

March 14, 1994

MEMORANDUM FOR: Brian K. Grimes, Director
 Division of Operating Reactor Support

FROM: Alfred E. Chaffee, Chief
 Events Assessment Branch
 Division of Operating Reactor Support

SUBJECT: OPERATING REACTORS EVENTS BRIEFING
 MARCH 9, 1994 - BRIEFING 94-10

On March 9, 1994, we conducted an Operating Reactors Events Briefing (94-10) to inform senior managers from offices of the Commission, AEOD, NRR, and regional offices of selected events that occurred since our last briefing on March 2, 1994. Enclosure 1 lists the attendees. Enclosure 2 presents the significant elements of the discussed events.

Enclosure 3 contains reactor scram statistics for the week ending March 6, 1994. No significant events were identified for input into the NRC Performance Indicator Program.

[original signed by]

Alfred E. Chaffee, Chief
 Events Assessment Branch
 Division of Operating
 Reactor Support

Enclosures: As stated

cc w/enclosures:
 See next page

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RETURN TO REGULATORY CENTRAL FILE

cc:

W. Russell, NRR (12G18)
F. Miraglia, NRR (12G18)
F. Gillespie, NRR (12G18)
Acting ADPR, NRR (12G18)
S. Varga, NRR (14E4)
J. Calvo, NRR (14A4)
G. Lainas, NRR (14H3)
J. Roe, NRR (13E4)
J. Zwolinski, NRR (13H24)
E. Adensam, NRR (13E4)
A. Thadani, NRR (12G18)
M. Hodges (Acting), NRR (7D26)
M. Virgilio, NRR (8E2)
S. Rosenberg, NRR (10E4)
C. Rossi, NRR (9A2)
B. Boger, NRR (10H3)
F. Congel, NRR (10E2)
D. Crutchfield, NRR (11H21)
W. Travers, NRR (11B19)
D. Coe, ACRS (P-315)
E. Jordan, AEOD (MN-3701)
G. Holahan, AEOD (MN-9112)
L. Spessard, AEOD (MN-3701)
K. Brockman, AEOD (MN-3206)
S. Rubin, AEOD (MN-5219)
M. Harper, AEOD (MN-9112)
W. Bateman, EDO (17G21)
F. Ingram, PA (2G5)
E. Beckjord, RES (NLS-007)
A. Bates, SECY (16G15)
T. Martin, Region I
R. Cooper, Region I
S. Ebnetter, Region II
J. Johnson, Region II
S. Vias, Region II
J. Martin, Region III
E. Greenman, Region III
L. Callan, Region IV
A. Beach, Region IV
K. Perkins, Region V
S. Richards, Region V

A. Gody (PDIII-2)
J. Dyer (PDIII-2)
R. Hernan (PDI-4)
J. Stolz (PDI-4)

bcc: Mr. Sam Newton, Manager
Events Analysis Department
Institute of Nuclear Power Operations
700 Galleria Parkway
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UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

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A handwritten signature in cursive script, appearing to read "Alfred E. Chaffee".

Alfred E. Chaffee, Chief
Events Assessment Branch
Division of Operating
Reactor Support

Enclosures: As stated

cc w/enclosures:
See next page

ENCLOSURE 1

LIST OF ATTENDEES

OPERATING REACTORS EVENTS FULL BRIEFING (94-10)

MARCH 9, 1994

<u>NAME</u>	<u>OFFICE</u>	<u>NAME</u>	<u>OFFICE</u>
A. CHAFFEE	NRR	J. DYER	NRR
E. GOODWIN	NRR	J. STOLZ	NRR
D. SKEEN	NRR	W. LYON	NRR
N. FIELDS	NRR	C. ROSSI	NRR
K. GRAY	NRR	S. VARGA	NRR
R. DENNIG	NRR	R. JONES	NRR
B. GRIMES	NRR	R. HERNAN	NRR
T. YAMADA	NRR	A. VIETTI-COOK	OCM/IS
S. ROSENBERG	NRR	G. HOLAHAN	AEOD
A. GODY, JR.	NRR		

TELEPHONE ATTENDANCE
(AT ROLL CALL)

Regions

Region I
Region II
Region III
Region IV
Region V

Resident Inspectors

D. Beaulieu, TMI
M. Evans, TMI

IIT/AIT Team Leaders

Misc.

OPERATING REACTORS EVENTS BRIEFING 94-10

LOCATION: 10 B11, WHITE FLINT
WEDNESDAY, MARCH 9, 1994 11:00 A.M.

