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ACCESSION NBR: 8704280330 DOC. DATE: 87/04/16 NOTARIZED: NO DOCKET #
FACIL: STN-50-528 Palo Verde Nuclear Station, Unit 1, Arizona Publi 05000528
STN-50-529 Palo Verde Nuclear Station, Unit 2, Arizona Publi 05000529
STN-50-530 Palo Verde Nuclear Station, Unit 3, Arizona Publi 05000530

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SORENSEN, C. Region 5, Office of Director

SUBJECT: Procedure Change Notice 1 to Rev 0 to Procedure 41AO-1ZZ54, "Monitoring Reactor Vessel Inventory W/Reactor Vessel Level Monitoring Sys Inoperable." W/870416 ltr.

DISTRIBUTION CODE: IE28D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 18
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PROCEDURE CHANGE NOTICE (PCN)

Procedure No.	Revision:	PCN No. (obtain from DDC only)
41AO-1ZZ54	0	01

Title: Monitoring The Reactor Vessel Inventory with RVLMS inoperable

DDC Contact (ext. 6633): JOHN Bradish

Orignator: (Print)	Ext.	Unit(s) affected:
Larry SPEIGHT	2708	1

Reason for this PCN:

To provide a method of manually plotting RVLMS should the trend recorder not be available

Expiration: Permanent

Page number(s) affected by this PCN: 2, 3, 4, 5, 6, 7, 11A, 11B, 11C, 11D, 11E

Total Number of Pages attached: 16.

- Does PCN require a 50.59 review? ____ No X Yes (refer to 5.1.2)
- Does PCN affect activities in the RCA? X No ____ Yes (Copy to ALARA)
- Does PCN effect the non-radiological environment of any offsite or previously undisturbed onsite area? X No ____ Yes (refer to 7N408.01.00)
- Does PCN pertain to an AC, Program, Emerg. Plan or Secur. Prog., Phase I-IV Test, or a ST? (refer to 5.4) X No ____ Yes (PRB/PRG/TRRG review required)

Frank Burkhardt — TECHNICAL REVIEWER (Supervisory Level) — 3/2/87 Date

NA — PRB/PRG/TRRG CHAIRMAN (if required) — ____ Date

F. Burkhardt for John M. Allen — FINAL APPROVAL — 3/2/87 Date

3/2/87 — EFFECTIVE DATE (DDC only)

5-8 — Assigned Copy Number (DDC only)

IE28 1/1

PALO VERDE NUCLEAR GENERATING STATION MANUAL	PROCEDURE NO. 41AO-1ZZ54	
MONITORING THE REACTOR VESSEL INVENTORY WITH RVLMS INOPERABLE	REVISION 0	Page 1 of 11

AUTHOR Larry Speight

REVISED BY N/A EXT.

TECH. REVIEWER [signature] DATE 2/19/87

PRB/PRG/TRRG REVIEW [signature] DATE 2/19/87

FINAL APPROVAL [signature] DATE 2/19/87

EFFECTIVE DATE 2-20-87 (DDC only)

5-8 ASSIGNED COPY NUMBER (DDC only)

DN-0012E/1217C

OBJECTIVE

The objective of this procedure is to provide the Control Room Staff a means of monitoring the Reactor Vessel Inventory with the RVLMS inoperable due to the loss of the heaters on the HJTC. This procedure should be used in those circumstances where an event has occurred that has overcooled the RCS or there has been a loss of RCS Inventory, and will be used in conjunction with the Recovery Operation procedure in progress as a means of determining the presence of a void in the head.

Since the RVLMS is called upon in several places in the Emergency Operating Procedures, the CRS must verify that the Outlet Plenum UJTCs indicate a subcooled condition, to circle yes for RVLMS INDICATES CORE COVERED.

The primary means of determing the presence of a void is plotting the thermodynamic condition of the UJTCs in the head in Appendix C. A chart recorder has been installed to monitor the UJTCs for trends to aide in the evaluation.

TABLE OF CONTENTS

APPENDICES

1.0 VERIFICATION CHECKS

1.1 RVLMS has been declared inoperable due to the heaters on the HJTCs being burned out

OR

[illegible] due to the HJTC or UJTC thermocouples being inoperable.

