Located at Duke Power Co., Oconee Nuclear Station
Rockwell Size 2½", Figure 3628M
Limitorque SMB-2-40, per Mfg. No. 342869D
Rockwell P.O. 36-29014, Dwg. B-441804

Gentlemen:

The purpose of this letter is to confirm our 'phone conversation of December 31 and to enumerate the immediate and long term actions taken to eliminate the problem encountered at the above valve application.

The immediate action to be taken is:

A. Continue to utilize the present SMB-2 operator with alterations to the Bellville washers (torque spring package) and motor.
B. Rewind the motor from 3600 RPM to 1800 RPM.
C. Change from the present 13-spring washer set (.189" thick -.0787" dish) to a 9-spring washer set (.1378" thick -.0984" dish)
D. Set the torque switch on both sides, (both scales), at 1½ so the operator will torque out at 93'# at the stem nut.

The immediate action recommendations arose from the need to quickly eliminate the problem within a 3 day span and were based on an actual operating pressure differential of 50 psi where the maximum differential to be encountered would be 200 psi.

(continued)

cc: Mr. Joe Davis, Duke Power Co., Seneca, S.C.
Mr. Bob Burnley, Babcock & Wilcox, Lynchburg, Va.
Mr. Ed Logan, Babcock & Wilcox, Seneca, S.C.
Mr. Tom Stoecker, Rockwell, Raleigh, N.C.
Mr. Jim Morris, Rockwell, Raleigh, N.C.

The effect of the above modifications will be observable within the next few days and will probably be taken into account by Jim Morris of Rockwell and Bob Burnley of your company in their present long range decision. I say long range since I understand they are contemplating going to a smaller motor and operator on this and a second valve. The time required to manufacture new operators and coordinating their installation at the next downage necessarily make it a long range action.

This immediate action of 12-28 through 12-31 has in essence relied on decreasing the valve stem speed and making the torque cut-out feature more sensitive. With it's success, Jim and Bob may want to consider decreasing the speed on any other similar problem applications by altering gear ratios and altering torque spring packages, and keeping the present operators.

On the part of Limitorque Corporation, our next step is to get in touch with Rockwell and be of service to Jim Morris in his evaluation and action on this valve and operator application.