LASALLE, UNIT 2

BURSTING OF REACTOR CORE
ISOLATION COOLING SYSTEM
RUPTURE DISK

THREE MILE ISLAND, UNIT 1

PROBLEMS ENCOUNTERED WHILE
DRAINING DOWN TO MID-LOOP

PRESENTED BY: EVENTS ASSESSMENT BRANCH
DIVISION OF OPERATING REACTOR
SUPPORT, NRR

LASALLE, UNIT 2
BURSTING OF REACTOR CORE
ISOLATION COOLING SYSTEM RUPTURE DISK
FEBRUARY 21, 1994

PROBLEM

REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM EXHAUST DIAPHRAGM RUPTURE DISK BURST DURING START UP, RELEASING STEAM INTO THE RCIC ROOM AND CONTAMINATING WORKERS.

CAUSE

COLLECTION OF CONDENSATE IN THE EXHAUST LINE DUE TO A PLUGGED DRAIN LINE AND ORIFICE.

SAFETY SIGNIFICANCE

PERSONNEL SAFETY HAZARD.

DISCUSSION

- WITH UNIT 2 AT 100% POWER, PERSONNEL WERE PERFORMING THE QUARTERLY RCIC SYSTEM COLD START SURVEILLANCE TEST.
- 11:27 A.M. - THE EXHAUST DIAPHRAGM RUPTURE DISK BURST IMMEDIATELY UPON STARTUP, RELEASING STEAM INTO THE RCIC ROOM.
- THREE INDIVIDUALS INSIDE THE RCIC ROOM AND ONE INDIVIDUAL ON THE STAIRS OUTSIDE THE ROOM WERE SLIGHTLY CONTAMINATED.