2.0 REFERENCES

2.1 Implementing

2.1.1 Technical Specifications 3.3.3.6

2.2 Developmental

2.2.1 CEN-152 Revision 02, Appendix A

3.0 PRECAUTIONS AND LIMITATIONS

3.1 Appendix B is supplied to show approximately what will happen to UJTC temperatures when a void is drawn in the head. There are no increments of time supplied because depending upon the event that is being experienced those times will vary greatly. Appendix B should be used to give the Control Room Staff an idea of the expected trends.

4.0 MONITORING THE REACTOR VESSEL INVENTORY WITH RVLMS INOPERABLE

4.1 Personnel Indoctrination

4.1.1 None

4.2 Prerequisites

4.2.1 A trend recorder should be installed from the QSPDS cabinet to be used to monitor UJTC temperatures, and the temperature manually plotted (Appendix C).

4.3 Instructions

4.3.1 If the heaters of the HJTC have failed, then proceed to step 4.3

OR

4.3.2 If both the HJTC and UJTC thermocouples have failed then proceed to Section 4.3.4.

4.3.3 With the heaters failed on the HJTC

4.3.3.1 Ensure chart recorder is energized.

4.3.3.2 Select a chart paper speed, a slow speed is desirable initially, but the speed may be varied as desired to monitor trends.

4.3.3.3 If installed ensure the pens are inking and that the paper drive is working and the pens are matching QSPDS output.

4.3.3.4 Verify that none of the UJTC indicate a saturated condition by comparing Pressurizer Pressure and UJTC temperature with the graph in Appendix A and manual plot in Appendix C.

4.3.3.4 If a void formation is indicated (See Appendix B), then at the discretion of the shift supervisor, he may attempt to control or collapse the void per Standard Appendix E of 41EP-1ZZ01, Emergency Operations, or Section 3.0 of 41AO-1ZZ13, Natural Circulation Cooldown.

4.3.3.6 If none of the UJTC indicate a saturated or superheated temperature continue to monitor the UJTC or recorders.

NOTE

Appendix B demonstrates how the initial void is formed. The UJTCs should follow the same trend if the void gets larger, with the lower UJTC increasing dramatically in temperature as the void is formed and then the temperature decreasing as the water mixes with the natural circulation flow.

4.3.3.7 If the void expands down into the outlet plenum as evidenced by saturation or superheated conditions at:

1) Thermocouples in the outlet plenum
2) CET temperatures
3) Hot Let temperatures.

Then the heat removal method shifts from subcooled natural circulation to reflux boiling.