Very truly yours,

LIMITORQUE CORPORATION

George Cusack
District Manager

GC:fa

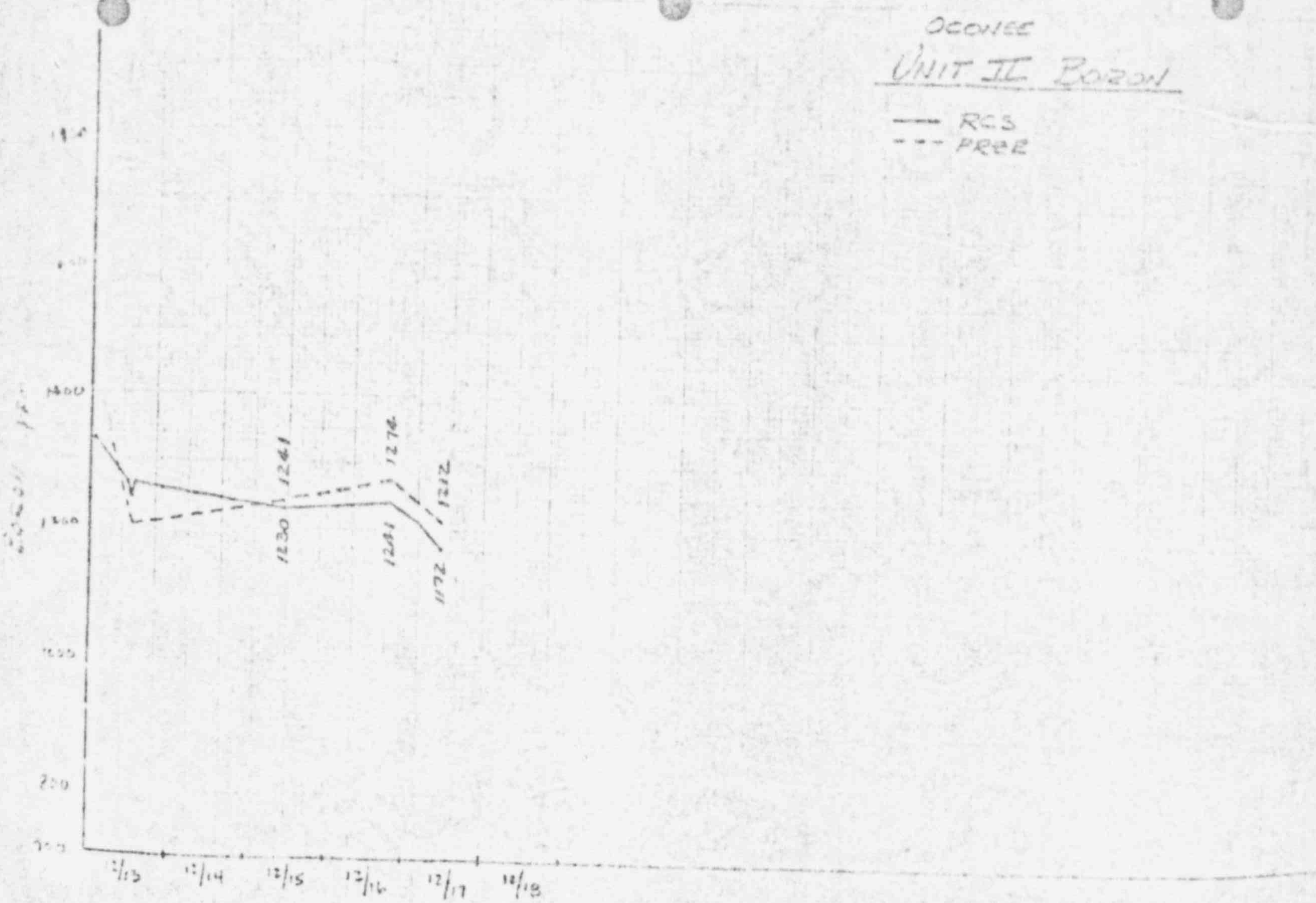


FIGURE 3

LOGAN

RLP

Babcock & Wilcox

Power Generation Group
P.O. Box 1260 Lynchburg, Va. 24505
Telephone: (804) 384-5111

December 28, 1973 SOM 641

Duke Power Company
Oconee Nuclear Station
P. O. Box 1175
Seneca, South Carolina 29678

Subject: RC-V1 (Spray Valve) Interim "Fix"

Attention: Mr. J. Ed Smith

Dear Mr. Smith:

RC-V1 has experienced a high failure rate. This is apparently due to the forces exerted on it by the high speed operator (SMB-2-40), provided to achieve the desired RCS transient response.

B. & W. has ordered SMB-0-15 operators to replace the current RC-V1 operators on all three units, however; the promised delivery on these units is 25 weeks. The smaller operators are permitted by re-evaluation of the required transient response and should improve the performance of RC-V1.

As an interim means of extending the life of the spray valve, B. & W. recommends modifying the existing operator to reduce its power or exchanging it with a lower powered operator.

RC-V5 (spray line block valve) is identical to the spray valve but has a smaller operator (SMB-00) as it has no transient response requirements.

Exchanging these operators has been reviewed by B. & W. and would provide an increased reliability for the spray valve at the cost of decreased transient response. As operation with no spray flow has been reviewed by the Station Review Committee and found to be permissable, operation with a slow spray valve should also be acceptabl .

RC-V5 is very seldom operated and use of the larger operator should not greatly affect its life. The proper operator would be re-installed when the replacement RC-V1 operators became available.

Please note that there is a difference in the motor voltage between the two operators, and the control circuits would also require modification.

We will be glad to review any alternate means of decreasing the power of the RC-V1, which you may find available.

Yours truly,

R. J. McConnell

R. J. McConnell
Site Operations Manager

RJM/bh

cc: R. R. Beach,
G. E. Kulynych and J. P. Ittner

B. Pittman

[illegible]

cc: [illegible] Burnley
R. Pittman

[illegible] Sr. Buyer

Do not type below this line.

Date [illegible]-73

FILE NFS- 3
12M2-SPR- 546

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To W.C. BUTT - NSS For Action
R.J. McConnell - S.D.M.
L. Allen - A.P.M.

To J. Kaelin - ARK For Information
J. Kennedy - SMUD
J. Phinney - Met Ed
K. Suhrke
H.J. Worsham

CONTRACT 620-00 - 03

SPR 546

TITLE RC-V1 Shaft Scored

DATE 7-18-73

Date Reply to Be Submitted To Nuclear Service Support Engineer

Action Requested: Upon receipt of the DUKE Maintenance report, the feasibility of exchanging the present bonnet with a new bonnet (possibly from Unit II) will be determined.
W.C. BUTT IS investigating other types of valves which are suitable for spray valves i.e (Copes Vulcan, non rotating stem, bellows). Site is requested to fwd DUKE's maintenance report when its available.

R. C. Pittman
Nuclear Service Support Engineer

cc: G. E. Kulynych
E. G. Ward
G. M. Olds
R. T. Schomer
N. S. Embrey
J. McFarland
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance
R.G. BURNLEY
O. Pettsgruber

MANHOUR LIMITS
COST LIMITS
CHARGE No.
APPROVED: L. Allen
Project Manager

PDS-21091-1.

SITE PROBLEM REPORT — BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Co. CONTRACT NO. 620-0003 SPR NO. 546 SPR REV. NO. 0

VENDOR Rockwell P.O. NO. 081480 COMP. NO. 28 GROUP NO. 41 SEQ NO.