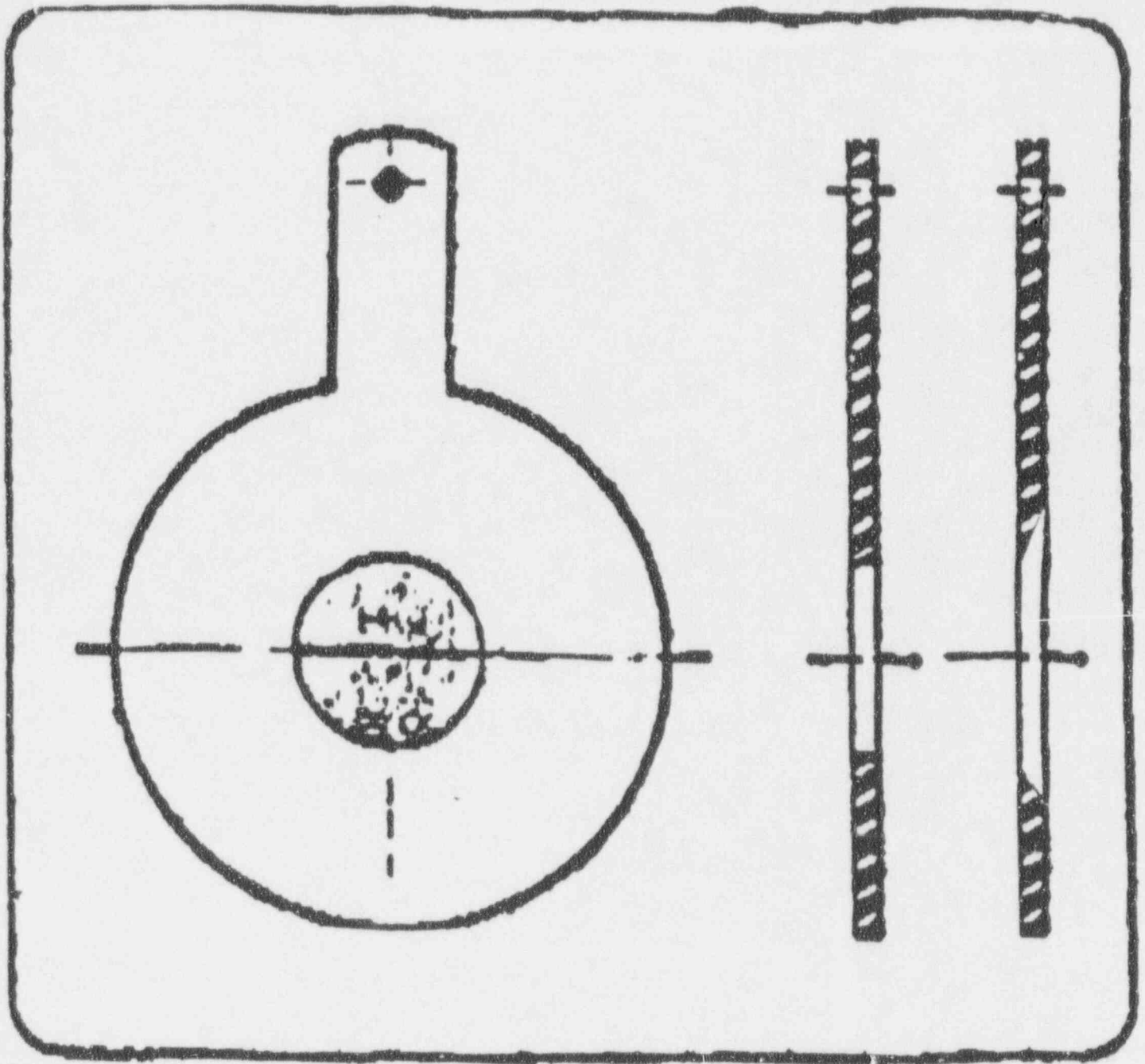
CONTACT: D. SKEEN, NRR/OEAB
REFERENCE: 10 CFR 50.72 #26824

AIT: NO
SIGEVENT: TBD

- THE CONTROL ROOM RECEIVED BOTH THE RCIC ROOM FIRE ALARM AND HIGH RADIATION ALARM WITHIN 8 SECONDS. THE CONTROL ROOM OPERATOR TRIPPED THE RCIC TURBINE 22 SECONDS LATER.
- NEITHER THE RUPTURE DISK LEAKAGE ALARM NOR THE EXHAUST LINE HIGH PRESSURE ALARM WERE RECEIVED AND CONSEQUENTLY NO AUTOMATIC STEAM ISOLATION OR TURBINE TRIP OCCURRED.
- LICENSEE INVESTIGATION DETERMINED THAT THE RCIC EXHAUST LINE WAS BLOCKED AT BOTH THE 3/4" TAP AT THE DRAIN POT AND THE RESTRICTING ORIFICE DOWNSTREAM.
- THE DRAIN LINE BLOCKAGE ALLOWED CONDENSATE TO ACCUMULATE IN THE EXHAUST LINE. WHEN THE TURBINE STARTED, THE BACKPRESSURE CAUSED BY THE SLUG OF WATER BURST THE RUPTURE DISKS.
- THE RESTRICTING ORIFICE WITH AN OPENING OF 5/32" HAD A METAL SHAVING LODGED IN THE OPENING. THE ORIFICE HAD BEEN INSTALLED BACKWARDS. DURING INSPECTION 6 MONTHS AGO THE ORIFICE HAD BEEN REMOVED AND REPLACED.
- SUBSEQUENT INSPECTION OF THE TWO ORIFICES IN THE STEAM SUPPLY SIDE FOUND THAT THEY WERE ALSO INSTALLED BACKWARDS.
- CONTRARY TO SYSTEM DESIGN DOCUMENTS, THE ORIFICES WERE KNIFE-EDGED INSTEAD OF SQUARE-EDGED.
- THE BLOCKAGE AT THE 3/4" TAP WAS DETERMINED TO BE DUE TO PIPING SCALE THAT ACCUMULATED AS A RESULT OF THE ORIFICE BLOCKAGE.

FOLLOWUP

- THE LICENSEE FORMED A SPECIAL MULTI-DISCIPLINE TEAM TO INVESTIGATE THE EVENT.
- NRC SPECIAL TEAM INSPECTION CONSISTING OF TWO REGION III INSPECTORS, INCLUDING THE TEAM LEADER OF THE QUAD CITIES INSPECTION TEAM, WAS DISPATCHED TO THE SITE.
- THE NRC TEAM NOTED THAT THE MINIMAL PARTICIPATION OF THE LICENSEE'S RADIATION PROTECTION DEPARTMENT IN THE INVESTIGATION WAS A WEAKNESS.
- THE STAFF IS CONSIDERING A SUPPLEMENT TO INFORMATION NOTICE 93-67 WHICH WAS ISSUED FOLLOWING THE JUNE 1993 QUAD CITIES HPCI RUPTURE DISK EVENT.

