ATTACHMENT F

SURVEILLANCE PROCEDURE

SP 1303-1.1

"REACTOR COOLANT SYSTEM LEAK RATE",

REVISION 7, MAY 25, 1976

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1303-1.1
Revision 5
05/25/76

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 5-31-76
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 _____

Approval _____ Date 5-25-76
Station Superintendent/
Unit Superintendent

TMI-66-8 11 74

AAH

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°F.

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 condition 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 dat . 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	Pzr 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	Pzr 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 $\frac{lbm}{in}$ 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 $\frac{lbm}{in}$ 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 x 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 7.9)

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: _____

_____

_____

_____

_____

CVCS Pump Model #_____ Serial #_____

_____ _____
Performed by Date

_____ _____
Approved by Date

MAY 2 - 1979

DATA SHEET 1103-1 1.1.2

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	Pzr 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	Pzr 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°F - (Line 2____x5) = ____°F

Line 11

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

570°F - (Line 7____x5) = ____°F

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 volulme 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 _____ MUT 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. Identific 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

A 0 4

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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 ac n)

_____ No Explain _____

_____

_____

_____

_____ Shift Supervisor _____ Date

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

[illegible]

4. [illegible]

4.1 The enclosure tab 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 [illegible]

5.1 Equipment for use on patch panel

5.1.1 Digital voltmeter capable of reading ± 10 VDC

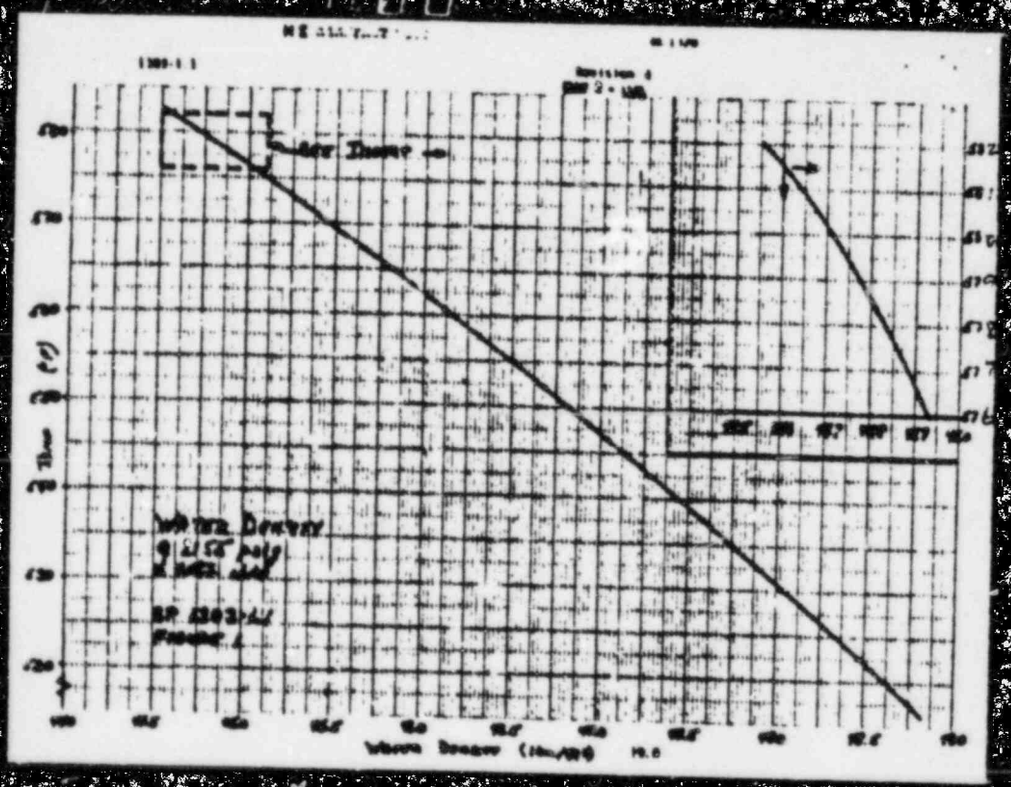
5.1.2 Leads for patch panel to voltmeter

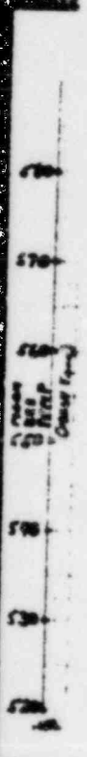
6.0 PROCEDURE

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
[illegible]	Computer is operational

2 0





#06

[illegible]

[illegible] through [illegible] gland.

5. 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.)

6. 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).

6. 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

SOURCES OF DATA

PARAMETER	COMPUTER POINT	CONTROL ROOM INSTRUMENTATION	REMOTE PANEL: TAG #	RANGE	[illegible]	METER ID
Temp	540 Loop A Tc [illegible] Loop A Th [illegible] Loop B Tc [illegible] Loop B Th [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pressurizer Level	[illegible]	Control Console Center Panel	[illegible]	[illegible]	[illegible]	[illegible]
Make-up Tank Level	[illegible]	Control Console Center Panel	[illegible]	[illegible]	[illegible]	[illegible]
Reactor Coolant Waste Tank Level	[illegible] at Panel	Level Recorder [illegible] Panel	[illegible]	[illegible]	[illegible]	[illegible]

Note: Remote Panel Data may be obtained from the voltmeters installed for a shutdown 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.

A.1.1

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 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: 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: