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MEMORANDUM FOR: File

FROM: Harold L. Ornstein
Office for Analysis and Evaluation
of Operational Data

SUBJECT: EVENTS AT TMI-2 DURING PREOPERATIONAL
TESTING (SEPTEMBER 5-12, 1977)

50-320

With John Pellet's assistance, I have reviewed the TMI-2 logbook entries of September 5-12, 1977. Unfortunately, the data available is sparse, but nonetheless many important pieces of information can be gleaned from that document.

1. The polisher malfunction resulted in the introduction of resins into the demineralized water system. The polisher system interface with the demineralized water system so that polisher water can be diverted to the demineralized water system, and demineralized water can be directed to the polisher inlet. It is not clear from the log sheets exactly how the alignment or alignments were such that the resins migrated from the polisher to the demineralized water system, but they did.
2. The logbook indicated (9/7/77, 1st shift) that resin (from the polishers) was found in the demineralized water system in the turbine and auxiliary buildings. The resin clogged the pump suction strainers of all the Nuclear Service Closed Cooling Water (NSCCW) pumps. Figure 1 is a simplified piping diagram of the demineralized water system (based upon TMI FSAR figures 9.2-9 and 10.4-1). As shown in Figure 1, some of the important systems and components in the auxiliary and turbine buildings which connect to the demineralized water system are:

Diesel generator jacket cooling water
Borated water storage tank
Boric acid makeup tank
Reactor building normal cooling water
Core flood makeup tank
Nuclear services closed cooling water
Intermediate closed cooling water
Decay heat closed cooling water
Reactor building spray pumps suction header
Makeup pump suction
Seal return coolers
Spent fuel cooling system

It is interesting to note that the demineralized water system also feeds into the "emergency steam generator feed pumps" which are located in the control building area.

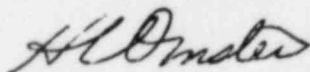
It is not possible to tell from the logbook or the FSAR data which of the aforementioned components have strainers to catch resins in the demineralized water, which actually did have such strainers in place during the event, or which specific components in the auxiliary or turbine buildings were found to contain resins during the event.

3. The logbook did not pinpoint the times that the following events took place:
 - a. Loss of reactor coolant pumps (due to loss of NSCCW which cools the RCP seals and motors).
 - b. Formation of bubble(s) in the hot leg(s) with the resultant loss of natural circulation cooling.
 - c. Loss of makeup (HPI) pumps (due to loss of NSCCW which cools the makeup pump motors).

It is conceivable that, under other circumstances, these events (a, b, and c) could occur concurrently, thereby losing all convective "core cooling" and eventually uncovering the core. The time it took to establish nuclear service river water cooling to the makeup pumps (and thereby reestablish makeup pump flow) during the subject event is not known; however, if the reactor was fueled and at power at the time of the event, the time required to reestablish makeup pump flow (initiate feed and bleed) would be crucial. It is estimated that for a B&W 205 FA plant, failure to do so within about 30 minutes of event initiation would result in core uncover.

In conclusion, the subject logbook entries can be envisioned to be similar to that of a fair maiden in a bikini - very revealing - very interesting - but still keeping important parts under wraps, possibly never to be known.

In addition to the obvious recommendations about looking into systems interactions, polishers, demineralized water systems, etc., in retrospect it might be worthwhile to pursue installation of a "reactimeter" in all plants prior to startup testing so that important operational data (potential precursors) may not be lost.



Harold L. Ornstein
Office for Analysis and Evaluation
of Operational Data

Enclosures:

1. Figure 1 - Simplified Piping
Diagram - Demineralized Water System
2. TMI-2 Logsheets (September 9-12, 1977)
3. J. Pellet's Overview of TMI-2 Logsheets
(September 5-12, 1977)

cc w/enclosures:

