U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-289/83-20

Docket No. 50-289

License No. DPR-50 Priority -- Category C

Licensee: GPU Nuclear Corporation

100 Interpace Parkway

Parsippany, New Jersey 07054

Facility Name: Three Mile Island Nuclear Station, Unit 1

Inspection At: Middletown, Pennsylvania

Inspection Conducted: July 11 - September 9, 1983

Inspectors: J. W. Chung, Lead Reactor Engineer — 9-21-83 date

P. . Wen, Reactor Engineer — 9-21-83 date

E. C. Vanterpool, Summer Technical Intern — 9/21/83 date

J. Tusar, Summer Technical Intern — 9/21/83 date

Approved by: L. H. Bettenhausen, Chief, Test Programs Section — 9/21/83 date

Inspection Summary:
Inspection on July 11, 1983 - September 9, 1983 (Report Number 50-289/83-20)
Areas Inspected: Special unannounced inspection of Reactor Coolant System Leak Rate test procedures, equipment and records for the period of April 1, 1978, through March 31, 1979. The inspection included approximately 800 hours at site and local NRC offices and 200 hours at the NRC Regional office by two region-based inspectors and two technical interns.
Results: Instances of failure to follow station procedures and regulatory requirements were found.

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EXECUTIVE SUMMARY

OBJECTIVES

The basic objective of this inspection was to verify that records of Reactor Coolant System (RCS) leak rate testing at Three Mile Island (TMI) Unit 1, from the period April 1, 1978, to March 31, 1979, showed no indications of practices similiar to alleged irregularities at Unit 2. The allegations related to Unit 2 RCS leak rate testing involved the following:

-- That tests were often repeated until the results met the acceptance criteria and that unfavorable results were discarded;

-- That RCS water inventory was adjusted contrary to procedural requirements; in that water additions were made and not recorded in the test package nor included in the RCS leak rate test calculations;

-- That computer data entries for the leak rate calculations were "fudged" to make the leak rate test calculations appear acceptable; and,

-- That hydrogen gas was added to the Make-Up Tank (MUT) to influence leak rate test calculations.

Supplemental objectives of the inspection were to:

-- Examine compliance with the Technical Specifications on RCS Leak Rate;

-- Inspect the leakage test procedure for technical and functional adequacy; and,

-- Examine the effects of instrument calibration and variations on leak rate determinations.

CONDUCT OF INSPECTION

From July 11, 1983 to September 9, 1983, members of the engineering staff of Region I conducted an inspection of TMI-1 records, procedures, equipment and specifications related to reactor coolant system leak rate testing performed by station personnel in the year immediately preceding the accident at TMI-2. The inspectors reviewed and correlated diverse records related to leak rate tests, performed an "as-built" walkdown of related plant systems and instrumentation, and, in conjunction with licensee personnel, demonstrated by system operation a technique by which RCS leak rate results could be modified.

Surveillance records for RCS leak rate tests were reviewed for the period from April 1, 1978 through March 31, 1979. Six hundred and forty-five test records were the principal object of this review. These surveillance records were compared with control room logs, power traces and makeup tank level recorder charts developed during the tests to determine abnormal test operations, adequacy of records and compliance with test procedures. The station surveill-

ance test procedure in effect at that time was evaluated for completeness and adequacy. Independent leak rate calculations were performed by the NRC staff with an NRC microcomputer and compared with TMI-1 data to verify the validity of licensee calculations.

The inspector performed a walkdown inspection of the makeup system and verified that the instrumentation system for measuring makeup tank (MUT) level contained a loop seal. The significance of this loop seal is that hydrogen additions made to the MUT during a test could result in errors in RCS leak rate test calculations. Further, a review of plant maintenance records for 1978 identified narrative which described the effects of gas additions on indicated Make-Up Tank (MUT) level.

The MUT strip chart recorder traces were independently analyzed and evaluated by the inspectors to identify instances of improper performance of RCS leak rate tests, such as the addition of hydrogen or water during the performance of the leak rate test. Strip chart data were compared with control room logs and surveillance test calculations to determine if test conditions as indicated by the strip chart were incorporated, or considered, in the calculation of leak rate. Further, the inspectors directed and monitored an actual demonstration of the effects of gas additions to the MUT at Unit 1 on indicated MUT level to support their conclusions. Licensee personnel assisted in this demonstration and acknowledged the resulting conclusions.

MAJOR FINDINGS

The RCS leak rate tests performed at TMI-1 during the year prior to the accident at TMI-2 contained several inadequacies and deviations from procedural and regulatory requirements. These would, in most instances, have lead to a less conservative calculation of RCS leakage rates.

a. The RCS leak rate procedure, SP 1303-1.1, Rev. 7, in use during the time period reviewed, was inadequate because:

   - it contained incorrect procedural steps (§3.3);
   - it did not prohibit acceptance of test results showing negative leakage (§2.3);
   - it failed to incorporate temperature compensation for several leak rate factors (§3.3);
   - it omitted several important factors; such as, no provisions to include steam generator tube leakage as identified leakage or the effects of pressure variation in the RCS (§3.3); and,
   - it utilized incorrect values for volume and water mass change per unit level change (§3.3).

b. The as-built configuration of the MUT level instrument system provided a loop seal on the low pressure reference leg, which introduced the potential for non-conservative effects on RCS leak rate test results from MUT gas additions. During discussions with station operating personnel, the inspectors were informed there was no loop seal in the makeup tank level instrument system. An NRC walkdown revealed the loop, which provides a means to affect leakage calculations (§4.3.1).

c. An analysis of MUT level strip charts for the period inspected indicated at least seven hydrogen additions were made during RCS leak rate tests. There were no entries in the control room logs which recorded the fact that these gas additions were made nor were they compensated for in the leak rate calculations. The calculated leak rates, therefore, were in error. Actual leakages were, in fact, higher than the recorded values (§4.3.3).

d. Seven instances of apparent water addition to the RCS during leak rate tests were identified. In only one test was the water addition accounted for in the calculations; and, in that case, the volume accounted for was considerably less than the apparent actual addition. These unaccounted additions resulted in recorded leakage values lower than actual leakages (§5.2).

e. Eleven instances of apparent feed and bleed operations during testing were identified, for which the leak rate calculation was not properly corrected for the operator-caused water inventory change (§2.3).

f. A number of instances of substantial apparent level changes in the Reactor Coolant Drain Tank during leak rate tests were identified. No logbook entries which would explain these level changes were found. (86.2)

g. The licensee established a conservative administrative test frequency for RCS leak rate testing of once per shift, whereas, technical specification required only daily testing. Seventeen missing test records were identified (§2.3).

CONCLUSION

Based on this review of licensee records and limited discussions with licensee personnel, it is concluded that there were indications of practices at TMI Unit 1 related to RCS leak rate testing similar to those alleged at Unit 2; i.e., seven (7) examples of water additions, seven (7) examples of hydrogen gas additions, and eleven (11) examples of feed and bleed operations were identified, from a population of 645 test records, which were not properly incorporated in RCS leak rate test calculations.

DETAILS

1.0 Persons Contacted

GPU Corporation

J. D. Abramovici, Mechanical System Engineer, Parsippany
R. Barley, Lead Mechanical Engineer
N. Hollerbush, Supervisor, Document Control
H. Hukill, Director, TMI-1
V. Orlandi, Lead I&C Engineer
F. Paulewicz, Mechanical Engineer
M. Sanford, Supervisor, Plant Engineering, Parsippany
H. Shipman, Operations Engineer
C. Smyth, Supervisor, Licensing
P. Snyder, Manager, Preventive Maintenance
H. Wilson, Supervisor, Preventive Maintenance

USNRC

R. Conte, Senior Resident Inspector
F. Young, Resident Inspector

The inspector also held discussions with other licensee employees during the inspection, including operations, technical support, and administrative personnel.

2.0 SCOPE OF INSPECTION

2.1 Objectives

The basic objective of this inspection was to verify that records of Reactor Coolant System (RCS) leak rate testing at Unit 1, from the period April 1, 1978, to March 31, 1979, showed no indications of practices similiar to alleged irregularities at Unit 2. The allegations related to Unit 2 RCS leak rate testing involved the following:

-- That tests were often repeated until the results met the acceptance criteria and that unfavorable results were discarded;

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-- That computer data entries for the leak rate calculations were "fudged" to make the leak rate test calculations appear acceptable; and,

-- That hydrogen gas was added to the Make-Up Tank (MUT) to influence leak rate test calculations.

Supplemental objectives of the inspection were to:

-- Examine compliance with the Technical Specifications on RCS Leak Rate;

-- Inspect the leakage test procedure for technical and functional adequacy; and,

-- Examine the effects of instrument calibration and variations on leak rate determinations.

2.2 Documents and Records Reviewed

The RCS leakage test records for the period of April 1, 1978, through March 31, 1979 were reviewed. The requirements and commitments discussed herewith are those applicable specifications and requirements for that review period.

2.2.1 Specifications/System Descriptions

-- FSAR, Unit 1, Sections 4.2.3.8 and 4.2.3.9.

-- Technical Specifications Amendments through March 1979: Amendment Nos. 11, 15, 17, 29, 32 and 35.

-- Make-up and Purification System, Preliminary System description by Babcock and Wilcox (B&W), Med. Ed. Co., TMI Unit 1, Initial Issue, August 14, 1969.

-- Pressurizer Instruction Manual, Babcock & Wilcox Instruction Book No. 620-0006, 01-0110 01.

-- Drawings: RCS, TMI Unit 1, DWG #4192 C-302-650, Revision 21; Make-up and Purification, TMI Unit 1, DWG #4192-C-302-661, Revision 23; Liquid Waste Disposal, TMI Unit 1, DWG #4192-C-302-690; Make-up Tank, B&W 35-44-002-05; Reactor Cooland Drain Tank, B&W DWG #37-44-001-01.

2.2.2 Procedures

-- SP 1303-1.1, Reactor Coolant System Leak Rate, Revision 7, May 25, 1976; Revision 8, August 21, 1981; Revision 10, May 18, 1983; Revision 11, July 13, 1983.

-- TP 600/10, RCS Hot Leakage Test, Revision 0, December 16, 1973, performed February 19, 1974

-- Operating Procedure (OP) 1101-1, Plant Limits and Precautions, Revision 15, May 18, 1983.

-- OP-1102-4, Power Operations, Revision 34.

-- OP-1103-4, Soluble Poison Level Control, Revision 20

-- OP-1104-2, Make-up and Purification System, Revision 41.

-- OP-1101-21, Nuclear Plant Setpoints.

-- Station Administrative Procedure (AP) 1012, Shift Relief and Log Entries, Revision 8, November 4, 1977

2.2.3 Control Room Records

-- Control Room Operator (CRO) Logs, dated April 1, 1978 to March 31, 1979.

-- Senior Reactor Operator (SRO) Logs, dated April 1, 1978 to March 31, 1979.

-- Technical Specification Surveillance Procedure (SP) 1303-1.1 Records, dated April 1, 1978 to March 31, 1979.

-- Selected Computer Outputs, Daily Summaries

-- Selected Auxiliary Operator Logs

-- Makeup Tank (MUT) Strip Chart Traces, dated April 1, 1978 to March 31, 1979, excluding those dated July 8, 1978 to August 4, 1978

-- Power Range (NI-5) Recorder (SA-125) Traces, April, 1978 to March, 1979

2.2.4 Other Records

-- Selected Instrument Calibration Records; Reactor Coolant Drain Tank (RCDT) Foxboro Temperature Sensor, July 26, 1972; RCS Wide Range Pressure Sensor, March, 1972; Pressurizer Level Detector, June 5, 1971; RCS RTD, December 15, 1973, August 22, 1974; pressure vessel specification data sheet for MUT and RCDT.

-- Selected Chemistry and Sampling records, 1978

-- Plant Operations Review Committee (PORC) minutes of meetings, dated December 31, 1975 to December 30, 1976; January 1, 1978 to December 3, 1978; January 8, 1979 to January 22, 1979.

-- Selected Work Requests (WR).

2.3 Summary of Record Review

Surveillance records of RCS leak rate tests were reviewed for a period from April 1, 1978 through March 31, 1979. During that period, there were 290 days which required daily RCS leak rate testing in accordance with Technical Specification Table 4.1-2, item 7. The reactor was not in operation during June 22-29, 1978 and February 16 - March 27, 1979.

The surveillance test procedure (SP 1303-1.1) records were compared with SRO Shift Foreman and CRO log entries in order to obtain the number of times of test performance. The following entries were identified:

Record	No. Tests	Period
CRO Log	713	4-1-78/3-31-79
SRO Log	707	4-1-78/3-31-79
SP 1303-1.1	714	4-1-78/3-31-79

The surveillance records from the period of July 8, 1978 to August 4, 1978 were not reviewed due to missing MUT recorder traces. Thus, 69 surveillance test records could not be reviewed. Therefore, 645 surveillance test records were reviewed against MUT recorder traces and other data, such as daily logs and computer listings.

The licensee had established a conservative administrative test frequency of once per shift. Tests were often performed once per shift, whereas Technical Specification required a daily test.

The total number of days covered by surveillance record was 290 days, during which the following tests were completed:

No. Tests Performed Per Day	No. Days
1 (Daily)	27
2 (Twice Daily)	114
3 (Each Shift) or more	149

Major findings from the record review are:

-- Some of the tests noted in the CRO and SRO shift logs were missing in the surveillance files. These surveillance records were either never created, lost, discarded or misfiled. Two test records were found filed out of normal sequence and six were found misfiled. Seventeen missing test records were identified. They are listed in Table 1.

-- The surveillance test records frequently showed negative leak rate results. Two months of leak rate test data were reviewed to identify examples of test records demonstrating negative leakage. The following summarizes the results of that review:

	May, 1978	June, 1978	May + June 1978
Total Test Records Reviewed	60	61	121
Number Test Records Demonstrating Negative Leakage Rate Results			
Leakage Plus Losses	10	4	14
Gross Leak Rate	20	16	36
Unidentified Leak Rate	28	20	48

Table 1

Lost, Misfiled, Discarded or Never Created RCS Leak Rate Test Records

No.	Date	Time
1	4-29-78	1400
2	5-07-78	1436
3	5-21-78	1025
4	6-06-78	0530
5	7-04-78	2205
6	7-10-78	0338
7	8-19-78	1450
8	9-03-78	1247
9	11-05-78	1955
10	11-10-78	1125
11	12-11-78	0432
12	01-07-79	0600
13	01-18-79	0530
14	01-18-79	1310
15.	01-26-79	0032
16	01-29-79	0310
17	02-11-79	2230

Almost 40% (48 out of 121) of the calculated and recorded unidentified leak rates during the two month period had negative values.

-- The RCS leak test procedure, SP 1303-1.1, recommended water additions such as Feed-and-Bleed (F&B) operations be avoided during the test. The inspector identified at least 11 tests, during which F&B operations appeared to have taken place; and in each case, the change in water inventory was not properly compensated for by the operator in the computer calculations of RCS leakage rates. They are identified in Table 2.

These record review findings are indicative of the failure of the licensee to comply with regulatory and procedural requirements for record-keeping and test performance.

Table 2

Apparent Uncompensated Feed & Bleed Operations
During RCS Leak Rate Testing

No.	Date	Test Start Time	F&B Recorded In CRO/SRO Log	Power*
1	5-12-78	0047	No	89.5 Steady
2	5-30-78	0134	No	99.0 Steady
3	7-02-78	0256	Yes	89.0 - 87.0 Decreasing
4	8-05-78	1456	No	100.5 Steady
5	9-15-78	0921	No	101 Steady
6	11-13-78	0304	No	100 Steady
7	11-16-78	0426	Yes	72.0 - 81.0 Increasing
8	11-20-78	2110	Yes	100.0 Steady
9	11-24-78	0423	No	102.0 Steady
10	11-24-78	1111	No	102.0 Steady
11	11-24-78	1724	No	102.0 Steady

*Strip chart traces of power range recorder, SA-125. "Steady State" was assumed if there was less than ± 0.2% Variation on the recorder traces.

Attachment A contains copies of records for these tests.

3.0 Reactor Coolant System (RCS) Leak Rate

3.1 Background

The TMI Unit 1 Technical Specifications, paragraph 3.1.6 and Table 4.1-2, required that RCS leakages be determined at least once per day during steady state operations, and that the leakage-plus-losses, total gross leakage and unidentified leakages be maintained within their respective limits of 30 Gallons-Per-Minute (GPM), 10 GPM and 1 GPM. The TMI-1 Final Safety Analysis Report (FSAR), Section 4.2.3.8.a, specified that the leakages were measured by counting water inventory changes within the RCS pressure boundary for a fixed time interval.

The test procedure included a precaution to avoid addition or removal of water and chemicals from the RCS. The procedure also recommended that, for the most accurate leak rate determination, the initial and final values of power, RCS temperature, RCS pressure and pressurizer level should be maintained identical.

The procedure specified a test duration of one to eight hours, and specified the plant computer as the favored tool for performing test calculations. Hand calculations were allowed as a backup when the computer was not available. There was only one record of a hand calculation during the one year period from April, 1978 thru March, 1979.

When the computer program was initiated, data was taken automatically from hard-wired, pre-designated computer points, except for RCDT water levels, which did not have the direct input points to the computer. Therefore, RCDT levels were always required to be taken from a local patch panel using a digital voltmeter (DVM), and were entered manually into the computer calculations. Other manual actions required by the computer method were input specifications, such as test time interval (normally one hour), any identified leakages and the operator actions of make-up water additions and RCDT pumping. RCS leak rate calculations were automatically done by the computer when the above steps were completed. For hand calculations, the preferred data source was defined to be DVM readings from a patch panel rather than data obtained from control room indicators, due to the inherent inaccuracies in the latter readings.

The procedure also specified a set of corrective steps to be taken when the RCS leakages were in excess of the requirements. The first step was to perform another leak rate determination, followed by careful examination of the operator actions affecting the water inventory. The final step was to initiate action to determine the source of the leakage, and then to proceed with the ACTION statements specified in Technical Specification 3.1.6, which required placing the reactor in hot shutdown within 24 hours of detection of excessive leakage.

3.2 RCS Leak Rate Calculations

The leakage determination was based on a mass balance of the RCS water inventory changes over a prescribed time interval, normally one hour, even though the procedure allowed a test duration of up to eight hours.

The station surveillance procedure for RCS leak rate testing, SP 1303-1.1, Revision 7, May 25, 1976 (effective through August 21, 1981), determined "total RCS leakages plus losses" (30 gpm limit) from the difference between initial and final water inventory of the RCS, compensated for thermal expansion (or contraction) and level changes in the pressurizer and the make-up tank. "Gross RCS leakage rate" (10 gpm limit) was determined from the difference between "total RCS leakages plus losses" and changes to Reactor Coolant Drain Tank inventory. The "unidentified leakage" was determined from the difference between the gross and operator identified leakages, excluding the combined effects of normal evaporative losses and Reactor Coolant Pump (RCP) seal purge. An evaporative loss of 0.51 gpm was applied, based on the results of preoperational test TP 600/10, performed February 19, 1974.

Details of the computer algorithm and calculational steps are illustrated in Figure 1.

Where the symbols used are:

Tc_a, Th_a = A loop T_{cold}, T_{hot} (°F)

Tc_b, Th_b = B loop T_{cold}, T_{hot} (°F)

Z = Water level (in)

ρ = density (lb_m/ft^3)

Δm = mass change (lb_m)

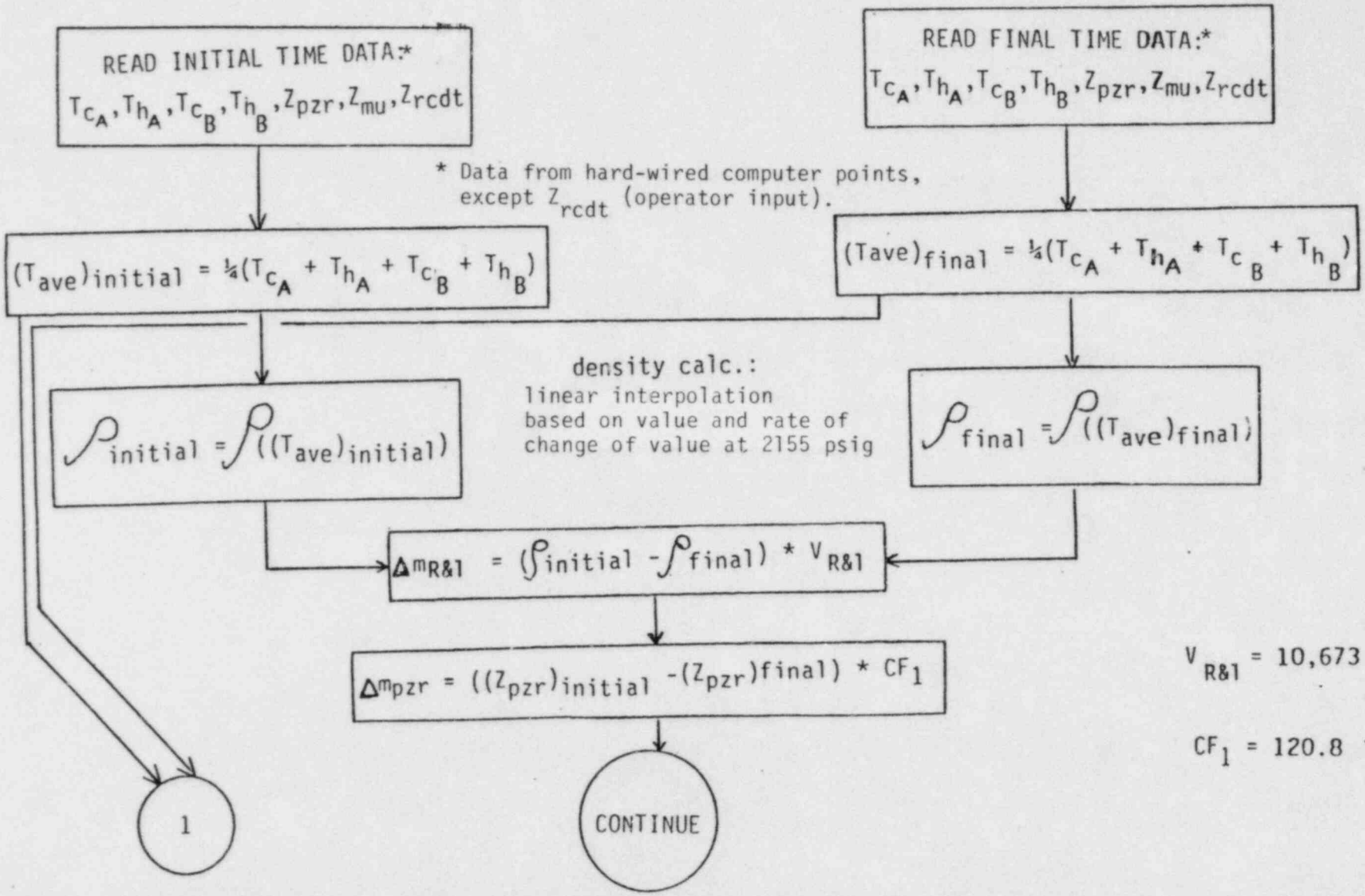
ΔV = volume change (gal)

$\Delta V'$ = operator induced change to the RCS or RCDT (gal)

CF = conversion factor from lb_m to gallon, a function of T_{ave} based on a linear interpolation about 2155 psig

FIGURE 1. TMI-1 RCS LEAK RATE CALCULATION (pre-April 1979)

1303-1.1 Rev. 7, 5/25/76

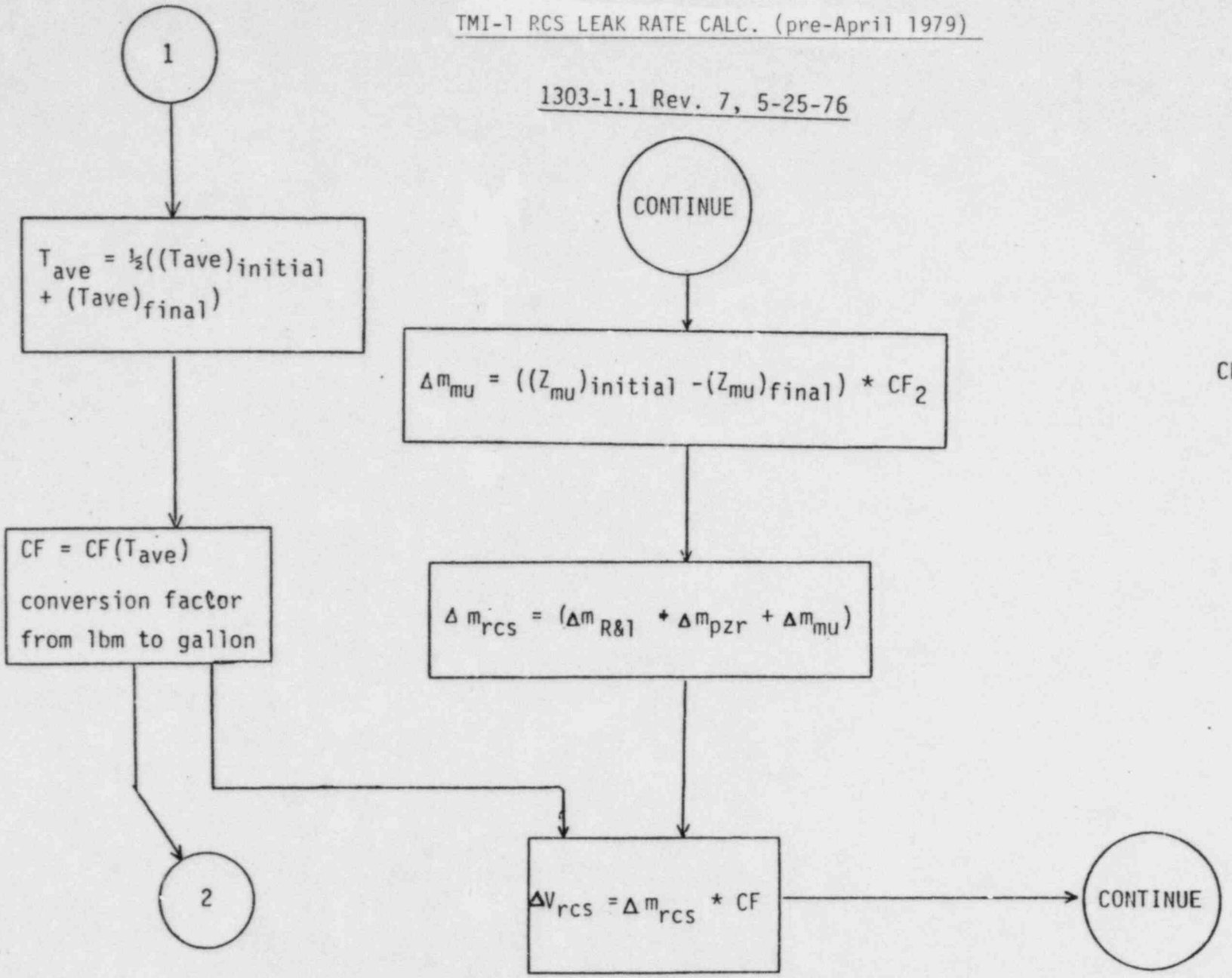


$V_{R\&1} = 10{,}673\ ft^3$

$CF_1 = 120.8$ lbm/in

TMI-1 RCS LEAK RATE CALC. (pre-April 1979)

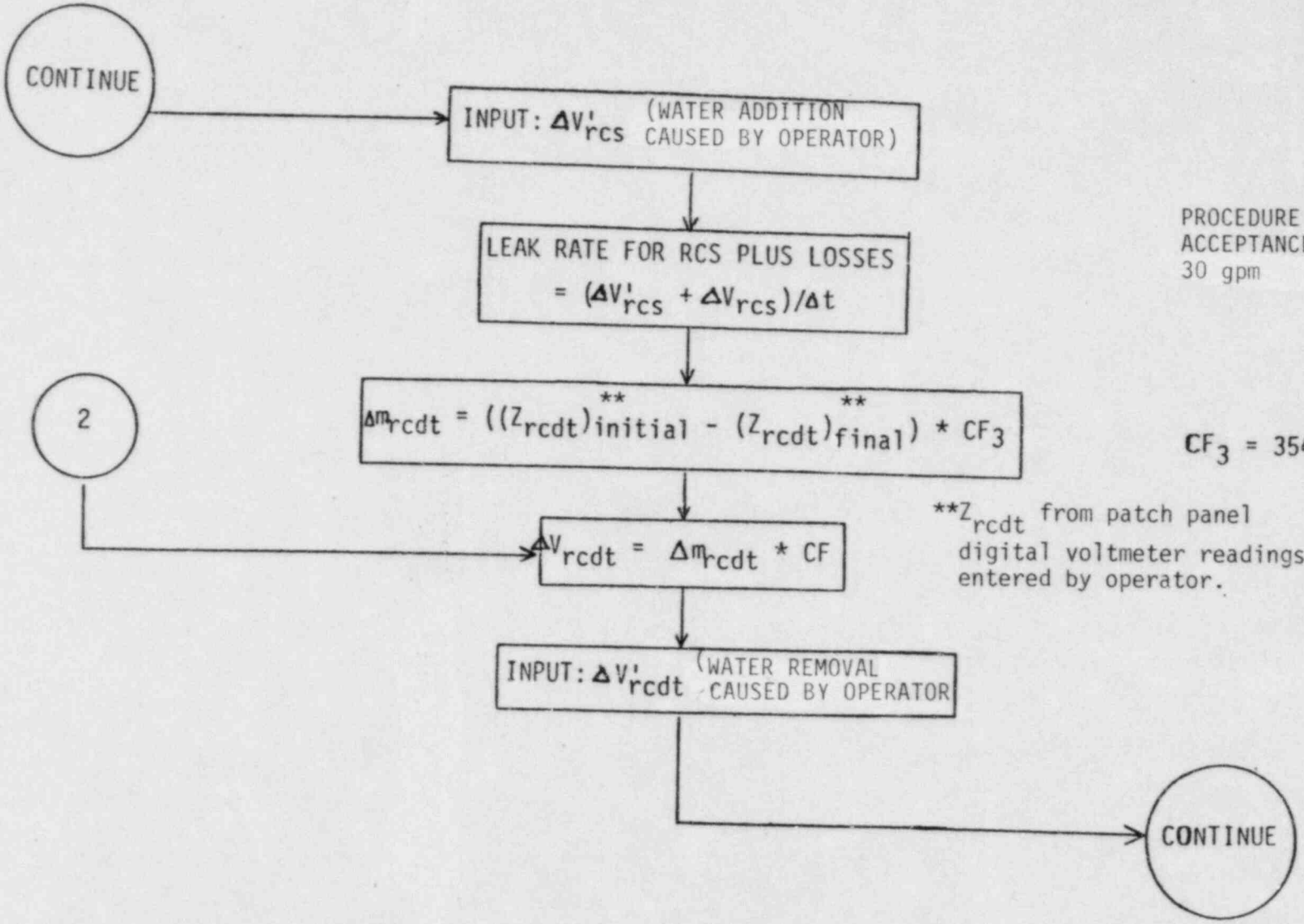
1303-1.1 Rev. 7, 5-25-76



CF_2 = 250 lbm/in

TMI-1 RCS LEAK RATE CALC. (pre-April 1979)

1303-1.1 Rev. 7, 5-25-76



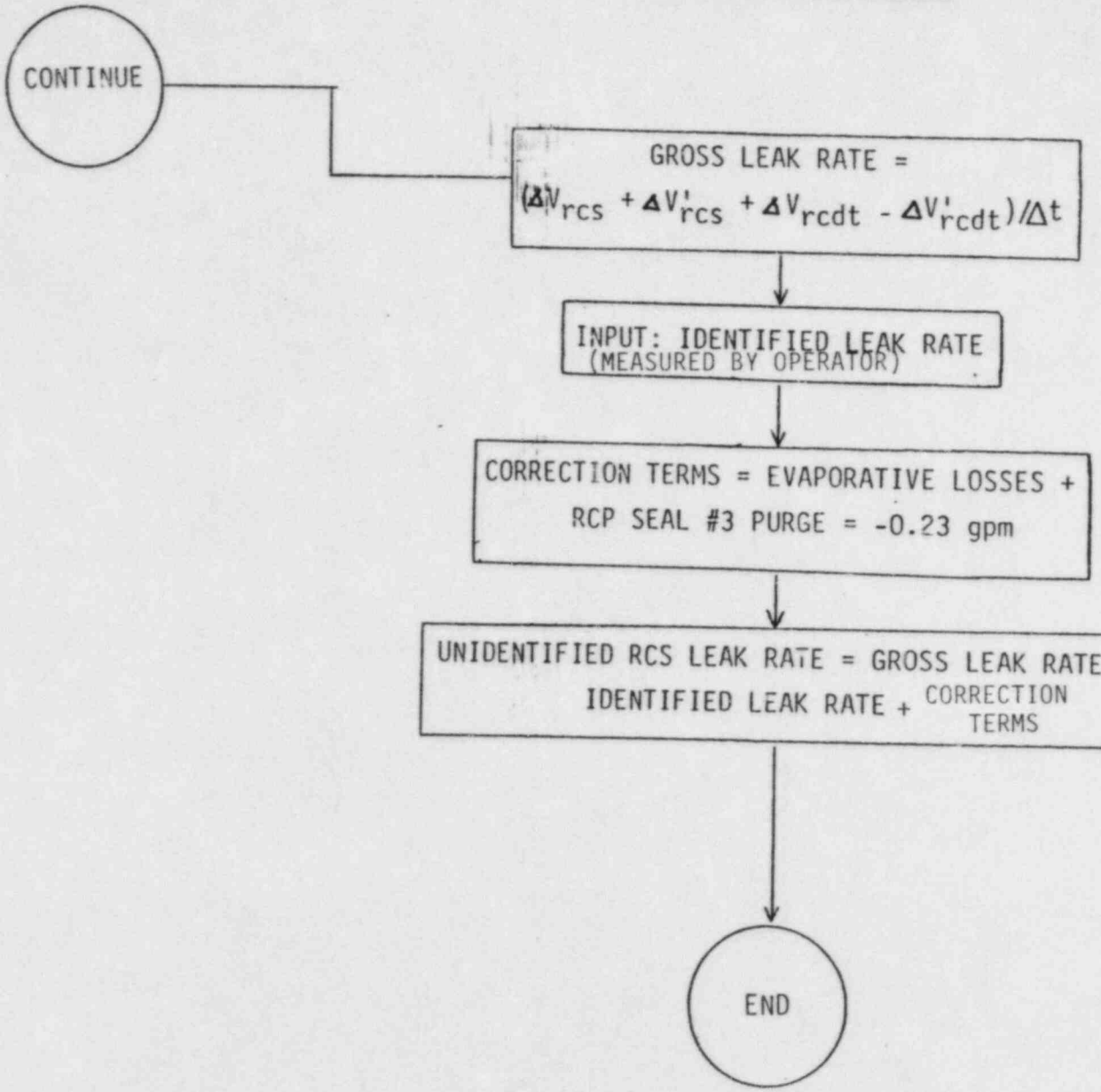
PROCEDURE STATED ACCEPTANCE CRITERIA:
30 gpm

CF_3 = 3540 lbm/volt

**Z_{rcdt} from patch panel digital voltmeter readings entered by operator.

TMI-1 RCS LEAK RATE CALC. (pre-April 1979)

1303-1.1 Rev. 7, 5-25-76



PROCEDURE STATED
ACCEPTANCE CRITERIA: 10 gpm

PROCEDURE STATED
ACCEPTANCE CRITERIA: 1 gpm

Table 3

Selected RCS Leak Rate Results Comparison

	GPU	USNRC	(NRC - GPU) Δ	| Δ NRC % Δ |
Leakage-Plus-Losses				
6-21-78:	4.1299	4.14771	0.01781	0.42939
7-6-78:	0.2205	0.22516	0.00466	2.0696
9-11-78:	-0.3875	-0.389682	-0.002182	0.5600
11-28-78:	0.1972	0.2029785	0.0057785	2.847
1-6-79:	-0.1774	-0.179124	-0.001724	0.9624
Gross				
6-21-78:	1.1721	1.189077	+0.016977	1.42775
7-6-78:	-0.1476	-0.13949	+0.00811	5.814
9-11-78:	-0.3562	-0.36010	-0.0039	1.0830
11-28-78:	-0.1162	-0.10750	+0.0087	8.093
1-6-79:	-0.3648	-0.366395	-0.001595	0.435
Unidentified				
6-21-78:	0.9421	0.959077	+0.016977	1.7701
7-6-78:	-0.3776	-0.36949	+0.00811	2.140
9-11-78:	-0.5812	-0.59010	-0.0039	0.6610
11-28-78:	-0.3462	-0.33750	-0.0039	1.156
1-6-79:	-0.5948	-0.596395	-0.001595	0.2674

CF_1 = pressurizer water mass change per level height change (lb_m/in).

CF_2 = make-up tank mass change per level height change (lb_m/in).

CF_3 = reactor coolant drain tank mass change per level sensor voltage output change (lb_m/volt)

Subscripts:

pzr = pressurizer

mu = make-up tank

rcdt = reactor coolant drain tank

R&l = reactor vessel & loops

rcs = reactor coolant system

To verify the licensee surveillance calculations, a program was written for an Osborne portable computer, based on SP 1303-1.1, Revision 7. Sample calculations were performed for five test cases. The results indicated an average of 0.31% difference between the licensee's and NRC calculations with a 2.98% standard deviation. The results are tabulated in Table 3. Most of the differences in licensee and NRC calculations are attributed to the use of different density correction factors. The NRC computer program then was used to independently check licensee results for many of the tests examined and to calculate the effects and changes due to the irregularities found and described in the sections which follow.

3.3 Procedural Inadequacies

3.3.1 Total RCS Leakage Plus Losses

Technical Specification Section 3.1.6.8 stated in part, "Loss of reactor coolant through reactor coolant pump seals and system valves to connecting systems which vent to the gas vent header and from which coolant can be returned to the reactor coolant system... when added to leakage shall not exceed 30 gpm."

Surveillance Procedure SP 1303-1.1 computed "Total RCS Leakage Plus Losses" as shown in Figure 1. The calculational procedure did not account for temperature and pressure differences between the MUT and RCS. Table 4 shows that the MUT water is normally at 125°F in comparison to RCS Tave of 579°F. Failure to convert MUT level changes to equivalent RCS conditions volume changes resulted in errors in the leak rate calculations and was a procedural inadequacy.

To illustrate this, assume that during a one hour test period an operator adds 60 gallons of water (at 125°) into the MUT. If temperature correction was not required, the 60 gallons would remain 60 gallons and the calculation would not be in error. In reality the 60 gallons would expand in the RCS to 82.56 gallons, but SP 1303-1.1 assumes no expansion and therefore would introduce a nonconservative reduction in RCS leakage rates of 0.376 gpm.

3.3.2 Total RCS Leakage

Technical Specification 3.1.6.1 stated, "if the total reactor coolant leakage rate exceeds 10 gpm, the reactor shall be placed in hot shutdown within 24 hours of detection". The total reactor coolant system leakage was called the "Gross RCS Leak Rate" in SP 1303-1.1 and was computed as shown in Figure 1.

Surveillance Procedure SP 1303-1.1, Rev. 7 incorrectly accounted for RCS leakage collected in the Reactor Coolant Drain Tank (RCDT) which was removed by operator action, since the calculation failed to correct for the lower temperature of RCDT water as compared to the RCS; thus, each gallon removed from the RCDT caused a nonconservative estimate of "Gross RCS Leak Rate."

3.3.3 Unidentified RCS Leak Rate

Technical Specification Section 3.1.6.2 states: "If unidentified reactor coolant leakage (excluding normal evaporative losses) exceeds one gpm or if any reactor coolant leakage is evaluated as unsafe, the reactor shall be placed in hot shutdown within 24 hours of detection."

Surveillance Procedure SP 1303-1.1 computes "Unidentified RCS Leak Rate" as shown in Figure 1. The calculational procedure incorrectly accounts for Reactor Coolant Pump #3 Seal Purge in that the value of this purge was added to the calculation of "Unidentified RCS Leak Rate" as a correction factor. Since the purge is taken from the MUT and ultimately flows to the RCDT, it is appropriately compensated in the calculation of "Total RCS Leakage."

3.3.4 Other Procedural Deficiencies

- The evaporative loss factor (-0.51 gpm) utilized in computing "Unidentified RCS Leak Rate", was obtained from the pre-operational test results TP600/10, "RCS Hot Leakage Test", Revision 0, performed March 14, 1974. In that procedure, the evaporative loss (-0.51 gpm) was calculated assuming 125°F MUT water, which was not corrected to equivalent RCS conditions.

Table 4

System Data for RCS Leak Rate Calculations

System	Operating Conditions
Reactor Coolant System	
T_{ave}, °F	579
volume (without pressurizer, at 579°F), ft^3	10678
Pressure, psig	2155
Make-up Tank	Vertical, Cylindrical
pressure psig	15 - 35
Temperature, °F	125
Level, inch	73
Volume, gallon	2955
Reactor Coolant Drain Tank	Vertical, Cylindrical
Pressure, psig	0
Temperature, °F	105 - 110
Level, inch	94.5
Volume/Level, gal/inch	35.4
Volume, ft^3	771
Pressurizer	
pressure, psig	2166
Temperature, °F	648
Level, inch	220
Volume (liquid), ft^3	800
Volume (Steam), ft^3	702
Volume/Level, gal/inch	240

- In addition to the failure to correctly convert MUT level changes to equivalent RCS water inventory changes, due to failure to correct for the higher RCS temperature, the procedure assumed the MUT and RCDT were maintained at a constant temperatures, and therefore did not account for the effects of temperature variation on water density.

- The Reactor Coolant Pump #3 Seal Purge was incorrectly converted to equivalent gallons at 534°F versus the proper conversion to 579°F.

- The procedure failed to account for the effects of changes in pressurizer pressure on pressurizer level.

- The procedure utilized an RCS Volume figure (excluding the pressurizer) of 10,673 ft^3 in calculations; whereas, the correct Volume figure at an RCS Tave of 579°F was 10,678 ft^3.

- The procedure utilized a MUT water mass change per unit level change of 250 lbm/in in calculations; whereas, the correct value for 125°F was 255 lbm/in.

3.4 Measurement Sensor Limitations

The sensors and instrumentation used in leak rate calculations were examined for accuracy and repeatability. Since these instruments have direct input (except for the RCDT level) to the plant process computer for use in the leak rate calculations, an understanding of their accuracy and repeatibility is useful when reviewing leakage rate determinations.

Table 5 summarizes the estimations of accuracy and repeatability. These estimations were checked against a period of stable reactor operation and found to be realistic. Instrument and sensor limitations and performance were not found to be limitations in leak rate calculations. A conservative estimate of measurement error due to instrument repeatability is 11.6 gallons regardless of test duration.

The following reference documents were reviewed to determine repeatability to construct Table 5.

-- Calibration notes, TMI-1

-- Bailey BYXXXO type differential pressure transmitter specifications E 21-17, page 31; Type BY8230-A Make-up Tank level differential pressure transmitter, order number, A-29062Z, calibration specifications sheet No. 150L339.

-- Foxboro model E13DM Differential pressure Transmitter, MI 20-110, January 1969.

-- RCS RTD Calibration Acceptance Test Data Sheet, February 8, 1974.

-- Model 694A Converter, Foxboro; Model 620 Series indicating transmitter

-- Model 1152GP Rosemont pressure transmitter

-- Foxboro 99B series totalizer specification sheet, February 1967.

A significant variation in reactor coolant system parameters can be expected due to inherent periodic oscillations of some of these parameters. The oscillations can be significant if a beginning or final data set is gathered over a time span which is comparable to the period of oscillations. It was understood that due to relatively improved system tune-up for Unit 1, during the one year period of interest, the system oscillation or inherent periodic perturbation in Unit 1 was negligible compared with the expected errors from such perturbation in Unit 2. This was understandable since Unit 1 had been in commercial operation since 1974 and Unit 2 started its operation in December 1978.

A stable period of plant operation was selected to check for such oscillations. The inspector noted that the reactor was maintained at 100% power for seven hours during a period of 1600-2300 hour on September 30, 1978.

The inspector reviewed computer summary sheets for the same date, and verified that the cold and hot leg temperatures (total six readings; 4 cold legs and 2 hot leg readings) were indeed maintained constant during the entire seven hour period. Also, the T_{ave} variation was far less than one tenth of the RTD uncertainty and less than the estimated repeatability of the instrumentation.

Accuracy of the RCS leakage calculation is not dependent on the absolute accuracy of the RCS inventory measurements but rather is dependent on accurate measurement of the inventory changes. Therefore, test accuracy does not depend on the absolute instrument accuracy of the individual detection systems, but rather on each instrument's repeatability, or closeness of agreement among a number of consecutive measurements. Based on several discussions with licensee representatives and review of listed documents, it was learned that repeatability of pressure, temperature and level detection elements was considerably better than their respective accuracies.

Table 5 shows a summary of the instrument accuracy and estimated repeatability and consequenty expected measurement errors. Note that the measurement errors due to the instrument repeatability are independent of the test duration. For example, total measurement

Table 5

Instrument Repeatability

Instrument	Accuracy		Repeatability	Expected Inventory Change Variance
	Individual	Over-all (RMS)	parameter	gal
RCS Temperature (100°F span)		0.52%	0.052%	<6 gal.
RTD	0.25%			
Drift after 2 yrs.	0.25%			
Bridge	0.35%			
Signal Conversion	0.15%			
RCS Pressure (800 psi span)		1.128%	0.113%	~0
Transmitter	0.5%			
Buffer Amplifier	0.15%			
Isolation Amplifier	1.0%			
Pressurizer Level (400 inch span)				
Level	0.5%	.4 inch	0.4"	9.6 gal
RTD (same as RCS RTD)	2.8°F/700°F			
MUT level, (100 inch span)		0.5%	0.05"	1.5 gal
RCDT level, (120 inch span)		0.5%	0.06"	2.1 gal
Flow Totalizer		0.25%	0.1%	
Total RMS Variance in Inventory Change Calculation				<11.6 gal

errors estimated from the instrument repeatability would be 11.6 gallons regardless of test duration, and subsequent contribution to the leak rate error would be 0.19 gpm and 0.05 gpm for one and four hour test durations, respectively.

3.5 Uncertainty of Make-Up Tank (MUT) Chart Time

During the one year period, 264 water additions were logged in CRO logbooks and these entries were identified on the MUT strip chart tracings, as tabulated in Table 10. The purpose of this comparison was to determine the accuracy and validity of the chart time. It was understood that the time entered in the shift log by an SRO and CRO was the control room clock time, and the control room MUT recorder time was adjusted periodically to the control room clock time at midnight.

The traces of water addition on MUT charts were compared statistically with the CRO log entry times. Statistical analysis showed that the chart traces of water additions were ahead of the log times by an average of 3.2 minutes with a standard deviation of 10.73 minutes. This was an expected result since the operator or SRO would enter the water additions into the shift log after completion of the operation. On this basis, it was determined that the MUT recorder chart time was accurate statistically to ± 10 minutes.

This information was later utilized to isolate the interval of the MUT level strip chart trace which bracketed the period of test performance. The resulting interval of strip chart was typically 80 minutes wide, (a 60 minute test + 13 minutes before + 7 minutes after) starting 13 minutes prior to the recorded test start time in terms of chart time. All available records were then correlated to identify the actual period of test performance within this interval.

3.6 System and Human Error Potential

Beside the procedural inadequacies and the "As Built" system limitations, there are three additional expected or potential errors in the RCS leakage rate calculations.

(1) RCDT level patch panel DVM readings

The procedure specified that all other level readings besides the RCDT's were automatically fed from the process computer input data points. RCDT levels were manually entered after taking patch panel DVM readings. Since a small error in DVM readings could cause a large error in the RCS leak rate result, the RCDT level readings could be a major source of the errors in leak rate calculations. This is discussed further in Section 6.0.

(2) MUT Water Addition

Procedure SP 1303-1.1 recommended that no addition of make-up water be made during a test, and further specified that water addition, if any, be entered manually into computer.

If make-up water was added during a test, after initial data taking but before final data reading, and the addition was not included in the computer calculations, the RCS leak rate calculated results would be inaccurate and understated. This is discussed further in Section 5.0.

(3) Hydrogen Addition

Because of the configuration and environment of the MUT level detection instrumentation system, water condenses and collects in the low pressure reference leg. Under this condition, hydrogen additions to the MUT during a test cause an increase in the indicated MUT level without actually adding water into the system. This would definitely change the RCS leak rate test results, yielding inaccurate and understated RCS leak rate test results. So long as the condensed water is blocking the low pressure U-leg as described above, hydrogen addition would cause an indicated MUT level shift upward.

Details are discussed in the Sections 4.0.

4.0 Effects of Hydrogen Addition on Leak Rate Test Results

4.1 Discussion

Hydrogen addition to the make-up tank is often required in order to limit the oxygen content in the Reactor Coolant System. The RCS leak rate test procedure, SP 1303-1.1, prohibits the addition of chemicals during a test, although the procedure did not specifically identify hydrogen as a chemical.

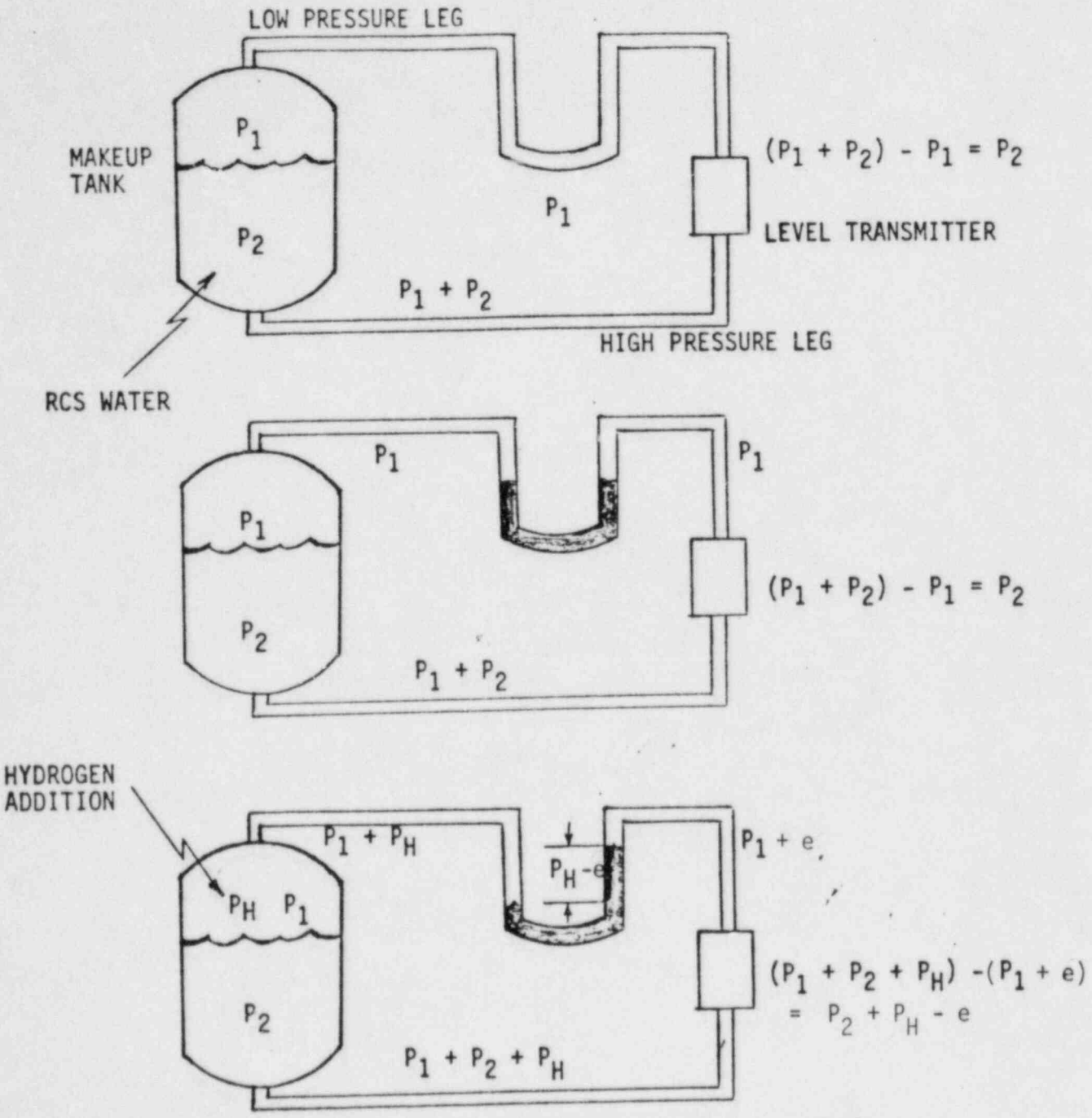
As discussed later, the addition of hydrogen to the make-up tank (MUT) can cause an indicated increase in the MUT level without water addition. Therefore, addition of hydrogen at an appropriate time (after initial data collection, and preferrably just prior to final data readings) will affect the leak rate results in a non-conservative fashion. The conditions under which such hydrogen additions were made resulted in a characteristic trace on the MUT level chart record. In order to isolate hydrogen additions, level recorder charts were searched for the characteristic trace of the hydrogen addition. These traces, once found, were then compared with the CRO logbook entries and surveillance records.

4.2 Makeup Tank Level Shift with Hydrogen Addition

The water level in the make-up tank is determined by measuring the differential pressure between the top and bottom of the tank, as shown in figure 2. With the level instrumentation operating properly, any change in cover gas pressure (P_1) will be applied equally to the top and bottom of the tank, and the level transmitter will give the pressure P_2, representing the liquid head in the tank. The piping leading from the bottom of the tank to the higher pressure side of the level detector is intended to be filled with water, and the piping from the top of the tank to the low pressure side of the detector is intended to be dry. The water in the MUT is normally at 125°F, a higher temperature than the ambient room temperature, and the saturated water vapor over the MUT water is at a higher pressure than that which can exist in the colder pipe. Thus, the Low Pressure Piping will act as a slow vapor condenser, and the condensed water will gradually fill the "dry" low pressure leg (see figure 2). If enough water exists in the loop it will form a water loop seal and, for small pressure changes, serve to isolate the low pressure side of the level detector from the make-up tank.

FIGURE 2

LOOP SEAL



NOTE: The "e" term accounts for the slight compression of the trapped gas due to the movement of the water column and is approximately equal to zero.

Referring to the bottom diagram in Figure 2, if a small amount of pressure, say P_H, is added to the MUT, the condensed loop seal water will behave like a manometer, and the high pressure side will sense the additional pressure (P_H) added to the tank, but the low pressure side will only sense a small percentage of the addition. The net effect will be an apparent increase of the MUT water level, equal to the pressure increase (P_H) expressed in inches of water. For each inch of apparent level change, it takes only 0.036 psi pressure addition (P_H), or 1 psi pressure addition can give 2.3 ft (27.69 inches) water level increase. To influence the leak rate, it takes only a few inches level change, since the water volume change for each inch of level in the MUT is 30.8 gallons. For example, by adding 0.072 psi hydrogen pressure (P_H), the apparent MUT level will increase by 2 inches, an apparent inventory increase of 61.7 gallons, resulting in a decrease of the calculated gross and unidentified leak rates by 1.028 gpm in a one hour test.

The characteristic trace of a hydrogen addition on the MUT level recorder when a water loop seal is present will be a strip chart trace like a step increase with over-and under-shoot. This pattern (⌐‾) of over/under-shoot is due to the manometer-like oscillation of loop seal water in the incompletely filled low pressure reference leg due to the sudden pressure increase.

Obviously, the effect of a pressure addition on the level is limited by the height of the water column in the loop seal. Any excess pressure will either push the water column toward the top of the U-loop and into the detector or cause gas bubbles through the water seal, negating the pressure effect. For practical purposes, 2 - 4 inch level changes by hydrogen addition will not cause any measurable gas compression on the detector side of the loop seal in the low pressure leg.

4.3 Findings Regarding Hydrogen Addition

4.3.1 Existence of Loop Seal

The inspector questioned several licensee staff members relative to the possible existence of a loop seal in the MUT level instrument system legs. These licensee representatives informed the inspector that no loop seal existed.

During an as-built inspection on July 11, 1983, the inspector found the existence of a loop seal in the "dry" leg of the MUT level instrumentation. Subsequently, the inspector, accompanied by a licensee representative, verified that the U-loop in the dry leg is more than 4 ft. in height. The following entries in the plant maintenance logs indicate that some members of the plant staff were aware of the effect of water condensation in the low pressure leg of the level instrument:

-- Work Request (WR) No. 23660, April 28, 1978 at 2200 hour, "make-up tank level recorder is not responding correctly. Put in 100 gallon - recorder went up 8" or 240 gallons. If you change make-up tank pressure 4 lbs. - level changes ≥ 18".

-- WR No. 23904, May 16, 1978 at 2145 hour, "while adding H^2 to MUT-1, received MUT-1 high level alarm..."

-- WR No. 23852, May 23, 1978, Make-up tank level increase 10" for addition of 100 gal. - should only move by about 3"."

-- WR No. 24843, August 8, 1978, "Transmitter/recorder erratic. Suspect that reference leg has moisture in it"; blow down low side. Got a lot of water."

-- WR No. 21284, September 12, 1979 at 1900 hour, '... suspect MUT-1 level transmitter"

4.3.2 Test To Develop Recorder Trace For Hydrogen Addition

On July 28, 1983, the licensee challenged the proposition that hydrogen addition would cause an increase of the MUT's indicated level and produced MUT strip chart traces from a test. The inspector recognized that during this test, the licensee introduced over 20 psi pressure. This pressure was much greater than that required to affect MUT level. It would require a loop seal 46 feet in elevation versus the existing loop seal with a maximum four foot elevation. To demonstrate the effect of a realistic hydrogen addition on MUT level, the inspector proposed a test.

On July 29, 1983, two inspectors were accompanied by licensee representatives inside and outside of the MUT room, and another inspector with a licensee representative directed the test from the control room. The test was performed with nitrogen gas. The effect of the pressure addition was observed as summarized in the following:

-- When the loop seal was drained immediately preceding the test, no effect of pressure addition was observed on indicated level.

-- With water in the loop seal, small amounts of nitrogen gas were introduced for 1 second, 2 seconds and 10 seconds by opening and closing MU-V-27, and the resulting level increases were 1.0 inch, 2 inches and 7 inches. The pressure increases during these tests were too small to register on the pressure indicator in the control room.

-- The trace of the level shift due to the pressure increase (⊣⊢) was the same as those suspected hydrogen additions on the MUT chart for the period April 1978 thru March 1979. (See Table 6)

The test traces are shown in Figure 3. For clarity, Figure 3A provides a magnified hand drawn version of the appropriate section of Figure 3. A computer graphic trace is shown in Figures 4 for this test. After the test, licensee representative acknowledged the inspector's findings of the effect of hydrogen additions and their characteristic traces on the MUT level charts.

4.3.3 Hydrogen Additions During Leak Rate Tests

The Control Room Operator's and Shift Foreman's logs were searched for entries showing hydrogen addition during the periods of leak rate testing records. This was done for records from April, 1978, through March, 1979. No entries showing the hydrogen additions were observed in the logs. The makeup tank level strip chart was then examined for the additions; 13 additions were identified. Considering the accuracy of MUT chart times, seven hydrogen additions during RCS leak rate testing were confirmed as shown in Table 6. The hydrogen additions were not recorded in the logs nor compensated for in the leak rate calculations. When the hydrogen additions and consequent level shifts were included in the leak rate calculations, the unidentified leak rates were all increased, and all but one exceeded the limiting conditions of operation in Technical Specification 3.1.6.2, which specified the limit as 1 gpm. Further, Technical Specification 3.1.6.2 stated that if the unidentified reactor coolant leakage exceeded 1 gpm, the reactor should be placed in hot shutdown within 24 hours of detection.

These findings constitute examples of apparent failure to comply with procedural and regulatory requirements.

Figure 3. Hydrogen Addition Test, July 29, 1983

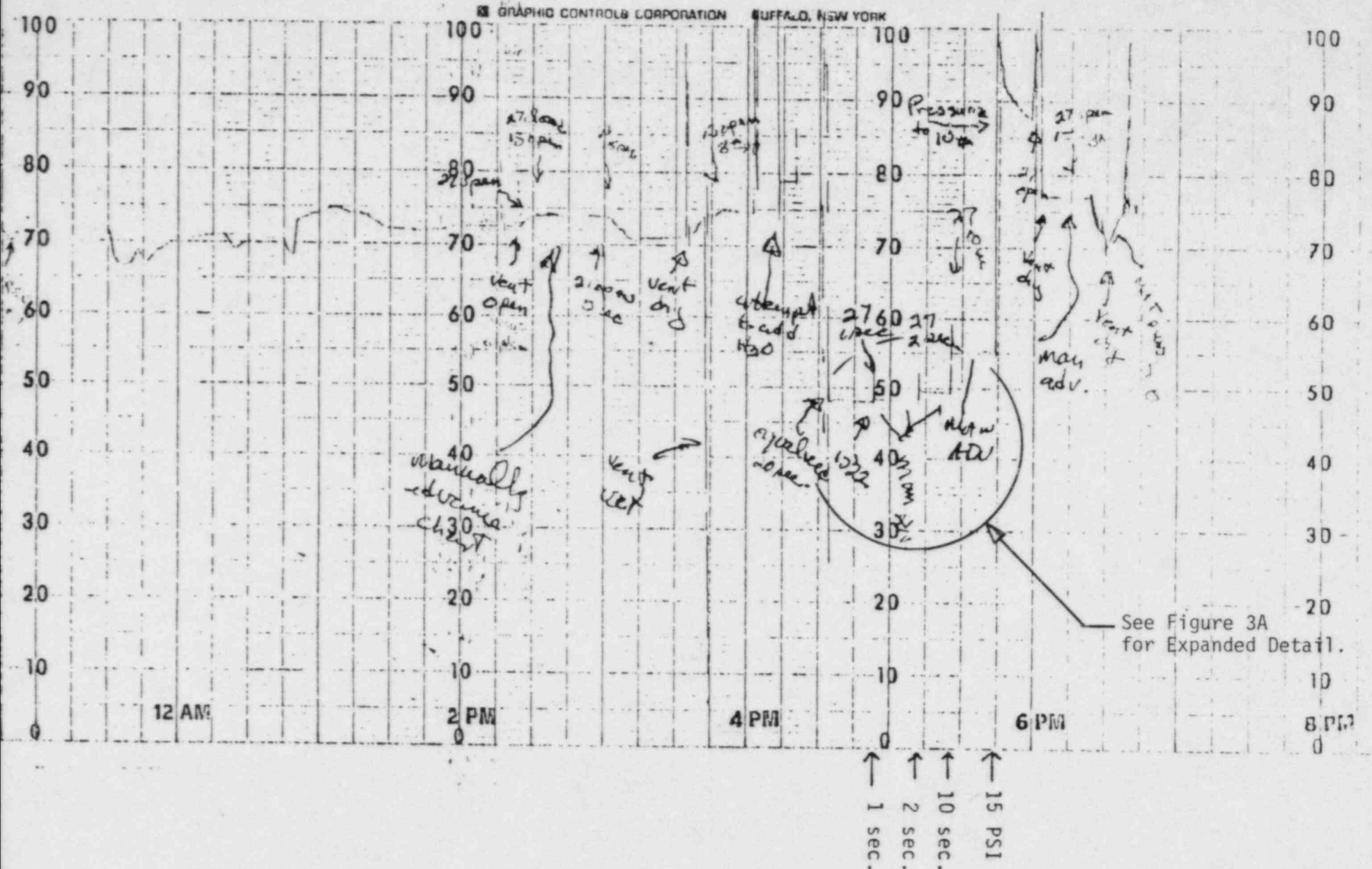


Figure 3A. Detail Sketch of Make-Up Tank Level Response
Hydrogen Addition Test, July 29, 1983

Time and Level Expansion of Figure 3.

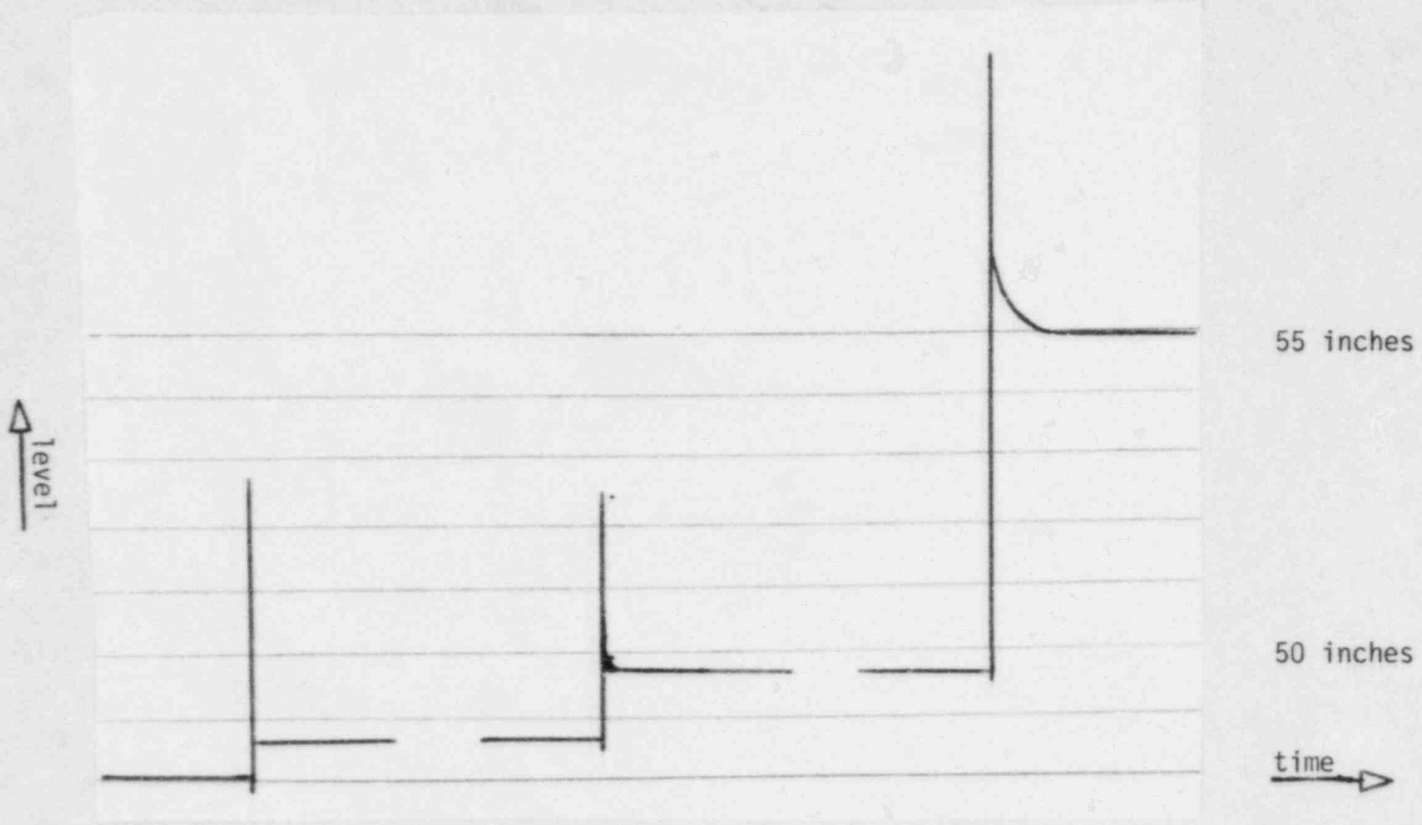
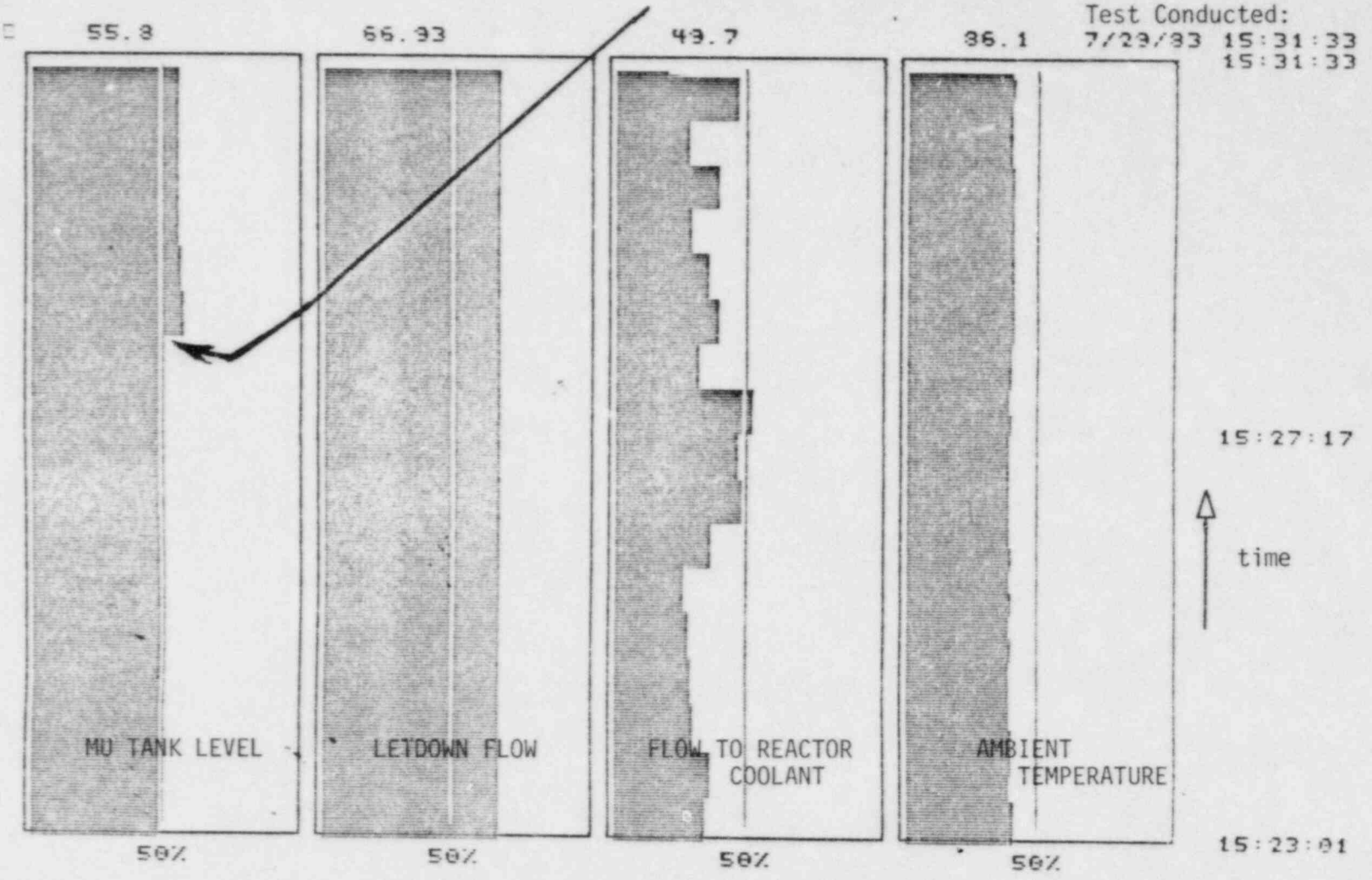


FIGURE 4.' Process Computer Display
Hydrogen Addition Test
MUT Level Shift on Gas Addition :
10 Seconds Opening/Closing



A498	MU TANK LVL (IN)	INH20	ZERO=	0.0	FULL= 100.0
A497	MU LETDOWN FLOW (GPM)	GPM	ZERO=	0.00	FULL= 100.00
A500	MU FLOW TO REACT COOLANT (GPM)	GPM	ZERO=	25.0	FULL= 150.0
A092	AMBIENT-DRY BULB TEMP	DEGF	ZERO=	70.0	FULL= 110.0

PLOT RATE = 2 SECOND(S)

Table 6

Hydrogen Additions To Makeup Tank During Leak Rate Test

Date	Time	Effect on Level inch	Effect on Leak Rate, Gallon Temperature not corrected	Temperature corrected	Unidentified Leak Rate, gpm Original	Corrected	Hydrogen Entry in CRO Log	Power* %
8/8/78	0735	2	61.77	84.996	-0.1099	1.3067	No	99.5, steady
9/8/78	1629	3	92.649	127.439	-0.5823	1.5417	No	99.0, steady
9/18/78	2355	1	30.883	42.512	0.4014	1.1099	No	100.0, steady
9/19/78	2348	2	61.17	84.996	0.0168	2.1536	No	100.0, steady
10/2/78	1645	3	92.649	127.457	0.0293	1.4612	No	99.0, steady
11/12/78	0816	1.5	46.32	63.761	-0.1954	0.8673	No	100.0, steady
2/3/79	1608	3	92.649	127.509	0.4092	2.5344	No	102.0, steady

*Strip chart traces of Power Range Recorder, SA-125

Attachment B contains copies of records for these tests.

5.0 Effects of Water Additions on Leak Rate Test Results

5.1 Discussion

When water is added to the makeup tank during an RCS leak rate test (before the final readings but after the initial data taking), it should always cause an apparent reduction in the leak rate results.

Even though procedure SP 1303-1.1 recommended against any water additions during the leak rate test, the procedure provided for the entry of the water additions into the computer.

As stated earlier, the computer program did not account for the water expansion as the cold water from MUT (125°F) heated up in the RCS (579°F), and consequently, even a correctly entered water addition would result in an error. For example, a 100 gallon water addition and subsequent computer entry would result in a 100 gallon water inventory increase, even though that 100 gallons of water would expand to 137.6 gallons in the RCS. If not manually entered into the calculation by the operator, this would give a 1.67 gpm (100 gal. in 60 min.) reduction in the uncompensated gross and unidentified leak rates for a 60 minute test and would result in an actual 2.29 gpm (137.6 gal into RCS in 60 min.) reduction of the leak rates.

The water additions to the RCS are required to be entered in the Control Room Operator's (CRO) log in order to account for the operator actions. Therefore, one would expect to see any operator-induced water addition to the RCS recorded in the CRO log as well as in the computer calculations.

Water addition could be identified from the makeup tank level recorder chart, whose traces shifted upward in level when the water was added. This characteristic pattern or trace could be easily correlated with the entries in the CRO log. However, the trace of a water addition would be different than the trace or pattern seen when hydrogen was added. The hydrogen addition would result in an almost perfect step increase with a characteristic overshooting due to the loop seal water oscillations. In contrast to this, water additions would not produce sharp, right-angled step-wise indicated level changes with overshoot, but would show some slope of increasing indicated level with time.

The makeup tank recorder chart was reviewed in order to determine if water additions had been made during RCS leak rate tests without recording the addition in the control room CRO and SRO logs, and/or without including such additions in the RCS leak rate calculations.

5.2 Findings Regarding Water Addition

During a previous inspection, four such water additions were identified. During this inspection it was determined that three of them were wrongly identified. In fact, one of the three wrong cases is now identified as a hydrogen addition.

Based on the review of MUT strip chart traces of water addition, surveillance SP 1303-1.1 computer output and pressurizer level response during tests, seven tests were identified during which water additions were made but were not entered into the computer calculations. Table 7 summarizes these water additions.

In some cases, the chart traces indicated that water might have been added gradually to the RCS. One test, performed January 6, 1979, accounted for 300 gallons of water addition in the computer calculations. However, the level shift, a characteristic trace of water addition on the MUT strip chart, indicated that approximately 479 gallons of water was added instead of 300 gallons. This recorded MUT level shift provided additional evidence of the existence of a loop seal in the low pressure reference log, since raising MUT level compresses the MUT cover gas and causes the same effect as a gas addition discussed in Section 4.

When these water additions were accounted for in the leak rate calculations, all but one showed that the failure to enter the water addition into the computer resulted in the unidentified leak rate in excess of 1 gpm, as tabulated in Table 7. This was contrary to the requirement specified in Technical Specification 3.1.6.1 and are further examples of apparent failure to comply with procedural and regulatory requirements.

Table 7

Water Additions During RCS Leak Rate Test Without Entry Into the Computer

Date	Time	Water Addition inch	Water Addition gallons	Entry in CRO Log	Unidentified Leak Rate, GPM Original	Compensation	Corrected	Power** %
5/12/78	1643	8.0	247.1	Yes	-0.7443	3.384	4.930	90, steady
6/11/78	0804	9.0	277.9	Yes	-0.5826	5.215	6.977	97, steady
6/21/78	0341	8.0	247.1	Yes	0.9421	5.060	6.613	99.5, steady
8/31/78	0801	5.5	169.86	No	-0.4141	2.417	3.481	100, steady
11/7/78	1608	2.0	61.77	No	0.0445	1.0735	1.553	100, steady
12/13/78	1842	10.0	308.83	Yes	-0.2170	4.930	6.865	100, steady
1/6/79*	0756	15.5*	478.69*	Yes	-0.5948	0.1497	0.900	101, steady

*300 gallons of 478.69 gallons added were included in the original leak rate calculations.

**Strip chart traces of Power Range Recorder, SA-125

Attachment C contains copies of records for these tests.

6.0 Effects of Reactor Coolant Drain Tank (RCDT) Level Inputs on Leak Rate Test Results

6.1 Discussion

The Reactor Coolant Drain Tank collects the effluent or leakage from the pressurizer PORV and code safety valves. It also collects leakage past the reactor coolant pumps primary mechanical seal. The tank fluid can be circulated through a cooler and returned to the tank by spraying into the tank vapor space. The RCDT also has a connection to the Reactor Building Sump. Surveillance Procedure SP 1303-1.1, Revision 7 (effective revision during 1978-79), treated the water level change in the RCDT as a loss of Reactor coolant covered by Technical Specification 3.1.6.8. Therefore this was not subject to the 10 gpm limit of total RCS leakage. This treatment of RCDT water would allow leakage through relief and safety valves and reactor coolant pump seals to approach a 30 gpm limit.

6.2 Findings Regarding RCDT Level Inputs

Manual reading of RCDT level and manual input of the value into the computer were required. The RCDT level transmitter output was not hard-wired into the computer, and consequently its value had to be manually entered into the computer after taking a patch panel DVM reading. A 0.1 volt error in the reading could lead to a 1.0 gpm error in total and unidentified leak rate measurements during a one hour test. Normal RCDT level readings were 8 to 9 volts. It was not possible to cross-check records to determine if actual errors were made.

When an operator took an action such as pumping out water from the RCDT, this action is required to be logged in the CRO shift log. As listed in Table 8, the RCDT tank levels were decreased substantially according to the surveillance records of leak rate tests; yet, no entries in the SRO or CRO logs were identified reporting the cause for the apparent large volume of water removed from the RCDT. An unaccounted water removal from the RCDT would result in conservative values of calculated gross leakage rate. These are additional apparent failures to follow procedural requirements concerning required log entries.

Based on the computer printouts of surveillance results, Table 9 lists those RCDT level changes greater than 60 gallons of water during the review period. If these changes are overstated, the resulting RCS leak rate calculations will be nonconservative.

Table 8

Reactor Coolant Drain Tank Decreases During
Leak Rate Test ($\leq$ 0.1 Volt)

Date	Time	Level change Volt	Volume change at 579°F, gal	Effect on Leak Rate gpm
4/27/78	0805/0905	-0.112	-66.212	-1.104
5/12/78	1643/1743	-0.279	-164.939	-2.749
5/16/78	1615/1915	-0.117	-69.168	-0.384
6/7/78	1646/1846	-0.184	-108.777	-0.906
9/14/78	2355/0055	-0.218	-128.877	-2.148
10/16/78	1852/1952	-0.890	-526.150	-8.769
12/13/78	1842/1942	-0.592	-349.979	-5.833

Table 9

Reactor Coolant Drain Tank Increases During
Leak Rate Test (≥ 0.1 Volt)

Date	Time	Level change Volt	Volume change at 579°F, gal	Effect on Leak Rate, gpm
5/8/78	2320/0120	0.123	72.715	0.606
5/21/78	0328/0428	0.114	67.395	1.123
6/1/78	0746/0846	0.145	85.721	1.429
6/2/78	0046/0346	0.247	146.021	0.811
6/2/78	1658/1858	0.175	103.457	0.862
6/9/78	2341/0441	0.430	254.207	0.847
6/11/78	0804/0904	0.111	65.621	1.094
6/12/78	1645/1745	0.187	110.551	1.843
6/16/78	0035/0135	0.928	548.615	9.144
6/16/78	1925/2125	0.190	112.324	0.936
6/20/78	0041/0141	0.112	66.212	1.104
6/21/78	0341/0441	0.309	182.675	3.045
6/21/78	0912/1012	0.480	283.766	4.729
7/7/78	1603/1903	0.181	107.004	0.594
7/8/78	1935/2135	0.190	112.324	0.936
7/11/78	1535/2035	0.117	69.163	0.235
7/17/78	0040/0440	0.219	129.468	0.539
8/15/78	0455/0555	0.224	132.424	2.207
8/23/78	2349/0349	0.217	128.286	0.535
11/5/78	1712/1812	0.105	62.074	1.035
12/24/78	0740/1040	0.395	233.516	1.300
12/28/78	1627/1927	0.151	89.268	0.496
1/12/79	2347/0047	0.111	65.621	1.094

7.0 MANAGEMENT MEETINGS

An entrance meeting was conducted with H. Hukill and staff on July 11, 1983. The purpose and scope of the inspection was discussed at this meeting. No other management meetings were held. No written notes or requests were provided to the licensee by the inspectors during the course of this inspection.

Table 10

Log Time Versus MUT Recorder Chart Time for Water Additions

No.	Date	Time		Δ, min.
		CRO	Chart	
1.	4/30/78	1400	1355	5
2.	5/4/78	0130	0145	-10
3.	5/5/78	0005	0005	0
4.	5/5/78	0315	0315	0
5.	5/5/78	1700	1700	0
6.	5/5/78	0520	0515	5
7.	5/8/78	1300	1255	5
8.	5/9/78	2055	2050	5
9.	5/10/78	0830	0820	10
10.	5/12/78	1745	1735	10
11.	5/12/78	1543	1547	-4
12.	5/11/78	1800	1746	14
13.	5/13/78	0815	0800	5
14.	5/13/78	1505	1500	5
15.	5/14/78	2225	2220	5
16.	5/15/78	0050	0045	5
17.	5/15/78	1845	1840	5
18.	5/16/78	2120	2110	10
19.	5/16/78	0500	0450	10
20.	5/17/78	0325	0320	5
21.	5/17/78	1530	1530	0
22.	5/18/78	1340	1340	0
23.	5/19/78	0415	0415	0
24.	5/20/78	0525	0523	2
25.	5/21/78	0315	0315	0
26.	5/21/78	0003	0005	-2
27.	5/21/78	1930	1930	0
28.	5/21/78	2245	2245	0
29.	5/22/78	0419	0419	0
30.	5/22/78	1130	1130	0
31.	5/23/78	0530	0520	10
32.	5/24/78	0630	0625	5
33.	5/26/78	2200	2200	0
34.	5/26/78	0112	0107	5
35.	5/26/78	1826	1810	16
36.	5/28/78	1925	1910	15
37.	5/28/78	0320	0315	5
38.	5/30/78	0240	0235	5
39.	6/3/78	0214	0150	24
40.	6/3/78	1515	1450	25
41.	6/4/78	0847	0850	-3
42.	6/5/78	0140	0140	0

No.	Date	Time		Δ, min.
		CRO	Chart	
43.	6/6/78	1500	1500	0
44.	6/7/78	0330	0330	0
45.	6/8/78	0620	0620	0
46.	6/8/78	1930	1925	5
47.	6/9/78	1440	1440	0
48.	6/9/78	1230	1230	0
49.	6/9/78	0500	0500	0
50.	6/11/78	0755	0750	5
51.	6/11/78	0838	0830	8
52.	6/11/78	1000	0952	8
53.	6/11/78	1055	1050	5
54.	6/11/78	1125	1120	5
55.	6/12/78	1035	1035	1
56.	6/13/78	1110	1055	15
57.	6/13/78	1848	1835	13
58.	6/14/78	1140	1133	7
59.	6/14/78	1325	1315	10
60.	6/14/78	1615	1555	20
61.	6/14/78	1730	1720	10
62.	6/15/78	0845	0840	5
63.	6/15/78	1812	1807	5
64.	6/15/78	2000	1955	5
65.	6/15/78	2131	2113	18
66.	6/16/78	0840	0840	0
67.	6/16/78	1752	1745	7
68.	6/17/78	0200	0155	5
69.	6/17/78	1225	1220	5
70.	6/17/78	2005	2000	5
71.	6/18/78	1500	1455	5
72.	6/19/78	0445	0446	-1
73.	6/19/78	1105	1055	10
74.	6/19/78	1735	1727	8
75.	6/19/78	2040	2030	10
76.	6/20/78	0632	0625	7
77.	6/20/78	2029	2015	14
78.	6/20/78	1530	1520	10
79.	6/21/78	0030	0032	-2
80.	6/21/78	0200	0152	8
81.	6/21/78	0325	0315	10
82.	6/21/78	0450	0440	10
83.	6/21/78	0730	0710	20
84.	6/21/78	0900	0832	28
85.	6/21/78	1100	1040	20
86.	6/21/78	1315	1240	35
87.	6/21/78	1415	1350	25
88.	6/21/78	1620	1620	0
89.	7/1/78	0740	0705	35

No.	Date	Time CRO	Time Chart	Δ, min.
90.	7/3/78	2225	2215	10
91.	7/5/78	0730	0722	8
92.	7/5/78	1815	1810	5
93.	7/7/78	0445	0440	5
94.	8/6/78	1535	1535	0
95.	8/7/78	0345	0345	0
96.	8/9/78	1600	1608	-8
97.	8/9/78	1859	1905	-6
98.	8/10/78	2335	2335	0
99.	8/11/78	2330	2330	0
100.	8/12/78	0042	0050	-8
101.	8/12/78	2313	2314	-1
102.	8/13/78	2315	2320	-5
103.	8/14/78	0507	0510	-3
104.	8/14/78	2315	2320	-5
105.	8/15/78	0610	0610	0
106.	8/15/78	2310	2310	0
107.	8/16/78	0801	0735	26
108.	8/16/78	1115	1115	0
109.	8/16/78	2320	2320	0
110.	8/17/78	0615	0615	0
111.	8/18/78	1955	1950	5
112.	8/20/78	0015	0032	-17
113.	8/20/78	0910	0917	-7
114.	8/22/78	0700	0700	0
115.	8/24/78	0815	0815	0
116.	8/26/78	0142	0140	2
117.	8/28/78	1600	1550	10
118.	8/30/78	0355	0345	10
119.	9/1/78	0032	0027	5
120.	9/2/78	0725	0710	15
121.	9/2/78	1947	1940	7
122.	9/3/78	2240	2235	5
123.	9/4/78	0830	0828	2
124.	9/4/78	1520	1516	4
125.	9/5/78	1945	1940	5
126.	9/7/78	2015	2005	10
127.	9/9/78	0050	0050	0
128.	9/9/78	0715	0705	10
129.	9.9/78	1830	1825	5
130.	9/10/78	0557	0550	7
131.	9/10/78	2245	2240	5
132.	9/12/78	0530	0528	2
133.	9/12/78	1715	1710	5
134.	9/13/78	0300	0330	-30
135.	9/13/78	2035	2035	0
136.	9/16/78	0240	0238	2

No.	Date	Time CRO	Time Chart	Δ, min.
137.	9/16/78	2345	2345	0
138.	7/18/83	0030	0032	-2
139.	7/18/78	2147	2143	4
140.	9/19/78	2315	2308	7
141.	9/20/78	1435	1435	0
142.	9/20/78	2345	2343	2
143.	9/21/78	1501	1455	6
144.	9/27/78	0725	0715	10
145.	9/27/78	2142	2125	17
146.	9/29/78	0740	0715	25
147.	9/30/78	1915	1900	15
148.	10/3/78	0125	0115	10
149.	10/4/78	2140	2135	5
150.	10/5/78	0800	0755	5
151.	10/5/78	2215	2215	0
152.	10/7/78	2330	2335	-5
153.	10/8/78	1425	1430	-5
154.	10/8/78	1940	1950	-10
155.	10/9/78	0035	0050	-15
156.	10/10/78	1122	1140	-18
157.	10/12/78	1820	1855	-35
158.	10/13/78	0605	0635	-20
159.	10/15/78	0405	0400	5
160.	10/15/78	2145	2140	5
161.	10/15/78	2226	2221	5
162.	10/17/78	1503	1455	8
163.	10/17/78	1902	1850	12
164.	10/17/78	2237	2233	4
165.	10/18/78	1350	1340	10
166.	10/18/78	2015	2015	0
167.	10/19/78	0859	0850	9
168.	10/19/78	2330	2325	5
169.	10/22/78	2305	2308	-3
170.	10/23/78	0220	0215	5
171.	10/24/78	2340	2339	1
172.	10/25/78	2130	2125	5
173.	10/25/78	1556	1540	16
174.	10/27/78	0100	0100	0
175.	10/27/78	0844	0843	1
176.	10/28/78	1859	1853	6
177.	11/3/78	2205	2200	5
178.	11/5/78	1520	1510	10
179.	11/6/78	0530	0520	10
180.	11/6/78	1935	1925	10
181.	11/7/78	1530	1518	12
182.	11/8/78	1352	1338	14
183.	11/9/78	0409	0358	11

No.	Date	Time		Δ, min.
		CRO	Chart	
184.	11/9/78	1345	1335	10
185.	11/12/78	1415	1402	13
186.	11/13/78	2025	2020	5
187.	11/13/78	0100	0052	8
188.	11/14/78	2145	2140	5
189.	11/15/78	1553	1542	11
190.	11/15/78	1810	1805	5
191.	11/17/78	0645	0638	7
192.	11/18/78	0315	0305	10
193.	11/18/78	1437	1418	19
194.	11/19/78	0408	0357	11
195.	11/19/78	2110	2105	5
196.	11/20/78	0813	0810	3
197.	11/20/78	1015	1013	2
198.	11/21/78	0120	0105	15
199.	11/22/78	0520	0505	15
200.	11/23/78	0610	0600	10
201.	11/23/78	2350	2350	0
202.	11/27/78	2220	2220	0
203.	11/28/78	1400	1400	0
204.	11/30/78	1300	1330	-30
205.	12/1/78	0424	0458	-34
206.	12/2/78	1145	1220	-35
207.	12/5/78	1132	1123	9
208.	12/7/78	0520	0508	12
209.	12/7/78	2332	2330	2
210.	12/9/78	1415	1403	12
211.	12/10/78	2220	2230	-10
212.	12/11/78	1000	1008	-8
213.	12/13/78	1110	1130	-20
214.	12/13/78	1858	1915	-17
215.	12/15/78	0504	0528	-24
216.	12/16/78	0540	0546	-6
217.	12/16/78	1805	1813	-8
218.	12/18/78	0430	0430	0
219.	12/18/78	2130	2135	-5
220.	12/19/78	1330	1335	-5
221.	12/23/78	0350	0350	0
222.	12/23/78	1245	1255	-10
223.	12/23/78	2345	2348	-3
224.	12/25/78	2145	2145	0
225.	12/26/78	0035	0035	0
226.	12/27/78	0900	0850	10
227.	12/28/78	1950	1947	3
228.	12/28/78	2335	2330	5
229.	12/29/78	0730	0723	7
230.	12/29/78	2230	2220	10

No.	Date	Time CRO	Time Chart	Δ, min.
231.	1/5/79	0807	0740	27
232.	1/6/79	0915	0917	-2
233.	1/8/79	0900	0908	-8
234.	1/8/79	1905	1914	-9
235.	1/9/79	1625	1630	-5
236.	1/10/79	0750	0743	7
237.	1/11/79	0701	0735	-34
238.	1/11/79	1745	1738	7
239.	1/12/79	1437	1425	12
240.	1/13/79	1550	1538	12
241.	1/14/79	0940	0930	10
242.	1/15/79	0417	0408	9
243.	1/16/79	1800	1750	10
244.	1/20/79	1520	1512	8
245.	1/21/79	2330	2323	7
246.	1/21/79	2350	2340	10
247.	1/23/79	2115	2108	7
248.	1/24/79	1641	1532	9
249.	1/27/79	0335	0408	-33
250.	1/28/79	0623	0640	-17
251.	1/29/79	1620	1655	-35
252.	1/30/79	1930	1945	-15
253.	2/2/79	0210	0205	5
254.	2/3/79	0830	0820	10
255.	2/4/79	0508	0517	-9
256.	2/5/79	0350	0342	8
257.	2/5/79	2335	2330	5
258.	2/6/79	2205	2215	-10
259.	2/7/79	0510	0515	-10
0.	2/9/79	0315	0305	10
61.	2/10/79	1930	1943	-13
262.	2/13/79	1040	1043	-3
263.	2/14/79	1325	1315	10
264.	2/15/79	1745	1738	7

ATTACHMENT D

COMPUTER PROGRAM LISTING

OF

RCS LEAK RATE CALCULATION

ATTACHMENT A

COPIES OF RCS LEAK RATE

TEST RAW DATA SUPPORTING

TABLE 2

FEED AND BLEED OPERATIONS

SHIFT RELIEVED [illegible signature] TIME 1500 DATE [illegible]
Signature

SHIFT ASSUMED BY [illegible signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE [illegible] °F MWE GROSS [illegible] MWE
RCS PRESSURE 2155 psig NI POWER 90 %
RCS BORON CONC. 819 ppmb C.R. POS. 1-4 100 %
5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: 6 100 %
7 90 %
8 30 %

1801 [illegible] on [illegible]
1802 Completed SP 1303-[illegible] R.C.S. [illegible] ~[illegible] gpm
1910 Started [illegible] 85-78-[illegible] [illegible]
1920 Completed SP 1303-[illegible] [illegible] O.K.

