VOL. 8

FNP-1-IMP-224.2
January 25, 1980
Revision 1

FARLEY NUCLEAR PLANT

INSTRUMENT MAINTENANCE PROCEDURE

FNP-1-IMP-224.2

SAFETY RELATED

REACTOR COOLANT DRAIN TANK LEVEL, LT-1003

CONTROLLED COPY

Approved:

Wm. B. Shipman
Maintenance Superintendent

Date Issued: 2/21/80

B1/1

LIST OF EFFECTIVE PAGES

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DATA PACKAGE IMP-224.2A											
1	X										
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FARLEY NUCLEAR PLANT
UNIT 1
INSTRUMENT MAINTENANCE PROCEDURE IMP-224.2

REACTOR COOLANT DRAIN TANK LEVEL, LT-1003

1.0 Purpose

1.1 The purpose of this procedure is to verify and, if required, re-establish the accuracies and control functions of the channel sensor and associated signal processing equipment.

1.2 This procedure is written for normal complete calibration; however, partial performance is also possible. Partial performance is divided into: 1) the sensor, sections 2.0 through 7.1 and 7.9 or 2) signal processing equipment excluding the controller sections 2.0 through 6.0 and 7.2 through 7.9 excluding sections 7.7 or 3) the controller only, sections 2.0 through 6.0, 7.2 and 7.7 through 7.9.

2.0 Acceptance Criteria

2.1 The acceptance criteria for this test is that the process instrumentation provide in-tolerance conversion of the process parameter and perform its as-designed indication and control functions. The setpoints and tolerances to be used are contained in the data package listed as reference 3.1.

3.0 References

3.1 FNP-1-IMP-224.2A, Instrument Maintenance Procedure Data Package/Surveillance Test Procedure Data Package.

3.2 U-260930 Barton Model 396/352 D/P Transmitter, Calibration section 6-1-4.4, Maintenance section 6-1-3.

3.3 U-183501, Westinghouse Drawing 271C597, Sh. 43.

3.4 U-183509, Westinghouse Drawing 271C597, Sh. 51.

3.5 U-183499, Westinghouse Drawing 271C597, Sh. 40.

3.6 U-183497, Westinghouse Drawing 271C597, Sh. 38.

3.7 U-167989, Elem. Wiring Diag., RC Drain Tank Pump No. 1.

3.8 U-167990, Elem. Wiring Diag., RC Drain Tank Pump No. 2.

3.9 D-181762, Waste Process Liquid Pannel Connection Diagram N1G21NBWPP2603B-N.

3.10 U-260716, PCS Users Guide Instruction Manual.

3.10.1 Model 62-H Controller, sections 18-710, 16-711.

3.10.2 Model 63U-B Duplex Alarm, sections 18-692, 18-693.

3.10.3 Model 630-A Single Alarm, sections 18-690, 18-691.

3.10.4 Acopian Power Supply, Non-Foxboro Material section.

3.11 U-260715, Waste Process Boron Recycle Panel Instruction Manual.

3.12 D-175042, Sh. 1, P&ID Waste Process Sys. P&ID.

4.0 Test Equipment

4.1 Fluke Digital Multimeter, Model 8120A or equivalent (2).

4.2 Transmation Transmitter Simulator, Model 1040 or equivalent (2).

4.3 General Radio Decade Box, Model 1433-T or equivalent.

4.4 Wallace and Tiernan Pneumatic Calibrator, Series 65-120 (0-125 in. WC) or equivalent.

5.0 Precautions and Limitations

5.1 All reference to data sheets by this procedure is to data sheets contained in reference 3.1. All reference to attachments are to the attachments of FNP-0-IMP-443.1.

5.2 Critical procedure sections and steps are listed on page 2 of the data package used with this procedure and are marked with an asterisk (*) within the body of this procedure. As each critical step or section is completed, initial on the space provided on Table 1 of the data package.

5.3 Observe all precautions and limitations listed in FNP-0-IMP-0, General Instrumentation and Controls Precautions and Limitations.

5.4 Do not perform any of the following during this test:

5.4.1 PRT normal cooldown

5.4.2 Excess letdown operation

5.4.3 Loop, Accumulator, or PRT draining operation

5.5 If clearance is required on RCDT LI-1003 root valves 1-LWP-V-7145A and B, PT-1004 will be disabled. Refer to initial conditions, precautions and limitations of IMP-224.1.

5.6 Transmitter MUST be revented if the Drain Tank is drained below the lower instrument tap.

6.0 Initial Conditions

6.1 RCDT level is less than 50% if RCP No. 1 seal leak-off es established.

6.2 RCDT pumps 1A and 1B are OFF and RCDT level control valve 1-LWD-LCV-1003 is in manual and closed.

6.3 The Shift Foreman has granted administrative authority to perform this test and is aware of indications, alarms and printouts that will result.

7.0 Detailed Procedure

7.1 Calibrate D/P transmitter LT-1003 as follows:

*7.1.1 Open the equalizing valve.

*7.1.2 Have the High pressure root valve, 1-LWP-V-7145A closed and tagged.

*7.1.3 Have the Lo pressure root valve, 1-LWP-V-7145B closed and tagged.

CAUTION: Do not open the vent fittings on the transmitter.

*7.1.4 Vent the high pressure leg by opening the process test connection (swagelok fitting) on the high pressure (upper) bellows isolation housing.

*7.1.5 Open the drain and calibration valve and drain the sensing lines. Collect any fluid in a suitable container.

CAUTION: Observe caution when handling contaminated fluids.

*7.1.6 Connect the test pressure source and test pressure gauge to the drain and calibration connection.

*7.1.7 Close the equalizing valve.

7.1.8 Connect a DVM to the transmitter test resistor.

7.1.9 Vary the transmitter input as necessary to obtain a transmitter output equal to 0.12 VDC across the 10 ohm test resistor. Verify that the D.C. potential across the transmitter output terminals is 35 $\pm$ 2.4VDC.

7.1.10 If the voltage is out of tolerance, measure and record on data sheet 1 the "AS FOUND" potential at the Liquid Waste Process Cabinet, between TB-L4, terminal 11(-) and LP/1003, red(+) test jack. Then adjust LQ-1003, R-7 (voltage adjust pot) in the Liquid Waste Process Panel, to obtain 48.0 $\pm$ 0.25VDC at the above terminals and record the FINAL value.

7.1.11 Apply the inputs called for on data sheet 1 and record "AS FOUND" data.

7.1.12 If "AS FOUND" data is within tolerance, no further adjustments are required. Proceed to step 7.1.15.

7.1.13 If "AS FOUND" data is out of tolerance, apply a test pressure equal to 0% of the transmitter span and adjust the transmitter ZERO to obtain the required value shown on data sheet 1.

7.1.14 Apply a test pressure equal to 100% of the transmitter span, and adjust the SPAN to obtain the required value shown on data sheet 1.

7.1.15 Repeat step 7.1.12 and 7.1.13 until both zero and span meet required values.

7.1.16 Apply the values called for on data sheet 1 and ensure all output values are within tolerances. If transmitter output is non-linear, offset the transmitter zero and span within the allowed tolerances to minimize the maximum difference between "REQUIRED" and "FINAL" data. If the transmitter cannot be calibrated using these instructions, refer to reference 3.2. Record the "FINAL" data on data sheet 1.

*7.1.17 Replace the cap on the upper bellows isolation housing.

*7.1.18 Close the drain and calibration valve.

7.1.19 Disconnect all test equipment connected to the transmitter and return the transmitter to service as follows:

*7.1.19.1 Open the equalizing valve

*7.1.19.2 Have the transmitter high pressure root valve opened.

*7.1.19.3 Have the transmitter low pressure root valve opened.

7.1.19.4 Do not close the equalizing valve.

*7.1.19.5 Vent the low pressure leg at the lower bellows isolation vent (swage-lok fitting).

NOTE: If required, vent PT-1004.

7.2 Calibration Setup

*7.2.1 Pull power supply, LQ-1003 out of its socket in the Liquid Waste Process Panel.

*7.2.2 Lift the leads from Liquid Waste Process Panel, TB-L4, terminals 10 and 11 and connect the transmitter simulator to the terminals.

*7.2.3 Reinsert LQ-1003 in its socket.

7.2.4 Connect a DVM to LP.1003 inside the Liquid Waste Process Panel. This DVM is connected across a 250 ohm resistor and is to be used for adjusting transmitter simulator input values during the remainder of this test.

*7.3 Calibration of Power Supply, LQ-1003, Acopian Model 48-LIO, Location - Liquid Waste Process Panel.

7.3.1 Adjust the transmitter simulator for an input of 12 mA. Measure and record on data sheet 2 the "AS FOUND" DC potential in the Liquid Waste Process Cabinet between terminals TB-L4, terminal 11 and LP/1003, red (+) test jack.

7.3.2 Adjust power supply LQ-1003, R-7 (voltage adjust pot.) to obtain a DC potential of 48.0 VDC.

7.3.3 Record the FINAL DC potential on data sheet 2.

*7.4 Indicator Calibration, Number LI-1003 Location Liquid Waste Process Panel.

7.4.1 Apply the inputs called for on data sheet 2 by adjusting the transmitter simulator and record "AS FOUND" values.

7.4.2 If required adjust the indicator's zero screw to minimize the maximum error.

NOTE: Do not turn zero screw more than 1/4 turn in either direction.

7.4.3 If tolerances cannot be met, replace the indicator and repeat 7.4.1.

7.4.4 Record "FINAL" data.

7.5 Calibration of Signal Comparator, LB-1003 Model 63U-B, Location Liquid Waste Process Panel.

7.5.1 Adjust the transmitter simulator so that the comparator LB-1003A is reset (Annunciator 1-1, REACTOR COOLANT DRAIN TANK HI-LOW LEVEL, Liquid Waste Process Panel is OFF).

*7.5.2 Hi Alarm

7.5.2.1 Slowly increase the input from the transmitter simulator and record the "AS FOUND" value, on data sheet 3, at which the comparator trips (as indicated by Ann. 1-1 turning ON).

7.5.2.2 Slowly decrease the input from the transmitter simulator and record the value at which the comparator resets (as indicated by Ann. 1-1 turning OFF).

*7.5.3 Lo Alarm

7.5.3.1 Slowly decrease the input from the transmitter simulator and record the "AS FOUND" value, on data sheet 3, at which the comparator trips (as indicated by Ann. 1-1 turning ON).

7.5.3.2 Slowly increase the input from the transmitter simulator and record the value at which the comparator resets (as indicated by Ann. 1-1 turning OFF).

7.5.4 If necessary adjust the comparator in accordance with reference 3.10.2. (Note: reset is the same as lockup adjustment).

7.5.5 Record FINAL trip and reset values on data sheet 3.

*7.6 Calibration of Signal Comparator, LB-1003B Model 63U-A, Location Liquid Waste Process Panel.

7.6.1 Connect a DVM (ohms scale) to Liquid Waste Process Panel, relay LY-1003B, terminals 9 and 10.

7.6.2 Adjust the transmitter simulator so that comparator, LB-1003B is reset (short on relay LY-1003B, terminals 9 and 10).

7.6.3 Slowly decrease the input from the transmitter simulator and record the "AS FOUND" value, on data sheet 4, at which the comparator trips (as indicated by an open on LY-1003B, terminals 9 and 10).