4.3.4 If both the UJTC and the HJTC have failed then monitor the Reactor Vessel by monitoring:

4.3.4.1 Pressurizer Level unstable.

4.3.4.2 Pressurizer spray causes pressurizer level to rise.

4.3.4.3 Pressurizer heaters causes pressurizer level to drop.

4.3.4.4 Unexplained increase in pressurizer level.

4.3.4.5 Unexplained letdown flow greater than charging flow.

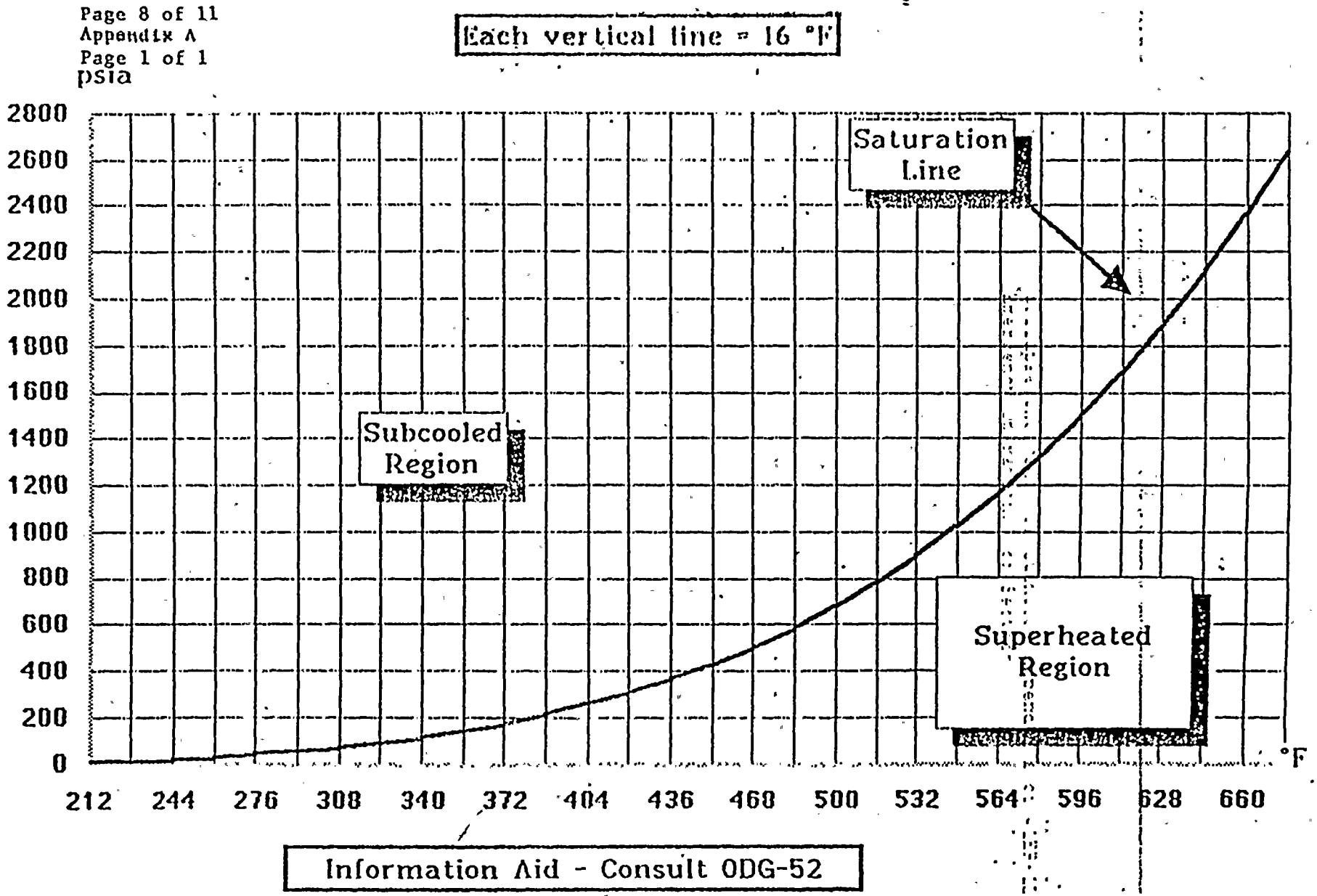
4.3.4.6 Loss of subcooling.

4.3.4.7 If a void formation is indicated, then at the discretion of the shift supervisor, he may atttempt to control or collapse the void per Standard Appendix E of 41EP-1ZZ01, Emergency Operations, or Section 3.0 of 41AO-1ZZ13, Natural Circulation Cooldown.

4.3.4.8 If the void expands down into the outlet plenum as evidenced by saturation or superheated conditions at:

1) CET temperatures
2) Hot Leg temperatures

Then the heat removal method shifts from subcooled natural circulation to reflux boiling.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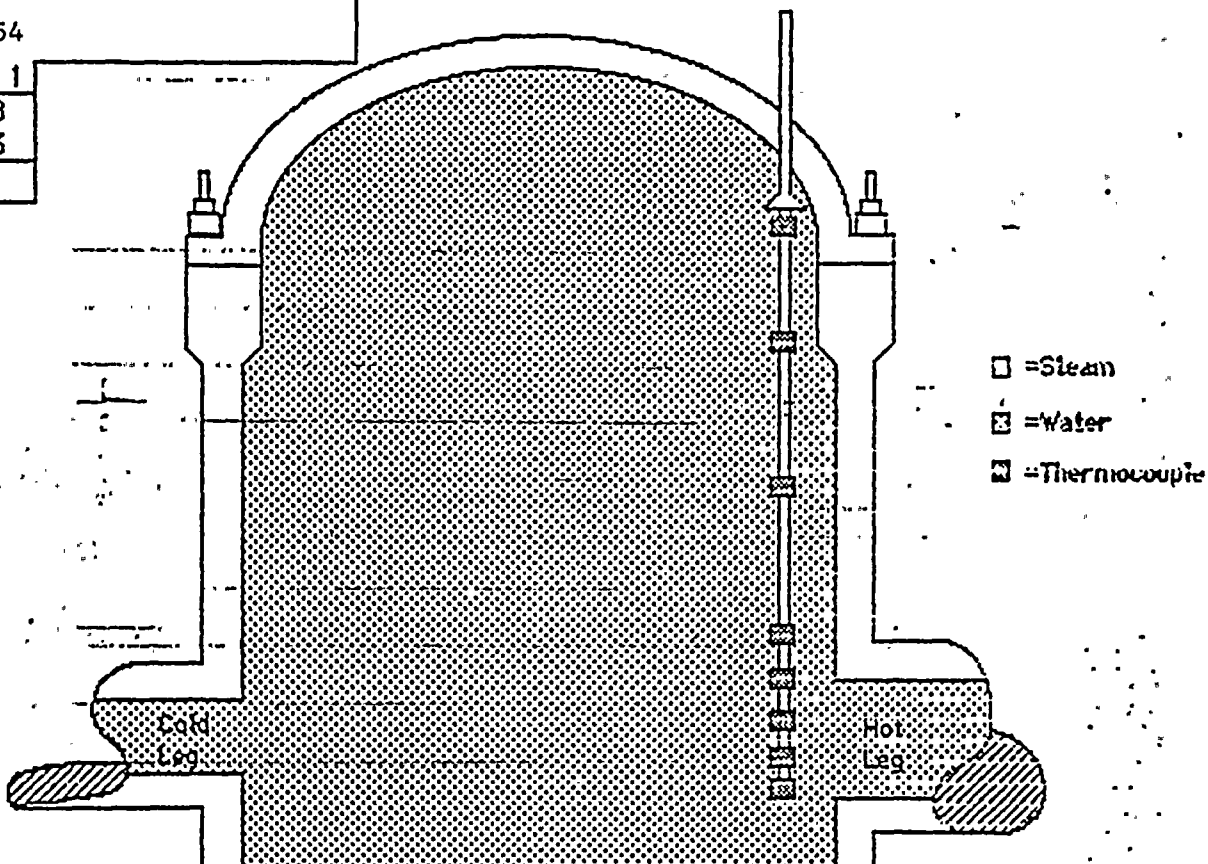
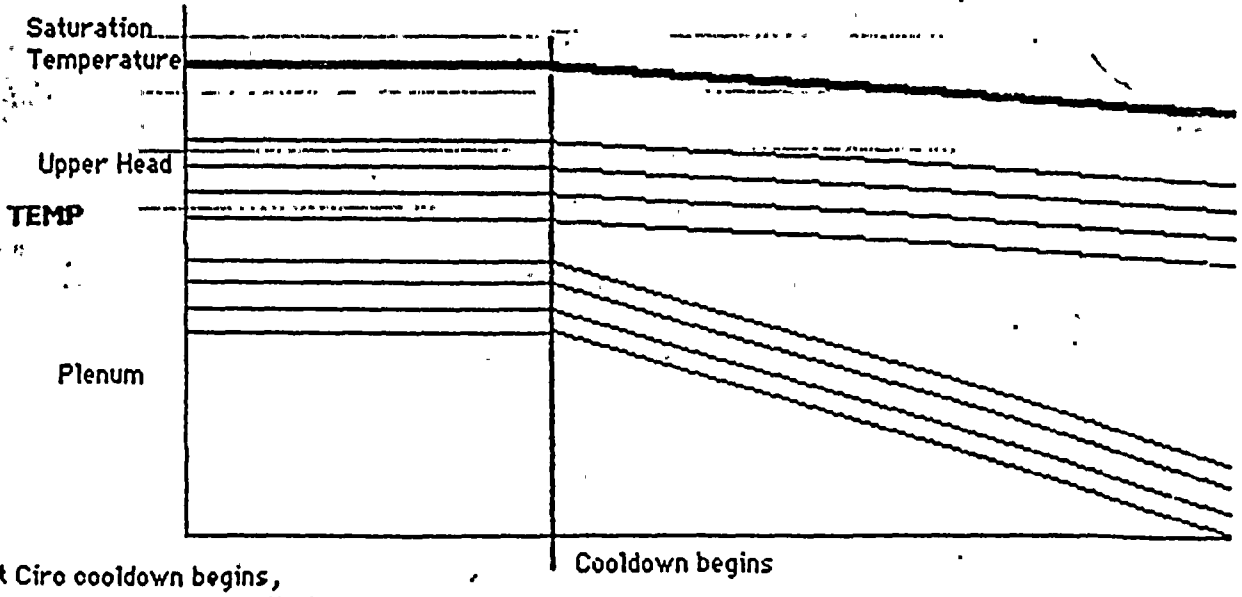
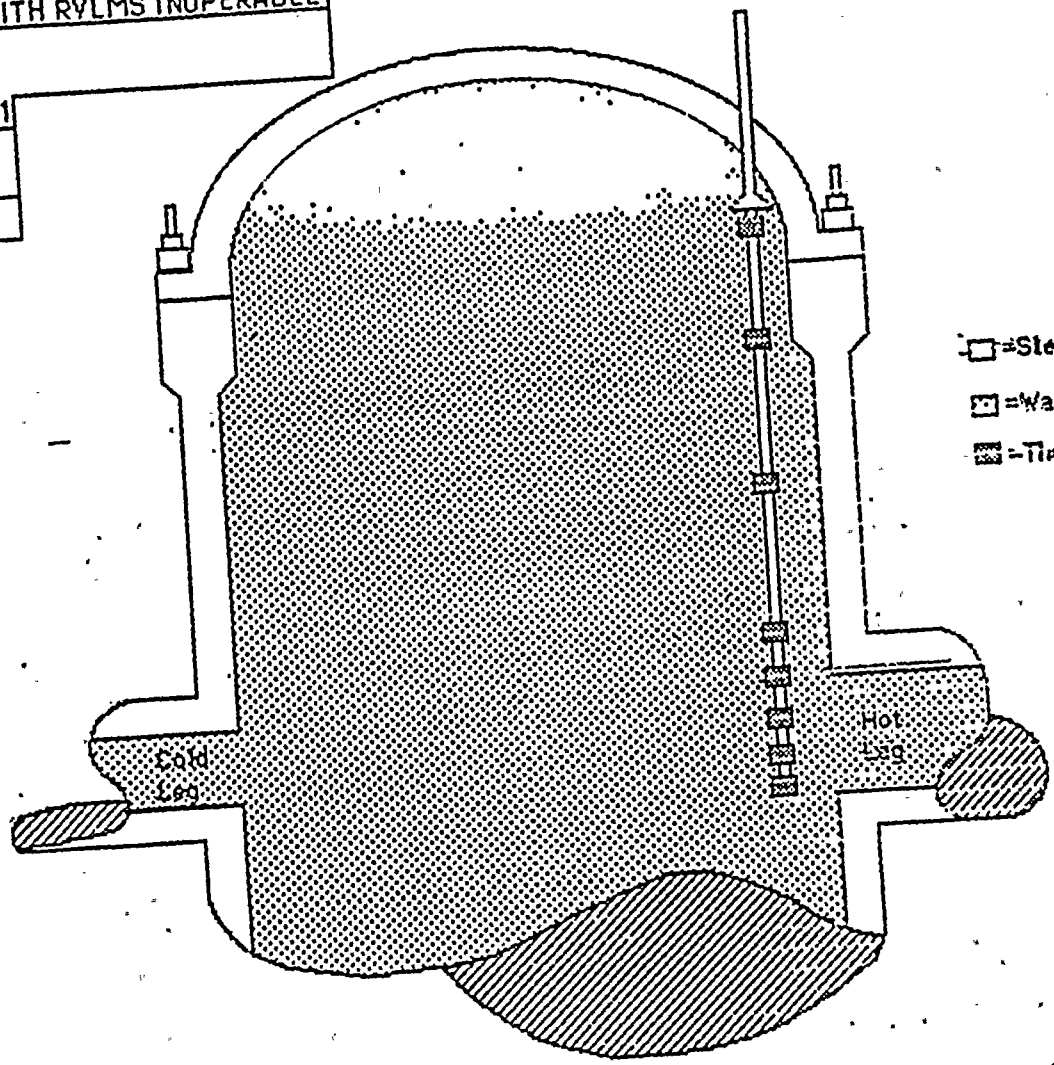
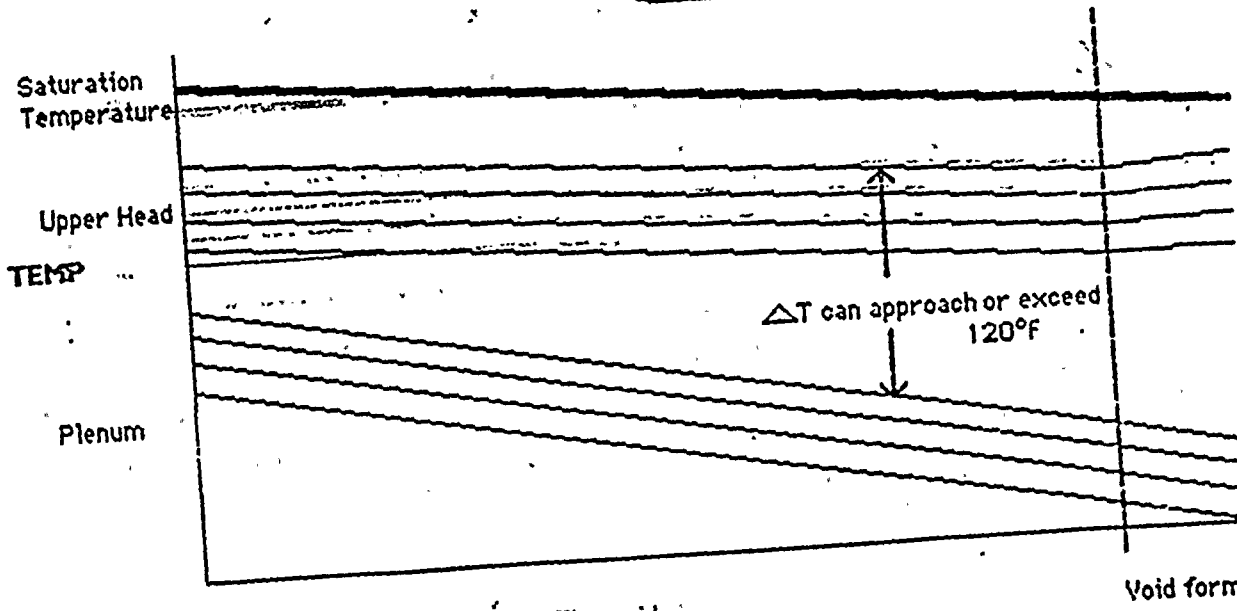




As the Nat Ciro cooldown begins, the thermocouples will track with the cooldown but without the same slope and as the plant is depressurized the saturation temperature will decrease.





As the cooldown continues, the void begins to form. The void ces the hotter water at the top of the head down which would seen as the thermocouple temperature rises toward saturation temperature.

MONITORING THE REACTOR VESSEL INVENTORY WITH RVLMS INOPERABLE

41AO-1ZZ54

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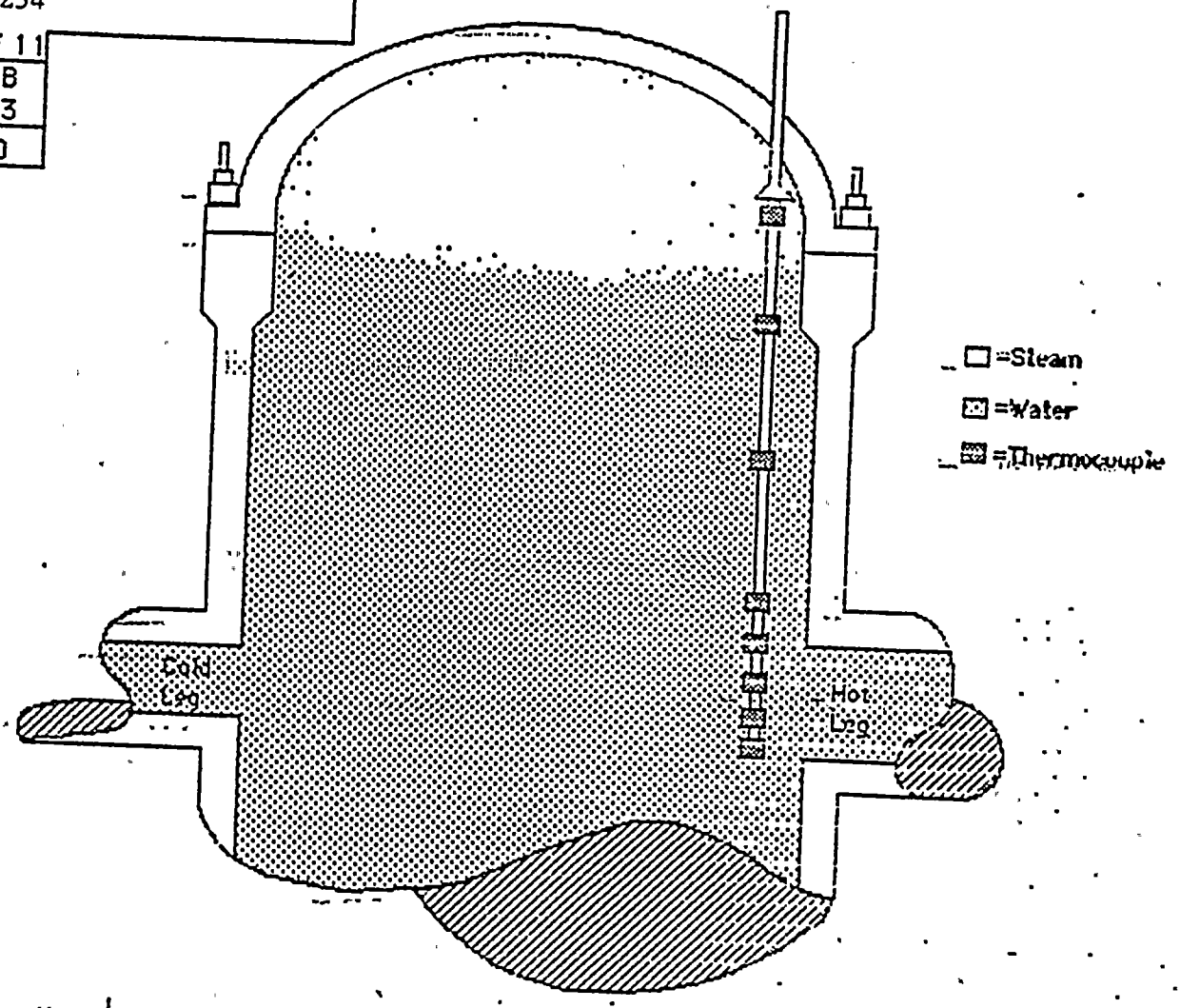
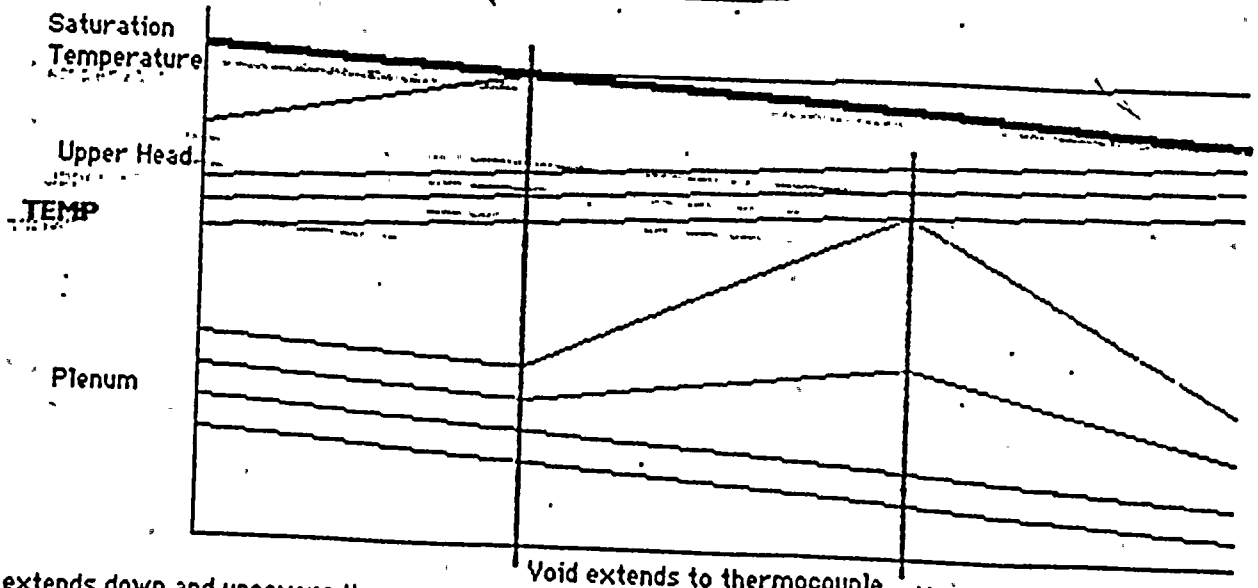
APPENDIX B
PAGE 3 OF 3
REVISION 0