SHIFT RELIEVED [illegible signature] TIME 2300 DATE [illegible]
Signature

SHIFT ASSUMED BY [illegible signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 750 MWE
RCS PRESSURE 2155 psig NI POWER 90 %
RCS BORON CONC. 817 ppmb C.R. POS. 1-4 100 %
5 100 %

PLANT CONDITIONS/SPECIAL REMARKS 6 100 %
7 92 %
8 31 %

2305 RM-8-9 returned to service
2316 RMS monthly survey 1302-3.1
0005 SP 1303-4.25 [illegible] completed
0050 completed SP 1302-1.1 heat balance calc
0100 terminated 85-78-6 [illegible]
0210 completed SP 1303-1.1 leak rate -0.37 gpm
0540 RM-[illegible] returned to service

rc

DATE: 5/12/78
TIME: 0:47: 8

+3"
92.649 gal
+.544 gpm

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1.0
ENTER IDENTIFIED LEAKAGE FROM OS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCSCHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
0:47:26:	560.094	600.053	559.047	599.383	579.641	213.928	79.945	9.042
1:47:26:	560.547	600.516	559.617	599.766	580.109	215.604	80.470	9.052

LEAKAGE PLUS LOSSES (<30 GPM): -0.0436 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.1460 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.3760 GPM

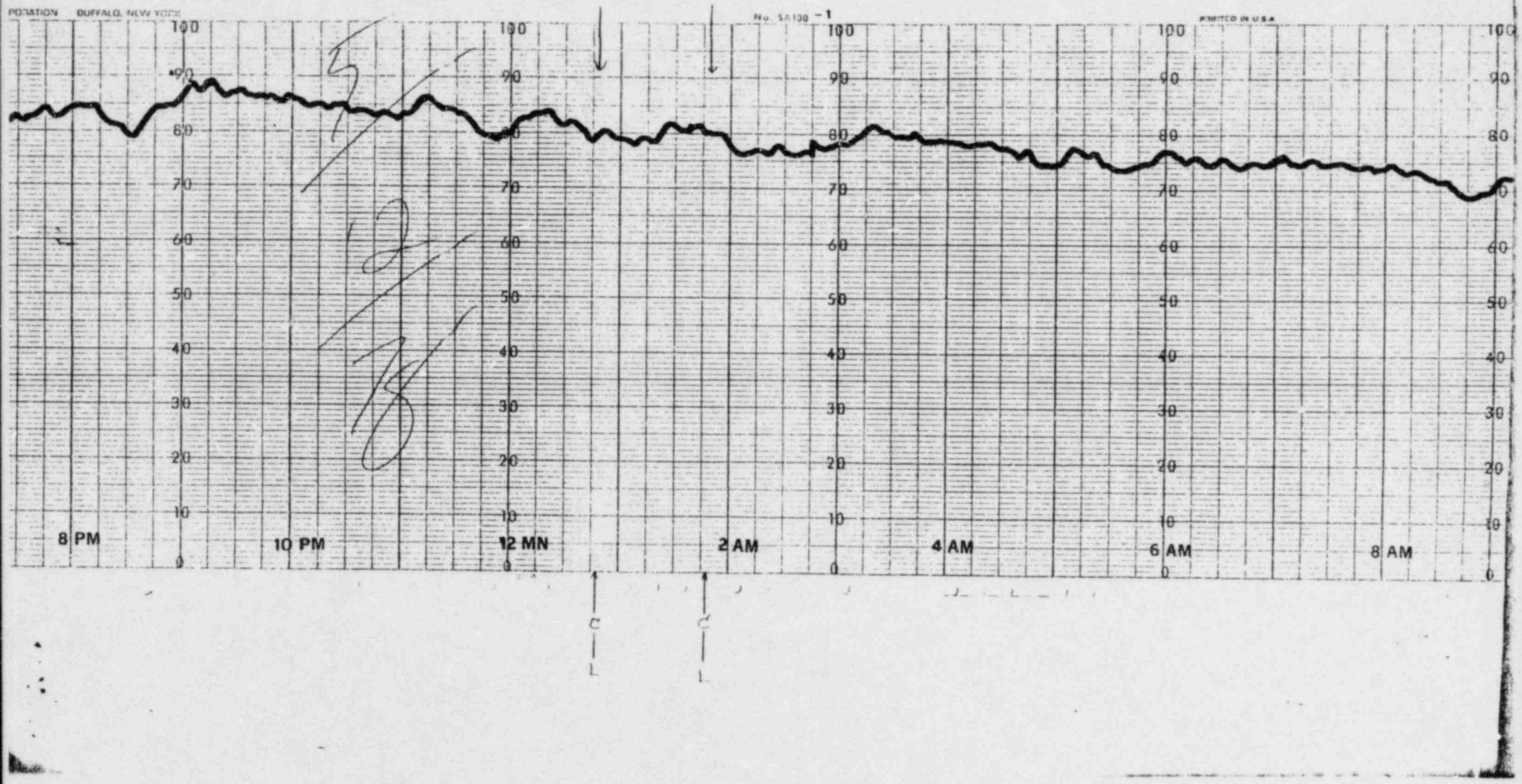
OPERATOR: J E Beach 5/12/78

APPROVED: [signature]

STOP 0

!

OC051


PORATION BUFFALO, NEW YORK
No. SA100 – 1
PRINTED IN U.S.A.
100
90
80
70
60
50
40
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20
10
0
8 PM
10 PM
12 MN
2 AM
4 AM
6 AM
8 AM

5/12/78

2300 [signature] Rx Power 90% Tave 579°F Pressure 2155psig
RCS Boron 819 ppm Rod Index 292 G18 @ 317
Tech Spec Emergency Boron Source is 'B' RBAT - concentration
is 12366ppm. Level 9.8'. Min Level for present
concentration is 8.5'.
2305 RM-A8 RETURNED TO SERVICE.
2315 RM-A6 OOS FOR MONTHLY SURV. 1302-3.1
2330 STARTED AHE-101
0005 completed 1303-11.25 Rx Bldg Door Test SAT +2.95cf.
0050 completed SP 1302-1.1 HEAT BALANCE SAT
0100 TERMINATED Release 85-78-L 'A' WECST
→ 0210 completed SP 1303-1.1 LEAK RATE SAT. -0.37 gpm
0540 RM-A6 RETURNED TO SERVICE
0630 STOPPED AHE101
0700 [signature]
0700 RHeilman Rx Pwr. ≈ 90%, Tavg. 579, Press. 2155
Boron 819, Gp. # 7 at 94%, Gp. # 8 at 33%, #MWe 748
0720 started MO-P-1A
0745 Verified S.B.L.R.T. headsets operable and inplace
0825 Completed SP 1302-1.1 SAT.
0845 Filled RCP standpipes
1500 RHeilman
1700 Paul Chalecki 90% Rx Pwr as before
* { 1743 ADDED 75 GALS. FROM 'A' RCBT TO MUT-1
1745 ADDED 70 GALS. FROM 'A' RCBT TO MUT-1 } *
→ 1750 Completed SP 1303-1.1 -.7443 GPM
1708 Completed SP 1302-1.1 HEAT BALANCE SAT
1820 STARTED MOP 1F
1745 Filled RCP STANDPIPES
2040 Completed SP 1301-9.9D PIPE Supports HANGERS
2130 Completed SP 1303-4.14 RBS System Logic Chan
2205 STOPPED MOP 1B + MOP 1E
2210 Verified headsets AT MUV 16A&B
2230 Completed SP 1301-4.1 Weekly Checks
2235 Completed SP 1300-3A3 BS Pumps
□ 2240 ADDED 50 GALS FROM 'A' & 'B' RCBT TO MUT-1
2300 Paul Chalecki

1630 Checked loose parts monitor No alarms
1631 Verified ... @ ... all ...
1750 ... AH-R-10 0 ..., AH-R-10 ... AH-R-...
40 ...
1830 Completed SP 1302-1.1 Heat balance ... sat.
1945 Completed SP 1303-1.1 RCS leak rate ... gpm sat.
2015 Started liquid release 98-78-2 ... B WECST
2115 Conducted Fire Drill at Unit 1 ... SP 1305-... was followed.
2130 Secured from fire drill.
2230 Checked loose parts monitor no alarms

SHIFT RELIEVED [signature] TIME 2245 DATE 5-29-78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS:	RCS TEMPERATURE	579°	°F	MWE GROSS	816	MWE
	RCS PRESSURE	2155	psig	RX POWER	100	%
	RCS BORON CONC.	792	ppmb	C.R. POS. 1-4	100	%
				5	100	%
PLANT CONDITIONS/SPECIAL REMARKS:	759 MWE net			6	100	%
				7	95	%
				8	29	%

0012 completed valve testing per SP1106-1 on FW Pumps
0114 stopped 62-78C Due To RM-A-9 Pump Trip
0135 completed SP1302-1.1 Heat Balance sat.
0242 completed SP1303-1.1 RCS leak rate - 0.2391 gpm
0425 commenced NeutTK. Dump
0445 completed SP1303-11.25 RB personnel Door leak check sat.

Hvd? (margin note at 0242)

W.P. Surveillance (margin note)

SHIFT RELIEVED [signature] TIME 0700 DATE 5-30-78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS:	RCS TEMPERATURE	579	°F	MWE GROSS	774	MWE
	RCS PRESSURE	2155	psig	RX POWER	100	%
	RCS BORON CONC.	792	ppmb	C.R. POS. 1-4	100	%
				5	100	%
PLANT CONDITIONS/SPECIAL REMARKS:				6	100	%
				7	93	%
				8	28	%

SF Log Reviewed [signature]

5/29/78
2300 R.H. Heilman Rx. Pwr. 100%, Tavg. 579, Press. 2150, Gp. #7 at 94%, Gp. #8 at 28%, Boron 742, & MWe 812. Tech Spec. emergency B.A. Tank is "B" R.B.A.T. at a level of 9.8 ft. and a conc. of 12,283 ppm b Minimum level for this conc. is 8.4 ft. Met. Ed. Equip. O.O.S. same as 5/28/78 except the order #726 on R.C. Evap. was cleared
2345 Verified S.B.L.A.T. headsets in place & operable
0130 Terminated Waste Gas Release #61-786 of "B" WGDT
0140 Checked noise monitor
✓ 0250 Completed SP1303-1.1 RC leakrate is -.07 gpm
0440 Added 100 gal. to M.U. Tank
0450 Completed SP1302-1.1 Sat.
0500 Filled RCP standpipes
0540 Completed liq. release #96-782 of "B" WECST
0700 R.H. Heilman

0700 J. E. Kunch REALTOR POWER 100%, TAVE 579°F, R.C. PRESSU 2155 PSIG, GROUP 7 AT 94%, GROUP 8 AT 29%.
0715 VERIFIED HEADSETS AT MU-V-16 A/B/C/D
0730 CHECKED LOOSE PARTS MONITOR - NO ALARMS.
0900 COMPLETED S.P. 1302-1.1 HEAT BALANCE.
1015 STARTED R.B. PURGE #62-78-G.
1345 CHECKED LOOSE PARTS MONITOR - NO ALARMS.
1500 J E Kunch
1500 D.R. Dietz Rx Pwr 100%, Tave 579 F, R.C. Press 2155 psig Rod Index 293 Grp 8 at 28%.
1630 CHECKED LOOSE PARTS MONITOR NO ALARMS.
1631 VERIFIED HEADSETS AT MU-V-16 A, B, C, D OPERABL
1758 DRAINED RB FAN "A" and "B" 40 ml, AND "C" 80 ml
1820 COMPLETED SP 1302-1.1 HEAT BALANCE SAT.
✓ 1945 Completed SP 1303-1.1 Leak rate Sat. .4877
2015 STARTED Liquid release 98-78-L
2115 Oslo Pilatz conducted a fire drill at unit I Powder EP 1209-S1 was followed.
2130 Secured from fire drill
2230 checked Loose parts monitor no Alarms.
2300 D.R. Dietz

DATE: 5/30/78
TIME: 1:34:39

+6"
185.3 gal
3.09 gpm

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1.0
ENTERIDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
0.0
ENTERRCDTCHANGE (GAL)
0.0
ENTERRCSCHANGE(GAL)
0.0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
1:34:57:	957.508	601.609	556.414	600.977	579.117	215.133	71.697	9.041
2:34:57:	957.867	601.914	556.516	601.227	579.375	216.578	71.086	9.081

LEAKAGE PLUS LOSSES (<30 GPM): 0.3904 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.0091 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.2391 GPM

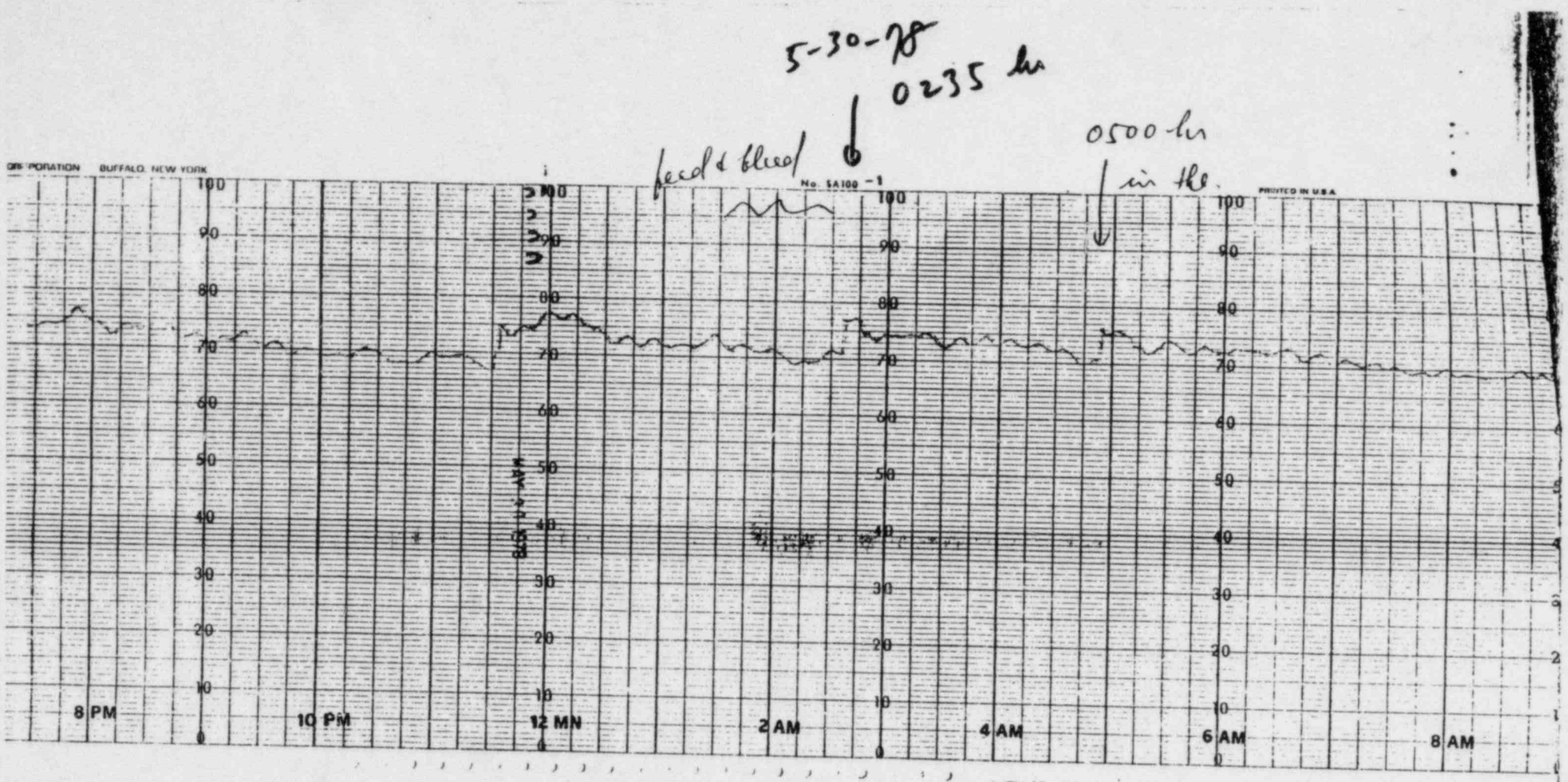
OPERATOR: R A Heilman 11-7

APPROVED: A Watson

STOP 0

00120

6/30/78
2300 Paul Chalecki Rx Pwr 100% RC Press 2155 Tave 579°F Rod Index 274 Cp III 29.5% Tech Spec Emergency Boration Source is 'B' RBAT at 9.7' @ 12,129 ppm b min level for this conc is 8'6"
Met ED Equipment OOS SAME AS 6/29/78 WITH the Following Exceptions: REMOTE #724 - AHV 1A & 1D
2335 ADDED 25 GALS FROM A & B RCBT TO MUT-1
0010 Verified SMALL LOCA Headsets AT MU-V-16 A, B, C, D
0012 Completed VALVE Testing per OP 1106-1 on FW Pumps
0114 STOPPED 62-78-6 Due To RM A-9 Pump Tripping
0135 Completed SP 1302-1.1 HEAT BALANCE SAT
0240 ADDED 100 GALS FROM 'A' RCBT TO MUT-1
0242 Completed SP 1303-1.1 - 2391 GPM SAT
0425 Commence Next TH Dump
0440 Filled RCP Standpipes
0445 Completed SP 1303-1.1.25 RCS Personnel L/R Check SAT
0450 Check Loose Parts Monitor - No Alarms
0500 ADDED 100 GALS FROM 'A' RCBT To MUT-1
0700 Paul Chalecki
0700 B'Parnellee 100% Power as before
Clo log Reviewed no/sac
0725 started MO-P-1A & MO-P-1D
0742 Loose parts monitor checked no alarms
0810 Terminated Reb# 96-76L
0905 Sampling · Letdown
0913 Stopped MO-P-1B & MO-P-1E
0930 RMA 2 OOS for IC-48
1014 RMA 2 Returned to Service
0440 Tkd 100 gal from RCBT 'A'
1145 Tkd 132 gal from "B" RCBT, 68 gal from A "RCBT"
1213 RMA 9 Returned to Service
1219 Verified Small Loca Headsets at MU-V-16 A, B, C & D
1400 Loose parts monitor checked no alarms
1420 Completed SP 1302-1.1 Heat Bal (sat)
1425 B'Parnellee
1425 J. Martin Rx Power @ 100%, Tave 579°, RC Press 2155 PSIG, Gap 8 @ 28% Rod Index @ 274.5%
1501 Tkd 68 gal from 'A' RCBT & 132 GAL From "B" RCBT To MU-TNK.
1530 Verified Headsets at MU-V-16 A, B, C & D OPERABLE


5-30-78
0235 hr
feed & bleed
0500-hr
in the
No. SA100 -1
PRINTED IN U.S.A.
8 PM
10 PM
12 MN
2 AM
4 AM
6 AM
8 AM

SHIFT RELIEVED C. [illegible] DATE 7/2/78

2340

SHIFT ASSUMED BY [illegible]

Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 745

RCS PRESSURE 2155 psig RX POWER [illegible]

RCS BORON CONC. [illegible] C.R. POS. [illegible]

PLANT CONDITIONS/SPECIAL REMARKS: [illegible]

Bleed & feed 0300

0007 started AR-R-104

0220 Bled [illegible] to RCBT B [illegible] 1000 gal from RCBT "A"

0240 completed SP 1303-1.1 [illegible]

0400 completed SP 1303-1.1 [illegible]

0500 started [illegible]

0530 stopped [illegible]

0530 completed SP 1303-1435 on RB Pump down (sat)

0600 completed 1300-3 [illegible] RB Pump & Valve [illegible] (sat)

0629 stopped AR-R-101

SHIFT RELIEVED [illegible] TIME [illegible] 0700 DATE 7/3/78

Signature

SHIFT ASSUMED BY [illegible]

Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 745 MWE

RCS PRESSURE 2153 psig RX POWER 96 %

RCS BORON CONC. 670 ppmb C.R. POS. 1-4 100 %

5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: Increasing Reactor Power to 100% 6 100 %

7 92 %

8 29 %

0730 Bled & fed 1100 gal

0810 started Rx Pwr Increase to 100%

0830 Rx @ 100%

0900 started NO PIC & F

0905 verified NU-U16A, B, C, D [illegible]

0955 completed SP1302-1.1 sat

1057 SP1303-1.1 completed sat

1140 S/D margin calculation -4.08 [illegible]

1145 completed I&I Test 1300-3C

1205 started liquid release [illegible]

1235 completed SP1302-1.1 sat

rc

DATE: 7/ . ....
TIME: 2:56:29

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
0
ENTER RCDT CHANGE (GAL)
0.
ENTER RCS CHANGE (GAL)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLTS)
2:56:47:	559.742	598.680	557.125	597.375	578.227	224.920	73.237	7.645
3.:..¢#7:	560.516	598.516	558.000	597.242	578.563	226.537	72.791	7.574

LEAKAGE PLUS LOSSES (<30 GPM): 0.2597 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.9566 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.7266 GPM

OPERATOR: J.C. Herman

APPROVED: J.C. Kuretz 7/2/78

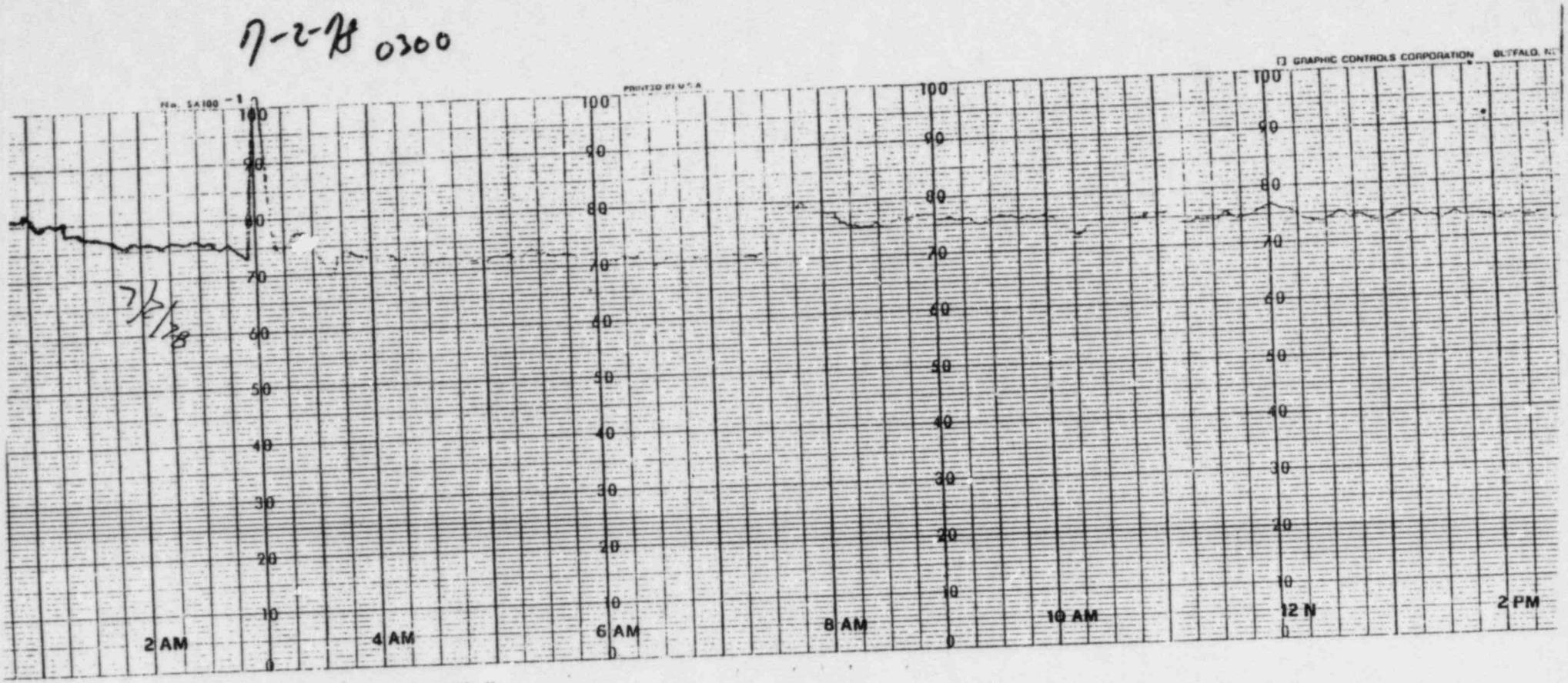
0C006

CRO LOG

7-2-78

0300 R. Parnell III 90% Power as before Tave 577
Press 2155 psig Rod Index 291% Br 8 at 297%
Test Spec Energy Boration Source Source is "B"
RCBT at 8.5' conc is 13,203 ppmb min Cond is 7
Met Ed Equipment OOS same as 7-1-78
2335 Checked Loose Parts Monitor No alarms
2345 Verified Headsets at MU-V-16A,B,C,+D for Small LOCA
0037 Started AH-E-101
0120 Bled 1000 gal to RCBT "B" ? fed 1000 gal from RCBT "A"
0250 Completed SP-1302-1.1 Heat Bal (Sat)
0330 Checked Loose Parts Monitor no alarms
0345 Fed & Bled 1590 gal ? to RCBT "B" From RCBT "A"
0400 completed SP-1303-1.1 Leak Rate +.726 gpm
0345 Placed Seal Inj Filter "B" in Service Took "A" out
0517 Started MU-P-1A ~~Stopped MU P~~
0520 Stopped MU-P-1A
0430 Completed SP-1303-11.25 on RB Pen. Doors (Sat)
0600 Completed 1300-3HA/B MU Pump + Valve Lining (Sat)
0629 Stopped AH-E-101
0700 T. R. Parnell III
0700 D. Woodall Rx Pwr 77% Tave 577°F RCS Pkss.
2155 psig. Rod Index 297 GP 8 @ 31%
0730 STARTED Bleed & Feed
0800 COMPLETED 1100 gal Feed & Bleed
0810 STARTED Rx Power Increase From 90% to 100% PWR
0850 Rx Power 100%
0900 BACKLOG STARTED MU-P-1C & P1F @ 0805
0905 VERIFIED MU-V16 A/D HEADSETS
0730 TERMINATED Neutralizing Tank Dump
0955 COMPLETED SP 1302-1.1 SAT
1057 SP1303-1.1 COMPLETE +0.0837 GPM
1130 RCS Boron 670 ppm
1140 S/D MARGIN CALCULATION -4.08 ΔK/K
1145 COMPLETED ISI TEST 1300-3.C
1205 STARTED LIQUID RELEASE 124-78-L
1235 COMPLETED SP 1302-1.1 SAT
1500 D. Woodall
1500 S. W. Brantley Rx power 100% Tave 579°F RCS pressure
2155#, Rod index 292 GP 8 @ 25%
1600 STARTED BLEED & FEED

7-2-18 0300



0400 Bled & feed 1300 gals from [illegible] to [illegible]
0530 at 100% [illegible]
0600 added 50 gals from BAST

SHIFT RELIEVED [illegible] TIME [illegible] DATE [illegible]
Signature
SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE [illegible] °F [illegible]
RCS PRESSURE [illegible] psig [illegible] 100 %
RCS BORON CONC. [illegible] ppm C.R. POS. 1-4 100 %
100 %
PLANT CONDITIONS/SPECIAL REMARKS: [illegible] 100 %
[illegible] 90 %
25 %

0730 Checked [illegible]
1010 Bled & fed 600 gal from "A" & "B" RCBT
1135 Started MU-P-1C stopped MU-P-1A
1245 Completed SP 1302-1.1 heat balance

SHIFT RELIEVED [illegible] TIME 1445 DATE 8/5/78
Signature
SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F [illegible] 815 [illegible]
RCS PRESSURE 2165 psig RX POWER 100 %
RCS BORON CONC. 578 ppm C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: [illegible] 6 100 %
7 94 %
8 26 %

1545 Completed SP 1302-1.1 Heat Balance 99.557% Sat
1546 [illegible] opevable @ [illegible] A, B, C, D?
1646 Leak rate complete +.2077 gpm Sat SP 1303-11
1740 Started changing [illegible]

STOP 0

1

rc

DATE: 8/ 5/78
TIME: 15:46:19

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1.

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2. (GPM)
0
ENTER RCDT CHANGE (GAL)
0
ENTER RCS CHANGE (GAL)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
15:46:37:	557.984	601.547	556.094	600.617	579.055	227.881	83.961	9.184
16:46:37:	558.000	601.758	556.039	600.805	579.141	228.137	83.201	9.188

LEAKAGE PLUS LOSSES (<30 GPM): 0.5398 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.4977 GPM

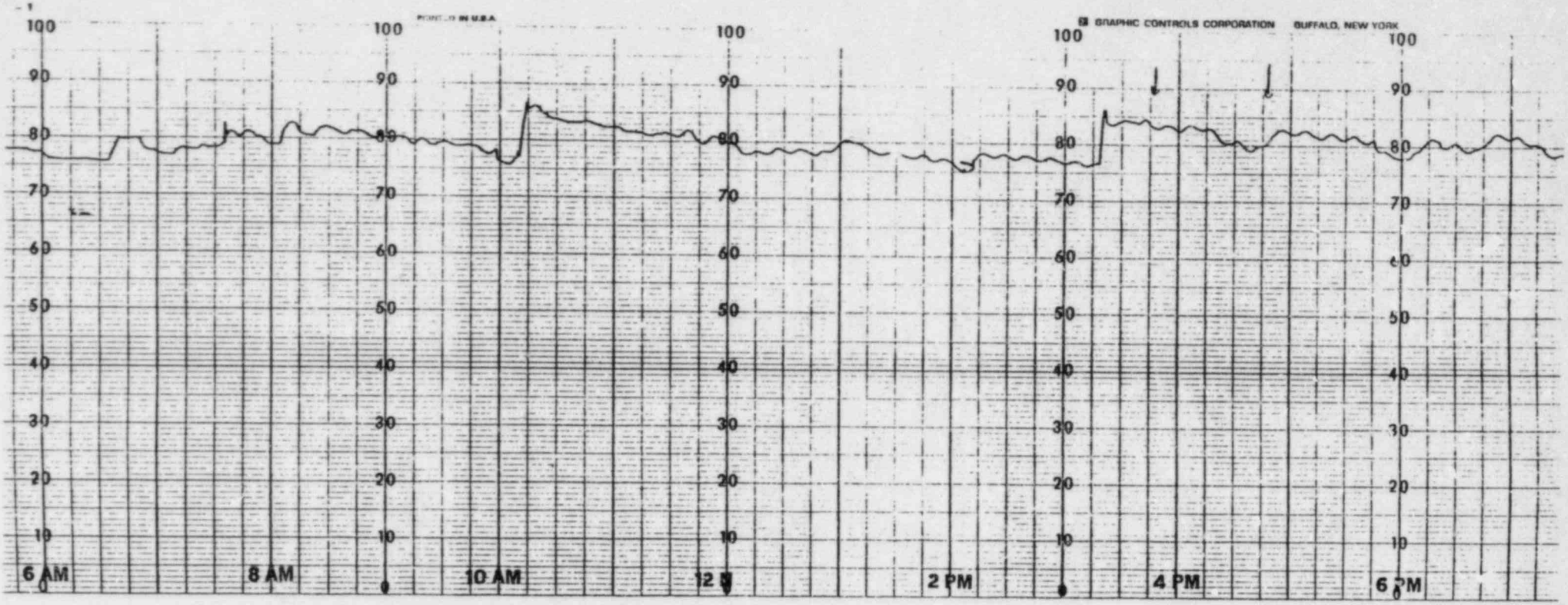
NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.2677 GPM

OPERATOR:
APPROVED:

021

STOP 0

8-5-18
1546 ~ 1646



8-5-78

0255 tilt less than 3.64

Continuous 0230 valve timer for testing as follows

CV-1	8.8 sec	MS-V-1	27.2 sec
CV-2	9.7 sec	MS-V-2	11.7 sec
CV-3	N/A	MS-V3	25 sec
CV-4	N/A	MS V4	27 sec

CIV-1	28 sec	CIV-4	24.5 sec
CIV-2	24.2 sec	CIV-5	28 sec
CIV-3	26.5 sec	CIV-6	25 sec

0305 added 500 gallon feed & Bleed from "A" RCBT to "C" "B" RCBT

0315 Started MOP1B & MOP1E

0400 added Feed & Bleed 1000 gal from "A" RCBT to "C" RCBT

0510 maintaining 100 % Power.

0630? added 56 gal Boric acid from BAM T TORUS.

0700 D. Smith

0700 J.E. Keirch Reactor Power 100%, Tave 579°F, R.C. Pressure 2155 PSIG, Group 7 at 83%, Group 8 at 17%.

1010 BLED & FED 600? GAL FROM A RCBT TO B RCBT.

1135 STARTED C HEATER DRAIN PUMP STOPPED A HEATER DRAIN PUMP

1245 COMPLETED S.P. 1302-1.1 HEAT BALANCE.

BACK LOG 0730 CHECKED S.B.L. HEADSETS.

1500 J.E. Keirch

1500 J.M. Smith RX POWER 100%, TAVE 579°F RC PRESS 2155 PSIG. ROD INDEX 94% 6 & 8 @ 26% MWE/MWT 807/2506.

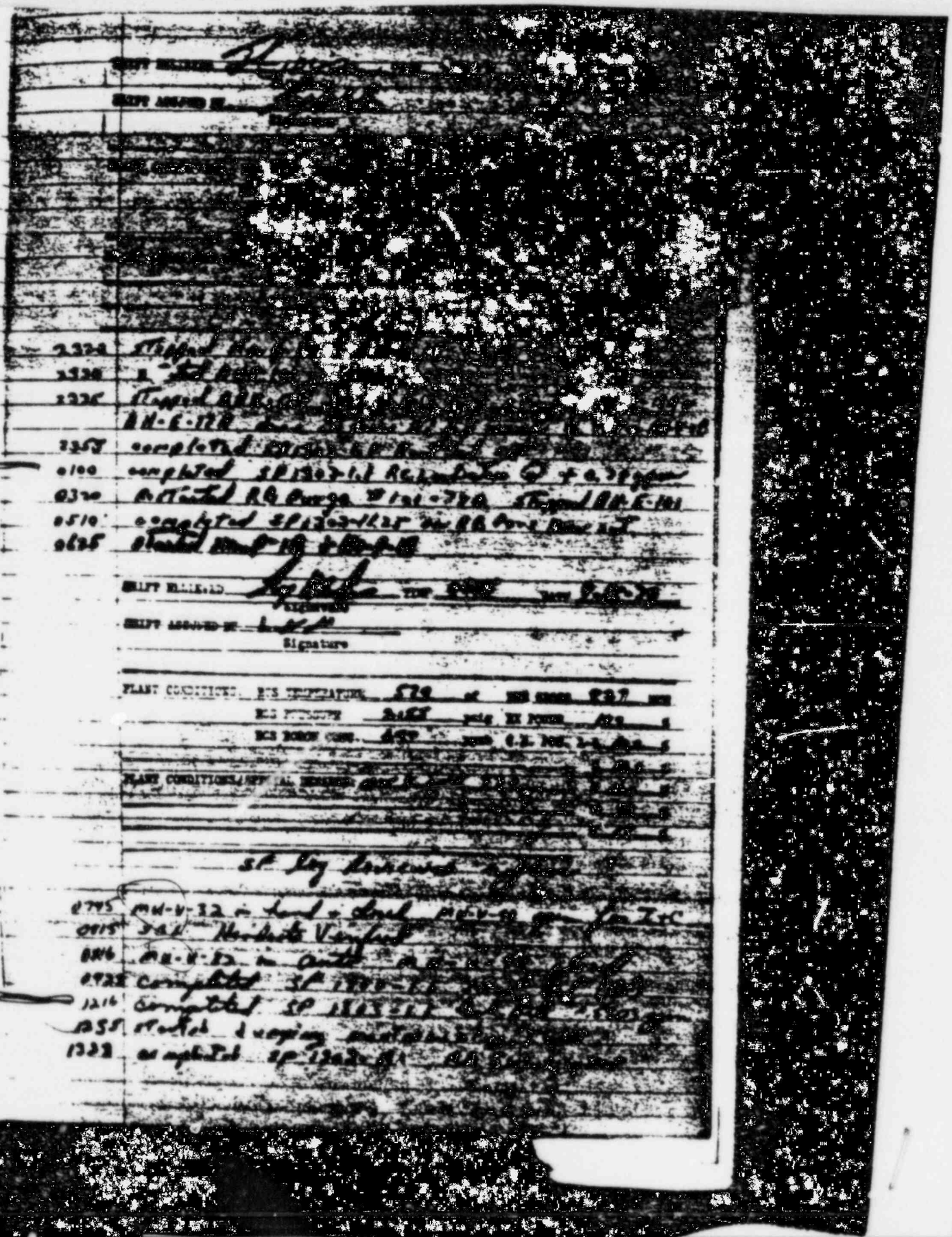
1545 HEAT BALANCE COMPLETE SAT SP-1302-1.1

1546 HEAD SETS VERIFIED OPERABLE FOR S.B.L.

1646 LEAK RATE COMPLETE SAT SP-1303-1.1 4.269 gpm

1745 STARTED DUMPING TO HEAT TANK.

2300 J.M. Smith



rc

DATE: 9/15/78
TIME: 9:20:52

+4"

623.53 gal

2.0589 gpm

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1.
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
9:21: 9:	558.313	602.133	556.500	601.227	579.539	227.242	82.911	9.012
10:21: 9:	558.817	602.352	556.914	601.391	579.813	228.281	83.199	9.041

LEAKAGE PLUS LOSSES (<30 GPM): -0.0422 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.3203 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.5503 GPM

OPERATOR: M P Kenley

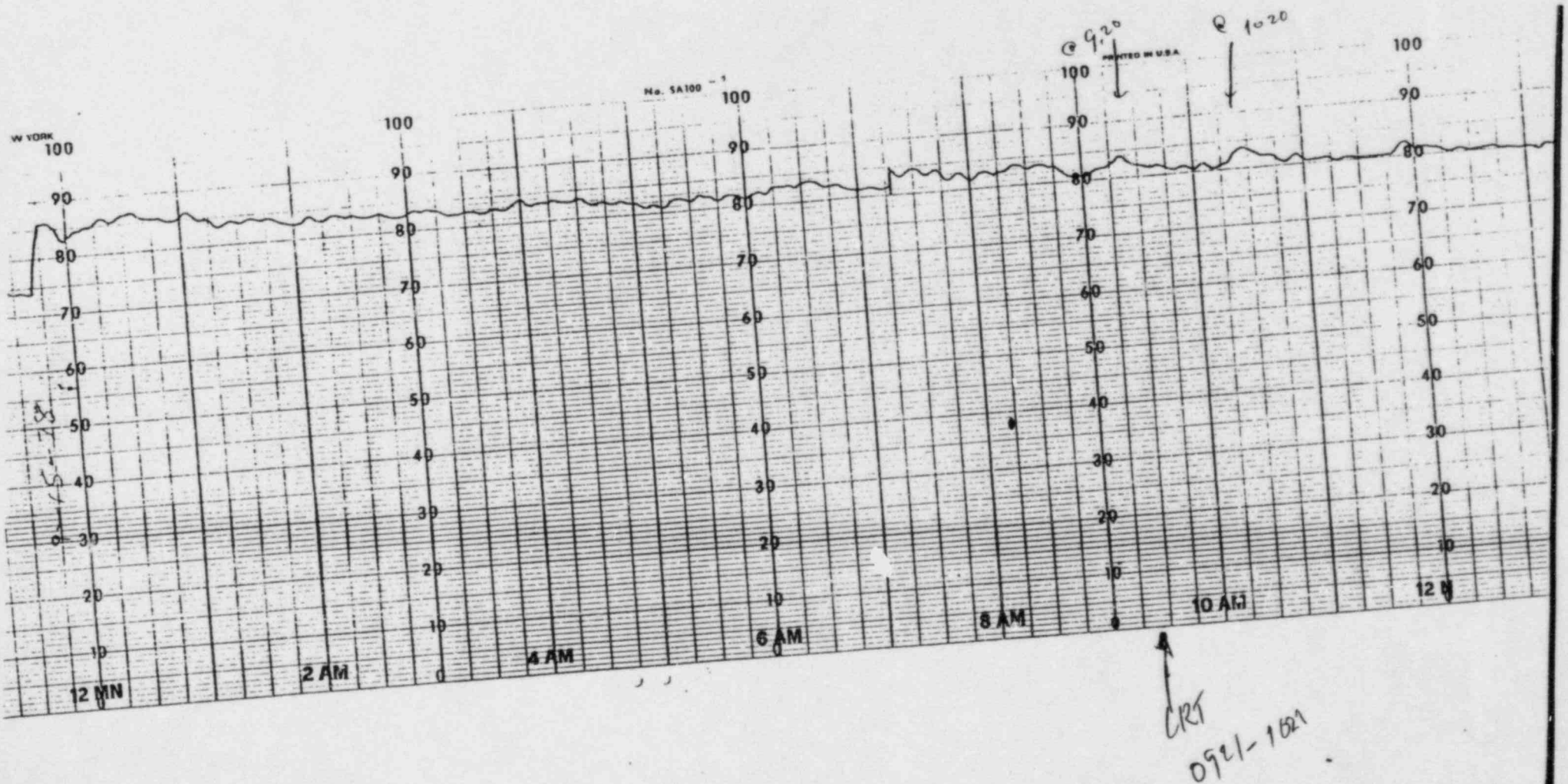
APPROVED: L. Rees

078

STOP 0

1-15-78

2300 R.Hellman Rx. Pwr. 100%, Tavg. 579, Press. 2150, Boron 480, Gp. #7 at 95%, Gp. #8 at 24%, # MWe 830
Tech. spec. emerg. B.A. Tank is "B" RBAT at a level of 10.6 ft. and a conc. of 15,315 ppm b. Minimum level for this conc. is 6 ft.
Met.-Ed. equip. O.O.S. same as 9-14-78 except as follows: order #1115 HD-V1011 #1013, #1116 MU-23-DPT-2, #1117 solid waste were added to equip. O.O.S. and order #1111 solid waste, #1107 EG-V15B; #1095 WDL-P-3A were cleared
2320 Stopped MO-P-1B and MO-P-1E
2330 Verified S.B.L.R.I. headsets operable and in place
2330 Started AH-E-101
2335 Stopped AH-E-17B and AH-E-19B and started AH-E-19A and AH-E-17A due to Hi ΔP accross "B" filter
2355 Completed SP1302-1.1 sat.
0100 Completed SP1303-1.1 RC leakrate is +.78 gpm
0320 Restarted R.B. Purge #101-78G. Stopped AH-E-101
0510 Completed SP1303-11.25 on R.B. Personnel Door sat.
0625 Started MO-P-1B and MO-P-1E
0700 R.Hellman
0700 R.E. Bryan Rx Pwr 100%, Tave 579°, Press 2155 Rod Index 291, Grp 8 19% mwt/mwe 2516/820
0815 SBL Headsets verified
0745 MU-V32 to hand & closed MU-V90 opened for IA
0816 MU-V32 back to normal MU-V90 closed
0923 1302-1.1 SAT 99.328%
1216 1303-1.1 SAT -.5503 GPM
1255 Neut. tank dump started
1323 1303-5.1 RB Clg & Isolation Test Computer-SAT
1500 R.E. Bryan
1500 J.E. Kunich REACTOR POWER 100%, TAVE 579°F, R.C. PRESSURE 2155 PSIG, GROUP 7 AT 94%, GROUP 8 AT 22%.
1540 SP1302-1.1 COMPLETE O.K., SBL phones checked
1710 STARTED NRP-1A
1715 NRP-1A IS OPERABLE NRP-1A SC ARE E.S. SELECTED
1800 SECURED R.B. PURGE #1-78-G.
2300 J.E. Kunich


@ 920
@ 1020
12 MN
2 AM
4 AM
6 AM
8 AM
10 AM
12 N
CRT
0921 - 1021

2" F+B

rc

DATE: 11/13/78
TIME: 3: 4:24

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1.0
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
0.0
ENTER RCDT CHANGE (GAL)
.0
ENTER RCS CHANGE (GAL)
0.0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
3: 4:45:	557.922	601.789	556.180	600.867	579.180	228.477	74.537	9.182
4: 4:45:	557.945	601.875	556.383	600.977	579.289	228.920	74.987	9.188

LEAKAGE PLUS LOSSES (<30 GPM): -0.2594 GPM

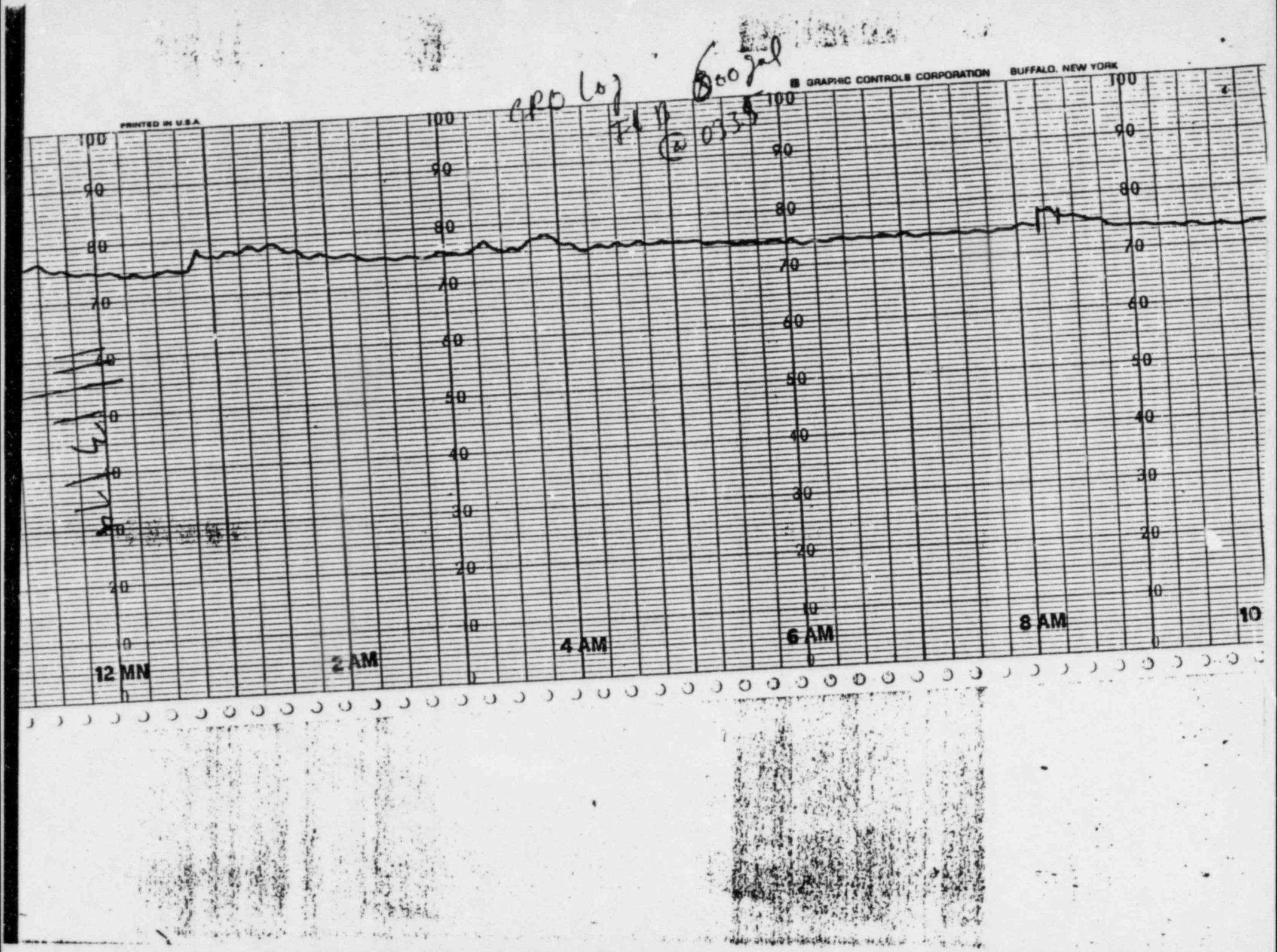
GROSS RCS LEAK RATE (<10 GPM): -0.3207 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.5507 GPM

OPERATOR: Paul Chalecki
APPROVED: N James

.. 050

STOP 0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© GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK
12 MN
2 AM
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6 AM
8 AM
10

1/13/78

2300 [illegible] Rx Power 100% Tave 579°F RC Press 2155 psig Rod Index 297 GP#6 227 Tave Spec Surv. Borated water source is RBAT 'B' Present level is 10.6' present concentration is 15,185 ppm Boron. Min Level for present concentration is 6.3'

2335 completed SP 1302-1.1 Heat Balance SAT.

0015 Verified SBL Headsets

0100 completed 300 gal Feed & Bleed RCBT 'A' To RCBT 'B'

0335 completed 600 gal Feed & Bleed RCBT 'A' To RCBT 'B'

0405 Completed SP 1303-1.1 Leak Rate SAT. -0.5507 gpm

0410 STARTED RB Hdg Purge Release # 112-78-G

0415 completed SP 1303-11.25 RB Hdg Dom Test SAT. +.175 SCFH

0445 completed SP 3303-M1 SAT. Fire Pump Surv.

0550 Stopped Neutralizing Tank Dump

0600 STARTED MO-P-1B & MO-P-1E

0700 [illegible]

0700 J. Martin Rx Power 100%, Tave 579°F, RC Press 2155 psig, Rod Index 293%. Gp 8 @ 19%. MWT / MWE 2535 / 841

0755 Scanning PMS Monthly SP-1303-4.15

0827 Heat Balance completed SAT - SP-1302-1.1.

0830 Verified S.B.L. Headsets operable.

1350 Verified operability of DR-P-1B.

1420 Leak Rate completed SP-1303-1.1 -.1202 gpm

1500 J. Martin.

1500 R. Bleiman Rx. Pwr. 100%, Tavg. 579, Press. 2150, Boron 305, Gp. #7 at 96%, Gp. #6 at 21%, & MWe 846

1525 Verified S.B.L.R.T. headsets in place & operable

1530 Completed SP 1302-1.1 sat.

1550 SP 1303-4.15 complete

1700 Started DR-P-1A to prove operability

1740 Completed SP 1303-1.1 RC leakrate is -.26 gpm

2025 Added 300 gal. To M.U. Tank from "A" RCBT

2215 Stopped MO-P-1C and MO-P-1F

2230 Completed Small break LOCA drill

2300 R. Bleiman

SHIFT RELIEVED [illegible] TIME 2300 DATE 11-15-78

SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: [illegible] 579 °F MWE GROSS 71 MWE
R.C. [illegible] 2155 psig RX POWER 85 %
R.C. [illegible] 301 ppm C.R. POS. 1-4 100 %
5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: [illegible] 6 100 %
increasing to 90% 7 97 %
8 [illegible] %

2300 Verified SRL [illegible] operable
0025 start [illegible] [illegible] [illegible] 176-78
0000 Stop [illegible] the [illegible]
0100 Start [illegible]
0115 Start HD-P1B & HD-P1C stopped HPP-1A
0120 Start Start FW-P1B
0310 Changed ICS limit to 660 MWE
0300 [illegible] Stop FW-P1B [illegible] operate [illegible]
0340 [illegible] and FW in hand
0445 [illegible] and FW in Auto
0500 SP 176-78
0530 Completed SP1303-61 [illegible]

SHIFT RELIEVED [illegible] TIME 0700 DATE 11-16-78
Signature

SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: R.C. TEMPERATURE 579 °F MWE GROSS ___ MWE
R.C. PRESSURE 2155 psig RX POWER 76 %
R.C. BORON CONC. 301 ppm C.R. POS. 1-4 100 %
5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: "B" MFP [illegible] 6 100 %
[illegible] to speed & [illegible] [illegible] 7 70 %
8 [illegible] %

0700 [illegible] [illegible] from BWST
0740 [illegible] [illegible] from BWST
·STALLATION 0742 Checked [illegible] [illegible]
·WATCH ESTABLISHED 0925 FW P-1B on line
0926 FW P1A & 1B in Auto
0926 Verified RPS [illegible] @ 95%
0930 increasing Pwr 2.2 [illegible]
1000 Holding @ 90% PWR
1032 [illegible] [illegible] 2 & Reset [illegible] [illegible] @ [illegible]

rc

DATE: 11/16/78
TIME: 4:26:20

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1.0
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
4:26:39:	565.453	594.508	563.758	593.078	579.195	236.361	83.516	8.948
5:26:39:	563.055	597.141	561.109	595.727	579.250	230.223	85.353	8.953

LEAKAGE PLUS LOSSES (<30 GPM): 0.8877 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.8359 GPM

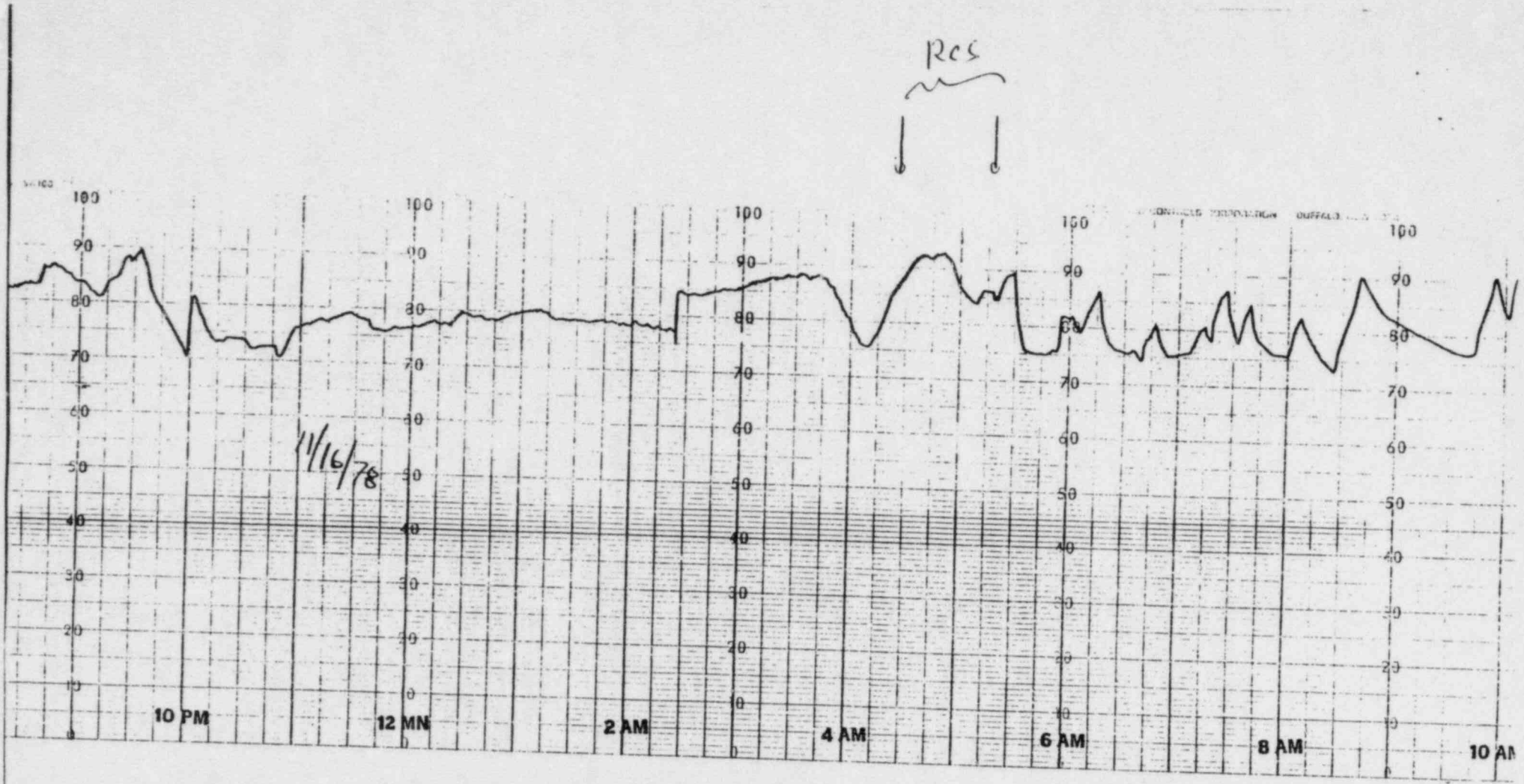
NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.6059 GPM

OPERATOR: Woodell

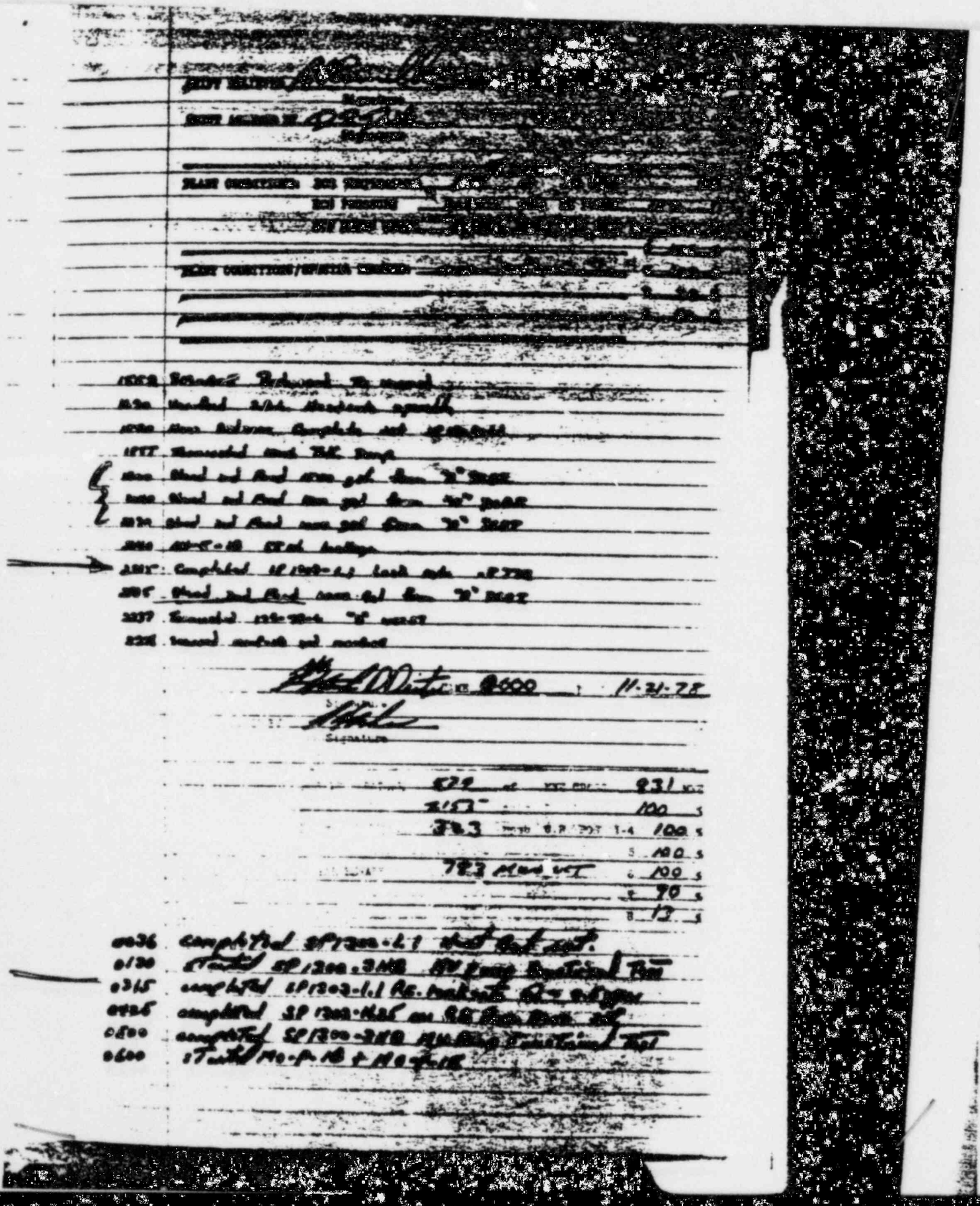
APPROVED:

STOP 0

073


RCS
11/16/78
10 PM
12 MN
2 AM
4 AM
6 AM
8 AM
10 AM

2300 Paul Chalecki Rx PWR 20%, Tave 579°F RC Press 2155
Rod Index 295 - Cp TIII 72% Emer Tech Spec
Boration Source is B' RBAT @ 15,134 ppm b +10.7'
Min level for this conc is 6.25
Verified SBL headset operable
0035 Commence 176-78-L
Backlog 0800 Secure Neut TK Dump
0100 STARTED CO-P2B
0115 STARTED HD-P1B, HD-P1C Stopped HD-P1A
0117 STARTED MO-P1C, MO-P1D, MO-P1E
0130 STARTED FW-P1B
0300 changed ICS RunBack Limit TO 660 MWE for 1 feed pump
BACKLOG 0320 Stopped FW-P1B
0340 Went TO MANUAL ON ~~CRT~~ DFC DIAMOND & FW DEMANDS A&B
0445 Went To AUTO ON DIAMOND & FW DEMAND A&B (INC PWR 50→75%)
0500 Secured 176-78-L
0520 Pumped 40 GALS. FROM BAMT TO RCS.
0530 Completed SP1303-1.1 .6059 GPM
0540 Pumped 40 GALS FROM BAMT TO RCS
0600 Pumped 26 GALS FROM BAMT TO RCS
0640 Pumped 40 GALS FROM BAMT TO RCS
11/16/78
0700 J.A. Bauch III PWR ≈ 1986 MWt, INDEX 272, CPHT @ 14%, 579°F, 2155 PSI, ≈ 80% PWR
0700 ADDED 100 GAL From BAMT
0840 ADDED ≈ 101 GAL From BAMT
0843 CHECKED SBL PHONES
0925 FWP1B ON LINE, Boron 338 PPM IN RCS
0926 FWP1A+B IN AUTO
0926 RPS ~~TRIP~~ SET POINTS SET AT 95%
0930 INCREASING PWR ≈ 2 MWe/MIN
1000 HOLDING @ ≈ 90% PWR
1037 STARTING 1005-2 TO RESET Hi Ø TRIP SET POINT To 104.15%
1045 B RPS IN MANUAL BYPASS
1100 B RPS OUT OF MANUAL BYPASS SET @ 104.75
1105 A RPS IN MANUAL BYPASS
1110 A RPS OUT OF MANUAL BYPASS
C RPS IN MANUAL BYPASS
C RPS OUT OF MANUAL BY-PASS
D RPS IN MANUAL BY-PASS



'C .

DATE: 11/20/78
TIME: 21: 9:55

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

ESIRED INTERVAL (1-8 HOURS)

ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
1:10:11:	557.859	601.742	556.203	600.750	579.133	221.658	77.356	9.866
2:10:11:	558.148	601.961	556.281	600.953	579.336	220.410	76.970	9.862

LEAKAGE PLUS LOSSES (<30 GPM): 1.0663 GPM

GROSS RCS LEAK RATE (<10 GPM): 1.1072 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.8772 GPM

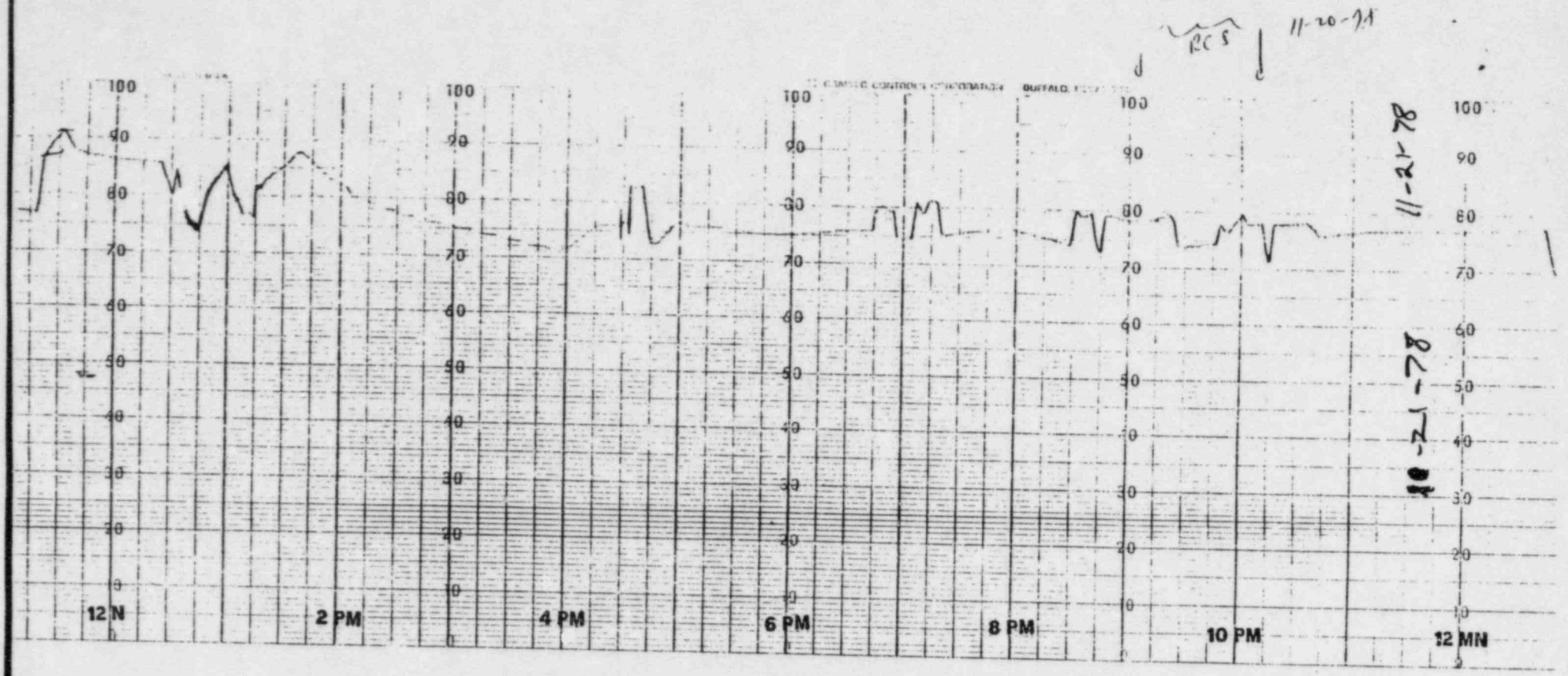
OPERATOR: Brantley

APPROVED: DR Dart

STOP 0

089

!


RCS
11-20-78
11-21-78
100
90
80
70
60
50
40
30
20
10
0
12 N
2 PM
4 PM
6 PM
8 PM
10 PM
12 MN

11/20/78
1500 JCBonham III
1500 [signature] Rx Power 100%, Tave 579°F, RC
Press 2155 psig, Gr 8 @ 237. Rod Index 292%
MWT/MWe 2535/837.
1552 RM-A-8 Returned to Normal.
1630 Verified S.B.L. Headsets operable.
1820 Heat Balance complete SAT SP-1302-1.1.
1855 Terminated Neut Tnk Dump.
1900 ~~Bleed & Feed 1500 Gal from "A" RCBT.~~
2040 ~~Bleed & Feed 500 Gal from "A" RCBT.~~
2130 ~~Bleed & Feed 1000 Gal from "A" RCBT.~~
2140 AH-E-1B 55 gal Leakage.
~~2215~~ Leak Rate Comp: Sat SP-1303-1.1. .8772 gpm ~~+.8782~~ gpm
2215 ~~Bleed & Feed 1000 Gal from "A" RCBT.~~
2237 Term Liquid Release 179-78-L.
2238 Stopped MO-P-6 & 1B.
2245 ~~Bleed & Feed 1000~~ Gal from "A" RCBT.
2300 [signature]

SHIFT RELIEVED: [illegible] TIME 2300 DATE [illegible]

SHIFT ASSUMED BY: [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE 837 MWE
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 295 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 779 [illegible] 6 100 %
7 93 %
8 17 %

0100 Started liquid release #780-782 of A WECST
0207 Start [illegible] TK Dump
0210 Stopped [illegible] TK. Dump
0310 Start [illegible] TK Dump
0314 completed SP1303-1.1 Heat Bal sat
0525 completed SP1303-1.1 RC leak rate @ -0.37 gpm
0540 completed SP1303-4.25 on RB. Personnel Door sat.

SHIFT RELIEVED: [illegible] TIME 0700 DATE 11-20-78
Signature

SHIFT ASSUMED BY: [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE 836 MWE
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 298 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: [illegible] 787 6 100 %
7 92 %
8 15 %

SF Log Reviewed [illegible]

0718 verified headsets operable at [illegible] stations
0730 completed [illegible] liquid release 780-782
0915 completed SP 1303-1.1 sat.
1220 completed SP 1303-1.1 -0.30 gpm

SHIFT RELIEVED: [illegible]
Signature

SHIFT ASSUMED BY: [illegible]
Signature

PLANT CONDITIONS: [illegible] 579 [illegible] 536
[illegible] 2150 [illegible] 100
[illegible] 100

PLANT CONDITIONS/SPECIAL REQUIREMENTS: 292 [illegible] 100
96
20

1725 SP1303-1.1 [illegible]
1725 115-72-6 STARTED
1825 SP1303-1.1 complete [illegible]
2000 171-72-6 STARTED

SHIFT RELIEVED: [illegible] TIME [illegible] DATE [illegible]
Signature

SHIFT ASSUMED BY: [illegible]
Signature

PLANT CONDITIONS: [illegible] 579 [illegible]
[illegible] 2155 [illegible] 100 5
[illegible] 100 5
5 100 5
PLANT CONDITIONS/SPECIAL REQUIREMENTS: [illegible] 292 6 100 5
7 96 5
8 20 5

2321 Secured [illegible]
2338 Completed SP1303-1.1 [illegible] (sup)
0025 Terminated 171-72-6
0040 STARTED [illegible] TANK Dump
0046 Completed SP1303-[illegible] [illegible]
0100 Completed SP1303-11.25 [illegible] Test [illegible]
0105 Performed SP1303-[illegible] [illegible] valve Test
0200 Verified [illegible] Headsets operable
0600 STARTED [illegible] and [illegible]

RU

DATE: 11/24/78
TIME: 4:22:55

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
0
ENTER RCDT CHANGE (GAL)
0
ENTER RCS CHANGE (GAL)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
4:23:12:	557.836	601.742	556.266	600.852	579.172	224.143	79.928	9.461
5:23:12:	558.164	601.727	556.586	600.805	579.313	225.602	79.337	9.494

LEAKAGE PLUS LOSSES (<30 GPM): 0.1817 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.1359 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.3659 GPM

OPERATOR: R E Smith II 7 11/24/78

APPROVED:

STOP 0

c

DATE: 11/24/78
TIME: 11:10:59

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
11:11:26:	558.156	602.148	556.586	601.188	579.516	224.727	78.391	9.594
12:11:26:	557.992	601.859	556.328	600.914	579.266	223.020	78.520	9.604

LEAKAGE PLUS LOSSES (<30 GPM): 0.0056 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.0967 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.3267 GPM

OPERATOR: M P Kendrig

APPROVED: L. Nace

STOP 0

STOP 0

!

DATE: 11/24/78
TIME: 17:24:48

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1.0
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
17:25: 5:	557.633	601.531	555.867	600.633	578.906	221.477	77.657	8.860
18:25: 5:	558.016	601.664	556.336	600.719	579.180	222.615	77.661	8.847

LEAKAGE PLUS LOSSES (<30 GPM): 0.1366 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.2701 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.0401 GPM

OPERATOR: J. B. Burk

APPROVED: B. Crouse

STOP 0

!

11-24-78

2300 R.H. Heilman Rx. Pwr. 100%, Press. 2150, Temp. 579, Boron 2ppm, Gp. "7 at 95%, Gp. "8 at 20%, MWe 834, ΔXe 2.67%. Tech. spec. emergency B.A. Tank is "B" R.B.A.T. at a level of 10.6' and a conc. of 15,190 ppm b. Minimu level for this conc. is 6.2 ft. Met. Ed. equip. O.O.S. same as 11-23-78.

2315 Verified S.B.L.R.T. headsets operable and in place

2350 ~~Added 300 gals to Mkup Tank~~ from "A" RCBT

0100 Start liq. release #180-78L of "A" WECST

0207 Start neut. tank dump

0210 Stop neut. tank dump

0310 Start neut. tank dump

0315 Completed SP1302-1.1 sat.

0515 De-energized Halon sys.

0525 Completed SP 1303-1.1 R.C. leakrate is -.37gpm

0540 Completed SP1303-11.25 on R.B. Personnel door - sat.

0600 Halon sys. returned to service

0700 R.H. Heilman

0700 M.P. Kenley Rx Power 100%, Press. 2155, TAVE 579° God Order 292, Bk. 3 @ 16, HWT 2530 MWe 340

0713 VERIFIED SBL HEADSETS

0730 TERMINATED LIQUID RELEASE 180-78-L

CRO Log Reviewed by Rose

0915 COMPLETED SP-1302-1.1 SAT. 99.343

0920 COMPLETED SP-1303-1.1 SAT - 0.3267

1300 1302-3.1 STARTED BY EAC

1340 1302-3.1 TERMINATED.

1415 FEED & BLEED 450GAL FROM "A" RCBT TO "B" RCBT.

1500 M.P. Kenley

1511 J.A. Bankhead III @ 100% Power, INDEX 296, 6 #8 @ 20%, 579°F, 2155 PSI,

1425 Completed S.P. 1302-1.1.

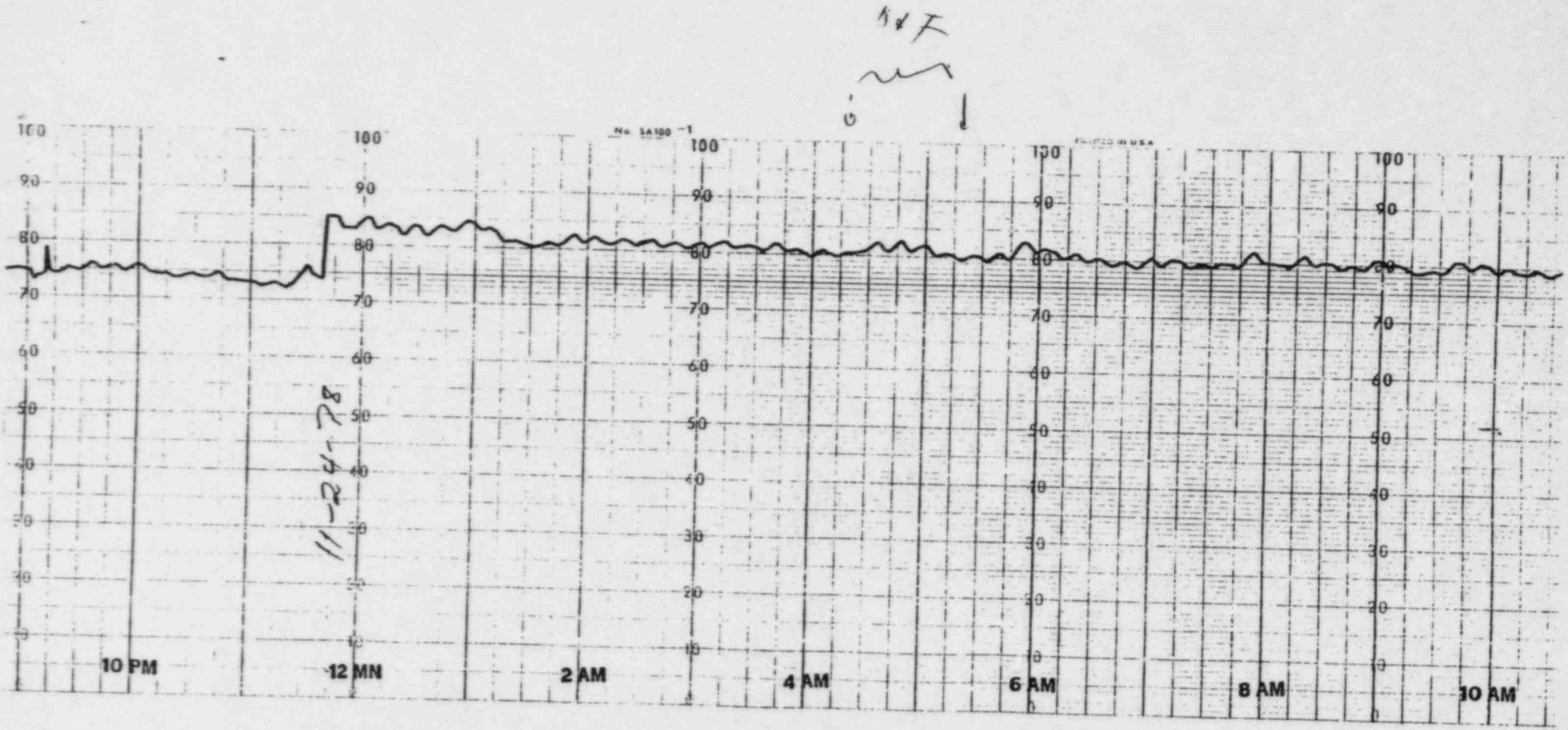
1725 115-78-L STARTED

1821 SP 13.3-1.1 Complete +0.040164pm

2011 STARTED 181-78-L

2300 J.A. Bankhead III

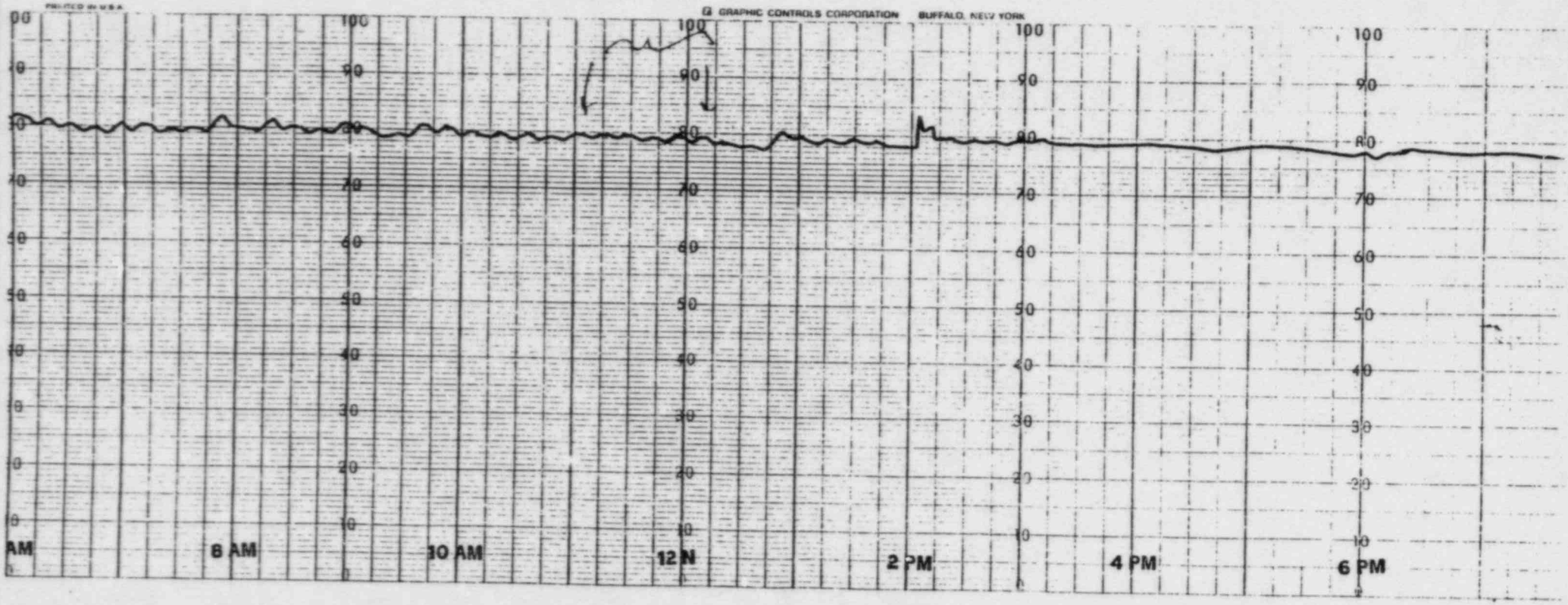
11/25/78 S.U. Brantley At pwr 100%, RC pressure 2155 psig
2300 Tave 578°F, Gp 7 @ 952, Gp 8 @ 202, MWe 843
Tech spec emergency boration tank is 5' RBAT @ a level of 10.6' and a concentration of 15,190 ppmb. Min. level for this concentration is 6.2'. Met-Ed equipment O.O.S. is
#195 - CO-P-6
#222 - EHC unit htr & fan
#400 - Jib crane
#521 - WDL-P-2A
#772 - SS-P-1
#896 - WDL-T-#8
#1050 - 4A htr sight/fans
#1128 - Solid waste
#1124 - SR-P-2C
#1159 - PI-330
#1213 - 'A' Bar rake
#1228 - SP-10A1PT2
#1245 - SW-P-2A
#1289 - IW-P-38/39
#1308 - security camera
#1336 - Heat tracing
#1337 - heat tracing
#1351 - SR-P-3A
#1359 - IW-P-2/IW-T-2
#1362 - IW-P-31
#1385 - FW-V-1B
#1387B
2324 SECURED MD-P-1C & MD-P-1F
2338 COMPLETED HPAT BALANCE SAT SP-1302-1.1
0025 TERMINATED 181-78-L
0040 STARTED NEDT. TK. DUMP (SECONDARY)
0046 COMPLETED SP 1303-1.1 LEAK RATE SAT. = 0.7176 GPM
0050 REMOVED RM-A-2 FROM SERVICE TO FIX FILTER TEAR PROBLEM
0140 RB DOOR TEST COMPLETE SAT.
0205 PERFORMED SP 1303-4.17 SAT. 'A' MAIN STM ISOLATION VALVES TEST
0600 PLACED RM-A-2 BACK IN SERVICE
LATE ENTRY 2340 VERIFIED SBL HEADSETS OPERABLE
0700 S.U. Brantley
0700 J.W. Hoolbey
0701 Verified SBL Headsets
0730 COMPLETED SP 1302-1.1 SAT. 99.049


10 PM
12 MN
2 AM
4 AM
6 AM
8 AM
10 AM

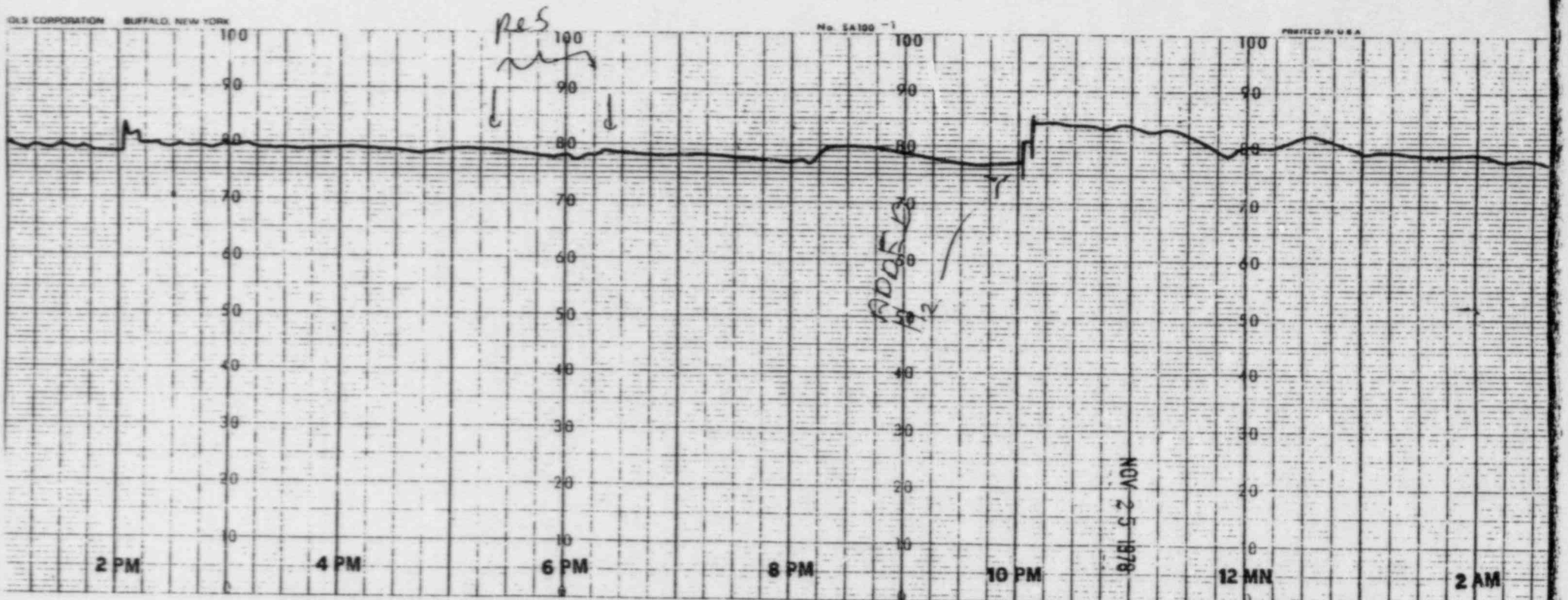
11-24-78

1111 ~ 1211

RCS LRT



11-24-78


GLS CORPORATION BUFFALO, NEW YORK
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0
2 PM
4 PM
6 PM
8 PM
10 PM
12 MN
2 AM

ATTACHMENT B

COPIES OF RCS LEAK RATE

TEST RAW DATA SUPPORTING

TABLE 6

HYDROGEN ADDITIONS

DATE: 8/ 8/78
TIME: 7:35:26

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1.0.
ENTER IDENTIFIED LEAKAGE FROM DS 1303-11 (GPM)
0.0.
ENTER RCDT CHANGE (GAL)
0.0.
ENTER RCS CHANGE (GAL)
0.0.

+2"
61.72 gal
1.03 gpm

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	RDTK LVL (IN)	RCDT LVL (VOLT)
8:35:42	557.762	601.711	558.881	600.7	579.01	231.	70.	1.11

LEAKAGE PLUS LOSSES (<10 GPM): 0.8000 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.1201 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.1000 GPM

OPERATOR: Paul Chalich

APPROVED: C Brother

STOP 0

037

0800 VERIFIED SMALL BREAK LOCA [illegible] [illegible]

0900 COMPLETED 1303-[illegible] (UNQUALIFIED) -[illegible] GPM

1100 COMMENCED CONDENSATE [illegible] FROM UNIT 2

1140 AIR INTAKE [illegible] [illegible] RESTORED TO SERVICE

1215 AIR INTAKE [illegible] SYS OUT OF SERVICE FOR 1303-[illegible]

SHIFT RELIEVED [illegible] TIME [illegible] 1545 DATE 8/8/78

Signature

SHIFT ASSUMED BY [illegible]

Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 811 MWE

RCS PRESSURE 2155 psig RX POWER 100 %

RCS BORON CONC. 594 ppm C.R. POS. 1-4 100 %

5 [illegible] %

PLANT CONDITIONS/SPECIAL REMARKS: [illegible] MWE [illegible] 6 100 %

7 9[illegible] %

8 2[illegible] %

1555 started AR-E[illegible]

1620 verified small LOCA [illegible]

1755 SP1302-1.1 [illegible]

1806 SP1303-1.1 [illegible]

1807 air tunnel deluge operable

SHIFT RELIEVED BY [illegible] TIME 23[illegible] DATE 8-8-78

Signature

SHIFT ASSUMED BY [illegible]

Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 817 MWE

RCS PRESSURE 2155 psig RX POWER 100 %

RCS BORON CONC. 586 ppm C.R. POS. 1-4 100 %

5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: 717 MWE 6 100 %

7 95 %

8 26 %

~~2345 completed SP1303-1.1 Heat Bal set~~

0050 completed SP 1303-1.1 RCS Leak Rate @ -0.7 gpm

0615 started AR-P-1A to verify operability set

0616 stopped AR-P-1A

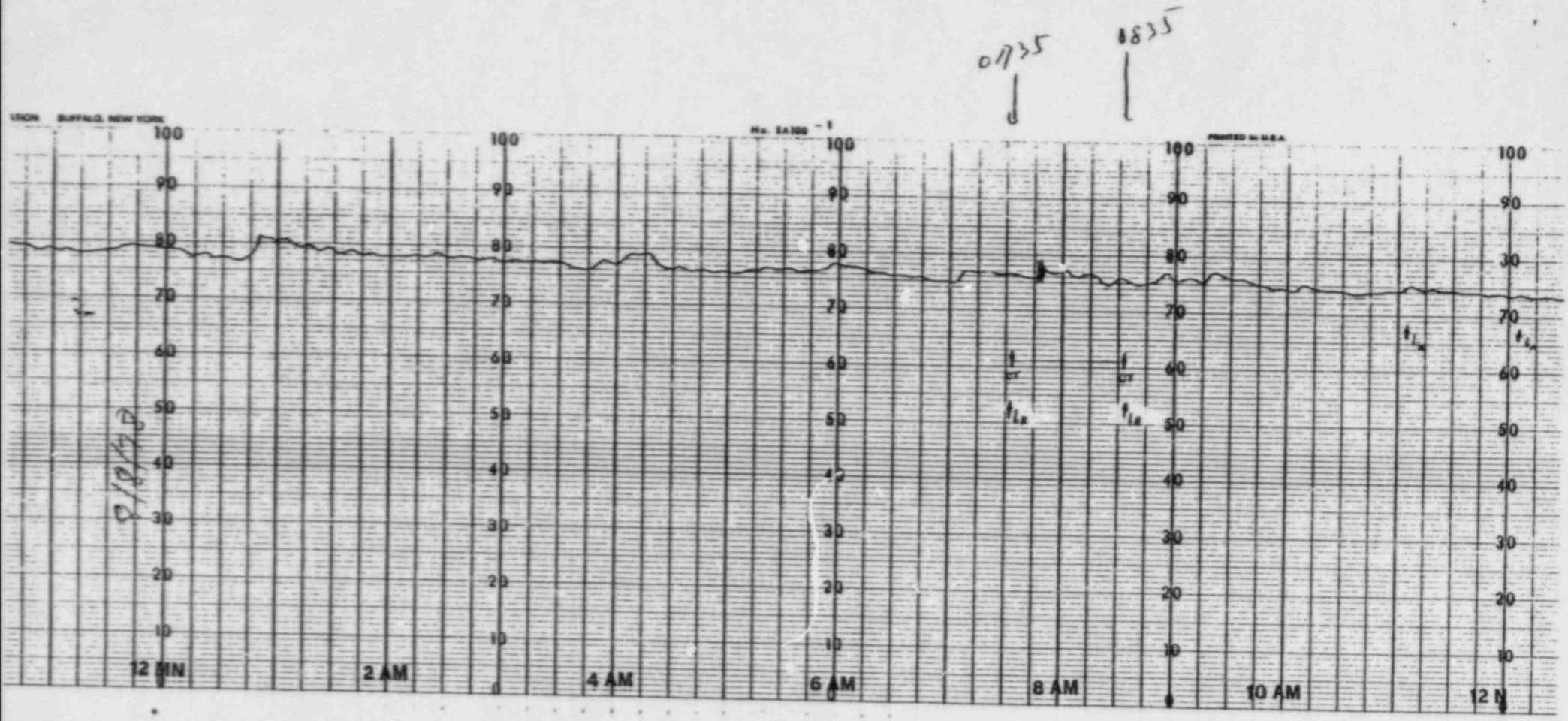
0625 stopped AR-E-10[illegible]

0640 started R.B. Purge [illegible] 28-87G

0645 started MO-P-1B

2 hour clock

9-8-78
2300 B.H. Heilman Rx. Pwr. 100%, Tavg. 577, Press. 2150, Boron 594, Gp. #7 @ 95%, Gp. #8 @ 26%, #Mlk 814 Tech. Spec. Emerg. B.A. Tank is "B" R.B.A.T. at a conc. of 15,388 ppm and a level of . Minimum level for this conc. is 8 ft. Met.-Ed. equip. O.O.S. same as 8/7/78 except as follows: #994 DR-P-1B, #995 HD-P-1A, #996 Halon, & #997 IA-P-1A were added to equip. O.O.S. and #988 WDL-P-7B, #990 Halon, & #985 IW-P-38 & 39, ~~& #997~~ RHR were returned to service.
2335 Completed SP 1302-1.1 sat.
2335 Verified S.B.L.R.T. headsets in place & operable
2345 Started AH-E-101
0040 Completed SP 1303-1.1 RC leakrate is +.11 gpm
0630 Started MD-P-1D
0630 Stopped AH-E-101
0700 B.H. Heilman
0700 D.W. Waddell RX Power 100% Tave 577 F Press. 2155 psig Rod Index 293 Gp 8 @ 25%
0740 completed SP 1302-1.1 HEAT BALANCE SAT.
0800 Verified SBL HEADSETS
0900 completed SP 1303-1.1 LEAKRATE SAT - 0.109 gpm
1100 STARTED CONDENSATE RETURN FROM U2 & U1
1500 D.W. Waddell
1500 J.T. Master RX POWER @ 100%, TAVE 577°F PRESS 2155 PSIG ROD INDEX 294 & 6 & 8 @ 26% MWE/MWT 798/2521
1525 Added 300 GAL to DCS from "A" DEBT.
1555 Started AH-E-101
1620 Verified Headsets for S.B.L. Operable.
1755 Heat Balance Complete SAT SP 1302-1.1
1806 Leak rate complete SAT SP-1303-1.1 +.223 gpm
1807 Aux Turbine Feedwater Sys Returned to Service.
2300 J.T. Master


0735
0835
12 MIN
2 AM
4 AM
6 AM
8 AM
10 AM
12 N

clear

+3"

92.649 gal

1.5442 gpm

TC

DATE: 9/ 8/78
TIME: 16:28:54

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8HOURS)
1
ENTERIDENTIFIED LEAKAGE FROM OS 1303-1.1.2 (GPM)
0
ENTERRCDT CHANGE (GAL)
0
ENTER RCS CHANGE (GAL)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
16:29:13:	557.363	601.273	555.797	600.266	578.719	230.068	68.349	8.919
17:29:13:	557.703	601.445	556.016	600.453	578.898	229.512	69.604	8.919

LEAKAGE PLUS LOSSES (<30 GPM): -0.3523 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.3523 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.5823 GPM

OPERATOR: Stuart Beasley

APPROVED: D.L. Patterson

044

STOP

381

[illegible] G. Hallock [illegible] 1445 [illegible]

[illegible] D.K. Peluchy

PLANT CONDITIONS: RCS TEMPERATURE 579 °F [illegible] 821 [illegible]
RCS PRESSURE 2155 psig [illegible] 100 %
RCS BORON CONC. 497 ppm [illegible] 100 %
[illegible] 102 %

PLANT CONDITIONS/SPECIAL [illegible]: 2542 MWt 775 [illegible] 102 %
96 %
26 %

1546 Completed SP 1303-4.1 [illegible]
1603 Verified [illegible] operable [illegible]
1730 Completed SP 1303-4.1 [illegible] - [illegible] gpm [illegible]

SHIFT RELIEVED D.K. Peluchy TIME 2245 DATE 9-8-78

SHIFT ASSUMED BY [illegible]
Signature

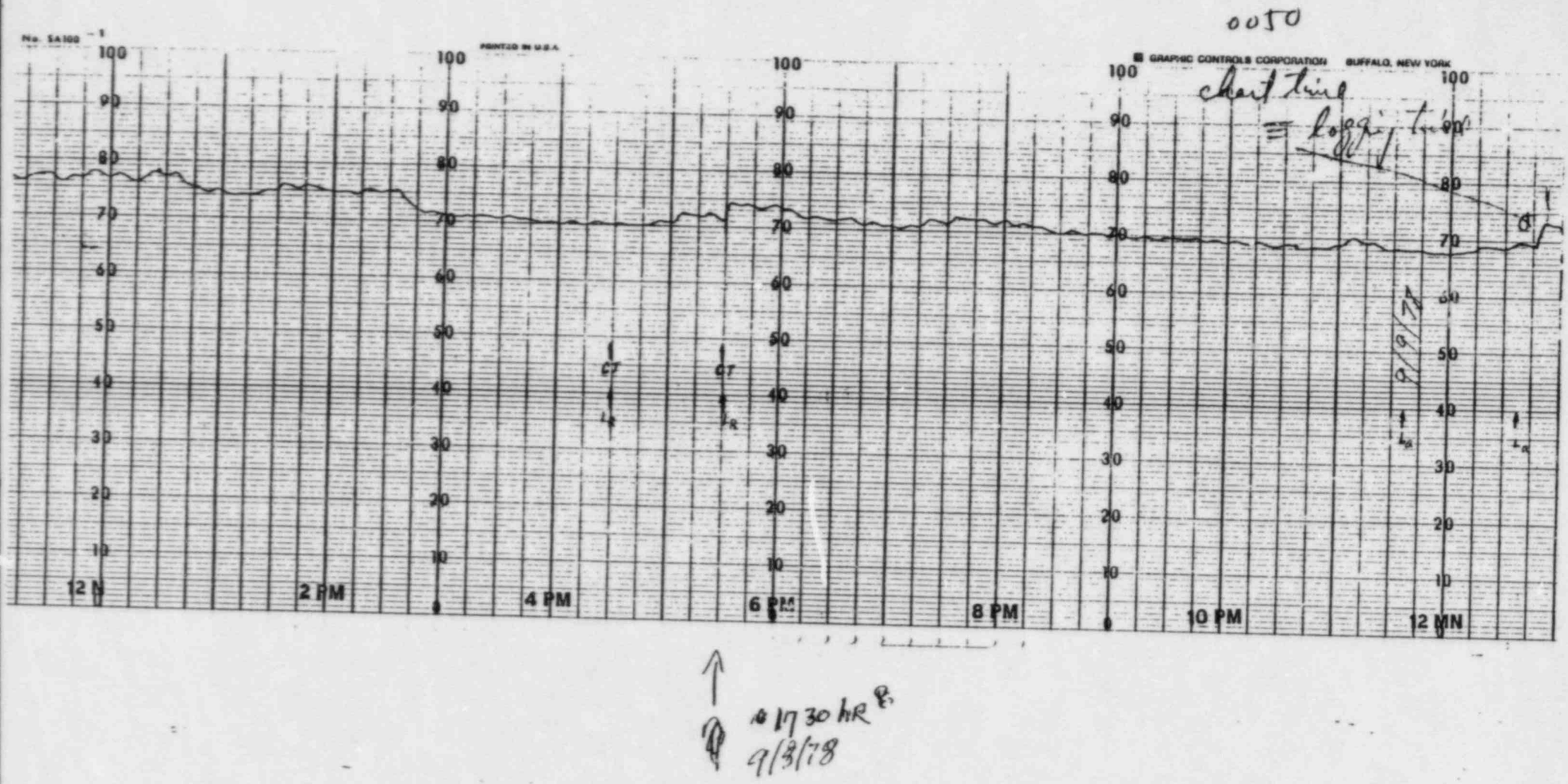
PLANT CONDITIONS: RCS TEMPERATURE 579 °F [illegible] 827 [illegible]
RCS PRESSURE 2155 psig [illegible] 100 %
RCS BORON CONC. 497 ppm [illegible] 100 %
100 %

PLANT CONDITIONS/SPECIAL [illegible]: 781 MWe NET 100 %
97 %
26 %

2335 Completed SP 1303-1.1 [illegible]
0030 Started AH-E-101
0100 Completed SP 1303-2.1 Control Rod movement
0110 Reducing Rx Pwr To 65%
0130 @ 65% Rx Pwr
0145 Increasing Rx Pwr completed Turbine valve testing
CV-1 8.5 sec MS-V-1 27.5 sec CI-V-1 [illegible] CI-V-5 [illegible]
CV-2 9.5 sec MS-V-2 11.5 sec CI-V-2 24.5 sec CI-V-6 2.5 sec
CV-3 N/A MS-V-3 28.5 sec CI-V-3 26.5 sec
CV-4 N/A MS-V-4 27.5 sec CI-V-4 [illegible]
0050 added 50 gals To MU TK From BAMT.
0410 D RPS To Manual bypass per OP 1105-2 To reset Hi Flux Trip
0415 D RPS To normal + C RPS To manual bypass
0420 1C RPS To normal + 1B RPS To manual bypass
0425 1B RPS To normal + A RPS To manual bypass [illegible]
0430 A RPS To Normal and all Hi Ø RPS Trip setpoints are now 95%
0600 A RPS To manual bypass per OP 1105-2 To reset Hi Ø setpoints

9/8/78

2300 [signature] RX Power 10% Tave 579°F RC Press 2155 PSIG
Rod Index 296 GP 8 @ 262 Tech Spec Shutdown BORATED
WATER SOURCE is 'B' BAT Level 10.6' CONCENTRATION is
15070 ppm b. Min Level for present CONCENTRATION is 6.4'
2310 Stopped MU-P-1A & P-1D
2315 Verified SBL HEADSETS
2353 Stopped RX Bldg Purge # 99-78-6
0005 COMPLETED SP 1303-11.25 RX Bldg Personnel Door Test SAT. 0.73 SCFH
0045 COMPLETED SP 1302-1.1 HEAT BALANCE SAT.
0200 [signature] COMPLETED SP 1303-1.1 LEAK RATE SAT -0.0992 GPM
0245 Feed & Bleed 300 gal.?
0525 Verified operable RR-P-1B, DR-P-1A, NR-P-1B, NR-P-1C
Verified NR-P-1B on 1R BUS & NR-P-1C on 1T BUS ES SELECTED
0530 Removed From Service RR-P-1A, DR-P-1B, NR-P-1A, FS-P-3
Switching ORDER # 1082
0600 STARTED MU-P-1A & P-1D
0700 [signature]
0700 [signature] @ 100% PWR, INDEX 294.5, GP # 8 @ 24%,
578°F TAVE, 2155 PSI, BORON 497 PPM
0723 VERIFIED S.B.L. HEADSETS
0930 SP 1302-1.1 COMPLETE
1230 ISOLATED CONDENSATE RETURN
1337 RETURNING CONDENSATE FROM UNIT #2
1345 ISOLATED CONDENSATE RETURN
1445 STARTED CONDENSATE RETURN
1500 [signature]
1500 [signature] RX Pwr 101% Tave 579 RC Press 2155 psig
Rod Index 296 GP 8 262
1540 COMPLETED SP-1302-1.1 HEAT BALANCE SAT.
1603 VERIFIED SBL HEADSETS OPERABLE
1720 COMPLETED SP-1303-1.1 SAT = .5823 GPM
Emmy KA6 VERIFIED FS-P-3 OPERABLE
1826 VERIFIED DR-P-1B OPERABLE
1828 VERIFIED NR-P-1A OPERABLE
1830 VERIFIED RR-P-1A OPERABLE
1923 VERIFIED SW-P-2A OPERABLE
2245 STOPPED MU-P-1B & MU-P-1E
2300 [signature]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GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK
12 N
2 PM
4 PM
6 PM
8 PM
10 PM
12 MN
CT
CT
9/3/78

@ 1730 hr

STOP 0

IFC

DATE: 9/18/78
TIME: 23:55:26

+1"
30.883
0.5147 gpm

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
0
ENTER RCDT CHANGE (GAL)
0
ENTER RCS CHANGE (GAL)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
23:55:42:	557.984	601.844	558.258	600.891	579.243	229.346	81.899	8.947
0:55:42:	558.117	601.875	556.328	600.953	579.313	228.887	81.349	8.981

LEAKAGE PLUS LOSSES (<30GPM): 0.4761 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.8314 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.4014 GPM

OPERATOR: J M Martin

APPROVED: D K Dutt

102

STOP 0

SHIFT RELIEVED [illegible] TIME 1500 DATE 9-1[illegible]
Signature
SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F RCS GROSS [illegible]
RCS PRESSURE 2155 psig RX POWER [illegible]
RCS BORON CONC. [illegible] ppm C.R. POS. [illegible]

PLANT CONDITIONS/SPECIAL REMARKS: [illegible]

1523 SBL phones operable
1955 verified DA-P-1B, SR-P-1B & BS-P-2 operable
2126 SP1303-1.1 completed 0.4263 gpm
2030 SP1303-1.1 completed sat

SHIFT RELIEVED [illegible] TIME 2300 DATE 9/18/78
Signature
SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F RCS GROSS [illegible]
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 463 ppm C.R. POS. 3-4 [illegible]
[illegible] 100 %
PLANT CONDITIONS/SPECIAL REMARKS: [illegible] 100 %
[illegible] 96 %
[illegible] 24 %

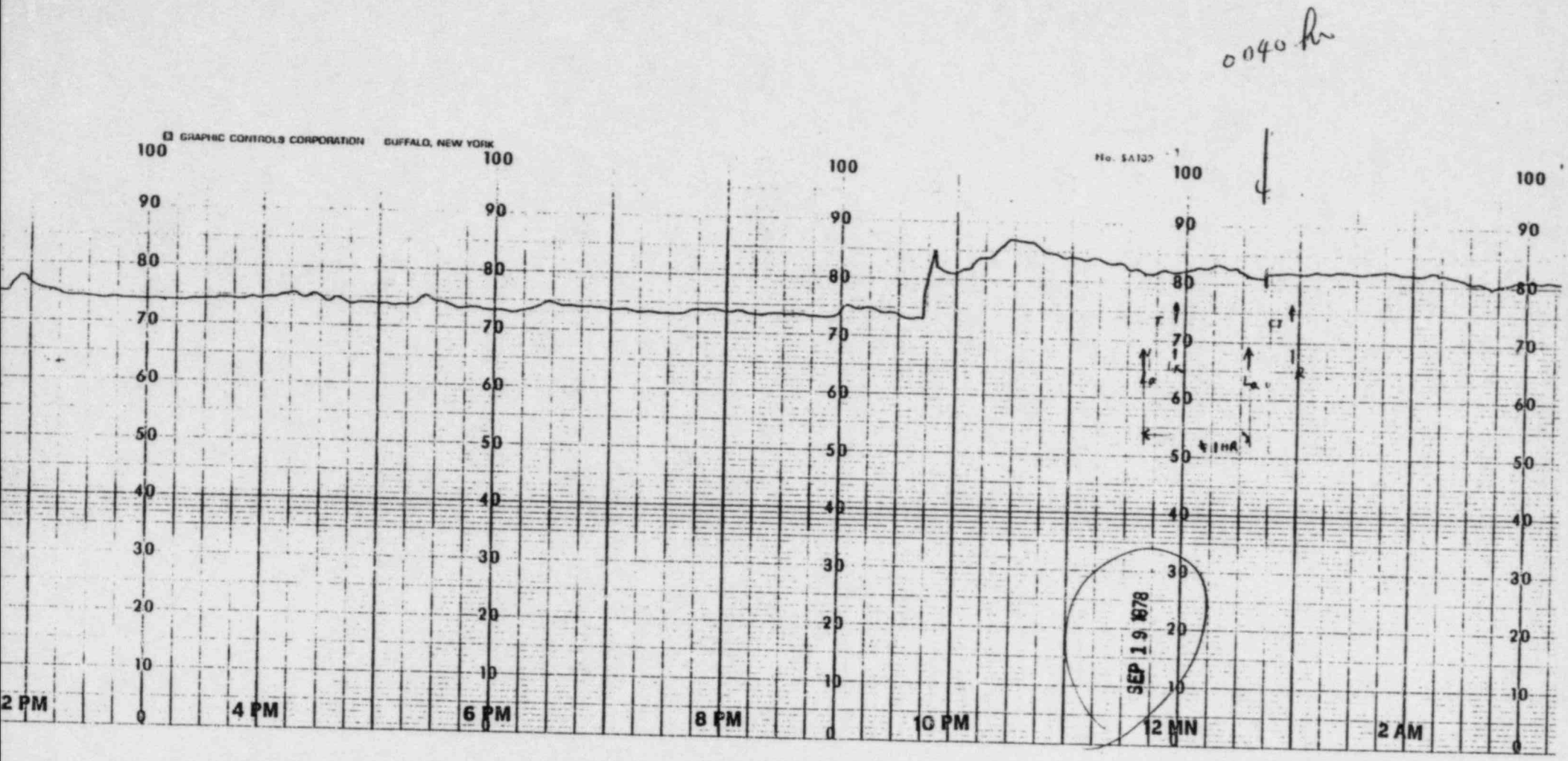
2350 Verified SBL breakouts operable. Heat balance SP1302-1.1 completed (sat)
0055 Completed SP1303-1.1 leak rate .4018 gpm

SHIFT RELIEVED [illegible] TIME 0700 DATE 9-19-78
Signature
SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F RCS GROSS 813 MW
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 463 ppm C.R. POS. 5-4 100 %
[illegible] 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 767 MWe nt 100 %
0740 completed SP1303-1.1 heat bal rate 93 %
1140 started neutralizing TK sump 26 %

SF Log Reviewed [illegible]

9/19/78
2300 J. F. Marston Rx Power 100%, Tave 579°F, RC Press 2155 psig, Gr 8 @ 25% Rod Index 296%. Tech Spec Boron Tank "B" RBAT level min level 6.2' Boron concentration 15,315 ppm b.o.c. MWe/MWT 859/2507, Mot & Equip OOS same as 9/18/78.
2350 Verified S.B.C. headsets operable.
2350 Heat balance complete sat SP-1302-1.1
0017 Started AH-E-101
0055 Leak rate complete sat SP-1303-1.1 +.4014 gpm
0220 Operability of DR-P-1A, NR-P-1A, & NR-P-1C satisfactory
0605 Started NO-P-1B & 1E.
0618 Stopped AH-E-101.
0700 J. F. Marston
0700 J. C. Hermanto Rx Power 100%, tave 579, 2155 psi, Boron 463 Rod Index 294 Gp 8 @ 22.
0720 Verified SBL headsets operable and in place
CRO Log Reviewed [illegible]
1140 started dumping neut. tank
1240 Pressurized CF tanks with N_2
BACK LOG 0741 Completed SP-1302-1.1 sat Heat Balance
1500 J. C. Hermanto
1500 J. E. Kuick Reactor Power 100%, Tave 579°F, R.C. Pressure 2155 PSIG, Group 7 at 96%, Group 8 at 24%.
1523 Checked SBL phones operable
1600 SP1302-1.1 Complete o.k.
1715 SP1303-1.1 Complete -.40 GPM
1950 DRP1B Tested & operable
1952 FSP-2 Tested & operable
1955 SRP1B Tested & operable
2300 J E Kuick


GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK
No. SA100
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80
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60
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40
30
20
10
0
2 PM
4 PM
6 PM
8 PM
10 PM
12 MN
2 AM
SEP 19 1978
1 HR

STOP

1

rc

+2"
61.566 gal
1.029 gpm

DATE: 9/19/78
TIME: 23:48:23

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8HOURS)
1
ENTER IDENTIFIEDLEAKAGE FROM DS 1303-1.1.2 (GPM)
0
ENTER RCDTCHANGE(GAL)
0
ENTER RCS CHANGE (GAL)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
23:48:46:	558.242	601.820	556.500	600.859	579.352	230.852	79.804	9.244
0:48:46:	558.383	601.859	556.563	600.914	579.422	229.059	80.370	9.253

LEAKAGE PLUSLOSSES (<30GPM): 0.3395 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.2468 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.0168 GPM

OPERATOR: D J Wharton

APPROVED: D L Gilbert

STOP 0

SHIFT RELIEVED [illegible] TIME 1500 DATE 9-19-78
Signature

SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS ____ MWE

RCS PRESSURE 2165 psig RX POWER 100 %

RCS BORON CONC. 413 ppm C.E. POS. 1-4 100 %

PLANT CONDITIONS/SPECIAL REMARKS: 5 100 %

6 100 %

7 95 %

8 24 %

1523 Checked SBL [illegible] operable.
1800 SP1302-1.1 complete OK.
1915 SP1303-1.1 complete -0.4 gpm

SHIFT RELIEVED [illegible] TIME 2300 DATE 9-20-78
Signature

SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 815 MWE

RCS PRESSURE 2165 psig RX POWER 100 %

RCS BORON CONC. 443 ppm C.E. POS. 1-4 100 %

5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: [illegible] set 773 6 100 %

7 96 %

8 24 %

2320 Verified SBL Headsets operable
2350 Completed SP1302-1.1 sat Heat Balance
0045 Completed SP1303-1.1 sat +.0166 gpm
0440 DR-F-1B, NR-F-1B 003
0510 Secured Neut. Tank Pump.

9/24/78

2300 Shift Bradley Rx power 100% Tave 579°F RC pressure 2155 psig Rod Index 296 Gp 8B 249. Tech Spec Emergency Boration Source TANK is BRWST TANK Level of 10.6' and concentration of 14,315 ppmb. Min level is 6.2' Met ECO Equipment out of Service is same as 9/19/78 with following exceptions Add- #1139 - IW-P-23, #142 AH-E-8A, Remove #1128 MO-7-18

2315 Added 300 Gallons from 'A' RCBT to MU TANK

2320 Verified SBL headsets operable

2330 Started MO-P-1C & 1E

2345 Placed MU-K-1A in service

Took MU-K-1B out of service

2350 Completed SP 1302-1.1 SAT

Late Entry 2310 Placed AH-E-101 in service

0048 Boric Acid Tank Completed SAT SP-1303-4.1 +.0168 gpm

0400 Verified DR-P-1A, NR-P-1A, NR-P-1C OPERABLE

0440 - DR-P-1B, NR-P-1B 003. Start 72 HR. clock

0510 - SLC Recirc TK Pump

Late Entry 0145 - Placed MU-K-1B in service, Placed MU-K-1A OOS.

0610 - SLC AH-E-101

0625 - Started MO-P-1C & 1E

0700 Shift Bradley

0700 Paul Chalecki 100 Rx PWR RC Press 2155 Tave 579°F Rod Index 293.5 Gp VIII 22

0810 Commence SP 1303-4.1 RPS 'D' Test, 'D' RPS in MANUAL

0812 Verified RR P1B OPERABLE, RR P1A OOS AND ON A 72 hr clock

0831 Verified S.B.L. headsets operable

0950 Completed SP 1303-1.1 .2271 G.P.M. SAT

1035 Went To MANUAL ON DIAMOND & FW FOR EKR Trips

1039 Went To Auto ON Diamond & FW Demand

1130 Completed SP 1303-4.1 RPS 'D' SAT

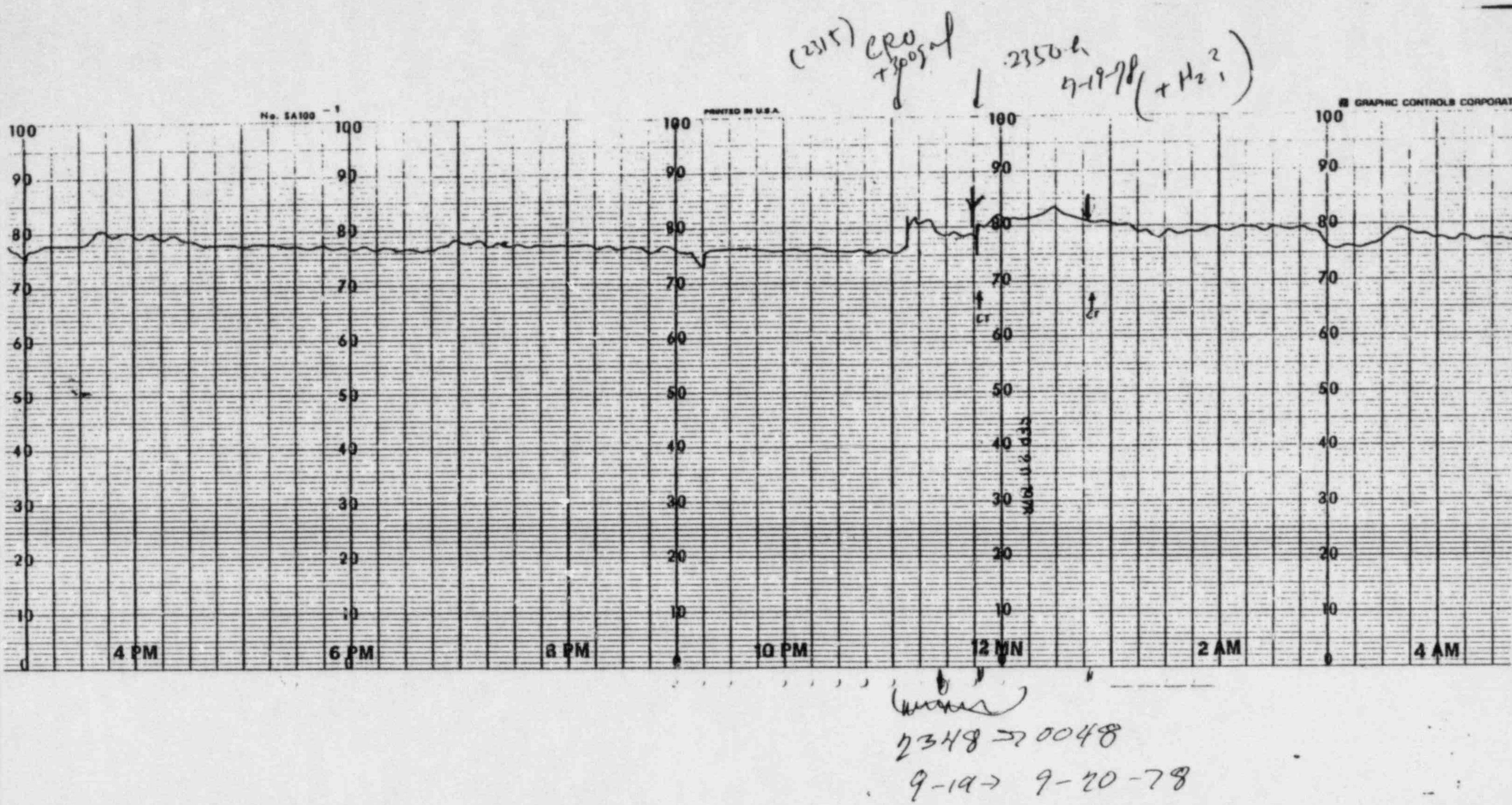
1200 STARTED HDP 1B, STOPPED HDP-1C

1230 STARTED AH-E-101

1235 ADDED 200 GALS. FROM 'A' RCBT to MUT-1

1437 Verified RR P1A OPERABLE

1500 Paul Chalecki


(2315) CRO +300 gal
2350 h
9-19-78 (+ H2 ?)
No. SA100 - 1
PRINTED IN U.S.A.
GRAPHIC CONTROLS CORPORATI
SEP 20 1978
4 PM
6 PM
8 PM
10 PM
12 MN
2 AM
4 AM
2348 → 0048
9-19 → 9-20-78

OIC

@ +3"

rc

DATE: 10/ 2/78
TIME: 16:45:40

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1.0
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
0.0
ENTER RCDT CHANGE (GAL)
0.0
ENTER RCS CHANGE (GAL)
0.0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
16:45:57:	557.578	601.406	555.813	600.414	578.797	226.156	76.440	9.163
17:45:57:	557.828	601.602	556.117	600.617	579.031	228.689	76.591	9.084

LEAKAGE PLUS LOSSES (<30GPM): -0.5212 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.2593 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.0293 GPM

OPERATOR: Dave Chalich

APPROVED: D James

STOP 0

008

2300 MU-K1A in Service MU-K1A .005
2305 Verified SBL Headroom
2330 Completed SP-1302-1.1 Heat Bal (Sat)
0100 MU-K1B in Service MU-K1A .005
0141 Completed 3303-M1 on FS-PS Sat
0153 [illegible] [illegible] [illegible]
0237 Completed SP-1303-1.1 leak Rate -.0095
0600 Started MO-P-1B + MO-P-1D

SHIFT RELIEVED [signature] 0700 10/2/78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE ____ °F MWE GROSS ____ MWE
RCS PRESSURE ____ psig RX POWER ____ %
RCS BORON CONC. ____ ppm C.R. POS. 1-4 ____ %
5 ____ %
PLANT CONDITIONS/SPECIAL REMARKS: 6 ____ %
7 ____ %
8 ____ %

St. log [illegible] [illegible]
0735 Completed SP1302-1.1
1025 Isolated MU-V-17 for Repairs
1445 Stopped R.B. Purge

SHIFT RELIEVED [signature] TIME 1500 DATE 10/2/78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 890 MWE
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 430 ppm C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 792 MWE Net 6 100 %
7 94 %
8 21 %

~~1530 [illegible] D.J.~~
1620 Restart RB Purge 102-786
1645 Complete SP1312-A1 Sat
1650 stopped RB Purge 102-786
1755 Complete SP1303-1.1 Sat +0.036 GPM

OCT 2 1978

2300 H Goolley Rx Power 100% Tave 579 RCP 2155 GP7@94% GP8@23
1378.09 EFPD Boron 440
2300 MU-K1A in Service - MU-K1B out
Tech. Spec. Emerg. Boration Source B RBAT @ 15480ppmB 10.7'
min. Required Level 6'3"
2305 Verified SBL Headsets
2330 1302-1.1 SAT 99.412%
0025 Tested FP Turb. Stop Vvs per 1106-1
0100 MU-K1B in Service - MU-K1A off
0141 3303-M4 Comp. - SAT on FS-P2
0155 Terminated Neut. TK. Dump
0237 1303-1.1 Comp. - SAT .0095
0515 Verified operability of DR-P1B & RR-P1A
0600 DR-P1A, RR-P1B, NL-P1C, & SR-P1C Tagged out
0605 Started MO-P1B & MC-P1B
0700 JH Goolley
0700 N E Smith 100% Rx Power, 835 MWe.
579 °F Tave, 2150 PSIG, GP7@94% GP8@21%
0730 Verified SBL Headsets operable
Cro Log Reviewed [illegible]
0755 completed SP 1302-1.1
1025 ISOLATED MU-V-17 for REPAIRS. CONTROLLING PZR LVL WITH MU-V-5
1445 STOPPED RB Purge 102-78-6 DUE TO RELEASE IN FH & AUX BLDG.
1500 E Smith
1500 [illegible] Rx Power 100% Tave 579 °F RCS Press 2155 psig
Rod Index 274 GP8@21%
1530 Wind speed & Direction Recorder Returned to Service
1620 Restarted Rx Bldg Purge 102-78-6
1645 completed SP 1302-1.1 Heat Ballance SAT
1650 Stopped Rx Bldg Purge 102-78-6 Due to Release in FH & Aux Bldg.
1755 completed SP 1303-1.1 Leak Rate SAT 0.0293 g/m
1800 Verified SBL Headsets
1945 STARTED Neutralizing TANK DUMP
1900 ALERT ALARMS ON RM-A4 PART., Iodine, GAS
RMA6 PART. & GAS, RM-A8 GAS, ALERT AND High
ALARM ON RM-G10
!! Local Emergency Declaired By Shift Foreman

10/2/78

1901 Announcement of Local Emergency made Evacuated Unit 1 Aux & Fuel Handling Bldgs and Unit 2 Fuel Handling Bldg. Notified Sh. Ft Supervisor of Local Emergency conditions

1910 Health Physics Dept. Dispatched To South End of Island To obtain Samples. Unit 1 Aux & Fuel Handling Bldgs. Requested To Determine Cause of Release

1942 Received RM-A6 Part. High Alarm

2035 All ~~HR~~ RMS Alarms Clear For Aux & Fuel Handling Bldgs. Secured From Local Emergency

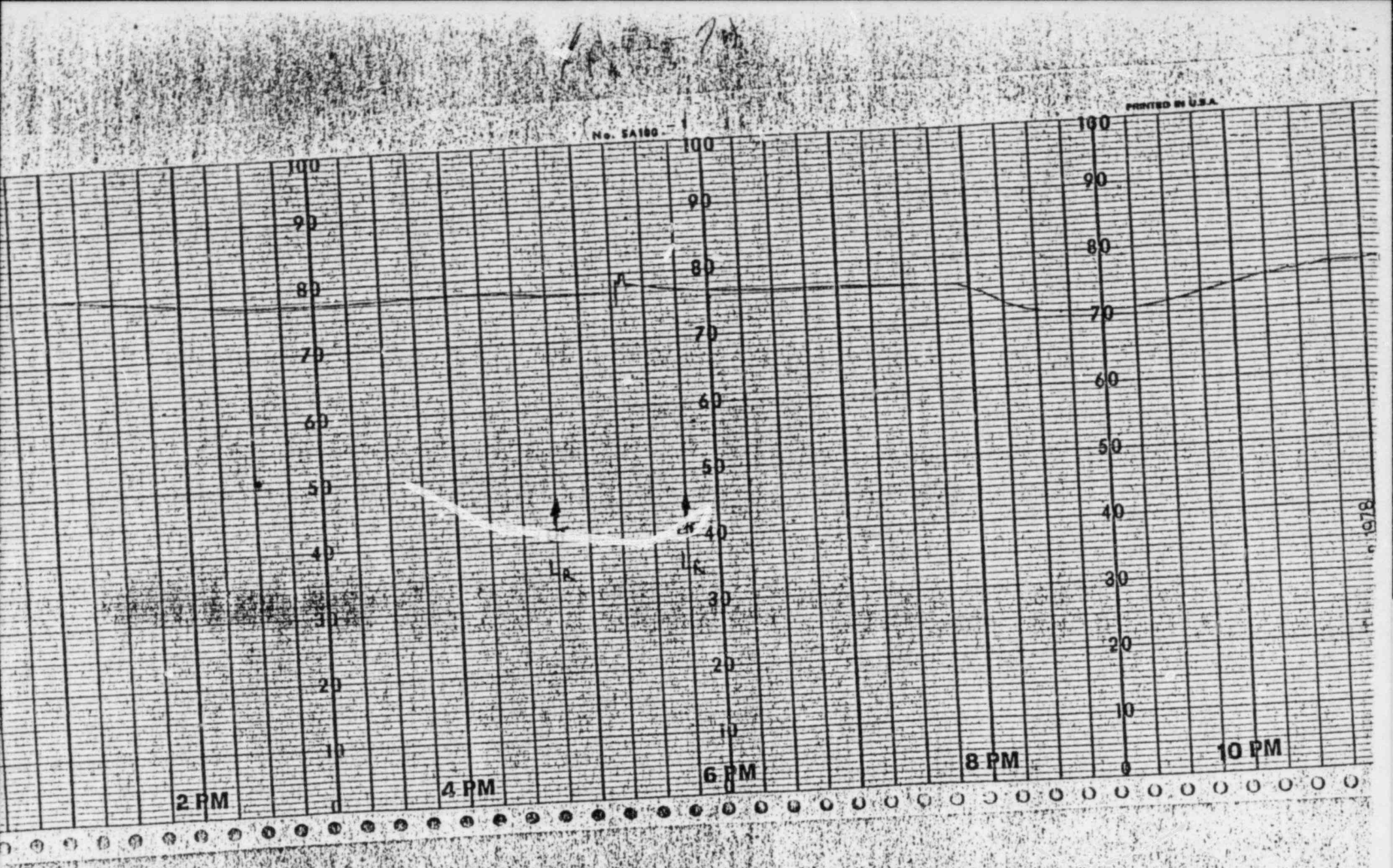
2105 Started & Verified operable DR-P 1A, RR-P 1B and NR-P 1C

2108 Selected NR-P 1C For ES on The 1T Bus & Removed NR-P 1B From Service

2135 Restarted R Bldg Purge 102-78-6

2210 Stopped MO-P 1B & MO-P 1E

2300 [signature]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1978

10-2-78

0 1 E

H_2

STOP 0

1.5"

lrc

DATE: 11/12/78
TIME: 8:16:35

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
0
ENTER RCDT CHANGE (GAL)
0
ENTER RCS CHANGE (GAL)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
8:16:53:	557.945	601.797	556.391	600.891	579.250	229.441	74.674	8.861
9:16:53:	557.945	601.742	556.242	600.820	579.180	229.193	75.486	8.796

LEAKAGE PLUS LOSSES (<30 GPM): -0.6127 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.0346 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.1954 GPM

OPERATOR:

APPROVED:

033

STOP 0

0030 Unit Fred RBC hand sets
0400 Completed SP 1303-1.1 total leak rate @ 1.0 gpm

SHIFT RELIEVED [signature] TIME 1300 DATE 11-12-78
Signature

SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F RCS ... 843 ...
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 307 ppm C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 795 MWE net 6 100 %
7 95 %
8 22 %

OHL 1445 ~~completed~~ Started Liquid Rel # 175-78L 1A WECST
1606 completed SP1302-1.1 Heat Bal sat
1744 completed RCS leak rate SP1303-1.1 @ +0.25 gpm
2117 completed Liquid Rel # 175-78L 1A WECST
2155 Started Neutr TK dump

... [signature] TIME 1100 DATE 11-13-78

... [signature]

579 ... 845 ...
2155 ... 100 ...
305 ... 1-4 100 ...
5 100
798 MWE Net 6 100
7 96
8 22

2335 1302-1.1 Sat
0015 Verified SBC headsets
0100 300 Gall Bleed & feed
0405 Complete 1303-1.1 Sat.
0410 Slow purge 11-2-78-6
04.. Complete 1303-11.25
0445 SP1303-M1 complete sat.
0550 stopped neut. TK dump

11/12/78

2300 Paul Chalicki Rx Pwr 100% Tave 579°F RC Press 2155 Rod Index 296 Gp #III 24% Tech Spec Emergency Boration Source is 'B' RCBAT @ 15,185 + 10.6' min level for this conc is 6.3' Verified SBL headsets operable. STARTED AHE-101 Met ED Equipment OOS SAME AS 11/11/78 with the following Exceptions: ADD #1352 Misc Evap

2315 Fed & Bled 500 FROM A RCBT To 'B' RCBT

0120 Completed SP 1303-11.25 Rx BLDG Door Check SAT

0300 Completed SP 1303-1.1 -.4548 GPM

0340 Completed SP 1303-5.4 EMERGENCY FEEDWATER Pumps

0350 Completed SP 1302-7.1 HEAT BALANCE SAT

0600 STARTED MOPIA & MOPID

0700 Paul Chalicki

0700 D.B. Mayhue Rx 100% Tave 579°F RC Press 2155 Rod Index 294 Gp #3 @ 21%

0745 Secured Neut. Tk Dump

0816 Heat Balance Complete SAT. SP 1302-1.1

0830 Verified SBL Headsets Operable

0900 Leak Rate Complete SAT. SP-1303-1.1 -0.1964 gpm

1415 BLCD & FED 250 gpm TO NU. TK. TO 'B' BLEED TK.

1600 D.B. Mayhue

1500 J.C. Herman Rx Power 100% Tave 579 Pressure 2155 Rod index 295 Gp. B @ 23%

BACK LOG

1445 - started Liq Rel. # 175-78-L

1606 - completed SP 1303-1.1 SAT.

1744 - completed SP 1303-1.1 sat +.25 GPM.

1750 - Verified SBL headsets inplace and operable.

2117 Jed

~~2011~~ terminated Liq Rel. # 175-78-L

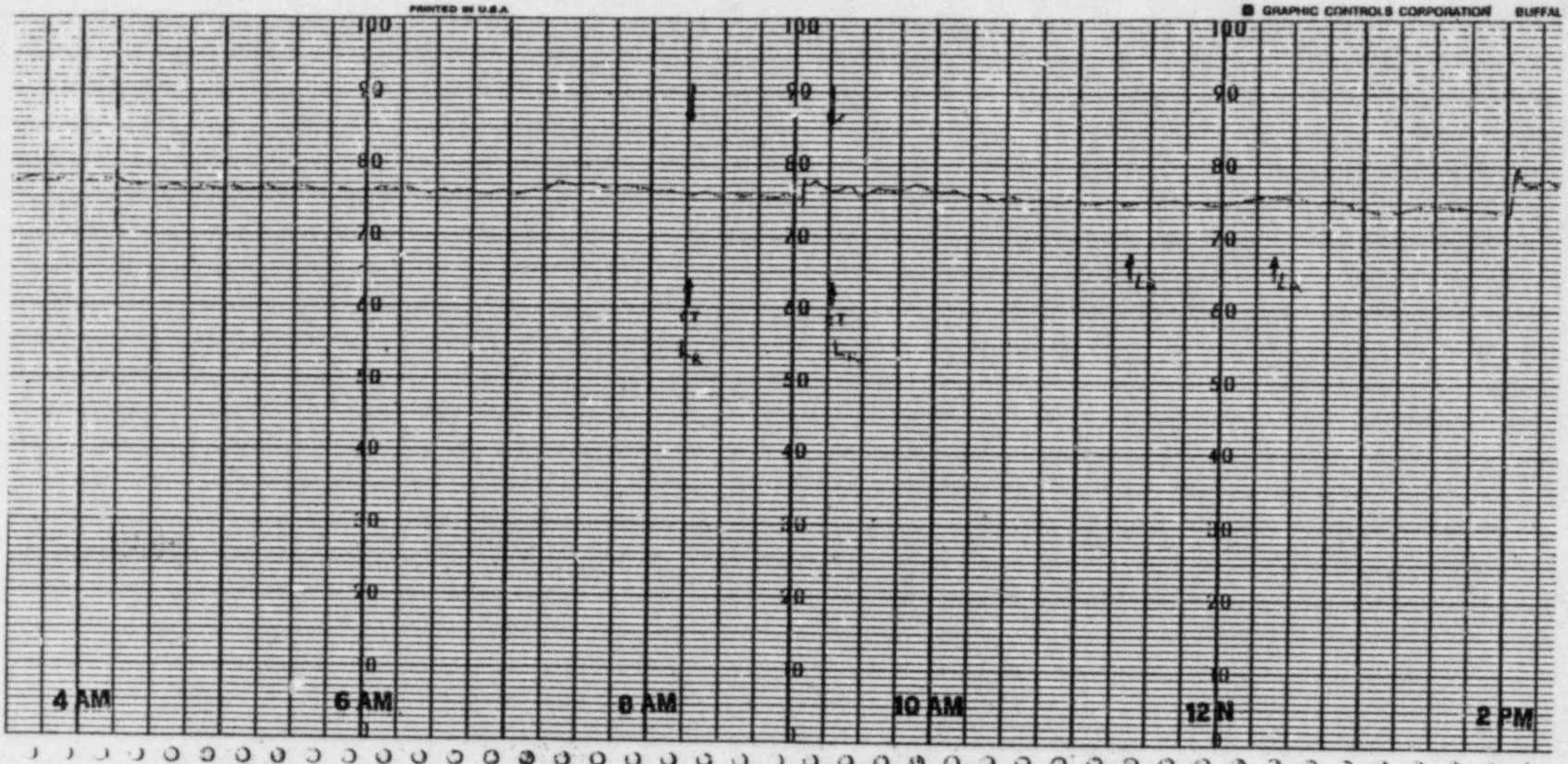
2155 - started Dumping Neut. tank.

2232 - started pumping BAMT to "B" spent fuel pool

2243 - stopped MO-P-1B and MO-P-1E

2300 J.C. Herman

11-12-78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GRAPHIC CONTROLS CORPORATION
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8 AM
10 AM
12 N
2 PM

[illegible]

Inc.

+3"

92.65 gal

1.5442 gpm

DATE: [illegible]
TIME: [illegible]

[illegible] COOLANT LEAKAGE TEST
[illegible] 1303-1.1

DESIRED INTERVAL (1-4 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DG 1303-1.1.2 (GPM)
0
ENTER [illegible] CHANGE (GAL)
?
ENTER RES CHANGE (GAL)
?

TIME	[illegible]	[illegible]	TEB (F)	TIB (F)	TAVE (F)	PRZR LVL (IN)	PZTR LVL (IN)	RCDT LVL (VOLT)
15:18: 58	[illegible]	001.[illegible]	55[illegible]	[illegible].099	577.[illegible]	[illegible]	[illegible]	[illegible]
17:18: 58	[illegible]	[illegible]	556.[illegible]	[illegible].023	577.[illegible]	[illegible]	[illegible]	[illegible]

LEAKAGE [illegible] GPM): 1.[illegible] GPM

[illegible] DG RES LEAK RATE ([illegible] GPM): 0.[illegible] GPM

[illegible] UNIDENTIFIED LEAK RATE (<1 GPM): 0.[illegible] GPM

OPERATOR: [illegible]

[illegible]: [illegible]

STOP [illegible]

[illegible]

[illegible]

[illegible]

DATE: [illegible]
TIME: [illegible]

F ACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL [illegible]
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
0
ENTER RCDT CHANGE [illegible]
0
ENTER RCS CHANGE [illegible]
?

TIME	[illegible]	[illegible]	[illegible] (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (% LT)
16:16:[illegible]	[illegible]	[illegible]	556.[illegible]	601.037	579.172	220.717	76.453	3.031
17:[illegible]	[illegible]	[illegible]	[illegible]	601.073	579.1[illegible]	227.[illegible]	74.611	3.045

[illegible]

LEAKAGE PLUS LOSSES [illegible]: 1.2522 GPM

GROSS RCS LEAK RATE [illegible]: 0.7172 GPM

[illegible] UNIDENTIFIED LEAK RATE (CC GPM): 0.[illegible]72 GPM

OPERATOR: [illegible]
[illegible]: [illegible]

STOP

0607 Stopped AH-E-101

SHIFT RELIEVED [signature] TIME 0700 DATE 2/3/79
Signature

SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F GEN LOAD 840 MW
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 77 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 6 100 %
7 95 %
8 20 %

0715 verified SBL headsets
0725 SP 1302-1.1 headsets heat bal
0745 SP 1303-1.1 leak rate

SHIFT RELIEVED [signature] TIME 1400 DATE 2/3/79
Signature

SHIFT ASSUMED BY [signature]
Signature

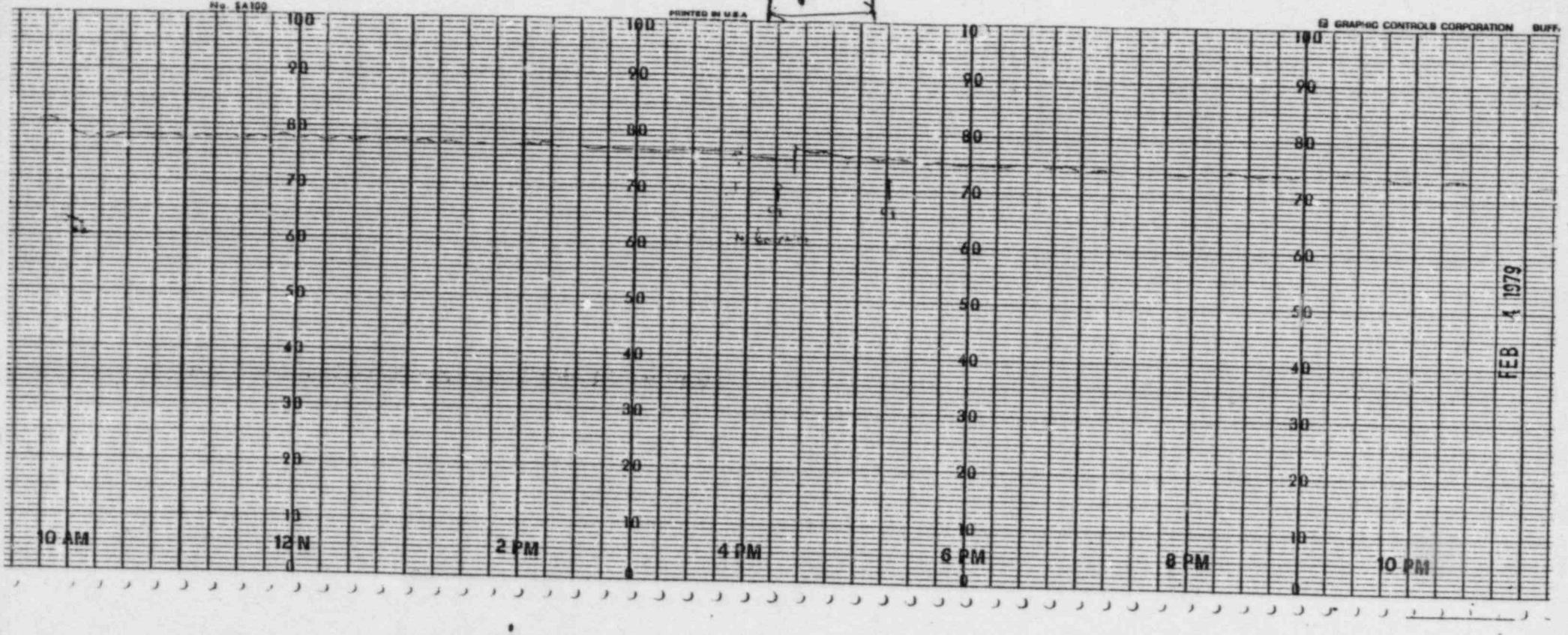
PLANT CONDITIONS: RCS TEMPERATURE 579 °F GEN LOAD 848 MW
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 77 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: MWE Net 799 6 100 %
7 96 %
8 20 %

1532 Verified SBL headsets in place and operable.
1600 Completed SP 1302-4.1 heat balance 99.130% ssl
1715 Started transferring contents of "A" WECST to "A" RCBT.
1710 Completed SP 1303-11 RCS leak rate + .1892 gpm ssl

2/3/79

0725 Heat balance sat. SP 1302-1.1
0830 Added 300 gal to MU Tank from 'A' bleed tank
0845 Leak rate sat SP 1303-1.1
1500 T. Ruppert
1500 L.W. Brantley Rx power 100%, Tave 579°F, RC pressure 2155psig
Rod index 296, GP 8@ 192
1552 VERIFIED SBL HEADSETS IN PLACE AND OPERABLE
1553 COMPLETED HEAT BALANCE SP 1302-1.1 SAT.
1715 COMMENCED TRANSFERRING 'A' WECST TO 'A' RCBT.
1716 COMPLETED LEAK RATE SP 1303-1.1 +.4892 GPM
2040 DEBORATED 1500 GALLONS THRU WDL-K-1A
2210 SECURED MU-P-1B & MU-P-1E
2300 L.W. Brantley

2-3-1979, 1625 hr.



ATTACHMENT C

COPIES OF RCS LEAK RATE

TEST RAW DATA SUPPORTING

TABLE 7

WATER ADDITIONS

+ & -1/

+ 247.1 gal

4.12 gpm

rc

DATE: 5/12/78
TIME: 16:43: 3

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTERIDENTIFIED LEAKAGEFROM DS 1303-1.1.2 (GPM)

ENTERRCDTCHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
16:43:19:	559.914	600.148	558.977	599.484	579.628	216.025	72.008	8.519
17:43:19:	560.391	600.688	559.406	599.945	580.102	216.297	77.845	8.240

LEAKAGE PLUS LOSSES (<30 GPM): -3.2582 GPM 0.8682

GROSS RCS LEAK RATE (<10 GPM): -0.5144 GPM 3.6144

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.7443 GPM 3.3843

OPERATOR: R. Blanchard

APPROVED:

OC049

SHIFT RELIEVED [signature] TIME 1500 DATE 5-11-78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 752 MW
RCS PRESSURE 2155 psig RX POWER 90 %
RCS BORON CONC. 819 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 6 100 %
7 92 %
8 32 %

1801 Sodium Hydroxide Ht. on Recirc.
1902 Completed SP 1303-1.1 R.C.S. leak rate ~.33 gpm
1910 Started ab. 85-78-6 "A" WECST
1920 Completed SP 1302-1.1 Heat Balance O.K.

SHIFT RELIEVED [signature] TIME 2300 DATE 5/11/78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 752 MW
RCS PRESSURE 2155 psig RX POWER 90 %
RCS BORON CONC. 817 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 6 100 %
7 92 %
8 31 %

2305 Rm 8-8 returned to service
2315 RMS monthly surv 1302-3.1
0005 SP 1303-11.25 flow test completed
0050 completed SP 1302-1.1 heat balance sat
0100 terminated 85-78-6 "A" WECST
0210 completed SP 1303-1.1 leak rate -0.37 gpm
0240 Rm-16 returned to service

SHIFT RELIEVED [signature] TIME 0700 DATE 5/12/78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 — MW GROSS 748 MW
RCS PRESSURE 2155 — RX POWER 90 %
RCS BORON CONC. 849 — C.R. POS. 1-4 100 %

PLANT CONDITIONS/SPECIAL REMARKS: 701 MWE net — 5 100 %
6 100 %
7 94 %
8 37 %

0826 completed SP1302-1.1 Sat Heat Balance

SHIFT RELIEVED [signature] TIME 1500 DATE 5-12-78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F — MWE GROSS 697 MWE
RCS PRESSURE 2155 psig — RX POWER 90 %
RCS BORON CONC. 849 ppmb — C.R. POS. 1-4 100 %
5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: — 6 100 %
7 94 %
8 37 %

1750 Completed SP1303-1.1 R.C.S. Leak Rate -.7443
1800 Completed SP1302-1.1 Heat Balance Sat.
2040 Completed SP1301-9.9D Southern.
2130 Completed SP1303-4.14 R.C. Spray Logic Check.
2230 Completed SP1301-1.1 Weekly Check.
2235 Completed ESC 1300-30 B R.C. Spray Sys. Logic test.

SHIFT RELIEVED [signature] TIME 2300 DATE 5/12/78
Signature
SHIFT ASSUMED BY [signature]
Signature

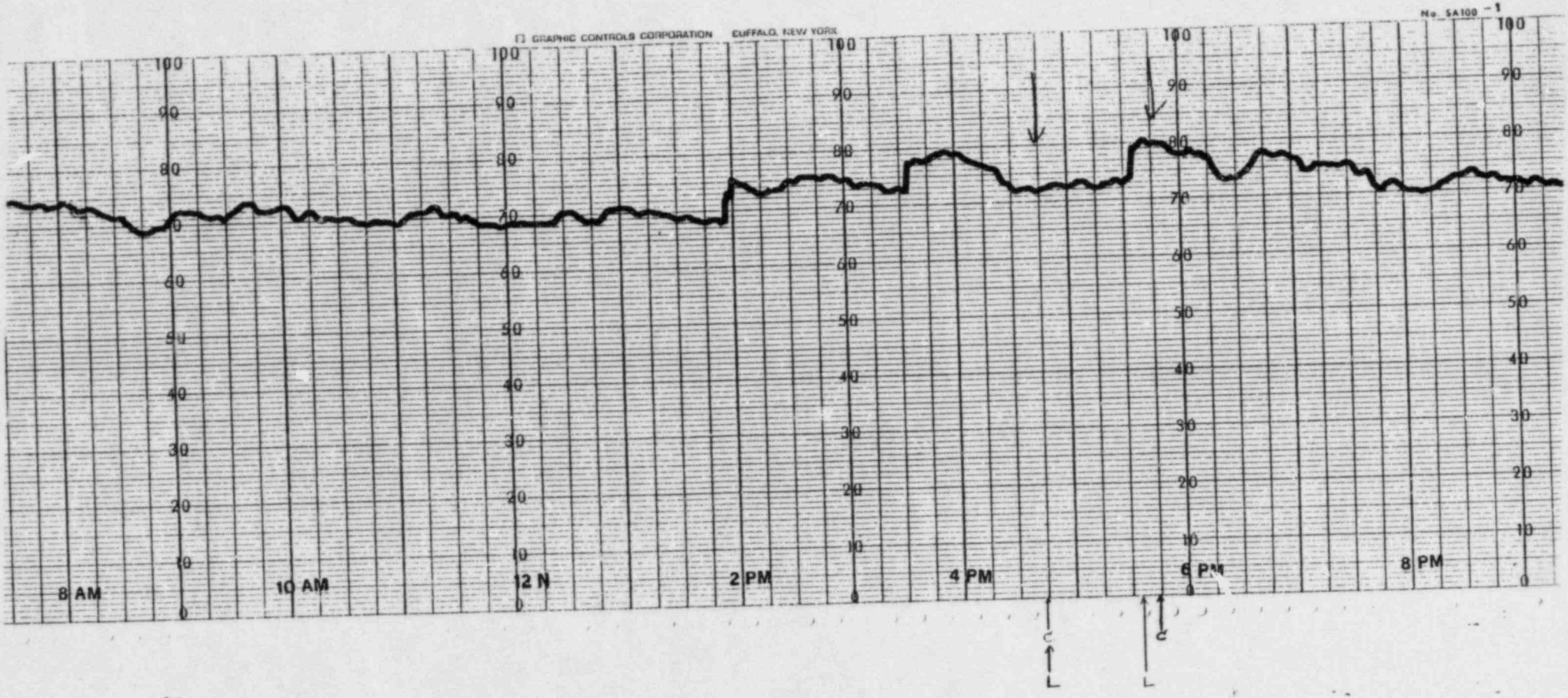
PLANT CONDITIONS: RCS TEMPERATURE 579 °F — MWE GROSS 740 MWE
RCS PRESSURE 2155 psig — RX POWER 100 %
RCS BORON CONC. 819 ppmb — C.R. POS. 1-4 100 %
5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: MWE net 697 — 6 100 %
7 94 %
8 37 %

5/17/78

2300 [redacted] Rx Power 90% Tave 579°F Pressure 2155 psig
RCS Boron 819 ppm Rod Index 292 Gp 8 @ 317
Tech Spec Emergency Boron Source is 'B' RBAT - concentration
is 12366 ppm. Level 9.8'. Min Level for present
concentration is 8.5'.
2305 RM-A8 returned to service.
2315 RM-A6 OOS for monthly Surv. 1302-3.1
2330 STARTED AHE-101
0005 completed 1303-11.25 Rx Bldg Door Test SAT +2.95 CF.
0050 completed SP 1302-1.1 Heat Ballance SAT
0100 Terminated Release 85-78-L 'A' WECST
→ 0210 completed SP 1303-1.1 Leak Rate SAT. -0.37 gpm
0540 RM-A6 returned to service
0630 started AHE 101
0700 [redacted]
0700 R Stellman Rx Pwr. ≈ 90%, Tavg. 579, Press. 2155
Boron 819, Gp. #7 at 94%, Gp. #8 at 33%, #MWe 748
0720 started MO-P-1A
0745 Verified S.B.L.K.T. headsets operable and inplace
0825 Completed SP 1302-1.1 sat.
0845 Filled RCP standpipes
1500 R Stellman
1700 Paul Chalecki 90% Rx Pwr as before
* { 1743 ADDED 75 GALS. FROM 'A' RCBT TO MUT-1 } *
1745 ADDED 70 GALS. FROM 'A' RCBT TO MUT-1
→ 1750 Completed SP 1303-1.1 -.7443 GPM
1708 Completed SP 1302-1.1 HEAT BALANCE SAT
1820 STARTED MOP 1F
1945 Filled RCP STANDPIPES
2040 Completed SP 1301-9.9D Pipe Supports HANGERS
2130 Completed SP 1303-4.14 RBS System Logic Chan
2205 STOPPED MOP 1B & MOP 1E
2210 Verified headsets AT MUV 16 ABGD
2230 Completed SP 1301-4.1 Weekly Checks
2235 Completed SP 1300-3AB BS Pumps
□ 2240 ADDED 50 GALS FROM 'A' & 'B' RCBT TO MUT-1
2400 Paul Chalecki

5-12-78 1643 ~1743



rc

DATE: 6/11/78
TIME: 8: 4:39

+ 9"
277.9 gal
4.63245 gpm

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIEDLEAKAGE FROMSP1303-1.1.2 (GPM)
ENTERRCDTCHANGE (GAL)
ENTERRCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
8:4:56:	559.875	602.414	558.859	601.680	580.703	225.965	75.707	9.030
9:4:56:	560.016	602.820	559.109	602.078	581.000	220.723	78.478	9.141

P = 2155 psig.

LEAKAGE PLUS LOSSES (<30 GPM): 1.8142 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.8126 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.5826 GPM

OPERATOR: [signature]
APPROVED: C. Guthrie

0C052

SHIFT RELIEVED L. Nash TIME 2350 DATE 6-10-78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F TVE GROSS 822 MWE
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. ppmb C.R. POS. 1-4 110 %
100 %
PLANT CONDITIONS/SPECIAL REMARKS: MWT 776 100 %
45 %
29 %

2310 Checked phones @ MU-U16A,B,C&D
2330 Checked L.P.M, no alarms
0010 Initiated 109-78-L
0035 Completed SP1302-1.1 Heat Balance
0037 STARTED AH-E-101
0240 completed SP 1303-1.1 Re Bak rate -0.23 gpm
0615 110-78-L started
0640 Checked L.P.M, no alarms

SHIFT RELIEVED [signature] TIME 0645 DATE 6/11/78
Signature
SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 770 MWE
RCS PRESSURE 2155 psig RX POWER 95 %
RCS BORON CONC. ppmb C.R. POS. 1-4 100 %
100 %
PLANT CONDITIONS/SPECIAL REMARKS: PHYSICS TESTING 100 %
IN PROGRESS, MWE NET 723, LIQUID RELEASE 90 %
110-78L IN PROGRESS 29 %

0739 COMPLETED PHYSICS TESTING, COMMENCED POWER ESCALATION TO 100% (1350-05)
0800 STARTED MU-P-1C W/F, STOPPED MU-P-1A & 1B
0828 CHECKED LOOSE PARTS MONITOR - NO ALARMS
0910 COMPLETED SP 1302-1.1 .52 GPM
1005 VERIFIED HEADSETS AT MU-U16A,B,C&D OPERABLE
1030 FILLED RCP STANDPIPES
1130 LOOSE PARTS MONITOR - NO ALARMS
1152 "C" RPS IN CHANNEL BYPASS
1157 "C" RPS NORMAL; RECTIMETER DISCONNECTED

6/11/78

2300 J.E. Barker III ≈ 100% PWR, BORON 708 PPM, 579°F, 2155 PSI, INDEX 295, 6P #8 @ 29%

2300 T.S. EMERGENCY BORON SOURCE IS "B" RCBT @ 12129 PPM MIN LEVEL REQUIRED IS 8.6'. ACTUAL 9.8'

2310 CHECKED PHONES @ MUV 16 A, B, C, D

2330 CHECKED L.P.M. NO ALARMS

0010 FINISHED 109-78-L

0035 COMPLETED S.P. 1302-1.1 HEAT BALANCE.

0037 STARTED AHE-101

0240 COMPLETED S.P. 1303-1.1 R.C. LEAKRATE — .23 GPM

0615 110-78-L STARTED

0534 STARTED 1550-05

0550 CHECKED L.P.M. NO ALARMS

0628 STOPPED AHE-101

0630 REDUCING TO 95% PWR PER 1550-05

0640 @ 95% PWR

0700 J.E. Barker III

0700 Carl Chalecki 95% PWR TAVE 579°F RC PRESS 2155 Index 290 Gp VIII 28.5%

0704 Commence INC Rx PWR TO 100%

0715 Rx PWR AT 97%

0739 Completed Physics Testing per 1550-05

☑ 0755 ADDED 100 GALS FROM 'A' RCBT TO MUT-1

0800 STARTED MOP 1C & MOP 1F STOPPED MOP 1A & 1D

0828 Checked Loose Parts Monitor — 16 ALARMS

0529 BLED 300 GALS FROM RCS TO 'B' RCBT

* ☑ 0838 ADDED 300 GALS FROM 'A' RCBT TO MUT-1

* 0910 Completed SP 1303-1.1 .5826 GPM

☑ 1000 ADDED 100 GALS. FROM 'A' RCBT TO MUT-1

1005 Verified SMALL LOCA HEADSETS AT MUV 16 A, B, C, D

1030 Filled RCP STAND PIPES

☑ 1055 ADDED 100 GALS FROM 'B' RCBT TO MUT-1

☑ 1125 ADDED 100 GALS FROM 'B' RCBT TO MUT-1

1130 Checked LOOSE PARTS MONITOR — NO ALARMS

1152 Went To MANUAL BYPASS ON 'C' RPS

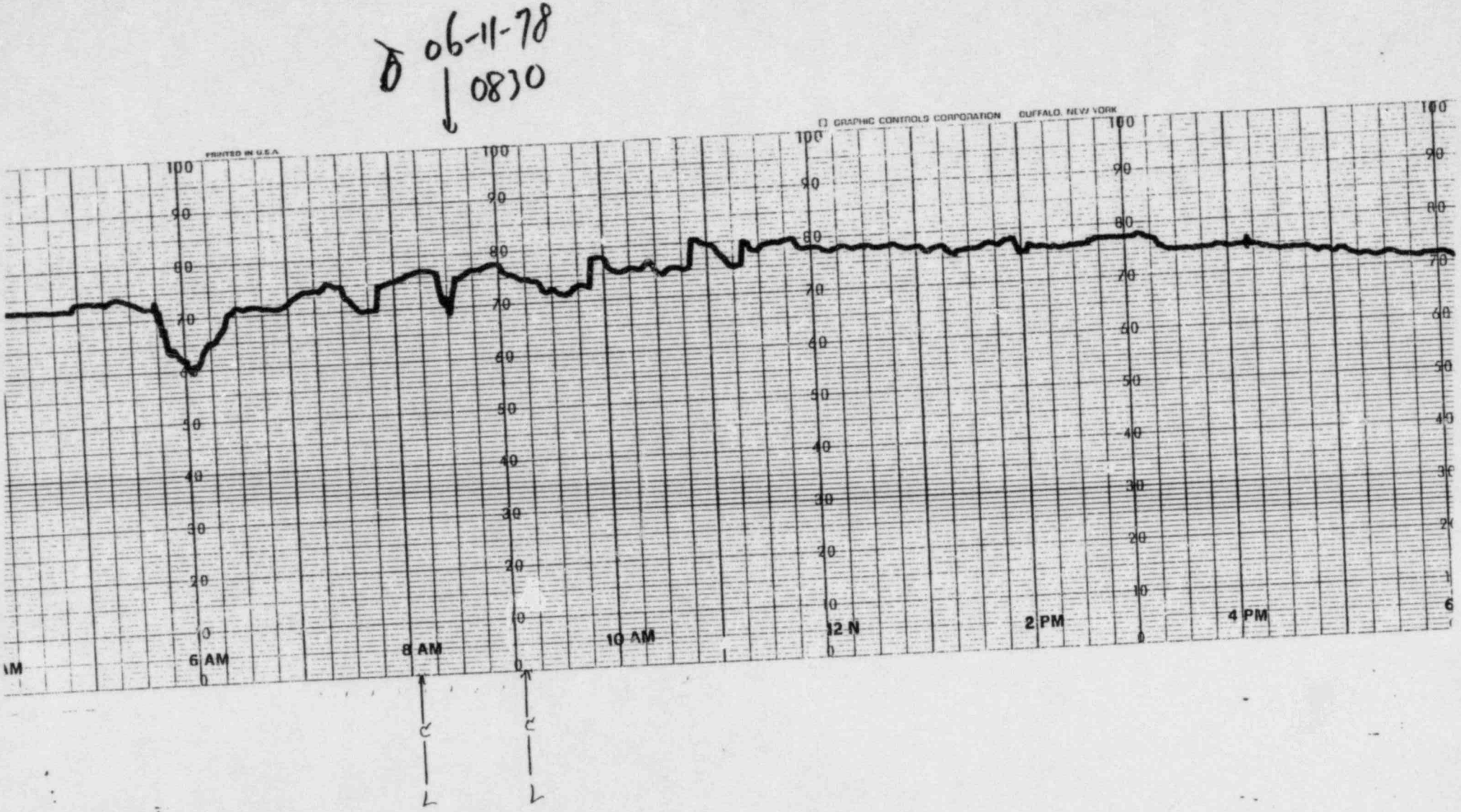
1157 Went To NORMAL ON 'C' RPS

☑ 1235 ADDED 10 GALS FROM BAMT TO MUT-1

☑ 1325 ADDED 10 GALS FROM BAMT TO MUT-1

☑ 1350 ADDED 10 GALS FROM BAMT TO MUT-1

1355 Commence Decreasing Rx PWR TO 60% Due To Fuel


06-11-78
0830
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK
PRINTED IN U.S.A.
6 AM
8 AM
10 AM
12 N
2 PM
4 PM

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

11-7 Shift
06/21/78

+8 1/

DESIRED INTERVAL (1-8 HOURS)
1

247.1 gal
4.1177 gpm

ENTERIDENTIFIEDLEAKAGEFROMDS1303-1.1.2(GPM)

ENTERRCDTCHANGE (GAL)

ENTERRCSCHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
3:41:47:	557.742	601.961	556.422	601.156	579.320	222.762	80.382	8.187
4:41:47:	558.219	602.383	556.805	601.477	579.711	224.133	74.853	8.487

LEAKAGE PLUS LOSSES (<30 GPM): 4.1299 GPM

GROSS RCS LEAK RATE (<10 GPM): 1.1721 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.9421 GPM

OPERATOR: H Hoolbrook

APPROVED:

00098

F03

SHIFT RELIEVED C. Guthri TIME 2245 DATE 6/20/78
Signature

SHIFT ASSUMED BY L. Nolde
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 819 MWE
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 691 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: MWE Net 771 6 100 %
7 94 %
8 28 %

2329 verified headsets operable at MU-V-16A,B,C,D
0008 Received B-1-4 alarm #1 seal leakoff low. Recycle
0015 point & 2&7 decreased to ≈ 0 Gpm on recycle
0016 seal #1 outlet Δp low alarm in and out.
"C" RC pump stand pipe went to normal
0018 Seal #1 Temp 150°, no vibration.
0030 verified readings on #1 seal leak off in
R.B. as being ≈ 0 gpm. alarm at 0.6 gpm
0355 completed sp 1303-11.35 sat - permanent
0455 completed sp 1303-11.19 A,D sat.
0510 completed sp 1303-5.5 sat.
0606 completed sp 1303-11.1 +.94 Gpm

SHIFT RELIEVED L. Nolde TIME 0645 DATE 6-21-78
Signature

SHIFT ASSUMED BY D. L. Colbert
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 824 MWE
RCS PRESSURE 2155 psig RX POWER 100 %
RCS BORON CONC. 694 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: MWE Net 777 6 100 %
7 93 %
8 27 %

0750 Completed SP 1302-1.1 heat balance 99.606 % sat.
0755 Started 1303-4.1 RPS Monthly
0805 Placed D RPS Channel in manual bypass
0836 Disabled TSI to take vibration readings
0845 Placed D RPS in S/D bypass
0846 Checked loose parts monitor. No alarms
0905 Verified headsets @ MU-V16 A,B,C,D.
0950 Started HH-E-01
1020 Started Waste Gas tank release 69-78-G.
1021 Completed SP 1303-11.1 RCS leak rate -0.6308 gpm

SHIFT RELIEVED A.L. [illegible] TIME 1500 DATE 6/[illegible]/78
Signature

SHIFT ASSUMED BY [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 902 MWE

RCS PRESSURE 2155 psig RX POWER 100 %

RCS BORON CONC. ______ ppm C.R. POS. 1-4 100 %

5 100 %

PLANT CONDITIONS/SPECIAL REMARKS: RC-P-1C #2 SEAL PROBLEM

6 100 %

7 94 %

8 2? %

1800 Verified small break loca Handsets.
1620 add 200 gall RCBTC [illegible] 100 Gall RCBTA
1715 added 250 gall RCBTC of 150 Gall RCBTA
17[illegible] closed 70-78-6
1855 added 175 Gall CRCBT.
2015 reissued 69-78-6
2030 RCS Boron 686
2045 Commence RCS Degas per 1103-12
2145 commence Boration for S/D 105.6
2200 Commence plant S/D Per 1102-10 Boron
Rods 295% G8 29% Tave Xe 2.65%
EF-PD 45.98
2235 RC Boron 708 PPM

SHIFT RELIEVED [illegible signature] TIME 2300 DATE 6-21-78
Signature
SHIFT ASSUMED BY [illegible signature]
Signature

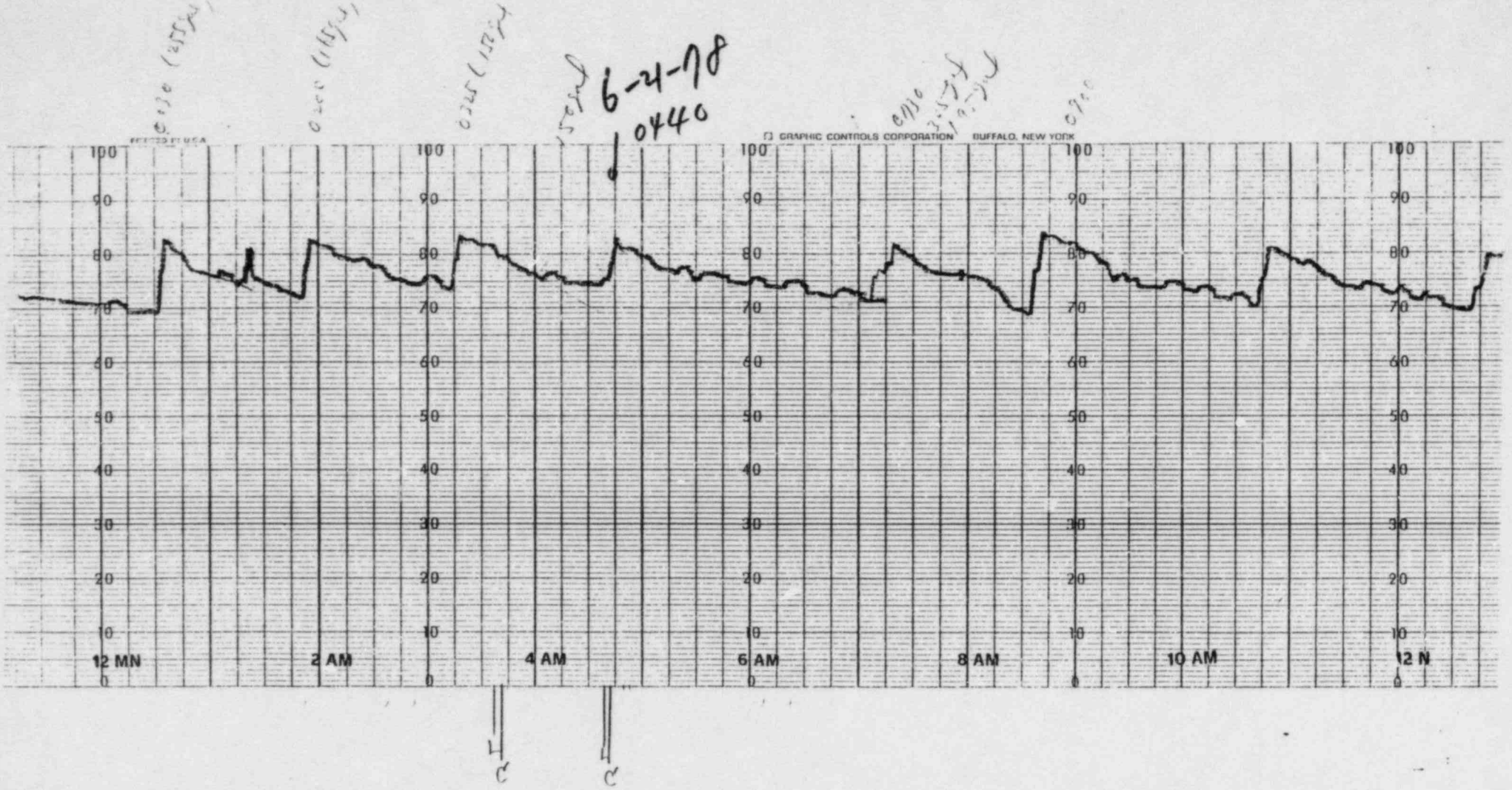
PLANT CONDITIONS: RCS TEMPERATURE 579 °F [illegible] 542 [illegible]
RCS PRESSURE 2155 psig RX POWER 62.25 %
RCS BORON CONC. 686 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: [illegible] 6 100 %
7 92 %
8 22 %

2300 secured FW-P-1A
2320 stopped HD-P-1B, CO-P-2B, [illegible] [illegible] [illegible]
2325 stopped HD-P-1A and CO-P-1C
2350 Rx power at 0%
0012 10 Temps - Boron 760 ppm, Tave 537, 2155 psig, ~~[illegible]~~ PAT 309, 1-7 100%
0013 started RCS Boration
0029 stopped RC-P-1C
0050 RCS boron 786 ppm
0130 RCS boron 844 ppm - checked Lpm
0145 RPS setpoints to 95%
0145 "D" RPS in manual bypass
0155 "D" RPS out of bypass
0156 "C" RPS in manual bypass
0205 "C" RPS to normal
0206 "B" RPS to manual bypass
0208 "B" RPS to normal
0209 "A" RPS to manual bypass
0210 RCS boron is 923 ppm
0215 "A" RPS to normal - RPS s/p to 95%
0220 RCS boron is 975 ppm
0250 RCS boron is 1064 ppm
0350 RCS boron is 1234 ppm
0420 RCS Boron is 1300, commenced cooldown
0434 stopped RC-P-1B
0450 RCS pressure 1850, inserted safetys, tripped Rx
0457 RCS Boron 1410 ppm
0502 RPS set points - Hi @ set at 5%
0503 RPS A, B, C, D in shut down bypass, cocking safetys
0520 RCS boron is 1575 ppm
0540 stopped FW-P-1B, bypassed H.P injection
0550 RCS boron is 1557 ppm, safetys cocked

3445?

CRO LOG

6-21-78 RE Boyce Rx Pwr 100% Rod Index 294 Gip Pe 29
2300 Boron 691 Tave 579 Pressr 2155 mwe/mwe 809/2500
EFPD 45.07 Tech Spec Emerg Boration Source "B" RBA
C 9.8' 12,214 ppmb min level 8.0'
2329 SBL Headsets verified
0015 Point #3 & #7 decrease #1 seal leakoff
0016 Seal ΔP low Alarm in rout
0020 I&C confirmed Point #3 & #2 real
0030 Larry Knoll & Stupak in Rx bldg
0035 local indication no flow indicated RC standpipe Normal
RC drain tank increasing faster normal - No Vibration
late 0018 Seal #1 Temp ok 152° 15 min later 148°
0020 Added 255 to MUT1 from "A" RCBT, 165 from "C" RCBT
0200 Added 165 to MUT1 from "C" RCBT, 135 from "A" RCB
0200 commenced surveilance on "C" RC pump every 30 min
vibration & Lab ΔP every 10 min RCBT level,
MUT1 level, seal out Temp, water to bearing Temp.
0325 Added 150 to MUT1 from "C" RCBT, 150 from "A" RCB
0355 1303 11.25 Personnel door cat .4 scfm
0430 MUT1A IN Service? MUT1B OOS?
0450 Added 150 to MUT1 from "C" RCBT, 150 from "A" RCB
0455 1303 -11.19 A/O Turb overspeed testing complete SAT
0510 1303 - 6.5 complete control Bldg Vent
late 0008 Received E-1-4 RC #1 seal leakoff low point #7
0605 started MOP 1B & 1E
0606 SP 1303-1.1 SAT 7.94
0630 MUT1B IN Service MUT1A OOS
0659 1302-1.1 SAT 99.371%
0700 RE Boyce
0700 J Martin Rx Power @ 100%, Tave 57
RC Press 2155 psig, MWE/MWT 2519/817
0730 Added 205 GAL to MU TNK FROM "A" RCBT
0750 Added 195 GAL FROM "B" RCBT.
0850 HEAT BALANCE COMPLETE SAT SP 1302-1.1
0755 STARTING 1303-4.1 RPS MONTHLY
0805 PLACED "D" RPS IN MANUAL BYPASS
0836 TSI IS DISABLED.
0845 PLACED "D" RPS IN SHUTDOWN BYPASS.
0846 LOOSE PARTS MONITOR CHECKED NO ALARMS
0900 ADDED WATER TO MU TNK 81% "A" RCBT 18%
FROM ~~B~~ RCBT.


6-4-78
0440
GRAPHIC CONTROLS CORPORATION BUFFALO, NEW YORK
100
90
80
70
60
50
40
30
20
10
0
12 MN
2 AM
4 AM
6 AM
8 AM
10 AM
12 N

STOP 0

!

FG

DATE: 8/31/78
TIME: 8:1:41

REACTOR COOLANT LEAKAGE TEST
SP 1303-I.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIEDLEAKAGE FROMDS1303-1.1.2(GPM)
0
ENTERRCDTCHANGE (GAL)
0
ENTERRCSCHANGE (GAL)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
8:1:58:	557.859	601.656	556.063	600.695	579.063	229.373	75.994	9.290
9:1:58:	557.992	601.656	556.078	600.672	579.094	228.066	77.212	9.183

LEAKAGE PLUS LOSSES (<30 GPM): -0.3501 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.1841 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.4141 GPM

OPERATOR:

APPROVED:

STOP 0

0735 Started E.S. testing SP 1303-4.1 E.S. Logic
0736 Verified headsets operable @ [illegible] R.C.R.
0757 Completed SP 1302-4.1 Heat balance 97.811% Sat.
0906 Completed SP 1303-1.1 RCS leak rate -.414 gpm Sat
0935 Started RB purge 97-78-G
1102 ES-P-2 Auto started due to flushing of fire system line in Unit 2
1115 Completed SP 1303-4.1 E.S. testing Sat

SHIFT RELIEVED [signature] TIME 1500 DATE 8/31/78
Signature
SHIFT ASSUMED BY [signature]
Signature

PL. * CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 806 MWE
RCS PRESSURE 2155 psig NI POWER 100 %
RCS BORON CONC. 529 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 766 [illegible] 6 100 %
7 95 %
8 25 %

1605 completed SP1302-1.1 Heat Bal sat
1936 Removed Tags from SR-P-1A, NR-P-1B, RR-P-1A DR-P-1B, & FS-P-3
1720 completed SP1303-1.1 RCS leak Rate @ -0.86gpm
2150 completed SP1303-11.25 on RB Emergency Door sat. at 1.8 SCFM

SHIFT RELIEVED [signature] TIME 2300 DATE 8-31-78
Signature
SHIFT ASSUMED BY L.N. [illegible]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F MWE GROSS 812 MWE
RCS PRESSURE 2155 psig NI POWER 100 %
RCS BORON CONC. 529 ppmb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: MCR MWE 771 6 100 %
7 96 %
8 26 %

2354 completed sp 1302-1.1 SAT
0035 verified headsets operable at all stations
0123 completed sp 1303-11.25 SAT. [illegible]
0633 completed sp 1303-1.1 -.1325 gpm

8/31/78

2300 JH Goodlavage Rx. Pwr 100% Gr7@95 Gr8@25 Boron 529
MWE/MWT 810/2521 106.36 EFPD

2300 MU-K1A in Service - MU-K1B out
Tank Spr. Emerg. Boration Source is B Rec. BA
Storage Tk @ 10.7' 15481 PPMB min. Emerg. Lvl 6'5"

2336 1302-1.1 SAT 99.506%

2337 Verified SBL Headsets

2338 Started AH-E-101

2342 1303-11.25 Complete - SAT Personnel Hatch .9 SCFM

0024 Testing FP Stop VVs. Per 105-1

0100 MU-K 1B in Service - MU-K1A out

0200 Starting HD-P1A - Stopped HD-P1B

0225 1300-3N Complete - SAT

0525 Verified operability of DR-P1A & RR-P1B

0530 RR-P1A & DR-P1B OOS 72 Hr Clock

0552 1303-1.1 Comp. - SAT -.05 GPM

0600 Started MO-P1 B & E

0601 Stopped AH-E-101

0610 FS-P3 OOS

0625 Started AH-E-101

0700 JH Goodlavage

0700 J Martin Rx Power 100%, Tave 579°F,
RC Press 2155 psig MWE / MWT 806/2516
Rod Index 295% Gr8@25%.
CRO Log Reviewed [illegible]

0735 Starting ES Testing SP 1303-4.11 ES Logic

0736 Verified S.B.L. Headsets Operable.

0757 Heat Balance Complete SAT SP 1302-1.1.

0906 LEAK RATE COMPLETE SAT SP 1303-1.1 -.4141 gpm

0935 Started R.B. Purge 97-78-6.

1102 FS-P-2 Auto Started due to flushing
of fire sys. lines in Unit II.

1115 ES Testing Completed SP 1303-4.11 SAT.

1500 J Martin

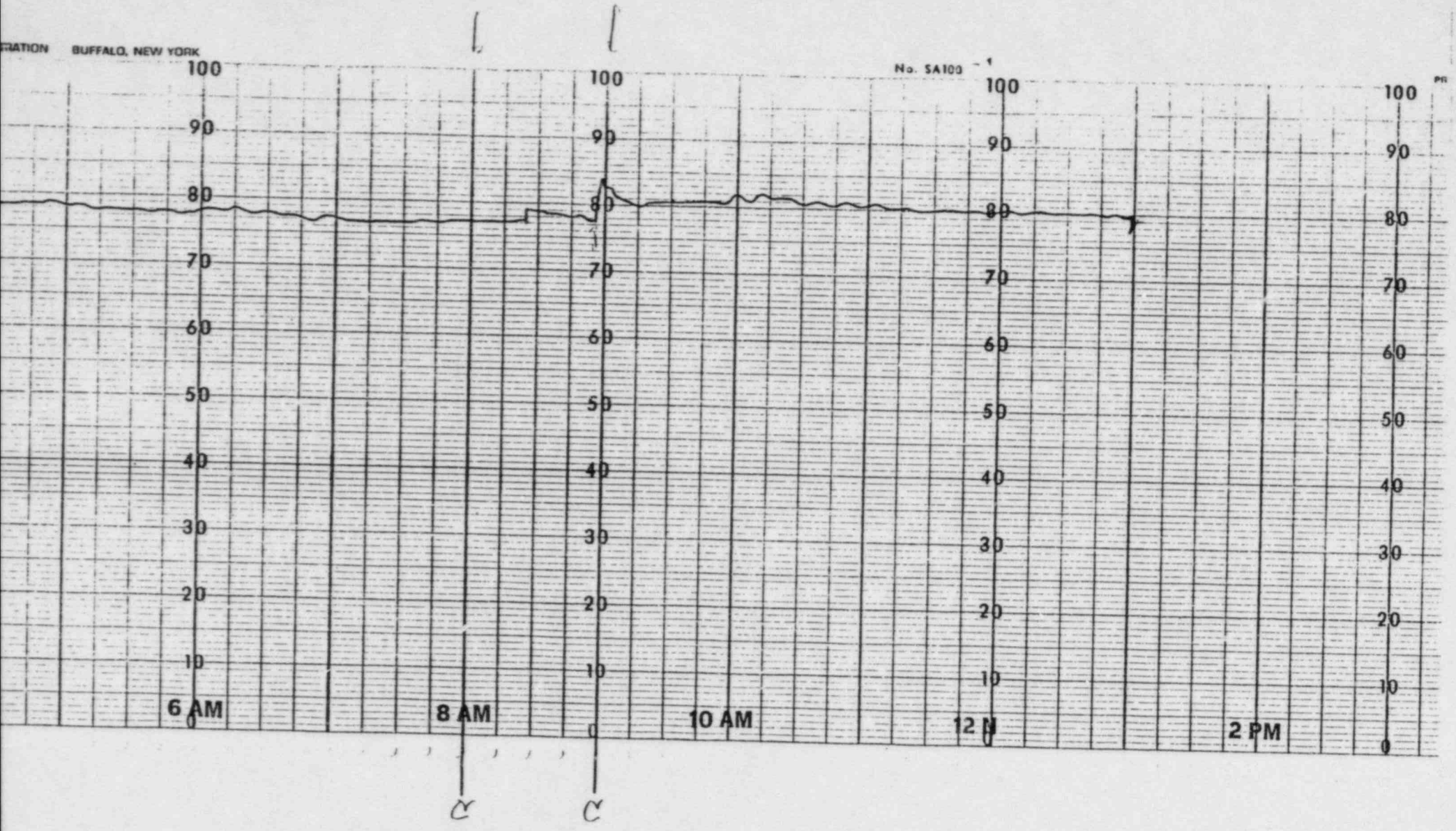
1500 [illegible] 100% Rx Power, 805 MWE
2150 psig RC Press., 579°F Tave, GP 7@ 95%, GP8@25%

1525 - Verified SBLOCA Head set in place & operable.

1650 - completed SP 1302-1.1 sat.

1936 Removed, Red Tags #1061 from SC-P-1A,
NR-P-1A, RR-P-1A, DR-P-1A & FS-P-3

8-31-78


BUFFALO, NEW YORK
No. SA100
100
90
80
70
60
50
40
30
20
10
0
6 AM
8 AM
10 AM
12 N
2 PM

No 2

STOP 0

1

rc

DATE: 11/ 7/78
TIME: 16: 8: 7

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
16: 8:27:	557.828	601.641	555.977	600.711	579.031	228.275	76.311	8.935
17: 8:27:	558.031	601.883	556.266	600.906	579.266	230.172	75.928	8.915

LEAKAGE PLUS LOSSES (<30 GPM): 0.0784 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.2745 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 0.0445 GPM

OPERATOR: Paul Chalecki

APPROVED: D James

STOP 0

1

SHIFT RELIEVED [illegible signature] TIME 1500 DATE 11-7-78
Signature

SHIFT ASSUMED BY B. James
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F [illegible] 833 [illegible]
RCS PRESSURE 2155 psig [illegible] 100 %
RCS BORON CONC. 331 ppm C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: 735 6 100 %
7 97 %
8 22 %

1515 stop vent TK dump
1615 Verified SBL [illegible] operable
1625 Complete SP1303-1.1 Sat
1725 complete SP1303-1.1 Sat
2300 Stopped MO-P1C & MO-P1F

SHIFT RELIEVED B. James TIME 2300 DATE 11-7-78
Signature

SHIFT ASSUMED BY [illegible signature]
Signature

PLANT CONDITIONS: RCS TEMPERATURE 579 °F [illegible] 837 [illegible]
RCS PRESSURE 2155 psig [illegible] 100 %
RCS BORON CONC. 326 ppm C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: MWe net 792 6 100 %
7 93 %
8 20 %

2307 MU-K1A in Service MU-K1B OOS
2308 Verified SBL [illegible]
2330 completed SP-1303-1.1 Heat Bal (sat)
0107 MU-K1B in Service MU-K1A OOS
0412 completed SP-1303-1.1 Leak Rate - .2677 gpm
0010 completed SP-1303-11.25 on RB Pers Doors (Sat)
0555 Stopped AH-E-101
0612 Started MO-P-1C & MO-P-1E

11-7-78

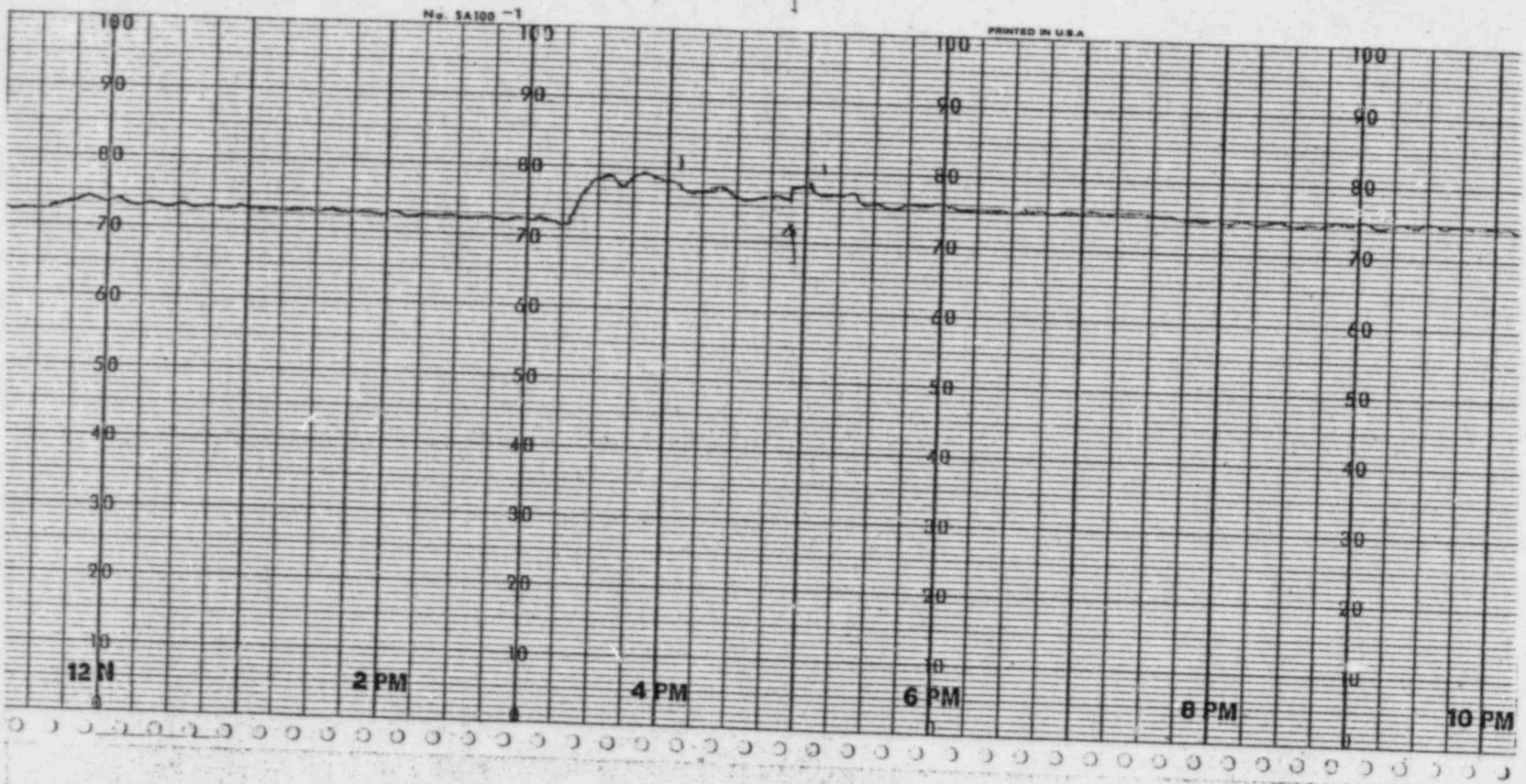
2300 R E Boyce Rx Pwr 100%, Tave 579°, Rc press 2155
Rod index 295, Grp 8 @ 21% mwt/mwe 2529/841
Tech spech emergency boration "B" RBAT @ 13.8' 15,117 ppm b
min level required 6.6'
MCT-EO equipment OOS same as 11-6-78 with the
following exceptions: Add #1328 Halon, 1329, 1332 CAF-12

2301 MUP 1A in Service MUP 1B OOS
2309 AHE 101 started
2315 SBL Headsets verified
0124 1302-1.1 SAT 99.319%
0200 MUP 1B in service MUP 1A OOS
0230 1303-11.25 complete ↑ 1.7 scfm
0404 1303-1.1 SAT .4408 GPM
0420 1300-3W complete
0430 Started Neut Tank dump
0523 RR-P 1B, DR-P 1A verified operable
DR-P 1B, RR-P 1A, NR-P 1A, SR-P 1A Tagged OOS
0600 started MO P 1B & MO P 1E
0617 AHE 101 off

CRO Log Reviewed by MJ Cross

0700 L.E. Boyce
0700 John Conrad Banks III, ≈ 100% POWER, INDEX 296, GP # 8 @ 21.5%, BORON 326 PPM, 579° F TAVE, 2155 PSI
0710 SBL PHONES CHECKED
0930 SP 1302-1.1 COMPLETE
1200 STARTED CONDENSATE RETURN
1500 John C. Banks III
1500 [signature] Power 100% Tave 579°F Press 2155 psig
Rod Indx 297 Grp 8 @ 22%
1515 Stopped Neutralizing Tank Dump
1530 completed 700 gal Feed & Bleed
1615 Verified SBL HEADSETS
1625 Completed SP 1302-1.1 HEAT BALANCE SAT.
1725 completed SP 1303-1.1 LEAK RATE SAT. 0.0445 gpm
2045 Verified operable RR-P 1A, DR-P 1B, NR-P 1A
2200 Stopped MO-P 1C & MO-P 1F
2300 [signature]

11-7-78


No. SA100 -1
PRINTED IN U.S.A.
100
90
80
70
60
50
40
30
20
10
0
12 N
2 PM
4 PM
6 PM
8 PM
10 PM

STOP 0

!

rc

DATE: 12/13/78
TIME: 18:40:18

+10"
308.839 gal
5.1472 gpm

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

)ESIRED INTERVAL (1-8 HOURS)
1
ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)
)
ENTER RCDT CHANGE (GAL)
)
ENTER RCS CHANGE (GAL)
)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
.8:42:18:	557.867	601.602	556.258	600.617	579.078	221.920	72.086	9.428
.9:42:18:	557.727	601.453	556.063	600.500	578.930	221.324	80.361	8.833

LEAKAGE PLUS LOSSES (<30 GPM): -5.8482 GPM

GROSS RCS LEAK RATE (<10 GPM): 0.0130 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): -0.2170 GPM

)PERATOR: R. Bruce

\PPROVED:

.. 063

STOP 0

!

1454 RM-A-2 OOS
1455 RM-A-2 back in service
1456 SP1303-1.1 -0.0084 gpm

SHIFT RELIEVED [signature] TIME 1500 DATE 12-13-78
Signature

SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: R.C. TEMPERATURE 579 °F MWE GROSS 838 MWE
R.C. PRESSURE 2155 psig RX POWER 100 %
R.C. BORON CONC. 218 ppb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: MWE net 790 6 100 %
7 94 %
8 14 %

1505 Verified SBL Headsets
1520 Started SOP-78-95 Control Bldg Vent. Testing
1555 Deborated 500 gal thru WDL-K-1B
1700 Completed SOP-78-95 Control Bldg Vent. testing
1845 Completed SP-1302-1.1 Heat Bal (Set)
1858 Fed 200 gal from "A" RCBT
1950 Vent Tank dump Terminated
2005 Completed SP-1303-1.1 Leak Rate -.217 gpm
2202 Stopped MC-P-1B + 1C

SHIFT RELIEVED [signature] TIME 2338 DATE 12-13-78
Signature

SHIFT ASSUMED BY [signature]
Signature

PLANT CONDITIONS: R.C. TEMPERATURE 579 °F MWE GROSS 840 MWE
R.C. PRESSURE 2155 psig RX POWER 100 %
R.C. BORON CONC. 217 ppb C.R. POS. 1-4 100 %
5 100 %
PLANT CONDITIONS/SPECIAL REMARKS: MWE Net 792 6 100 %
7 94 %
8 20 %

12/13/78

1457 completed SP 1303-1.1 SAT .0084 GPM

1500 deBrantley

1500 [illegible] RJ Howard Tave 579F RC Press 2155psig Rod Index 296 GP 8 0.27%

1505 Verified SBL Headsets

1520 STARTED SOP 78-45 Control Bldg Vent. Testing

1555 completed 500 gal DeBoration Thru WDL-K 1B

1700 completed SOP 78-45 Control Bldg Vent. Testing

1845 completed SP 1303-1.1 Heat Balance SAT.

1850 [illegible]

1850 RE Bryan same as before

1858 Added 200gals To mut 1 From "A" RCBT

1950 Neut Tank Dump terminated

2005 1303-1.1 SAT -.2170 Gpm

2202 MOP 1B & MOP 1E Stopped

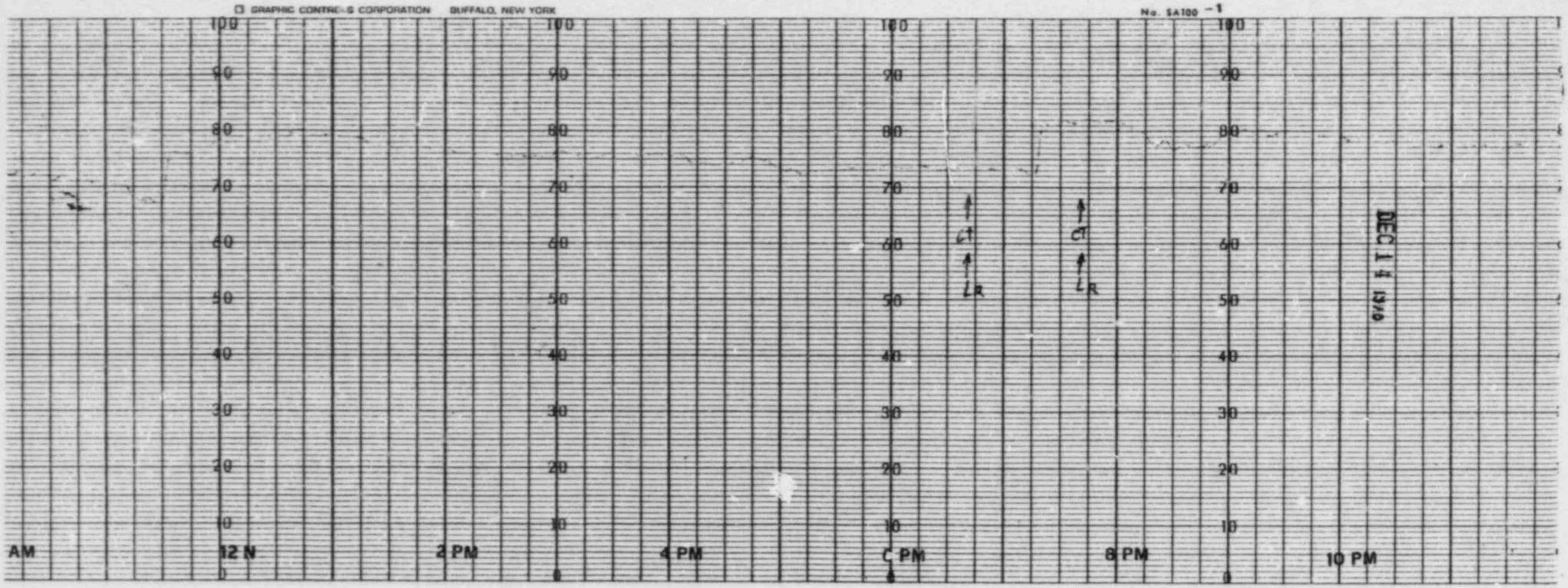
2300 RC Bryan

Clo log Reviewed [illegible]

12-13-18

CKD by
(1858 hr)
1/9/18 hr

RCS UKT



Actual NWT level not found.

NO Lg

DATE: 1/ 6/76
TIME: 7:35:56

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.2

15.5" +13"
478.68 05 401.48 gal
~~6.6913 gpm~~
1.6728

DESIRED INTERVAL (1-4 HOURS)
4
ENTER IDENTIFIED LEAKAGE FROM SP 1303-1.2.2 (GPM)
ENTER RCDT CHANGE (GAL)
ENTER RCS CHANGE (GAL)
300.0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	REFTK LVL (IN)	RCDT LVL (VOLT)
7:30:00:	557.650	601.706	556.313	600.022	579.188	222.466	83.312	3.236
11:30:00:	556.750	600.836	557.104	599.691	578.156	221.536	77.861	3.372

LEAKAGE FROM UNKNOWN (<2 GPH): -0.1774 GPH

GROSS RCS LEAK RATE (<10 GPH): -0.3048 GPH

NET UNIDENTIFIED LEAK RATE (<1 GPH): -0.5048 GPH

OPERATOR: Waddell
APPROVED: L Gamble

SHIFT RELIEVED [illegible] TIME 0700 DATE 1-6-79

Signature

SHIFT ASSUMED BY D Jones

Signature

PLANT CONDITIONS: [illegible] 579 °F [illegible] MWE

[illegible] 2155 [illegible] 100 %

[illegible] 155 [illegible] 1-4 100 %

5 100 %

PLANT CONDITIONS/[illegible] REMARKS: MWE net [illegible] 6 100 %

7 97 %

8 21 %

710 SBL [illegible] operable

800 1302-41 Sat.

947 decreased power to 95%

1200 SP1303-1.1 - [illegible] GPM

1312 [illegible] power to 100% SP1303-1.3 complete

SHIFT RELIEVED D Jones TIME 1500 DATE 1-6-79

Signature

SHIFT ASSUMED BY [illegible]

Signature

PLANT CONDITIONS: [illegible] 579 [illegible] 947 MWE

[illegible] 2155 [illegible] 100 %

[illegible] 155 [illegible] 1-4 100 %

5 100 %

PLANT CONDITIONS/[illegible] REMARKS: MWE net 918 6 100 %

7 90 %

8 15 %

1510 Verified SBL [illegible]

1610 Started [illegible] Tank Pump

1645 Completed SP-1302-41 [illegible]

1720 [illegible] 1303-1.1 [illegible]

SHIFT RELIEVED [illegible] TIME 2300 DATE 1/6/79

1915 [illegible] and fuel handling [illegible] [illegible].

Signature

SHIFT ASSUMED BY [illegible]

Signature

PLANT CONDITIONS: [illegible] 579 [illegible] MWE

[illegible] 2155 [illegible] 100 %

[illegible] 152 [illegible] 1-4 100 %

5 100 %

PLANT CONDITIONS/[illegible] REMARKS: 6 100 %

7 95 %

8 20 %

SHIFT RELIEVED BY [Crouse] TIME 0700 DATE 1-6-79

SHIFT ASSUMED BY D. Janos

579 MWE

2155

155 100 S

100 S

MWE net 100 S

92 S

21 S

710 SBC headsets operable

800 1302-61 sat.

947 decreased power to 95%

1200 SP1303-1.1 -.5749GPM

1312 increased power to 100% SP1303-1.13 complete

SHIFT RELIEVED BY D. Janos TIME [illegible] DATE 1-6-79

SHIFT ASSUMED BY [illegible]

579 947

2155 100

155 100

100

MWE net 798 100

90

15

1510 Verified SBC Headsets

1610 Started [illegible] Tank Pump

1645 Completed SP1302-61 sat

1720 [illegible] TIME 2300 DATE 1/6/79

1816 [illegible] fuel handling [illegible] exercised.

SHIFT ASSUMED BY [Crouse]

579 MWE

2155 100 S

152 100 S

100 S

100

95

20

WHY WASN'T THIS INITIALED

1/6/78 79 [redacted]

2300 John L. Barnes III, 100% PWR, 579°F, 2155 PSI, Boron 133 PPM Index 297, GPM 8 @ 21%

2300 T.S. EMERG BORON SAMPLE IS 8 RBTT @ 1326 PPM MIN LEVEL REQUIRED IS 6.5', ACTUAL IS 10.6 FT.

2308 SBL PHONES CHECKED

2323 SP 1302-1.1 COMPLETE

0100 STARTED AHE 101

0100 STOPPED MOP 1A & D

0105 SP 1303-M2S

0400 STARTED 1302-3.1

0133 SP 1303-1.1 COMPLETE -0.1 GPM

0541 RMA-1 IN DEFEAT PER 1302-3.1

0550 PERFORMED 1201-6 B EFP-1 TEST A O.K.

0605 STARTED MOP 1A & D

0633 STARTED AHE 101

0700 J. A. Barnes

0700 J. Chalick 100% Rx Pwr 579°F RC Press 2155 Rod Index 21 Gp III 21%

0710 Verified SBL Headsets OPERABLE

0800 Completed SP 1302-1.1 HEAT BALANCE

0915 ADDED 300 GALS TO MUT-1

0947 Decreased Rx Pwr To 95%

0950 Commence SP 1303-11.3 Main Steam Safety Valve Surv.

1200 Completed SP 1303-1.1 -.5948 GPM

1215 Fed & Bled 1500 GALS Thru WDL KIA

1312 INC Rx PWR To 100% Completed SP 1303-11.3

1600 Paul Chalick

1500 M. P. Kerdig 100% Pwr; TAVE 579° RC Press. 2155# Rod Index 93 Bk. B @ 18 Tave 549 Tave 2503

1510 VERIFIED SBL HEADSETS.

1610 STARTED NEUT. TK DUMP.

1715 SP-1302-1.1 COMP. SAT.

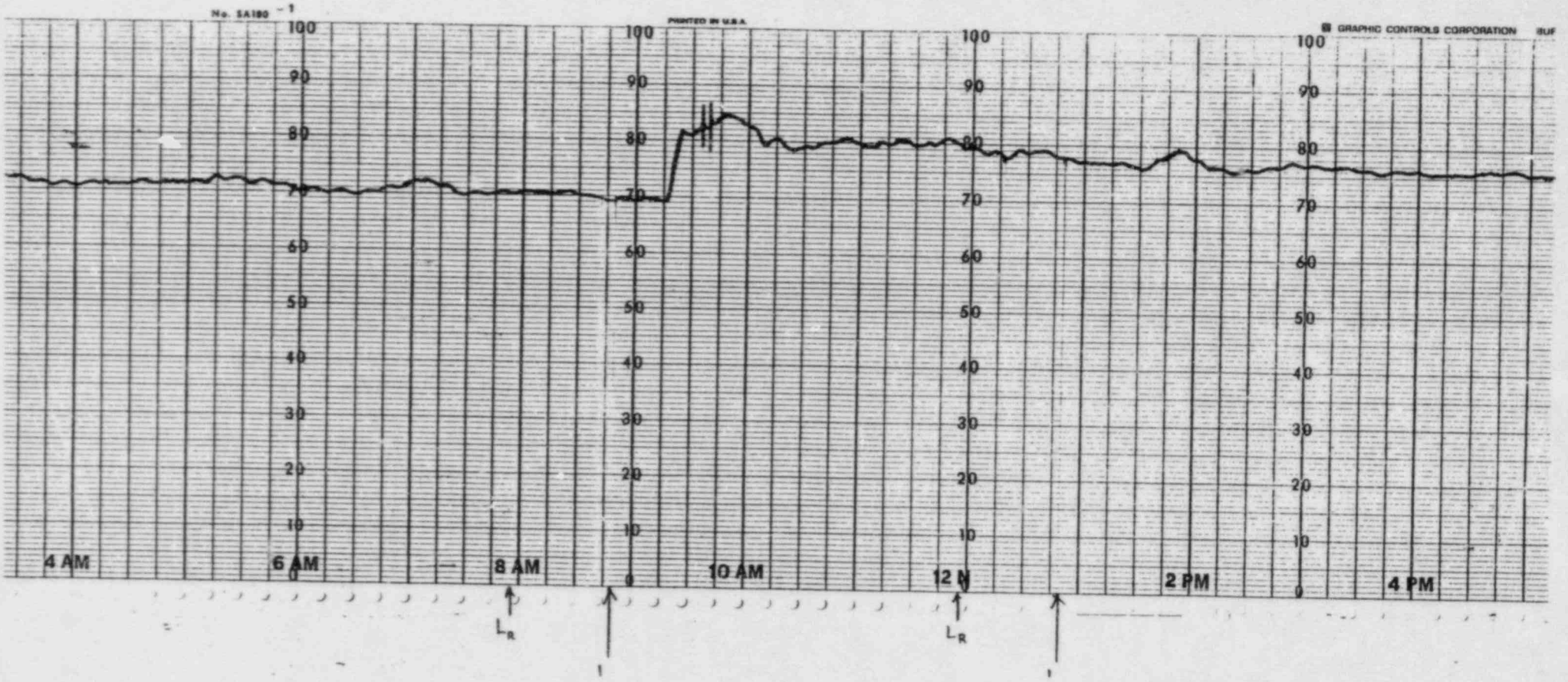
1720 SP-1303-1.1 COMP SAT. -0.49

1915 AUX & F.H. BLDG DOORS EXERCISED

2300 M. P. Kerdig

1-6-79

0750 ← Res LRT → 1156 hrs



ATTACHMENT D

COMPUTER PROGRAM LISTING

OF

RCS LEAK RATE CALCULATION

```
C*****THIS*IS*THE*REACTOR*COOLANT*LEAKAGE*PROGRAM**********************
C***** AUTHOR: ROBERT S. SHENG ***********************************
C***** METROPOLITAN EDISON CO. ***********************************
C**** THREE MILE ISLAND UNIT 1 ***********************************
C*****************************************************************
      REAL INP(6,3),IAVG(6,2),ISUM
      DIMENSION RCDL(2)
      COMMON//DNI,DNF,RCSV,TRCS,TAVAG,IAVG
      COMMON//TAVE(2)
      COMMON//ITIME(2),OGAL,OPGAL,XIDLK,GAL
      COMMON/BOB1/CLOCKI,ITEMP,NTIME,ISAVE,IFLG
      COMMON/BOB/CLOCK,ITMP,INP
      COMMON/BOB2/INDIC,RCDT(3)
S     EXTRN INPUT,OCTBCD
S     EXTRN CONV,BCDOCT
S     EXTRN SUB1
      INDIC=1
S     SXJ 3,INPUT
      CALL OVERLY(RCDL,CFACT,INDIC,NTIME)
      INDIC=0
      IFLG=0
      K=0
14    INPUTC=1
      IRICK=0
      ITMP=0
      ISAVV=0
S     LDA 043624
S     STA CLOCKI
S     LDX 2,K
S     STA ITIME,2
SL$16 SXJ 3,INPUT
S     LDX 1,IRICK
S     LDA 011742
S     SXJ 3,CONV
S     F$H21 RCDT,1
      IRICK=IRICK+1
      INPUTC=INPUTC+1
      IF (INPUTC.GT.3) GO TO 99
S     LDA 043624
S     CAM CLOCK
S     JL $-2
S     J L$16
99    K=K+1
      IF (K.GE.2) GO TO 111
S     SXJ 3,SUB1
111   DO 100 I=1,6
100   IAVG(I,K)=(INP(I,1)+INP(I,2)+INP(I,3))/3000.0
      RCDL(K)=(RCDT(1)+RCDT(2)+RCDT(3))/30000.0
      ISUM=0.0
      DO 300 I=1,4
300   ISUM=ISUM+IAVG(I,K)
      TAVE(K)=ISUM/4.0
      IF (K.GE.2) GO TO 199
```

```
S    LDA IFLG
S    CAM =0
S    JE $+7
S    LDA 043624
S    RSA 16
S    SXJ 3,OCTBCD
S    CAM ISAVE
S    JE $+2
S    J $-5
S    LDA 043624
S    CAM CLOCK
S    JL $-2
S    J L$14
199  CALL OVERLY(RCDL,CFACT,INDIC,NTIME)
C    TOTAL LEAKAGE PLUS LOSSES.
C    LEAK RATE
     TGAL=GAL+OGAL
     TIME=NTIME*60
     RLEAK=TGAL/TIME
     TYPE 406,RLEAK
406  FORMAT(////,31H LEAKAGE PLUS LOSSES (<30 GPM):,9X,F10.4,4H GPM)
C    GROSS LEAK RATE
     CMRCDT=(RCDL(1)-RCDL(2))*3540.0
     GCRCDT=CFACT*CMRCDT
C    GROSS RCS LEAKAGE.
     GRCSL=TGAL+GCRCDT+OPGAL
C    GROSS RCS LEAK RATE
     GRCSLR=GRCSL/TIME
     TYPE 409,GRCSLR
409  FORMAT(//,31H GROSS RCS LEAK RATE (<10 GPM):,9X,F10.4,4H GPM)
C    CORRECTIONS--IDENTIFIED LEAKAGE.
     XIDLK=-XIDLK
     TIDLK=-XIDLK-.23
     TLKR=GRCSLR+TIDLK
     TYPE 411,TLKR
411  FORMAT(//,37H NET UNIDENTIFIED LEAK RATE (<1 GPM):,3X,
    1F10.4,4H GPM,//,9HOPERATOR:,//,9HAPPROVED:,//////////)
     STOP
     END
!EOF
```

evaporative leakage? seal pump number?
unknown

(CORRECT ≡ 1.37)

```
      SUBROUTINE INPUT
      REAL INP(6,3)
      DIMENSION IDAY(3),ITIM(3)
      COMMON/BOB/CLOCK,ITMP,INP
      COMMON/BOB2/INDIC,RCDT(3)
S     EXTRN CONV
S     LDA INDIC
S     CAM =1
S     JE L$10
S     LDA 043624
S     SKL 11
S     J $+16
S     SKL 8
S     J $+14
S     STA CLOCK
S     AND =0177400
S     CAM =054400
S     LDA CLOCK
S     RLU 11
S     RLU 8
S     JL $+5
S     RLU 12
S     RLU 14
S     ADDB =0200000
S     J $+4
S     ADDB =010000
S     J $+2
S     ADDB =0400
S     STA CLOCK
S     LDX 1,ITMP
S     LDA 011235
S     SXJ 3,CONV
S     F$H21 INP,1
S     ICX 1,19
S     LDA 011233
S     SXJ 3,CONV
S     F$H21 INP,1
S     ICX 1,19
S     LDA 011240
S     SXJ 3,CONV
S     F$H21 INP,1
S     ICX 1,19
S     LDA 011234
S     SXJ 3,CONV
S     F$H21 INP,1
S     ICX 1,19
S     LDA 076022
S     SXJ 3,CONV
S     F$H21 INP,1
S     ICX 1,19
S      LDA C.1221
S     SXJ 3,CONV
S     F$H21 INP,1
S     ICX 1,19
```

```
S     STX 1,ITMP
       RETURN
SL$10  CLA
S      LDB 043625
S      LSC 8
S      SXJ 3,CONV
S      STA IDAY
S      CLA
S      LSC 8
S      SXJ 3,CONV
S      STA IDAY+1
S      CLA
S      LSC 8
S      SXJ 3,CONV
S      STA IDAY+2
40      TYPE 50,(IDAY(I),I=1,3)
50      FORMAT(//,6H DATE:,2X,2(I2,1H/),I2)
S       CLA
S       LDB 043624
S       LSC 8
S       SXJ 3,CONV
S       STA ITIM
S       CLA
S       LSC 8
S       SXJ 3,CONV
S       STA ITIM+1
S       CLA
S       LSC 8
S       SXJ 3,CONV
S       STA ITIM+2
60      TYPE 70,(ITIM(I),I=1,3)
70       FORMAT(6H TIME:,2X,2(I2,1H:),I2)
        RETURN
        END
!EOF
!
```

```
      ENTRY SUB1
      EXTRN OCTBCD,CONV
SUB1  STX 3,RETURN
      LDA CLOCKI
      AND =0177777
      STA ITEMP
      LDA CLOCKI
      RSA 16
      SXJ 3,CONV
      ADDB NTIME
      CAM =027
      JG $+2
      J $+6
      SUBB =030
      STA ISAVE
      LDA ONE
      STA IFLG
      LDA ISAVE
      SXJ 3,OCTBCD
      STA ISAVE
      LSA 16
      OR ITEMP
      STA CLOCK
      J RETURN
ONE   DATA 1
RETURN RES 1
BOB1$ COM 5
CLOCKI CEQ 0
ITEMP CEQ 1
NTIME CEQ 2
ISAVE CEQ 3
IFLG  CEQ 4
BOB$  COM 20
CLOCK CEQ 0
ITMP  CEQ 1
INP   CEQ 2
      END
!EOF
```

```
OCTBCD  ENTRY OCTBCD
        CAM =10
        JL  CLB 0,3
        RSC DVCB 24=10
        STB RESS
        LSA 4
        OR  J 0,3 RESS
RESS    RES 1
        END
!EOF
```

```
        ENTRY BCDOCT
        ENTRY CONV
CONV    NOP
BCDOCT  STX 1,BDI
        STD REX
        JAN NEG
        STA TEMP
        CLAB
        STA FLG
        J $+6
NEG     AP
        STA TEMP
        LDA COD
        STA FLG
        CLA
        STA INT
        SX 1,0
LOOP    CLA
        LDB TEMP
        LSC 4
        STB TEMP
        ADDB INT
        MUPB =10
        STB INT
        ICX 1,5
        JL LOOP
        CLA
        LDB TEMP
        LSC 4
        ADDB INT
        STA INT
        LDX 1,BDI
        LDB REX
        LDA FLG
        CAM COD
        LDA INT
        JE $+2
        J $+2
        AN
        J 0,3
BDI     RES 1
TEMP    RES 1
INT     RES 1
FLG     RES 1
REX     RES 1
COD     DATA 077777777
        END
!EOF
!
```

```
      SUBROUTINE INTER(XIN,OUT,N,A,B)
      DIMENSION A(N),B(N)
      IF (XIN-A(1)) 5,5,6
    6 IF (XIN-A(N)) 1,2,2
    2 OUT=B(N)
      RETURN
    5 OUT=B(1)
      RETURN
    1 DO 3 I=2,N
      IF (XIN.LT.A(I)) GO TO 4
    3 CONTINUE
    4 OUT=B(I-1)+(XIN-A(I-1))*(B(I)-B(I-1))/(A(I)-A(I-1))
      RETURN
      END
!EOF
!
```

density interpolation

```
      SUBROUTINE OVERLY(RCDL,CFACT,INDIC,NTIME)
      DIMENSION T1(8),DN(8),T2(6),CF(6)
      DIMENSION RCDL(2)
      DIMENSION IHR(2),IMIN(2),ISEC(2)
      REAL IAVG(6,2)
      COMMON//DN1,DNF,RCSV,TRCS,TAVAG,IAVG
      COMMON//IAVE(2)
      COMMON//ITIME(2),OGAL,OPGAL,XIDLK,GAL
      DATA T1(1),T1(2),T1(3),T1(4),T1(5),T1(6),T1(7),T1(8)/516.,
     1545.,558. 575.,576.,578.6,580.8,582./
      DATA DN(1),DN(2),DN(3),DN(4),DN(5),DN(6),DN(7),DN(8)/
     148.85,47.15,46.25,45.1,44.93,44.8,44.66,44.56/
      DATA T2(1),T2(2),T2(3),T2(4),T2(5),T2(6)/520.,548.,
     1562.5,577.25,580.4,583./
      DATA CF(1),CF(2),CF(3),CF(4),CF(5),CF(6)/.154,.1592,
     1.1628 .16652,.1674,.16816/
      EXTRN CONV
      IF (INDIC.NE.1) GO TO 10
      T   400
  400 FO MAT(////,22X,28HREACTOR COOLANT LEAKAGE TEST)
      TYPE 401
  401 FORMAT(27X,11HSP 1303-1.1,////)
      TYPE 100
  100 FORMAT(28HDESIRED INTERVAL (1-8 HOURS))
      ACCEPT 11,NTIME
   11 FORMAT(I1)
      RETURN
   10 TYPE 404
  404 FORMAT(50H ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM))
      ACCEPT 405,XIDLK
  405 FORMAT(F10.4)
      TYPE 406
  406 FORMAT(24H ENTER RCDT CHANGE (GAL))
      ACCEPT 405,OPGAL
      TYPE 407
  407 FORMAT(23H ENTER RCS CHANGE (GAL))
      ACCEPT 405,OGAL
    S LDX 2,ZERO
    S CLA
    S LDB ITIME,2
    S LSC 8
    S SXJ 3,CONV
    S STA IHR,2
    S CLA
    S LSC 8
    S SXJ 3,CONV
    S STA IMIN,2
    S CLA
    S LSC 8
    S SXJ 3,CONV
    S STA ISEC,2
    S ICX 2,2
    S JL $-14
    S J $+2
```

T°F

steam table density

conversion factor

✓

✓

✓

```
SZERO DATA 0
      CALL INTER(TAVE(1),DNI,8,T1,DN)
      CALL INTER(TAVE(2),DNF,8,T1,DN)
      TYPE 506
506   FORMAT(//,2X,4HTIME,6X,3HTCA,6X,3HTHA,6X,3HTCB,6X,3HTHB,
     15X,4HTAVE,4X,8HPRZR LVL,2X,8HMUTK LVL,2X,8HRCDT LVL)
      TYPE 560
560   FORMAT(12X,5(3H(F),6X),4H(IN),6X,4H(IN),6X,6H(VOLT))
      DO 600 J=1,2
      TYPE 507,IHR(J),IMIN(J),ISEC(J),(IAVG(I,J),I=1,4),TAVE(J),
     1(IAVG(II,J),II=5,6),RCDL(J)
507   FORMAT(/,3(I2,1H:),6(2X,F7.3),2(3X,F7.3))
600   CONTINUE
      RCSV=(DNI-DNF)*10673.
C     MASS CHANGE IN PZRZ. LEVEL
      PRZL=IAVG(5,1)-IAVG(5,2)
      CPRZL=PRZL*120.8
C     MASS CHANGE IN MU TANK LEVEL
      CMUTK=250.0*(IAVG(6,1)-IAVG(6,2))
C     TOTAL RCS MASS CHANGE
      TRCS=RCSV+CPRZL+CMUTK
C     TOTAL RCS CHANGE IN GALLONS
      TAVAG=(TAVE(1)+TAVE(2))/2.
      CALL INTER(TAVAG,CFACT,6,T2,CF)
      GAL=TRCS*CFACT
      RETURN
      END
!EOF
!
```

initial to final

Tave average

ATTACHMENT E

APPLICABLE

TECHNICAL SPECIFICATIONS

TABLE 4.1-2

MINIMUM EQUIPMENT TEST FREQUENCY

	Item	Test	Frequency
1.	Control Rods	Rod drop times of all full length rods	Each refueling shutdown
2.	Control Rod Movement	Movement of each rod	Every two weeks, when reactor is critical
3.	Pressurizer Safety Valves	Setpoint	50% each refueling period
4.	Main Steam Safety Valves	Setpoint	25% each refueling period
5.	Refueling System Interlocks	Functional	Start of each refueling period
6.	Main Steam Isolation Valves	(See Section 4.8)	
7.	Reactor Coolant System Leakage	Evaluate	Daily, when reactor coolant system temperature is greater than 525°F
8.	Charcoal and high efficiency filters for Control Room, and RB Purge Filters	DOP test on HEPA filters, freon test on charcoal filter units	Each refueling period and at any time work on filters could alter their integrity
9.	Spent Fuel Cooling System	Functional	Each refueling period prior to fuel handling
10.	Intake Pump House Floor (Elevation 262 Ft 6 in.)	(a) Silt Accumulation-Visual inspection of Intake Pump House Floor	Each refueling period
		(b) Silt Accumulation Measurement of Pump House Flow	Quarterly
11.	Hydraulic Shock Suppressors on Safety Related Systems	Inspection of Hydraulic Shock Suppressors (Snubbers) on Safety Related Systems.	Refueling Interval

3.1.6 LEAKAGE

Applicability

Applies to reactor coolant leakage from the reactor coolant system and the makeup and purification system.

Objective

To assure that any reactor coolant leakage does not compromise the safe operation of the facility.

Specification

3.1.6.1 If the total reactor coolant leakage rate exceeds 10 gpm, the reactor shall be placed in hot shutdown within 24 hours of detection.

3.1.6.2 If unidentified reactor coolant leakage (excluding normal evaporative losses) exceeds one gpm or if any reactor coolant leakage is evaluated as unsafe, the reactor shall be placed in hot shutdown within 24 hours of detection.

3.1.6.3 If any reactor coolant leakage exists through a non-isolable fault in a RCS strength boundary (such as the reactor vessel, piping, valve body, etc., except the steam generator tubes), the reactor shall be shutdown, and cooldown to the cold shutdown condition shall be initiated within 24 hours of detection.

3.1.6.4 If reactor shutdown is required by Specification 3.1.6.1, 3.1.6.2, or 3.1.6.3, the rate of shutdown and the conditions of shutdown shall be determined by the safety evaluation for each case and reported as required by specification 6.7.

3.1.6.5 Action to evaluate the safety implication of reactor coolant leakage shall be initiated within four hours of detection. The nature, as well as the magnitude, of the leak shall be considered in this evaluation. The safety evaluation shall assure that the exposure of offsite personnel to radiation is within the guidelines of 10 CFR 20.

3.1.6.6 If reactor shutdown is required per Specification 3.1.6.1, 3.1.6.2, or 3.1.6.3 the reactor shall not be restarted until the leak is repaired or until the problem is otherwise corrected.

3.1.6.7 When the reactor is critical and above 2 percent power, two reactor coolant leak detection systems of different operating principles shall be in operation for the Reactor Building with one of the two systems sensitive to radioactivity. The systems sensitive to radioactivity may be out-of-service for no more than 72 hours provided a sample is taken of the Reactor Building atmosphere every eight hours and analyzed for radioactivity and two other means are available to detect leakage.

3.1.6.8 Loss of reactor coolant through reactor coolant pump seals and system valves to connecting systems which vent to the gas vent header and from which coolant can be returned to the reactor coolant system shall not be considered as reactor coolant leakage and shall not be subject to the consideration of Specifications 3.1.6.1, 3.1.6.2, 3.1.6.3, 3.1.6.4, 3.1.6.5, or 3.1.6.6 except that such losses when added to leakage shall not exceed 30 gpm. If leakage plus losses exceeds 30 gpm the reactor shall be placed in hot shutdown within 24 hours of detection.

Bases

Any leak of radioactive fluid, whether from the reactor coolant system primary boundary or not can be a serious problem with respect to in-plant radioactive contamination and required cleanup or, in the case of reactor coolant, it could develop into a still more serious problem and, therefore, the first indications of such leakage will be followed-up as soon as practical. The unit's makeup system has the capability to makeup considerably more than 30 gpm of reactor coolant leakage.

Water inventory balances, monitoring equipment, radioactive tracing, boric acid crystalline deposits, and physical inspections can disclose reactor coolant leaks.

Although some leak rates on the order of gallons per minute may be tolerable from a dose point of view it is recognized that leaks in the order of drops per minute through any of the barriers of the primary system could be indicative of materials failure such as by stress corrosion cracking. If depressurization, isolation, and/or other safety measures are not taken promptly, these small leaks could develop into much larger leaks, possibly into a gross pipe rupture. Therefore, the nature and location of the leak, as well as the magnitude of the leakage must be considered in the safety evaluation.

When reactor coolant leakage occurs to the reactor building, it is ultimately conducted to the reactor building sump. Although the reactor coolant is safely contained, the gaseous components in it escape to the reactor building atmosphere. There, the gaseous components become a potential hazard to plant personnel, during inspection tours within the reactor building, and to the general public whenever the reactor building atmosphere is periodically purged to the environment.

When reactor coolant leakage occurs to the auxiliary building it is collected in the auxiliary building sump. The gases escaping from reactor coolant leakage within the auxiliary building will be collected in the auxiliary and fuel handling building exhaust ventilation system and discharged to the environment via the unit's auxiliary and fuel handling building vent. Since the majority of this leakage occurs within confined, separately ventilated cubicles within the auxiliary building, it incurs very little hazard to plant personnel.

When reactor coolant leakage occurs to the nuclear services closed cooling water system, the leakage, both gaseous and liquid, is contained because the nuclear services closed cooling water system surge tank is a closed tank that is maintained above atmospheric pressure. The leakage would be detected by the nuclear services closed cooling water system monitor and by purge tank liquid level, both of which alarm in the control room. Since the nuclear services closed cooling water system's only potential contact with reactor coolant is in the sample coolers, it is considered not to be a hazard. However, if reactor coolant leakage to this receptor occurred and the surge tank's relief valve discharged, radioactive gases could be discharged to the environment via the unit's auxiliary and fuel handling building vent.

When reactor coolant leakage occurs to the intermediate cooling closed cooling water system, the leakage is indicated by both the intermediate cooling water monitor (RM-L9) and the intermediate cooling closed cooling water surge tank liquid level indicator, both of which alarm in the control room. Reactor coolant leakage to this receptor ultimately could result in radioactive gas leaking to the environment via the unit's auxiliary and fuel handling building vent by way of the atmospheric vent on the surge tank.

When reactor coolant leakage occurs to either of the decay heat closed cooling water systems, the leakage is indicated by the affected system's radiation monitor (RM-L2 or RM-L3 for system A and B, respectively) and surge tank liquid level indicator, all four of which alarm in the control room. Reactor coolant leakage to this receptor ultimately could result in radioactive gas leaking to the environment via the unit's auxiliary and fuel handling building vent by way of the atmospheric vent on the surge tank of the affected system.

Assuming the existence of the maximum allowable activity in the reactor coolant, a reactor coolant leakage rate of less than one gpm unidentified leakage within the reactor or auxiliary building or any of the closed cooling water systems indicated above, is a conservative limit on what is allowable before the guide lines of 10 CFR 20 would be exceeded. This is shown as follows: if the specific activity of the reactor coolant is $130/\bar{E}$ μCi/ml and the gaseous portion of it (as identified by Table 11-2) is discharged to the environment via the unit's auxiliary and fuel handling building vent, the yearly whole body dose resulting from this activity at the site boundary, using an annual average $\chi/Q = 4.5 \times 10^{-6}$ sec/m^3, is 0.34 rem. This may be compared with the 10 CFR 20 guideline of 0.5 rem/year whole body dose.

When the reactor coolant leaks to the secondary sides of either steam generator, all the gaseous components and a very small fraction of the ionic components are carried by the steam to the main condenser. The gaseous components exit the main condenser via the unit's vacuum pump which discharges to the condenser vent past the condenser off-gas monitor. The condenser off-gas monitor will detect any radiation, above background, within the condenser vent.

However, buildup of radioactive solids in the secondary side of a steam generator and the presence of radioactive ions in the condensate can be tolerated to only a small degree. Therefore, the appearance of activity in the condenser off-gas, or any other possible indications of primary to secondary leakage such as water inventories, condensate demineralizer activity, etc., shall be considered positive indication of primary to secondary leakage and steps shall be taken to determine the source and quantity of the leakage.

If reactor coolant leakage is to the containment, it may be identified by one or more of the following methods:

a. The containment air particulate monitor is sensitive to low leak rates. The rate of leakage to which the instrument is sensitive is 0.054 gpm within sixty minutes, assuming the presence of corrosion product activity.

b. The containment radioactive gas monitor is less sensitive but can be used as a backup to the air particulate monitor. The sensitivity range of the instrument is approximately 2 gpm to greater than 10 gpm.

c. A leakage detection system which determines leakage losses from water and steam systems within the containment. This system collects and measures moisture condensed from the containment atmosphere by cooling coils of the main recirculation units. This system provides a dependable and accurate means of measuring total leakage, including leaks from the cooling coils themselves which are part of the containment boundary.

d. Indication of leakage from the above sources shall be cause to require a containment entry and limited inspection at power of the reactor coolant system. Visual inspection means, i.e., looking for steam, floor wetness, or boric acid crystalline formations, will be used. Periodic inspections for indications of leakage within the containment will be conducted to enhance early detection of problems and to assure best on-line reliability.

If reactor coolant leakage is to the auxiliary building, it may be identified by one or more of the following methods:

a. The auxiliary and fuel handling building vent radioactive gas monitor is sensitive to very low activity levels and would show an increase in activity level shortly after a reactor coolant leak developed within the auxiliary building.

b. Water inventories around the auxiliary building sump.

c. Periodic equipment inspections.

d. In the event of gross leakage, in excess of 13 $\pm$ 2 gpm, the individual cubicle leak detectors in the makeup and decay heat pump cubicles, will alarm in the control room to backup "a", "b", and "c" above.

When the source and location of leakage has been identified, the situation can be evaluated to determine if operation can safely continue. This evaluation will be performed by the Three Mile Island Operations Group according to routine established in Section 12.1.1 of the FSAR. Under these conditions, an allowable leakage rate of 30 gpm has been established.

ATTACHMENT F

SURVEILLANCE PROCEDURE

SP 1303-1.1

"REACTOR COOLANT SYSTEM LEAK RATE",

REVISION 7, MAY 25, 1976

A4220 C07030001

1303-1.1
Revision 7
05/25/76

CONTROLLED COPY

Central file

THREE MILE ISLAND NUCLEAR STATION
UNIT #1 SURVEILLANCE PROCEDURE 1303-1.1
REACTOR COOLANT SYSTEM LEAK RATE

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Unit 1 Staff Recommends Approval

Approval _____ Date _____
Cognizant Dept. Head

Unit 2 Staff Recommends Approval

Approval _____ Date _____
Cognizant Dept. Head

Unit 1 PORC Recommends Approval

_____ Date _____
Chairman of PORC

PORC comments of _____ included
(date)

By _____ Date _____

Unit 2 PORC Recommends Approval

_____ Date _____
Chairman of PORC

PORC comments of _____ included
(date)

By _____ Date _____

Approved _____ Date _____
Station Superintendent/
Unit Superintendent

TMI-00-0 11-74

Revision 4
MAY 2 - 1975

THREE MILE ISLAND NUCLEAR STATION

UNIT #1 SURVEILLANCE PROCEDURE 1303-1.1

RC SYSTEM LEAK RATE

Required Interval -

Daily, when RCS temperature > 525°oF.

1.0 PURPOSE

To evaluate reactor coolant system leakage in accordance with Technical Specification Table 4.1-2 item 7.

2.0 PLANT STATUS

2.1 Reactor coolant system temperature is greater than 525°F.

2.2 The Make-Up Tank level is between 66" and 96".

2.3 The pressurizer level is greater than 200".

2.4 Reactor power, temperature and pressure are in a steady state condition. (i.e. initial and final conditions approximately the same.)

3.0 LIMITS AND PRECAUTIONS

3.1 Avoid addition and removal of water from the reactor coolant and Make-Up systems during this test. The following operations should not be conducted during this test:

a. Make-Up or chemical addition to the make-up system.

b. Sampling of the RCS or make-up system.

c. Venting or draining of the RCS or make-up system.

d. Changing purification demineralizers or make-up filters in service.

e. Boration or deboration.

3.2 The RCS and makeup system should be maintained in a steady state conditior during this test. Changes in valve line-ups, coolers-in-service, pumps-in-service, etc. should be avoided.

3.3 For the most accurate determination of the RCS leak rate, the initial and final conditions of reactor power, RCS temperature, pressure and pressurizer level should be identical.

3.4 The same sources should be used when recording initial and final RCS temperature, pressurizer level, make-up tank level and RCDT level. Differences in sources could be misinterpreted as RCS leakage when comparing successive readings.

3.5 Minimize power level variations during this test.

4.0 LOCATION OF SYSTEM/ASSEMBLY

NOTE: See enclosure two for sources of data.

4.1 The computer is the favored source of information.

4.2 If two or more inputs are not obtainable on the computer, the patch panel is to be used to obtain the required data.

5.0 EQUIPMENT

5.1 Equipment for use on patch panel.

5.1.1 Digital voltmeter capable of reading ± 10 VDC.

5.1.2 Leads for patch panel to voltmeter.

6.0 PROCEDURE

6.1 If the computer is available, initiate the "Reactor Coolant Leakage Test" as detailed in Enclosure II. Data sheets for hand calculations are provided for use as follows:

Data Sheet	For Use When
1303-1.1.1.1	Computer is operational

but not available for RCS program.

1303-1.1.1.2 Computer not operational

6.2 If a hand calculation is being performed, obtain the applicable data sheet (see step 6.1) and take the initial set of data. After a minimum of one hour, take the final set of data and determine the net RCS leak rate as per instructions on the data sheet.

6.3 If changes to the RCS inventory must be made during the performance of this test, they must be accounted for using Data Sheet 1303-1.1.3. Operations such as adding water to the Make Up Tank or sampling the RCS may be accounted for in this manner.

6.4 If the net RCS leakage is excessive as defined by the acceptance criteria in section 7, proceed as follows:

6.4.1 Perform another determination of the RCS leak rate.

6.4.2 Insure that no un-accounted for operator action has occurred that would change the RCS inventory. (See section 3.1 for a listing of possibilities). If such an action has occurred, it invalidates the measurement. Enter this in the "Remarks" section of the data sheet, clearly describing the action that invalidated the measurement.

6.4.3 Initiate action to determine the source of leakage. Check items such as:

a. Proper valve line-up.

b. Valve stem leakage.

c. Make-up pump packing glands.

d. Relief valves not seated properly.

6.4.4 If sources of leakage are found, initiate data sheet 1303-1.1.2.

a. Document completely the source of leakage. (Example: MU-V-159A stem leakage through packing gland).

b. Determine the leak rate. The most perferred method is to collect the leakage in a calibrated container. (Obtain from Chemistry Dept.) over a known period of time. Use data sheet 1303-1.1.2 to document the method used to determine the leak rate. Include: Model # & Serial # of DVM used, description of other equipment used, length of measurement and quantity of leakage collected (Example: Used 50 cc graduated cylinder to collect 40 cc of water in 10 seconds.)

c. Determine the leak rate and enter on Data Sheet 1303-1.1.2.

This quantity may be subtracted from the net RCS leakage (Line 8C of Data Sheet 1303-1.1.1 and 1.1.2).

d. The Shift Supervisor shall make the initial determination of the safety implications of the leak. If he decides that there are possible safety implications, he shall notify the proper personnel in accordance with AP 1014.

7.0 ACCEPTANCE CRITERIA

7.1 If the gross reactor coolant leakage rate (Item 7 of Data Sheet) exceeds 10 gpm, the reactor shall be placed in hot shutdown within 24 hours of detection.

7.2 If unidentified reactor coolant leakage (Item 9 of Data Sheet) exceeds 1 gpm of the reactor shall be placed in hot shutdown within 24 hours of detection.

7.3 If any reactor coolant leakage is evaluated as unsafe, the reactor shall be placed in hot shutdown within 24 hours of detection.

7.4 If any reactor coolant leakage exists through a non-isolable fault in a RCS strength boundary (such as the reactor vessel, piping, valve body, etc., except the steam generator tubes), the reactor shall be shutdown, and cooldown to the cold shutdown condition shall be initiated within 24 hours of detection.

7.5 If reactor shutdown is required by criteria 7.1, 7.2, 7.3, or 7.4, the rate of shutdown and the conditions of shutdown shall be determined by the safety evaluation for each case and justified in writing as soon thereafter as practicable.

7.6 Action to evaluate the safety implication of reactor coolant leakage shall be initiated within four hours of detection. The nature, as well as the magnitude, of the leak shall be considered in this evaluation. The safety evaluation shall assure that the exposure of offsite personnel to radiation is within the guidelines of 10 CFR 20.

7.7 If reactor shutdown is required per Specification 7.1, 7.2, 7.3, the reactor shall not be restarted until the leak is repaired or until the problem is otherwise corrected.

7.8 Loss of reactor coolant through reactor coolant pump seals and system valves to connecting systems which vent to the gas vent header and from which coolant can be returned to the reactor

coolant system shall not be considered as reactor coolant leakage and shall not be subject to the consideration of the above criteria except that such losses when added to leakage shall not exceed 30 gpm. If leakage plus losses exceeds 30 gpm the reactor shall be placed in hot shutdown within 24 hours of detection.

DATA SHEET 1303-1.1.1.1

For Use When Computer is Available

Initial Conditions - To be taken at one minute intervals

		Computer Point	T_1	T_2	T_3	T_2
Line 1	Time					
Line 2a	T_c Loop A	510	____ + ____ + ____	____	+ 3 =	____
Line 2b	T_H Loop A	508	____ + ____ + ____	____	+ 3 =	____
Line 2c	T_c Loop B	513	____ + ____ + ____	____	+ 3 =	____
Line 2d	T_H Loop B	509	____ + ____ + ____	____	+ 3 =	____
Line 2e	Unit Tave	(Sum of Lines 2a, 2b, 2c and 2d ÷ 4)			____ + 4 =	____
Line 3	Przr Level	1720	____ + ____ + ____	____	+ 3 =	____
Line 4	MU T_k Level	498	____ + ____ + ____	____	+ 3 =	____
Line 5	RCDT Level	Patch Panel DVM	____ + ____ + ____	____	+ 3 =	____

Final Conditions - To be taken at one minute Intervals

		Computer Point	T_1	T_2	T_3	T_2
Line 6	Time					
Line 7a	T_c Loop A	510	____ + ____ + ____	____	+ 3 =	____
Line 7b	T_H Loop A	508	____ + ____ + ____	____	+ 3 =	____
Line 7c	T_c Loop B	513	____ + ____ + ____	____	+ 3 =	____
Line 7d	T_H Loop B	509	____ + ____ + ____	____	+ 3 =	____
Line 7e	Unit Tave	(Sum of Lines 7a, 7b, 7c and 7d ÷ 4)			____ + 4 =	____
Line 8	Przr Level	1720	____ + ____ + ____	____	+ 3 =	____
Line 9	MU Tk Level	498	____ + ____ + ____	____	+ 3 =	____
Line 10	RCDT Level	Patch Panel DVM	____ + ____ + ____	____	+ 3 =	____

NOTE: Carry Algebraic signs through all steps.

1. Mass change due to RCS Temperature change.

(use line 2a and Figure 1 to determine density)

Line 11 a. Initial Density _____ lbm/ft^3

(use line 7a and figure 1 to determine density)

Line 12 b. Final Density _____ lbm/ft^3

c. RCS Volume change (line 11 minus line 12 x 10,673)

Line 11 _____

Minus Line 12 _____

Line 13 10,673 ft^3 x _____ lbm/ft^3 = _____ lbm

2. Mass change in Pzr. Level

(Line 3 minus Line 8 x 120.8)

Line 3 _____

Minus Line 8 _____

Line 14 120.8 $\frac{\text{lbm}}{\text{in}}$ x _____ in = _____ lbm

3. Mass change in MU Tank Level

(Line 4 minus Line 9 x 250 lbm/inch)

Line 4 _____

Minus Line 9 _____

Line 15 250 $\frac{\text{lbm}}{\text{in}}$ x _____ in = _____ lbm

4. Total RCS Mass Change

(Algebraic sum of lines 13, 14 and 15)

Line 13 _____ Tave change of mass

Line 14 _____ Pressurizer mass change

Line 15 _____ MUT mass change

Line 16 _____ lbm

5. Total RCS change in gallons

a. Mean Tave (line 2 plus line 7; ÷ 2)

Line 2e___°F

+Line 7e___°F

Line 17 ___÷ 2 = ___°F

b. Use figure 2 and Line 17 to find

Line 18 conversion factor from lbm to gallons: ___gal/lbm

c. RCS Inventory change (Line 16 times line 18)

Line 16 ____lbm

Line 19 ×Line 18____gal/lbm=___gal

d. Operator caused changes to system

Line 20 (from data sheet 1303-1.1.3):___gal

e. Total RCS leakage plus losses

(Algebraic sum of lines 19 and 20)

Line 19 ___

Line 20 ___

Line 21 ___gal.

6. Total leakage plus losses

a. Duration of Test (Line 6 minus Line 1)

Line 6 ____h___m

-Line 1 ____h___m

Line 22 ____h___m = _____min

b. Leak Rate (Line 21 divided by Line 22)

Line 21 _ _

Line 23 +Line 22 ___ = ___gpm

LIMIT: Line 23 shall not exceed 10 gpm (see acceptance criteria 7.8)

7. Gross Leak Rate

a. Mass change in RCDT

Unit 1 : RCDT is a vertical T

(Line 5 minus line 10 x 3540 lbm/volt)

Line 5 ____

-Line 10 ___

Line 24 ____v x 3540 lbm/volt = ___lbm

b. RCDT change in gallons

(Line 24 times Line 18)

Line 24 ____

xLine 18 ____ (Conversion factor)

Line 25 = ____ gal

c. Operator caused changes to the RCDT

Line 26 (from data sheet 1303-1.1.3): ___gal

d. Gross RCS Leakage

(Algebraic sum of Lines 21, 25 and 26)

Line 21 ___Total RCS Leakage + Losses

Line 25 ___RCDT increase (considered RCS losses)

Line 26 ___RCDT change by operator

Line 27 ___gal

e. Gross RCS leak rate (identified and unidentified leakage)

(Line 27 divided by line 22)

Line 27 ___

Line 28 +Line 22 ___ = ___gpm

LIMIT: Line 28 shall not exceed 10 gpm. (See Acceptance Criteria 7.1)

8. Corrections (Identified leakage)

a. Evaporative losses -.51 gpm

b. RCPump Seal #3 Purge +.28 gpm

c. Identified leakage -____gpm (sign is minus)

(from data sheet 1303-1.1.2)

Line 29 Total (Algebraic sum) ____gpm

9. Net unidentified RCS Leak Rate

Algebraic sum of lines 28 and 29

Line 28 ____

Line 29 ____

Line 30 ____gpm

LIMIT: Line 30 may not exceed 1 gpm (See Acceptance Criteria 7.2 and section 6.4 for action)

Remarks: _____

_____

_____

_____

_____

DVM Model #_____ Serial #_____

_____ _____
Performed by Date

_____ _____
Approved by Date

Date
MAY 3 - 1979

DATA SHEET 1101-1 1.1.5

For Use When Computer is Not Available

Initial Conditions - To be taken at one minute intervals

			Patch Panel Point	T_1	T_2	T_3	T_2
Line 1	Time						
Line 2	Tave	40					
Line 3	Prop level	27					
Line 4	MU Tank	18					
Line 5	RCDT	DVM					

Final Conditions - To be taken at one minute intervals

			Patch Panel Point	T_1	T_2	T_3	T_2
Line 6	Time						
Line 7	Tave	40					
Line 8	Prop Level	27					
Line 9	MU Tank	18					
Line 10	RCDT	DVM					

Caution: When using patch panel voltage, be sure to record the voltage polarity (+ or -) and treat this as an algebraic sign.

