REQUEST TO CHANGE PROCEDURE
NORTH ANNA POWER STATION
VIRGINIA POWER

ADM-5.4
Attachment 3
Page 1 of 1
07-09-87

TO SUPERVISOR RESPONSIBLE FOR FOLLOWING PROCEDURE: 1

- ☐ ABNORMAL
- ☐ ADMINISTRATIVE
- ☐ ANNUNCIATOR
- ☐ CALIBRATION
- ☐ CHEMISTRY
- ☐ CURVE BOOK
- ☐ EMERGENCY
- ☐ IN-SERVICE INSPECTION
- ☒ MAINTENANCE
- ☐ NON-DESTRUCTIVE TEST
- ☐ OPERATING
- ☐ PERIODIC TEST
- ☐ HEALTH PHYSICS
- ☐ SPECIAL TEST
- ☐ START-UP TEST
- ☐ WELDING
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

PROCEDURE NO: 1-AP-5.1 2 UNIT NO: 1 3 REVISION DATE: 10-9-87 4

TITLE: UNIT 1 RADIATION MONITORING SYSTEM 5

CHANGES REQUESTED: (GIVE STEP NUMBER, EXACT SUGGESTED WORDING, AND LIST REFERENCES, STAPLE COPY OF PROCEDURE WITH SUGGESTED CHANGES MARKED TO THIS FORM.) 6

REVISE STEP 5.1, ADD STEP 5.5.1, STEP 5.14.4, STEP 5.14.4.2 5.14.5.1, 5.14.5.2

REFERENCES:

DVA-87-526, STANDING ORDER #155
W-'s RM TECH MANUAL

REASON FOR CHANGES: 7

PROVIDE STEPS TO DETERMINE OPERABILITY OF A-1G RM MONITOR PROVIDE ACC NOTIFICATION IF AE RM FAILS

CHG REQUESTED BY: [signature] 8 DATE: 10-9-87 9

ACTION TAKEN: 10

DOES THIS CHANGE THE OPERATING METHODS AS DESCRIBED IN THE UFSAR? ☐ YES ☒ NO
DOES THIS CHANGE INVOLVE A CHANGE TO THE TECH. SPECS? ☐ YES ☒ NO
DOES THIS CHANGE INVOLVE A POSSIBLE UNREVIEWED SAFETY QUESTION? ☐ YES ☒ NO
IF ALL "NO", NO "SAFETY ANALYSIS" IS REQUIRED. IF ANY "YES", A "SAFETY ANALYSIS" IS REQUIRED. 10CFR50.59) APPROVED COPY TO BE PROVIDED TO LICENSING COORD. FOR INCLUSION IN ANNUAL REPORT.

RECOMMENDED ACTION: 11

☒ APPROVED ☐ DISAPPROVED

DOES THIS PROCEDURE CREATE A QA DOCUMENT? YES ☒ NO ☐

BY: (COGNIZANT SUPERVISOR) [signature] 12 DATE: 10-9-87 13

REVIEWED BY QUALITY ASSURANCE:

CHANGES MADE: YES ☐ NO ☒ 14

BY: [signature] 15 DATE 10/14/87 16

REVIEWED BY STATION NUCLEAR SAFETY AND OPERATING COMMITTEE: 17

☒ APPROVED ☐ DISAPPROVED ☐ APPROVED AS MODIFIED BY COMMITTEE

CHAIRMAN SIGNATURE: [signature] 18 DATE: 10/20/87 19

NEW PROCEDURE REVISION DATE: 20

ACTION COMPLETED BY: 21 DATE: 22

VIRGINIA POWER
NORTH ANNA POWER STATION
UNIT 1

UNIT 1 RADIATION MONITORING SYSTEM
(With One Attachment)

REFERENCES:

1. FSAR Chapter 11 and 12
2. North Anna Tech Specs
3. EPIP 1.01
4. EWR-87-569

REV. NO. 9 PAGE: ENTIRE DATE: 00-00-00 APPROVAL: _____

RECOMMENDED APPROVAL: _____

APPROVED BY: _____
CHAIRMAN STATION NUCLEAR SAFETY
AND OPERATING COMMITTEE

DATE: 00-00-00

1.0 Purpose

1.1 This procedure provides indications, probable causes, immediate operator actions, and long term operator actions for radiation monitoring alarms associated with any of the following monitors:

Condenser Air Ejector SV-121

Main Steam Header MS-RMS-193

Containment Gas and Particulate RMS-159, 160

Manipulator Crane RMS-162

Discharge Tunnel SW-130

Reactor Coolant Letdown CH-128

Steam Generator Blowdown SS-122, 123, 124

Containment High Range RMS-161

Reactor Containment Area RMS-163

Incore Instrument Room RMS-164

Recirc Spray Cooler Service Water SW-124, 125, 126, 127

This procedure also provides release levels from certain Rad Monitors which monitor environmental release points which will be used to determine whether the NRC should be notified within 4 hours or whether the Emergency Plan should be implemented, as required by Administrative Procedure 19.6 for any "Accidental, Unplanned, or Uncontrolled Radioactive Release".

2.0 Indications

2.1 Main Control Board annunciator, visual and audible alarm.

2.2 Individual channel alarm at radiation monitoring panel.

2.3 Area alarm and red light (LOCAL).

2.4 Main Steam Header N-16 radiation monitor alarms:

2.4.1 HI alarm (yellow light - S1) blinking or solid.

2.4.2 HI-HI alarm (red light - S2) blinking.

2.4.3 HI-HI-HI alarm (red light - SE) reflashes the HI-HI annunciator with 100 gpd from recorder.

3.0 Probable Causes

3.1 As applicable, primary leakage.

3.2 As applicable, primary to secondary leakage.

3.3 Movement of radioactive materials near the monitor.

3.4 Loss of high voltage to the detector, instrument malfunction or instrument not in the operate mode, as applicable.

3.5 Maintenance or cleanup in progress in the area of the monitor.

4.0 Immediate Operator Action

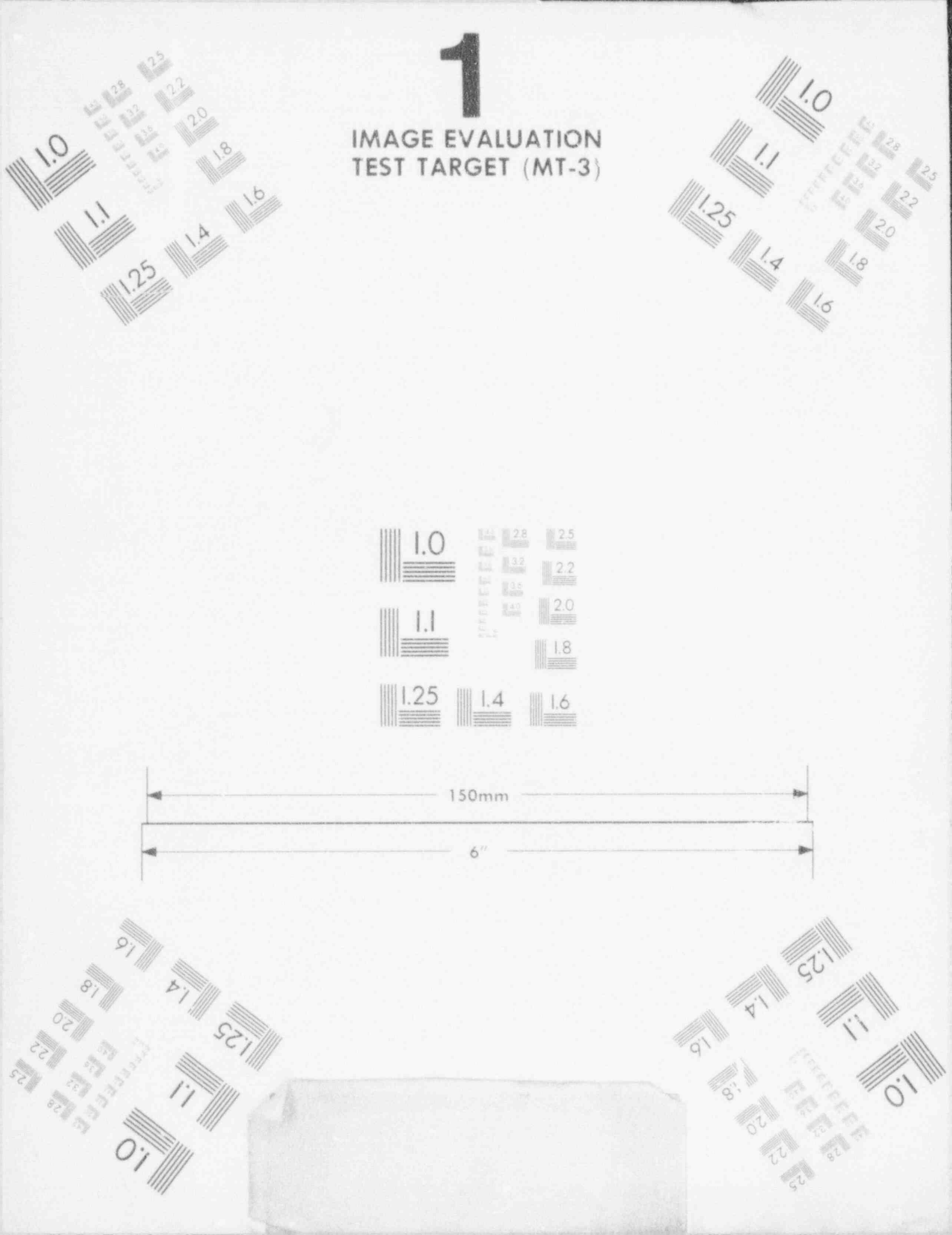
_____ 4.1 Determine which monitor is in alarm.