PRIMARY DOCUMENTS: DWG NO. ______ QA LEVEL ______ SPEC NOS. ______ EQUIP CODE/LEVEL/DATE ______ QA SPEC NO. ______

PRIORITY 1

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
E. L. Logan			

TITLE (MAX. 30 SPACES) RC-V1

DESCRIPTION OF PROBLEM Reference: SPR's 444, 447 & 496.

Valve operation erratic on 7/6/73. Shaft found to be galled. Shaft dressed-up in place with emery cloth and valve re-packed on 7/7/73. During checkout on 7/8/73 the key holding the gear on the motor shaft was found to be sheared. The key & gear were replaced. Operation at hot conditions on 7/9/73 AM was satisfactory. No packing leaks.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

Valve repaired by Duke Maintenance and returned to service. Duke preparing full report. Will try to obtain copy for B&W.

~~FURTHER~~ ACTION ~~REQUIRED~~ Recommended BY ~~OTHER THAN~~ SITE PERSONNEL -

Consider replacing Lantern Ring w/packing. Box in yoke for leakage collection

RECOMMENDED ACTION

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	E. L. Logan	7/9/73
SITE CONSTR. REP.		
SITE OPER. MGR.	R. M. Bonnell	7/10/73
NS SUPPORT ENGR.	R. L. Pittman	7/18/73
PROJECT MANAGER		

DOCUMENTS AFFECTED	ACTION TAKEN
☐ Drawings	
☐ Proc. Specs	
☐ Instr. Books	
☐ Operating Procedures	
☐ Tech Specs	
☐ FSAR/PSAR	
☐	
☐ Recommended Site Change	

Field Change Req ☐

Field Change No ______

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 ASS 3
SPR 546

Cost Category ☐ Norm ☐ C ☐ D ☐ O ☐ I

Auth. Charge No.

RESPONSIBILITY ASSIGN.

Date Completed ______

By: ______

OTHER CONTRACTS AFFECTED

DEVIATIONS ☐ NONE ☐ SEE REV. ______

INSTRUCTIONS FOR PDS-21091 - SITE PROBLEM REPORT

Initiated by B&W Nuclear Service

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No., Component No.; Group No.; Sequence No.; Drawing No., Title, Description of Problem, Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature, Date.

2. SITE OPERATIONS MANAGER - FILL IN: SPR No. and Rev. No., Priority; Site Engineer, Early Start Date; Required Completion Date, Approval Signature; Date.

   Note: Assign priority No. 1 or 2 defined as follows:

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. NUCLEAR SERVICE SUPPORT ENGINEER - FILL IN: Primary Documents; Documents Affected; Cost Category, Authorized Charge No., Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal nuclear service expenditures) are not to be incurred, take the following steps: (a) Approve SPR, (b) Indicate "Not Required" in space provided for project manager's approval, and (c) Distribute as indicated in step 5 below.

   If field change is not required but additional costs (over and above normal nuclear service expenditures) are to be incurred, approve SPR and forward to project manager for approval (step 4).

   If field change is required, see procedure No. NPG-0402-07; obtain field change No. from project manager, and indicate field change No. on SPR.

4. PROJECT MANAGER - Approve SPR and Return to Nuclear Service Support Engineer.

5. NUCLEAR SERVICE SUPPORT ENGINEER - Distribute in Accordance With Procedure No. NPG-0402-04; Initial Action Taken Box (on Support Engineer's File Copy) When Documents Affected Have Been Corrected.

6. SITE OPERATIONS MANAGER - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-04. Return completed SPR to nuclear service support engineer.

Initiated by B&W Construction Company

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title; Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SENIOR CONSTR. CO. SITE REPRESENTATIVE - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer. Early Start Date, Required Completion Date, Approval Signature, Date.

   Note: Assign priority No. 1 or 2 defined as follows.

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. PROJECT MANAGER - FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No., Responsibility Assignment, Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal construction Co. expenditures) are not to be incurred, take the following steps: (a) Approve SPR, and (b) Distribute in accordance with procedure No. NPG-0402-05.

   If field change is not required but additional costs (over and above normal construction Co. expenditures) are to be incurred, obtain abnormal cost charge No. from contract administration; approve and distribute in accordance with procedure No. NPG-0402-05.

   If field change is required, see procedure No. NPG-0402-07; assign field change No., have approved and distribute in accordance with procedure No. NPG-0402-05.

4. SENIOR CONSTR. CO. SITE REPRESENTATIVE - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-05. Return completed SPR to the project managrr.

NSS- 8

456

TITLE 855 Pzr Level Indication

RELATED SPRs

This SPR has been reviewed by Task Engineering Groups and is applicable to NSS- None. The following is the status and/or resolution of this SPR on other contracts.

REMARKS B.mco responsible for applicability.

11/20/73 - Per G.J. Gibbs this problem is N.A. to other contracts. Computers on other contracts have pts for Temp & pressure.

DCA

NSS-

NSS-

ACTION COMPLETE
ON ALL CONTRACTS

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

To H.A. BAKER For Information

G.J. GIBBS

C. C. Plunkett - Contract Admin.

Central Engineering Files

E. V. DeCarli - Quality Assurance

FILE: 12M2

Contract 620-0008

SPR 456

TITLE 855 PZR LEVEL INDICATION

DATE 2/19/74

The attached, cleared SPR is submitted for your information.

TO: ___ J. D. Phinney

___ J. P. Kennedy

___ R. J. McConnell

___ D.L. ALLISON

Attached is one copy of Site Problem Report No. 456 which has been processed on Contract 620-0008. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: NO ACTION TAKEN ON ARK. ENG. SHOULD CONSIDER CORRECTION ON NEW CONTRACTS.

cc:

[signature]

NUCLEAR SERVICE SUPPORT ENGINEER

CLEARED

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Arkansas Power & Light CONTRACT NO. 0005 SPR NO. 456 SPR REV NO - 0

VENDOR BMCo. P.O. NO. 908210 COMP. NO. 25 GROUP NO. 01 SEQ NO. 01

PRIMARY DOCUMENTS: SPEC NOS. DWG NO. EQUIP CODE/LEVEL/DATE QA LEVEL QA SPEC NO.

PRIORITY 1

SITE ENGINEER F. R. Faist

EARLY START DATE ACTUAL START DATE REQ'D COMP DATE 9/20/73

TITLE (MAX. 30 SPACES) 855 PZR LEVEL INDICATION

DESCRIPTION OF PROBLEM

See Attachment.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

Problem discussed with J. Albert with regards to NNI. However problem is in 855 software and G. Gibbs was contacted with regard to software problem. E. Davis contacted.

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

B & W and BMCo. to provide recommended modifications to 855 software in order to comply with customers request.

RECOMMENDED ACTION SEE ATTACHED LETTER H.A. BAKER TO T.D. STABLES 1/04/74

Attached copy of SPR reads as follows: DIRECT READING RC PRESSURIZER LEVEL A TEMP. COMPENSATED 1808 IN THE COMPUTER NOW. EXISTS AS POINT READ OUTS OF ΔP SENSORS. POINTS 0417, 0418, & 0419 ARE IS MISLEADING, IT CAN BE CHANGED LATER BY ARKANSAS. IF THE POINT DESCRIPTION (1808)

APPROVALS TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	F. R. Faist	9/1/73
SITE CONSTR. REP.		
SITE OPER. MGR.	[signature] RC	9/4/73
NS SUPPORT ENGR.	Bud D Stables	12/5/73
PROJECT MANAGER	H A Baker	1/ /74

DOCUMENTS AFFECTED: ☐ Drawings ☐ Proc Specs ☐ Instr Books ☐ Operating Procedures ☐ Tech Specs ☐ PSAR/FSAR ☐ ☐ Recommended Site Change

ACTION TAKEN

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 ____

Cost Category ☐ Norm ☐ C ☐ D ☐ O ☐ L

Auth Charge No

RESPONSIBILITY ASSIGN.

Date Completed 2/14/74

By: FRFaist

Field Change Req ☐

Field Change No ____

OTHER CONTRACTS AFFECTED

This problem should be corrected for all future contracts. RC

DEVIATIONS ☐ NONE ☐ SEE REV ____

Closed under protest! 2/14/74 [signature]

SPR# 456

Description of Problem

Reference 1) BWCo. Dwg. #2603477SC sheet 1 of 6, RC Control
Loop RC 1 and 2.

The reference dwgs. indicates that the three pressurizer level transmitters RC1-LT1, LT2 and LT3 each provide a pressurizer level input to the computer. The computer is presently programed to read transmitter output which is a Δ P signal (wet leg on the TIR level transmitters). Consequently, upon calling for pressurizer level, Point ID's 0417, 0418 and 0419, the computer output is that of level transmitter Δ P (inches) not pressurizer water level! AP&L has informed B&W site personnel that this is extremely confusing to operations and that the present situation is totally unacceptable.

Recommended Action

Since uncompensated pressurizer level can be in great error, it was recommended by B&W site personnel and AP&L personnel that the computer output for pressurizer level inputs, PT. ID. NO. 0417, 0418, 0419 be temperature, pressure compensated pressurizer level.

Again, AP&L is extremely displeased with the present arrangement and expects to see a modification.

FRF/sp

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To T. D. Stables - Nuclear Services	
From H. A. Baker - Associate Project Manager - 2158	BDS 663-5
Cust. Arkansas Power & Light Co.	File No. or Ref. NSS-8/8A25
Subj. SPR 456	Date January 14, 197[illegible]

This letter to cover one customer and one subject only

We agree that the representation of pressurizer level transmitter inputs to computer in terms of uncompensated delta P is confusing. However, the operator has available an average compensated pressurizer level readout as Point 1808 on the computer. In addition he has available a readout of the compensated pressurizer level signal selected for control on RC1-LR.

The attached correspondence indicates that this is a situation of long standing and are included for your information. Since the cost of the suggested changes to make the operators life a little easier is very high, we would like to leave the status as is and intend to make no changes.

H A Baker
H. A. Baker

HAB/pmf
CC: w/att
J. N. Kaelin
J. Bodmann

PDS-21091-1

SITE PROBLEM REPORT BABCOCK & WILCOX-NPG

CUSTOMER Arkansas Power & Light CONTRACT NO. 0008 SPR NO. 456 SPR REV NO - 0

VENDOR EMCo. P.O. NO. 808217 COMP. NO. 25 GROUP NO. 01 SEQ NO. 01

PRIMARY DOCUMENTS: SPEC NOS. ______
DWG NO. ______ EQUIP CODE/LEVEL/DATE ______
QA LEVEL ______ QA SPEC NO. ______

PRIORITY 1

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
F. R. Faist			9/1973

TITLE (MAX. 30 SPACES) 855 PZR LEVEL INDICATION

DESCRIPTION OF PROBLEM

See Attachment.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.
Problem discussed with J. Albert with regards to NNI. However problem is in 855 software and G. Gibbs was contacted with regard to software problem.
E. Davis contacted.

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL
B & W and EMCo. to provide recommended modifications to 855 software in order to comply with customers request.

RECOMMENDED ACTION
A temp compensated direct reading RC pressurizer level point exists in the computer now. Points 0417 0418, 0419 are now out of ΔP sensors. If the point description is misleading it can be changed later by Arkansas.

G. Gibbs

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	Fred R Faist	9/1/73
SITE CONSTR. REP.		
SITE OPER. MGR.	J. Karlin RC	9/4/73
NS SUPPORT ENGR.		
PROJECT MANAGER		

DOCUMENTS AFFECTED / ACTION TAKEN
☐ Drawings
☐ Proc. Specs
☐ Instr. Books
☐ Operating Procedures
☐ Tech. Specs
☐ PSAR/FSAR
☐
☐ Recommended Sites Change

Field Change Req'd ☐
Field Change No ______

DISTRIBUTION
SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 ______

Cost Category ☐ Norm ☐ C ☐ D ☐ O ☐ L

Auth Charge No

RESPONSIBILITY ASSIGN.

Date Completed ______
By: ______

OTHER CONTRACTS AFFECTED

DEVIATIONS
☐ NONE
☐ SEE REV ______

Bailey Babcock & Wilcox

INTER OFFICE MEMO

To: J. J. Bodmann	Office or Dept. NPO	Symbol or Mail Station No. 3B7	
From: M. W. Boesch	Office or Dept. Software Engineering	Symbol or Mail Station No. 2C8	
Customer & Plant: APL-Nuclear Unit #1	Engineers or Contractor		S.O. No. 1601L
Subject: Problem Report #303T-E10 (A172)			Date: November 26, 1973

Reference:

(1) R. L. Healer to M. N. Zaharna dated 6/8/73 discussing the RC Pressurizer Level Temperature Compensation Calculation.

(2) Spec Sheet representing S.O. 1601L125

(3) CS-3-90 Computer Spec for NSS-8 dated January 4, 1971

In the revised submittal of PR #303T-E10, Bailey Meter CMO is requested to touch base with B&W to get proceedings in motion to change the subject computer points to temperature compensated pressurizer level. I believe what the Bailey PSS means is that the APL personnel are requesting that all three computer differential pressure inputs should have calculated results rather than being averaged into one calculated result.

In the CS-3-90 dated January 4, 1971, Bailey is requested to supply 3 computer inputs representing uncompensated level readings (Sec.7.9, Page 8A.6). At a later date, Bailey was instructed to represent all uncompensated inputs as differential pressure inputs as opposed to uncompensated levels (Reference (1) above, Page 2, Item 1).

Also, in the CS-3-90 dated January 4, 1971, Bailey is requested to supply only one RC Pressurizer Level Computed Result (Sec. 7.9, Page 8A.27, Line 906). This Computed Result is currently an average of the three differential pressure inputs after temperature compensation. Thus, Bailey is according to spec and any change to existing program logic could only come as a result of B&W direction.

MWB:ll

M. W. Boesch

MWB

Distribution:

MWBoesch (4)

PROBLEM REPORT | FILE NO. 303T-E10 | 8/10/73 | E. CLAUSS | 32481 | 786

RUSSELLVILLE, AR

AR POWER & LIGHT NUCLEAR #1

REF AS 0917 - 0919

COMPUTER PRESSURIZER LEVELS

PROBLEM

To avoid a potential loss of accuracy Ref AS 0917 - 0919 have been changed from pressurizer level to pressurizer level dp.

~~ACTION REQUESTED FROM NPD~~ - with complete Baily point information listing as shown in attached sheets. Forward immediately to writer; pressurizer alarm settings (Low-160" H2O; Hi-220 H2O) in differential pressure at design conditions.

DATE SOLUTION REQUIRED 8/30/73 OR ☐ INFO ONLY

☐ CONT'D ON SEPARATE SHEET

SIGNATURE E. Clauss

FOR FIELD USE
DAYS SERVICE 0
SERVICE $ 0
EXPENSES $ 0
MATERIAL $
S.E.O. NO. 52 72

ALLOCATION
☐ PRODUCT
☐ PRODUCT APPLICATION
☐ SYSTEM
☒ SYSTEM APPLICATION
☐ WARRANTY
☐ OTHER

☐ NO
☐ YES ON
RM NO.

☐ IN WARRANTY
☐ ON RECEIPT
☐ IN SERVICE
EST. TIME IN SERVICE

POSSIBLE CAUSE FOR PROBLEM
☐ FAULTY MATERIAL
☐ FAULTY MANUFACTURING
☐ FAULTY DESIGN
☐ PERFORMANCE DEFICIENCY
☐ FAULTY PACKAGING
☐ COMPONENT FAILURE
☐ WEAROUT
☐ IMPROPER APPLICATION
☐ OPERATING ENV. CONDITION
☒ INSUFFICIENT INSTRUCTION

REPORT OF INVESTIGATION & CORRECTIVE ACTION

PRESS - ~~2155 PSIG~~ - electrical eng.
TEMP - 647 ~~579 F~~
AMBIENT ~~ROOM~~

~~PRESS TAPS ELEVATION - 327.375 in~~

AP&L has requested B&W to change subject computer points to temp. compensated pressurizer level. Please touch base with B&W to get proceedings in motion. Emme 10/3/73

INVESTIGATOR
ACTION DATE
EXPECTED REPLY DATE

FINAL DISPOSITION SIGNATURES
ENGINEERING
RELIABILITY
QC/QA
MFG. FOREMAN

DISPOSITION OF RM #
DATE RECEIVED
DATE RETURNED

CLASSIFICATION (RELIABILITY)
☐ MFG & QC
☐ RELIABILITY
☐ DESIGN
☐ STANDARDS
☐ APPLICATION
☐ PACKAGING
☐ FIELD
☐ OTHER

☐ PRELIM ANSWER ☐ FINAL SOLUTION

ACCOUNT ALLOCATION
COST CENTER
ASSIGNING INITIALS
APPROVAL INITIALS

FOLLOW UP ON CORRECTIVE ACTION
ACTION REQUESTED

RECEIVED
OCT 05 1973

RESULTS

ASSIGNED TO
DATE
APPROVAL
DATE

QTY	NAME	PART NO.	COMMENTS

RM NO.
DATE RCVD.
REPAIR NO.
REPAIRED BY
DEPT.
DATE

MWB 10-17-73

Babcock & Wilcox

INTER-OFFICE MEMO

To: M. N. Zaharna	Software Engineering	A2-13	A2-13
From: R. L. Healer ✓	Application Software Engineering	A2-13	R. L. Healer
Toledo Edison Company Davis Besse Unit #1	B&W/Bechtel		1220N
Subject: Reactor Coolant Pressurizer Level Temperature Compensation			Date 6/8/73

BACKGROUND

Although this memo specifically references the Toledo Edison Co. Job, BWCo Job 1220N, the problem and solutions presented here actually are applicable to all current and previous Nuclear Steam Supply 855/50 or 855/25 computer applications. Specifically these jobs are as follows:

1. Metropolitan Edison Company, BWCo. Job No. 150L
2. Arkansas Power & Light Company, BWCo. Job No. 1601L
3. Florida Power Corporation, BWCo. Job No. 430L
4. Sacramento Municipal Utility District, BWCo. Job No. 1602L
5. Jersey Central Power & Light Company, BWCo. Job No. 1595L
6. Toledo Edison Company, BWCo. Job No. 1220N

There was considerable uncertainty on the exact requirements for the reactor coolant pressurizer level temperature compensation calculation with regard to necessary accuracy and relationships of the various associated process variables. As a result, various memos were interchanged between Bailey Meter Company and the Babcock & Wilcox Company on this subject. Please reference the attached copies of the following memos for the background on this information interchange as follows:

1. R. L. Healer to J. C. McCreary on February 9, 1973.
2. R. L. Healer/M. N. Zaharna to J. R. Schmidt on March 9, 1973.
3. J. E. Jones to J. C. McCreary on March 23, 1973.
4. R. K. Jahn to J. E. Jones on April 18, 1973.
5. J. C. McCreary to J. E. Jones on February 15, 1973.
6. E. S. Nauful to J. C. McCreary on January 2, 1973.

Despite this proliferation of correspondence many uncertainties still existed about this calculation. In an attempt to secure a final resolutaion of all outstanding questions on the subject, a meeting was set up between Bailey Meter Company and Babcock & Wilcox Company on May 17, 1973 with R. L. Healer representing BMCo. and B. J. Benedict representing B&W. R. K. Jahn also attended some portions of the meeting briefly.

MEETING OBJECTIVES

1. Resolve the proper representation of the uncompensated input values and the "bad" alarming associated with them.

2. Resolve the proper relationship of the reactor coolant pressurizer level water reference leg temperature variations with respect to the reactor coolant pressurizer temperature variations themselves.

3. Establish the necessary accuracy for this computation throughout its range.

RESULTS

1. It was agreed that a reasonable representation for the uncompensated input was in terms of differential pressure only. It was noted by Bailey Meter Company that representing inputs as uncompensated level versus representing them in terms of differential pressure made them no more or less likely to be reported as "bad" alarms. This discussion was in reference to a question that was raised in the March 23, 1973 memo sent by J. E. Jones of B&W to J. C. McCreary of Bailey Meter. It was, therefore, agreed BMCo. would represent all uncompensated inputs on the various jobs as differential pressure inputs as opposed to uncompensated levels. It was also agreed that 32-character descriptors associated with these inputs should have the abbreviation "DP" added to them. The result of this agreement was that the uncompensated inputs would range from either 400-0 or 320-0 inches nominally.

2. It was agreed that a sixth-order surface fit for this calculation was more desirable than a seventh-order surface fit for various reasons, amongst them the facts that the BMCo. In-house facility can not go beyond sixth-order and ripples are more likely to occur in a seventh-order surface fit than they are in a sixth-order surface fit. Keeping the desirability of a sixth-order surface fit in mind it was agreed that BMCo. would attempt to implement a sixth-order surface fit with the following accuracy requirements:

   Plus or minus 1/2% of range in the normal operating reactor coolant pressurizer temperature range of 600 to 670 °F, and maximum allowable error of plus or minus 3/4% for the balance of the reactor coolant pressurizer temperature range.

   It was agreed that BMCo. would attempt the implementation advise B&W of the results.

3. There was considerable discussion about the exact relationship of the water reference leg temperature to the temperature in the pressurizer itself, and R. K. Jahn of BMCo. and J. D. Carlton of B&W participated in some of the discussion. The conclusions that were reached were that the variations in the water reference leg temperature had very little effect upon the final computed value of the temperature compensated reactor coolant pressurizer level, and, if a constant temperature were assumed for the water reference leg it could affect the output by only about 1/2 of 1%. Since, however, BMCo. has already implemented some work with a varing water reference leg temperature it was agreed that no significant work could be saved by changing to a constant water reference leg temperature. In addition to the preceding, if a constant water reference leg temperature were assumed, it would have to have a different value from job to job. and hence would also not allow any saving of work to BMCo. B&W also noted that the introduction of a 1/2 of 1% error into the calculations was close to th maximum allowable tolerance that they felt necessary for this computation. B&W did agree, however, that this relationship was basically an imperical one and it was very unlikely that the variation relationship would be different from job to job. Reviewing the specified variation as indicated on various previous and current jobs it was agreed between B&W and BMCo. that the variations specified for TECo undoubtly presented the smoothest and most probable variation, and therefore B&W agreed to recommend to their engineering department that this particular relationship be used on all future jobs. It was further agreed that as long as the relationship specified for the various jobs was the same as Toledo's or SMUD's, or that used on the Metropolitan Edison Co. Job, that no attempts would be made to change or deviate from that specified. If however, any different relationship was specified it was agreed that BMCo. would advise B&W of that fact and a mutually agreeable relationship would be set up to minimize additional work from job to job.

(The last two items listed under results are also listed in a hand written, signed, and dated agreement which is attached to this memo.)

Richard L. Healer
Richard L. Healer

RLH:mmj
Attachments

Distribution:
J. R. Schmidt A3-41 D. L. Popp A3-41 J. C. McCreary A3-41 J. E. Bur[illegible]
R. K. Jahn A3-41 J. J. Lodmann A3-41 M. W. Boesch A2-13 E. J. Star[illegible]
J. G. Steinbrunner A2-13 W. T. Gregor A2-13 P. A. Weintz A2-13
R. L. Healer A2-13

FORM E 1088-270

BAILEY METER COMPANY

WICKLIFFE, OHIO 44092

B.O. NO. 1601L125
Rev. A

CUST. ORDER 806217
Contract No. 620-00

CUST. REQ

SPECIFICATION SHEET

B&W
For: Arkansas Power & Light
Nuclear Sta.