NOTE: Carry Algebraic Signs Through all Steps

1. Volume change due to RCS temperature

a. Temperature conversions

1) Initial temperature (570 minus, line 2 times 5):

570^0F - (Line 2____x5) = ____^0F

Line 11

2) Final temperature (570 minus line 7 times 5):

570^0F - (Line 7____x5) = ____^0F

Line 12

b. Initial Density (use Line 11 and figure 1

Line 13 to determine density) ____lbm/ft^3

c. Final Density (use line 12 and figure 1

Line 14 to determine density) ____lbm/ft^3

d. RCS volume change (line 13 minus line 14, times 10,673)

Line 13 ____

-Line 14-____

Line 15 10,673 ft^3 x ____.____"

2. Volume change in Pzr level

(Line 3 minus Line 8 x 120.8)

Line 3 ____

-Line 8-____

Line 16 120.8 lbm/in x ____in=____lbm

3. Volume change in MU Tank Level

(Line 4 minus line 9; times 250)

Line 4 ____

-Line 9-____

Line 17 250 lbm/in x ____in=____lbm

4. Total RCS Mass change

(Algebraic sum of lines 15, 16 and 17)

Line 15 _____ Tave change of mass

Line 16 _____ Pressurizer mass change

Line 17 _____ RUT mass change

Line 18 _____lbm

5. Total RCS change in gallons

a. Mean Tave (Line 11 plus Line 12; ÷ 2)

Line 11 _____°F

+Line 12 _____°F

Line 19 _____ ÷ 2= _____°F

b. Use figure 2 and line 19 to find

Line 20 conversion factor from lbm to gallons: _____gal/lbm

c. RCS Inventory change (line 18 times line 20)

Line 18 _____lbm

Line 21 xLine 20 _____gal/lbm = _____gal

d. Operator caused changes to system

Line 22 (from data sheet 1303-1.1.3): _____gal

e. Total RCS leakage plus losses

(Algebraic sum of lines 21 and 22)

Line 21 _____

+line 22 _____

Line 23 _____gal.

6. Total leakage plus losses

a. Duration of test (line 6 minus line 1)

Line 6 ___h___m

-Line 1 ___h___m

Line 24 ___h___m =_____min

b. Leak rate (line 23 divided by line 24)

Line 23 _____

Line 25 ÷Line 24 _____.____gpm

LIMIT: Line 25 shall not exceed 10 gpm (see Acceptance Criteria 7.8)

7. Gross leak rate

a. Mass change in RCDT

(Line 5 minus line 10 x 3540 lbm/volt)

Line 5 _____

-Line 10_____

Line 26 _____v x 3540 lbm/volt = ____lbm

b. RCDT change in gallons

(Line 26 times line 20)

Line 26 _____

xLine 20 _____ (Conversion factor)

Line 27 =_____gal

c. Operator caused changes to the RCDT

Line 28 (from data sheet 1303-1.1.3):_____gal

d. Gross RCS leakage

(Algebraic sum of lines 23, 27 and 28)

Line 23 _____Total RCS leakage + losses

Line 27 _____RCDT increase (considered RCS losses)

Line 28 _____RCDT change(by operator)

Line 29 _____gal

e. Gross RCS leak rate (identified and unidentified leakage)

(line 29 divided by line 24)

Line 29 _____

Line 30 ÷Line 24 _____.____gpm

LIMIT: Line 30 shall not exceed 10 gpm. (see Acceptance Criteria 7.1)

8. Corrections (identified leakage)

a. Evaporative losses -.51 gpm

b. RCPump Seal #3 Purge +.28 gpm

c. Identified Leakage -_____gpm (sign is negative)

(from data sheet 1303-1.1.2)

Line 31 Total (Algebraic sum) _____gpm

9. Net unidentified RCS Leak Rate

(Algebraic sum of lines 30 and 31)

Line 30 _____

Line 31 _____

Line 32 _____gpm

LIMIT: Line 32 may not exceed 1 gpm. (See Acceptance Criteria 7.2 and section 6.4 for action)

Remarks: _____

_____

_____

_____

DVM Model #_____ Serial #_____

_____ _____
Performed by Date

_____ _____
Approved by Date

A04

SP 1303-1.1

Revision 4
MAY 2 - 1975

Data Sheet 1303-1.1.2

IDENTIFIED LEAKAGE

1. Source of Leakage
(Describe in detail, attach drawings if necessary)

2. Method used to determine leak rate
(Describe briefly)

3. Leak Rate: _____ gpm
(For use in step 8.c of Data Sheet 1303.1.1.1.1 and 1.1.1.2

_____ _____
Performed By Date

4. Possible Safety Implications
(Shift Supervisor Check One)

_____ Yes (Initiate necessary action)

_____ No Explain _____

_____

_____

_____

_____ _____
Shift Supervisor Date

SP 1303-1.1

Revision 4
MAY 2 - 1975

Data Sheet 1303-1.1.3

OPERATOR CAUSED CHANGES TO RCS INVENTORY

1. Identify operation that caused change: _____

_____

_____

_____

_____

2. Time Operation Started: _____

Time Operation Completed: _____

3. Calculations

4. Total change to RCS inventory: _____gal.

NOTES: 1) If change is to RCDT enter in section 7 of Data Sheet 1303-1.1.1.1 and 1303-1.1.1.2

2) If change is to any other part of the system, enter in section 5 of Data Sheet 1303-1.1.1.1 or 1.1.1.2

3) SIGNS: Removals from the system have a negative (-) sign. Additions to the system have a positive (+) sign.

_____ _____
Performed By Date

_____ _____
Approved By Date

4.0 [illegible]

4.1 The enclosure tab for sources of data

4.2 The computer is the favored source of information

4.3 If two or more inputs are not obtainable on the computer, the patch panel is to be used to obtain the required data

5.0 EQUIPMENT

5.1 Equipment for use on patch panel

5.1.1 Digital voltmeter capable of reading ± 10 VDC

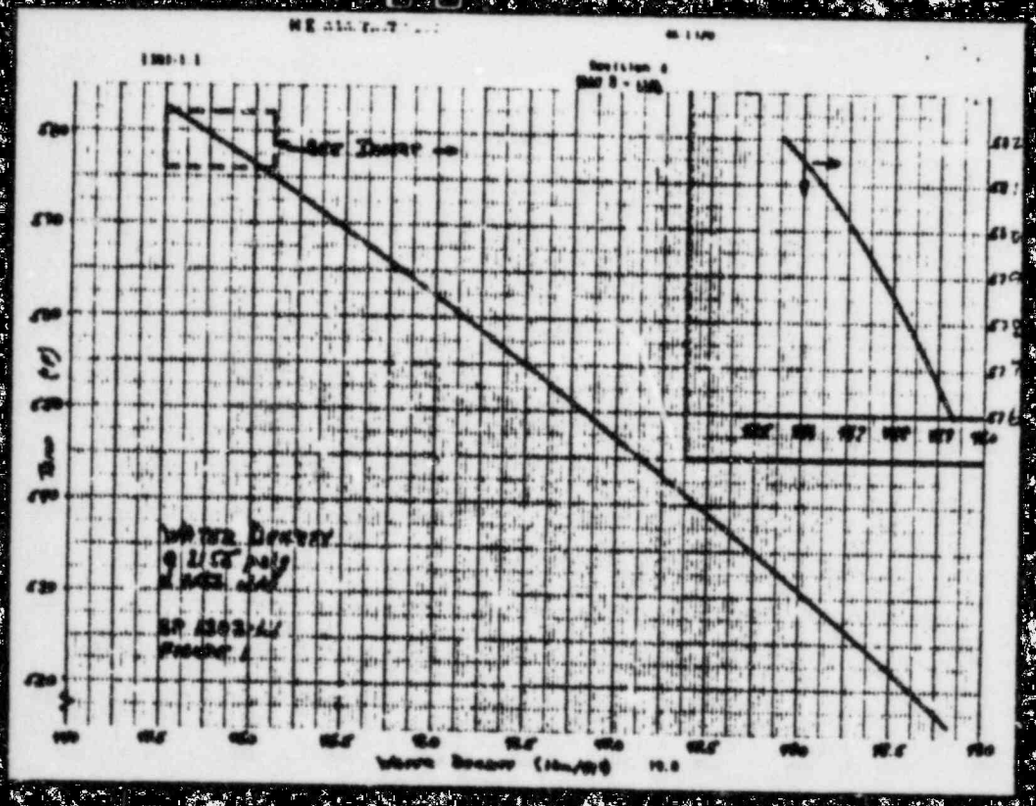
5.1.2 Leads for patch panel to voltmeter

6.0 PROCEDURE

6.1 If the computer is available, initiate the "Reactor Coolant Leakage Test" as detailed in Enclosure II. Data sheets for hand calculations are provided for use as follows

Data Sheet	For Use When
1383-1.1.1	Computer is operational

2.0



[illegible]

[illegible] leakage through [illegible] gland

b. Determine the leak rate. The most preferred method is to collect the leakage in a calibrated container (Obtain from Chemistry Dept.) over a known period of time. Use data sheet 1303-1.1.2 to document the method used to determine the leak rate. (Include Model # & Serial # of DVM used, description of other equipment used, length of measurement and quantity of leakage collected (Example: Used 50 cc graduated cylinder to collect 40 cc of water in 10 seconds.)

c. Determine the leak rate and enter on Data Sheet 1303-1.1.2.

This quantity may be subtracted from the net RCS leakage (Line 8C of Data Sheet 1303-1.1.1 and 1.1.2).

d. The Shift Supervisor shall make the initial determination of the safety implications of the leak. If he decides that there are possible safety implications, he shall notify the proper personnel in accordance with AP 1044.

7.0 ACCEPTANCE CRITERIA

ENCLOSURE 1

[illegible]

PARAMETER	COMPUTER POINT	CONTROL ROOM INSTRUMENTATION	[illegible]	[illegible]	[illegible]	[illegible]
Tave	560 Loop A T_h, 540, 541 Loop A T_c, 542, 550 Loop B T_h, 541, 5[illegible] Loop B T_c, 540	CC 7-150 or CC 6-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pressurizer Level	1[illegible], 1[illegible], 1[illegible]	Control Console Center Panel	[illegible]	0-400 in	+10 to -10	[illegible]
Make-up Tank Level	400	Control Console Center Panel	15	0-100 in	-10 to +10	[illegible]
Reactor Coolant Drain Tank Level	[illegible] at Patch Panel	Level Recorder [illegible] Panel	[illegible]	0-120 in	0 to +10	[illegible]

Note: Patch Panel [illegible] may be obtained from the [illegible] installed for a [illegible] from outside the Control Room

ENCLOSURE II

Computer Determination of RC

Leak Rate

E.2.1.0 PURPOSE

This program is designed to perform all the calculations accomplished on Data Sheet 1303-1.1.1.1. The plant computer will automatically gather all inputs and average three minute intervals of the initial and final readings. This program is run from the programmer's console of the Bailey 855 computer. It may be run at any time the programmer's console is not being used by another program.

E.2.2.0 PROCEDURE

E.2.2.1 Turn on the programmer's selectric typewriter next to the Bailey 855 computer. Be sure that the "OUTPUT SELECT" switch is on "UTILITY COMPUTER."

E.2.2.2.1 If the computer printout on the selectric shows a question mark (?), type "r", then depress the "Return" Key. The computer will respond with an exclamation mark (!). Proceed to E.2.2.2.2.

E.2.2.2.2 If the printout on the selectric shows an exclamation mark (!), type "RC" and then press the "Return" key. (See sample printout: Attachment 1)

E.2.2.3 The computer will then request the time interval over which the test is to be run. Any interval from 1 to 8 hours in one hour intervals may be choosen. Enter a single digit, then press the "Return" Key.

E.2.2.4 The computer will now request known leakage. Enter "Identified Leakage" (as determined by Data Sheet 1303-1.1.2) in gallons per minute. Enter operator caused changes to the RCDT or the RCS (as detailed on Data Sheet 1303-1.1.3) in gallons.

CAUTION: For the above entries, be sure to enter a decimal point. If no decimal point is entered, the computer will insert one according to the format it expects to see.

E.2.2.5 The computer will now print out all required data. Be sure to attach data sheets detailing any entries made in step E.2.2.4.

A11

1303-1.1
Revision 6
02/17/76

ATTACHMENT 1

lrc

DATE: 01/20/75
TIME: 16: 3:38

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1

ENTER IDENTIFIED LEAKAGE FROM OS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
16: 3:54	556.977	601.055	556.250	600.719	578.750	238.311	79.603	8.925
16: 8:54	557.031	601.070	556.180	600.719	578.742	230.178	79.095	8.945

LEAKAGE PLUS LOSSES (<30 GPM): 0.0473 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.1463 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM) -0.3763 GPM

OPERATOR:

APPROVED:

ENCLOSURE 2

TABLE A

SUMMARY OF REVISIONS

Page	Changes
5	Revised
6	Changed from page 5 Revision
7	Revised
7A	Added (Summary Table)
7B	Added (Summary Table)
7C	Added (Summary Table)
7D	Added (Summary Table)
7E	Added (Summary Table)
12	Revised
13	Revised (Table 1)
14	Revised
15	Revised (Table 2)
16	Revised
20	Revised
26	Revised
32	Revised
36	Revised (Table 6)
38	Revised
39	Revised (Table 7)
40	Revised

REVISED PAGES TO 289/83-20

EXECUTIVE SUMMARY

OBJECTIVES

The basic objective of this inspection was to verify that records of Reactor Coolant System (RCS) leak rate testing at Three Mile Island (TMI) Unit 1, from the period April 1, 1978, to March 31, 1979, showed no indications of practices similiar to alleged irregularities at Unit 2. The allegations related to Unit 2 RCS leak rate testing involved the following:

-- That tests were often repeated until the results met the acceptance criteria and that unfavorable results were discarded;

-- That RCS water inventory was adjusted contrary to procedural requirements; in that water additions were made and not recorded in the test package nor included in the RCS leak rate test calculations;

-- That computer data entries for the leak rate calculations were "fudged" to make the leak rate test calculations appear acceptable; and,

-- That hydrogen gas was added to the Make-Up Tank (MUT) to influence leak rate test calculations.

Supplemental objectives of the inspection were to:

-- Examine compliance with the Technical Specifications on RCS Leak Rate;

-- Inspect the leakage test procedure for technical and functional adequacy; and,

-- Examine the effects of instrument calibration and variations on leak rate determinations.

CONDUCT OF INSPECTION

From July 11, 1983 to September 9, 1983, members of the engineering staff of Region I conducted an inspection of TMI-1 records, procedures, equipment and specifications related to reactor coolant system leak rate testing performed by station personnel in the year immediately preceding the accident at TMI-2. The inspectors reviewed and correlated diverse records related to leak rate tests, performed an "as-built" walkdown of related plant systems and instrumentation, and, in conjunction with licensee personnel, demonstrated by system operation a technique by which RCS leak rate results could be modified.

Additional information was obtained subsequent to September 9, 1983. This information and previously obtained information has been extensively reanalyzed by the staff. This led to revision of the inspection report. Revised information is annotated by R1 in the right hand margin. R1

Surveillance records for RCS leak rate tests were reviewed for the period from April 1, 1978 through March 31, 1979. Six hundred and forty-five test records were the principal object of this review. These surveillance records were compared with control room logs, power traces and makeup tank level recorder charts developed during the tests to determine abnormal test operations, adequacy of records and compliance with test procedures. The station surveillance test procedure in effect at that time was evaluated for completeness and adequacy. Independent leak rate calculations were performed by the NRC staff with an NRC microcomputer and compared with TMI-1 data to verify the validity of licensee calculations.

The inspector performed a walkdown inspection of the makeup system and verified that the instrumentation system for measuring makeup tank (MUT) level contained a loop seal. The significance of this loop seal is that hydrogen additions made to the MUT during a test could result in errors in RCS leak rate test calculations. Further, a review of plant maintenance records for 1978 identified narrative which described the effects of gas additions on indicated Make-Up Tank (MUT) level.

The MUT strip chart recorder traces were independently analyzed and evaluated by the inspectors to identify instances of improper performance of RCS leak rate tests, such as the addition of hydrogen or water during the performance of the leak rate test. Strip chart data were compared with control room logs and surveillance test calculations to determine if test conditions as indicated by the strip chart were incorporated, or considered, in the calculation of leak rate. Further, the inspectors directed and monitored an actual demonstration of the effects of gas additions to the MUT at Unit 1 on indicated MUT level to support their conclusions. Licensee personnel assisted in this demonstration and acknowledged the resulting conclusions.

MAJOR FINDINGS

The RCS leak rate tests performed at TMI-1 during the year prior to the accident at TMI-2 contained several inadequacies and deviations from procedural and regulatory requirements. These would, in most instances, have lead to a less conservative calculation of RCS leakage rates.

a. The RCS leak rate procedure, SP 1303-1.1, Rev. 7, in use during the time period reviewed, was inadequate because:

   - it contained incorrect procedural steps (§3.3);
   - it did not prohibit acceptance of test results showing negative leakage (§2.3);
   - it failed to incorporate temperature compensation for several leak rate factors (§3.3);
   - it omitted several important factors; such as, no provisions to include steam generator tube leakage as identified leakage or the effects of pressure variation in the RCS (§3.3); and,
   - it utilized incorrect values for volume and water mass change per unit level change (§3.3).

b. The as-built configuration of the MUT level instrument system provided a loop seal on the low pressure reference leg, which introduced the potential for non-conservative effects on RCS leak rate test results from MUT gas additions. During discussions with station operating personnel, the inspectors were informed there was no loop seal in the makeup tank level instrument system. An NRC walkdown revealed the loop, which provides a means to affect leakage calculations (§4.3.1).

c. An analysis of MUT level strip charts for the period inspected indicated at least eleven hydrogen additions were made during RCS leak rate tests. There were no entries in the control room logs which recorded the fact that these gas additions were made nor were they compensated for in the leak rate calculations. The calculated leak rates, therefore, were in error. Actual leakages were, in fact, higher than the recorded values (§4.3.3). R1

d. Thirteen instances of apparent water addition to the RCS during leak rate tests were identified. In only one test was the water addition accounted for in the calculations; and, in that case, the volume accounted for was considerably less than the apparent actual addition. These unaccounted additions resulted in recorded leakage values lower than actual leakages (§5.2). R1

e. Thirteen instances of apparent feed and bleed operations during testing were identified, for which the leak rate calculation was not properly corrected for the operator-caused water inventory change (§2.3). R1

f. One instance of a combined hydrogen addition, water addition and feed and bleed operation was found (§4.3.3). R1 R1

g. A number of instances of substantial apparent level changes in the Reactor Coolant Drain Tank during leak rate tests were identified. No logbook entries which would explain these level changes were found. (§6.2)

h. The licensee established a conservative administrative test frequency for RCS leak rate testing of once per shift, whereas, technical specification required only daily testing. Fifteen missing test records were identified (§2.3). R1

CONCLUSION

Eleven instances of hydrogen addition, 13 instances of water addition, 13 instances of feed and bleed and one instance of combined feed, bleed, hydrogen and water addition were identified in a population of six hundred and forty five test records examined. These inventory changes or additions affected MUT level and were not properly incorporated into the RCS leak rate calculations. The instances were limited to performance by only a few individuals. Recalculation using best available information showed that, except for four instances, Technical Specifications would have been met. R1 R1 R1 R1 R1 R1 R1 R1

SUMMARY TABLE

OF

APPARENT IRREGULARITIES

DURING RCS LEAK RATE TESTING

(added as a result of Revision 1 to
Inspection Report 50-289/83-20)

R1
R1
R1
R1
R1
R1
R1

SUMMARY OF APPARENT IRREGULARITIES DURING RCS LEAK RATE TESTING

DATE	CLOCK TIME	WATER ADDITION CHART GALLON/TIME	WATER ADDITION INCLUDED IN CALCULATION	CRO/SF LOG ENTRY	HYDROGEN ADDITION PSI/TIME	UNIDENTIFIED LEAK RATE, GPM UNCORRECTED	UNIDENTIFIED LEAK RATE, GPM CORRECTED	
04/30/78	1532/1632	165/1538 (MUT +1.3";normal -2")	no	no	--	-1.8580	1.9260	R1
04/30/78	2321/0021 (05/01/78)	60/2335 (MUT +1" ; normal -1.5")	no	no	--	-0.9717	0.4044	
05/03/78	1822/1922	F&B (60 gal) (MUT +1.7";normal -2")	no	no	--	-0.7658	0.6102	R1
# 05/07/78	/1436	no surveillance data				-0.9933		
05/12/78	0047/0147	F&B (60/0125) (MUT +1.4";normal -3")	no	yes	--	-0.3760	1.0000	R1
* 05/12/78	1643/1743	180/1732 (MUT +5"; normal -1")	no*	yes (70/1745)	--	-0.7443	0.6337	
05/13/78	2340/0040 (05/14/78)	F&B (no effect)	no	no	--	0.5882(invalid test)		R1
05/21/78	/1025	no surveillance data				0.8460		
05/26/78	1656/1756	90/1753(jogged) (MUT +0.4";normal -3")	no	no	--	-0.7518	1.4498	R1
# 06/06/78	/0530	no surveillance data				0.5812		
06/11/78	0804/0904	F&B	no	yes	--	0.5826(invalid test)		
06/21/78	0341/0441	30/0410,90/0425 (MUT -6"; normal -11")	no	yes	--	0.9421	1.6301	R1

NOTE # : suspected to be misfiled.

* : RCDT drained ; 165 gal. @ 579°F

R1

7B

DATE	CLOCK TIME	WATER ADDITION CHART GALLON/TIME	WATER ADDITION INCLUDED IN CALCULATION	CRO/SF LOG ENTRY	HYDROGEN ADDITION PSI/TIME	UNIDENTIFIED LEAK RATE, GPM UNCORRECTED	UNIDENTIFIED LEAK RATE, GPM CORRECTED	
07/02/78	0256/0356	F&B(1590/0310) F&B(100/0340)	no	yes (F&B;1950/0345)	--	0.7266(invalid test)		R1
07/04/78	/2245	no surveillance data				0.9967		R1
07/10/78	/0338	no surveillance data				-0.0771		
08/08/78	0735/0835	no	no	no	2"/0750 (1.5" decayed; 0.5" effective)	-0.1099	0.2341	R1
08/19/78	/1450	no surveillance data				-0.2380		
? 08/29/78	1547/1647	240/1548 (↗ ↘) (MUT+0.3";normal-1" : 15 gal. effective)	no	no	--	-0.0673	0.2767	R1
08/30/78	1952/2052	no	no	no	1"/1952 (0.6" decayed; 0.4" effective)	0.1023	0.3775	R1
08/31/78	0801/0901	no	no	no	1.5"/0820 (MUT +1.3" ; normal -1")	-0.4141	0.6179	R1
09/03/78	/1138	no surveillance data				0.9667		
09/08/78	1629/1729	60/1705 (MUT +1.3";normal -1")	no	no	--	-0.5823	0.7937	R1
09/11/78	1825/1925	60/1840-50(jogged) (MUT +2.6";normal -2")	no	no	--	-0.5862	0.7898	R1
09/15/78	0921/1021	45/1010-20(jogged) (MUT +0.3";normal -1")	no	no	--	-0.5503	0.4817	R1

? : questionable

7C

	DATE	CLOCK TIME	WATER ADDITION CHART GALLON/TIME	WATER ADDITION INCLUDED IN CALCULATION	CRO/SF LOG ENTRY	HYDROGEN ADDITION PSI/TIME	UNIDENTIFIED LEAK RATE, GPM UNCORRECTED	UNIDENTIFIED LEAK RATE, GPM CORRECTED	
	09/17/78	0508/0608	F&B(100/0515-57) (no effect?)	no	no	--	0.7745(invalid test)		R1
?	09/18/78	2035/2136	45/2100(jogged)	no	no	--	-0.4265	0.6055	R1
	09/18/78	2355/0055 (09/19/78)	no	no	no	2"/0040 (MUT +1.3";normal -1")	-0.5823	0.7937	
	09/22/78	2100/2200	F&B	no	no	--	-0.0373(invalid test)		
	10/02/78	1645/1745	no	no	no	2"/1720 (1.5" decayed; 0.5" effective)	-0.0293	0.3147	R1
	10/17/78	1201/1301	60/1240-1303(jogged)	no	no	--	-0.4581	0.9179	
	11/05/78	/1955 /1950	no surveillance data				0.3395		R1
	11/07/78	1608/1708	no	no	no	2"/1653 (1.6" decayed; 0.4" effective)	0.0445	0.3197	
#	11/10/78	/1125	no surveillance data				0.5374		R1
	11/12/78	0816/0916	no	no	no	2"/0903 (MUT +0.8";normal -0.5": 1" effective)	-0.1954	0.4926	
	11/13/78	0304/0404	F&B(30/0356) (MUT +0.4"; normal -0.7")	no	no	--	-0.5507	0.1373	R1
	11/16/78	0426/0526	F&B (MUT +1.8"; normal -0.2")	no	no	--	0.6059(invalid test)		
	11/20/78	2110/2210	F&B	no	no	--	0.8772(invalid test)		
	11/21/78	0206/0306	F&B(90 gal)	no	no	--	-0.5078(invalid test)		R1

7D

	DATE	CLOCK TIME	WATER ADDITION CHART GALLON/TIME	WATER ADDITION INCLUDED IN CALCULATION	CRO/SF LOG ENTRY	HYDROGEN ADDITION PSI/TIME	UNIDENTIFIED LEAK RATE, GPM UNCORRECTED	UNIDENTIFIED LEAK RATE, GPM CORRECTED	
	11/28/78	1653/1853	F&B(200/1720-50)	no	no	--	-0.3462(invalid test)		R1
	12/11/78	0432	no surveillance data				-0.8118		R1
**	12/13/78	1842/1942	270/1920 (MUT +8.3"; normal -1")	no**	yes	--	-0.2170	0.1417	R1
	12/18/78	0830/0930	no	no	no	/0834(↑) (no effect?)	0.5220		R1
	01/06/79	0756/1156	400/0923;120F&B/1010	300 gal.	yes	/0937,/0940 (no effect)	-0.5948	0.4485	R1
	01/08/79	/0600 /0604	no surveillance data				0.4842		R1
	01/09/79	1936/2036	F&B(30 gal) (MUT +1"; normal -1")	no	no	--	-0.2981	0.3899	R1
	01/11/79	1606/1706	no	no	no	2"/1738	-0.6163	0.7597	R1
	01/18/79	0401/0501	60/0450(jogged) (MUT +1.1";normal -1")	no	no	--	-0.6938	0.6824	R1
	01/18/79	/1310	no surveillance data				0.0700		R1
	01/26/79	/0032	no surveillance data				-0.4909		
	01/29/79	/0310	no surveillance data				-0.3124		
	02/02/79	1600/1700	no	no	no	2"/1614,1620 (1.5" decayed; 0.5" effective)	0.3287	0.6727	
	02/03/79	1615/1715	no	no	no	2"/1623 (0.5" effective)	0.4692	0.8132	
	02/12/79	/2230	no surveillance data				-0.5000		

** : RCDT drained ; 350 gal. @ 579°F

7E

The surveillance records from the period of July 8, 1978 to August 4, 1978 were not reviewed due to missing MUT recorder traces. Thus, 69 surveillance test records could not be reviewed. Therefore, 645 surveillance test records were reviewed against MUT recorder traces and other data, such as daily logs and computer listings.

The licensee had established a conservative administrative test frequency of once per shift. Tests were often performed once per shift, whereas Technical Specification required a daily test.

The total number of days covered by surveillance record was 290 days, during which the following tests were completed:

No. Tests Performed Per Day	No. Days
1 (Daily)	27
2 (Twice Daily)	114
3 (Each Shift) or more	149

Major findings from the record review are:

-- Some of the tests noted in the CRO and SRO shift logs were missing in the surveillance files. These surveillance records were either never created, lost, discarded or misfiled. Two test records were found filed out of normal sequence and six were found misfiled. Fifteen missing test records have been identified. They are listed in Table 1. R1

-- The surveillance test records frequently showed negative leak rate results. Two months of leak rate test data were reviewed to identify examples of test records demonstrating negative leakage. The following summarizes the results of that review:

	May, 1978	June, 1978	May + June 1978
Total Test Records Reviewed	60	61	121
Number Test Records Demonstrating Negative Leakage Rate Results			
Leakage Plus Losses	10	4	14
Gross Leak Rate	20	16	36
Unidentified Leak Rate	28	20	48

TABLE 1

Lost, Misfiled, Discarded or Never Created RCS Leak Rate Test Records

NO.	DATE	TIME	
1	5-07-78	1436	R1
2	5-21-78	1025	
3	6-06-78	0530	
4	7-04-78	2245	
5	7-10-78	0338	R1
6	8-19-78	1450	
7	9-03-78	1247	
8	11-05-78	1955	
9	11-10-78	1125	
10	12-11-78	0432	
11	01-08-79	0600	R1
12	01-18-79	1310	R1
13	01-26-79	0032	
14	01-29-79	0310	
15	02-12-79	2230	R1

Almost 40% (48 out of 121) of the calculated and recorded unidentified leak rates during the two month period had negative values.

-- The RCS leak test procedure, SP 1303-1.1, recommended water additions such as Feed-and-Bleed (F&B) operations be avoided during the test. The inspector identified at least 13 tests, during which F&B operations appeared to have taken place; and in each case, the change in water inventory was not properly compensated for by the operator in the computer calculations of RCS leakage rates. They are identified in Table 2. | R1

These record review findings are indicative of the failure of the licensee to comply with regulatory and procedural requirements for record-keeping and test performance.

Table 2

Apparent Uncompensated Feed & Bleed Operations
During RCS Leak Rate Testing

DATE	CLOCK TIME	WATER ADDITION CHART GALLON/TIME	WATER ADDITION INCLUDED IN CALCULATION	CRO/SF LOG ENTRY	HYDROGEN ADDITION PSI/TIME	UNIDENTIFIED LEAK RATE, GPM UNCORRECTED	UNIDENTIFIED LEAK RATE, GPM CORRECTED	
05/03/78	1822/1922	F&B (60 gal) (MUT +1.7";normal -2")	no	no	--	-0.7658	0.6102	R1
05/12/78	0047/0147	F&B (60/0125) (MUT +1.4";normal -3")	no	yes	--	-0.3760	1.0000	
05/13/78	2340/0040 (05/14/78)	F&B (no effect)	no	no	--	0.5882(invalid test)		R1 R1
06/11/78	0804/0904	F&B	no	yes	--	0.5826(invalid test)		R1
07/02/78	0256/0356	F&B(1590/0310) F&B(100/0340)	no	yes (F&B;1950/0345)	--	0.7266(invalid test)		R1
09/17/78	0508/0608	F&B(100/0515-57) (no effect?)	no	no	--	0.7745(invalid test)		
09/22/78	2100/2200	F&B	no	no	--	-0.0373(invalid test)		R1
11/13/78	0304/0404	F&B(30/0356) (MUT +0.4"; normal -0.7")	no	no	--	-0.5507	0.1373	
11/16/78	0426/0526	F&B (MUT +1.8"; normal -0.2")	no	no	--	0.6059(invalid test)		
11/20/78	2110/2210	F&B	no	no	--	0.8772(invalid test)		
11/21/78	0206/0306	F&B(90 gal)	no	no	--	-0.5078(invalid test)		R1
11/28/78	1653/1853	F&B(200/1720-50)	no	no	--	-0.3462(invalid test)		
01/09/79	1936/2036	F&B(30 gal) (MUT +1"; normal -1")	no	no	--	-0.2981	0.3899	
								R1

3.0 Reactor Coolant System (RCS) Leak Rate

3.1 Background

The TMI Unit 1 Technical Specifications, paragraph 3.1.6 and Table 4.1-2, required that RCS leakages be determined at least once per day during steady state operations, and that the leakage-plus-losses, total gross leakage and unidentified leakages be maintained within their respective limits of 30 Gallons-Per-Minute (GPM), 10 GPM and 1 GPM. The TMI-1 Final Safety Analysis Report (FSAR), Section 4.2.3.8.a, specified that the leakages were measured by counting water inventory changes within the RCS pressure boundary for a fixed time interval.

The test procedure included a precaution to avoid addition or removal of water and chemicals from the RCS. The procedure also recommended that, for the most accurate leak rate determination, the initial and final values of power, RCS temperature, RCS pressure and pressurizer level should be maintained identical.

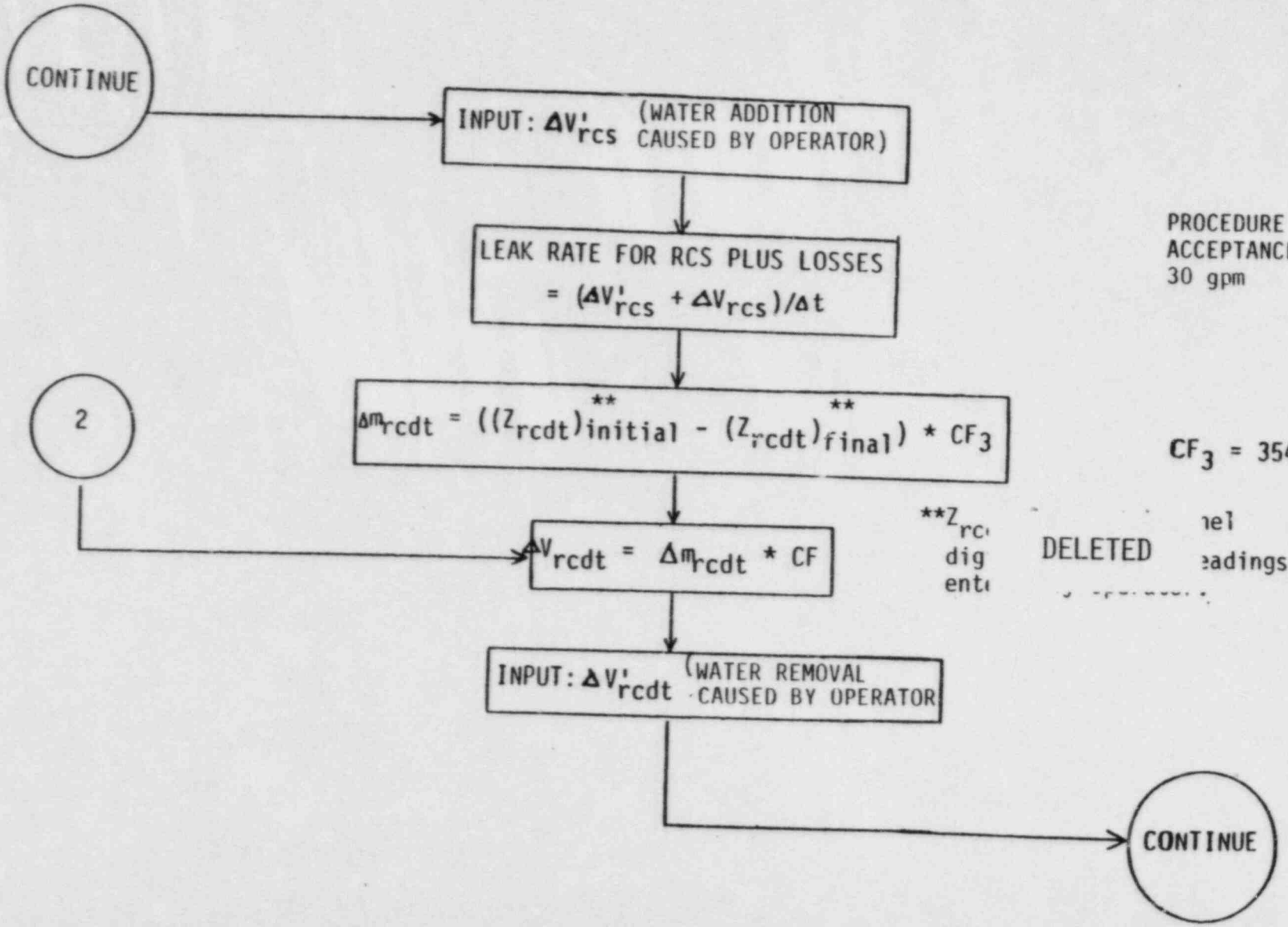
The procedure specified a test duration of one to eight hours, and specified the plant computer as the favored tool for performing test calculations. Hand calculations were allowed as a backup when the computer was not available. There was only one record of a hand calculation during the one year period from April, 1978 thru March, 1979.

Upon initiation of a computer calculation, data was taken automatically from hard-wired, pre-designated computer points. Manual actions required by the computer method were input specifications such as test time interval (normally one hour), any identified leakages and the operator actions of make-up water additions and RCDT pumping. RCS leak rate calculations were automatically done by the computer when the above steps were completed. For hand calculations, the preferred data source was defined to be DVM readings from a patch panel rather than data obtained from control room indicators, due to the inherent inaccuracies in the latter readings. R1

The procedure also specified a set of corrective steps to be taken when the RCS leakages were in excess of the requirements. The first step was to perform another leak rate determination, followed by careful examination of the operator actions affecting the water inventory. The final step was to initiate action to determine the source of the leakage, and then to proceed with the ACTION statements specified in Technical Specification 3.1.6, which required placing the reactor in hot shutdown within 24 hours of detection of excessive leakage.

TMI-1 RCS LEAK RATE CALC. (pre-April 1979)

1303-1.1 Rev. 7, 5-25-76



PROCEDURE STATED ACCEPTANCE CRITERIA: 30 gpm

CF_3 = 3540 lbm/volt

**Z_{rc} dig ent

DELETED

nel
eadings

R1
R1
R1
R1

20

errors estimated from the instrument repeatability would be 11.6 gallons regardless of test duration, and subsequent contribution to the leak rate error would be 0.19 gpm and 0.05 gpm for one and four hour test durations, respectively.

3.5 Uncertainty of Make-Up Tank (MUT) Chart Time

During the one year period, 264 water additions were logged in CRO logbooks and these entries were identified on the MUT strip chart tracings, as tabulated in Table 10. The purpose of this comparison was to determine the accuracy and validity of the chart time. It was understood that the time entered in the shift log by an SRO and CRO was the control room clock time, and the control room MUT recorder time was adjusted periodically to the control room clock time at midnight.

The traces of water addition on MUT charts were compared statistically with the CRO log entry times. Statistical analysis showed that the chart traces of water additions were ahead of the log times by an average of 3.2 minutes with a standard deviation of 10.73 minutes. This was an expected result since the operator or SRO would enter the water additions into the shift log after completion of the operation. On this basis, it was determined that the MUT recorder chart time was accurate statistically to ± 10 minutes.

This information was later utilized to isolate the interval of the MUT level strip chart trace which bracketed the period of test performance. The resulting interval of strip chart was typically 80 minutes wide, (a 60 minute test + 13 minutes before + 7 minutes after) starting 13 minutes prior to the recorded test start time in terms of chart time. All available records were then correlated to identify the actual period of test performance within this interval.

3.6 System and Human Error Potential

Beside the procedural inadequacies and the "As Built" system limitations, there are three additional expected or potential errors in the RCS leakage rate calculations.

(1) RCDT pumpout entries

The procedure required computer entry by operators of RCDT pumpouts. This is discussed further in Section 6.0 R1 R1 R1 R1

-- The trace of the level shift due to the pressure increase (┘├─) was the same as those suspected hydrogen additions on the MUT chart for the period April 1978 thru March 1979. (See Table 6)

The test traces are shown in Figure 3. For clarity, Figure 3A provides a magnified hand drawn version of the appropriate section of Figure 3. A computer graphic trace is shown in Figures 4 for this test. After the test, licensee representative acknowledged the inspector's findings of the effect of hydrogen additions and their characteristic traces on the MUT level charts.

4.3.3 Hydrogen Additions During Leak Rate Tests

The Control Room Operator's and Shift Foreman's logs were searched for entries showing hydrogen addition during the periods of leak rate testing records. This was done for records from April, 1978, through March, 1979. No entries showing the hydrogen additions were observed in the logs. The makeup tank level strip chart was then examined for the additions. Twelve (one combined) hydrogen additions during RCS leak rate testing were identified as shown in Table 6. The hydrogen additions were not recorded in the logs nor compensated for in the leak rate calculations. When the hydrogen additions and consequent level shifts were included in the leak rate calculations, the unidentified leak rates were all increased. R1 R1 R1 R1 R1

5.2 Findings Regarding Water Addition

During a previous inspection, four such water additions were identified. During this inspection it was determined that three of them were wrongly identified. In fact, one of the three wrong cases is now identified as a hydrogen addition.

Based on the review of MUT strip chart, traces of water addition, surveillance SP 1303-1.1 computer output and pressurizer level response during tests, fourteen (one combined) tests were identified during which water additions were made but were not entered into the computer calculations. Table 7 summarizes these water additions. R1

In some cases, the chart traces indicated that water might have been added gradually to the RCS. One test, performed January 6, 1979, accounted for 300 gallons of water addition in the computer calculations. However, the level shift, a characteristic trace of water addition on the MUT strip chart, indicated approximately 480 gallons added. When gas space compression is accounted for, the addition amounted to approximately 400 gallons, instead of the 300 gallons entered into the computer calculation. This recorded MUT level shift provided additional evidence of the existence of a loop seal in the low pressure reference leg, since raising MUT level compresses the MUT cover gas and causes the same effect as a gas addition discussed in Section 4. R1 R1 R1

When these water additions were accounted for in the leak rate calculations, three showed the unidentified leak rate in excess of 1 gpm, as tabulated in Table 7. This was contrary to the requirement specified in Technical Specification 3.1.6.1. These are further examples of apparent failure to comply with procedural and regulatory requirements. R1 R1 R1

Table 6

Hydrogen Additions To Makeup Tank During Leak Rate Test

DATE	CLOCK TIME	WATER ADDITION CHART GALLON/TIME	WATER ADDITION INCLUDED IN CALCULATION	CRO/SF LOG ENTRY	HYDROGEN ADDITION PSI/TIME	UNIDENTIFIED LEAK RATE, GPM UNCORRECTED	UNIDENTIFIED LEAK RATE, GPM CORRECTED	
08/08/78	0735/0835	no	no	no	2"/0750 (1.5" decayed; 0.5" effective)	-0.1099	0.2341	R1
08/30/78	1952/2052	no	no	no	1"/1952 (0.6" decayed; 0.4" effective)	0.1023	0.3775	R1
08/31/78	0801/0901	no	no	no	1.5"/0820 (MUT +1.3" ; normal -1")	-0.4141	0.6179	
09/18/78	2355/0055 (09/19/78)	no	no	no	2"/0040 (MUT +1.3";normal -1")	-0.5823	0.7937	R1
10/02/78	1645/1745	no	no	no	2"/1720 (1.5" decayed; 0.5" effective)	-0.0293	0.3147	
11/07/78	1608/1708	no	no	no	2"/1653 (1.6" decayed; 0.4" effective)	0.0445	0.3197	R1
11/12/78	0816/0916	no	no	no	2"/0903 (MUT +0.8";normal -0.5": 1" effective)	-0.1954	0.4926	R1
12/18/78	0830/0930	no	no	no	/0834( ) (no effect?)	0.5220		R1
01/06/79	0756/1156	400/0923;120F&B/1010	300 gal.	yes	/0937,/0940 (no effect)	-0.5948	0.4485	R1
01/11/79	1606/1706	no	no	no	2"/1738	-0.6163	0.7597	
02/02/79	1600/1700	no	no	no	2"/1614,1620 (1.5" decayed; 0.5" effective)	0.3287	0.6727	R1
02/03/79	1615/1715	no	no	no	2"/1623 (0.5" effective)	0.4692	0.8132	R1

Table 7

Water Additions During RCS Leak Rate Test Without Entry Into the Computer

	DATE	CLOCK TIME	WATER ADDITION CHART GALLON/TIME	WATER ADDITION INCLUDED IN CALCULATION	WATER ADDITION CRO/SF LOG ENTRY	HYDROGEN ADDITION PSI/TIME	UNIDENTIFIED LEAK RATE, GPM UNCORRECTED	UNIDENTIFIED LEAK RATE, GPM CORRECTED	
	04/30/78	1532/1632	165/1538 (MUT +1.3";normal -2")	no	no	--	-1.8580	1.9260	R1
	04/30/78	2321/0021 (05/01/78)	60/2335 (MUT +1" ; normal -1.5")	no	no	--	-0.9717	0.4044	R1
*	05/12/78	1643/1743	180/1732 (MUT +5"; normal -1")	no*	yes (70/1745)	--	-0.7443	0.6337	R1
	05/26/78	1656/1756	90/1753(jogged) (MUT +0.4";normal -3")	no	no	--	-0.7518	1.4498	R1
	06/21/78	0341/0441	30/0410,90/0425 (MUT -6"; normal -11")	no	yes	--	0.9421	1.6301	R1
?	08/29/78	1547/1647	240/1548 ( ) (MUT+0.3";normal-1" : 15 gal. effective)	no	no	--	-0.0673	0.2767	R1
	09/08/78	1629/1729	60/1705 (MUT +1.3";normal -1")	no	no	--	-0.5823	0.7937	R1
	09/11/78	1825/1925	60/1840-50(jogged) (MUT +2.6";normal -2")	no	no	--	-0.5862	0.7898	R1
	09/15/78	0921/1021	45/1010-20(jogged) (MUT +0.3";normal -1")	no	no	--	-0.5503	0.4817	R1
?	09/18/78	2035/2136	45/2100(jogged)	no	no	--	-0.4265	0.6055	R1
	10/17/78	1201/1301	60/1240-1303(jogged)	no	no	--	-0.4581	0.9179	R1
**	12/13/78	1842/1942	270/1920 (MUT +8.3"; normal -1")	no**	yes	--	-0.2170	0.1417	R1
	01/06/79	0756/1156	400/0923;120F&B/1010	300 gal.	yes	/0937,/0940 (no effect)	-0.5948	0.4485	R1
	01/18/79	0401/0501	60/0450(jogged) (MUT +1.1";normal -1")	no	no	--	-0.6938	0.6824	R1
									R1
									R1

? : questionable

* : RCDT drained ; 165 gal. @ 579°F

** : RCDT drained ; 350 gal. @ 579°F

6.0 Effects of Reactor Coolant Drain Tank (RCDT) Level Inputs on Leak Rate Test Results

6.1 Discussion

The Reactor Coolant Drain Tank collects the effluent or leakage from the pressurizer PORV and code safety valves. It also collects leakage past the reactor coolant pumps primary mechanical seal. The tank fluid can be circulated through a cooler and returned to the tank by spraying into the tank vapor space. The RCDT also has a connection to the Reactor Building Sump. Surveillance Procedure SP 1303-1.1, Revision 7 (effective revision during 1978-79), treated the water level change in the RCDT as a loss of Reactor coolant covered by Technical Specification 3.1.6.8. Therefore this was not subject to the 10 gpm limit of total RCS leakage. This treatment of RCDT water would allow leakage through relief and safety valves and reactor coolant pump seals to approach a 30 gpm limit.

6.2 Findings Regarding RCDT Level Inputs R1

When an operator took an action such as pumping out water from the RCDT, this action is required to be logged in the CRO shift log. As listed in Table 8, the RCDT tank levels were decreased substantially according to the surveillance records of leak rate tests; yet, no entries in the SRO or CRO logs were identified reporting the cause for the apparent large volume of water removed from the RCDT. An unaccounted water removal from the RCDT would result in conservative values of calculated gross leakage rate. These are additional apparent failures to follow procedural requirements concerning required log entries.

Based on the computer printouts of surveillance results, Table 9 lists those RCDT level changes greater than 60 gallons of water during the review period. The last column of Table 9 demonstrates the substantial effect of RCDT level changes on identified leak rates. R1 R1

NOTE:

ATTACHMENTS A, B, AND C TO ORIGINAL REPORT HAVE BEEN REVISED TO REFLECT CHANGES NOTED IN THE REVISED REPORT. COPIES OF THE REVISED ATTACHMENTS ARE VOLUMINOUS AND ARE NOT INCLUDED HERE. R1