7.6.4 Slowly increase the input from the transmitter simulator and record the "AS FOUND" value at which the comparator resets (as indicated by a short on LY-1003B, terminals 9 and 10).

7.6.5 If necessary adjust the comparator in accordance with reference 3.10.3. (Note: reset is the same as lockup adjustment).

7.6.6 Record FINAL trip and reset values on data sheet 4. Remove the DVM.

*7.7 Calibration of Controller, LC-1003 Model 62H, Style C, Location Liquid Waste Process Panel.

7.7.1 Record the "AS FOUND" switch and potentiometer settings on data sheet 5.

7.7.2 Unplug controller LC-1003.

7.7.3 Lift the leads from Liquid Waste Process Panel, TB-L4, terminals 13 and 14.

7.7.4 Connect a decade resistance adjusted for 250.00 ohms, to TB-L4, terminals 13 and 14, in order to monitor controller output.

7.7.5 Re-energize LC-1003.

7.7.6 Position transfer switch to MANUAL.

7.7.7 Position the transfer switch to the extreme right until the output is maximum. Record the "AS FOUND" DVM and controller output meter readings on data sheet 5.

7.7.8 Position the transfer switch to the extreme left until the output is minimum. Record the "AS FOUND" DVM and controller output meter readings on data sheet 5.

7.7.9 If necessary, adjust the output limits in accordance with reference 3.10.1 and repeat step 7.7.7 and 7.7.8.

7.7.10 Position the transfer switch to AUTO.

7.7.11 Turn Reset knob to maximum.

7.7.12 Turn Derivative knob to minimum (OFF).

7.7.13 Turn set point knob to 50% of scale.

7.7.14 Apply the inputs called for on data sheet 5. Allow the controller to stabilize and record the "AS FOUND" controller output.

7.7.15 If necessary, adjust the controller in accordance with reference 3.10.1 and repeat steps 7.7.10 thru 7.7.14.

7.7.16 Record "FINAL" data.

7.7.17 Unplug controller LC-1003.

7.7.18 Remove the decade resistor connected in step 7.7.4. Remove the transmitter simulator.

7.7.19 At LC-1003 rear terminal board, jumper terminal 7 to 3 and terminal 6 to 2.

7.7.20 Controller setup

7.7.20.1 Turn Proportional Band knob to minimum.

7.7.20.2 Turn Reset knob to minimum.

7.7.20.3 Turn Derivative knob to minimum.

7.7.20.4 Set Reversing switch to DEC.

7.7.20.5 Turn set point knob to 50%.

7.7.20.6 Position transfer switch to AUTO.

7.7.20.7 Reenergize controller LC-1003.

7.7.21 Controller Functional Check. If any of the required controller operations in step 7.7.21 are incorrect, trouble shoot in accordance with reference 3.10.1 and repeat step 7.7.21.

7.7.21.1 Verify Deviation Meter reads null ± two devisions (center scale).

7.7.21.2 Verify output meter reads 50±5% of scale.

7.7.21.3 Rotate setpoint knob upscale and downscale. Verify the output meter tracks and the deviation meter always reads null.

7.7.21.4 Position the transfer switch to MANUAL.

7.7.21.5 Turn the setpoint knob to 50% of scale. Use the transfer switch to manually adjust the controller output meter to 50% of scale. Verify the deviation meter reads null ± 2 divisions.

7.7.21.6 Position the transfer switch to AUTO. Turn Proportional Band knob to maximum. Verify the deviation meter reads null ± 2 divisions.

7.7.21.7 Record (initial) controller functional check on data sheet 5.

7.7.22 Controller Derivative Check. If the controller operation is incorrect in Step 7.7.22, trouble shoot in accordance with reference 3.10.1 and repeat step 7.7.22.

7.7.22.1 Unplug controller LC-1003.

7.7.22.2 Remove jumpers connected in step 7.7.19.

7.7.22.3 At the Liquid Waste Process Panel, TB-L4, jumper terminals 13 and 14.

7.7.22.4 Connect 2 transmitter simulators and a switch to TB-L4, terminals 10 and 11 to provide a step change input.

7.7.22.5 Turn Proportional knob to 100%.

7.7.22.6 Turn Reset knob to maximum.

7.7.22.7 Turn Derivative knob to 1.2 minutes.

7.7.22.8 Set reversing switch to INC.

7.7.22.9 Turn set point knob to 0% of scale.

7.7.22.10 Verify load switch (SW5) is turned clockwise.

7.7.22.11 Reenergize LC-1003

7.7.22.12 Position transfer switch to AUTO.

7.7.22.13 After the controller has stabilized, step the input from 10mA to 12mA.

7.7.22.14 Verify that the output meter reaches a peak between 30% and 40% and slowly drops back to approximately 5%.

7.7.22.15 If necessary, trouble shoot the controller in accordance with reference 3.10.1 and repeat 7.7.21.

7.7.22.16 Record (initial) controller derivative check on data sheet 5.

7.8 Restoration

*7.8.1 Unplug controller LC-1003. Remove Power Supply LQ-1003.

*7.8.2 Remove all test equipment.

*7.8.3 Remove jumpers attached in step 7.7.22.3.

*7.8.4 Reconnect leads TB-L4, terminals 10 and 11 (step 7.2.2) and TB-L4, terminals 13 and 14 (step 7.7.3).

*7.8.5 Reenergize LC-1003. Reinsert LQ-1003.

*7.8.6 Return all controller settings to their initial values.

NOTE: Proportional band may have a new setting if adjusted in step 7.7.15.

* 7.9 Notify the shift foreman that the test is complete.

FARLEY NUCLEAR PLANT
UNIT 1
INSTRUMENT MAINTENANCE PROCEDURE DATA PACKAGE IMP-224.2

REACTOR COOLANT DRAIN TANK LEVEL, LT-1003

1.0 Purpose

This data package is to be used in conjunction with procedure FNP-1-IMP-224.2 to record calibration data and provide calibration setpoints and tolerances.

2.0 References

2.1 Farley Nuclear Plant Precautions, Limitations and Set Points for Nuclear Steam Supply Systems.

2.2 Farley Nuclear Plant Process Instrumentation Accuracy Requirements and Guidelines, E-PCS-8327.

3.0 Procedure Sign-Off Sheet and Alteration Log

3.1 Initial the appropriate space in Table 1 as each step or section is completed in IMP-224.2.

3.2 Record any temporary alteration directed by attachments to IMP-224.2 on Table 2.

4.0 Test Results

4.1 ☐ Test completed satisfactory

4.2 ☐ Deficiencies occurred (see data sheets for explanation)

4.3 Time required for test _____ Procedure Rev. used ____

4.4 Test performed by _____ Date _____

4.5 Test reviewed by _____ Date _____

This data package consists of 7 pages. Rev. 0

STEP OR SECTION		INITIALS	STEP OR SECTION		INITIALS
6.0	Initial Conditions		7.3	Pwr. Sup Cal.	
7.1	Transmitter Cal		7.4	Indicator Cal.	
7.1.1	Open Equal Valve		7.5.2	Comparator Cal. HI.	
7.1.2	HP Root Valve		7.5.3	Comparator Cal. Low	
7.1.3	LP Root Valve		7.6	Comparator Cal.	
7.1.4	Vent HP Leg		7.7	Controller Cal.	
7.1.5	Drain Lines		7.8.1	Deenergize Ckt.	
7.1.6	Test Source		7.8.2	Remove Test Equip.	
7.1.7	Close Equal Valve		7.8.3	Remove Jumpers	
7.1.17	Replace Cap		7.8.4	Connect Leads	
7.1.18	Close Valve		7.8.5	Energize Ckt.	
7.1.19.1	Open Equal Valve		7.8.6	Controller Settings	
7.1.19.2	HP Root Valve		7.9	Notify Shift Foreman	
7.1.19.3	LP Root Valve				
7.1.19.5	Vent LP Leg				
7.2.1	Remove Pwr. Sup.				
7.2.2	Lift Leads				
7.2.3	Insert Pw. Sup.				

TABLE 1. PROCEDURE SIGNOFF

DESCRIPTION OF ALTERATION	ALTERED	RESTORED

TABLE 2. TEMPORARY ALTERATION LOG

Reactor Coolant Drain Tank Level, LT-1003

NUMBER: LT-1003 DESCRIPTION: DPT MANUFACTURER: Barton MODEL: 396/352

TEST EQUIPMENT NUMBER

SPECIAL INSTRUCTIONS

Test resistor is 10 ohm, 0.05% installed on transmitter terminal block

INPUT		OUTPUT				
	UNITS in. WC	UNITS mVDC	HIGH TOLERANCE +0.8	LOW TOLERANCE -0.8		
%	RANGE	REQUIRED	AS FOUND	ERROR	FINAL	ERROR
0	0.0	48.8				
25	5.4	79.8				
50	12.4	119.9				
75	19.4	160.1				
100	26.3	199.7				
75	19.4	160.1				
50	12.4	119.9				
25	5.4	79.8				
0	0.0	48.8				

SPECIAL CHECKS/REMARKS

7.1.10 AS FOUND VDC

7.1.10 FINAL VDC

Reactor Coolant Drain Tank Level, LT-1003

SPECIAL INSTRUCTIONS:

SIMULATE:			MONITOR: LI-1003			LOCATION: LWP Pnl.		MONITOR:			LOCATION:
	UNITS	UNITS VDC	UNITS %	HIGH TOLERANCE +2.0	LOW TOLERANCE -2.0	TYPE: West.		UNITS	HIGH TOLERANCE	LOW TOLERANCE	TYPE:
						STYLE:	152				STYLE:
%	RANGE	VARIABLE	REQUIRED	AS FOUND	ERROR	FINAL	ERROR	REQUIRED	AS FOUND	ERROR	FINAL / ERROR
0		1.0	0								
25		2.0	25								
50		3.0	50								
75		4.0	75								
100		5.0	100								
75		4.0	75								
50		3.0	50								
25		2.0	25								
0		1.0	0								

TEST EQUIPMENT NUMBER

SPECIAL CHECKS/REMARKS

Verified: Section Initials

AS FOUND	VDC	7.3.1
FINAL	VDC	7.3.3

SPECIAL CHECKS/REMARKS

Verified: Section Initials

SPECIAL INSTRUCTIONS:

SIMULATE:			MONITOR: LB-1003, HI			LOCATION: LWP		MONITOR: LB-1003, Low			LOCATION: LWP Pnl.	
	UNITS	UNITS	UNITS VDC	HIGH TOLERANCE +0.02	LOW TOLERANCE -0.02	TYPE: Foxboro		UNITS VDC	HIGH TOLERANCE +0.02	LOW TOLERANCE -0.02	TYPE: Foxboro	
%	RANGE	VARIABLE	REQUIRED	AS FOUND	ERROR	STYLE: 631-BT-0JER		REQUIRED	AS FOUND	ERROR	STYLE: 630-BT-0JER	
						FINAL	ERROR				FINAL	ERROR
			TRIP					TRIP				
75			4.00					1.48				
12												
			RESET					RESET				
			(Note 1)					(Note 2)				

TEST EQUIPMENT NUMBER

SPECIAL CHECKS/REMARKS

Verified: Section Initial:

NOTE 1: Reset is ACTUAL trip value MINUS 0.04 VDC

SPECIAL CHECKS/REMARKS

Verified: Section Initial:

NOTE 2: Reset is ACTUAL trip value PLUS 0.04 VDC

Reactor Coolant Drain Tank Level, LT-1003

SPECIAL INSTRUCTIONS:

SIMULATE:			MONITOR: LB-1003B			LOCATION: LHT Pnl.		MONITOR:			LOCATION:
	UNITS	UNITS	UNITS VDC	HIGH TOLERANCE +0.01	LOW TOLERANCE -0.01	TYPE: Foxboro STYLE:		UNITS	HIGH TOLERANCE	LOW TOLERANCE	TYPE: STYLE:
%	RANGE	VARIABLE	REQUIRED	AS FOUND	ERROR	FINAL	ERROR	REQUIRED	AS FOUND	ERROR	FINAL
			TRIP								
10			1.40								
			RESET								
			(Note 1)								

TEST EQUIPMENT NUMBER	SPECIAL CHECKS/REMARKS	SPECIAL CHECKS/REMARKS
	Verified: Section Initials	Verified: Section Initials
	NOTE 1: Reset is ACTUAL trip value PLUS 0.04 VDC	

Reactor Coolant Drain Tank Level, LT-1003

CONTROLLER: LT-1003 LOCATION: LWP Pnl. TYPE: Foxboro STYLE: 62H-5E-0J

SPECIAL INSTRUCTIONS:

SIMULATE:

	UNITS	UNITS VDC
%	RANGE	VARIABLE
		1.0
		2.0
		3.0
		4.0
		5.0
		4.0
		3.0
		2.0
		1.0

PROPORTIONAL OUTPUT DATA

UNITS VDC	HIGH TOLERANCE +0.02	LOW TOLERANCE -0.02	[redacted]	
REQUIRED	AS FOUND	ERROR	FINAL	ERROR
1.00				
2.00				
3.00				
4.00				
5.00				
4.00				
3.00				
2.00				
1.00				

STATIC OUTPUT DATA

UNITS	HIGH TOLERANCE	LOW TOLERANCE	[redacted]	
REQUIRED	AS FOUND	ERROR	FINAL	ERROR

TEST EQUIPMENT NUMBER

MISCELLANEOUS DATA

FUNCTION	REQUIRED	AS FOUND	ERROR	FINAL	ERROR
UPPER LIMIT VDC	5.0±1.02				
UPPER LIMIT %	100±5				
LOWER LIMIT VDC	1.0±0.02				
LOWER LIMIT %	0 ± 5				
SETPOINT	50%				

SWITCH/POTENTIOMETER SETTINGS

SWITCH/POT	AS FOUND	FINAL
PRO. BAND		
RESET		
RATE		
REV. SW.		

SPECIAL CHECKS/REMARKS: REFERENCE VOLTAGE (pins 13(+) to 42(-)) AS FOUND: FINAL

7.7.21 Functional Check

7.7.22 Derivative Check

Attachment (2)

SURVEILLANCE TEST PROCEDURE COVER SHEET

STP NO. O-27-1 TITLE RCS Leakage Evaluation

	Prepared By	Date	Reviewed By	Date	POSRC	Date	Approved By	Date
Original								
Revision #3	J Carroll	5/16/79	S Davis	5/16/79	79-56	5/16/79	[illegible]	5/17/79

PERFORMANCE OF SURVEILLANCE TEST

Approved [signature] Date 7-1-80
Shift Supervisor

TEST RESULTS

Test Results in Spec? YES ✓ NO ___ Malfunctions Indicated? YES ___ NO ✓
Adjustments Performed? YES ___ NO ✓ MR Submitted? YES ✓ NO ___

Remarks, Nature of Malfunctions, or Adjustments Performed and Results:

See

Test Completed By: [signature] Date 8-1-80

REVIEW OF COMPLETED TEST

Follow up Action : ___

Foreman/Shift Supervisor [signature] Date 8-1-80
Action Taken or Analysis Results: ___

Surveillance Test Engineer [signature] Date 8/1/80

*POSRC ___ Meeting ___ Date ___

*Approved ___ Date ___
Chief Engineer

*Required only if changes made to procedure

Note: Use back of sheet for additional comments

B/2.

STP-0-27-1 REACTOR COOLANT SYSTEM LEAKAGE EVALUATION

I. GENERAL PRECAUTIONS

1. The Reactor Coolant System leakage rate must be in accordance with Tech. Spec. 3.1 - E.
2. If emergency boration has taken place, the amt. of makeup to the RCS must be estimated and added to the total makeup for the day, or a new set of initial data must be taken.

II. GROSS LEAKAGE EVALUATION

A. Initial Conditions

1. System pressure is 2250 psia.
2. The following data is available:
   a. From start of time interval under consideration
      (a) Tave
      (b) Volume Control Tank Level
      (c) Diversion flow integrator reading
      (d) Pressurizer level
   b. At the time of determination
      (a) Tave
      (b) Volume control tank level
      (c) Diversion flow integrator reading
      (d) Pressurizer level
   c. The amount of Reactor Coolant System makeup in last 24 hours.

B. Procedure

1. Compute the gross Reactor Coolant System leakage, in Ft. 3 for any length of time from the following formula (specific volumes are listed in Table 1.):

- NOTE -

Subtract any makeup flow not sent the RCS or VCT. (i.e. makeup to RWT, etc).

GROSS RCS LEAKAGE (Ft^3 @ 120°F) =

$$\left[154.6\ \frac{(V_1-V_o)}{V_1V_o}\right] + \left[\frac{M/u\text{-}Div}{7.480}\right] - \left[2.491\ (LP1-LP0)\right] - \left[3.651\ (LV1-LV0)\right]$$

Where: V_o = Specific volume at previous Tave

V_1 = Specific volume at present Tave

M/u = Gallons of Make-up

Div = Gallons of letdown diverted

LP0 = Previous pressurizer level (in.)

LP1 = Present pressurizer level (in.)

LV0 = Previous VCT level

LV1 = Present VCT level

2. Change the leakage obtained in Step 1 to GPM by:

a. $GPM = \frac{ft^3}{t}\ (0.1247)$

Where:

ft^3 = Leakage from Step 1

t = Time interval in hours between sets of data

- NOTE -

If time interval is 24 hours use:

$GPM = Ft^3\ (5.195 \times 10^{-3})$

Specific volumes are given in Table 1

III. DAILY DETERMINATION OF REACTOR COOLANT SYSTEM LEAKAGE TO THE REACTOR COOLANT DRAIN TANK

A. Initial Conditions

1. The R.C. Drain Pump is not running. Not draining RC Drn Tank.
2. NSSS Temperature is greater than 532°F.
3. The regenerative heat exchanger drains (CVC-193, CVC-194, CVC-318, and CVC-319) are shut.
4. The safety injection leakage isolation valve (SI-661) is shut.
5. Draining from the Reactor Coolant System is not in progress.
6. Draining of the quench tank is not in progress.
7. Reactor Coolant Pump controlled bleed-off is aligned to the VCT and the RCP controlled bleed-off relief (CVC-199-RV) is shut.
8. The following reliefs have not lifted:
   A. RCP 11A Component Cooling Water Relief (CC-3835)
   B. RCP 11B Component Cooling Water Relief (CC-3836)
   C. RCP 12A Component Cooling Water Relief (CC-3837)
   D. RCP 12B Component Cooling Water Relief (CC-3838)

- NOTE -

The major sources of leakage to the reactor coolant drain tank is from valve stem leakoff and the reactor coolant pump vapor seals.

B. Procedure

1. Observe the R.C. drain tank level for a period of six (6) hours.
2. From the change in level and Table 2 compute the volume change in the Reactor Coolant drain tank.
3. To obtain the valve stem leak rate in G.P.M. divide the value from Step 2 by 360.

IV. NET LEAKAGE EVALUATION

A. Initial Conditions

1. Section II & III of this STP have been performed.

B. Procedure

Subtract value of reactor coolant system leakage to the reactor coolant drain tank from the value obtained in Section II.

TABLE 1

$V\left(\frac{ft^3}{LBM}\right)$ at 2250 PSIA

TEMP °F	V	TEMP °F	V
530	0.02079	553	0.02143
531	0.02082	554	0.02146
532	0.02084	555	0.02149
533	0.02087	556	0.02152
534	0.02089	557	0.02155
535	0.02092	558	0.02158
536	0.02095	559	0.02161
537	0.02097	560	0.02164
538	0.02100	561	0.02167
539	0.02102	562	0.02171
540	0.02105	563	0.02174
541	0.02108	564	0.02177
542	0.02111	565	0.02180
543	0.02114	566	0.02184
544	0.02117	567	0.02187
545	0.02120	568	0.02190
546	0.02122	569	0.02194
547	0.02125	570	0.02197
548	0.02128	571	0.02201
549	0.02131	572	0.02204
550	0.02134	573	0.02208
551	0.02137	574	0.02211
552	0.02140	575	0.02215

TABLE 2 - R.C.C. DIGEST DATA

DEPTH - IN.	VOL. IN GAL.	DEPTH - IN.	VOL. IN GAL.
1	3.76	28	494.23
2	10.56	29	517.04
3	19.20	30	539.60
4	29.66	31	562.06
5	41.28	32	584.22
6	54.38	33	607.45
7	68.36	34	628.47
8	83.54	35	650.17
9	99.43	36	671.61
10	115.98	37	692.59
11	133.52	38	713.27
12	151.80	39	733.64
13	170.37	40	753.44
14	189.77	41	772.84
15	209.58	42	791.41
16	229.94	43	809.69
17	250.62	44	827.23
18	271.60	45	843.78
19	293.04	46	859.67
20	314.74	47	874.85
21	336.76	48	888.82
22	358.99	49	901.93
23	381.15	50	913.55
24	403.61	51	924.01
25	426.17	52	932.65
26	448.98	53	939.45
27	471.60	54	943.21

Rev. 1

MONTH July YEAR 1980

UNIT # Two ONE

STP O-27-4 REACTOR COOLANT LEAKAGE EVALUATION

T0192 L0226 SECTION II L0110X(Y) SECTION III SECT. IV

DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	II
PRIOR DATA	570.6	77	41357	3277-	176 .4	220	3.--	.---	14"	0050	31"	3.13	0.57	
1 0100	571.81	72.9	42061	322 4630	17- .0	221.0	3.567	2250	15"	0105	33"	2.641	0.708	
2 0100	570.56	75	42061	3229560	176210	220	3.583	2205	16"	0105	33	3.146	.437	
3 0100	569.75	61.0	42061	323 4618	176 5--	220.2	3.639	2325	13.5"	0125	31"	3.183	0.546	
4 0100	570.12	78	44077	3242040	176496	220	3.653	2250	14"	0050	32	3.287	.366	
5 0100	571.06	71	45761	3248840	---	219	3.174	2240	17"	0020	31	3.114	.666	
6 0100	566.3	74.8	46386	3254980	176727	220.2	3.770	2300	14"	0110	33	3.213	0.56	
7 0100	570.81	75	49982	3263970	176854	220	3.895	2325	14½	0120	32	3.20	0.695	

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

COMMENTS:

[illegible]

DATE 7-2-80 [illegible]

DATE 7-3-80 [illegible]

DATE 7-4-80 [illegible]

DATE 7-5-80 C. L. Dunbar

DATE 7-6-80 C. L. Dunbar

DATE 7-7-80 C. L. Dunbar

MONTH _____ YEAR _____

STP O-27-A REACTOR COOLANT LEAKAGE EVALUATION

UNIT # I

T0192 L0226 SECTION II L0110X(Y) SECTION III SECT. IV

DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	II
PRIOR DATA	570.81	75	49982	3263770	176805	220	3.895							
8 0100	570.94	77.4	49982	3269830	176852	218.6	4.08	2305	14"	0105	32"	3.28	0.8	
9 0100	562.19	81.4	50961	3281050	178245	201.7	4.03	2300	13.5"	0100	32"	3.36	0.67	
10 0100	574.81	82.5	56798	3292270	178427	207.2	3.90	2325	14"	0125	32"	3.28	0.62	
11 0100	571.06	75	60375	3300810	178577	219	3.75	2310	14"	0110	31	3.10	.75	
12 0100	570.49	79	64890	3310810	178701	220	3.83	2250	15.5"	0110	35	3.07	.76	
13 0100	571.94	14.4	67689	3319160	178759	212.6	3.87	2255	14	0105	32	3.03	.84	
14 0100	[illegible]	82	67689	[illegible]	[illegible]	221	3.71	[illegible]	13	0110	31	3.01	.70	

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

7-8-80 C. Dunlevy

DATE 7-9-80 C. Dunlevy

DATE [illegible]

DATE 7-11-80 J.Z Brown

DATE 7-12-80 J. Noel

DATE 7-13-80 [illegible]

DATE 7-14-80 C. Dunlevy

COMMENTS:

MONTH JULY YEAR 80

UNIT # 1

STP O-27-1 REACTOR COOLANT LEAKAGE EVALUATION

T0192 L0226 SECTION II L0110X/0 SECTION III SECT. IV

DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	
PRIOR DATA	571.7	82	67089	3324550	[illegible]	[illegible]	3.71							
15 0100	570.2	70.1	69589	3331360	178859	220.4	3.69	[illegible]	14"	0105	33"	3.09	0.60	[illegible]
16 0100	570.5	71	69829	3339086	179395	220	3.67	2300	15"	0120	35"	3.14	0.53	[illegible]
17 0100	565.7	73	70415	3345120	179506	209	3.718	2300	13"	0107	32	3.258	0.46	[illegible]
18 0100	566.5	80	75535	3355400	179[illegible]	213	3.61	2305	13"	0105	40	3.24	0.37	[illegible]
19 0100	572.8	71.8	77532	3367[illegible]	180[illegible]	[illegible]	3.73	2315	13"	0115	30.5	3.171	0.56	[illegible]
20 0100	570.91	71	78546	3371[illegible]	[illegible]	220	3.64	[illegible]	13	0200	42	3.36	0.30	[illegible]
21 0100	570.5	73	78988	3379220	180764	220	3.73	2300	13"	0100	31	3.26	0.47	[illegible]

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

7-15-80 C. Dunkelberg

DATE 7-16-80 C. Dunkelberg

DATE 7-17-80 C. Dunkelberg

DATE 7-18-80 C. Dunkelberg

DATE 7-19-80 K. S. Miller

DATE 7-20-80 [illegible]

DATE 7-21-80 [illegible]

COMMENTS:

7-15-80 Filled HEWT 2680 gal

7-1 FILLED HEWT 2729 gal.

MONTH JULY YEAR 80

UNIT # 1

STP O-27-1 REACTOR COOLANT LEAKAGE EVALUATION

T0192 L0226 SECTION II L0110X/0 SECTION III SECT. IV

DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	II
PRIOR DATA	570.8	73	78788	3319220	180134	220	3.73					3.26	0.47	
22 0100	570.87	74	71057	32[illegible]	[illegible]	220	3.77	2305	13	0225	44	3.28	0.49	
23 0100	570.75	68	79053	3381[illegible]	180[illegible]	220	3.74	2305	13.5	0110	32	3.23	0.51	
24 0100	568.75	66	79053	3375120	180731	217	3.70	2255	13	2155	40	3.23	0.47	
25 0100	570.5	80	83566	3405140	180999	221	3.64	2300	14	0235	44.5	3.00	0.64	
26 0100	570.5	73	83675	3410340	181036	220	3.698	2255	13"	0110	33	3.238	0.46	
27 0100	[illegible]	75	86989	3[illegible]	[illegible]	221	3.161	2300	14"	0100	32	3.287	0.874	
28 0100	570.06	75.2	90952	3428030	181265	218	3.647	2250	13"	0100	33	3.23	0.409	

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

7-27-80 D Schmeltz

DATE [illegible]

DATE 7-24-80 D Schmeltz

DATE 7-25-80 D Hoover

DATE 7-25-80 J.C. [illegible]

DATE 7-27-80 L Zywiec

DATE 7-28-80 Mark Hunter

COMMENTS:

MONTH July YEAR 80

UNIT # 1

STP 0-27 REACTOR COOLANT LEAKAGE EVALUATION

T0192 L0226 SECTION II L0110(Y) SECTION III SECT. IV

DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE
PRIOR DATA	570.01	75.4	90952	34280[illegible]0	181[illegible]65	221.3	3.647						.409
29 0100	570.5	74	91859	34[illegible]4130	[illegible]	221	3.6[illegible]8	[illegible]30	13.5	010[illegible]	31	3.18	.57
30 0100	[illegible]	67	92121	3443[illegible]60	18213[illegible]	[illegible]	3.[illegible]64	2300	13	[illegible]	[illegible]	3.356	0.408
31 0100	571.31	78	94863	34[illegible]2250	18[illegible]2	215	3.713	2255	14	0050	32	3.287	.426
0100													
0100													
0100													
0100													

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

Mark Hunter 7-27-80
DATE

[illegible] 7-30-80
DATE

[illegible] 7-31-80
DATE

DATE

DATE

DATE

DATE

COMMENTS: 7-31-80 1025 Filled RCDT to 4220 to get total 5058

Date/ Time	Tave	VCT Level	Integrated Diversion	Pzr. Level	Integrated Make-up	Gross Leakage	Net Leakage
7-30-83 2100	570.81	71.8	77.57	[illegible]6	336760 180 661	—	—

TABLE 1

$V\ \left(\frac{ft^3}{LBM}\right)$ at 2250 PSIA

TEMP °F	V	TEMP °F	V
530	0.02079	553	0.02143
531	0.02082	554	0.02146
532	0.02084	555	0.02149
533	0.02087	556	0.02152
534	0.02089	557	0.02155
535	0.02092	558	0.02158
536	0.02095	559	0.02161
537	0.02097	560	0.02164
538	0.02100	561	0.02167
539	0.02102	562	0.02171
540	0.02105	563	0.02174
541	0.02108	564	0.02177
542	0.02111	565	0.02180
543	0.02114	566	0.02184
544	0.02117	567	0.02187
545	0.02120	568	0.02190
546	0.02122	569	0.02194
547	0.02125	570	0.02197
548	0.02128	571	0.02201
549	0.02131	572	0.02204
550	0.02134	573	0.02208
551	0.02137	574	0.02211
552	0.02140	575	0.02215

TABLE 2 - R.C. DRAIN TANK

DEPTH - IN.	VOL. IN GAL.	DEPTH - IN.	VOL. IN GAL.
1	3.76	28	494.23
2	10.56	29	517.04
3.	19.20	30	539.60
4	29.66	31	562.06
5	41.28	32	584.22
6	54.38	33	607.45
7	68.36	34	628.47
8	83.54	35	650.17
9.	99.43	36	671.61
10	115.98	37	692.59
11	133.52	38	713.27
12	151.80	39	733.64
13	170.37	40	753.44
14	189.77	41	772.84
15	209.58	42	791.41
16	229.94	43	809.69
17	250.62	44	827.23
18	271.60	45	843.78
19	293.04	46	859.67
20	314.74	47	874.85
21	335.76	48	888.82
22	358.99	49	901.93
23	381.15	50	913.55
24	403.61	51	924.01
25	426.17	52	932.65
26	448.98	53	939.45
27	471.60	54	943.21

MONTH _____ YEAR _____

STP 0-27-1 REACTOR COOLANT LEAKAGE EVALUATION

UNIT # _____

	T0192 - L0226	SECTION II			L0110X/Y			SECTION III					SECT. IV	
DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	INIT
PRIOR DATA														
22 0100														
23 0100														
24 0100														
25 0100														
26 0100														
27 0100														
28 0100														

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

COMMENTS:

_____

DATE

_____

DATE

_____

DATE

_____

DATE

_____

DATE

_____

DATE

_____

DATE

MONTH _____ YEAR _____

STP 0-27-1 REACTOR COOLANT LEAKAGE EVALUATION

UNIT # _____

	T0192 L0226	SECTION II			L0110X/Y		SECTION III					SECT. IV	
DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	
PRIOR DATA														
29 0100														
30 0100														
31 0100														
0100														
0100														
0100														
0100														

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

COMMENTS:

_____
DATE

_____
DATE

_____
DATE

_____
DATE

_____
DATE

_____
DATE

_____

Attachment (2)

SURVEILLANCE TEST PROCEDURE COVER SHEET

STP NO. 0-27-1 TITLE RCS Leakage Evaluation

	Prepared By	Date	Reviewed By	Date	POSRC	Date	Approved By	Date
Original								
Revision #3	J Collins	5/16/79	S Davis	5/16/79	79-56	5/16/79	[illegible]	5/17/79

PERFORMANCE OF SURVEILLANCE TEST

Approved _____ Date _____
Shift Supervisor

TEST RESULTS

Test Results in Spec? YES ___ NO ___ Malfunctions Indicated? YES ___ NO ___

Adjustments Performed? YES ___ NO ___ MR Submitted? YES ___ NO ___

Remarks, Nature of Malfunctions, or Adjustments Performed and Results:

_____

_____

_____

_____

_____

_____

Test Completed By: _____ Date _____

REVIEW OF COMPLETED TEST

Follow up Action : _____

_____

_____

Foreman/Shift Supervisor _____ Date _____

Action Taken or Analysis Results: _____

_____

_____

_____

Surveillance Test Engineer _____ Date _____

*POSRC _____ Meeting _____ Date _____

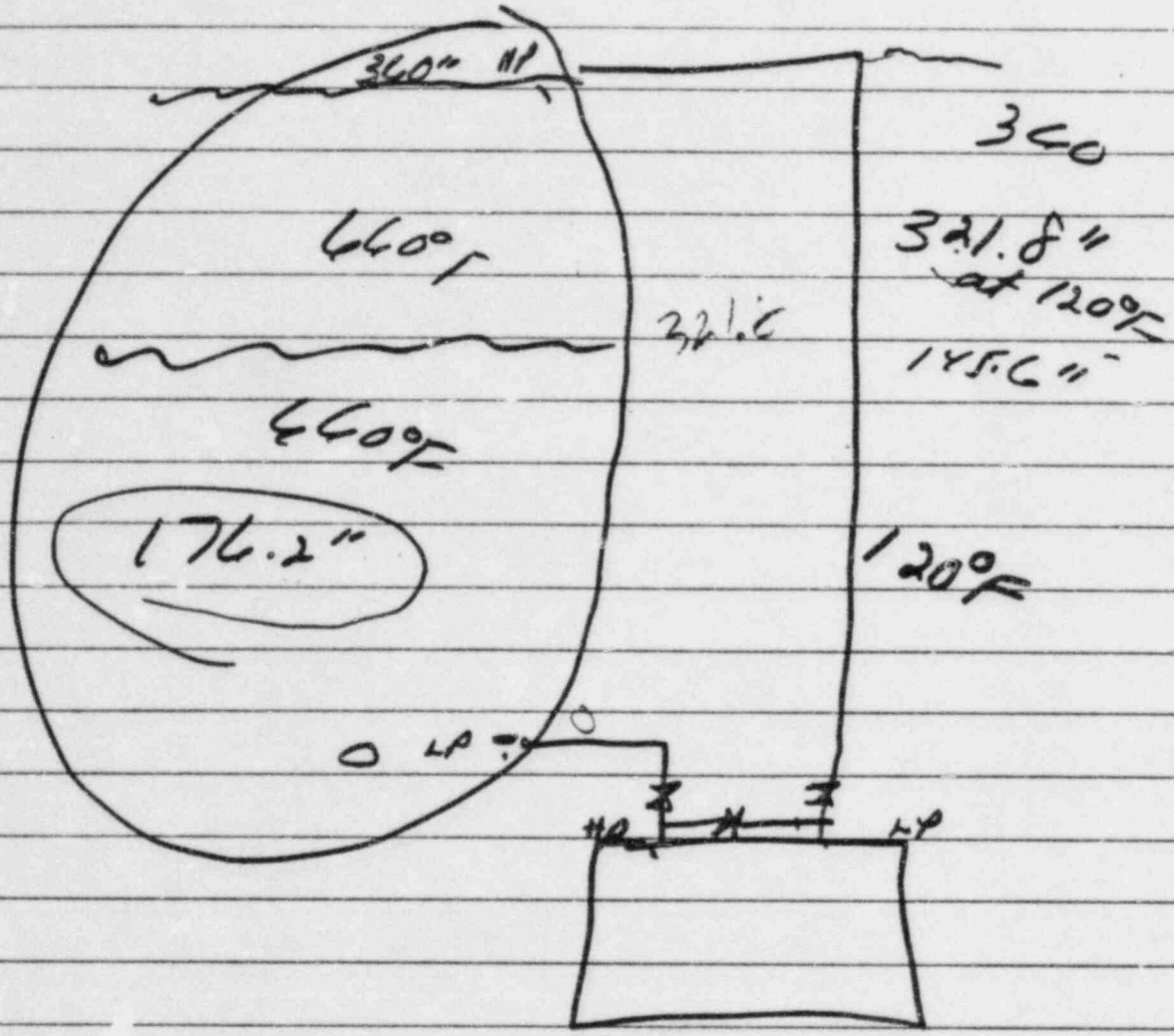
*Approved _____ _____ Date _____
Chief Engineer

*Required only if changes made to procedure

Note: Use back of sheet for additional comments

STP - O - 27-1 REACTOR COOLANT SYSTEM LEAKAGE EVALUATION

Date/ Time	Tave	VCT Level	Integrated Diversion	Pzr. Level	Integrated Make-up	Gross Leakage	Net Leakage



~~HHC~~

145.6"

321.8"

145.6

176.2

20.00 mode

4 mode

321.8

145.6

17.2

ENCLOSURE D: PLANT PROCEDURE AND PRACTICE (WOODRUFF)

RCS LEAKAGE DATA SHEET

Data Sheet Rev. 2

INSTRUMENT (MCB)	NAME / TIME	INITIAL READING	FINAL READING	FINAL - INITIAL
	TIME			A = 60 Minutes
TI-453	Pressurizer Temperature	°F	°F	No Change Allowed
PI-455 PI-456 PI-457	Pressurizer Pressure (Avg. of Readings)	2231 PSIG	2231 PSIG	No Change Allowed
TI-411A TI-421A TI-431A	RCS Temperature TAVG. (Avg. of Readings)	568 °F	568 °F	No Change Allowed
LI-459 LI-460 LI-461	Pressurizer Level (Avg. of Readings)	44 %	43 %	B = 93.66 x Δ% = -93.66 Gal.
LI-115	VCT Level	61 %	57 %	C = 14.06 x Δ% = -56.24 Gal.
LI-1003 (Waste Panel)	RCDT Level	21 % 79 *Gal.	22 % 83 *Gal.	D = 4 Gal.
LI-470	PRT Level	70 % *Gal.	70 % *Gal.	E = 0 Gal.
FIS-168	RMW/Total Flow Batch Integrator	462494 Gal. Gal. Gal.	462494 Gal. Gal. Gal.	F = 0 Gal. Dilution and Blended Makeup
FIS-113	Boric Acid Batch Integrator	060589 Gal. Gal. Gal.	060589 Gal. Gal. Gal.	G = 0 Gal. Boration Only

*From Tank Curve Book

Total Leakage = $\frac{F + G - B - C}{A}$ = 2.50 GPM

*Identified Leakage = $\frac{D + E}{A}$ = 0.07 GPM

*Unidentified Leakage = Total Leakage − Identified Leakage − Other Leakage (Note 1) = 2.43 GPM

OTHER LEAKAGE

Source	RATE (GPM)
(TOTAL)	0

NOTE 1: Identified Leakage does not include leakage which may be known to exist such as steam generator tube leakage.

ENCLOSURE E: PLANT PROCEDURE (MODIFIED)

Data Sheet
Rev. 2

RCS LEAKAGE DATA SHEET

INSTRUMENT (NCB)	NAME TIME	INITIAL READING	FINAL READING	FINAL - INITIAL Δ = 60 Minutes
TI-453	Pressurizer Temperature	°F	°F	No Change Allowed
PI-455 PI-456 PI-457	Pressurizer Pressure (Avg. of Readings)	2231 PSIG	2231 PSIG	No Change Allowed
TI-411A TI-421A TI-431A	RCS Temperature TAVG. (Avg. of Readings)	568 °F	568 °F	No Change Allowed
LI-459 LI-460 LI-461	Pressurizer Level (Avg. of Readings)	43.6 %	43.2 %	B = 93.66 x Δ% = -37.46 Gal.
LI-115	VCT Level	60.6 %	57.1 %	C = 14.06 x Δ% = -49.21 Gal.
LI-1003 (Waste Panel)	RCDT Level	21.0 % 79 *Gal.	22.0 % 83 *Gal.	D = 4 Gal.
LI-470	PRT Level	70.0 % *Gal.	70.0 % *Gal.	E = Gal.
FIS-168	RMW/Total Flow Batch Integrator	462494 Gal. Gal. Gal.	462494 Gal. Gal. Gal.	Dilution and Blended F = Gal. Makeup
FIS-113	Boric Acid Batch Integrator	060589 Gal. Gal. Gal.	060589 Gal. Gal. Gal.	G = Gal. Boration Only

*From Tank Curve Book

Total Leakage = $\frac{F + G - B - C}{\Delta}$ = = 1.44 GPM

*Identified Leakage = $\frac{D + E}{\Delta}$ = = 0.07 GPM

*Unidentified Leakage = Total Leakage − Identified Leakage − Other Leakage (Note 1) = 1.37 GPM

OTHER LEAKAGE

Source	RATE (GPM)
(TOTAL)	0

NOTE 1: Identified Leakage does not include leakage which may be known to exist such as steam generator tube leakage.

STP-O-27-1 REACTOR COOLANT SYSTEM LEAKAGE EVALUATION

I. GENERAL PRECAUTIONS

1. The Reactor Coolant System leakage rate must be in accordance with Tech. Spec. 3.1 - E.
2. If emergency boration has taken place, the amt. of makeup to the RCS must be estimated and added to the total makeup for the day, or a new set of initial data must be taken.

II. GROSS LEAKAGE EVALUATION

A. Initial Conditions

1. System pressure is 2250 psia.
2. The following data is available:
   a. From start of time interval under consideration
      (a) Tave
      (b) Volume Control Tank Level
      (c) Diversion flow integrator reading
      (d) Pressurizer level
   b. At the time of determination
      (a) Tave
      (b) Volume control tank level
      (c) Diversion flow integrator reading
      (d) Pressurizer level
   c. The amount of Reactor Coolant System makeup in last 24 hours.

B. Procedure

1. Compute the gross Reactor Coolant System leakage, in Ft. 3 for any length of time from the following formula (specific volumes are listed in Table 1.):

- NOTE -

Subtract any makeup flow not sent the RCS or VCT. (i.e. makeup to PWT, etc).

GROSS RCS LEAKAGE (Ft^3 @ 120°F) =

$$\left[\frac{154.6\ (V_1 - V_o)}{V_1 V_o}\right] + \left[\frac{M/u - Div}{7.480}\right] - \left[2.491\ (LP1 - LPO)\right] - \left[3.651\ (LV1 - LVO)\right]$$

Where: V_o = Specific volume at previous Tave

V_1 = Specific volume at present Tave

M/u = Gallons of Make-up

Div = Gallons of letdown diverted

LPO = Previous pressurizer level (in.)

LP1 = Present pressurizer level (in.)

LVO = Previous VCT level

LV1 = Present VCT level

2. Change the leakage obtained in Step 1 to GPM by:

a. $GPM = \frac{ft^3}{t}\ (0.1247)$

Where:

ft^3 = Leakage from Step 1

t = Time interval in hours between sets of data

- NOTE -

If time interval is 24 hours use:

$GPM = Ft^3\ (5.195 \times 10^{-3})$

Specific volumes are given in Table 1

IV. NET LEAKAGE EVALUATION

A. Initial Conditions

1. Section II & III of this STP have been performed.

B. Procedure

Subtract value of reactor coolant system leakage to the reactor coolant drain tank from the value obtained in Section II.

III. DAILY DETERMINATION OF REACTOR COOLANT SYSTEM LEAKAGE TO THE REACTOR COOLANT DRAIN TANK

A. Initial Conditions

1. The R.C. Drain Pump is not running. Not draining RC Drn Tank.
2. NSSS Temperature is greater than 532°F.
3. The regenerative heat exchanger drains (CVC-193, CVC-194, CVC-318, and CVC-319) are shut.
4. The safety injection leakage isolation valve (SI-661) is shut.
5. Draining from the Reactor Coolant System is not in progress.
6. Draining of the quench tank is not in progress.
7. Reactor Coolant Pump controlled bleed-off is aligned to the VCT and the RCP controlled bleed-off relief (CVC-199-RV) is shut.
8. The following reliefs have not lifted:
   A. RCP 11A Component Cooling Water Relief (CC-3835)
   B. RCP 11B Component Cooling Water Relief (CC-3836)
   C. RCP 12A Component Cooling Water Relief (CC-3837)
   D. RCP 12B Component Cooling Water Relief (CC-3838)

- NOTE -

The major sources of leakage to the reactor coolant drain tank is from valve stem leakoff and the reactor coolant pump vapor seals.