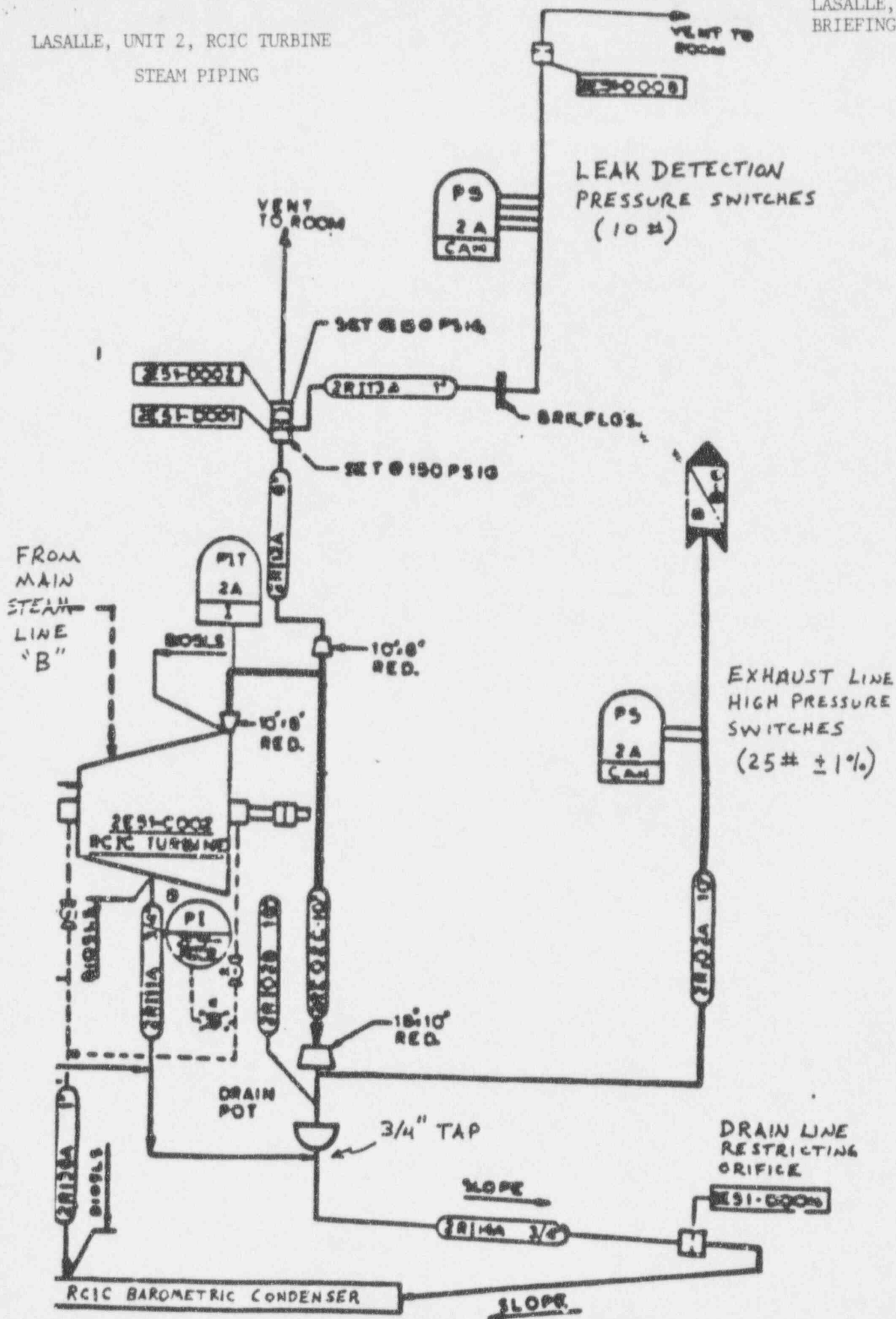


PADDLE TYPE ORIFICE PLATE

SQUARE
EDGE

KNIFE
EDGE

LASALLE, UNIT 2, RCIC TURBINE
STEAM PIPING



THREE MILE ISLAND, UNIT 1
PROBLEMS ENCOUNTERED WHILE DRAINING DOWN TO MID-LOOP
NOVEMBER 15, 1993

PROBLEM

REACTOR COOLANT SYSTEM (RCS) DRAIN DOWN ANOMALIES.

CAUSE

INADEQUATE PROCEDURE, PERSONNEL ERRORS.

SAFETY SIGNIFICANCE

- VORTEXING COULD LEAD TO GAS ENTRAINMENT AND THE LOSS OF SHUTDOWN COOLING.
- MAY BE INDICATIVE OF INADEQUATE CONTROL OVER PLANT ACTIVITIES.

DISCUSSION

- ON NOVEMBER 15 AND 16, 1993, TMI OPERATORS DRAINED RCS TO MID LOOP TO REPAIR LEAKING RESISTANCE TEMPERATURE DETECTOR (RTD) THERMOWELL.
- RESIDENT INSPECTOR RECENTLY REVIEWED RECORDS OF DRAIN DOWN AND DETERMINED SEVERAL ANOMALIES.
- REACTOR COOLANT (RC) DRAIN PUMP WAS USED TO REDUCE RCS LEVEL TAKING SUCTION ON LOW POINTS OF ALL FOUR COLD LEGS AND DISCHARGING INTO A RC BLEED TANKS (SEE FIGURE 1).

CONTACT: N. FIELDS, NRR/OEAB
REFERENCE: REGION I PROJECTS CALL

AIT: NO
SIGEVENT: NO

- THERE ARE TWO REACTOR VESSEL LEVEL TRANSMITTERS (RANGE 0-120 INCHES ABOVE COLD LEG CENTERLINE). TWO ADDITIONAL TYGON STANDPIPES INSTALLED FOR DRAIN DOWN (PER GENERIC LETTER 88-17).
- DRAIN-DOWN PROCEDURE REQUIRED OPENING A CONTROL ROD DRIVE (CRD) VENT LINE WHEN PRESSURIZER LEVEL REACHED 184 INCHES; THE LEVEL OF THE CRD VENTS.
- SHIFT SUPERVISOR (SS) INFORMED OPERATIONS MANAGER OF HIS INTENT TO DRAIN DOWN TO 110 INCHES PRESSURIZER LEVEL, THE POINT AT WHICH HE WOULD HAVE STOPPED TO ACTIVATE LEVEL INSTRUMENTATION. BECAUSE MAINTENANCE PERSONNEL WERE UNABLE TO FIND CRD VENT TOOL, VENT WAS NOT OPENED UNTIL VESSEL LEVEL HAD DECREASED TO 22 INCHES. NO TEMPORARY CHANGE NOTICE OF PROCEDURE CHANGE WAS WRITTEN.
- RC CAN DRAIN FASTER THAN IT CAN VENT, THEREFORE A VACUUM CAN DEVELOP IN THE VESSEL WHENEVER A DRAIN DOWN TAKES PLACE. THE REFERENCE LEG FOR THE LEVEL TRANSMITTERS IS ALIGNED BY PROCEDURE TO THE "A" HOT LEG WHICH IS AT CONTAINMENT BUILDING PRESSURE (OPEN HANDWAYS). WITH THE VESSEL AT PARTIAL VACUUM, THE INDICATED VESSEL LEVEL READS 5 TO 6 INCHES LESS THAN ACTUAL LEVEL. THIS WAS A CONSERVATIVE ERROR.
- PROCEDURE CALLED FOR MAINTAINING REACTOR VESSEL LEVEL AT $18" \pm 2"$. DUE TO SPILLOVER FROM THE VESSEL INTO THE COLD LEG DURING THE DRAIN DOWN, INDICATED VESSEL LEVEL DECREASED TO 13.1". SPILLOVER WAS POSSIBLY DUE TO INADEQUATE RCP SEAL VENTING.

- WHEN OPERATORS BECAME AWARE THAT LEVEL HAD FALLEN BELOW 18 INCHES THEY DECREASED DHR FLOW FROM 2000 GPM TO 1500 GPM TO AVOID VIOLATING THE VORTEX CURVE, FIGURE 2. HOWEVER, BEFORE THE OPERATORS' ACTIONS TO REDUCE FLOW WERE COMPLETE, THE LOW LEVEL AND DHR FLOW RATE COMBINED TO PLACE THE UNIT IN A CONDITION WHERE VORTEXING WAS ANTICIPATED. THE PLANT OPERATED IN THIS CONFIGURATION FOR A PERIOD OF 2 MINUTES, FALLING APPROXIMATELY .96 INCHES BELOW THE CURVE.
- WITH THE DECREASED FLOW RATE, THE RCS HEATED UP FROM 119°F TO 127°F IN 15 MINUTES. THE OPERATORS ADDED APPROXIMATELY 542 GALLONS OF WATER TO THE RCS TO INCREASE VESSEL LEVEL TO 18 INCHES AT WHICH POINT DHR FLOW WAS INCREASED TO 2000 GPM AND THE HEAT-UP WAS TERMINATED.
- OPERATORS AGAIN ATTEMPTED TO DRAIN THE COLD LEG BUT VESSEL LEVEL AGAIN FELL TO APPROXIMATELY 13 INCHES. OPERATORS REDUCED DHR FLOW RATE BUT NOT BEFORE LEVEL FELL BELOW THE VORTEX CURVE BY A MAXIMUM OF 1.66 INCHES FOR 5 MINUTES.
- NEITHER OF THE TWO MARGIN TO VORTEX COMPUTER ALARMS ACTUATED TO ALERT OPERATORS TO PLANT CONDITION.