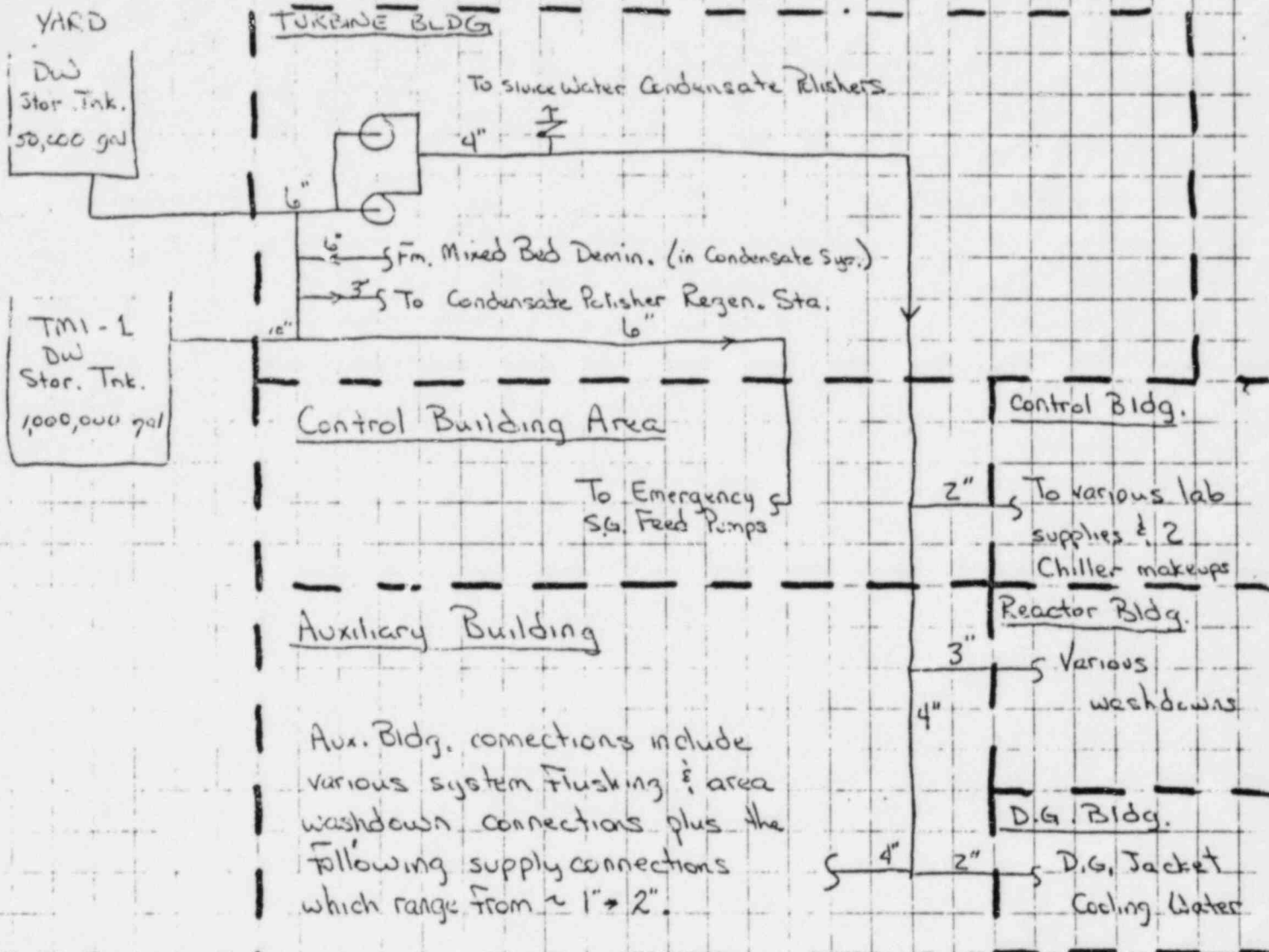
C. Michelson
J. Heltemes
T. Rehm
J. Pellet

FIGURE 1

ENCLOSURE 1 S.P. #16/81

Simplified Piping Diagram for the Demineralized Water System*

From FSAR Fig 9.2-9 & 10.4-1



Aux. Bldg. connections include various system flushing & area washdown connections plus the following supply connections which range from ~ 1" to 2".

- Borated Water Storage Tank
- Boric Acid M.U. Tank
- RB Normal Cooling Water
- Core Flood M.U. Tank
- Nuclear Services Closed Cooling Water
- Intermediate Closed Cooling Water
- Decay Heat Closed Cooling Water

These are as above but have a normally removed spool piece

- RB Spray Pumps Suction Header
- M.U. Pump Suction
- Seal Return Coolers
- Spent Fuel Cooling System

* Note that piping which does not directly relate to polishers or loads have been deleted. Much of the DW system in the turbine bldg. is essentially part of the condensate polishing system

ENCLOSURE 2
TMI 2 Logsheet (9/9-12/77)

It appears boiler pump low suction pressure was caused by high ΔP acrossed condenser polisher. CO-P-10 did not trip. Polisher by-pass was opened and CO-P-2A and FW-P-1A were restarted. Polisher outlet valves were checked wide open and hot-well level control was put in manual. Closed polisher by-pass (CO-V-12) and boiler pump suction pressure dropped. Hot-well level was put back in manual auto. Problem will be further investigated on next shift. Relieved by Andre Dominguez.

1st SHIFT
9-5

Craig M. Mullin 9-5-77

Relieved Craig M. Mullin, RCS at 532F, 0155 PSIG pressure level at 215". RC-P-1A/DA/10DB running with MU-P-1A^{11P} IC supplying seals. Restored Condensate system to normal with CO-P-1B/2A & FW-P-1A running FW-V-16A is in auto. & CO-V-35A is failed open. VA-P-1B/1C maintaining 27" vacuum. Valve stem leaks off of RC-V-1 & 2 was passing steam into A.D-ring thru the line that should be connected to RC-V-122. also check valve W.O.V-1122 was leaking at drain tank. Installed temporary plug in line from RC-V-122 & stopped check valve leaks by tightening bonnet. Replaced seal injection filters but ΔP still indicates 21.5 PSIG. Ran FF-P-1 after packing on outboard ^{of pump} being inspected. at 2200 RPM packing gland temp. read 161F. Flow thru packing gland was checked when packing was

2nd SHIFT
9-5

inspected and it was good. Mill weights to mill
job tomorrow. ^{FW}EF-V16B is manually shut since it
was passing ~ 2005 PM after it was "shut" from control
room. Conducted class "C" briefing for FC-602/28.
Relieved by Jon Green (GPU)

TP 600/28

3RD SHIFT
9-5

Relieved Andre Dominguez ^{5:45} 9-5-77
RCS at 532
PER 655 °F PER level 220", FWP-1A
running. Attempted to run EF-P-1 again
but packing gland reached 168 °F in
five minutes. Requested WESC to replace
packing in outboard bearing. #4 Pelican
back on line. Trilling on tank. Air operator
noticed water coming from overflow line float
on "C" bleed tank! Investigated and found
tank full even though level instrumentation
indicated 4 ft. Found that reference leg
had filled with water (due to "high level") and
caused false indication. Aigned letdown to
"B" ^{REF} bleed tank. Recording "C" bleed tank
for lab analysis. Briefed C. Adams for

TP 600
TLE
PR 9
D
TP 600

TP 600-15

TP 602-15. spray flow test. Bringing RCS
pressure to 1400 for TP 600-B. Sampled
from "A" seal return water to "B" cooler as
required in TP 600-4. Relieved by Craig McHallen
9-5-77

CG Dated

Sept. 6, 1977

1ST SHIFT
2-6

Relieved for Greene and Carl Gatter. RCS at 1400
 psig and 532°F. Pressurizer level at 220".
 VK-P-10/1C maintaining 27" vacuum. CO-P-10/2A
 running with FW-P-1A. CO-V-35A is failed open
 and KW-V-16A is maintaining 1000 gpm. Started
 VA-P-1A and tripped VA-P-1B so instrumentation
 TP-600/20 could be calibrated on VA-P-1B. Conducted class
 TP-600/13 C briefing for TP 600/28. Conducted class C
 PR-5090 briefing for TP 600/13 and revised PR-5090, see
 D-15

TP-600/17

total pressurizer heater output. (D-15) Conducted
 class C briefing for TP-600/17 and cycled all
 CRDS in groups 1-8. Tagged-out regeneration
 th, on polishes ^{cm²} so induction system
 can be fixed. Tanks has been drained and
 resin is in storage tank from #1 polisher.
 Increased RCS to 2155 psig. Relieved by
 Andre Dominguez. Craig McMillen

2ND SHIFT
2-6

Relieved Craig McMillen. RCS at 532F, 2170 PSIG,
 Pressurizer level at 230", all 4 RC-P's running
 with KO-P-1C supplying seals. Seal injection filters
 should be changed when ΔP as read on Lewis
 gauges across the filters reads 20+25=40PSI
 due to clean filters showing 20 PSI ΔP. Placed a
 clean filter in SF-F-1A. Manually closed
 AH-E-11C's section damper to stop bypass flow
 from windmilling it. Set RR-V9C to put max

SP 600/25

WA 1070, City
in breaker

flow these other 4 running fans. Tested one MS relief PR 5073
value - it did not meet its acceptance criteria. Value to
be rejected. Conducted a class 'G' briefing for TP 270/3
Relieved by John Ulrich. Andre Dominguez 9-6-77
Reviewed log 9-6-77 following comments:

1. JCU on 8-30 - no WR on CO-P-2B that wouldn't start. Same date no PR issued on ~~SP~~ on PC-PV-2. Continuation of PR 5073 for PC-PV-2
2. JCU on 9-2-77 EF-P-2A tripped twice no PR. Problem was identified to T.M. Hawkins
3. CMM - 9-5 entry by the trip bells are not to be used on MDCT.