_____ 4.2 Notify Shift Supervisor.

_____ 4.3 Go Immediately to Long Term Operator Actions.

Completed By: _____

Date: _____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1.8
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2.8
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3.5
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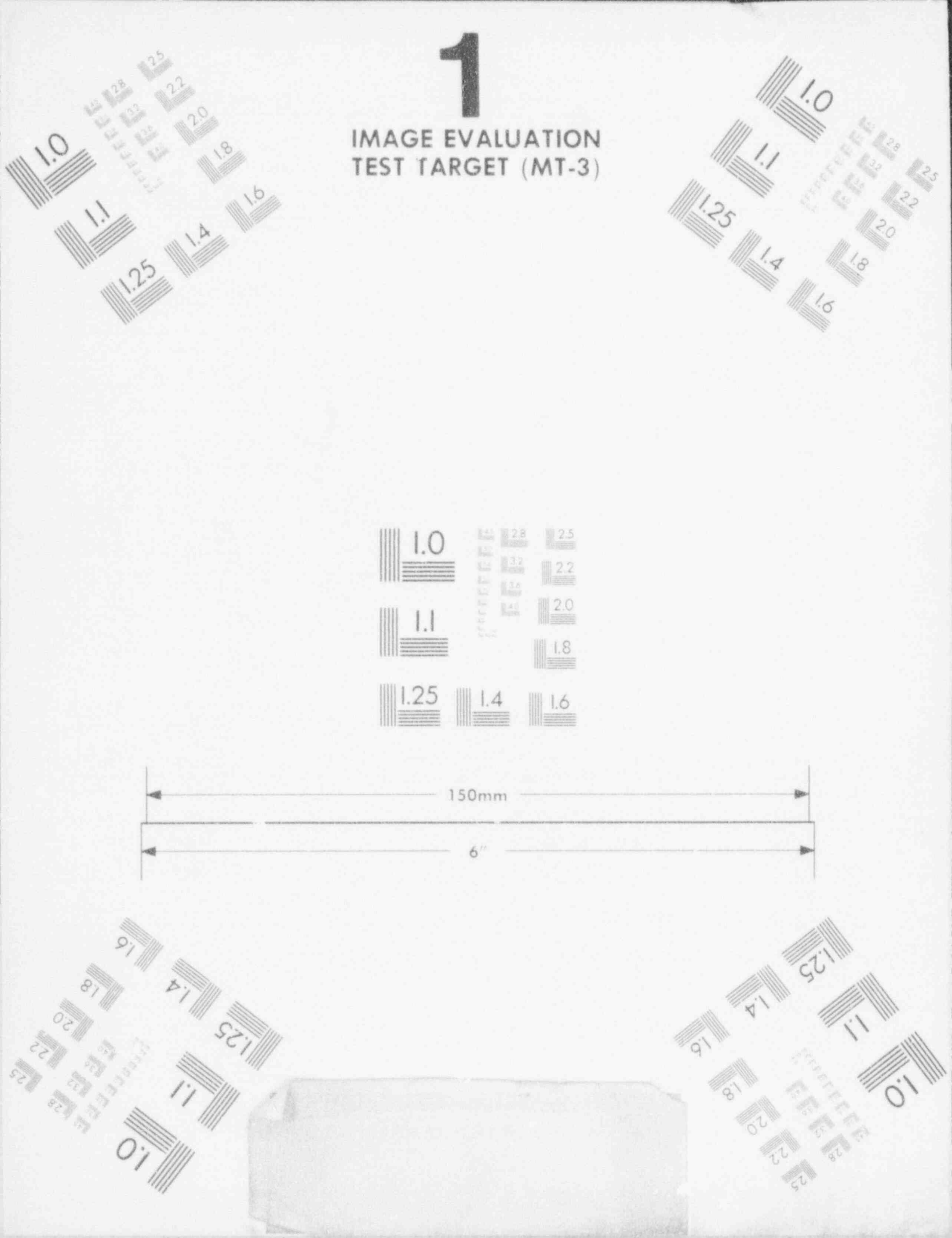
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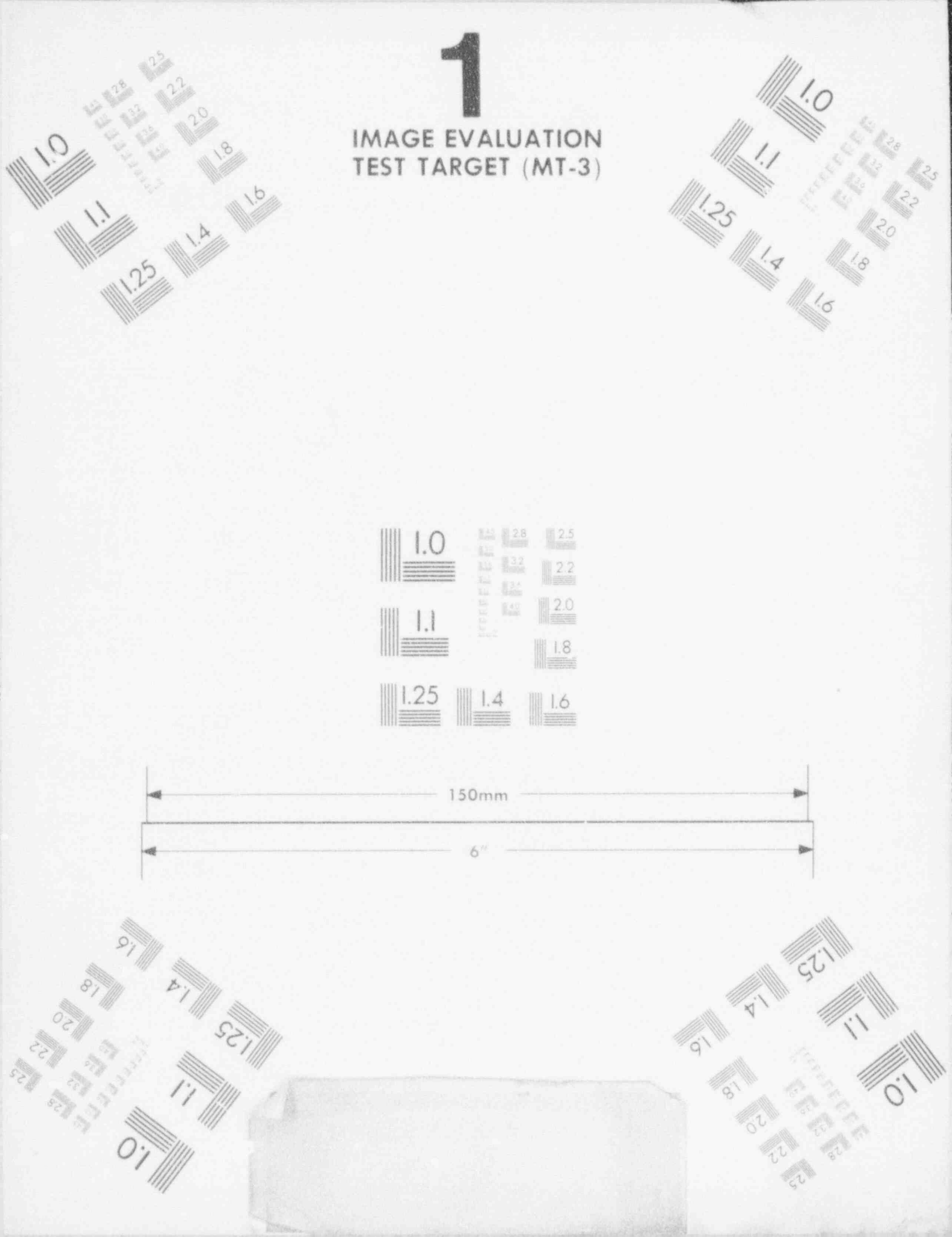
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IMAGE EVALUATION
TEST TARGET (MT-3)
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2.8
3.2
150mm
6"

Initials

5.0 Long Term Operator Action

_____ 5.1 Verify the alarm is VALID for the affected Rad Monitor(s) as follows:

5.1.1 Verify the following on the Main Steam Header N-16 Radiation Monitor:

_____ 5.1.1.1 IF the green (SS) light is lit, THEN the N-16 Rad Monitor is operable and not in alarm. Go to step 5.1.2.

_____ 5.1.1.2 IF any of the alarm lights (S1, S2, SE) are lit, THEN immediately notify the STA to evaluate the SG leakrate trend data AND go to step 5.3.

_____ 5.1.1.3 IF none of the lights (SS, S1, S2, or SE) are lit, THEN immediately notify the STA to evaluate the SG leakrate trend data AND go to step 5.14.5.

5.1.2 Verify the following for all other Unit 1 Rad Monitors:

_____ 5.1.2.1 High reading on meter.

_____ 5.1.2.2 ALL switches in normal position.

_____ 5.1.2.3 NO flow OR filter alarms present.

_____ 5.1.2.4 Increase in associated Rad Monitors activity.

_____ 5.1.2.5 RM-RR-100 (Trend recorder).

_____ 5.2 IF alarm is due to inoperable Rad Monitor, THEN go to steps 5.14.1 thru 5.14.6 as applicable.

_____ 5.3 Notify Health Physics to sample the affected system OR area.

5.4 Refer to appropriate step:

* _____ 5.4.1 Condenser Air Ejector (RM-SV-121)

Go to Step 5.5.

_____ 5.4.2 Main Steam Header N-16 (01-MS-RMS-193)

Go to Step 5.6.

* _____ 5.4.3 Discharge Tunnel (RM-SW-130)

Go to Step 5.7.

_____ 5.4.4 Containment Gas and Particulate (RM-RMS-159,160)

Go to Step 5.8.

_____ 5.4.5 Containment Manipulator Crane (RM-RMS-162)

Go to Step 5.8.

_____ 5.4.6 Containment OR Incore Inst. Room (RM-RMS-163,164)

Go to Step 5.9.

_____ 5.4.7 Containment Hi Range (RM-RMS-161)

Go to Step 5.10.

_____ 5.4.8 RCS Letdown (RM-CH-128)

Go to Step 5.11.

_____ 5.4.9 S/G Blowdown (RM-SS-122, 123, 124)

Go to Step 5.12.

_____ 5.4.10 R.S. HX S.W. Outlet (RM-SW-124,125,126,127)

Go to Step 5.13.

* Environmental Release Pathway

_____ 5.5 Condenser Air Ejector (RM-SV-121).

_____ 5.5.1 Immediately notify the STA to evaluate the SG leakrate trend data and refer to Standing Order #155.

5.5.2 IF required, THEN verify Air Ejector discharge swaps to containment.

_____ 5.5.2.1 TV-SV-102-1 OPEN

_____ 5.5.2.2 TV-SV-103 OPEN

_____ 5.5.2.3 TV-SV-102-2 CLOSED

_____ 5.5.3 IF necessary, notify personnel to exit containment.

NOTE: Utilize the following steps to determine whether the release limits have been exceeded until grab samples can be obtained AND analyzed (within 1 hour).

NOTE: IF the Air Ejector discharge has diverted to the containment, steps 5.5.4 thru 5.5.5 may OR may NOT be performed as determined by the Shift Supervisor.

_____ 5.5.4 Utilize the appropriate curve on Attachment 1 to determine if effluent release is greater than 1000% of the Tech. Spec. instantaneous allowable limit.

_____ 5.5.4.1 Valid reading greater than 1000% for greater than 15 minutes.

_____ 5.5.4.2 IF the release exceeded 1000% of the T.S. instantaneous limit, THEN

_____ 5.5.4.2.1 Initiate EPIP.

_____ 5.5.4.2.2 Declare an "Alert".

_____ 5.5.4.2.3 Initiate notifications as per ADM-19.6.

5.5.5 Utilize the appropriate curve on Attachment 1 to determine if effluent release is greater than 100% of the T.S. limit:

_____ 5.5.5.1 Valid reading is greater than 100% T.S. curve.

5.5.5.2 IF the release exceeded 100% of the T.S. Limit, THEN

_____ 5.5.5.2.1 Initiate EPIP.

_____ 5.5.5.2.2 Initiate "Notification of Unusual Event".

_____ 5.5.6 IF S/G tube leakage is suspected, THEN refer to 1-AP-24.

_____ 5.6 Main Steam N-16 Radiation Monitor (01-MS-RMS-193)

_____ 5.6.1 IF the yellow alarm light (S1) is lit OR blinking, THEN initiate 1-AP-24.2.

_____ 5.6.2 IF one or both of the red alarm lights (S2 or SE) are lit OR blinking, THEN refer to Standing Order #155.

_____ 5.6.3 Observe the trend on the recorder (01-MS-RR-193) to determine if the leakage is worsening.

5.7 Discharge Tunnel (RM-SW-130)

5.7.1 Secure any possible release to the discharge tunnel.

NOTE: Utilize the following steps to determine whether the release limits have been exceeded until grab samples can be obtained AND analyzed. (within 1 hour)

5.7.2 Determine if effluent release is greater than 10 times the T.S. instantaneous limit:

5.7.2.1 Valid reading is greater than 6.0×10^3 cpm for greater than 15 minutes.

5.7.2.2 IF the release exceeded 10 times the T.S. instantaneous limit, THEN:

5.7.2.2.1 Initiate EPIP.

5.7.2.2.2 Declare an "Alert".

5.7.2.2.3 Initiate notifications as per ADM-19.6.

5.7.3 Determine if effluent release is greater than 100% of the T.S. limit:

5.7.3.1 Valid reading greater than 6.0×10^2 cpm

5.7.3.2 IF the release exceeded 100% of the T.S. limit:

5.7.3.2.1 Initiate EPIP.

5.7.3.2.2 Initiate "Notification of Unusual Event".

_____ 5.8 Containment Gaseous or Particulate (RM-RMS-159,160)

Manipulator Crane (RMS-162)

5.8.1 IF unit is in Mode 5 or 6 AND alarm is due to Hi Hi radiation, THEN verify the following:

_____ 1-HV-F-4A NOT running
_____ 1-HV-F-4B NOT running
_____ 1-HV-F-5A NOT running
_____ 1-HV-F-5B NOT running

_____ MOV-HV-100A Closed
_____ MOV-HV-100B Closed
_____ MOV-HV-100C Closed
_____ MOV-HV-100D Closed
_____ MOV-HV-101 Closed
_____ MOV-HV-102 Closed

_____ 5.8.2 IF required refer to 1-AP-30 for Fuel Failure During Handling.

_____ 5.8.3 Determine cause for alarm AND take corrective action as required.

5.8.4 IF unit is in Mode 1-4 AND alarm is due to Hi-Hi radiation perform the following as required:

_____ 5.8.4.1 Perform 1-PT-52.2 (RCS Leakrate).

_____ 5.8.4.2 Have samples of Containment Sump Discharge analyzed by Chemistry and/or Health Physics.

_____ 5.9 Containment (RMS-163) OR Incore Room (RMS-164)

_____ 5.9.1 Secure any maintenance in Containment AND determine source of activity.

_____ 5.9.2 IF activity is due to Incore Detector Movement, keep all personnel away from Seal Table Area.

_____ 5.9.3 Insure alarm clears when flux mapping complete OR maintenance cleanup is complete.

_____ 5.10 Containment Hi Range (RMS-161)

_____ 5.10.1 Determine if activity is from contaminated materials OR sources being moved in area OR if radiography is in progress in vicinity of Rad Monitor.

_____ 5.10.2 Instruct H.P. to monitor radiation levels if required.

_____ 5.11 RCS Letdown (RM-CH-128)

NOTE: IF excessive activity levels warrant securing normal letdown, THEN refer to 1-OP-8.5 for operation of Excess letdown.

_____ 5.11.1 Consult with H.P. AND Chemistry to determine IF a change in letdown and purification rate is desired.

_____ 5.11.2 IF required refer to 1-OP-8.2.

_____ 5.11.3 Monitor Aux Bldg AND Vent Stack Rad Monitors for increasing radiation levels.

_____ 5.11.4 Refer to T.S. 3.4.8 for further actions as required.

_____ 5.12 S/G Blowdown (RM-SS-122,123,124)

_____ 5.12.1 Monitor Condenser Air Ejector (RM-SV-121) AND Main Steam Header N-16 (MS-RI-193A) radiation monitors for increasing activity.

_____ 5.12.2 Determine if Rad Monitor should be backflushed.

_____ 5.12.3 IF alarm persists OR activity level increases refer to 1-AP-24.

_____ 5.13 R.S. S.W. Outlet (RM-SW-124,125,126,127)

_____ 5.13.1 Isolate affected RS HX.

5.14 Perform the following for any Inoperable Rad Monitor(s)

_____ 5.14.1 Containment Gaseous and Particulate OR Manipulator Crane during Refueling.

5.14.1.1 Verify stopped OR secure the following:

_____ 1-HV-F-5A
_____ 1-HV-F-5B
_____ 1-HV-F-4A
_____ 1-HV-F-4B

5.14.1.2 Verify closed OR close the following:

_____ MOV-HV-100A
_____ MOV-HV-100B
_____ MOV-HV-100C
_____ MOV-HV-100D
_____ MOV-HV-101
_____ MOV-HV-102

_____ 5.14.1.3 IF necessary advise personnel in containment

_____ 5.14.1.4 Refer to T.S. 3.9.9 AND 3.3.3.1

_____ 5.14.2 Containment Gaseous and Particulate Modes 1 - 4. (RMS-159,160)

_____ 5.14.2.1 Refer to T.S. 3.4.6.1 AND 3.3.3.1

_____ 5.14.3 Discharge Tunnel (RM-SW-130)

_____ 5.14.3.1 Refer to T.S. 3.3.3.10

_____ 5.14.4 Condenser Air Ejector (RM-SV-121)

_____ 5.14.4.1 Immediately notify the STA to evaluate the SG leakrate trend data.

_____ 5.14.4.2 Notify the NRC Resident Inspector within 24 hours of the inoperable A.E. Rad Monitor.

_____ 5.14.4.3 Refer to Standing Order #155.

_____ 5.14.4.4 Refer to T.S. 3.3.3.11

_____ 5.14.5 Main Steam Header N-16 (01-MS-RMS-193)

_____ 5.14.5.1 Immediately notify the STA to evaluate the SG leakrate trend data.

5.14.5.2 Perform the following to determine operability:

_____ 5.14.5.2.1 Depress the "STA" button and verify the display reads "DF. CPTGE".

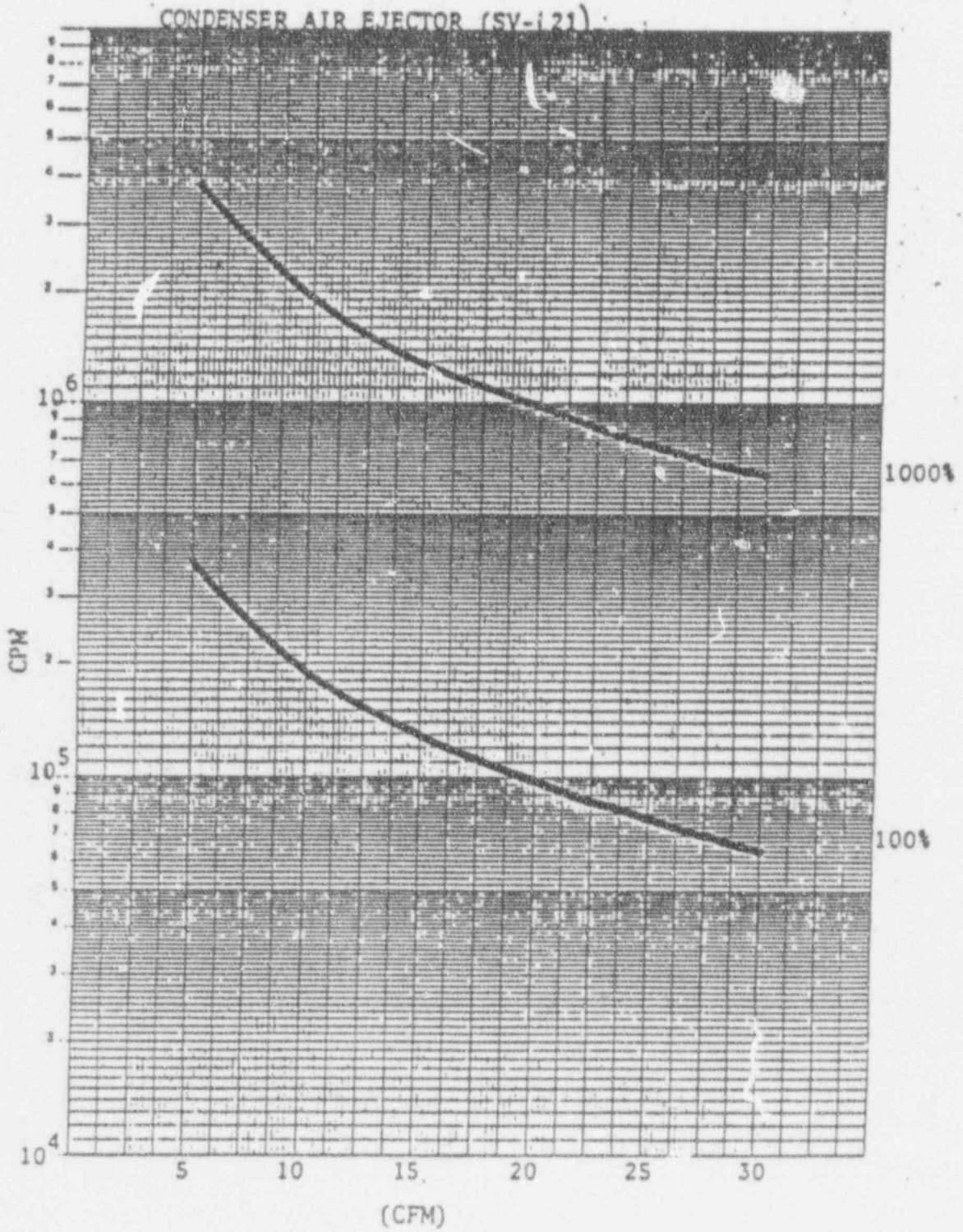
_____ 5.14.5.2.2 IF the display does not read "DF. CPTGE" or the green (SS) light does not come on after a maximum wait period of 10 minutes, THEN declare the N-16 Rad monitor inoperable AND refer to Standing Order #155.

_____ 5.14.5.2.3 IF the green (SS) light comes on after the required cycle time elapses AND the annunciator still does not clear, THEN return to step 5.1.

_____ 5.14.6 Submit a Work Request for ANY Inoperable Rad Monitor

Completed By: _____

Date: _____


CONDENSER AIR EJECTOR (SV-121)
CPM
10^6
10^5
10^4
1000%
100%
5
10
15
20
25
30
(CFM)

North Anna Power Station
Standing Order #155 (Revision 1)
Issue Date: October 9, 1987

TITLE: UNIT ONE (1) AND UNIT TWO (2) PRIMARY TO SECONDARY LEAKAGE

1. During power operation the following **leak rate limits are in effect.** These limits are more restrictive than Tech Spec 3.4.6.2.C and are consistent with PT-46.2, Primary-to-Secondary Leak Rate Determination **test.**

   a. **Total leakage** of ≤60 GPD increase from one surveillance interval to the next surveillance interval as specified in PT-46.2.

   b. Leakage from **an individual steam generator** of ≤60 GPD increase from one surveillance interval to the next surveillance interval as specified in PT-46.2.

   c. **Total leakage** of <300 GPD.

   d. Leakage from **an individual steam generator** of <100 GPD.

   e. An increasing trend based on the latest surveillance that indicates >100 GPD would be exceeded on an **individual steam generator** within ninety (90) minutes.

   If the limits of (a) or (b) are exceeded, then power is to be reduced to ≤50% as soon as possible under normal controlled conditions, but not to exceed ninety (90) minutes.

   If the limits of (c) or (d) are exceeded, then initiate a unit shutdown to be in MODE 3, Hot Standby, within six (6) hours. Initiate AP-24.1, Large Steam Generator Tube Leak Requiring Rapid Unit Shutdown.

   If the limits of (e) are exceeded, then initiate a unit shutdown to reduce power below 50% within ninety (90) minutes and be in MODE 3, Hot Standby, within six (6) hours of exceeding limit (e). Initiate AP-24.1, Large Steam Generator Tube Leak Requiring Rapid Unit Shutdown.

2. If the leak rate trend is such that the limits of (1.a) or (1.b) will be exceeded within the next 24 hour period, then notify the Superintendent Operations or SRO on-call.

3. If the limits of (1.a) through (1.e) are exceeded, then carry out station procedure ADM-19.6, Notification. When power reduction is commenced a one (1) hour report per 10CFR50.72 (b)(1)(i)(A) is to be made even though a Tech Spec limit has not been exceeded.

4. In order to perform PT-46.2, Primary-to-Secondary Leak Rate Determination, the following equipment or systems are required to be operable.

E/19

a. Primary sample system to obtain a RCS sample from any point except the pressurizer.

b. Secondary sample system to obtain a steam generator liquid sample.

c. Air ejector radiation monitor.

d. Air ejector flow rate indication for each air ejector.

e. N-16 radiation monitor on the main steam header.

f. Multichannel analyzer for counting various samples collected.

g. Steam generator blowdown flow indication when blowdown is in service.

5. Action to be taken for inoperable systems or equipment listed in item (4).

a. If the primary or secondary sample systems are inoperable, then the system must be returned to service within twenty-four (24) hours, provided the N-16 and air ejector radiation monitors are operable, or power reduced to $\leq$50% within the next ninety (90) minutes. If the N-16 and air ejector radiation monitors are not operable, then reduce power to $\leq$50% under normal controlled conditions, but not to exceed ninety (90) minutes.

b. If the air ejector radiation monitor is inoperable, then carry out the Tech Spec requirements every four (4) hours. If the air ejector radiation montior is not returned to service within the next seven (7) days, then reduce power to $\leq$50% within the next four (4) hours.

c. If air ejector flow rate indicators are inoperable, then carry out the Tech Spec requirements.

d. If the N-16 radiation monitor is inoperable, it must be returned to service as soon as possible, and the NRC Resident Inspector notified within twenty-four (24) hours. If the N-16 radiation monitor is not returned to service within seven (7) days, then reduce power to $\leq$50% within the next hour (4) hours.

e. If no Multichannel Analyzer (MCA) is operable, one must be returned to service as soon as possible. During the time of inoperability, an RCS leak rate calculation must be performed every eight (8) hours. If a MCA is not returned to service within seven (7) days, then reduce power to $\leq$50% within the next four (4) hours.

f. If blowdown flow indication is inoperable, then estimate flow when required.

g. If both the N-16 and air ejector radiation monitors are inoperable, then reduce power to ≤50% under normal controlled conditions, but not to exceed ninety (90) minutes.

h. If other combinations of required equipment or systems are not available, then notify Superintendent Operations (or Assistant Station Manager O&M) and the STA. A JCO will be required as well as discussions with the NRC.

6. Standing Order #152, U-1 Primary to Secondary Leakage, is superseded and cancelled by this standing order.

7. No deviations to this Standing Order are allowed without prior approval of the SNSOC and concurrence of the Station Manager or Vice President Nuclear Operations. The NRC Resident Inspector will be notified of any approved deviations.

M L Bowling
Chairman
SNSOC

R. O. Edfinger
Superintendent Operations

E. Wayne Harrell
Station Manager

ACTION REQUIRED TO CLEAR STANDING ORDER:

Revise Technical Specifications.

NORTH ANNA POWER STATION
UNIT #1

RAD MONITOR

SYST HI-HI

RAD LEVEL

ANNUNCIATOR 1K-28

1.0 Probable Cause

1.1 High-High radiation alarm on a Unit 1 or common radiation monitor.
1.2 High-High radiation alarm on the Main Steam Header N-16 Radiation monitor.
1.3 High-High-High radiation alarm on the Main Steam Header N-16 radiation monitor (reflash of the HI-HI alarm).
1.4 Failure of alarm relay 74C.

2.0 Operator Action	Response Not Obtained
2.1 Verify NO alarms on Unit 1 or common radiation monitors.	Initiate 1-AP-5 (radiation monitoring).
2.2 Verify NO red alarm light(s) are lit on the Main Steam Header N-16 radiation monitor (100 gpd from recorder causes the annunciator to reflash).	Initiate 1-AP-5 (radiation monitoring).
2.3 Verify NO radiation monitors have failed.	Notify Instrument department. Refer to T.S. 3.3.3.1. IF Main Steam Header radiation monitor is inoperable, refer to Standing Order #155.

3.0 References

3.1 ESK-10AAW, 11W, and 11X
3.2 S&W dwg 11715/12050-1.21-67
3.3 NAPS Instrumentation Manual page RM016
3.4 EWR-87-569
3.5 T.S. 3.3.3.1 (Radiation Monitoring)

4.0 Actuation

4.1 74HHC high-high radiation alarm relay.
4.2 K101 contacts from all Unit 1 and common radiation monitors.
4.3 Main Steam Header radiation monitor.

E/20

NORTH ANNA POWER STATION
UNIT #1

RAD MONITOR

SYSTEM HI

RAD LEVEL

ANNUNCIATOR 1K-12

1.0 Probable Cause

1.1 High radiation alarm on a Unit 1 or common radiation monitor.
1.2 High radiation alarm on the Main Steam Header N-16 Radiation monitor.
1.3 Failure of alarm relay 74-HC.

2.0 Operator Action

	Response Not Obtained
2.1 Verify NO alarms on Unit 1 or common radiation monitors.	Initiate 1-AP-5 (radiation monitoring).
2.2 Verify NO alarms (yellow light) on the Main Steam Header N-16 radiation monitor.	Initiate 1-AP-5 (radiation monitoring).
2.3 Verify NO radiation monitors have failed.	Notify Instrument department. Refer to T.S. 3.3.3.1. IF Main Steam Header radiation monitor is inoperable, THEN refer to Standing Order #155.

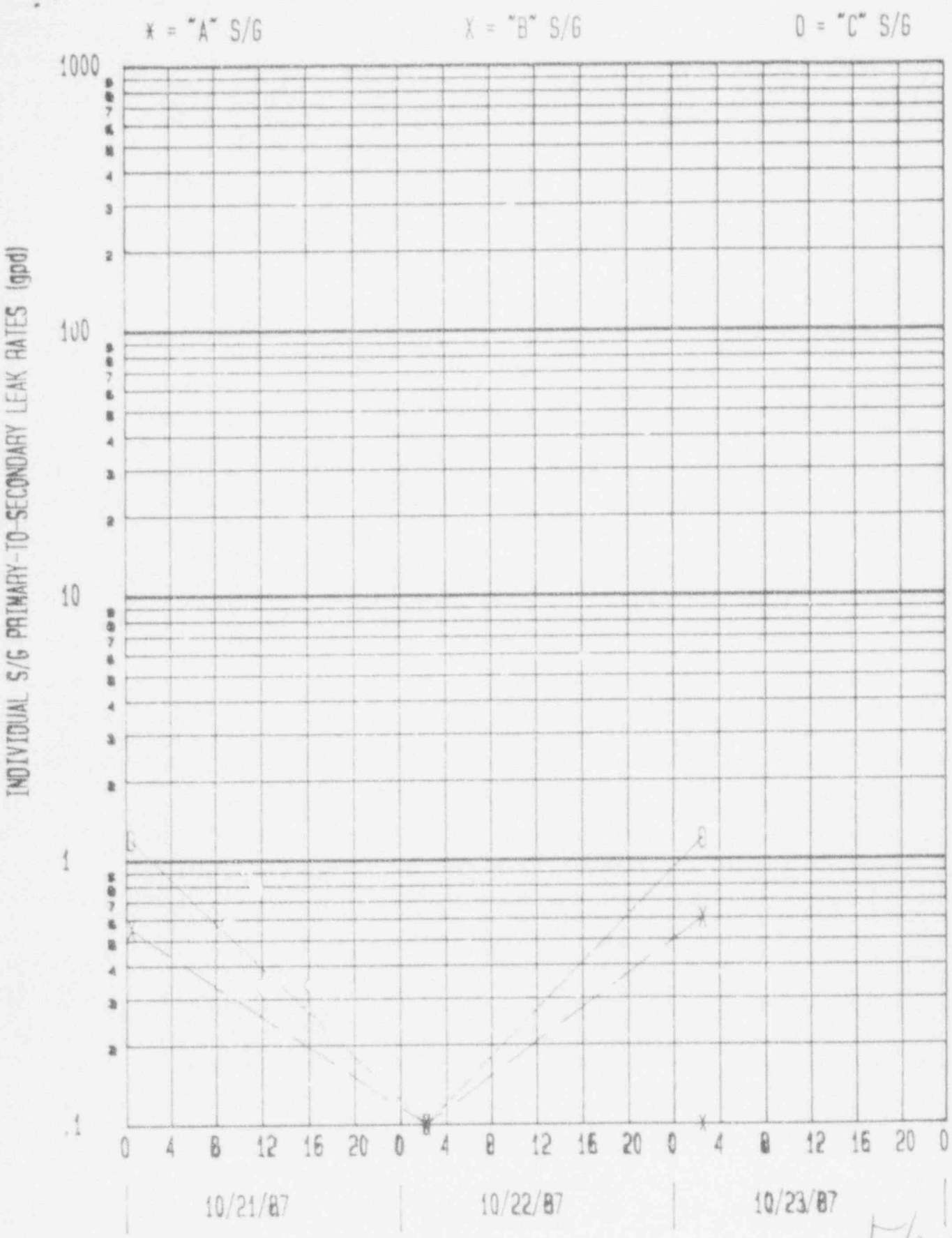
3.0 References

3.1 ESK-10AAW, 11W, and 11X
3.2 S&W dwg 11715/12050-1.21-67
3.3 NAPS Instrumentation Manual page RM011
3.4 EWR-87-569
3.5 T.S. 3.3.3.1 (Radiation Monitoring)

4.0 Actuation

4.1 74-HC radiation high alarm relay.
4.2 K102 contacts from all Unit 1 and common radiation monitors.
4.3 Main Steam Header radiation monitor.