FOLLOWUP:

- REGION IS CONSIDERING ENFORCEMENT ACTION.
- LICENSEE IS EVALUATING THE REASON NO COMPUTER ALARM ANNUNCIATED.

- LICENSEE ESTABLISHED A TASK GROUP TO FURTHER INVESTIGATE THE EVOLUTION.
- STAFF HAS ADVISED THE B&W OWNERS GROUP OF THIS EVENT.
- STAFF IS STILL ANALYZING THE SAFETY IMPLICATIONS OF EVENT.

FIGURE 8

General Reference Points

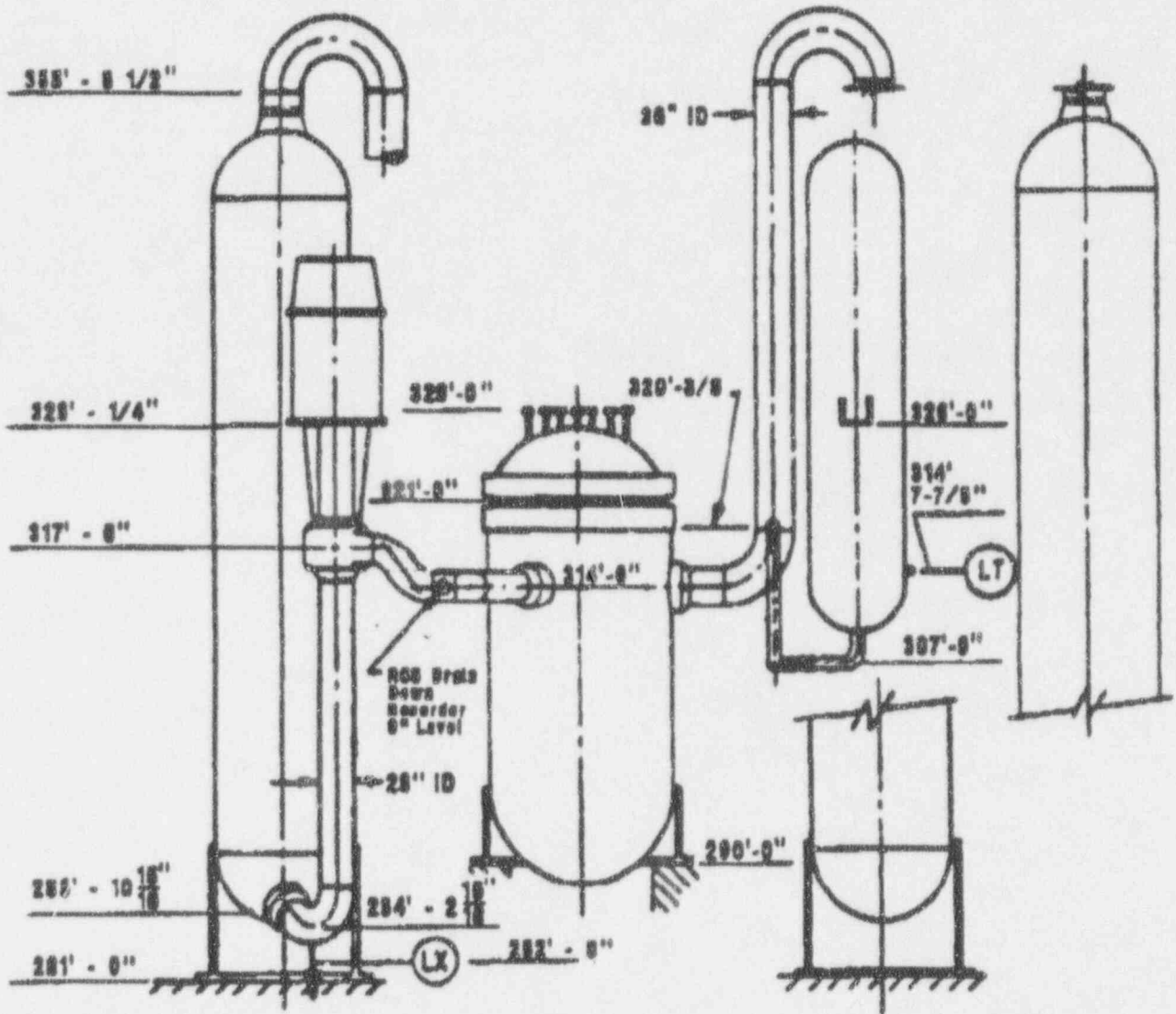
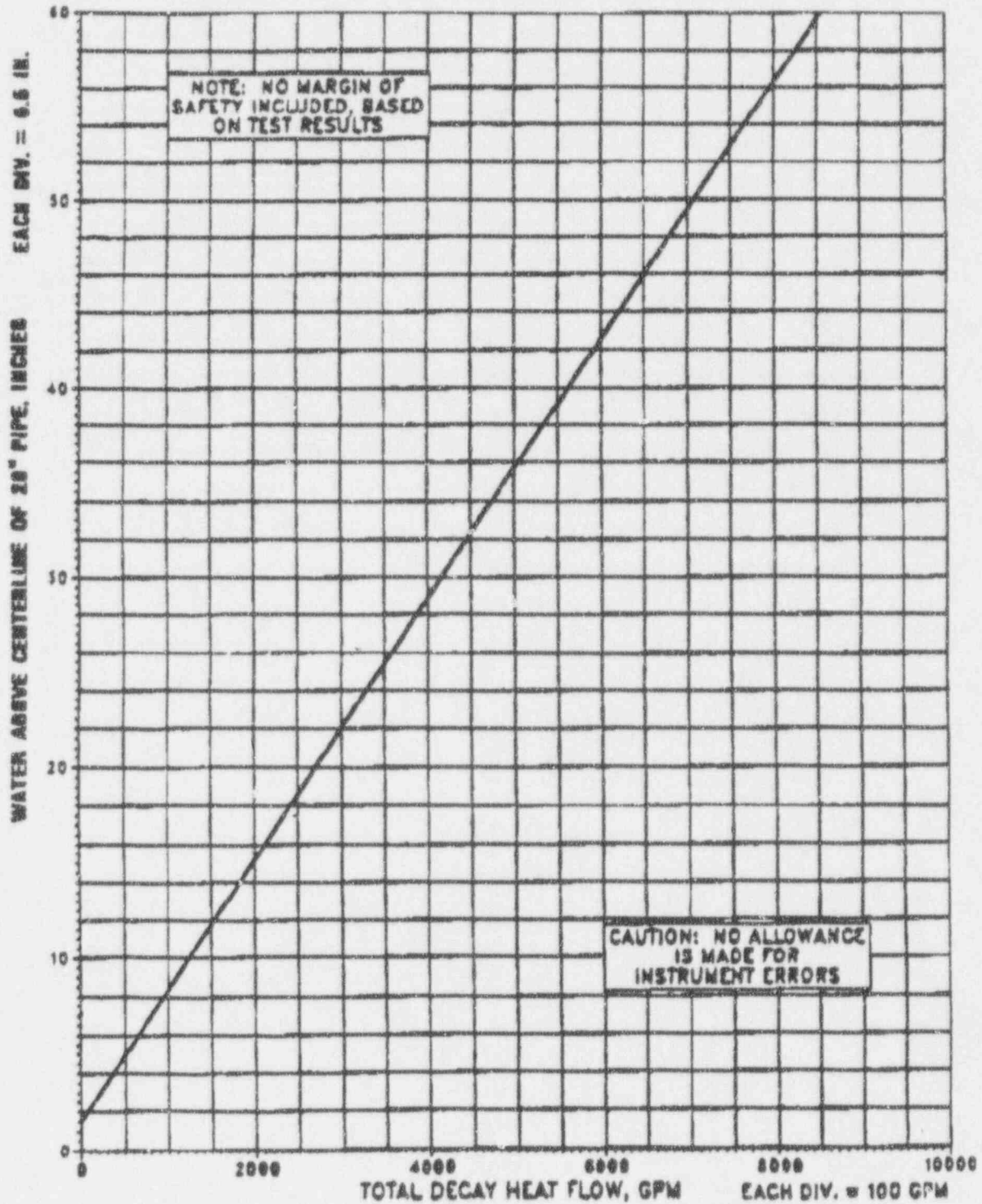