Void now extends down and uncovers thermocouple, thermocouple goes to saturation and then superheat. Other thermocouples in the Upper Head indicate hotter water being forced down due to void. Thermocouples in the Plenum indicate that hot water from the Upper Head is mixing in the Plenum area.

Void extends to thermocouple.

Hotter water from the Upper Head is forced down into the Plenum due to the formation of the bubble. The Plenum thermocouple temp then decreases due to mixing with Nat Circ.

WTC 1	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED
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UPPER HEAD REGION

OUTLET PLENUM REGION *

WTC 5	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED
WTC 6	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED
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TIME						

*** IF SATURATED OR SUPERHEATED CONDITIONS EXIST IN THE OUTLET PLENUM (OTHER THAN DUE TO FAILED SENSORS) THEN REFLUX BOILING HAS BECOME THE PRIMARY MEANS OF HEAT REMOVAL. REFER TO 41A0-1ZZ13, NATURAL CIRCULATION COOLDOWN, OR REFER TO 41EP-1ZZ01, EMERGENCY OPERATIONS**

NOTE

SHOULD WTC 1 INDICATE A SATURATED OR SUPERHEATED CONDITION (WHICH WOULD BE INDICATIVE OF VOIDING), THEN WTC 4 AND 5 MAY APPROACH SATURATED CONDITIONS AS THE HOTTER WATER IN THE UPPER HEAD MOVES INTO THE PLENUMS. APPENDIX B HAS BEEN SUPPLIED TO SHOW WHAT MAY HAPPEN TO WTC TEMPERATURES AS A VOID IS FORMED.

1) MARK THE CONDITION OF THE UPPER HEAD/OUTLET PLENUM BY COMPARING THE TEMPERATURE MEASURED BY THE THERMOCOUPLE AND PRESSURIZER PRESSURE, AND LOOKING AT EITHER APPENDIX A OR THE STEAM TABLES DETERMINE IF THE THERMOCOUPLE IS INDICATING SUBCOOLED, SATURATED, OR SUPERHEATED CONDITIONS.

NOTE

TIME SAMPLING SHOULD BE DONE AT 15 MINUTE INTERVALS, HOWEVER SHOULD AN UPPER HEAD THERMOCOUPLE INDICATE SATURATED OR SUPERHEATED CONDITION (OTHER THAN FAILED WTC) THEN THE SAMPLING FREQUENCY SHOULD BE INCREASED.

2) NOTE THE TIME IN THE SPACE PROVIDED.
3) COPY ADDITIONAL PAGES AS NEEDED

R10

WTC 1	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED
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UPPER HEAD REGION

OUTLET PLENUM REGION *

WTC 5	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED
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PCN 01

WTC 1	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED
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UPPER HEAD REGION

OUTLET PLENUM REGION*

WTC 5	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED
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UPPER HEAD REGION

OUTLET PLENUM REGION

WTC 5	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED	SUBCOOLED SATURATED SUPERHEATED
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UPPER HEAD REGION

OUTLET PLENUM REGION *

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Arizona Nuclear Power Project
P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

192-00194-JRB/TRB
April 16, 1987

Mr. Chris Sorenson
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596-5368

SUBJECT: Procedure for Monitoring Reactor Vessel Inventory
File: 87-020-404

REFERENCE: (1) Telephone Conversation Between C. Sorenson and T. R. Bradish on April 14, 1987

Dear Mr. Sorenson:

Attached please find the PVNGS procedure for monitoring reactor vessel inventory, with the Reactor Vessel Level Monitoring System inoperable, per your request of Reference (1).

Should you have any questions, please contact Tom Bradish, Compliance Supervisor, at (602) 932-5300, Ext. 6936.

Very truly yours,

J. R. Bynum
PVNGS Plant Manager

JRB/TRB/cld

cc: T. D. Shriver (w/o attachment)
T. R. Bradish

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