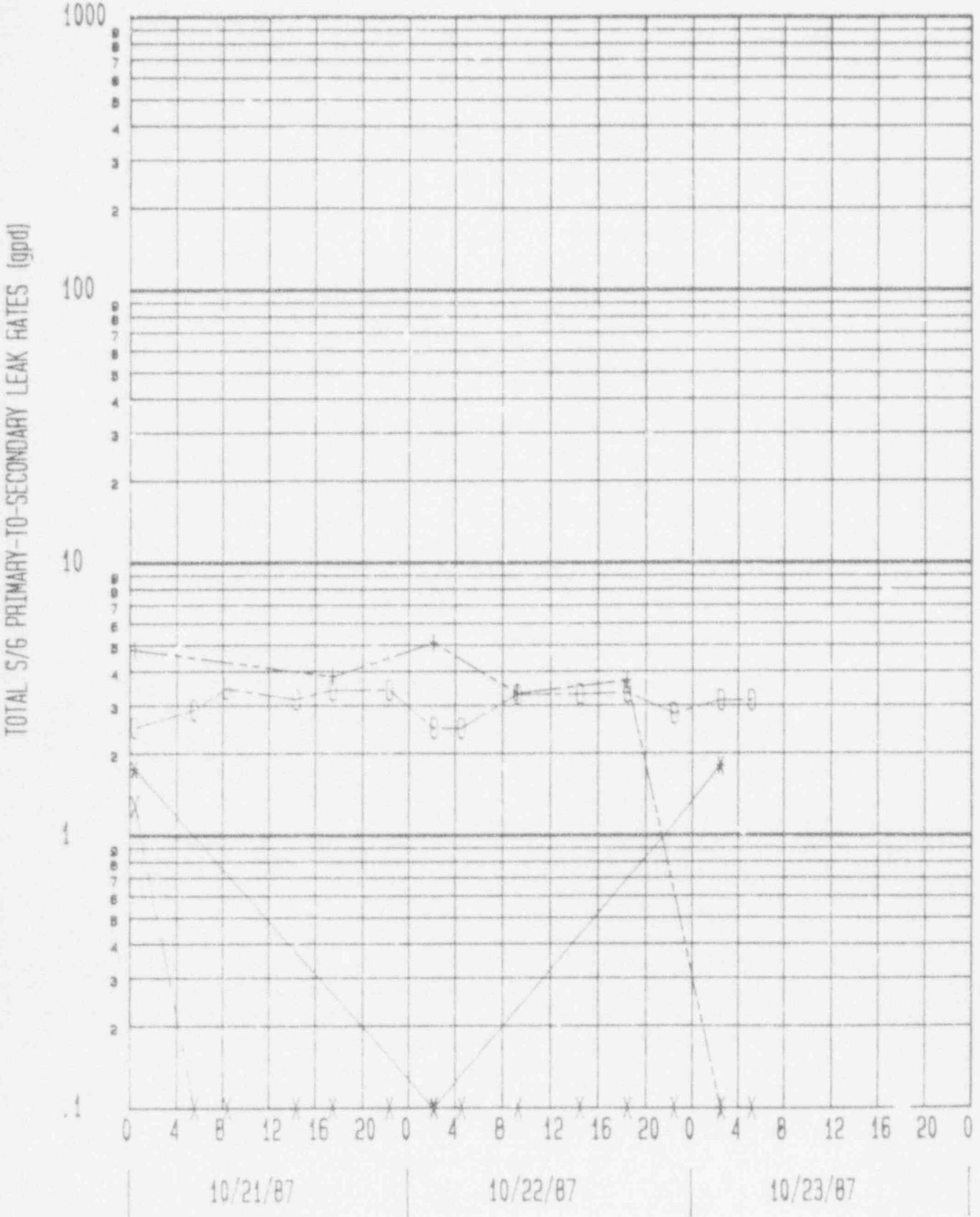
INDIVIDUAL S/G LEAK RATE TREND



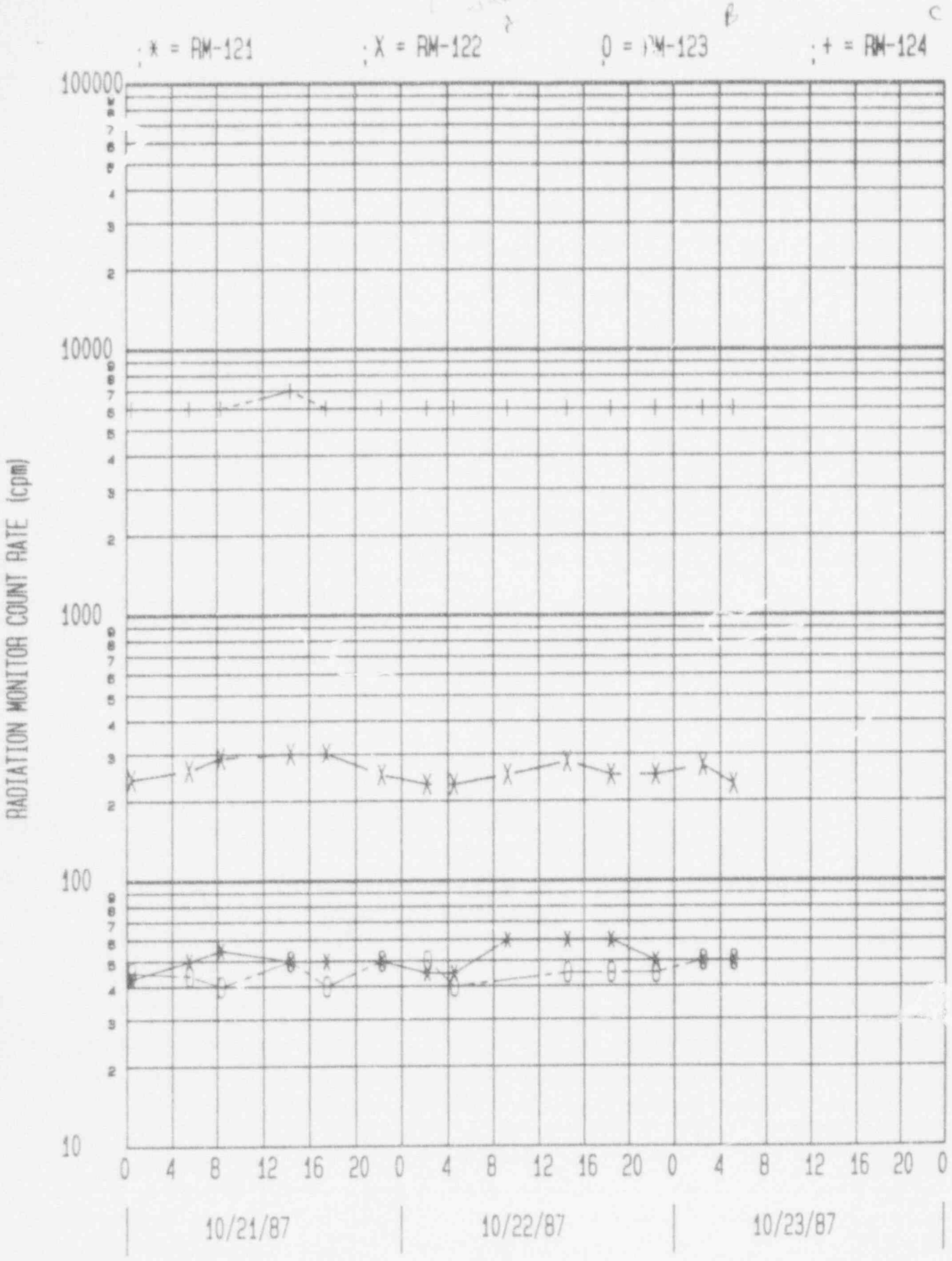
E/2

TOTAL S/G LEAK RATE TREND

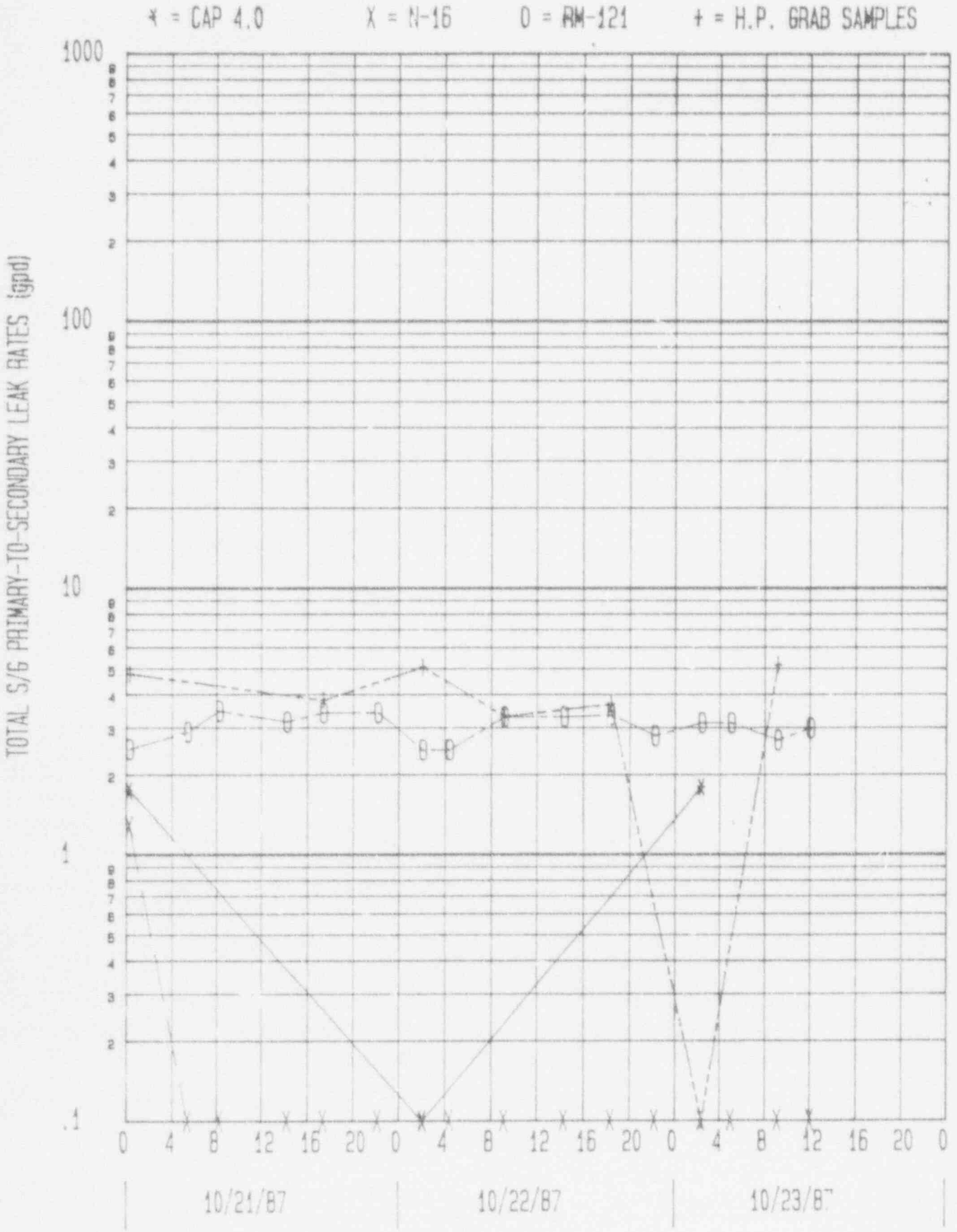
* = CAP 4.0 X = N-16 O = RM-121 + = H.P. GRAB SAMPLES