Rydale 9-6-77

Relieved Andre Dominguez. RCS @ 2153 psig and 532 °F. Pressurizer level at 220" and temperature at 655 °F. MU-P-1C running supplying RC pump seals. All 4 RC pumps running. CO-P-18/29 and FAT-P-1A running through COV 35A (failed open) and FW-V-16A and feeding OTSG's. VA-P-1A/1C/1B(2-31A) running maintaining 27" vacuum. Secured VA-P-1B. Conducted a class 'C' briefing for TP 260/3 and 600/28 sat. Rich Orby conducted a class 'C' briefing for TP 271/4 sat. The oil pressure switch for V-H-P-1B doesn't allow the pump to start. T.M. Hawkins was notified of the problem and installed a 100# gage on MU-6-PS for special test on the block and fire per

3RD SHIFT
9-6

TP 260/3
TP 600/28

Completed testing tonight of 2
MS relief valves. The testing will continue
tomorrow. DH-LS-7795 was calibrated
in preparation for TP 704/3 (TCN-2). Re-
ment of sections 9.1 and 9.2 for TP 704/3.
These sections will be completed tomorrow
when main instrument support is available.
PMU-4 to 5 repair was completed. Received
by Craig McMillin. John C. Ulrich 9-6-77

Sept. 7, 1977

Received John Ulrich. RCS at 215.5 psig and 532°F.
Bussinger had at 220" and temperature at 455°F.
MS-P-1C supplying ACP seals, CA-P-113/2A and
FW-P-1A running thru CO-V-351A (failed for) and
FW-2-10A, VA-P-119/1B (a-347) maintaining 27"
vacuum. Completed reparation the repair and closed
top. NS-P-1A/1B tripped on low cooling H₂O
flow to motor. Tried to start NS-P-1C, it
tripped within a minute. Called section
strainers small 3 pumps and found resin
faced in them. Resin has come from condenser
plates thru demin. H₂O exp to NSCCW exp.
The motor made up water. Cleaned and replaced
all 3 section strainers 2-4 times and failed
to keep a NS pump running for more than
20 minutes. Started flushing demin. H₂O exp.
and found resin in turbine and aux buildings.

SHIFT
9-7

6
Flushing will continue thru next shift. Notified
TP 200/4 T. Hawkins of problem. Completed section 9.1 for
TP 200/4. Secured MU-P-1C, RO-P-1A/1C and
all 4 RCP's. Shifted cooling water flow to AU
pumps to NSCW exp. and started MU-P-1B.
Established seal injection and return to RCP's.
When RCP's were tripped RO-P-2B and
pump did not start. T. Hawkins notified of
problem. Relieved by John Ulrich.

Craig McMillin 9-7-77
Relieved Craig McMillin, RCS pressure at 2100 psig
and decreasing. RCS temperature at 390°F and
decreasing. Pressurizer level at 190" and temperature
at 645°F. All RC pumps secured. MU-P-1B
supplying RC pump seals. CO-P-1B/2A and FW-P-1A
running on cleanup service. Though FW-V16A and
CO-V55A. VA-P-1A/1B (3-31A) maintaining 27" vacuum.
Started VA-P-1C and stopped VA-P-1B. Closed
NSCCW strainers, again several times trying to
flush resin out of pipes. Flushed DH system
of level control valve on NSCCW. Replaced
the internals of DW-V173. There was a fire
at the temporary outhouses behind the
trailer complex. Some heat tracing caught on fire.
No one was hurt, and damage was minimal.
Conducted a class C briefing for TP 204/3 at.
The DH level switches which interlock with

2ND SHIFT
9/7

TP 204
PR 5

TP 204/3

2ND SHIFT
9-7

DA-V6A/B were recalibrated with proper lead corrections inserted. RC-V108 and RC-V108 were closed to work on WPL-Vac Jack Knox worked on E-F-P-2B breaker problem with no resolution of problem. Relieved by Jack Garrison. John C. Ulrich 9-7-77

Relieved John Ulrich. RCS at ≈ 1400 psig 330°F with no RCP's running. MU-P-1B running. RCS pressure and Temp are decreasing; Continuously filling and draining pressure in attempt to reduce plant pressure.

Secondary plant @ 27" vacuum with CO-P-1B/2A & FW-P-1A running via FW-V16A & CO-V35A. Flushing of DW & NSCCW system still in progress. Started VA-P-1C and secured VA-P-1A when was discovered no water level in reservoir. When VA-P-1A was secured a water level returned to reservoir. Secured CO-P-2A and FW-P-1A due to plant cooldown. Conducted class c briefing for TP 204/3 section 9.4 with S/F satio activity. Testing of DA-V6A/6B except for section 9.4.9 which failed. DA-V6B could be closed from CR with level interlock in effect. Secured PR 5092. Level actuation points were not correct. Resolution and resetting of switches is being work by Met El inst dept. Relieved by John Ulrich.

3RD SHIFT
9-7

TP 204/3
PR 5092

Jack Garrison 9/7/77
Sept 8, 1977

Relieved Jack Garrison. RCS at 1100 psig and temperature at $\approx 290^\circ\text{F}$. Surging pressure

so pressurizer level is constantly changing.
 CO-P-1B running through FW-V16A and CO-V35A
 on cleanup recirc. VA-P-1B/1C maintaining 27"
 vacuum. MU-P-1B running and supplying RC pump
 seals and level makeup. Flushing of NSCW
 in progress. Started CO-P-1A and secured
 CO-P-1B due to ^{packing} leakage. MEC wrote
 WR to adjust packing. Obtained data needed
 to reset level switches for DH-V6A/6B
 interlocks and instrument department is
 resetting the setpoint to appropriate values.
 Re-established NS flow to the Reactor
 Bldg. Re-established NS flow to MU pumps
 and shut off NR to MU pumps. Tried to
 start MU-P-1A and both MU-P-1A and -B
 tripped on low suction pressure. The problem
 was identified to T.M. Hawkins. Isolated
 MU-P-1A suction pressure switch long enough
 to get MU-P-1A running. Reestablished RC
 pump seal injection. Placed BW5T on
 cleanup recirc. using SF-P-2. Opened RC-
 V155 and -V137 and started venting the pressurizer
 to the LG drain tank. Started venting the main
 generator. Completed recalibration of DH-V6A/6B
 interlock level switches. Placed RR-P-1A
 and -1C back into service to RB cooling
 coils. Relieved by Andre Dominguez.

1ST SHIFT
 9-8

John C. Ulrich 9.8.77

Relined John Ulrich. RCS at 200F & 460PSIG, pressurizer being restored to normal level. CO-P-11 running thru FW-V16A & CO-V35A. VA-P-1B/1C maintaining 27" vacuum. MV-P-1A running supplying RC pump seals. Adjusted the packing on NS-P-1E and started it satisfactorily. MEC mechanical maintenance started cleaning VA-P-1A water services. MV-P-1B, NS flow switches are now installed and calibrated. Lined up flow thru FW-P-1B to change level switch in FW-T-1A but could not isolate it from condenser because turbine exhaust valve MS-V45 was leaking. Ran OC-P-1A & 1E for ten minutes to check section strainers, they read 1" & 3" respectively. MV-P-1A aux gear oil pump was noticed running. Press on speed increaser was 7th but no visible oil level. Let off MO-P-1C and secured MV-P-1A. Pressurizer level unexpectedly increased when venting the pressurizer and decreased pressure from 500psig to 100psig. Pressurizer level increased $\approx 150"$ during this evolution. Pressurizer temp was = 340F. apparently the reference legs have flashed and there was no steam in pressurizer to fill the reference legs. One reference ^{leg} is going to ^{fill} to verify the correct level. MV-P-1A oil level is going to be restored to normal & Aux oil pump checked

2ND SHIFT
9-8

out on next shift. Relieved by Jack Garces & Andre Dominguez

Received Andre Dominguez. RCS at ≈ 340 psig and ≈ 250 indicated. Plant cooling down naturally. No R.I.P.'s running. MOPIC running supplying seals.

Preparations being made to place plant on DH. cooldown and drain RCS for R.I.P. seal inspections.

Secondary plant at $26''$ vacuum with VAP-1B1C and CO-P-1A on recirc via CO-V35A & FW-V16B.

BWST taken off cleanup recirc in preparation for DH removal operations. Pressurizer level transmitter RC-LT3 was backfilled at reference leg. Comparison was made between LT1-LT2 and LT3. All three were reading same. Pressurizer level indication as shown in control room is believed to be correct. Started DH-P-1B

and commenced plant cooldown. Plant temperature at start 160°F . Plant cooled down to 100°F . Whenever RC-V137 was opened to vent pressurizer, level would indicate an increase. Closed DH-V4B and put maximum auxiliary spray flow to pressurizer in attempt to cool down pressurizer. Feed both OTSG's up to $400''$ in preparation for wet layup. Shifted RR-P-1A to off and started RR-P-1B for RR. flush being conducted by U.E.I.C. startup engineers. Discovered oil level in MU-P-1A speed changer was actually high and not low as previously reported. Drained oil down to visible level. Secured seal injection and seal

3RD SHIFT
9-8

return on RCP's. Closed MU-V18. Changed IC-F-18 due to high SP. Found IC-V5 closed for no apparent reason. Reopened it & reestablished RCP flow. Relieved by John Ulrich
Jack Harrison 9/8/77

Sept. 9, 1977

Retrieved Jack Harrison. RCS pressure at 150 psig and decreasing. MW-P-1C running on recirc. DH-P-1B on recirc. to the R.C. vessel. CO-P-1A on recirc. through CO-V35A and FW-V16B. Closed RC-V137 and applied nitrogen to the pressurizer. The pressurizer level came down proving that there was a steam bubble in each of the hot legs. Left N₂ on until pressure started to slightly increase and secured N₂. Opened cold leg drains and lined up to the A' RC BT and drained RC system until level was not decreasing on pressurizer level recorder and then closed cold leg drains. Previous to draining, the hot legs and the pressurizer were equalized in pressure through the nitrogen system piping. Continued to decrease RCS pressure by venting the hot legs to atmosphere and the pressurizer to the RC drain tank. Stopped VA-P-1B and started VA-P-1A. Secured DH-P-1B and secured RCS cooldown at approx. 100°F. Reapplied sealing steam to FW-P-1A turbine and

1ST SHIFT
9-9

opened MS-V45 to the condenser. Secured auxiliary spray line up to the pressurizer. Started transfer of RCBT 'A' to RCBT 'C'. Connected tygon tubing to RC-V110 and -111 for RCS level indication when pressure is sufficiently decreased. Secured IC system due to this requirement for the system cooling on letdown coolers and CRD's. Relieved by Andre Dominguez. John C. Ulrich 9-9-77

2ND SHIFT
9-9

Relieved John Ulrich. RCS vented with 92" in tygon tube connected to RC-V110 & 111. MU-P-1C running on recirc to MU-T-1. CO-P-1A running thru CO-V35A & FW-V16B. Started VA-P-1B & secured VA-P-1C for reservoir cleaning. Drained the RC systems to 22" in tygon tube connected to RC-V110 & 111. Conducted a class 'C' briefing for TP 20413 and completed section 9.4.8 (DH-V6A/B auto open) satisfactorily and cleared D-23. Picked the "A" OTSG on recirc and added 3.5 gal. of hydrazine at 19:40. Relieved by Jack Garrison

TP 20413
PR 509
D-51

20413

Andre J. Dominguez 9-9-77

3RD SHIFT
9-9

Relieved Andre Dominguez. RCS vented and drained. Secondary plant at 27" vacuum with CO-P-1A running. Secured MU-P-1C when it was discovered tygon hose reading of 139". Opened hot leg vents and pressurizer vent to atmosphere. Drained RCS to 16" as indicated on tygon hose at RC-V110 & 111. Conducted class C briefing for TP 31013 satisfactorily and tested ES actuation of

31013
5093

1C-V3, 4, & 5 with noted deficiency and issuance of PR 5093 against not being able to open valves after ES reset using "TEST RESET" switch at pnl 13 when DC power circuit was deenergized. OTSG A on recirc with hydrazine added. Relieved by Craig McMullin Jack Garrison 9/9/77 Sept. 10, 1977

1ST SHIFT
9-10

TP 202/3

PR 5094

D-51

Relieved Jack Garrison. RCS vented and drained. Secondary plant at 27" vacuum with CO-P-1A running. Conducted a class 'C' briefing for TP 202/3. Tried to start MU-P-1B from 2-1E from C.R. Pump would not start. Notified T. Hopkins of problem. Issued PR 5094 after MU-P-1B (2-2E) tripped on low cooling water flow and MU-P-1C did not start automatically. (D-51). Tried to transfer bus 2A-1E-2 to 2B-1E-2, 2A-1E-2 opened but 2B-1E-2 did not close. Closed tie breakers on 2-3E-2 and 2-4E-2. Notified T. Hopkins of problem. Relieved by Artie Dominguez. Craig McMullin 9-10-77

2ND SHIFT
9-10

Relieved Craig McMullin. RCS vented with 14" in legs ¹¹⁰ Tygon tube connected to RC-V 110 & 111. CO-P-1A running thru CO-V35A & FW-V-16B, VA-A-1A & 1C running maintaining 27" vacuum. RC system & Secondary side of OTSG's have N₂ blankets. Added 2 gal. of hydrazine to A OTSG making a total of 5.5 gal. added. Conducted a class 'C' briefing and satisfactorily

21013 completed sections ^{9.4.12.1} ~~9.4.12.1~~ thru 9.7.12.4 satisfactorily. TP 256/4 and
NH-V142 has blown apart, this is the 5th regulator
in reactor building. MEC has submitted WR.

3rd FW-P-1A is isolated for suction strainer leak
repairs. Structural steel is being removed from
above RC-P-2B and a clean room is being built
around RC-P-1A seal area. Relieved by Jack Harrison

Andre Dominguez 9.10.77

Relieved Andre Dominguez. RCS vented and drained
with $\approx 14"$ in Tygon hose (RC-V110, 111) Secondary
plant at 27" vacuum with condensate on resin
clean-up. Conducted check of auto start features
of EFW pumps. EF-P-2A was not checked because
2-1E was deenergized. 2-1E is deenergized due to
fault in 2A-1E2 and 2B-1E2 breakers not being
able to be reclosed after surveillance test. EF-P-2C
did not auto start. T. Hawkins notified of problem.

3RD SHIFT
9-10

Relieved by Gray M. Mullin Jack Harrison 9/10/77

Sept. 11, 1977

Relieved Jack Harrison. RCS vented and drained.

1ST SHIFT
9-11
2273/3

Secondary plant at 27" vacuum with condensate
on resin clean-up. Tygon tube on RC-V110 + 111
is $\approx 13"$. Conducted class C piping for TP 273/5.
Ran EF-P-2B and verified 3rd pint on head/flow-
curve by lining pump up to "B" OTSG. MS-V-207
would not open from C.A. T. Hawkins notified of
problem. Added 3 gal. of hydrazine to "B" OTSG.

TP 256/4 and

TP 235/1

PR 5097

PR 5098

5th regulator
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7-10-77
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7/10/77
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-V-207
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3" OTSG

at 0600.
15256/4 and put on recir. Conducted class C briefing for TP 256/4 and satisfactory tested MS-V-3A/B on loss of inst. air. EF-P-1 could not maintain 4250 rpm when discharge valve was open to fill "B" OTSG. Pump was line-up to Ayt Steam which was at 160 psig. T. Harkin notified of problem. Relieved by Andre Dominguez.

2ND SHIFT
9-11

TP 235/1

PR 5097

PR 5098

Relieved Craig Mc Mullin 9-11-77
Secondary plant at 27" vacuum with condensate on clean-up recir. Tygon tube on RC-V110 & III is 14". Conducted Class C briefing for TP 235/1 and completed the TP with the following deficiencies:
D-4 R₁ Building Dump, Level Hi - motor in reverse issued PR to resolve
D-5 WOL-P-3A & B did not meet flow capacity. Issued PR to resolve.

AS-V10 is shut and MS-V207 does not open fully. ~~construction~~ Start up Instrument shop will repair MS-V207 tomorrow Relieved by Joel Harrison

3RD SHIFT
9-11

Relieved Andre Dominguez 9-11-77
Secondary plant at 27" vacuum. Sampled 3 OTSG. Results 255 ppb SO₄. Drained 3 OTSG to 30". Shifted condensate lineup up thru FW-V12A & 12B. Closed FW-V16B. Found out that flow has been secured thru CO-V55A since day shift

yesterday due to tag out of CO-P-2A and closing of its respective suction valve. All condensate flow was going thru FW-V16B. By log review it was \approx 2100 gpm. (800 gpm via #2 polisher 1300 via #4 polisher). Sampled FW at SS-V7 local sample point (SS-V117). Results 25 ppb PO₄. Resampled 3 hours later Results 120 ppb. FW continuing to clean up & SS-V117 open constantly. Made preparations for TP 160/3 Emerg Rx Bldg Cooling. Met-Ed ran DH-P-1B on recirc of Rx vessel for surveillance leak rate test DH-P-1B is secured. Relieved by Craig McMullen Jack Garrison 9/11/77.

Sept. 12, 1977

1ST SHIFT
9-12
Relieved Jack Garrison. RCS drained and vented. Secondary plant at 27" vacuum. Put N₂ on both OTSGs. Found #5-V-293A/B, 294A/B, 295A/B and 296A/B closed. Drained "A" OTSG to 30" due to PO₄. Filled both "A" & "B" OTSG to \approx 400" TP 160/3 after FW came in spec. Conducted class C piping for TP 160/3. Verified head/flow curves PR 5096 for RR-P-1A/1B/1C. Issued PR for D-3; "A" pump at 3000 gpm did not meet acceptance criteria. Shut up RR-P-1A/1C to Rx. Bldg. Fans. Relieved by Andie Dominguez.

Craig McMullen 9-12-77

2ND SHIFT
9-12

Relieved Craig McMullen. RCS vented & drained. Secondary plant at 27" vacuum. Added 3" liter

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12-77
used
later

to inspect after bypassing isolates & securing
sending water to unit 1. Secured steam to RC-P

Reviewed log with following comments

- 1. JCU 9-6 entry valve number #AU-V-405? is not clear. #AU-V405A valve disc had fallen off stem. Now we was put.
- 2. CAM-9-7 entry when RC-P-2B didn't start a PR should have been issued. Ok
- 3. JCU Fire was under B&R piping trailer toilet. (9-7-77)

4. JWG - no entry as to what was done on Vac Pumps.

5. Generally this week we had a major unusual occurrence and numerous things were not entered in the log that should have been for example a. Vacuum Pumps were all cleaned of resin. b. Did Condensate Pump 1B on JCU 9-8 entry have resin in it? c. No one logged the fact that we did a complete flush of the Demin Water System.

6. There is no reason given for how we got into problem on Pressurizer Level. A change to cooldown procedure could be made if we knew what to do.

By Toole 9-12-77

For tests, broke maximum at 6000. Secured G.S. and secured CO-2-1A. Isolated CO & FW systems. CO-2-5 & CO-2-6 now resin added 5 gal. of hydroxy. To do more work. (To do) Demin CO-T-1A to

100
Dolwell and CC-T-113 to the yard drain. Relieved
by Jack Harrison. Andre Dominguez 9-12-77 77266/4

Relieved Andre Dominguez. RCS drained & RCP
work in progress on seals. Secondary plant
shutdown. Turbine on turning gear. Lined up
EFW system for auto start checks of all
three pumps. EF-P-2A & 2B started satisfactorily
however neither amp meter in control showed any
current. The AS-V207 valve is blowing fuses and
was not ~~not~~ checked. T. Hawkins notified of
problems. Removed MU-F-4B filter cartridge
in preparation for DP check of cartridge
housing. CO-P-1C was put on resin for
EFW checks. It is presently secured.

Relieved by Craig McMullen Jack Harrison 9/14/77
Sept. 13, 1977

Relieved Jack Garrison. RCS drained and RCP
work in progress on seals. Secondary plant
shutdown. Turbine on turning gear. Started
CO-P-1C and ran EF-P-1 on resin. Peak
steam pressure was 180 psig and max. rpm
that ~~that~~ ^{was} obtained was 4700 rpm. T.
Hawkins notified of problem. Secured EF-P-1
and CO-P-1C. Ran MU-P-1B on resin for
seal injection ^{filter} AP verification. Opened MU-V
32 and MU-V-275 and established 40 gpm.
AP thru MU-F-4B with filter removed

Overview of TMI-2 Log, September 5 - 12, 1977

1. 9-5-77 shift 1 High differential pressure across condensate polishers causes condensate booster pump trip on low suction pressure so polisher bypass opened and polisher repair started.
2. 9-5-77 shift 3 Polisher back on line, filling demineralized water tank (from condensate system).
3. 9-7-77 shift 1 All Nuclear Service Closed Cooling Water (NSCCW) pumps tripped due to clogged pump suction strainers. Clogging resin came from condensate polishers thru demin. water system. Resin found in demin. water system in turbine and auxiliary buildings. Loss of NSCCW produced a loss of RCP seal and motor cooling. Also loss of cooling to makeup (MU) pump motors occurred and makeup was secured. All RCP's were immediately secured on loss of both seal injection and seal cooling. Nuclear Service River Water cooling to MU pumps was established and MU restored.
4. 9-7-77 shift 2 Isolated normal pressurizer spray line to work on liquid waste system valving (note: spray lost when RCP's secured).
5. 9-7-77 shift 3 RCS on natural circulation with makeup via MU-P-1B. RCS temperature and pressure decreasing. Continuously filling and draining pressurizer to reduce RCS pressure. Secured condensate booster and main feedwater pumps due to plant cooldown (1 CBP on).
6. 9-8-77 shift 1 Pressurizer level constantly surging. Started venting pressurizer to reactor drain tank.
7. 9-8-77 shift 2 RCS at 200°F and 400 psig. Pressurizer level being restored to normal level. Pressurizer level increased 150" while

venting RCS from 500 psig to 460 psig. Pressurizer temperature about 340⁰ F. From the log, "Apparently the reference legs have flashed and there was no steam in the pressurizer to fill the reference legs." (note that at 460 psig $T_{sat} > 450^0F$).

8. 9-8-77 shift 3

RCS at 250⁰F and 340 psig. Pressurizer level transmitter LT-3 backfilled. LT-1, LT-2, and LT-3 all read the same in the control room and are believed to be correct. DHR started with B pump with RCS at 160⁰F and cooled to 100⁰F. Whenever the pressurizer was vented pressurizer level increased. DHR to vessel isolated and maximum auxiliary pressurizer spray established to try to cool the pressurizer. Secured seal injection and return on all RCP's.

9. 9-9-77 shift 1

RCS at 150 psig ($T_{sat} \cong 360^0F$). Closed pressurizer vent and, "...applied nitrogen to the pressurizer. The pressurizer level came down proving that there was a steam bubble in each of the hot legs." Left nitrogen on until pressure started to increase then secured. Opened cold leg drains to Reactor Coolant Bleed Tank and drained RCS until pressurizer level recorder was not decreasing. The hot legs and pressurizer were equalized in pressure thru the nitrogen piping. RCS pressure decrease continued by venting hot legs to atmosphere and pressurizer to Reactor Drain Tank. Secured cooldown with RCS at about 100⁰F. Connected Tygon tubing to RCS to measure RCS level when pressure decreased sufficiently.

10. 9-9-77 shift 2 RCS vented and drained such that level in tubing decreased from 92" to 22".

11. 9-9-77 shift 3 Secured makeup when tubing indicated a level of 139".
Opened hot leg and pressurizer vents to atmosphere and drained RCS to an indicated 16".

12. 9-10-77 shift 2 Inside containment nitrogen regulator (5#) found "blown apart" (NM-V142).

13. 9-12-77 Review "There is no reason given for how we got into a problem on pressurizer level. A change to cooldown procedure could be made if we knew what to do."