FIGURE 16
Minimum Height of Water Required to Avoid Vortex Formation vs. Decay Heat Flow



REACTOR SCRAM

Reporting Period: 02/28/94 to 03/06/94

<u>DATE</u>	<u>PLANT & UNIT</u>	<u>POWER</u>	<u>TYPE</u>	<u>CAUSE</u>	<u>COMPLICATIONS</u>	<u>YTD ABOVE 15%</u>	<u>YTD BELOW 15%</u>	<u>YTD TOTAL</u>
02/28/94	SOUTH TEXAS 1	28	SM	Equipment Failure	NO	1	1	2
03/01/94	OCONEE 3	100	SA	Equipment Failure	NO	1	0	1
03/02/94	COOPER 1	97	SA	Equipment Failure	NO	1	0	1
03/05/94	COMANCHE PEAK 2	75	SM	Equipment Failure	NO	1	0	1

Note: Year To Date (YTD) Totals Include Events Within The Calendar Year Indicated By The End Date Of The Specified Reporting Period

COMPARISON OF WEEKLY SCRAM STATISTICS WITH INDUSTRY AVERAGES

PERIOD ENDING
03/06/94

<u>SCRAM CAUSE</u>	NUMBER OF SCRAMS	1994 WEEKLY AVERAGE (YTD)	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE	1991* WEEKLY AVERAGE	1990* WEEKLY AVERAGE
POWER GREATER THAN OR EQUAL TO 15%						
EQUIPMENT FAILURE*	4	1.8	1.8	2.6	2.9	3.4
DESIGN/INSTALLATION ERROR*	0	0.0	-	-	-	-
OPERATING ERROR*	0	0.0	0.3	0.2	0.6	0.5
MAINTENANCE ERROR*	0	0.5	0.5	0.4	-	-
EXTERNAL*	0	0.0	0.1	-	-	-
OTHER*	0	0.0	-	0.2	-	-
Subtotal	4	2.3	2.7	3.4	3.5	3.9
POWER LESS THAN 15%						
EQUIPMENT FAILURE*	0	0.2	0.4	0.4	0.3	0.4
DESIGN/INSTALLATION ERROR*	0	0.1	-	-	-	-
OPERATING ERROR*	0	0.1	0.1	0.1	0.2	0.1
MAINTENANCE ERROR*	0	0.0	-	0.1	-	-
EXTERNAL*	0	0.0	-	-	-	-
OTHER*	0	0.0	-	0.1	-	-
Subtotal	0	0.4	0.5	0.7	0.5	0.5
TOTAL	4	2.7	3.2	4.1	4.0	4.4

<u>SCRAM TYPE</u>	NO. OF SCRAMS	1994 WEEKLY AVERAGE (YTD)	1993 WEEKLY AVERAGE	1992 WEEKLY AVERAGE	1991 WEEKLY AVERAGE	1990 WEEKLY AVERAGE
TOTAL AUTOMATIC SCRAMS	2	1.9	2.4	3.1	3.3	3.2
TOTAL MANUAL SCRAMS	2	0.9	0.9	1.0	0.7	1.2

TOTALS MAY DIFFER BECAUSE OF ROUNDING OFF

* Detailed breakdown not in database for 1991 and earlier

- EXTERNAL cause included in EQUIPMENT FAILURE

- MAINTENANCE ERROR and DESIGN/INSTALLATION ERROR causes included in OPERATING ERROR

- OTHER cause included in EQUIPMENT FAILURE 1991 and 1990

NOTES

1. PLANT SPECIFIC DATA BASED ON INITIAL REVIEW OF 50.72 REPORTS FOR THE WEEK OF INTEREST. PERIOD IS MIDNIGHT SUNDAY THROUGH MIDNIGHT SUNDAY. SCRAMS ARE DEFINED AS REACTOR PROTECTIVE ACTUATIONS WHICH RESULT IN ROD MOTION, AND EXCLUDE PLANNED TESTS OR SCRAMS AS PART OF PLANNED SHUTDOWN IN ACCORDANCE WITH A PLANT PROCEDURE. THERE ARE 111 REACTORS HOLDING AN OPERATING LICENSE.
2. PERSONNEL RELATED PROBLEMS INCLUDE HUMAN ERROR, PROCEDURAL DEFICIENCIES, AND MANUAL STEAM GENERATOR LEVEL CONTROL PROBLEMS.
3. COMPLICATIONS: RECOVERY COMPLICATED BY EQUIPMENT FAILURES OR PERSONNEL ERRORS UNRELATED TO CAUSE OF SCRAM.
4. "OTHER" INCLUDES AUTOMATIC SCRAMS ATTRIBUTED TO ENVIRONMENTAL CAUSES (LIGHTNING), SYSTEM DESIGN, OR UNKNOWN CAUSE.

OEAB SCRAM DATA

Manual and Automatic Scrams for 1987	-----	435
Manual and Automatic Scrams for 1988	-----	291
Manual and Automatic Scrams for 1989	-----	252
Manual and Automatic Scrams for 1990	-----	226
Manual and Automatic Scrams for 1991	-----	206
Manual and Automatic Scrams for 1992	-----	212
Manual and Automatic Scrams for 1993	-----	176
Manual and Automatic Scrams for 1994	--(YTD 03/06/94)--	26