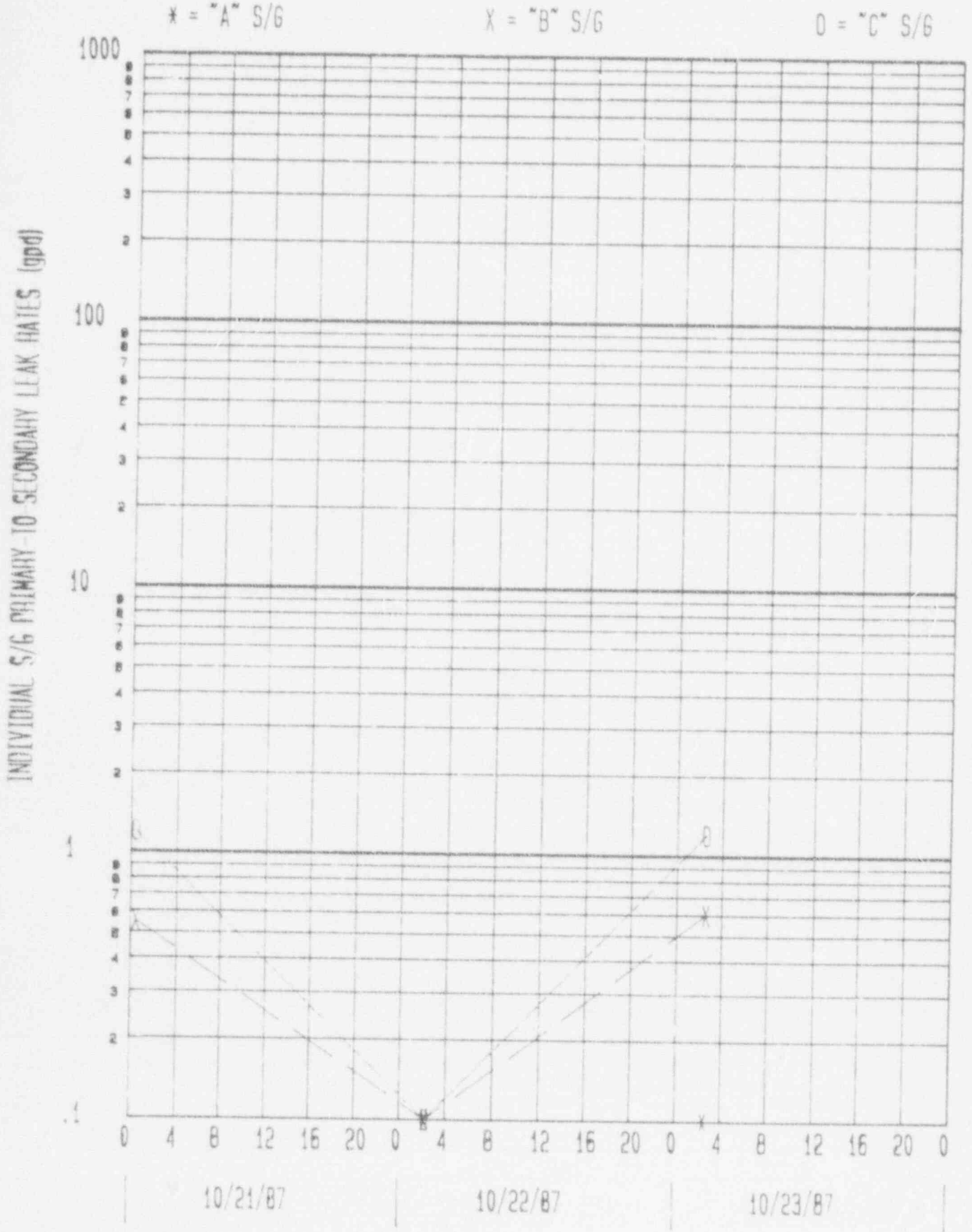
RADIATION MONITOR COUNT RATE TREND



TOTAL S/G LEAK RATE TREND



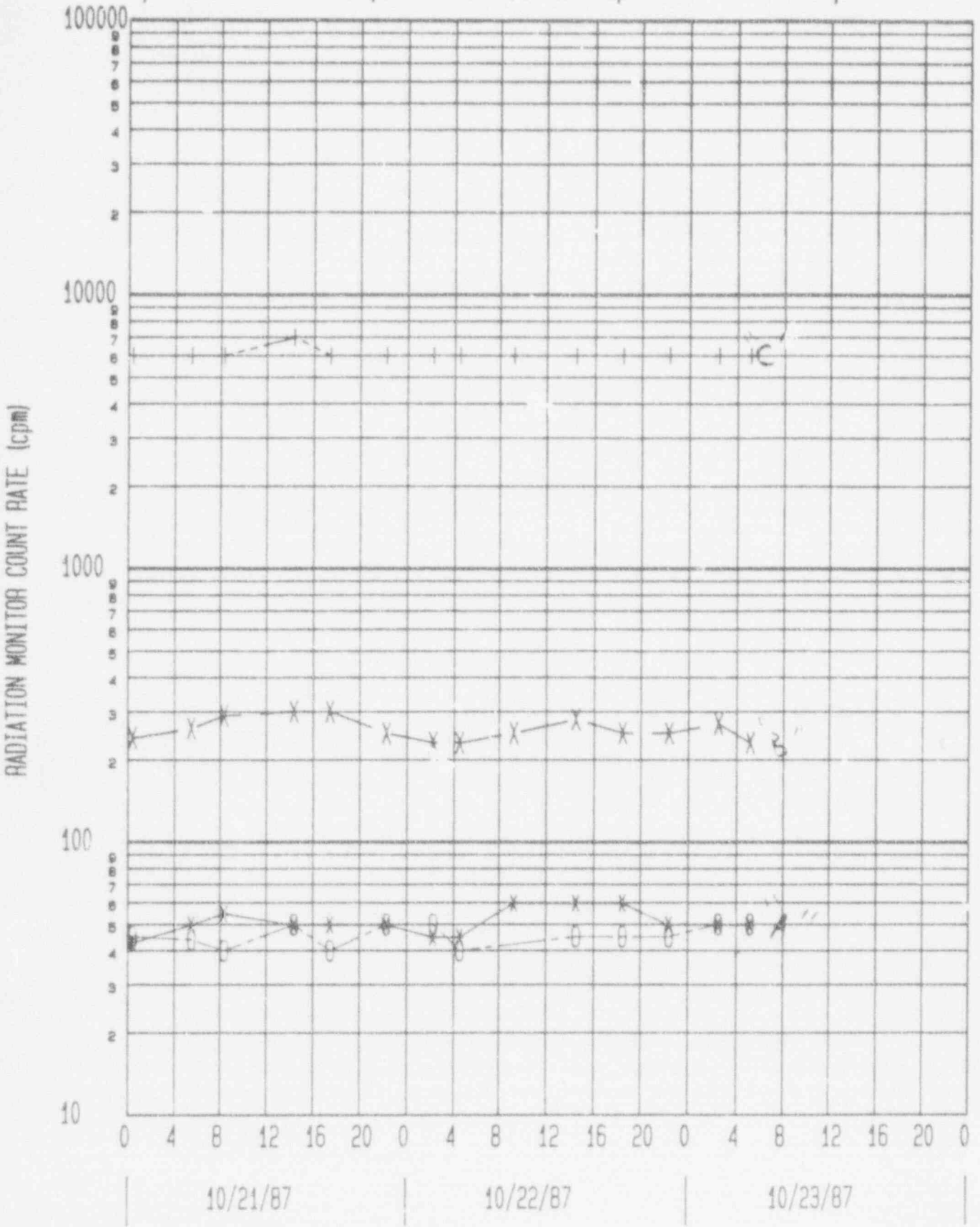
INDIVIDUAL S/G LEAK RATE TREND



RADIATION MONITOR COUNT RATE TREND

Air Ejector Blow Down

* = RM-121 ; X = RM-122 "A" ; 0 = RM-123 "B" ; + = RM-124 "C"



North Anna Power Station
Standing Order #155 (Revision 1)
Issue Date: October 9, 1987

TITLE: UNIT ONE (1) AND UNIT TWO (2) PRIMARY TO SECONDARY LEAKAGE

1. During power operation the following **leak rate limits** are in effect. These limits are more restrictive than Tech Spec 3.4.6.2.C and are consistent with PT-46.2, Primary-to-Secondary Leak Rate Determination test.

   a. **Total leakage** of ≤60 GPD increase from one surveillance interval to the next surveillance interval as specified in PT-46.2.

   b. Leakage from an* **individual steam generator** of ≤60 GPD increase from one surveillance interval to the next surveillance interval as specified in PT-46.2.

   c. **Total leakage** of <300 GPD.

   d. Leakage from an* **individual steam generator** of <100 GPD.

   e. An increasing trend based on the latest surveillance that indicates >100 GPD would be exceeded on an* **individual steam generator** within ninety (90) minutes.

   If the limits of (a) or (b) are exceeded, then power is to be reduced to ≤50% as soon as possible under normal controlled conditions, but not to exceed ninety (90) minutes.

   If the limits of (c) or (d) are exceeded, then initiate a unit shutdown to be in MODE 3, Hot Standby, within six (6) hours. Initiate AP-24.1, Large Steam Generator Tube Leak Requiring Rapid Unit Shutdown.

   If the limits of (e) are exceeded, then initiate a unit shutdown to reduce power below 50% within ninety (90) minutes and be in MODE 3, Hot Standby, within six (6) hours of exceeding limit (e). Initiate AP-24.1, Large Steam Generator Tube Leak Requiring Rapid Unit Shutdown.

2. If the leak rate trend is such that the limits of (1.a) or (1.b) will be exceeded within the next 24 hour period, then notify the Superintendent Operations or SRO on-call.

3. If the limits of (1.a) through (1.e) are exceeded, then carry out station procedure ADM-19.6, Notification. When power reduction is commenced a one (1) hour report per 10CPR50.72 (b)(1)(i)(A) is to be made even though a Tech Spec limit has not been exceeded.

4. In order to perform PT-46.2, Primary-to-Secondary Leak Rate Determination, the following equipment or systems are required to be operable.

* Resident Inspector Comment: Per discussions with Licensee Management Any increase in leak rate will be considered to come from one S/G and the actions will be taken based on one. S/G until Lab Chemistry (individual) S/G samples prove otherwise. E/D

a. Primary sample system to obtain a RCS sample from any point except the pressurizer.

b. Secondary sample system to obtain a steam generator liquid sample.

c. Air ejector radiation monitor.

d. Air ejector flow rate indication for each air ejector.

e. N-16 radiation monitor on the main steam header.

f. Multichannel analyzer for counting various samples collected.

g. Steam generator blowdown flow indication when blowdown is in service.

5. Action to be taken for inoperable systems or equipment listed in item (4).

a. If the primary or secondary sample systems are inoperable, then the system must be returned to service within twenty-four (24) hours, provided the N-16 and air ejector radiation monitors are operable, or power reduced to $\leq$50% within the next ninety (90) minutes. If the N-16 and air ejector radiation monitors are not operable, then reduce power to $\leq$50% under normal controlled conditions, but not to exceed ninety (90) minutes.

b. If the air ejector radiation monitor is inoperable, then carry out the Tech Spec requirements every four (4) hours. If the air ejector radiation montior is not returned to service within the next seven (7) days, then reduce power to $\leq$50% within the next four (4) hours.

c. If air ejector flow rate indicators are inoperable, then carry out the Tech Spec requirements.

d. If the N-16 radiation monitor is inoperable, it must be returned to service as soon as possible, and the NRC Resident Inspector notified within twenty-four (24) hours. If the N-16 radiation monitor is not returned to service within seven (7) days, then reduce power to $\leq$50% within the next hour (4) hours.

e. If no Multichannel Analyzer (MCA) is operable, one must be returned to service as soon as possible. During the time of inoperability, an RCS leak rate calculation must be performed every eight (8) hours. If a MCA is not returned to service within seven (7) days, then reduce power to $\leq$50% within the next four (4) hours.

f. If blowdown flow indication is inoperable, then estimate flow when required.

g. If both the N-16 and air ejector radiation monitors are inoperable, then reduce power to ≤50% under normal controlled conditions, but not to exceed ninety (90) minutes.

h. If other combinations of required equipment or systems are not available, then notify Superintendent Operations (or Assistant Station Manager O&M) and the STA. A JCO will be required as well as discussions with the NRC.

8. Standing Order #152, U-1 Primary to Secondary Leakage, is superseded and cancelled by this standing order.

7. No deviations to this Standing Order are allowed without prior approval of the SNSOC and concurrence of the Station Manager or Vice President Nuclear Operations. The NRC Resident Inspector will be notified of any approved deviations.

M K Bowling
Chairman
SNSOC

R. O. Eufinger
Superintendent Operations

E. Wayne Harrell
Station Manager

ACTION REQUIRED TO CLEAR STANDING ORDER:

Revise Technical Specifications.

VIRGINIA POWER
NORTH ANNA POWER STATION
CHEMISTRY
PRIMARY-TO-SECONDARY LEAK RATE CALCULATION

1.0 References

1.1 Calculational Basis for CAP-4.0, approved March 14, 1987.

1.2 PT-46.2, "Primary-to-Secondary Leak Rate Determination."

1.3 Standing Orders.

2.0 Purpose

2.1 The purpose of this procedure is to provide a method for calculating the primary to secondary leakage through a steam generator.

3.0 Procedure

NOTE: The primary to secondary leak rate must be performed prior to 0300 every day.

3.1 Record the most recent RCS (Reactor Coolant System) specific isotopic activities on Attachment 6.1 (Note 5.1).

3.2 Record the most recent specific isotopic activities for each steam generator (S/G) on Attachment 6.1 (Note 5.1).

3.3 From the Control Room Operator, obtain the steam generator blowdown rates at the time the samples in Step 3.2 were pulled.

3.4 Determine which isotopes may be used for leak rate calculation by verifying that the respective unit has been at stable power and S/G blowdown rate has been constant for the period of time listed on Attachment 6.2.

3.5 On Attachment 6.3, record whether each isotope has met the Stability Criteria. If the Stability Criteria is not met, then mark the respective leak rate N/D.

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3.6 For each steam generator, calculate the leak rate for the isotopes that have met the Stability Criteria by using the leak rate equation on Attachment 6.1. Record the results on Attachment 6.3.

3.7 For each steam generator, calculate the Short Lived Iodine Average Leak Rate by averaging the calculated leak rates for I-132, I-133, I-134, and I-135. Record the results on Attachment 6.3.

3.8 For each steam generator, determine which of the following leak rates is the largest:

Na-24, I-131, or Short Lived Iodine Average.

3.9 Record the largest leak rate for each steam generator on Attachment 6.4 (Note 5.2).

3.10 Record the largest leak rate for each steam generator on the Steam Generator Activity Log Sheet.

3.11 Notify the Shift Technical Advisor of the results on Attachment 6.4.

4.0 Discussion

4.1 A problem that can occur with a nuclear power plant is a primary to secondary leak. A leak can develop in a steam generator: primary coolant enters and mixes with the bulk water in the steam generator, then the radioactive isotopes in the primary coolant enter the steam system. The particulate activity will stay in the bulk water of the steam generator and tend to concentrate; removal of the radioactive isotopes is accomplished by natural decay and steam generator blowdown.

PRIMARY TO SECONDARY LEAK RATE CALCULATION DATA SHEET

UNIT: _____

RCS Specific Activities (uCi/gram)

Sample Location: _____ Date: _____ Time: _____

Na-24 = _____

I-131 = _____

I-132 = _____

I-133 = _____

I-134 = _____

I-135 = _____

S/G Specific Activities (uCi/gram)

S/G Blowdown Rates (gpm) A = _____ B = _____ C = _____
Date: _____ Time: _____

S/G	Na-24	I-131	I-132	I-133	I-134	I-135
A						
B						
C						

$$\text{Leak Rate (gpd)} = \frac{(\text{S/G Activity})\left[0.676 + \lambda + (\text{Blowdown})\,(0.0997)\right]}{(\text{RCS Activity})\,(9.19 \times 10^{-5})}$$

Where:

Isotope	λ (day^{-1})
Na-24	1.11
I-131	0.0862
I-132	7.23
I-133	0.80
I-134	19.00
I-135	2.49

STABILITY CRITERIA

ISOTOPE	*STABILITY CRITERIA
Na-24	48 hours of Stable Power Level & 12 hours Constant S/G Blowdown Rate
I-131	72 hours of Stable Power Level & 20 hours Constant S/G Blowdown Rate
I-132	30 hours of Stable Power Level & 18 hours Constant S/G Blowdown Rate
I-133	48 hours of Stable Power Level & 14 hours Constant S/G Blowdown Rate
I-134	**0 hours of Stable Power Level & ***0 hours Constant S/G Blowdown Rate
I-135	24 hours of Stable Power Level & 8 hours Constant S/G Blowdown Rate

* Stability Criteria is 2 equivalent half-lives for each isotope, assuming 60 gpm letdown and 10 gpm blowdown, and a spiking factor of 70.

** Actual Stability Criteria is 6.5 hours of Stable Power Level, but use 0 hours for calculations.

***Actual Stability Criteria is 1.5 hours of Constant S/G Blowdown Rate, but use 0 hours for calculations.

PRIMARY-TO-SECONDARY LEAK RATE CALCULATION WORKSHEET

S/G Leak Rate Calculation (gpd)

"A" STEAM GENERATOR

ISOTOPE	STABILITY CRITERIA MET (Y or N)	LEAK RATE (gpd)
Na-24		
I-131		
I-132		
I-133		
I-134		
I-135		
SHORT LIVED IODINE AVERAGE LEAK RATE		

"B" STEAM GENERATOR

ISOTOPE	STABILITY CRITERIA MET (Y or N)	LEAK RATE (gpd)
Na-24		
I-131		
I-132		
I-133		
I-134		
I-135		
SHORT LIVED IODINE AVERACE LEAK RATE		

"C" STEAM GENERATOR

ISOTOPE	STABILITY CRITERIA MET (Y or N)	LEAK RATE (gpd)
Na-24		
I-131		
I-132		
I-133		
I-134		
I-135		
SHORT LIVED IODINE AVERAGE LEAK RATE		

PRIMARY TO SECONDARY LEAK RATE RESULTS

"A" S/G Leak Rate (gpd) _____

"B" S/G Leak Rate (gpd) _____

"C" S/G Leak Rate (gpd) _____

Basis for Primary to Secondary
Leakage Limits

Virginia Power has placed in effect five administrative primary-to-secondary leak rate limits and corresponding actions. These are:

1. If leakage from an individual steam generator increases by 35 gpd or more in approximately 4 hours or less, reduce reactor power to 50% or less within 90 minutes or less.

2. If total leakage from all three steam generators increases by 60 gpd or more in approximately 4 hours or less, reduce reactor power to 50% or less within 90 minutes or less.

3. If leakage from an individual steam generator is projected to exceed 100 gpd within 90 minutes or less, reduce reactor power to 50% or less in 90 minutes or less and be in Mode 3 (Hot Standby) in 6 hours or less.

4. If total leakage from all three steam generators exceeds 300 gpd, be in Mode 3 (Hot Standby) in 6 hours or less.

5. If leakage from an individual steam generator exceeds 100 gpd, be in Mode 3 (Hot Standby) in 6 hours or less.

These leakage limits are designed to provide effective response for three different tube degradation mechanisms. These three mechanisms are:

1. The rapid propogation of a fatigue crack due to the presence of high alternating stresses (i.e. stresses greater than 7 ksi).

2. The less rapid propogation of a fatigue crack due to the presence of moderate to low alternating stresses (i.e., stresses of 7 ksi or less).

3. The slow propogation of a corrosion crack.

A fatigue crack can be expected to initially penetrate thru-wall, then turn and propogate around the wall. This would result in an step initiation of leakage followed by continually increasing leakage. Leakage limits 1 and 2 above are designed to provide timely, effective response to initiation and propogation of a fatigue crack where very high alternating stresses are present. It should be noted that the modifications made to the North Anna steam generators make it extremely improbable that a tube will be subjected to these levels of stress. However, it is prudent that the leakage limits address this unlikely case.

Leakage limits 3, 4 and 5 above are designed to provide effective, timely response to the initiation and propogation of fatigue cracks where lower levels of alternating stresses are present and to corrosion cracks. If the stresses are 7 KSI or less, the absolute limit of 100 gpd allows sufficient time to take corrective action prior to a rupture.

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