B. Procedure

1. Observe the R.C. drain tank level for a period of six (6) hours.
2. From the change in level and Table 2 compute the volume change in the Reactor Coolant drain tank.
3. To obtain the valve stem leak rate in G.P.M. divide the value from Step 2 by 360.

Table 4-8

Reactor Coolant Piping Parameters

Number of loops	2
Flow per loop, lb/hr	61×10^6
Pipe Size	
Reactor outlet, ID, in.	42
Reactor inlet, ID, in.	30
Surge line, nominal, in.	12
Design Pressure, psia	2500
Design Temperature, °F	650
Velocity Hot leg, ft/sec	42
Velocity Cold leg, ft/sec	37

The reactor coolant piping is designed and fabricated in accordance with the rules and procedures of ANSI B31.7, Class I. The anticipated transients listed in Section 4.2.1 form the basis for the required fatigue analysis to insure an adequate useage factor.

The reactor coolant piping is fabricated from SA516-GR70 carbon steel mill clad internally with type 304L stainless steel. A minimum clad thickness of 1/8 inch is maintained. The 12-inch surge line is fabricated from ASTM A351 Gr CF8M alloy steel. 2

Thermal sleeves are installed in the surge nozzle, charging nozzles and shutdown cooling inlet nozzle to reduce thermal shock effects from auxiliary systems. Clad sections of piping are fitted, where necessary, with safe ends for field welding to stainless steel components.

The piping is shop fabricated and shop welded into subassemblies to the greatest extent practicable to minimize the amount of field welding. Fabrication of piping and subassemblies is done by shop personnel experienced in making large heavy wall welds. Welding procedures and operations meet the requirements of Section IX of the ASME Boiler and Pressure Vessel Code. All welds are 100 percent radiographed and liquid-penetrant tested and all reactor coolant piping penetrations are attached in accordance with the requirements of ANSI B31.7. Cleanliness standards consistent with nuclear service are maintained during fabrication and erection.

4.3.5 PRESSURIZER

The pressurizer maintains reactor coolant system operating pressure and compensates for changes in coolant volume during load changes. Table 4-9 gives design parameters for the pressurizer. The pressurizer is shown in Figure 4-8.

Table 4-9

Pressurizer Parameters

Design Pressure, psia	2,500
Design Temperature, °F	700
Normal Operating Pressure, psia	2250
Normal Operating Temperature, °F	653
Internal Free Volume, ft^3	1500
Normal Operating Water Volume, ft^3	600-800
Normal Steam Volume, Full Power, ft^3	700-900
Installed Heater Capacity, kw	1500
Spray Flow, Maximum, gpm	375
Spray Flow, Continuous, gpm	1.5
Nozzles	
Surge Line (1 ea) nominal, in.	12
Safety and Relief Valves (2) ID, in.	4
Spray (1 ea) nominal, in.	4
Heaters (120 ea) OD, in.	0.875
Instrument, Level (4 ea) nominal, in.	1
Temperature (1 ea) nominal, in.	1
Pressure (2 ea) nominal, in.	1
Materials	
Vessel	A-533, Gr B, Class 1
Cladding	Stainless Steel* and Ni-Cr-Fe Alloy
Dimensions	
Overall Length, in.	441 3/8
Outside Diameter, in.	106 1/2
Inside Diameter, in.	95 9/16
Cladding Thickness, in. (minimum)	1/8
Dry Weight, Including Heaters, lb	206,000
Flooded Weight, Including Heaters, lb	300,000

*Weld deposited type 308-309 stainless steel composition with type 308 in contact with coolant.

REACTOR COOLANT SYSTEM

REACTOR COOLANT SYSTEM LEAKAGE

LIMITING CONDITION FOR OPERATION

3.4.6.2 Reactor Coolant System leakage shall be limited to:

a. No PRESSURE BOUNDARY LEAKAGE,

b. 1 GPM UNIDENTIFIED LEAKAGE,

c. 1 GPM total primary-to-secondary leakage through steam generators, and

d. 10 GPM IDENTIFIED LEAKAGE from the Reactor Coolant System.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With any PRESSURE BOUNDARY LEAKAGE, be in at least HOT STANDBY within 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With any Reactor Coolant System leakage greater than any one of the above limits, excluding PRESSURE BOUNDARY LEAKAGE, reduce the leakage rate to within limits within 4 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.4.6.2 Reactor Coolant System leakages shall be demonstrated to be within each of the above limits by:

a. Monitoring the containment atmosphere particulate radioactivity at least once per 12 hours,

b. Monitoring the containment sump discharge frequency at least once per 12 hours,

c. Performance of a Reactor Coolant System water inventory balance at least once per 72 hours during steady state operation except when operating in the shutdown cooling mode, and

4.2 DESIGN BASIS

4.2.1 DESIGN PARAMETERS

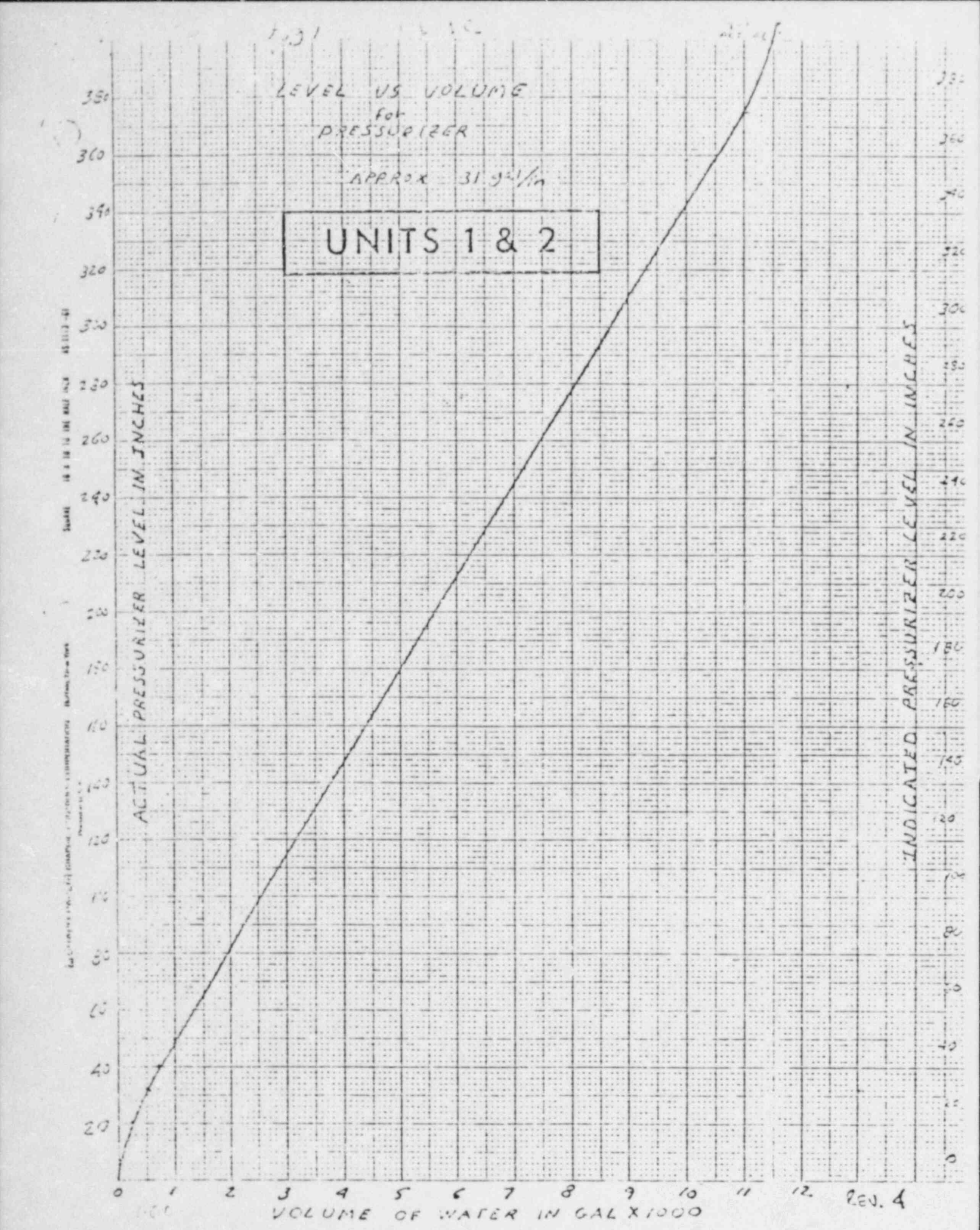
The reactor coolant system will operate initially at a power level of 2570 Mwt but it is anticipated that the conservatively designed system will be capable of attaining higher power levels. For this reason, the major systems and components which bear significantly on the acceptability of the site have been evaluated for operation at a power level of 2700 Mwt. The principal design parameters for the reactor coolant system are listed in Table 4-1. The design parameters for each of the major components are given in Section 4.3 for each individual component. The reactor coolant system is designated a Class 1 system for seismic design and is designed to the criteria for load combinations and stresses which are presented in Table 4-2.

Table 4-1

Principal Design Parameters Of Reactor Coolant System

Design Thermal Power, Mwt	2570
Btu/hr	8.73×10^9
Design Pressure, psia	2500
Design Temperature (Except Pressurizer), °F	650
Coolant Flow Rate, lb/hr	122×10^6
Cold Leg Temperature, Operating, °F	544.5
Average Temperature, Maximum, °F	572.5
Hot Leg Temperature, Maximum, °F	599.4
Normal Operating Pressure, psia	2250
System Volume, ft^3 (Without Pressurizer)	9601
Pressurizer Water Volume, ft^3	800
Pressurizer Steam Volume, ft^3	700

The system design temperature and pressure are conservatively established and exceed the combined normal operating value and the change due to anticipated operating transients. They include the effects of instrument error and the response characteristics of the control system. The change due to the anticipated transients also considers the effect of reactor core thermal lag, coolant transport time, system pressure drop and the characteristics of the safety and relief valves.


LEVEL VS VOLUME
for
PRESSURIZER
APPROX 31 gal/in
UNITS 1 & 2
ACTUAL PRESSURIZER LEVEL IN INCHES
INDICATED PRESSURIZER LEVEL IN INCHES
VOLUME OF WATER IN GAL X 1000
REV. 4

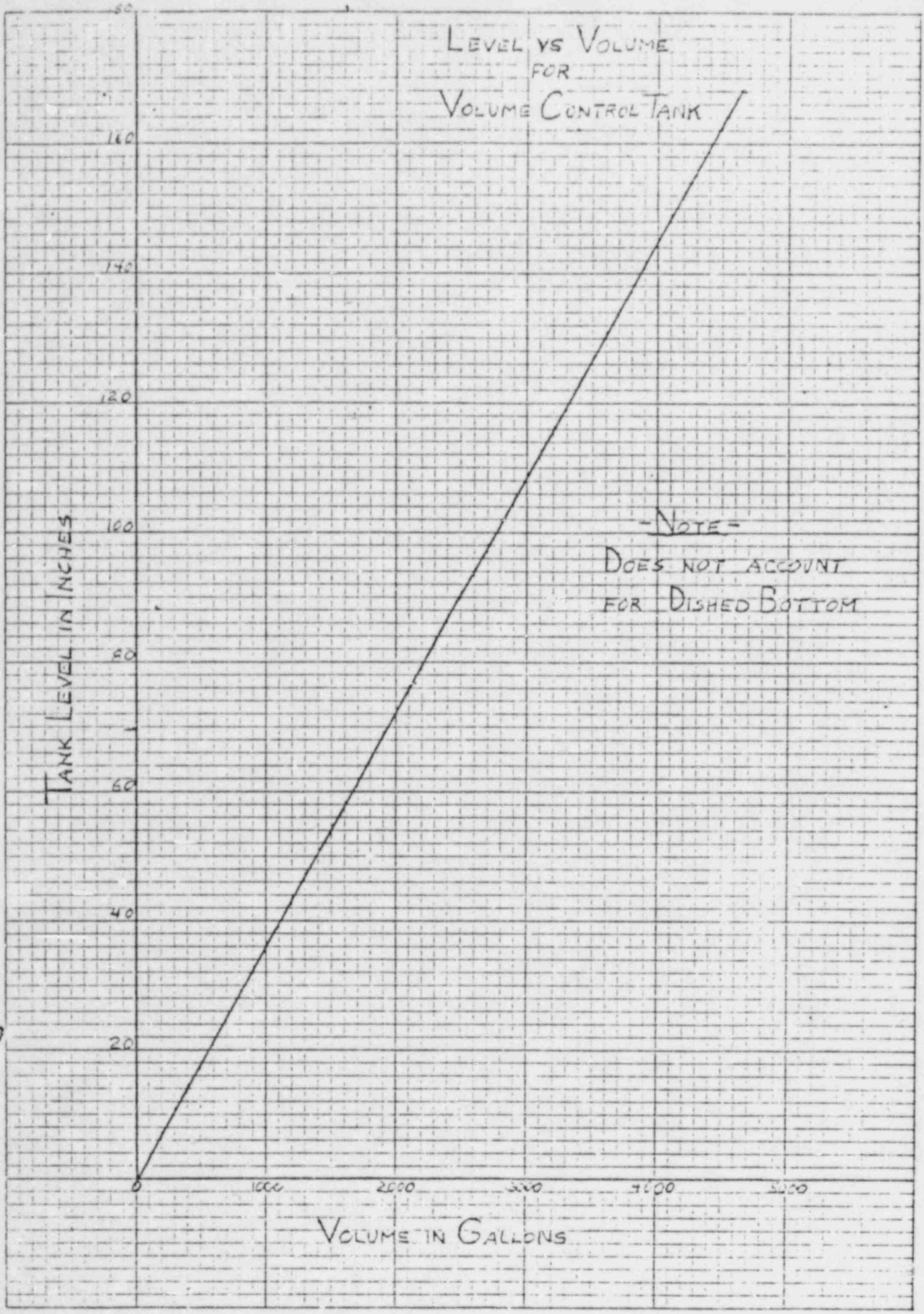
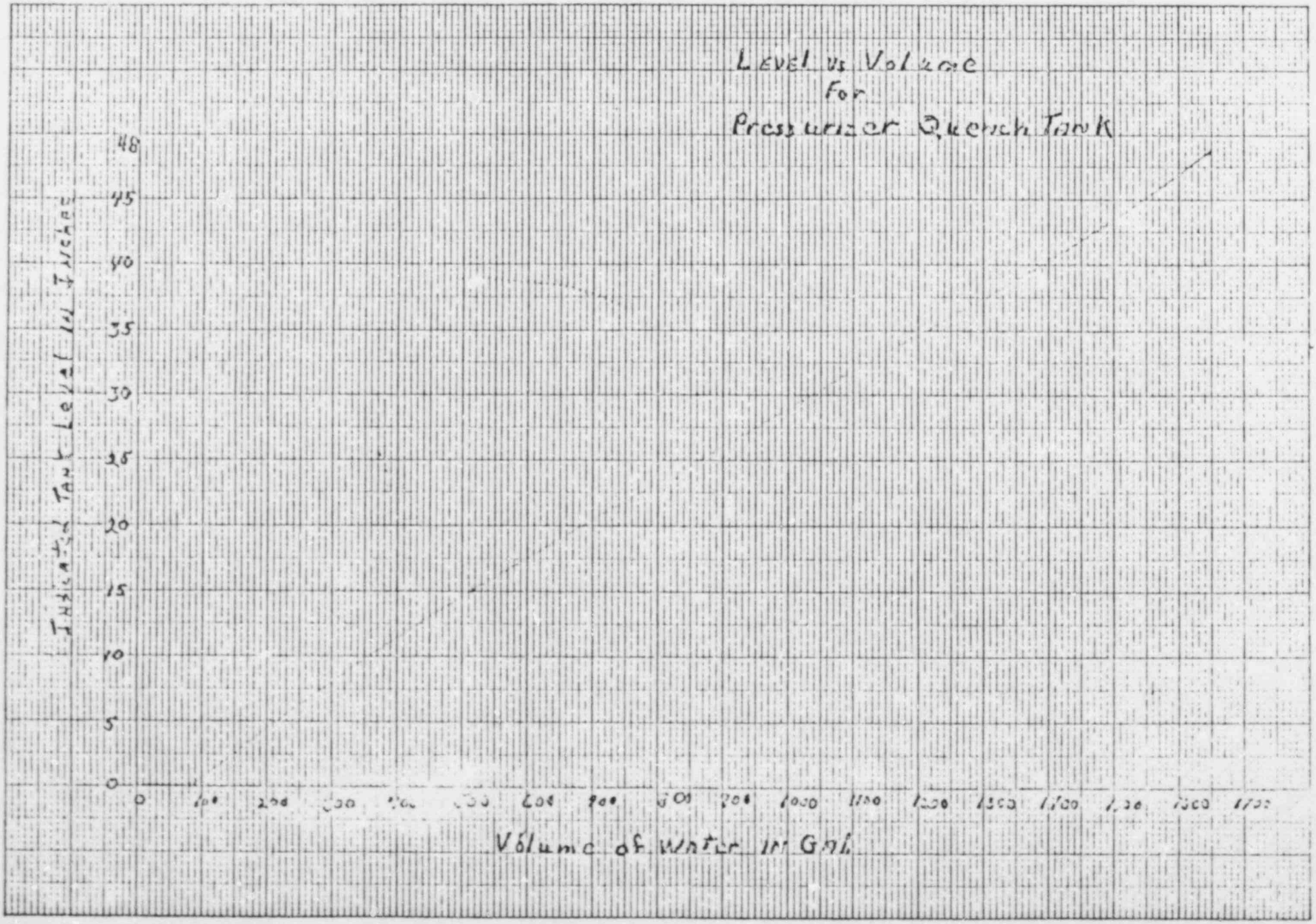

LEVEL VS VOLUME
FOR
VOLUME CONTROL TANK
-NOTE-
DOES NOT ACCOUNT
FOR DISHED BOTTOM
TANK LEVEL IN INCHES
160
140
120
100
80
60
40
20
0
1000
2000
3000
4000
5000
VOLUME IN GALLONS

Fig. 1

Rev. 7

fig. 1

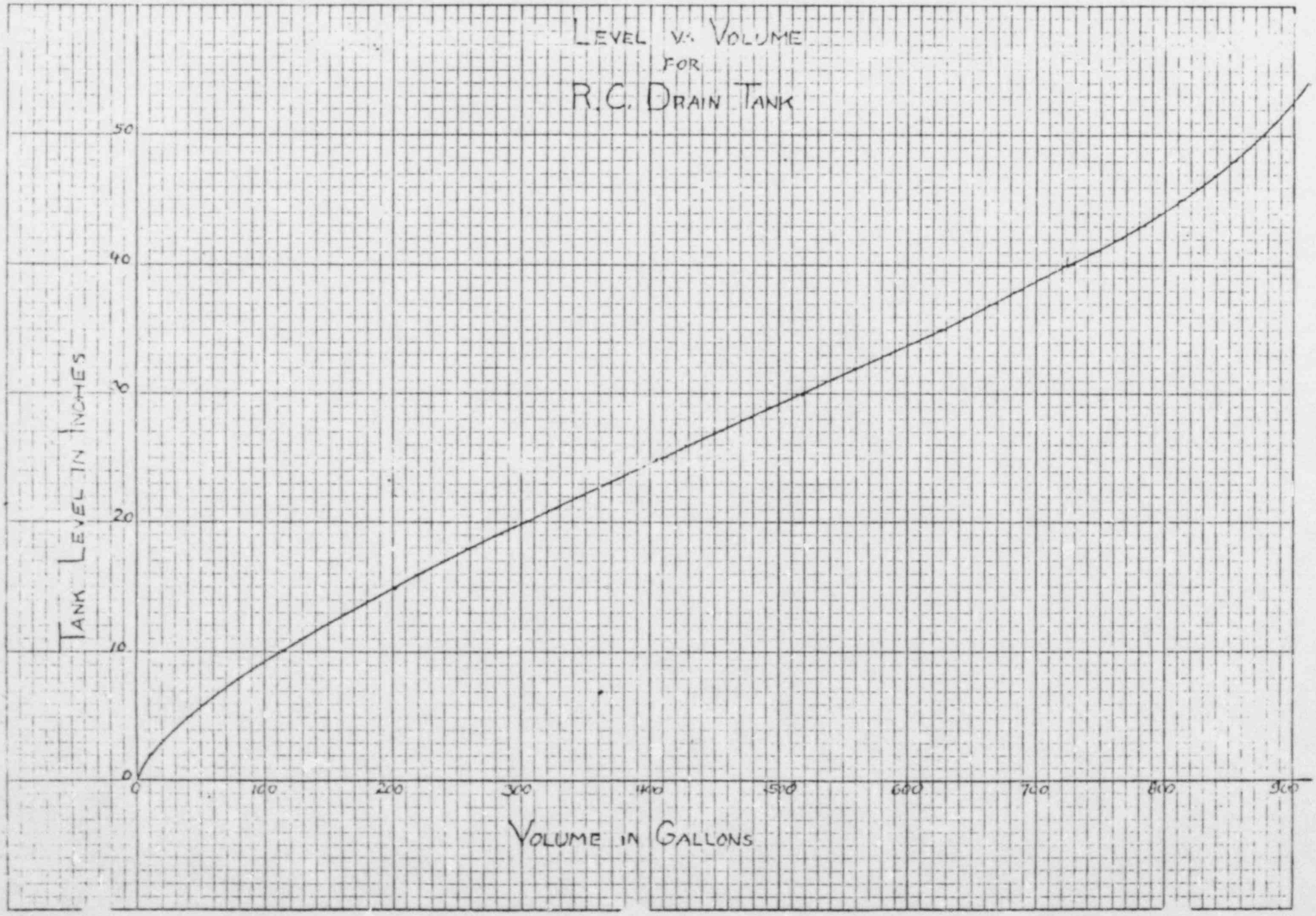
Rev. 1



KEUFFEL & ESSER CO.

fig 1

Rev. 7



MONTH _____ YEAR _____

STP O-27-1 REACTOR COOLANT LEAKAGE EVALUATION

UNIT # _____

	T0192 L0226	SECTION II			L0110X/Y			SECTION III					SECT. IV	
DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	TIT
PRIOR DATA														
1 0100														
2 0100														
3 0100														
4 0100														
5 0100														
6 0100														
7 0100														