QUANTITY	REV.	
3		Type BY3X40X-A (325.42 to 7.33"H_2O) Level Transmitter
	A	Ser.# 716169-71 Service: Pressurizer Level X:Environmental Qualif.Constr. with Amplifier Pt.#6625480A1 B/M6632748 Dwgs. D6625492, D6625483, D6625484
	A	Finish Plastic Per Spec. N2323-1B on all Aluminum and Steel Parts
		X=Clean Per Spec.N2326-2A:Also Calibrate and Hydrostatic Test (at 2155 PSIG) to Spec. N2321-1D
		Calibration for 60 PSI N_2 over 68F H_2O and 68F Wet Leg with Connz. at Elevations 0 and 327.375 In:

Rev.	Level In.	Diff."68F H_2O	Output V DC
A	320	7.33	+10
A	240	86.85	+ 5
	160	166.38	0
	80	245.90	-5
	0	325.42	-10

3(AW) Tags Per Spec. A16958A

620-0008	620-0008	620-0008
RC1-LT1	RC1-LT2	RC1-LT3
LT-1000	LT-1001	LT-1002

Certificate of Compliance Required with Calibration Report to Include Pg. 4 of Spec. N2321-1D in Q/A Package with Item Identification(Per Form E1810 to Q/A Attn: C.E. Miller, W1-24 Attached)

FINAL INSPECTION REQUIRED

HAP/[illegible]

FOR EXPLANATION OF BAILEY NOMENCLATURE, REFER TO THE APPROPRIATE INSTRUCTION SECTIONS.

REV.A 5-72 B C

B.O. NO. 1601L125

REPORT

FILE 303T-5

8/ /73

E.GLM

52431

RUSSELLVILLE

ARK POWER & LIGHT NUCLEAR #1

COMPUTER PRESSURIZER LEVELS

To avoid a potential loss of accuracy ref pts 0717 - 0719 have been changed from pressurizer level to pressurizer level dp.

ACTION REQUIRED FROM APO - (1) Please update utility point information listing as shown on attached sheets. (2) Forward immediately to writer, pressurizer alarm settings (low-100" H2O, hi - 220" H2O) in differential pressure at design conditions.

Rec'd 9/13

8/30/73

This Problem Report Was Originally Received With A Twofold Action Required Plan. At A Later Date, It Was Re-submitted With A New Action Plan (See Attached Reference For New Action). Item (1) Above Will Be Documented Formally. Item (2) Above Could Best Be Answered By B&W. Please Reference The Attached References For Further Info Concerning The New Customer Request.

APPLY TO OTHER CONTRACTS?

☑ YES ☐ NO

IF YES LIST:

FPC
JPC
Metd
SMUD
TECO

being taken care of in Software Eng. per individual contract needs.

FINAL SOLUTION

N.W. Beech 11-26-73

Rec'd APO 8/14/73

December 5, 1973

The Babcock & Wilcox Co.
P.O. Box 1260
Lynchburg, Virginia 24505

J.J. Bodmann 3B7
E. Clauss Jobsite
M.N. Zaharna 2C8
LYN
SF
STL

Attention: Mr. H.A. Baker

Subject: Arkansas Power & Light Company
Arkansas Nuclear One
B&W Order No.: 808212
B&W Contract No.: NSS-8
BMCo. Job No.: 1601L

Reference: FPR 303TE10 (attached)
Software Problem Letters dated 7/30/73 and 10/23/73
J.J. Bodmann to H.A. Baker

Gentlemen:

Attached is FPR 303TE10 which requires B&W action to resolve.

We have received your letter of 11/12/73 on Plant Computer Status and we are pleased by your response. FPR 303TE10 and the problems covered by the above referenced letters fall into the same category of outstanding software problems which your 11/12/73 letter addresses. We offer our full assistance to bring these matters to quick resolution.

Sincerely,
BAILEY METER COMPANY

J Bodmann

J.J. Bodmann, Project Manager
Nuclear Project Office

JJB/jdl

1LH w/o enc.: G.M. Olds
1LH w/o enc.: G.V. Carroll
2LH w/2 enc.: G.D. Quale

FILE NSS- 8
12M2-SPR- 456

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To J.N. KAELIN For Action

CONTRACT 620-00 08

SPR 456

TITLE 855 PZR LEVEL INDICATION

To H.A. BAKER For Information
G.J. GIBBS

DATE 1/17/74

Date Reply to Be Submitted To Nuclear Service Support Engineer

Action Requested: Project Management has responded by saying that the cost of fix vs. end result does not make a change feasible.

cc: J.D. Phinney
RJ McConnell
D.L. ALLISON
JP Kennedy

[signature]
Nuclear Service Support Engineer

C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance

MANHOUR LIMITS

COST LIMITS

CHARGE No.

APPROVED:
Project Manager