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

COMMENTS:

_____
DATE

_____
DATE

_____
DATE

_____
DATE

_____
DATE

_____
DATE

_____

MONTH _____ YEAR _____

UNIT # _____

STP 0-27-1 REACTOR COOLANT LEAKAGE EVALUATION

	T0192	L0226	SECTION II			L0110X/Y		SECTION III						SECT. IV	
DAY TIME	TAVG	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	INIT.
PRIOR DATA														
8 0100														
9 0100														
10 0100														
11 0100														
12 0100														
13 0100														
14 0100														

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

COMMENTS:

_____ DATE

_____ DATE

_____ DATE

_____ DATE

_____ DATE

_____ DATE

_____ DATE

MONTH _____ YEAR _____

STP O-27-1 REACTOR COOLANT LEAKAGE EVALUATION

UNIT # _____

T0192 L0226 SECTION II L0110X/Y | SECTION III | SECT. IV

DAY TIME	Tave	VCT LEVEL	DIVERSION INT. RDG	RC MAKEUP INT. RDG.	BORIC ACID INT. RDG.	PZR LEVEL	GROSS LEAKAGE	TIME START	RCDT LEVEL	TIME STOP	RCDT LEVEL	VALVE LEAKAGE	NET LEAKAGE	TE
PRIOR DAY														
15 0100														
16 0100														
17 0100														
18 0100														
19 0100														
20 0100														
21 0100														

NOTE: If the Plant is less than 532°F, enter this on the form

COMPUTATIONS CHECKED BY:

COMMENTS:

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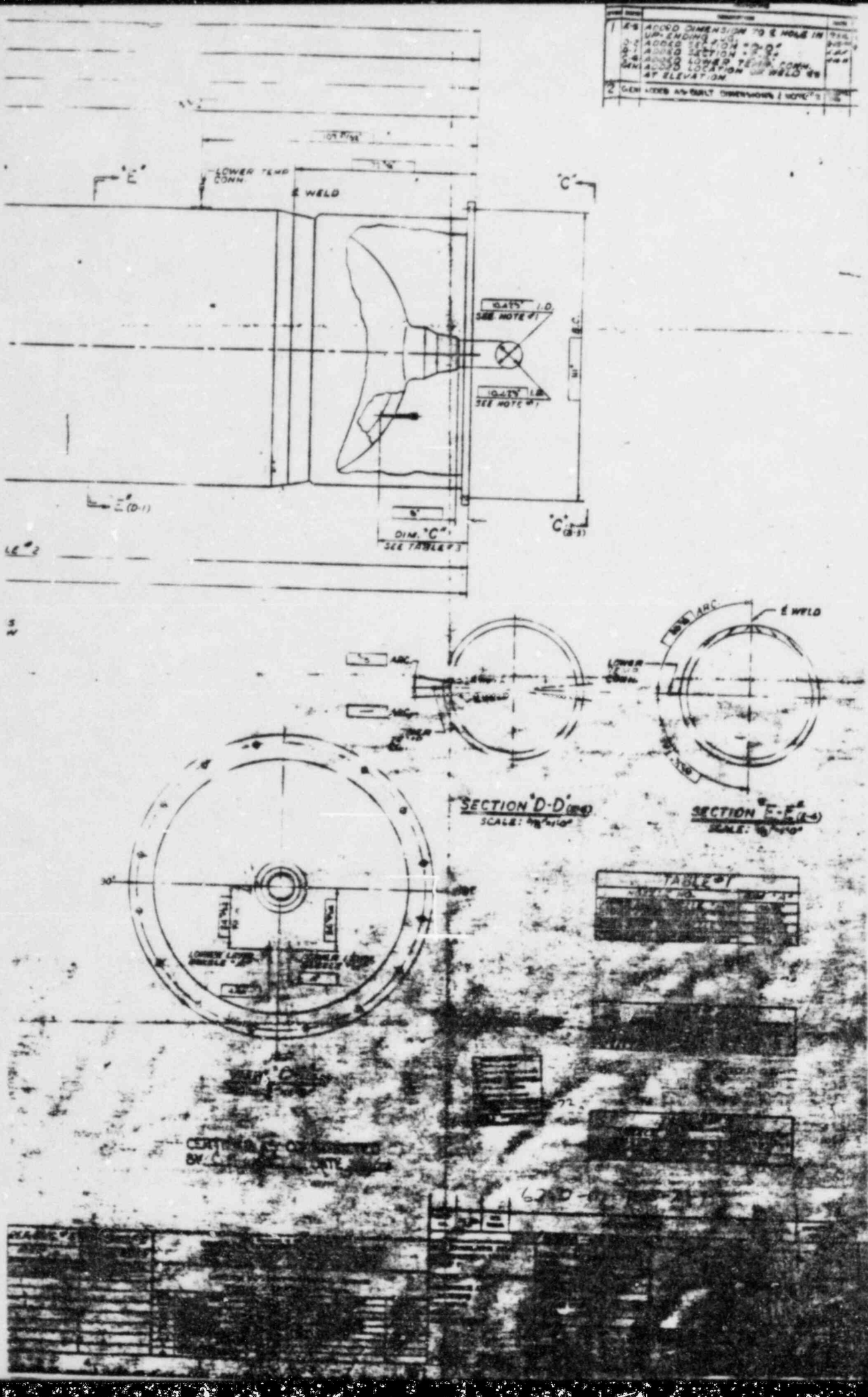
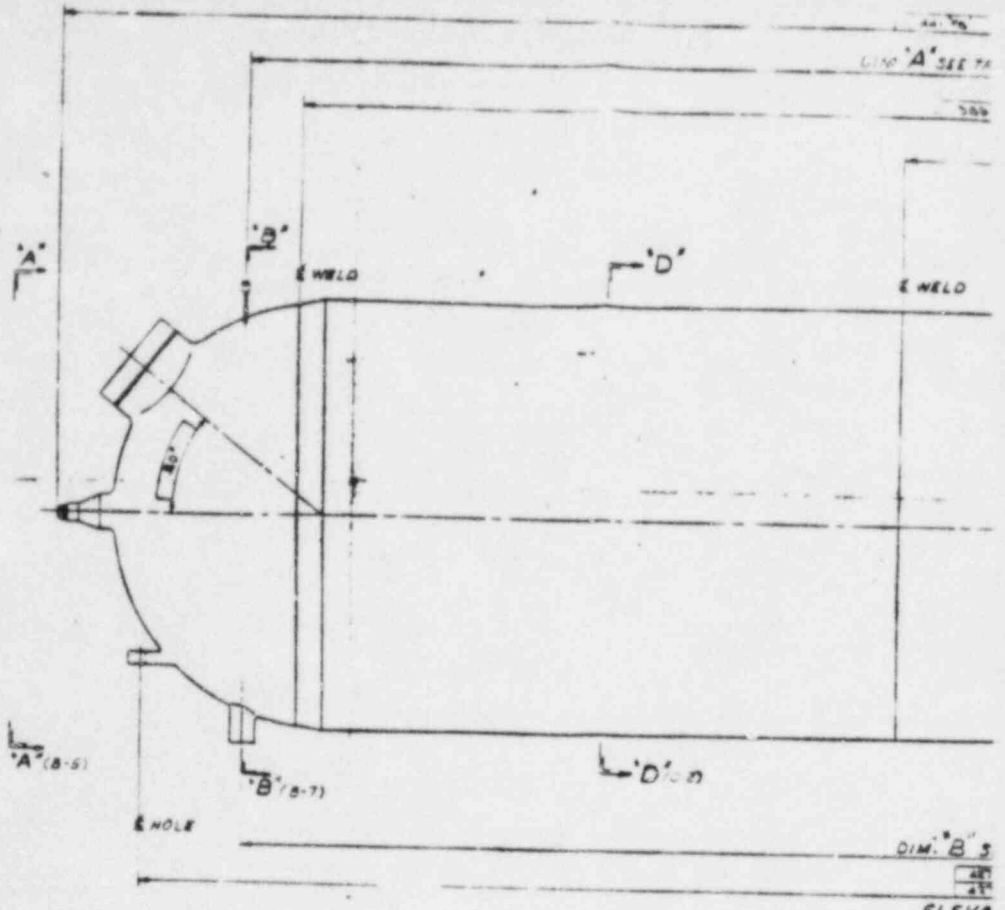
DATE

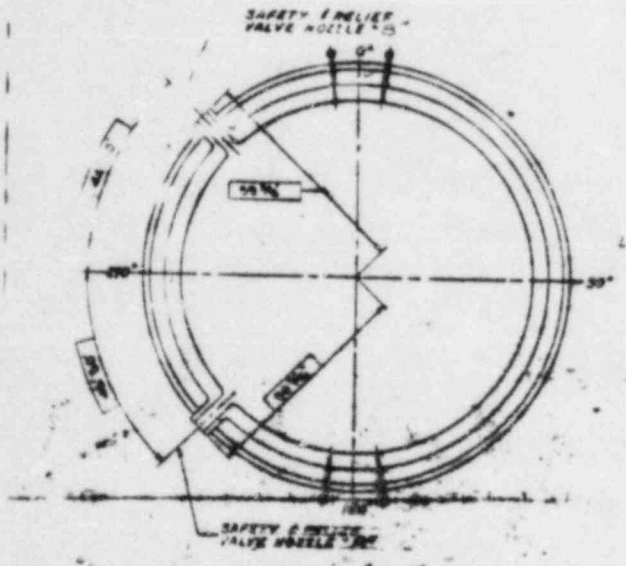

LOWER END CONN.
E WELD
"E"
"C"
DIM. "C"
SEE TABLE #1
SECTION "D-D"
SECTION "E-E"
TABLE #1



ELEVATION

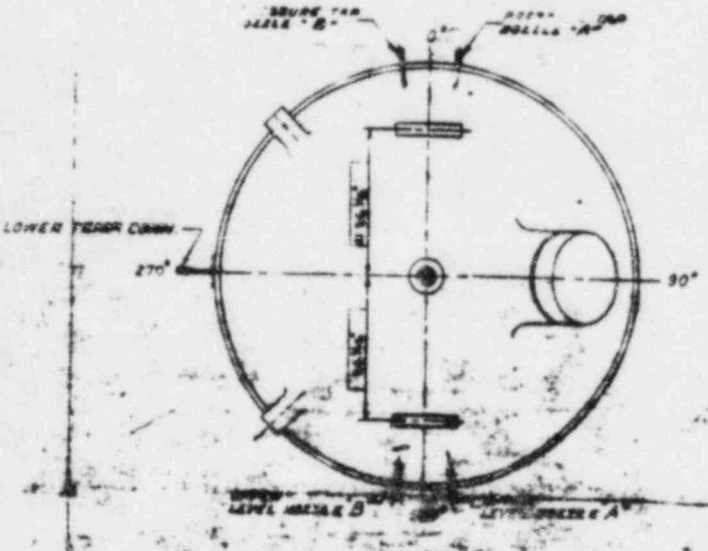
SCALE: 1/4"

NOZZLES ROTATED



SECTION 'B-B' (B-11)

SCALE: 3/4"=1'-0"



VIEW 'A-A' (B-7)

SCALE: 3/4"=1'-0"

GENERAL NOTES