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PASSPORT DOCUMENT

TRANSMITTAL

	Item	Facility	Type	Sub	Document Number / Title	Sheet	Revision	Doc Date	Copy #	Media	Copies
*	0001	MP	PROC	CH	CP 2804L UNIT 2 RX COOLANT LIQUID WASTE PASS		003 01			P	01
*	0002	MP	PROC	CH	CP 2804M UNIT 2 VENT CONTAINMENT AIR PASS		001 01			P	01

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A001

08/22/01
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08/23/01
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Document Action Request

SPG # 020123-190106

A

Initiated By: Nileen Drzewianowski Date: 01/24/2002 Department SPG Ext 5139

Document No: CP 2804L Rev. No: 003 Minor Rev No. 01

Title: **Unit 2 Rx Coolant and Liquid Waste PASS**

B

Reason for Request (attach commitments,CR's,AR's,etc)

Editorial Correction; AR#01005693-01 Updated NRC commitment reference

Continued ☒

Select One *See MP-05-DC-SAP01 sect 2.3 to determine type of change*

C

☐ Intent Change (SQR Independent, RCD, ENV Screen Required (Other reviews may be required. See MP-05-DC-FAP 01.1 Att 3

☑ Edit Corr

☐ Non-Intent Change (Only SQR Independent Review and Env. screen Required)

D

Editorial Correction Approval

Lm Mth 1/28/02
Plant Mngt Staff Member - Approval / Date

TPC Interim Approval

/
(1) Plant Mngt Staff Member Print/Sign/Date

/
(2) SM/SRO/CFH on Unit Print/Sign/Date

E

Procedure Request/Feedback Disposition

Priority: ☑ Perform Now ☐ Perform Later - See Comments

Activity: ☐ Revision ☑ Minor Revision (See DC-GDL01 for guidance) ☐ Cleanup Rev ☐ Biennial Review ☐ Cancellation ☐ Supercedure

☐ TPC ☐ OTC ☐ Place in Void

F

Reviews continued ☐	Print	Sign	Date	SQR Qualified Yes	SQR Qualified No	SQR Qualified Dept.	If Comments
☐				☐	☐		☐
☐				☐	☐		☐
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Licensing Basis ☐	N/A	N/A	N/A	☐	☐	N/A	☐
Independent ☐	N/A	N/A	N/A	☐	☐	N/A	☐

G

An NRRL update was required ? ☐ Yes

H

1. ☒ **SQR Program Final Review and Appproval**

Approval ☐ Disapproval ☐

N/A /
SQR Qualified Independent Reviewer / Date

N/A
Department Head/Responsible Individual

N/A
Approval Date

2. ☐ SORC ☒ **RI/DH Final Review and Approval**

N/A
Department Head/Responsible Individual Sign

Meeting No. N/A

N/A
SORC Approval Signature

N/A
Approval Date

I

Effective Date 01/30/02

MILLSTONE NUCLEAR POWER STATION
CHEMISTRY PROCEDURE

Unit 2 Rx Coolant and Liquid Waste PASS [✤Ref.6.17]

CP2804L

Rev. 003−01

STOP THINK ACT REVIEW

NOTE

A review by the Emergency Planning Department is required whenever this procedure is revised or whenever changes are made to this procedure which impact the ability to collect and analyze a PASS sample.[Ref. 6.25]

A review by the Nuclear Fuels Safety Analysis is required whenever modifications to this procedure may impact dose limit time and motion study calculations. ①

Approval Date: 01/28/02

Effective Date: 01/30/02

Level of Use
Continuous

Subject Matter Expert:

Millstone Unit 2

Unit 2 Rx Coolant and Liquid Waste PASS [✣Ref.6.17]

TABLE OF CONTENTS

ATTACHMENTS AND FORMS

1. PURPOSE

1.1 Objective

Provide the method for sampling and analyzing Unit 2 reactor coolant and liquid waste during Station Emergency Response Organization (SERO) activation when high radioactivity levels, due to an accident, may preclude the normal (conventional) sampling method. The sampling and analysis are performed by the Liquid PASS Team as directed by the Manager of Radiological Dose Assessment (MRDA) or the Assistant Manager of Radiological Dose Assessment (AMRDA).

Performance and implementation of this procedure satisfies the Millstone Unit 2 Technical Specification 6.18.

1.2 Discussion

This procedure provides instructions used by the Liquid PASS Team for sampling and analysis of reactor coolant, liquid waste, or both, during post accident conditions. The analyses conducted in this procedure identify the presence and amounts of various radioactive isotopes and ionic impurities contained in the reactor coolant or liquid waste. The presence and amounts of certain radioactive isotopes are indicative of the type(s) and extent of core damage that exists. The results obtained from this procedure assist the MRDA or AMRDA in determining an estimate of Unit 2 core damage. The Unit 2 systems which can be sampled and the analyses which can be conducted through performance of this procedure are summarized in the following lists:

Systems	Analyses
Reactor Coolant	Liquid Isotopic
Shutdown Cooling	Gaseous Isotopic
High Pressure Safety Injection	Gaseous Composition
Low Pressure Safety Injection	Total Dissolved Gas
Liquid Radwaste	Chloride
	Boron
	pH

The time required to collect and analyze core coolant samples is 3 hours or less from the time the ADTS makes the decision to obtain a sample using PASS, except for chloride, which is 96 hours. Gross activity is the sum of liquid and gaseous isotopic activity.

In the event of a SIAS accident the following valves 2–RC–001, 2–RC–003 and 2–RC–045 will automatically close. If this occurs they will have to be manually over–ridden to open. This action will require SM/US direction and concurrence. These valves are over–ridden by taking them to the closed position and then to the open position.

This procedure is linked to the Emergency Plan, therefore the Emergency Planning Services Department will be a cross discipline reviewer for all revisions or changes to this procedure.[Ref. 6.25]

1.3 **Applicability**

This procedure is applicable during SERO activation when in-plant radioactivity levels are too high to permit reactor coolant or liquid waste sampling via the normal (conventional) method.

1.4 **Frequency**

Performance of this procedure may be repeated periodically during SERO activation, when requested by the MRDA or AMRDA for updates or reassessments of Unit 2 reactor coolant or liquid waste PASS results.

2. PREREQUISITES

2.1 General

___/___ 2.1.1 IF drill OR exercise performance, SM or US has granted permission to perform procedure.

___/___ 2.1.2 SERO is activated OR drill simulation is in progress.

___/___ 2.1.3 MCRO **or** drill coordinator has been notified that a PASS sample will be taken.

___/___ 2.1.4 Health Physics has evaluated need for RWP.

___/___ 2.1.5 Nitrogen bottle with at least 500 psig is available at the ROM.

___/___ 2.1.6 Lab ventilation is operating.

2.1.7 Lead brick shielding has been placed at the following locations:

___/___ • ICP

___/___ • Lab ventilation hood

___/___ 2.1.8 Computer radioisotopic analysis system in operation and calibrated.

___/___ 2.1.9 ICP has been set up for PASS sample boron analysis and calibrated or calibration has been initiated.

___/___	2.1.10	IF necessary, gas chromatograph has been set up for PASS sample analysis and calibrated or calibration has been initiated (NA for liquid waste sampling).
___/___	2.1.11	14cc gas vial has been stoppered and 100 µl evacuated (NA for liquid waste sampling).
___/___	2.1.12	Proper operation of sample syringes verified using instructions in Attachment 10 (NA for liquid waste sampling).
___/___	2.1.13	pH probe has been installed IAW with Attachment 11.
___/___	2.1.14	Radmonitor bypass key has been obtained from Operations.
___/___	2.1.15	PASS anti–tamper key has been obtained from Chemistry Supervisor's Office.

____/____ 2.1.16 Manager of Radiological Dose Assessment (MRDA) or the Assistant Manager of Radiological Dose Assessment (AMRDA) has requested a PASS sample to include the following:

REACTOR COOLANT

Check Requested Analysis	Sample Equipment Needed
☐ pH	PASS pH probe and pH probe cable
☐ Pressurized 2 ml grab sample	2 ml grab sample chamber
☐ Depressurized 2 ml grab sample	2 ml grab sample chamber
☐ Reactor coolant liquid isotopic	250 µl "LIQUID ISOTOPIC" syringe[1]
☐ Gas isotopic	250 µl "GAS ISOTOPIC" syringe and a stoppered and evacuated 14cc gas vial
☐ Gas composition	500 µl "GAS COMP" syringe
☐ Total dissolved gas	None
☐ Chlorides	1 ml "CHLORIDES" syringe
☐ Boron	"LIQUID ISOTOPIC" syringe [1]

[1] Same syringe is used for both

LIQUID WASTE

Check Requested Analysis	Sample Equipment Needed
☐ Required sample aliquots for discharge permit preparation	Sample bottle

____/____ 2.1.17 Sample module ventilation is in operation.

2.1.18 Anti–tamper covers have been removed from the following modules and panels:

____/____ • ROM

____/____ • Panel C103C

____/____ • Panel C103D

2.1.19 Liquid PASS Team has completed pre–job brief as follows:

____/____ • Manager of Operational Support Center (MOSC) – designates, assembles, and briefs the Liquid PASS Team for implementation of this procedure

____/____ • Manager of Radiological Dose Assessment (MRDA) or the Assistant Manager of Radiological Dose Assessment (AMRDA) – designates one the following sample points:

Check One

☐ RCS Hot Leg

☐ HPSI/LPSI

☐ CWMT A or B

☐ AWMT A or B

____/____ • If RCS hot leg sample point is designated, Manager of Operational Support Center (MOSC) or designee has provided RCS system pressure.

RCS pressure: _____ psia

____/____ • Manager of Radiological Dose Assessment (MRDA) or the Assistant Manager of Radiological Dose Assessment (AMRDA) – designates one the following paths to receive PASS system effluent (NA for liquid waste sampling):

Check One

☐ Rad waste (EDST) – May **only** receive effluent when this procedure is performed as part of a drill or exercise.

☐ Volume control tank

____/____ • Operational Support Center Assistant Radiological Protection Supervisor (OSC ARPS) with the concurrence of the Manager of Radiological Consequence Assessment (MRCA) – specifies the radiological controls required for implementation of this procedure

2.2 Documents

2.2.1 CP 801/2801/3801Y, "Routine Operation and Calibration of the Laboratory Ion Chromatography System"

2.2.2 CP 801/2801/3801AD, "Gas Chromatograph Operation and Calibration"

2.2.3 CP 801/2801AJ, "Inductively Coupled Argon Plasma Analysis"

2.2.4 CP 801/2801/3801AT, "Gamma Spectroscopy Counting System Maintenance and Operation"

2.2.5 RWP for PASS sample collection

2.2.6 SP 2864, "Liquid Waste Discharge"

2.3 **Personnel**

NOTE

If procedure is being performed as part of a drill or exercise all personnel may not be required. Personnel required will be determined by the Emergency Planning Services Department.

2.3.1 Assistant Director, Technical Support (ADTS)

2.3.2 Manager of Radiological Dose Assessment (MRDA)

2.3.3 Assistant Manager of Radiological Dose Assessment (AMRDA)

2.3.4 Manager of Radiological Consequence Assessment (MRCA)

2.3.5 Manager of Operational Support Center (MOSC)

2.3.6 Operational Support Center Assistant Radiological Protection Supervisor (OSC ARPS)

2.3.7 Manager of Control Room Operations (MCRO)

2.3.8 Liquid PASS Team consisting of at least the following personnel:

- At least two Chemistry Technicians
- At least one Health Physics Technician

2.4 Tools and Consumables

2.4.1 1 watch (range: 0 – 24 hours) (resolution: 1 second)

2.4.2 14cc gas vial with septum

2.4.3 1 transport cart

2.4.4 Plastic bags

2.4.5 Seven, 1 liter plastic bottles

2.4.6 Plastic wrap

2.4.7 One, 2 ml grab sample chamber

2.4.8 Two, 250 µl syringes

2.4.9 One, 500 µl syringes

2.4.10 One, 1.0 ml syringes

2.4.11 1 sample transport container

2.4.12 One, 2 ml grab sample chamber transport container

2.4.13 1 grab sample transport cart

2.4.14 Syringe transport container

2.4.15 pH probe

2.4.16 Small tipped screwdriver

2.4.17 Tongs for inverting samples

2.4.18 Flat head screwdriver

2.4.19 Large channel lock pliers

2.5 Responsibilities

2.5.1 Manager of Control Room Operations (MCRO) directs valve lineups from the Control Room required for Liquid PASS Team acquisition and retrieval of samples.

2.5.2 The ADTS shall make the decision to obtain a sample using PASS.

2.5.3 The Manager of Operational Support Center designates, assembles and briefs the PASS team.

2.5.4 The Manager of Radiological Consequence Assessment specifies PASS team radiological controls.

2.5.5 The Operational Support Center Assistant Radiological Protection Supervisor assigns HP technicians and briefs the PASS team on radiological conditions.

2.5.6 The Manager of Radiological Dose Assessment or the Assistant Manager of Radiological Dose Assessment specify PASS team sampling and analysis requirements.

2.6 **Definitions**

2.6.1 CIRCLE – to draw a circle around

2.6.2 NOTE – To Notice or Observe with Care

2.6.3 EDST – equipment drains sump tank

3. PRECAUTIONS

3.1 **Do not** exceed 165°F influent sample flow temperature to the sample module. If influent sample flow temperature exceeds 165°F, secure sample flow to prevent damage to the sample module.

3.2 **Do not** exceed 2500 psig system pressure because this may damage reactor coolant PASS components.

3.3 **Do not** run stripping pump dry for longer than 5 minutes because this may damage the pump.

3.4 Valves 2–S–492 (V–9) and 2–S–496 (V–14) in the sample module must be **closed** at all times except when a syringe is inserted into either sample chamber (liquid or gas) for sample retrieval. Failure to do so may discharge radioactive reactor coolant from the sample module into the Unit 2 Primary Sample Sink Room.

3.5 Valve 2–S–499 (V–18) on the remote operating module must always be in the **low flow** position when system pressure is greater than 415 psia to prevent high pressure spikes due to water hammer.

3.6 In the event of unexpected results during the course of this procedure, place the equipment in a safe or stable condition, cease performance of further steps, and contact the MRDA or AMRDA for further instructions.

3.7 The maximum design pressure for the pH probe is 250 psig. Do not exceed 250 psig at pH probe.

3.8 PASS sample effluent may be sent to radwaste (EDST) when this procedure is performed as part of a PASS drill or exercise. PASS effluent **must** be directed to the VCT for **all** other performances of this procedure.

__/__ 3.9 2–RB–210, Degassifier Effluent Cooler Return Isolation Valve Assembly, needs to be open during sampling to prevent exceeding temperature limits of the equipment. It should not be open for extended periods of time as cooling will be diverted from other components when this valve is open.

4. INSTRUCTIONS

4.1 **Determination of Procedure Entry Point**

4.1.1 IF you have been directed to perform reactor coolant sampling and analysis, Go To Section 4.2.

4.1.2 IF you have been directed to perform liquid waste sampling and analysis, Go To Section 4.21.

– End of Section 4.1 –

4.2 PASS Preparation for Reactor Coolant Sampling

4.2.1 REQUEST Operations OPEN 2–RB–210, Degassifier Effluent Coolant Return Isolation Valve Assembly.

4.2.2 At Remote Operating Module, PERFORM the following:

a. OPEN front panel.

b. ENSURE 2–GAN–253 (nitrogen supply valve) is open.

c. CLOSE front panel.

d. On ROM panel, PRESS the "POWER ON" button to energize the ROM.

e. NOTE current time and RECORD time: _____ ROM was energized.

f. ENSURE "BLOWER FUSE" and "LINE FUSE" indicator lights are *not* lit.

g. RESET ROM timer to zero.

4.2.3 *Without* transport cart and syringes, PROCEED to PANEL C72 (located outside Primary Sample Sink Room).

4.2.4 On PANEL C72, POSITION the following valves as specified:

a. 2–RC–003 to "CLOSE"

b. 2–RC–002 to "CLOSE"

c. 2–LRR–61.1 to "CLOSE"

4.2.5 PROCEED into Primary Sample Sink Room.

4.2.6 At sample module PERFORM the following:

a. OPEN sample module ventilation damper.

b. OPEN module door.

NOTE

Valves 2–S–492 (V–9) and 2–S–496 (V–14) are closed when the handle of each valve is parallel to the side of the sample chamber in a vertical position and fully inserted.

___ c. ENSURE 2–S–492 (V–9) and 2–S–496 (V–14) are closed.

___ d. ENSURE 2 ml grab sample chamber is installed and its quick connects are properly engaged.

___ e. CLOSE module door.

___ 4.2.7 IF sampling HPSI/LPSI, behind primary sample sink, OPEN 2–S–504.

NOTE

PASS sample purge may be returned to the VCT or Rad Waste. MRDA or AMRDA will designate purge return location.

4.2.8 At PASS valve manifold, PLACE 2–S–453 to POSITION 1.

4.2.9 IF sample effluent is to be directed to Equipment Drains Sump Tank PERFORM the following:

___ a. OPEN 2–S–458

___ b. CLOSE 2–S–460

4.2.10 IF sample effluent is to be directed to VCT PERFORM the following:

___ a. OPEN 2–S–460

___ b. CLOSE 2–S–458

___ 4.2.11 CLOSE 2–S–2, Reactor Coolant Pre–Cooler Stop

___ 4.2.12 OPEN 2–S–2, Reactor Coolant Pre–Cooler stop 1 turn.

4.2.13 At PASS valve manifold, PERFORM one of the following:

- IF RCS Hot Leg is to be sampled, POSITION 2–S–451 to "POSITION 1"

- IF LPSI/HPSI System is to be sampled, POSITION 2–S–452 to "POSITION 1"

4.2.14 PROCEED to reactor coolant PASS area in Unit 2 Turbine Building.

4.2.15 At PASS Nitrogen Supply bottle, PERFORM the following:

a. OPEN nitrogen bottle isolation valve.

b. VERIFY nitrogen supply pressure is greater than or equal to 500 psig.

c. ADJUST 2–GAN–235 (nitrogen bottle pressure regulator valve) to obtain 400 psig downstream pressure.

4.2.16 On ROM, PERFORM the following:

NOTE

Monitoring of T1, T2, or T3 temperatures via the remote operating module should be selected using only the "TEMPERATURE" rotary switch. The "T1" pushbutton on the remote operating module should remain depressed, regardless of the "TEMPERATURE" rotary switch setting.

a. ENSURE "T1" pushbutton switch is depressed.

b. ADJUST 2–GAN–260 nitrogen pressure regulator, to obtain 80 psig as indicated on PI–1087.

c. SET rotary temperature switch to "T1."

4.2.17 On PANEL C103C, POSITION the following valves to "CLOSE."

a. RC–001

b. RC–045

c. S–446

4.2.18 On PANEL C103D, POSITION the following as specified:

- S−448 to "CLOSE"
- S−457 to "CLOSE"

NOTE

A minimum of 15 minutes is required for remote operating module warm−up.

4.2.19 Refer To step 4.2.2.e. and ENSURE at least 15 minutes have elapsed since remote operating module was energized.

4.2.20 At the ROM, SET temperature indicator calibration setpoint to 212°F as follows:

a. PRESS and HOLD temperature calibration button.

b. IF readout is greater than 165°F AND "High temp" Alarm does not flash, RELEASE temperature calibration button and CONSULT with Chemistry Supervision.

c. IF readout does not indicate 212°F, ADJUST the Cal Trim screw with screwdriver to obtain a readout of 212°F.

d. RELEASE temperature calibration button.

4.2.21 On remote operating module, POSITION the following valves as specified:

___ a. 2–S–482 (V–1) to "BYPASS"

___ b. 2–S–486 (V–2) to "GRAB"

___ c. 2–S–487 (V–3) to "GRAB SAMPLE"

___ d. 2–S–488 (V–4) to "CLOSE"

___ e. 2–S–489 (V–6) to "CLOSE"

___ f. 2–S–490 (V–7) to "BYPASS"

___ g. 2–S–491 (V–8) to "BYPASS"

___ h. 2–S–493 (V–11) to "LIQUID"

___ i. 2–S–494 (V–12) to "BYPASS"

___ j. 2–S–495 (V–13) to "BYPASS"

___ k. 2–GAN–259 (V–15) to "CLOSE"

___ l. 2–S–497 (V–16) to "CLOSE"

___ m. 2–S–498 (V–17) to "CLOSE"

___ n. IF system pressure is > 400 psig 2–S–499 ("V–18") to "LO–FLOW"

___ o. IF system pressure is < 400 psig 2–S–499 ("V–18") to "HIGH–FLOW"

4.2.22 At remote operating module, FILL sample module gas loop as follows:

a. POSITION the following valves as specified:

1) 2–S–493 (V–11) to "GAS"

2) 2–GAN–259 (V–15) to "OPEN"

3) 2–S–490 (V–7) to "INLINE"

4) 2–S–489 (V–6) to "OPEN"

b. WAIT 30 seconds

c. POSITION 2–S–494 (V–12) to "INLINE"

d. POSITION 2–S–495 (V–13) to "INLINE"

e. WAIT 30 seconds

f. POSITION 2–S–494 (V–12) to "BYPASS"

g. POSITION 2–S–491 (V–8) to "INLINE."

h. WAIT 30 seconds

i. POSITION 2–S–490 (V–7) to "BYPASS."

j. POSITION 2–S–491 (V–8) to "BYPASS."

k. WAIT 30 seconds

l. POSITION 2–S–493 (V–11) to "LIQUID"

4.2.23 PERFORM the following to leak check the gas loop:

a. ALLOW pressure to stabilize as indicated on PI–1067.

b. NOTE pressure as indicated on PI–1067.

c. CLOSE 2–GAN–259 (V–15)

d. WAIT at least 1 minute

e. NOTE pressure as indicated on PI−1067.

f. IF a pressure decrease is noted following the 1 minute wait, NOTIFY MRDA.

g. POSITION 2−S−489 (V−6) to "CLOSE."

4.2.24 PERFORM the following to depressurize gas sample loop:

a. POSITION 2−S−494 (V−12) to "INLINE"

b. At Sample Module, OPEN 2−S−741, Gas Loop Vent

c. WAIT at least 10 seconds

d. CLOSE 2−S−741, Gas Loop Vent

e. VERIFY 2−S−556, RCS Test Connection Valve, is open.

f. At ROM, POSITION the following valves as specified:

1) 2−S−494 (V−12) to "BYPASS"

2) 2−S−495 (V−13) to "BYPASS"

3) 2−S−493 (V−11) to "LIQUID"

4.2.25 At flush module, PERFORM the following:

a. IF demineralized water flush tank level indicator light does not indicate "FULL," PERFORM the following:

1) THROTTLE 2−S−505, PMW To Flush Tank Fill.

2) While filling tank, manually PUMP flush module level indicator to obtain an accurate water level.

3) WHEN demineralized water flush tank indicates full, CLOSE 2−S−505, PMW To Flush Tank Fill.

b. POSITION the following valves as specified:

___ 1) 2–S–506 to "OPEN"

___ 2) 2–S–503 to "OPEN"

___ 3) 2–GAN–237 to "CLOSED"

___ 4) 2–S–507 to "CLOSED"

– End of Section 4.2 –

4.3 Isolation of Reactor Coolant Samples

4.3.1 PRESS reset button on PASS flowmeter (FI−1062) to zero the gallons indication.

4.3.2 READ totalizer and RECORD initial totalizer reading on Attachment 1.

4.3.3 VERIFY with Operations that 2−RB−210, Degassifier Effluent Coolant Return Isolation Valve Assembly is open.

4.3.4 On PANEL C103C, PERFORM one of the following:

- IF RCS Hot Leg is to be sampled, OPEN RC−001 **and** RC−045.
- IF HPSI/LPSI System is to be sampled, OPEN 2−S−446.

4.3.5 On Remote Operating Module, PERFORM the following:

a. POSITION 2−S−486 (V−2) to "BYPASS."

NOTE

A reactor coolant flow path to the sample module is now established.

b. READ sample module radiation level on "RMSII" radiation meter and RECORD reading on Attachment 1.

c. IF sample flow is not at least 0.25 gpm, CONSULT with MRDA or AMRDA for instructions.

CAUTION

Influent sample temperatures exceeding 165°F can damage the sample module. The "HIGH−TEMP" ("T1") indicator light on the remote operating module flashes when influent sample temperature exceeds 165°F.

4.3.6 IF HIGH−TEMP (T1) indicator light flashes, PERFORM the following:

a. IF sampling RCS Hot Leg PERFORM the following:

1) CLOSE 2–RC–001

2) CLOSE 2–RC–045

3) REQUEST Operations CLOSE 2–RB–210, Degassifier Effluent Coolant Return Isolation Valve Assembly

b. IF Sampling HPSI/LPSI System, CLOSE 2–S–446.

c. NOTIFY MRDA or AMRDA and REQUEST further instructions.

4.3.7 IF sampling RCS Hot Leg AND Total Dissolved Gas Analysis ***has*** been requested, PURGE 25 gallons.

4.3.8 IF sampling RCS Hot Leg, AND Total Dissolved Gas Analysis has ***not*** been requested,PURGE 10 gallons

4.3.9 IF sampling HPSI/LPSI, PURGE 5 gallons

4.3.10 PERFORM the following actions as applicable:

- IF acquisition of pressurized 2 ml grab sample is directed by MRDA or AMRDA, Refer To Section 4.4 and ISOLATE pressurized 2 ml grab sample via remote operating module.
- IF acquisition of depressurized 2 ml grab sample is directed by MRDA or AMRDA, Refer To Section 4.5 and ISOLATE depressurized 2 ml grab sample via remote operating module.
- IF acquisition of liquid in–line sample OR gaseous in–line sample is directed by MRDA or AMRDA, Refer To Section 4.6 and ISOLATE in–line sample via remote operating module.

4.3.11 On PANEL C103C, PERFORM one of the following:

- IF RCS Hot Leg was sampled, CLOSE 2–RC–001 **and** 2–RC–045.
- IF HPSI/LPSI System was sampled, CLOSE 2–S–446.

4.3.12 REQUEST Operations CLOSE 2–RB–210, Degassifier Effluent Coolant Return Isolation Valve Assembly.

4.3.13 Go To Section 4.7.

– End of Section 4.3 –

4.4 Reactor Coolant Pressurized 2 ml Grab Sample Isolation

ALARA

This Section should only be performed when directed by MRDA or AMRDA.

___ 4.4.1 POSITION 2–S–482 (V–1) to "GRAB"

___ 4.4.2 POSITION 2–S–486 (V–2) to "GRAB"

___ 4.4.3 ALLOW approximately 60 seconds for flow to stabilize.

NOTE

A pressurized sample is now trapped (isolated) in the 2 ml shielded grab sample chamber.

___ 4.4.4 POSITION 2–S–487 (V–3) to "NORMAL AND FLUSH."

___ 4.4.5 POSITION 2–S–482 (V–1) to "BYPASS."

NOTE

Flow rate should drop to zero when "2–S–486" ("V–2") is positioned to "BYPASS."

___ 4.4.6 POSITION 2–S–486 (V–2) to "BYPASS."

4.4.7 RECORD the following information on Attachment 1:

___ • System sampled

___ • Grab Sample isolation date

___ • Grab Sample isolation time

___ 4.4.8 Go To Step 4.3.10.

– End of Section 4.4 –

4.5 Reactor Coolant Depressurized 2 ml Grab Sample Isolation

ALARA

This Section should only be performed when directed by MRDA or AMRDA.

___ 4.5.1 POSITION 2–S–482 (V–1) to "GRAB"

___ 4.5.2 POSITION 2–S–486 (V–2) to "GRAB"

___ 4.5.3 ALLOW approximately 60 seconds for flow to stabilize.

___ 4.5.4 POSITION 2–S–482 (V–1) to "BYPASS"

___ 4.5.5 POSITION 2–S–487 (V–3) to "NORMAL AND FLUSH."

NOTE

A depressurized sample is now trapped (isolated) in the 2 ml shielded grab sample chamber.

4.5.6 RECORD the following information on Attachment 1:

___ • System sampled

___ • Grab sample isolation date

___ • Grab sample isolation time

___ 4.5.7 Go To Step 4.3.10.

– End of Section 4.5 –

4.6 Reactor Coolant In–Line Sample Isolation

ALARA

This Section should only be performed when directed by MRDA or AMRDA.

4.6.1 SET rotary temperature switch to "T2."

4.6.2 POSITION the following valves as specified:

a. 2–S–482 (V–1) to "BYPASS."

b. 2–S–486 (V–2) to "GRAB."

c. 2–S–498 (V–17) to "OPEN."

d. 2–S–487 (V–16) to "OPEN."

e. 2–S–488 (V–4) to "OPEN."

4.6.3 IF flow is not at least 0.25 gpm, CONSULT with MRDA or AMRDA for guidance.

4.6.4 WAIT at least 1 minute.

4.6.5 WHEN pH reading has stabilized, RECORD the following on Attachment 1:

- pH reading
- pH temperature (T2)

4.6.6 POSITION the following valves as specified:

a. 2–S–487 (V–6) to OPEN.

b. 2–S–498 (V–17) to "CLOSE'.

c. 2–S–497 (V–16) to "CLOSE"

4.6.7 Refer To Attachment 2 and DETERMINE correction factor for measured temperature.

4.6.8 ADD correction factor to pH value and RECORD sum on Attachment 1.

4.6.9 POSITION 2–S–490 (V–7) to "INLINE"

4.6.10 POSITION 2–S–491 (V–8) to "INLINE."

4.6.11 FLUSH 2 gallons

4.6.12 POSITION 2–S–490 (V–7) to "BYPASS"

4.6.13 POSITION 2–S–491 (V–8) to "BYPASS"

4.6.14 FLUSH 2 gallons

4.6.15 POSITION 2–S–491 (V–8) to "BYPASS."

4.6.16 START stripping pump

4.6.17 FLUSH 2 gallons

4.6.18 STOP stripping pump

4.6.19 POSITION 2–S–489 (V–6) to "CLOSE."

4.6.20 POSITION 2–S–488 (V–4) to "CLOSE."

NOTE

A pressurized sample of known volume is now isolated within the boundaries of 2–S–488 (V–4), 2–S–489 (V–6), and 2–S–493 (V–11).

4.6.21 RECORD the following information on Attachment 1:

- System sampled
- In–line sample isolation date
- In–line sample isolation time

4.6.22 READ totalizer and RECORD final totalizer reading on Attachment 1.

___ 4.6.23 Go To Step 4.3.10.

– End of Section 4.6 –

4.7 **Stripping of Dissolved Gases**

___ 4.7.1 SET rotary temperature switch to "T3."

4.7.2 RECORD the following on Attachment 1:

___ • Initial gas loop temperature (T3)

___ • Initial gas loop pressure reading from PI−1067.

___ 4.7.3 POSITION 2−S−493 (V−11) to "GAS" to allow liquid loop and sample chamber to depressurize.

4.7.4 NOTE the following:

___ • Gas Loop Pressure

___ • Gas Loop Temperature (T−3)

4.7.5 POSITION the following valves as specified:

___ 4.7.6 2−S−493 (V−11) to "LIQUID".

___ 4.7.7 2−S−491 (V−8) to "BYPASS"

___ 4.7.8 2−S−490 (V−7) to "BYPASS."

___ 4.7.9 START stripping pump.

___ 4.7.10 <u>WHEN</u> 1 minute has elapsed, STOP stripping pump.

___ 4.7.11 POSITION 2−S−493 (V−11) to "GAS".

___ 4.7.12 <u>WHEN</u> Gas Loop Pressure reading (P−2) from PI−1067 stabilizes, NOTE pressure: _____ _____ _____ _____

___ 4.7.13 POSITION 2−S−493 (V−11) to "LIQUID".

___ 4.7.14 POSITION 2−S−491 (V−8) and 2−S−490 (V−7) to "INLINE"

___ 4.7.15 START stripping pump

___ 4.7.16 <u>WHEN</u> 1 minute has elapsed, STOP stripping pump.

___ 4.7.17 POSITION 2−S−493 (V−11) to "GAS".

4.7.18 WHEN Gas Loop Pressure reading (P−2) from PI−1067 stabilizes, NOTE pressure: _____ _____ _____ _____

4.7.19 IF a pressure increase was noted between steps 4.7.12 and 4.7.18, Go To step 4.7.6.

4.7.20 POSITION 2−S−493 (V−11) to "LIQUID".

4.7.21 POSITION 2−S−490 (V−7) to "BYPASS."

4.7.22 START stripping pump.

4.7.23 POSITION the following valves as specified:

a. 2−S−491 (V−8) to "BYPASS."

b. 2−S−494 (V−12) to "BYPASS."

c. 2−S−495 (V−13) to "BYPASS."

d. 2−S−493 (V−11) to "GAS."

4.7.24 WAIT 1 minute

4.7.25 POSITION 2−S−494 (V−12) to "INLINE"

4.7.26 POSITION 2−S−495 (V−13) to "INLINE."

4.7.27 WHEN 1 minute has elapsed, STOP stripping pump.

4.7.28 RECORD the following on Attachment 1:

- Final Gas Loop Temperature (T3).
- Final Gas loop pressure reading from PI−1067.

4.7.29 Go To Section 4.8.

– End of Section 4.7 –

4.8 Flushing PASS Prior to Reactor Coolant Samples Retrieval

4.8.1 On Remote Operating Module, POSITION the following valves are positioned as specified:

___ a. 2–S–482 (V–1) to "BYPASS"

___ b. 2–S–486 (V–2) to "GRAB"

___ c. 2–S–487 (V–3) to "NORMAL AND FLUSH"

___ d. 2–S–488 (V–4) to "CLOSE"

___ e. 2–S–489 (V–6) to "CLOSE"

___ f. 2–S–490 (V–7) to "BYPASS"

___ g. 2–S–491 (V–8) to "BYPASS"

___ h. 2–S–493 (V–11) to "LIQUID"

___ i. 2–S–494 (V–12) to "BYPASS"

___ j. 2–S–495 (V–13) to "BYPASS"

___ k. 2–GAN–259 (V–15) to "CLOSE"

___ l. 2–S–497 (V–16) to "CLOSE"

___ m. 2–S–498 (V–17) to "CLOSE"

4.8.2 On PANEL C103D, PERFORM one of the following:

___ • IF RCS Hot Leg was sampled, OPEN "S–449."

___ • IF HPSI/LPSI System was sampled, OPEN "S–448."

NOTE

Opening "2–S–497" ("V–16") and "2–S–498" ("V–17") allows flow past the pH probe in the sample module.

4.8.3 At ROM, POSITION the following:

___ a. 2–S–498 (V–17) to "OPEN"

___ b. 2–S–497 (V–16) to "OPEN"

___ c. 2–S–488 (V–4) to "OPEN"

___ d. 2–S–499 (V–18) to "HI–FLOW."

NOTE

A flow should be evident on remote operating module "FLOWMETER" when Flush Pump P–155 is running.

___ 4.8.4 On Panel C103D, POSITION "FLUSH PUMP P–155" to "ON."

___ 4.8.5 START the stripping pump

NOTE

The following flush times may vary according to the activity of the samples required.

___ 4.8.6 WAIT 2 minutes.

___ 4.8.7 CYCLE 2–S–488 (V–4) with its final position being open.

NOTE

Radiation level in sample module should decrease markedly as sample is flushed from sample module piping.

___ 4.8.8 MONITOR flow and radiation levels to assess flush effectiveness.

4.8.9 POSITION the following valves as specified:

a. 2–S–489 (V–6) to "OPEN"

b. 2–S–497 (V–16) to "CLOSE"

c. 2–S–498 (V–17) to "CLOSE"

4.8.10 WAIT 1 minute.

4.8.11 CYCLE 2–S–489 (V–6) several times with its final position being open.

4.8.12 POSITION 2–S–493 (V–11) to "GAS."

4.8.13 WAIT 1 minute.

4.8.14 STOP stripping pump.

4.8.15 POSITION the following valves as specified:

a. 2–S–489 (V–6) to "CLOSE"

b. 2–S–486 (V–2) to "BYPASS"

c. 2–S–488 (V–4) to "CLOSE"

4.8.16 WAIT 1 minute.

4.8.17 POSITION 2–S–482 (V–1) to "GRAB"

4.8.18 POSITION 2–S–486 (V–2) to "GRAB"

4.8.19 FLUSH for 60 seconds

4.8.20 PERFORM the following on PANEL C103D:

a. POSITION "FLUSH PUMP P–155" to "OFF."

b. PERFORM one of the following:

- IF RCS Hot Leg was sampled, CLOSE "S–449."
- IF HPSI/LPSI System was sampled, CLOSE "S–448."

4.8.21 Go To Section 4.9

– End of Section 4.8 –

4.9 Reactor Coolant Sample Retrieval

Chem Tech

4.9.1 OBTAIN the following items and PROCEED to sample module in Primary Sample Sink Room:

- PASS transport cart
- Prepared syringes

HP Tech

4.9.2 PERFORM a rapid radiation survey of sample module area to ensure radiation level is less than level specified in radiological controls.

Chem Tech

4.9.3 IF radiation level is greater than or equal to level specified in radiological controls, Refer To Section 4.8 and PERFORM PASS flush.

4.9.4 PERFORM the following actions as applicable:

- IF acquisition of pressurized 2 ml grab sample or depressurized 2 ml grab sample is directed by MRDA or AMRDA, Refer To Section 4.10 and RETRIEVE 2 ml grab sample from sample module.
- IF acquisition of liquid in−line sample is directed by MRDA or AMRDA, Refer To Section 4.11 and RETRIEVE liquid in−line sample from sample module.
- IF acquisition of gaseous in−line sample is directed by MRDA or AMRDA, Refer To Section 4.12 and RETRIEVE gaseous in−line sample from sample module.

4.9.5 RETURN to chemistry lab with transport cart and samples.

4.9.6 Go To Section 4.13.

− End of Section 4.9 −

4.10 Reactor Coolant 2 ml Grab Sample Retrieval

ALARA

This Section should only be performed when directed by MRDA or AMRDA.

___ 4.10.1 PROCEED to Primary Sample Sink Room

___ 4.10.2 OPEN module door.

___ 4.10.3 GRAB unlatching knob and PULL slide tray outside of sample module.

___ 4.10.4 DISCONNECT flexible hoses from grab sample valve operator.

___ 4.10.5 LIFT 2 ml grab sample chamber from slide tray and PLACE in transport container.

___ 4.10.6 PLACE lid on transport container.

___ 4.10.7 PLACE spare 2 ml sample chamber on slide tray.

___ 4.10.8 ENSURE 2 ml grab sample chamber is located so that quick connect collars are properly positioned in yoke and 2 ml grab sample chamber is pressed firmly down onto slide tray.

___ 4.10.9 CONNECT flexible hoses to grab sample chamber air operator.

___ 4.10.10 ENSURE blue quick connects on grab sample chamber air operator are mated.

___ 4.10.11 PUSH slide tray, with 2 ml grab sample chamber, back into sample module until liquid quick connects latch.

___ 4.10.12 Go To step 4.9.4.

___ 4.10.13 IF no further samples are to be obtained, CLOSE module door.

– End of Section 4.10 –

4.11 Reactor Coolant Liquid In–Line Sample Retrieval

ALARA

This Section should only be performed when directed by MRDA or AMRDA.

4.11.1 PROCEED to Primary Sample Sink Room

4.11.2 OPEN sample module door.

4.11.3 INSERT "LIQUID ISOTOPIC" syringe gently into brass needle guide until syringe needle is bottomed.

4.11.4 OPEN 2–S–492 (V–9) by gently pulling valve handle out to its stop.

4.11.5 COMPLETE insertion of "LIQUID ISOTOPIC" syringe needle into brass needle guide until syringe needle nut mates into needle guide slot.

ALARA

1. Do *not* unscrew syringe nosecap more than 2 turns. Excessive turns will disengage nosecap and needle from syringe.
2. Steps 4.11.6 through 4.11.9 should be performed rapidly to minimize exposure.

4.11.6 WITHDRAW approximately 100 µl liquid sample.

4.11.7 UNSCREW syringe body 2 turns counterclockwise to lock sample syringe.

4.11.8 WITHDRAW "LIQUID ISOTOPIC" syringe carefully and CLOSE 2–S–492 (V–9) as syringe is removed.

4.11.9 PLACE "LIQUID ISOTOPIC" syringe in transport container.

4.11.10 INSERT "CHLORIDES" syringe gently into brass needle guide until syringe needle is bottomed.

4.11.11 OPEN 2–S–492 (V–9) by gently pulling valve handle out to its stop.

4.11.12 COMPLETE insertion of "CHLORIDES" syringe needle into brass needle guide until syringe needle nut mates into needle guide slot.

ALARA

1. Do *not* unscrew syringe nosecap more than 2 turns. Excessive turns will disengage nosecap and needle from syringe.
2. Steps 4.11.13 through 4.11.16 should be performed rapidly to minimize exposure.

4.11.13 WITHDRAW approximately 1.0 ml liquid sample

4.11.14 UNSCREW syringe body 2 turns counterclockwise to lock sample syringe.

4.11.15 WITHDRAW "CHLORIDES" syringe carefully and CLOSE 2-S-492 (V-9) as syringe is removed.

4.11.16 PLACE "CHLORIDES" syringe in transport container.

4.11.17 Go To step 4.9.4.

4.11.18 IF no further samples are to be obtained, CLOSE sample module door.

– End of Section 4.11 –

4.12 Reactor Coolant Gaseous In–Line Sample Retrieval

ALARA

This Section should only be performed when directed by MRDA or AMRDA.

4.12.1 PROCEED to Primary Sample Sink Room

4.12.2 OPEN sample module door.

4.12.3 INSERT "GAS ISOTOPIC" syringe gently into brass needle guide until syringe needle is bottomed.

4.12.4 OPEN 2–S–496 (V–14) by gently pulling valve handle out to its stop.

4.12.5 COMPLETE insertion of "GAS ISOTOPIC" syringe needle into brass needle guide until syringe needle nut mates into brass needle guide slot.

ALARA

1. Do *not* unscrew syringe nosecap more than 2 turns. Excessive turns will disengage nosecap and needle from syringe.
2. Steps 4.12.6 through 4.12.12 should be performed rapidly to minimize exposure.

4.12.6 WITHDRAW approximately 100 µl gas sample.

4.12.7 UNSCREW syringe body 2 turns counterclockwise to lock sample syringe.

4.12.8 WITHDRAW "GAS ISOTOPIC" syringe carefully and CLOSE 2–S–496 (V–14) as syringe is removed.

4.12.9 RECORD volume of gas sample transferred to syringe (V_t) on Attachment 1.

4.12.10 INSERT needle into stoppered 14cc gas vial.

4.12.11 UNLOCK syringe and INJECT gas contents into stoppered 14cc gas vial.

4.12.12 PLACE "GAS ISOTOPIC" syringe and 14cc gas vial in transport container.

4.12.13 IF gas composition sample is required, PERFORM the following:

a. INSERT "GAS COMP" syringe gently into brass needle guide until syringe needle is bottomed.

b. OPEN 2–S–496 (V–14) by gently pulling valve handle out to its stop.

c. COMPLETE insertion of "GAS COMP" syringe needle into brass needle guide until syringe needle nut mates into brass needle guide slot.

ALARA

1. Do *not* unscrew syringe nosecap more than 2 turns. Excessive turns will disengage nosecap and needle from syringe.
2. Steps 4.12.13d. through 4.12.13g. should be performed rapidly to minimize exposure.

d. WITHDRAW approximately 500 µl gas sample

e. UNSCREW syringe body 2 turns counterclockwise to lock sample syringe.

f. WITHDRAW "GAS COMP" syringe carefully and CLOSE 2–S–496 (V–14) as syringe is removed.

g. PLACE "GAS COMP" syringe in transport container.

4.12.14 Go To step 4.9.4.

4.12.15 IF no further samples are to be obtained, CLOSE sample module door.

– End of Section 4.12 –

4.13 Analysis of Reactor Coolant Samples

Chem Tech

4.13.1 IF retrieved, PLACE 2 ml shielded grab sample and transport container in properly shielded location for future off–site transport.

NOTE

Analysis outlined in the following Sections may be performed concurrently as equipment and personnel permit.

Chem Tech

4.13.2 Refer To the following sections as applicable and PERFORM analysis:

- Section 4.14, "Reactor Coolant Liquid Isotopic Analysis"
- Section 4.15, "Reactor Coolant Total Dissolved Gas Analysis"
- Section 4.16, "Reactor Coolant Chloride Analysis"
- Section 4.17, "Reactor Coolant Boron Analysis"
- Section 4.18, "Reactor Coolant Gaseous Isotopic Analysis"
- Section 4.19, "Reactor Coolant Gas Composition Analysis"

4.13.3 WHEN analysis are complete, REPORT results to MRDA or AMRDA.

4.13.4 COMPLETE applicable Attachments.

4.13.5 IF copies of results are requested, FAX or SEND copies of the applicable Attachments or isotopic printouts to requesting individuals:

4.13.6 FORWARD original and copy of completed attachments and gamma spectrometer printouts to Chemistry Supervision.

ALARA

High–level (greater than or equal to 100 mrem/hr) radioactive waste samples cannot be disposed of in the chemistry lab hot sink.

4.13.7 IF any diluted sample bottles measuring greater than or equal to 100 mR/hr on contact were prepared in step 4.14.5, PERFORM the following:

___ a. REQUEST OSC ARPS to provide storage instructions for sample bottles.

___ b. STORE sample bottles as directed by OSC ARPS.

– End of Section 4.13 –

4.14 Reactor Coolant Liquid Isotopic Analysis

Chem Tech

4.14.1 PREPARE 20 ml "ISOTOPIC ORIGINAL" sample bottle as follows:

___ a. TARE 20 ml sample bottle.

___ b. ADD 10 ml DI water to sample bottle.

___ c. RECORD DI water mass on Attachment 7.

___ d. TARE 20 ml sample bottle with water.

> **ALARA**
>
> Steps 4.14.1 e. through k. should be performed rapidly to minimize exposure.

___ e. REMOVE "LIQUID ISOTOPIC" syringe from syringe transfer container.

___ f. UNLOCK syringe and INJECT contents of "LIQUID ISOTOPIC" syringe into sample bottle.

___ g. RECORD 100 µl sample mass on the following:

___ • Attachment 4 (M_{dl})

___ • Attachment 7

___ h. CIRCLE "Isotopic Original" on Attachment 4.

___ i. PLACE empty "LIQUID ISOTOPIC" syringe in plastic bag and SEAL bag.

___ j. PLACE sealed plastic bag in properly shielded location for future disposal.

___ k. Using tongs, INVERT sample bottle several times to mix.

___ l. WRAP "ISOTOPIC ORIGINAL" bottle in plastic wrap.

___ HP Tech

4.14.2 MEASURE **contact** dose rate of "ISOTOPIC ORIGINAL" bottle.

Chem Tech

4.14.3 IF contact dose rate of sample bottle is greater than or equal to 25 mR/hr, Go To step 4.14.5.

4.14.4 IF contact dose rate of "ISOTOPIC ORIGINAL" bottle is less than 25 mR/hr, Go To step 4.14.6.

4.14.5 DILUTE sample using 1:1000 (solute:solvent) dilution factor as follows: [✣Ref. 6.18]

a. TRANSFER 1.0 ml from bottle containing sample (solute bottle) into 1 liter bottle filled with DI water (solvent bottle) and CAP bottle.

b. PLACE solute bottle in plastic bag and SEAL bag.

c. STORE solute bottle in shielded location.

d. Using tongs, INVERT solvent bottle several times to mix.

e. LABEL solvent liter bottle either "1st, "2nd, "3rd, "4th, "5th, "6th, or "7th DILUTION," as applicable, for the 1:1000 dilution being performed.

f. CIRCLE either "1st, "2nd, "3rd, "4th, "5th, "6th, or "7th Dilution" in Sample Dilution column on Attachment 4, as applicable, for the 1:1000 dilution being performed.

HP Tech

g. MEASURE **contact** dose rate of solvent liter bottle.

Chem Tech

h. IF contact dose rate of solvent liter bottle is less than 25 mR/hr, Go To step 4.14.6.

i. IF contact dose rate of solvent liter bottle is greater than or equal to 25 mR/hr, Go To step 4.14.5 a..

4.14.6 DETERMINE reactor coolant liquid isotopic activity as follows:

a. PLACE 2.5 cm shelf in detector to be used for reactor coolant liquid isotopic analysis.

b. Using the following information, Refer To CP 801/2801/3801AT, "Gamma Spectroscopy Counting System Maintenance and Operation," and ANALYZE sample:

- Closed cave
- Applicable geometry for sample container and shelf being used
- Five minute count time
- General library
- Sample mass corresponding to the last circled sample dilution on Attachment 4 in gms
- Inline sample date and time as recorded on Attachment 1

c. IF dead time is greater than or equal to 20%, PERFORM the following:

1) ABORT count.

2) Go To step 4.14.5.

d. STORE sample bottle in shielded location.

e. DETERMINE background as follows:

1) Using the following information, Refer To CP 801/2801/3801AT, "Gamma Spectroscopy Counting System Maintenance and Operation," and PERFORM background count on detector that was used for reactor coolant liquid isotopic analysis.

- Closed cave
- Applicable geometry for shelf that was used
- Five minute count time
- General library
- Sample mass corresponding to the last circled sample dilution on Attachment 4

2) RECORD all identified isotopes and their associated background activity levels in μCi/gm on Attachment 5.

f. Refer To Attachment 5 and CALCULATE reactor coolant liquid isotopic activity as follows:

___ 1) Refer To reactor coolant liquid isotopic printout and RECORD all identified isotopes and their associated activity levels in μCi/gm.

___ 2) For each isotope listed, SUBTRACT background activity and RECORD as isotope activity in μCi/gm.

___ 3) ADD isotope activities and RECORD as total isotope activity in μCi/gm.

___ 4.14.7 Go To step 4.13.2 and COMPLETE any remaining analysis.

– End of Section 4.14 –

4.15 Reactor Coolant Total Dissolved Gas Analysis

4.15.1 Refer To one of the following and CALCULATE total dissolved gas:

- Computer program
- Attachment 3

4.15.2 RECORD total dissolved gas in cc/kg on Attachment 1.

4.15.3 Go To step 4.13.2 and COMPLETE any remaining analysis.

– End of Section 4.15 –

4.16 Reactor Coolant Chloride Analysis

___ 4.16.1 REMOVE "CHLORIDES" syringe from syringe transfer container.

___ 4.16.2 INJECT contents of "CHLORIDES" syringe into small test tube located in lead brick at IC.

___ 4.16.3 Refer To CP 801/2801/3801Y, "Routine Operation and Calibration of the Laboratory Ion Chromatography Systems," and ANALYZE sample for chlorides.

___ 4.16.4 PLACE empty "CHLORIDES" syringe in plastic bag and SEAL bag.

___ 4.16.5 PLACE sealed plastic bag in properly shielded location for future disposal.

___ 4.16.6 RECORD chloride concentration in ppm on Attachment 7.

___ 4.16.7 Go To step 4.13.2 and COMPLETE any remaining analysis.

– End of Section 4.16 –

4.17 Reactor Coolant Boron Analysis

___ 4.17.1 WHEN sample bottle labeled "ISOTOPIC ORIGINAL" is no longer needed for isotopic analysis, Refer To CP 801/2801AJ, "Inductively Coupled Argon Plasma Analysis" and ANALYZE sample bottle for boron.

___ 4.17.2 PLACE "ISOTOPIC ORIGINAL" sample bottle in plastic bag and SEAL bag.

___ 4.17.3 PLACE sealed plastic bag in properly shielded location for future disposal.

___ 4.17.4 Refer To Attachment 7 and CALCULATE boron concentration in ppm.

___ 4.17.5 Go To step 4.13.2 and COMPLETE any remaining analysis.

– End of Section 4.17 –

4.18 **Reactor Coolant Gaseous Isotopic Analysis**

4.18.1 WRAP stoppered 14cc vial in plastic wrap.

4.18.2 PLACE sample on 2.5 cm shelf.

4.18.3 DETERMINE gas isotopic activity as follows:

a. Using the following information, Refer To CP 801/2801/3801AT, "Gamma Spectroscopy Counting System Maintenance and Operation," and ANALYZE sample:

- Open cave
- Applicable geometry for shelf being used
- Five minute count time
- General library
- Sample in−line isolation date and time as recorded on Attachment 1
- Sample quantity as calculated on Attachment 1

b. IF dead time is greater than or equal to 20%, PERFORM the following:

1) ABORT count.

NOTE

There are 3 shelves available for this count. They are the 2.5 cm, the 10 cm and the 30 cm shelves.

2) REPLACE shelf with next higher shelf.

3) Go To step 4.18.3.a.

c. PLACE empty "GAS ISOTOPIC" syringe and 14cc vial in labeled plastic bag and SEAL bag.

d. PLACE sealed plastic bag in source locker for future disposal.

e. DETERMINE background as follows:

1) Using the following information, Refer To CP 801/2801/3801AT, "Gamma Spectroscopy Counting System Maintenance and Operation," and PERFORM background count on detector that was used for gas isotopic analysis.

- Open cave
- Applicable geometry for shelf that was used
- Five minute count time
- General library
- Sample quantity as calculated on line 14 of Attachment 1

2) RECORD all identified isotopes and their associated background activity levels in μCi/gm on Attachment 6.

f. Refer To Attachment 6 and CALCULATE gas activity as follows:

1) Refer To gas isotopic printout and RECORD all identified isotopes and their associated activity levels in μCi/gm.

2) For each isotope listed, SUBTRACT background activity from printout activity and RECORD as isotope activity in μCi/gm.

3) ADD isotope activities and RECORD as "Total Gaseous Activity."

4.18.4 Go To step 4.13.2 and COMPLETE any remaining analysis.

– End of Section 4.18 –

4.19 Reactor Coolant Gas Composition Analysis

___ 4.19.1 REMOVE "GAS COMP" syringe from transport container.

4.19.2 Refer To CP 801/2801/3801AD, "Gas Chromatograph," and PERFORM the following analyses on sample:

___ • Hydrogen analysis

___ • Oxygen analysis

___ 4.19.3 PLACE empty "GAS COMP" syringe in plastic bag and seal bag.

___ 4.19.4 STORE sealed plastic bag in properly shielded location for future disposal.

___ 4.19.5 RECORD results of gas composition analysis on bottom of Attachment 6.

___ 4.19.6 Go To step 4.13.2 and COMPLETE any remaining analysis.

– End of Section 4.19 –

4.20 PASS Restoration

NOTE

Performance of this section prepares the reactor coolant PASS and sample chambers for the next sampling by removing (flushing) existing contamination from sampling piping and equipment.

4.20.1 PROCEED to PASS sampling area in Unit 2 Turbine Building.

4.20.2 IF demineralized water flush tank level indicator light does not indicate "FULL," PERFORM the following:

a. THROTTLE 2–S–505, PMW To Flush Tank Fill.

b. While filling tank, manually PUMP flush module level indicator to obtain an accurate water level.

c. WHEN demineralized water flush tank indicates full, CLOSE 2–S–505, PMW To Flush Tank Fill.

4.20.3 On Remote Operating Module, POSITION the following valves as specified:

a. 2–S–482 (V–1) to "BYPASS"

b. 2–S–486 (V–2) to "GRAB"

c. 2–S–487 (V–3) to "GRAB SAMPLE"

d. 2–S–488 (V–4) to "CLOSE"

e. 2–S–489 (V–6) to "CLOSE"

f. 2–S–490 (V–7) to "INLINE"

g. 2–S–491 (V–8) to "BYPASS"

h. 2–S–493 (V–11) to "GAS"

i. 2–S–494 (V–12) to "BYPASS"

j. 2–S–495 (V–13) to "BYPASS"

k. 2–GAN–259 (V–15) to "CLOSE"

l. 2–S–497 (V–16) to "CLOSE"

m. 2–S–498 (V–17) to "CLOSE"

n. 2–S–499 (V–18) to "HI–FLOW"

4.20.4 On PANEL C103D, PERFORM the following:

a. PERFORM one of the following:

- IF RCS Hot Leg was sampled, OPEN "2–S–449."
- IF HPSI/LPSI System was sampled, OPEN "2–S–448."

4.20.5 POSITION the following valves as specified:

a. 2–S–489 (V–6) to "OPEN"

b. 2–S–498 (V–17) to "OPEN"

c. 2–S–497 (V–16) to "OPEN"

d. 2–S–488 (V–4) to "OPEN"

4.20.6 POSITION "FLUSH PUMP P–155" to "ON."

NOTE

A flow should be evident on "FLOWMETER" when stripping pump is running.

4.20.7 START stripping pump

4.20.8 WAIT at least 3 minutes

4.20.9 POSITION 2–S–493 (V–11) to "LIQUID."

4.20.10 POSITION 2–S–491 (V–8) to "INLINE."

4.20.11 STOP stripping pump

4.20.12 WAIT at least 3 minutes

4.20.13 POSITION the following valves as specified:

a. 2–S–490 (V–7) to "BYPASS"

b. 2–S–491 (V–8) to "BYPASS"

c. 2–S–486 (V–2) to "BYPASS"

4.20.14 WAIT at least 30 seconds

4.20.15 POSITION the following valves as specified:

a. 2–S–488 (V–4) to "CLOSE"

b. 2–S–498 (V–17) to "CLOSE"

c. 2–S–497 (V–16) to "CLOSE"

d. 2–S–489 (V–6) to "CLOSE"

e. 2–S–482 (V–1) to "GRAB"

f. 2–S–486 (V–2) to "GRAB"

4.20.16 FLUSH for at least 3 minutes

4.20.17 POSITION 2–S–487 (V–3) to "NORMAL AND FLUSH."

4.20.18 On Panel C103D, POSITION "FLUSH PUMP P–155" to "OFF."

4.20.19 On flush module, CLOSE "2–S–506".

4.20.20 On PANEL C103D, PERFORM one of the following:

- IF RCS Hot Leg was sampled, CLOSE "2–S–449."
- IF HPSI/LPSI System was sampled, CLOSE "2–S–448."

4.20.21 PERFORM nitrogen flush of gas loop as follows:

a. POSITION 2–S–486 (V–2) to "GRAB."

b. OPEN 2–S–489 (V–6).

c. POSITION the following valves as indicated:

- 2–S–493 (V–11) to "GAS"
- 2–S–494 (V–12) to "INLINE"
- 2–S–495 (V–13) to "INLINE"

d. VERIFY 2–GAN–260 is approximately 80 psig.

e. OPEN 2–GAN–259 (V–15).

f. START stripping pump.

g. WAIT at least 1 minute.

h. POSITION valves as follows:

- 2–S–494 (V–12) to "BYPASS"
- 2–S–495 (V–13) to "BYPASS"

i. WAIT at least 1 minute.

j. POSITION valves as follows:

- 2–S–495 (V–13) to "INLINE"
- 2–S–490 (V–7) to "BYPASS"

k. STOP stripping pump.

l. WAIT 30 seconds.

m. CLOSE 2–GAN–259 (V–15).

n. CLOSE 2–S–489 (V–6).

o. POSITION 2–S–493 (V–11) to "LIQUID."

4.20.22 On Remote Operating Module, PERFORM the following:

a. POSITION the following valves as specified:

1) 2–S–482 (V–1) to "BYPASS"

2) 2–S–486 (V–2) to "GRAB"

3) 2–S–487 (V–3) to "GRAB SAMPLE"

4) 2–S–488 (V–4) to "CLOSE"

5) 2–S–489 (V–6) to "CLOSE"

6) 2–S–490 (V–7) to "BYPASS"

7) 2–S–491 (V–8) to "BYPASS"

8) 2–S–493 (V–11) to "LIQUID"

9) 2–S–494 (V–12) to "BYPASS"

10) 2–S–495 (V–13) to "BYPASS"

11) 2–GAN–259 (V–15) to "CLOSE"

12) 2–S–497 (V–16) to "CLOSE"

13) 2–S–498 (V–17) to "CLOSE"

14) 2–S–499 (V–18) to "LO–FLOW"

b. BACK OFF 2–GAN–260 (V–19) (nitrogen pressure regulator) completely.

4.20.23 BACK OFF 2–GAN–235, Nitrogen Supply Regulator.

4.20.24 At nitrogen bottle, CLOSE nitrogen bottle isolation valve.

4.20.25 DE–ENERGIZE Remote Operating Module.

4.20.26 REPLACE and LOCK anti–tamper covers on the following modules and panels:

- Remote Operating Module
- "PANEL C103C"
- "PANEL C103D"

4.20.27 IF demineralized water flush tank level indicator light does not indicate "FULL," PERFORM the following:

___ a. THROTTLE 2–S–505, PMW To Flush Tank Fill.

___ b. While filling tank, manually PUMP flush module level indicator to obtain an accurate water level.

___ c. WHEN demineralized water flush tank indicates full, CLOSE 2–S–505, PMW To Flush Tank Fill.

___ 4.20.28 PROCEED to sample module in Primary Sample Sink Room.

___ 4.20.29 PLACE 2–S–453 in "POS 2."

___ 4.20.30 PLACE 2–S–451 in "POS 2."

___ 4.20.31 IF open, CLOSE "2–S–460."

___ 4.20.32 CLOSE 2–S–556, RCS Test Connection.

___ 4.20.33 Behind primary sample sink, CLOSE 2–S–504.

ALARA

pH probe may be extremely radioactive. Proper radiological controls and surveys should be adhered to in order to prevent over–exposure or contamination of adjacent equipment or personnel.

___ 4.20.34 REMOVE pH probe (AE 1068) and o–ring from sample chamber.

___ 4.20.35 IF pH probe protective cover absorbant material is not damp, FILL pH probe protective cover with a few drops of KCL.

___ 4.20.36 INSTALL pH probe protective cover onto pH probe.

___ 4.20.37 INSTALL FME cover on AE 1068 sample chamber.

___ 4.20.38 STORE pH probe in a vertical position such that the KCL remains on the pH probe sensor.

4.20.39 REQUEST second chemistry technician to independently verify the position of the following valves:

a. 2–RC–001 "CLOSE."

b. 2–RC–002 "CLOSE."

c. 2–RC–003 "OPEN."

d. 2–RC–045 "OPEN."

e. 2–LRR–61.1 "CLOSE."

4.20.40 DOCUMENT independent verification on Attachment 12, "Isolation Valves Independent Verification Sheet."

4.20.41 RETURN to chemistry lab.

4.20.42 NOTIFY MCRO that reactor coolant PASS sampling has been completed.

– End of Section 4.20 –

Liquid PASS Team

4.21 Liquid Waste Sampling and Analysis

ALARA

This Section should only be performed when directed by MRDA or AMRDA.

4.21.1 ENSURE lead brick shield in Chemistry Lab Primary Sample Hood Area is intact.

4.21.2 PERFORM one of the following:

- IF CWMT is to be sampled, CONSULT MCRO to ensure CWMT has been recirculated at least 2.0 hours with mixer or at least 7.7 hours with pump.

- IF AWMT is to be sampled, CONSULT MCRO to ENSURE AWMT has been recirculated at least 0.5 hours with mixer or at least 4.0 hours with pump.

4.21.3 PROCEED to left side of primary sample sink in Primary Sample Sink Room.

4.21.4 IF CWMT is to be sampled, ESTABLISH sample flow from CWMT as follows:

a. ENSURE "2–S–262" (rack shutoff valve) is open.

b. OPEN "2–S–111" (sample isolation valve).

c. IF sampling A CWMT, REQUEST operations close "2–LRR–124.1A."

d. IF sampling B CWMT, REQUEST operations close "2–LRR–124.1B."

HP Tech.

e. MONITOR radiation dose rate as sample flow is established to ensure personnel radiation exposure remains less than level specified in radiological controls.

ALARA

Sample flow rate and flush time may require adjustment as radiation levels increase. MRDA or AMRDA shall specify the required adjustments.

Chem Tech.

f. THROTTLE 2–S–111 to obtain sample flow rate of approximately 500 ml/min and FLUSH for 20 minutes.

g. RETURN to Chemistry Lab.

4.21.5 IF AWMT is to be sampled, ESTABLISH sample flow from AWMT as follows:

a. ENSURE 2–S–126 (Rack Shutoff valve) is open.

b. OPEN 2–S–128 (sample isolation valve).

c. REQUEST Operations to close "2–LRA–55.1".

d. MONITOR radiation dose rate as sample flow is established to ensure personnel radiation exposure remains less than level specified in radiological controls.

ALARA

Sample flow rate and flush time may require adjustment as radiation levels increase. MRDA or AMRDA shall specify the required adjustments.

e. THROTTLE 2–S–128 to obtain sample flow rate of approximately 500 ml/min and FLUSH for 20 minutes.

f. RETURN to Chemistry Lab.

4.21.6 WHEN required flush period is completed, RETURN to primary sample sink.

HP Tech. 4.21.7 MONITOR dose rates

Chem Tech. 4.21.8 IF dose rates preclude obtaining required discharge samples, PERFORM the following:

a. NOTIFY MRDA

b. REQUEST guidance on sample volumes.

c. OBTAIN sample equipment required to collect adequate sample for analyses.

4.21.9 Refer To SP 2864 and OBTAIN required sample aliquots for discharge permit preparation.

4.21.10 IF AWMT was sampled AND sampling is complete, PERFORM the following:

a. NOTIFY Operations that "2–LRA–55.1" may be opened

b. CLOSE "2–S–128" Sample Isolation Valve.

4.21.11 IF CWMT was sampled AND sampling is complete, PERFORM the following:

a. IF A CWMT was sampled, NOTIFY Operations that "2–LRR–124.1A may be opened.

b. IF B CWMT was sampled, NOTIFY Operations that "2–LRR–124.1B may be opened.

4.21.12 CLOSE 2–S–111 Sample Isolation Valve.

4.21.13 Refer To CP 801/2801/3801AT, "Gamma Spectroscopy Counting System Maintenance and Operation," and PERFORM liquid waste activity analysis as follows:

a. PERFORM a 5 minute, closed cave, *background* count on the detector to be used for liquid isotopic analysis.

b. RECORD required isotopes and their associated background activity levels on Attachment 9.

c. SAVE gamma spectrometer printout for future reference.

d. PLACE bagged sample liter bottle on detector in gamma spectrometer and PERFORM a 5 minute, closed cave count using the following information:

- Sample date and time as recorded on Attachment 9.
- Sample volume corresponding to the last circled sample dilution on Attachment 4.

e. IF dead time is less than 20%, Go To step 4.21.14.

f. IF dead time is greater than or equal to 20%, PERFORM the following:

1) OPEN cave and REMOVE sample liter bottle.

2) TRANSFER 1.0 ml of sample from sample liter bottle (the solute liter bottle) into another 1 liter plastic bottle filled with demineralized water (the solvent liter bottle).

3) RECORD new sample volume on Attachment 4, as applicable, for the 1000:1 dilution being performed.

4) PACKAGE solvent liter bottle (diluted sample liter bottle) in a plastic bag and SEAL bag.

5) Go To step 4.21.13.d.

4.21.14 Refer To SP 2864, "Liquid Waste Discharge," and PERFORM required NPDES analyses.

4.21.15 Refer To Attachment 9 and DETERMINE total waste activity as follows:

a. SUBTRACT background activity level from printout activity level to obtain isotope activity level for each isotope.

b. ADD isotope activity level for each isotope to obtain total isotope activity.

4.21.16 Refer To SP 2864, "Liquid Waste Discharge," and PERFORM manual calculation for discharge permit.

4.21.17 COPY the following documents 2 times:

- Completed attachments
- Gamma spectrometer printouts
- IF originated, completed liquid discharge permit

4.21.18 SEND originals of the following documents to MRDA or AMRDA:

- Completed attachments
- Gamma spectrometer printouts
- IF originated, completed liquid discharge permit

4.21.19 FILE copies of the following documents:

- Completed attachments
- Gamma spectrometer printouts
- IF originated, completed liquid discharge permit

4.21.20 PLACE bagged sample liter bottle(s) in properly shielded location for future disposal.

– End of Section 4.21 –

4.22 PASS Equipment Inventory

4.22.1 Quarterly and after each PASS sample, PERFORM inventory of all equipment required to perform containment PASS sampling.

4.22.2 COMPLETE Attachment 8, "Reactor Coolant Sampling Inventory."

4.22.3 FORWARD Attachment 8 to Chemistry Supervision

– End of Section 4.22 –

5. REVIEW AND SIGNOFF

5.1 Indicate (check) Subsections of this procedure which were performed:

☐ 4.1	☐ 4.2	☐ 4.3	☐ 4.4	☐ 4.5	☐ 4.6
☐ 4.7	☐ 4.8	☐ 4.9	☐ 4.10	☐ 4.11	☐ 4.12
☐ 4.13	☐ 4.14	☐ 4.15	☐ 4.16	☐ 4.17	☐ 4.18
☐ 4.19	☐ 4.20	☐ 4.21	☐ 4.22		

5.2 If procedure was terminated prior to completion, specify cause:_____

_____

_____

_____

_____

_____

_____

5.3 This procedure was performed by the following personnel:

- Job supervisor (MRDA):

_____	_____	___
Print Name	Signature	Initials

- Liquid PASS Team personnel:

_____	_____	___
Print Name	Signature	Initials
_____	_____	___
Print Name	Signature	Initials
_____	_____	___
Print Name	Signature	Initials
_____	_____	___
Print Name	Signature	Initials

5.4 This procedure was reviewed by Chemistry Supervision:

_____	_____	___
Print Name	Signature	Initials

6. REFERENCES

6.1 "Final Safety Analysis Report Unit 2," Appendix 12A

6.2 "Millstone Nuclear Power Station Emergency Plan"

6.3 RAB Accident and Shielding File #608.002

6.4 NUREG–0654, "Criteria for Preparation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants"

6.5 NUREG–0737, "Clarification of TMI Action Plan Requirements, Supplement 1, Requirements for Emergency Response Capability"

6.6 "Instructions Model 8500 Gas Chromatograph:" Perkin–Elmer, October 1987

6.7 "Technical Manual for De–Ionized Water Flushing Module:" General Dynamics Corporation; Electric Boat Division, Reactor Plant Services, November 1981

6.8 "Technical Manual for Reactor Coolant Post–Accident Sample System:" General Dynamics Corporation; Electric Boat Division, Reactor Plant Services, May 1982

6.9 "VAX/VMS Spectroscopy Applications Package User's Manual 07–0196," April 1982

6.10 SP 2864, "Liquid Waste Discharge"

6.11 CP 801/2801/3801AT, "Gamma Spectroscopy Counting System Maintenance and Operation"

6.12 CP 801/2801/3801AD, "Gas Chromatograph Operation and Calibration"

6.13 CP 2801X, "Routine Operation, Calibration and Maintenance of the DX–120 and DX–500 Laboratory Ion Chromatography Systems"

6.14 CP 807/2807/3807AA, "Boron Analysis"

6.15 Chemistry Memorandum CHEM–93–1212; from J. P. Kangley to J. Broussard, dated January 18th 1993

6.16 CP 801/2801/3801AJ, "Inductively Coupled Argon Plasma Analysis"

6.17 NRC, B18443 Dated, July 31, 2001 | ①

6.18 NRC, Commitment Record # RCR–10781. Docketed Correspondence Dated 11/17/87. Combined Inspection 50–245/87–24, 50–336/87–21, 50–423/87–19.

6.19 USNRC Reg Guide 1.97, Rev. 3 May 1983, "Instrumentation for Light Water Coolant Nuclear Power Plants to Assess Plant and Environs Condition During and Following an Accident

6.20 CR M3-97-3450, "Calculation Used in Liquid PASS E Plan Procedure Appears In Error"

6.21 CR M2-97-2509, "PASS Operation and Configuration Differ in FSAR, Reg Guide 1.97 and EPOP"

6.22 CR M2-97-2797, "PASS Equipment and Supplies are not Inventoried IAW Regulatory and Site requirements"

6.23 CR M2-97-2905, "Audit of PASS Determined that Existing Program Requirements may not Ensure TS 6.18 Compliance"

6.24 CR M1-97-0641, "EPOP Procedures References Call for Performing Chloride Analysis"

6.25 Memo 98-067, From Max Keyes to Tom Blount, PASS Procedure Meeting Minutes

6.26 Millstone Nuclear Power Station, Unit 2, Technical Specification 6.18, August 28, 1992.

6.27 MPNS-2 FSAR, Section 9.6, "Post Accident Sampling System"

6.28 EPRI NP-3513, "Postaccident Liquid Sampling Systems," Final Report, May 1984

6.29 INPO Post Accident Sampling Preparedness CY 707 INPO 91-019

6.30 Technical Paper, "Temperature – Another Wild Card in pH Control, " submitted by TBI-Bailey, February 14, 1995.

7. SUMMARY OF CHANGES

7.1 Added amplifying wording as to when 2−RB−210 is to be opened.

7.2 Added specific instructions as to when to open and close 2−RB−210.

7.3 Added alternate total purge volumes based on analysis required as part of sampling.

7.4 Changed initial purge volume due to increasing volumes purged through lines prior to isolating in−line samples.

7.5 Increased line purge volumes to ensure lines are sufficiently flushed prior to isolating sample.

7.6 Deleted requirement for Health Physics to monitor radiation levels on contact with sample just prior to analysis. This monitoring is performed as sample is acquired both utilizing RMS−2 data and also as samples are physically retrieved at the Primary Sample Module.

Summary of Changes Rev. 003−01

7.7 Editorial Correction; Updated Reference 6.17 NRC commitment letter. B18443, AR#01005693−01.

7.8 Moved basis information on cover sheet into a note to be consistant with the other PASS procedures.

Attachment 1
Unit 2 Determination of Total Dissolved Gas and Sample Quantity Worksheet

(Sheet 1 of 2)

Grab Sample
System Sampled: _____
Isolation Date: _____
Isolation Time: _____

In−line Sample
System Sampled: _____
Isolation Date: _____
Isolation Time: _____

Worksheet Completed by: _____
Print Name

Signature: _____

DATA

1. Initial Totalizer Reading _____Gals
2. Radiation Meter Reading: _____ rem/hr
3. Uncorrected Coolant pH _____
4. pH Temperature Reading _____°F
5. Corrected (77°F) Coolant pH _____
6. Final Totalizer Meter Reading _____Gals
7. Initial Gas Loop Temperature _____°F
8. Initial Gas Loop Pressure _____psig
9. Final Gas Loop Temperature _____°F
10. Final Gas Loop Pressure _____psig
11. Volume of Gas Transferred to the Syringe _____cc

CALCULATIONS

12. Total Dissolved Gas from computer or Attachment 3: TDG_____cc/Kg

13. Calculate the syringe sample quantity as follows:

$$Ms = \frac{V_t \bullet 6.40}{V_t + 5}$$

Ms_____gm

Where V_t = Volume of Gas Sample in Syringe in ml.

Reviewed by: _____ _____ Date:_____
Print Name Signature

Attachment 2
pH Temperature Compensation

Temperature (°F)	pH				
	5	6	7	8	9
60	−0.05	−0.03	0	−0.03	−0.05
62	−0.04	−0.02	0	−0.02	−0.04
64	−0.03	−0.02	0	−0.02	−0.03
66	−0.03	−0.02	0	−0.02	−0.03
68	−0.02	−0.01	0	−0.01	−0.02
70	−0.01	−0.01	0	−0.01	−0.01
72	−0.01	−0.01	0	−0.01	−0.01
74	0.00	0.00	0	0.00	0.00
76	0.01	0.00	0	0.00	0.01
78	0.01	0.01	0	0.01	0.01
80	0.02	0.01	0	0.01	0.02
82	0.03	0.01	0	0.01	0.03
84	0.03	0.02	0	0.02	0.03
86	0.04	0.02	0	0.02	0.04
88	0.05	0.02	0	0.02	0.05
90	0.05	0.03	0	0.03	0.05
92	0.06	0.03	0	0.03	0.06
94	0.07	0.03	0	0.03	0.07
96	0.08	0.04	0	0.04	0.08
98	0.08	0.04	0	0.04	0.08
100	0.09	0.04	0	0.04	0.09
102	0.10	0.05	0	0.05	0.10
104	0.10	0.05	0	0.05	0.10
106	0.11	0.06	0	0.06	0.11
108	0.12	0.06	0	0.06	0.12
110	0.12	0.06	0	0.06	0.12
112	0.13	0.07	0	0.07	0.13
114	0.14	0.07	0	0.07	0.14
116	0.14	0.07	0	0.07	0.14
118	0.15	0.08	0	0.08	0.15
120	0.16	0.08	0	0.08	0.16

Attachment 3
Liquid PASS Total Dissolved Gas Worksheet

NOTE

When performing the following calculation carry significant digits throughout calculation to infinity. Ensure that the "N" term is carried out to a minimum of 3 significant digits. This is absolutely necessary in order to ensure the accuracy of this equation

Initial Data:

A – Initial Gas Loop Pressure (psig) B – Absolute Gas Loop Pressure (psia)

A				B
	+	14.7	=	

C – Initial Gas Loop Temperature (°F) D – Absolute Gas Loop Temperature (°R)

C				D
	+	460	=	

Equilibrium Data:

E – Final Gas Loop Pressure (psig) F – Absolute Gas Loop Pressure (psia)

E				F
	+	14.7	=	

G – Final Gas Loop Temperature (°F) H – Absolute Gas Loop Temperature (°R)

G				H
	+	460	=	

I – Henry's Constant for Nitrogen at Equilibrium (psia/mole Fraction)

[(H*0.9893)−406.46]*10000

H								I
	X	0.9893	–	406.46	X	10000	=	

J – Partial Pressure of Nitrogen at Equilibrium (psia) – J1 (Numerator Term)

B*H*I*0.195*18.015*454

B		H		I								J1
	X		X		X	0.195	X	18.015	X	454	=	

Attachment 3
Liquid PASS Total Dissolved Gas Worksheet

J – Partial Pressure of Nitrogen at Equilibrium (psia) – J2 (Denominator Term)

[(I*0.195*18.015*454) + (H*250*10.73*28.317)]*D

a – Left Hand Side of Denominator Term

I								a
	X	0.195	X	18.015	X	454	=	

b – Right Hand Side of Denominator Term

H								b
	X	250	X	10.73	X	28.317	=	

Completed Denominator Term

a		b		D		J2
	+		X		=	

Completed J Term

J1		J2		J
	÷		=	

K – Vapor Pressure of Water at Equilibrium (psia)

[(−9496.5*/H)INVℓn]*21790834

		H	INVℓn_1				K
−9496.5	÷			X	21790834	=	

L – Partial Pressure of Hydrogen at Equilibrium (psia)

F−J−K

F		J		K		L
	−		−		=	

Note 1: This step means that the inverse natural log will be taken of the result of −9496.5 ÷ H. On some calculators this can be performed by pressing the INV key followed by the ℓn key. On others this will be done by pressing the 2nd key followed by the ℓn key. In any case should you have any questions, contact Supervision for guidance.

Attachment 3
Liquid PASS Total Dissolved Gas Worksheet

M – Henry's Constant for Hydrogen at Equilibrium (psia/mole fraction)

[(H*0.3081)–64]*1000

H								M
	X	0.3081	–	64	X	10000	=	

N = TDG @ STP (cc/kg)

([(*250)/(M*18.015*454)]+[(L*0.195)/(H*10.73*28.317)])*[(10.73*492*28.317*1000/(14.7*0.25)]

N1 – Left Hand Term

a – left hand side

L				M						a
	X	250	÷		÷	18.015	÷	454	=	

b – right hand side

L				H						b
	X	0.195	÷		÷	10.73	÷	28.317	=	

Completed Left Hand Term

a		b		N1
	+		=	

N2 – Right Hand Term

(10.73*492*28.317*1000)/(14.7*0.25)

												N2
10.73	X	492	X	28.317	X	1000	÷	14.7	÷	0.25	=	40677543.87

Completed N Term

N1		N2		N
	X	40677543.87	=	

Attachment 4
Unit 2 Post Accident Sampling Reactor Coolant Sample Dilution Data Sheet

(Sheet 1 of 1)

Sample Type: _____
System Sampled: _____
Isolation Date: _____
Isolation Time: _____

Worksheet Completed by: _____
Print Name

Signature: _____

NOTE

Circle the appropriate sample bottle dilution corresponding to the dilution(s) required during performance of step. The sample mass is determined by multiplying the 100 µl sample mass (M_{dl}) by the applicable correction for the sample dilution that is being counted.

Sample Dilution	Degas Liquid Sample Mass (gm)
Isotopic Original	M_{dl} = _____ gm
1st Dilution	M_{dl} • 1.0E−01 = _____ • 1.0E−01 = _____ gm
2nd Dilution	M_{dl} • 1.0E−04 = _____ • 1.0E−04 = _____ gm
3rd Dilution	M_{dl} • 1.0E−07 = _____ • 1.0E−07 = _____ gm
4th Dilution	M_{dl} • 1.0E−10 = _____ • 1.0E−10 = _____ gm
5th Dilution	M_{dl} • 1.0E−13 = _____ • 1.0E−13 = _____ gm
6th Dilution	M_{dl} • 1.0E−16 = _____ • 1.0E−16 = _____ gm
7th Dilution	M_{dl} • 1.0E−19 = _____ • 1.0E−19 = _____ gm

Reviewed by: _____ _____ Date: _____
Print Name Signature

Attachment 5

Unit 2 Post Accident Sampling Reactor Coolant Isotopic Worksheet

Sample
Location: ____________
Isolation Date: ____________
Isolation Time: ____________

Worksheet Completed by: ______________________
Print Name

Signature: ______________________

Printout Activity – *Background* = *Isotope Activity*

Isotope	Printout Activity (2–place accuracy) (μCi/gm)	Background (μCi/gm)	Isotope Activity (2–place accuracy) (μCi/gm)
		Total Isotope Activity (2–place accuracy) (μCi/gm)	

NOTE: Total Isotope Activity = summation of all isotope activities.

Reviewed by: ______________________ ______________________ Date: __________
Print Name Signature

Attachment 6
Unit 2 Post Accident Sampling
Reactor Coolant Gaseous Activity Worksheet

(Sheet 1 of 1)

Sample
Location: _____
Isolation Date: _____
Isolation Time: _____

Worksheet Completed by: _____
Print Name

Signature: _____

Printout Activity – *Background* = *Isotope Activity*

Isotope	Printout Activity (2–place accuracy) (µCi/gm)	Background (µCi/gm)	Isotope Activity (2–place accuracy) (µCi/gm)

NOTE: Total Gaseous Activity = summation of all isotope activities.

Total Gaseous Activity (2–place accuracy) (µCi/gm) _____

Gas Composition Analysis

% Hydrogen: _____ % Oxygen: _____

Reviewed by: _____ _____ Date: _____
Print Name Signature

Level of Use
Continuous

Attachment 7
Unit 2 Post Accident Sampling
Reactor Coolant Chemical Analysis Worksheet

(Sheet 1 of 1)

Sample
Location: _____
Isolation Date: _____
Isolation Time: _____

Worksheet Completed by: _____
Print Name

Signature: _____

Boron Data:

Boron Weight Data:

DI Water Mass: _____ grams

100 µl Sample Mass: _____ grams

Boron Correction Factor:

$$\text{Correction Factor} = \frac{\text{DI water mass} + \text{100 µl Sample Mass}}{\text{100 µl Sample Mass}}$$

$$\text{Correction Factor} = \frac{\text{_____ gm} + \text{_____ gm}}{\text{_____ gm}} = \text{_____}$$

Boron (ppm) = Analysis results in ppm • Correction Factor

Boron (ppm) = _____ ppm • _____ = _____ ppm

Coolant chloride concentration: _____ ppm

Coolant pH (Attachment 1) _____

Additional Analysis	Concentration
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Reviewed by: _____ _____ Date: _____
Print Name Signature

Attachment 8
Reactor Coolant PASS Sampling Equipment Inventory
(Sheet 1 of 1)

Equipment Name	Required	On Hand	Ordered
250 µl syringe with sideport needle	2		
500 µl syringe with sideport needle	1		
1.0 ml syringe with sideport needle	1		
Syringe transport container	1		
Liquid radwaste sample vial	4		
Transport container for sample vials	1		
0.1 cc sample loop for gas chromatograph	1		
2 ml grab sample chamber	2*		
Transport cask for grab sample chamber	1		
Transport cart	1		
CaroPac PA1 Guard (10−32) column	2		
Anion micromembrane suppressor	1		
250 ml sample loop	1		

* 1 installed in PASS reactor coolant sample cabinet.

Reason for Inventory: (circle one) Quarterly After Use

Remarks:_____

Date:_____ Signature:_____

Attachment 9
Unit 2 Post Accident Sampling Liquid Waste Isotopic Worksheet
(Sheet 1 of 1)

Sample
Tank: ____________________
Date: __________
Time: ____________________

Worksheet Completed by: ________________________
Print Name

Signature: ________________________

Printout Activity – Background = Isotope Activity

Isotope	Printout Activity (2–place accuracy) (μCi/gm)	Background (μCi/gm)	Isotope Activity (2–place accuracy) (μCi/gm)
		Total Isotope Activity (2–place accuracy) (μCi/gm)	

NOTE: Total Isotope Activity = summation of all isotope activities.

Reviewed by: ________________________ ________________________ Date: __________
Print Name Signature

Attachment 10
Syringe Check
(Sheet 1 of 1)

1. CHECK each of the prepared syringes for proper operation as follows:

   1.1 ENSURE syringe is open (syringe nosecap screwed against syringe body).

   1.2 DRAW air into syringe.

   1.3 PLACE needle in a beaker of water.

   1.4 PRESS plunger and ENSURE air exits syringe.

   1.5 REMOVE needle from beaker.

   1.6 DRAW air into syringe.

   1.7 UNSCREW syringe nosecap 2 turns.

   1.8 PLACE needle in beaker of water.

   1.9 PRESS plunger and ENSURE **no** air exits syringe.

   1.10 REMOVE needle from water and SCREW syringe nosecap against syringe body.

   1.11 PRESS plunger.

Attachment 11
pH Probe Installation

(Sheet 1 of 1

1. OPEN module door.
2. REMOVE FME cover from pH probe (AE 1068) sample chamber.
3. REMOVE protective cover from pH probe sensor.
4. INSTALL pH probe (AE 1068) and O−ring into sample chamber.
5. INSTALL electrical connector onto pH probe.
6. CLOSE module door.

Attachment 12
Isolation Valve Independent Verification Sheet
(Sheet 1 of 1)

Valve	Required Position	Independently Verified By: **Sign Name**	Independently Verified By: **Print Name**
2–RC–001	**CLOSED**		
2–RC–002	**CLOSED**		
2–RC–003	**OPEN**		
2–RC–045	**OPEN**		
2–LRR–61.1	**CLOSED**		

08/22/01
Approval Date

08/23/01
Effective Date

Document Action Request

SPG # 020123-190432

A

Initiated By: Nileen Drzewianowski Date: 01/24/2002 Department SPG Ext 5139

Document No: CP 2804M Rev. No: 001 Minor Rev No. 01

Title: **Unit 2 Vent and Containment Air PASS**

B

Reason for Request (attach commitments,CR's,AR's,etc)

Editorial Correction AR# 01005693-01 Updated NRC Commitment reference

Continued ☒

Select One *See MP-05-DC-SAP01 sect 2.3 to determine type of change*

C ☐ Intent Change (SQR Independent, RCD, ENV Screen Required (Other reviews may be required. See MP-05-DC-FAP 01.1 Att 3) ☑ Edit Corr ☐ Non-Intent Change (Only SQR Independent Review and Env. screen Required)

D

Editorial Correction Approval

Plant Mngt Staff Member - Approval / Date 11/28/02

TPC Interim Approval

(1) Plant Mngt Staff Member Print/Sign/Date /

(2) SM/SRO/CFH on Unit Print/Sign/Date /

E

Procedure Request/Feedback Disposition

Priority: ☑ Perform Now ☐ Perform Later - See Comments

Activity: ☐ Revision ☑ Minor Revision (See DC-GDL01 for guidance) ☐ Cleanup Rev ☐ Biennial Review ☐ Cancellation ☐ Supercedure

☐ TPC ☐ OTC ☐ Place in Void

F

Reviews continued ☐	Print	Sign	Date	SQR Qualified Yes	SQR Qualified No	SQR Qualified Dept.	If Comments
☐				☐	☐		☐
☐				☐	☐		☐
☐				☐	☐		☐
☐				☐	☐		☐
☐				☐	☐		☐
Licensing Basis ☐	N/A	N/A	N/A	☐	☐	N/A	☐
Independent ☐	N/A	N/A	N/A	☐	☐	N/A	☐

G

An NRRL update was required ? ☐ Yes

H

1. ☒ **SQR Program Final Review and Appproval**

Approval ☐ Disapproval ☐

N/A /

SQR Qualified Independent Reviewer / Date

N/A

Department Head/Responsible Individual

N/A

Approval Date

2. ☐ **SORC** ☒ **RI/DH Final Review and Approval**

N/A

Department Head/Responsible Individual Sign

Meeting No. N/A

N/A

SORC Approval Signature

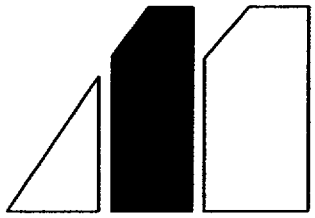
N/A

Approval Date

I

Effective Date 01/30/02

MILLSTONE NUCLEAR POWER STATION
CHEMISTRY PROCEDURE



Unit 2 Vent and Containment Air PASS [✤Ref.6.16]

CP2804M

Rev. 001-01

STOP THINK NOTE ACT REVIEW

A review by the Emergency Planning Department is required whenever this procedure is revised or whenever changes are made to this procedure which impact the ability to collect and analyze a PASS sample.[Ref. 6.19]

A review by the Nuclear Fuels Safety Analysis is required whenever modifications to this procedure may impact dose limit time and motion study calculations.

Approval Date: 01/28/02

Effective Date: 01/30/02

Level of Use
Continuous

Millstone Unit 2
Chemistry Procedure

Unit 2 Vent and Containment Air PASS
[✣Ref.6.16]

TABLE OF CONTENTS

1. PURPOSE

1.1 Objective

Provide method for sample collection and analysis of Unit 2 Vent, U2 releases to Main Station Stack and containment atmosphere via PASS when radioactivity levels may preclude the use or the normal sampling method. Sampling and analysis will be directed by the MRDA or AMRDA during an event which activates the Station Emergency Response Organization (SERO).

1.2 Discussion

This procedure provides the instructions used by chemistry for sampling and analyzing containment atmosphere and ventilation atmosphere during post accident conditions. The analysis conducted in this procedure identify the presence and amounts of various radioactive isotopes contained in the ventilation or containment air. The presence and amount of certain radioactive isotopes are indicative of the type(s) and extent of core damage that exists. The results obtained from this procedure assist the MRDA or the AMRDA in determining an estimate of Unit 2 core damage.

Samples (excluding ventilation) must be obtained and analyzed within 3 hours of the time the decision was made to obtain the sample.

Additionally gas composition of CTMT air is possible, the limiting factor in analysis of these samples will be gas composition analysis. The gas chromatograph may take up to an hour to replumb. If time allows, replumbing gas chromatograph (GC) for PASS analysis is made prior to sample collection.

1.3 Applicability

This procedure is applicable during SERO activation when in-plant radiation levels may be too high to permit ventilation and containment air sampling via the normal method.

1.4 Frequency

Performance of this procedure may be repeated periodically during SERO activation, when requested by the MRDA or AMRDA for updates or reassessments of containment conditions.

2. PREREQUISITES

2.1 General

2.1.1 Only Silver Zeolite Cartridges are used for iodine ventilation sampling in conjunction with this procedure (unless otherwise directed by Chemistry Supervision).[✣Ref 6.17]

2.1.2 Performance of this procedure must be authorized by the ADTS.

2.1.3 Assessment by the MRCA for personnel exposure has been performed and is within NU or Federal limits.

2.1.4 The sample aliquots listed in this procedure are not fixed numbers. Estimation of core damage may require a larger sample aliquot. If a larger sample is requested by the MRDA or AMRDA, substitute the required size syringes for those stated in this procedure.

2.1.5 Sections 4.7 through 4.16 are distinct sections that may be performed independently of each other.

2.2 Documents

2.2.1 CP 801/2801/3801AT, "Gamma Spectroscopy Counting System Maintenance and Operation"

2.2.2 CP 801/2801/3801AD, "Gas Chromatograph"

2.2.3 CP 2803/3803P, "Operation and Calibration for Perkin–Elmer Autosystem XL Gas Chromatograph"

2.2.4 The current SP 2814A–003

2.2.5 A new SP 2814A–003

2.2.6 The current SP 2815–002

2.2.7 SP 2863–002

2.2.8 SP 2815

2.3 Personnel

2.3.1 Performance of this procedure requires the response of the following personnel:

a. MRCA

b. OSC ARPS

c. ADTS

d. MRDA or the AMRDA

e. MOSC

f. MCRO

g. One air PASS team

- Two Chem Techs
- One HP Tech

2.4 Tools and Consumables

NOTE

Some tools and consumables are common to all samples and analyses, and are listed as such. The tools and consumables are listed for each type of sample. It is intended that the user refer to the applicable list.

2.4.1 Tools and consumables common to *all* samples:

- Gamma spectroscopy calibration source
- 8 1/8 inch gamma spectroscopy detector shelf extension tube
- 16 inch gamma spectroscopy detector shelf extension tube
- 24 inch gamma spectroscopy detector shelf extension tube

2.4.2 PASS Containment Atmosphere Sample

- Two, 1 ml syringes with side port needle
- Two, 500 µl syringes with side port needle
- PASS cabinet key
- Transport cart with lead syringe shield
- 2 evacuated 14.4 cc gas vials
- Two, 10x16 plastic bags
- Two, 4x6 plastic bags
- Plastic wrap

2.4.3 Vent Gas Sampling

- 5 cc gas syringe
- Evacuated 14.4 cc gas vial
- 41 cc gas collection chamber
- Lead transport container for gas vial
- 4x6 plastic bag
- 10x16 plastic bag
- Plastic wrap

2.4.4 Vent Particulate and Iodine Sampling

- 2 Silver zeolite cartridges[✣Ref. 6.17]
- Two, 2.25 inch glass fiber filters
- Eight, 4x6 plastic bags
- Adhesive tape
- Transport cart with shielded container
- In−use Chem Form 2814A−3
- New Chem Form 2814A−3

2.4.5 KAMAN High Range Filter Sampling

- 3 collector assemblies (consisting of housing, silver zeolite cartridge, and 2.25 inch glass fiber filter)[✣Ref. 6.17]
- Transport cart with transfer cask for collector assemblies
- Mechanical finger tool
- Reach Rod
- KAMAN microprocessor operating key
- Three, 10x16 plastic bags
- Six, 4x6 plastic bags
- SP 2863−001
- SP 2863−002

2.4.6 WRGM Normal Range Sampling

- Silver zeolite cartridges[✣Ref. 6.17]
- 47 mm glass fiber filters
- Plastic bag(s)
- Transport cart or container
- In–use SP 2815–002

2.4.7 WRGM High Range Sampling

- Two $^{9}/_{16}$" wrenches
- Transport cart for collector assemblies and caves

2.5 **Responsibilities**

2.5.1 The Air PASS Team performs the required sampling and analysis detailed in this procedure.

2.5.2 The Manager of Operational Support Center designates, assembles, and briefs the Air PASS Team for implementation of this procedure.

2.5.3 The MRCA or OSC ARPS specifies Air PASS team radiological controls required for implementation of this procedure.

2.5.4 The MRDA or AMRDA specifies Air PASS Team sampling and analysis requirements for implementation of this procedure.

2.5.5 The MCRO performs valve lineups for the acquisition and retrieval of samples upon request of the Air PASS Team.

2.5.6 The ADTS has final approval authority over team dispatch.

2.6 **Definitions**

2.6.1 WRGM–Wide Range Gas Monitor

2.6.2 DEOF – Director, EOF

2.6.3 ADEOF–Assistant Director, EOF

2.6.4 OSC ARPS – Operational Support Center Assistant Radiological Protection Supervisor.

2.6.5 ADTS – Assistant Director Technical Support.

2.6.6 Air PASS team: SERO personnel designated for sampling and analysis of vent and containment air of the affected unit. The air PASS team shall be comprised of at least two chemistry technicians and, one HP technician.

2.6.7 SLPM – Standard Liters Per Minute

2.6.8 SWITCH – To change positions

2.6.9 KELIC – KAMAN Electronic Local Indication and Control

2.6.10 KERIC – KAMAN Electronic Remote Indication and Control

2.6.11 NOTE – To observe with care

3. PRECAUTIONS

3.1 When locking air samples within syringes, do not rotate syringe more than two turns. Excessive turns will disengage needle from syringe resulting in the possible release of radioactive gasses.

3.2 In the event of unexpected results during the course of this procedure, place the equipment in a safe or stable condition, cease performance of further steps, and contact the MRDA or the AMRDA for further instructions.

3.3 Silver Zeolite cartridges are hazardous material. These cartridges must be collected and transferred to Waste Services Department for proper disposal.

4. INSTRUCTIONS

4.1 Preparation for Sampling

4.1.1 COMPLETE the following applicable steps as directed:

a. CONSTRUCT lead brick shield in chemistry lab sample hood.

b. ENSURE exhaust hood above gas chromatograph is operating.

c. LABEL two, 1.0 ml syringes, "HYDROGEN."

d. LABEL two, 500 µl syringes, "ISOTOPIC."

e. LABEL one, 5 cc syringe, "GAS."

f. VERIFY operability of syringes.

1) ENSURE syringe nosepiece is screwed against syringe body.

2) DRAW air into syringe.

3) TURN syringe nose piece 2 turns clock–wise.

4) PLACE needle in beaker of water.

5) PUSH plunger and ENSURE no air exits syringe.

6) TURN syringe nosepiece tight against syringe body.

7) PLACE needle in beaker of water.

8) PUSH plunger and ENSURE air exits syringe.

g. Refer To CP 801/2801/3801AD, "Gas Chromatograph Operation and Calibration" or CP 2803/3803P, "Operation and Calibration for Perkin–Elmer Autosystem XL Gas Chromatograph" and PREPARE gas chromatograph for PASS sampling.

h. Using silver zeolite cartridges and particulate filters, ASSEMBLE three KAMAN collector assemblies.

i. COPY the following applicable attachments of this procedure to expedite recording of data:

- Attachment 1, "Unit 2 Post Accident Sampling Containment Gaseous Activity Worksheet"
- Attachment 2, "Unit 2 Post Accident Sampling Gaseous Release Worksheet"
- Attachment 3, "Unit 2 Post Accident Sampling Particulate and Iodine Release Worksheet"

– End of Section 4.1 –

4.2 PASS Containment Air Sample Preparation

___ 4.2.1 REQUEST Operations verify Auxiliary Building Ventilation System operating.

___ a. IF inoperable, NOTIFY the MRDA or the AMRDA and WAIT for further instructions.

___ 4.2.2 DETERMINE which H_2 Analyzer is in service.

___ 4.2.3 NOTIFY MCRO that Containment Air PASS will be activated.

___ 4.2.4 With PASS Cabinet Key, PROCEED to Sample Module area.

___ 4.2.5 UNLOCK and OPEN anti−tamper cover on Sample Module.

___ 4.2.6 OPEN Sample Module ventilation damper.

___ 4.2.7 OPEN Sample Module door.

NOTE

When 2−S−502 is closed, handle is perpendicular to needle guide.

___ 4.2.8 CLOSE "2−S−502."

___ 4.2.9 PLACE valve "2−S−484" in POSITION #1.

4.2.10 IF C−86 H_2 Analyzer is in service, OPEN the following valves:

___ a. 2−S−463

___ b. 2−S−464

4.2.11 IF C−87 H_2 Analyzer is in service, OPEN the following valves:

___ a. 2−S−461

___ b. 2−S−462

___ 4.2.12 CLOSE valve "2−S−485."

___ 4.2.13 PROCEED to Remote Operating Module, UNLOCK and REMOVE anti−tamper cover.

4.2.14 PRESS ROM "POWER ON" button.

4.2.15 RESET timer to zero.

4.2.16 VERIFY line fuses are good by observing no blown fuse indication.

4.2.17 OPEN front panel of Remote Operating Module.

4.2.18 CLOSE "2-GAN-246."

4.2.19 CLOSE "2-GAN-247."

4.2.20 OPEN "2-GAN-248."

4.2.21 CLOSE front panel of Remote Operating Module.

4.2.22 BACK OFF "2-GAN-231."

4.2.23 BACK OFF "2-GAN-249" (V-7).

4.2.24 OPEN nitrogen bottle isolation valve.

4.2.25 ESTABLISH nitrogen pressure at 400 psig using "2-GAN-236."

4.2.26 ADJUST "2-GAN-249" (V-7) to regulate nitrogen pressure to 80 psig.

4.2.27 POSITION "2-GAN-252" (V-10) to ON.

4.2.28 ADJUST "2-GAN-231" to regulate nitrogen pressure to 70 psig.

4.2.29 POSITION "2-GAN-252" (V-10) to OFF.

4.2.30 RETURN to Chemistry Lab.

– End of Section 4.2 –

4.3 PASS Containment Air Sample Isolation

4.3.1 COLLECT the following equipment:

- Transport Cart
- 500 µl syringe labeled as "Isotopic"
- 1.0 ml syringe labeled as "Hydrogen"

4.3.2 PROCEED to Remote Operating Module.

4.3.3 OPEN Remote Operating Module door.

4.3.4 OPEN valve "2–GAN–246" to pressurize flask.

4.3.5 CLOSE Remote Operating Module door.

4.3.6 VERIFY 15 minute warmup of Remote Operating Module has been performed.

4.3.7 POSITION following valves to OFF:

a. 2–GAN–234 (V–11)

b. 2–GAN–252 (V–10)

4.3.8 OPEN "2–S–500" (V–1).

4.3.9 PLACE "2–S–501" (V–2) to SAMPLE.

4.3.10 INITIATE sample flow as follows:

a. PLACE "2–GAN–234" (V–11) to SAMPLE INFLUENT.

b. PROCEED to C–86A or C–87A and POSITION the operating hydrogen analyzer PASS sample switch to "ON."

c. VERIFY indication of flow on ROM flowmeter.

d. RECORD flow: _____ SLPM

e. IF there is not an indication of flow, REQUEST Operations to verify a Hydrogen Analyzer in service.

4.3.11 WAIT 15 minutes.

4.3.12 CLOSE "2–S–500" (V–1).

4.3.13 VERIFY indicated flow has decreased.

CAUTION

The following steps should be performed rapidly to prevent tripping the hydrogen analyzer. The sample chamber and tubing lines in and out are very small diameter which presents a flow restriction which can trigger the hydrogen analyzer lo flow/lo pressure alarm. This alarm is triggered if this flow restriction exists for more than 30 seconds. For that reason isolate the sample as quickly as possible after the 15 seconds has elapsed.

4.3.14 WAIT 15 seconds.

4.3.15 To isolate sample, PLACE "2–S–501" (V–2) to BYPASS AND FLUSH.

4.3.16 PROCEED to C–86A or C–87A and POSITION the operating hydrogen analyzer PASS sample switch to "OFF."

4.3.17 INITIATE Nitrogen Purge as follows:

a. PLACE "2–GAN–234" (V–11) to NITROGEN FLUSH position.

b. OPEN "2–S–500" (V–1).

c. PLACE "2–GAN–252" (V–10) to ON.

d. ADJUST "2–GAN–231" to regulate to 70 psig.

e. VERIFY indication of flow on flowmeter.

f. RECORD flow: _____ SLPM

4.3.18 WAIT 3 minutes.

4.3.19 CLOSE "2–S–500" (V–1).

4.3.20 VERIFY flow less than that which was indicated in step 4.3.17 f.

4.3.21 WAIT 3 minutes.

4.3.22 PLACE following valves to OFF:

a. 2–GAN–252 (V–10)

b. 2–GAN–234 (V–11)

4.3.23 OPEN "2–S–500" (V–1).

– End of Section 4.3 –

4.4 PASS Containment Air Sample Retrieval

4.4.1 PROCEED to Sample Module.

4.4.2 PERFORM a rapid radiation survey of Sample Module.

4.4.3 ENSURE radiation levels are low enough, per established radiological controls, to allow access to Sample Module.

4.4.4 VERIFY nosecap of 1.0 ml and 500 µl syringes are screwed up against body.

4.4.5 COLLECT 500 µl Containment Air Sample as follows:

a. LINE UP handle of "2−S−502" (V−3) with needle guide to open.

b. INSERT 1.0 ml "HYDROGEN" syringe needle into needle guide.

c. ENGAGE syringe needle nut into needle guide slot.

d. WITHDRAW 500 µl of containment air into syringe.

ALARA

Do not rotate syringe nosecap more than two turns. Excessive turns will disengage needle from syringe resulting in the possible release of radioactive gasses.

e. TURN syringe nosecap body two turns in the counterclockwise direction to lock syringe.

f. REMOVE syringe from needle guide.

g. CLOSE "2−S−502" (V−3).

h. PLACE syringe in lead transport container.

4.4.6 COLLECT 250 µl Containment Air Sample as follows:

___ a. LINE UP handle of "2–S–502" (V–3) with needle guide to open.

___ b. INSERT 500 µl "ISOTOPIC" syringe needle into needle guide.

___ c. ENGAGE syringe needle nut into needle guide slot.

___ d. WITHDRAW 250 µl of containment air into syringe.

___ e. TURN syringe nosecap two turns in counterclockwise direction to lock syringe.

___ f. REMOVE syringe from needle guide.

___ g. CLOSE "2–S–502" (V–3).

___ h. PLACE syringe in lead transport container.

___ 4.4.7 CLOSE and LATCH Sample Module door.

___ 4.4.8 RETURN to Chemistry Lab with transport cart and syringes.

– End of Section 4.4 –

4.5 **PASS Containment Air Sample Analysis**

4.5.1 PERFORM Gas Analysis as follows:

___ a. Refer To CP 801/2801/3801AD, and PERFORM hydrogen and oxygen analysis on the 1.0 ml hydrogen syringe.

___ b. RECORD results on Attachment 1 "Unit 2 Post Accident Sampling Containment Gaseous Activity Worksheet."

4.5.2 PERFORM Isotopic Analysis as follows:

___ a. Refer To CP 801/2801/3801AT and PERFORM a 5 minute, open cave, background count on the detector to be used.

___ 1) RECORD all identified isotopes and associated activity on Attachment 1 "Unit 2 Post Accident Sampling Containment Gaseous Activity Worksheet."

___ 2) SAVE gamma spectrometer printout for future reference.

___ b. TURN 500 µl isotopic syringe nosecap until it is screwed up against body.

___ c. INJECT isotopic syringe sample into evacuated 14.4 cc vial.

___ d. WRAP vial in plastic wrap.

___ e. PLACE sample vial on detector shelf

___ f. Refer To CP 801/2801/3801AT and INITIATE a 5 minute sample count.

___ g. IF dead time is less than 20%, Go To step 4.5.2i.

h. IF dead time is greater than or equal to 20%, PERFORM the following:[✤Ref. 6.17]

___ 1) REMOVE sample vial and detector shelf..

___ 2) PLACE shortest detector shelf extension tube on detector.

___ 3) Starting with lowest shelf and working up, PLACE vial on extension tube until a dead time of less than 20% is achieved.

4) TERMINATE count.

5) Refer CP 801/2801/3801AT and COUNT vial (open cave) for 5 minutes.

6) WHEN count is completed, Refer To Attachment 4, "Shelf Ratio Calculation" and DETERMINE shelf ratio.

i. CALCULATE activity for each isotope on Attachment 1, "Unit 2 Post Accident Sampling Containment Gaseous Activity Worksheet."

j. PLACE empty syringes and sample vial in a plastic bag.

k. STORE syringes and sample vial in lead brick shield for disposal.

l. COMPLETE Attachment 1.

m. REPORT analysis results to MRDA or AMRDA.

n. IF a backup sample is requested by MRDA or AMRDA, PERFORM the following:

1) OBTAIN new 500 µl and 1.0 µl syringes.

2) PROCEED to sample module area.

3) Go To Section 4.4.

o. IF a backup sample is not required, PERFORM the following:

1) PREPARE two copies of data sheets and computer printouts.

2) SEND copy of data sheets and computer printouts to MRDA or AMRDA.

3) FORWARD original and copy of data sheets and computer printouts to Chemistry Supervision.

– End of Section 4.5 –

4.6 PASS Containment Air System Restoration

4.6.1 PROCEED to Remote Operating Module.

___ 4.6.2 POSITION "2–S–501" (V–2) to "SAMPLE."

4.6.3 INITIATE nitrogen purge as follows:

___ a. POSITION "2–GAN–234" (V–11) to "NITROGEN FLUSH."

___ b. POSITION "2–S–500" (V–1) to "OPEN."

___ c. POSITION "2–GAN–252" (V–10) to "ON."

___ d. VERIFY a flow rate is indicated.

e. RECORD flow: _____ SLPM

___ 4.6.4 WAIT 3 minutes.

___ 4.6.5 POSITION "2–S–500" (V–1) to "CLOSE."

___ 4.6.6 VERIFY flow rate indicated is less than that which was recorded in step 4.6.3 e.

___ 4.6.7 WAIT 3 minutes.

4.6.8 POSITION valves as follows:

___ a. 2–GAN–252 (V–10) to "OFF"

___ b. 2–GAN–234 (V–11) to "OFF"

___ c. 2–S–500 (V–1) to "OPEN"

NOTE

The system is now purged of sample.

___ 4.6.9 CLOSE nitrogen bottle isolation valve.

___ 4.6.10 BACK OFF regulating valve "2–GAN–236."

4.6.11 BACK OFF regulating valve "2–GAN–249" (V–7).

4.6.12 PRESS "POWER ON" button to de–energize the Remote Operating Module.

4.6.13 OPEN front panel of module.

4.6.14 CLOSE "2–GAN–246."

4.6.15 BLEED off nitrogen pressure as follows:

a. CRACK open "2–GAN–247."

b. BLEED off nitrogen pressure.

c. CLOSE "2–GAN–247."

4.6.16 CLOSE and LATCH front panel of module.

4.6.17 On Remote Operating Module, REPLACE and LOCK anti–tamper cover.

4.6.18 PROCEED to Sample Module.

4.6.19 IF C–86 H_2 Analyzer is in service, CLOSE the following valves:

a. 2–S–463

b. 2–S–464

4.6.20 IF C–87 H_2 Analyzer is in service, CLOSE the following valves:

a. 2–S–461

b. 2–S–462

4.6.21 CLOSE Sample Module ventilation damper.

4.6.22 CLOSE and LOCK Sample Module door.

4.6.23 NOTIFY MCRO that PASS containment air sampling is complete.

– End of Section 4.6 –

4.7 Vent Gas Sampling

4.7.1 NOTIFY MCRO that a Vent Gas Sample will be collected.

4.7.2 COLLECT the following equipment:

- 5 cc gas syringe
- Stoppered and evacuated 14.4 cc vial
- Gas collection chamber
- Lead transport container for 14.4 cc vial

4.7.3 PROCEED to Auxiliary Vent Sampling Rig in 38' 6" East Penetration Room.

4.7.4 At Auxiliary Vent Sampling Rig, COLLECT sample as follows:

a. CONNECT tubing from flow gauge outlet to inlet of gas collection chamber.

b. CONNECT tubing from outlet of gas flask to suction of sample pump.

c. OPEN inlet and outlet stopcocks on gas collection chamber.

d. OPEN V−1 "Sample Inlet Isolation."

e. OPEN V−4 "Sample Outlet Isolation."

f. OPEN 2−HV−462, "RM Return to U2 Stack."

g. OPEN 2−HV−459, "Drain Valve."

h. OPEN flow gauge throttle valve.

i. START sample pump.

j. PURGE sample for 1 minute.

k. STOP sample pump.

l. CLOSE inlet and outlet stopcocks on gas flask.

m. RECORD sample time on Attachment 2.

n. Using the gas syringe, WITHDRAW 5 cc from gas flask.

o. REMOVE transport container cap, exposing needle guide.

p. INSERT syringe needle through needle guide.

q. INJECT 5 cc of gas into 14.4 cc sample vial.

r. REMOVE syringe needle.

s. REPLACE cap on transport container.

t. RESTORE system by closing the following valves:

1) V−1

2) V−4

3) 2−HV−462

4) 2−HV−459

u. REMOVE gas collection chamber.

v. PROCEED with sample to Chemistry Lab.

− End of Section 4.7 −

4.8 Vent Particulate and Iodine Sample Collection

___ 4.8.1 IF automatic isolation of on−line filters AND the Kaman high range system is in service, Go To Section 4.10.

___ 4.8.2 NOTIFY MCRO that a Particulate and Iodine Sample will be collected.

4.8.3 COLLECT the following equipment:

___ • 2 silver zeolite cartridges

___ • 2 particulate filters

___ • Four 4x6, plastic bags

___ • Adhesive tape

___ • Transport cart with shielded container

___ • Current SP 2814A−003

___ • New SP 2814A−003

4.8.4 DETERMINE sample collection time as follows:

___ a. REVIEW RM 8132A trend plot and DETERMINE elapsed time since count rate increase.

___ b. MULTIPLY current RM 8132A reading (cpm) by 2.0 E^{-06} µCi/cpm.

$$\mu Ci/cpm \times cpm = \mu Ci$$

___ c. DIVIDE result from step 4.8.4b. by elapsed time from step 4.8.4a.

$$\mu Ci \div \text{sec} = \mu Ci/sec$$

d. DIVIDE 10 µCi by result from step 4.8.4c.

$$10\mu Ci \div \mu Ci/sec = \text{sec}$$

4.8.5 REQUEST permission from Control Room to SECURE Rad Monitor Blower.

4.8.6 PROCEED to RM 8132A Sampling Cabinet in the 38' 6" East Penetration Room.

4.8.7 Refer To SP 2814A−003 and RECORD following:

a. Rad Monitor Blower in service

b. Sample flow as read on FIS−8132.

4.8.8 SECURE radiation monitor blower.

4.8.9 RECORD ventilation fan running hours on SP 2814A−003.

4.8.10 RECORD date and time removed on SP 2814A−003.

4.8.11 REMOVE charcoal cartridge from the radiation monitor cartridge holder.

4.8.12 PLACE removed charcoal cartridge in plastic bag.

4.8.13 SEAL bag and LABEL with date and time.

4.8.14 PLACE bag in shielded container

4.8.15 LABEL a new silver zeolite cartridge with an arrow to indicate direction of sample flow.

4.8.16 INSTALL new silver zeolite cartridge in radiation monitor cartridge holder.

4.8.17 RECORD date and time installed on SP 2814A−003.

4.8.18 REMOVE particulate filter from radiation monitor particulate filter holder.

4.8.19 PLACE removed particulate filter in plastic bag.

4.8.20 SEAL bag and LABEL with date and time.

4.8.21 PLACE bag in shielded container

4.8.22 RECORD date and time removed on SP 2814A–003.

4.8.23 INSTALL a new particulate filter in the radiation monitor particulate filter holder.

4.8.24 RECORD date and time installed on SP 2814A–003.

4.8.25 ZERO the ventilation fan run time meter.

4.8.26 START radiation monitor blower.

4.8.27 OBSERVE sample flow.

4.8.28 RECORD sample flow reading on a new SP 2814A–003.

4.8.29 RECORD the following on Attachment 3, "Unit 2 Post Accident Vent Particulate and Iodine Release Worksheet":

- Start date
- Start time
- Sample flow

4.8.30 EXIT East Penetration Room and PROCEED to a lower dose rate area.

4.8.31 WHEN sample time calculated in step 4.8.4 is reached, ENTER East Penetration Room.

4.8.32 RECORD sample flow on SP 2814A–003.

4.8.33 SECURE radiation monitor blower.

4.8.34 RECORD ventilation fan running hours on SP 2814A–003.

4.8.35 REMOVE silver zeolite cartridge from radiation monitor cartridge holder.

4.8.36 PLACE removed sliver zeolite cartridge in plastic bag.

4.8.37 SEAL bag and LABEL with date and time.

___ 4.8.38 PLACE bag in shielded container

___ 4.8.39 RECORD date and time removed on SP 2814A–003.

___ 4.8.40 LABEL a new silver zeolite cartridge with an arrow to indicate direction of sample flow.

___ 4.8.41 INSTALL new silver zeolite cartridge in radiation monitor cartridge holder.

___ 4.8.42 RECORD date and time installed on SP 2814A–003.

___ 4.8.43 REMOVE particulate filter from radiation monitor particulate filter holder.

___ 4.8.44 PLACE removed particulate filter in plastic bag.

___ 4.8.45 SEAL bag and LABEL with date and time.

___ 4.8.46 PLACE bag in shielded container

___ 4.8.47 RECORD date and time removed on SP 2814A–003.

___ 4.8.48 INSTALL a new particulate filter in radiation monitor particulate filter holder.

___ 4.8.49 RECORD date and time installed on SP 2814A–003.

___ 4.8.50 ZERO ventilation fan run time meter.

___ 4.8.51 START radiation monitor blower.

___ 4.8.52 OBSERVE sample flow.

___ 4.8.53 RECORD sample flow reading on a new SP 2814A–003.

4.8.54 RECORD the following on Attachment 3, "Unit 2 Post Accident Vent Particulate and Iodine Release Worksheet":

- Start date
- Start time
- Sample flow

4.8.55 TRANSFER filters to chemistry lab.

– End of Section 4.8 –

4.9 WRGM and Vent High Range Particulate and Iodine Sample Analysis

4.9.1 PLACE particulate filter and iodine cartridge that were in service at time of accident in a new plastic bag.

4.9.2 PLACE bag in lead brick shield.

4.9.3 PERFORM silver Zeolite cartridge and particulate filter analysis as follows:

a. IF performing a silver zeolite analysis, Refer To CP 801/2801/3801AT and with a gamma spectrometer, PERFORM a 5 minute, open cave, background count using silver zeolite geometry and a volume of 1 cc on the detector to be used.

1) LIST all identified isotopes and associated activity on Attachment 3, "Unit 2 Post Accident Sampling Particulate and Iodine Release Worksheet".

2) SAVE gamma spectrometer printout for future reference.

b. IF performing a particulate analysis, Refer To CP 801/2801/3801AT and with a gamma spectrometer, PERFORM a 5 minute, open cave, background count using particulate geometry and a volume of 1 cc on the detector to be used.

1) LIST all identified isotopes and associated activity on Attachment 3, "Unit 2 Post Accident Sampling Particulate and Iodine Release Worksheet".

2) SAVE gamma spectrometer printout for future reference.

c. SEAL plastic bag containing silver zeolite cartridge.

d. PLACE silver zeolite cartridge on detector shelf.

e. Refer To CP 801/2801/3801AT and INITIATE 5 minute sample count using 1 cc volume.

f. IF dead time is less than 20%, Go To step 4.9.3 h.

g. IF dead time is greater than or equal to 20%, PERFORM the following:[✣Ref. 6.17]

___ 1) REMOVE cartridge and detector shelf.

___ 2) PLACE shortest detector extension tube on detector.

___ 3) Starting with the shortest tube and working up, PLACE the cartridge on each tube until a dead time of less than 20% is achieved.

___ 4) TERMINATE count.

___ 5) Refer To CP 801/2801/3801AT and COUNT cartridge (open cave) for 5 minutes.

___ 6) WHEN count is completed, Refer To Attachment 4, "Shelf Ratio Calculation" and DETERMINE shelf ratio.

___ h. CALCULATE activity for each isotope on Attachment 3, "Unit 2 Post Accident Sampling Particulate and Iodine Release Worksheet."

___ i. REMOVE cartridge and PLACE in lead brick shield.

___ j. IF detector extension tube was used, REMOVE tube and REPLACE shelf on detector.

___ k. PLACE particulate filter on detector shelf.

___ l. Refer To CP 801/2801/3801AT and INITIATE 5 minute sample count using 1 cc volume.

___ m. IF dead time is less than 20%, Go To step 4.9.3 o.

n. IF dead time is greater than or equal to 20%, PERFORM the following:[✣Ref. 6.17]

1) REMOVE filter and detector shelf.

2) PLACE shortest detector shelf extension tube on detector.

3) Starting with the lowest shelf and working up, PLACE filter on each tube until a dead time of less than 20% is achieved.

4) TERMINATE count.

5) Refer To CP 801/2801/3801AT and COUNT filter (open cave) for 5 minutes.

6) WHEN count is completed, Refer To Attachment 4, "Shelf Ratio Calculation" and DETERMINE shelf ratio.

o. CALCULATE activity for each isotope on Attachment 3, "Unit 2 Post Accident Sampling Particulate and Iodine Release Worksheet."

p. IF detector extension tube was used, REMOVE tube and REPLACE shelf on detector.

q. COMPLETE Attachment 3.

r. PROVIDE MRDA or AMRDA with results.

s. PREPARE two copies of data sheets and computer printouts.

t. SEND copy of data sheets and computer printouts to MRDA or AMRDA.

u. FORWARD original and a copy of data sheets and computer printouts to Chemistry Supervision.

v. ENSURE cartridge and filter are labeled and placed in lead brick shield for future counting or final disposal.

– End of Section 4.9 –

4.10 Kaman High Range System Filter Sample Collection

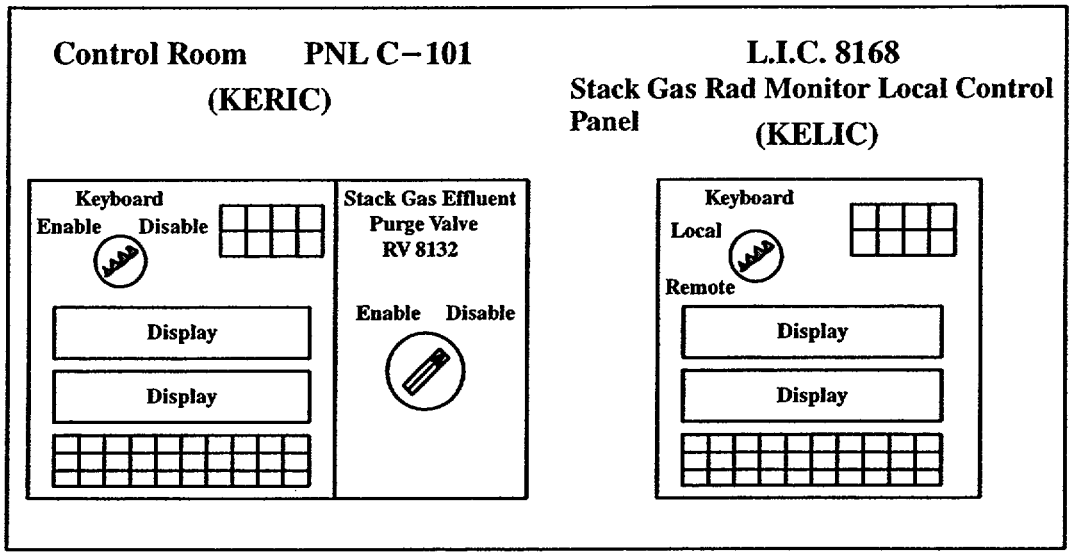
4.10.1 COLLECT the following equipment:

- Three collector assemblies
- Lead transfer cask for silver zeolite cartridges
- Reach rod
- Mechanical fingers
- KERIC microprocessor operating key
- Plastic bags labeled with channel numbers
- SP 2863–001
- SP 2863–002

4.10.2 NOTIFY MCRO that KAMAN high range filter samples will be collected.

4.10.3 Refer To Figure – 1 and PROCEED to KERIC panel located in Unit 2 Control Room on panel C101.

Figure – 1



4.10.4 POSITION switch "RV – 8132," stack gas effluent purge valve to "DISABLE."

NOTE

The MRCA or OSC ARPS determines whether local or remote keyboard is to be used.

4.10.5 To operate from KERIC keyboard, PERFORM the following:

___ a. POSITION KERIC key switch to "ENABLE."

___ b. IF KERIC panel does *not* respond to keyboard entries PERFORM the following:

___ 1) PROCEED to KELIC panel located in 4160 switchgear room in Turbine Building

___ 2) POSITION KELIC key switch to "REMOTE."

___ 3) RETURN to Control Room.

4.10.6 To operate from KELIC keyboard, PERFORM the following:

___ a. POSITION KERIC key switch to "DISABLE."

___ b. PROCEED to KELIC panel located in the 4160 switchgear room in the Turbine Building.

___ c. POSITION KELIC key switch to "LOCAL."

NOTE

The "Active Channel" is indicated by the channel with a radiation exposure rate greater than zero.

4.10.7 DETERMINE active channel by displaying radiation exposure rates as follows:

a. For channel 3, PERFORM the following:

___ 1) PRESS "DSP"

___ 2) PRESS "3"

___ 3) PRESS "23"

___ 4) PRESS "ENT"

b. For channel 4, PERFORM the following:

___ 1) PRESS "DSP"

___ 2) PRESS "4"

___ 3) PRESS "23"

___ 4) PRESS "ENT"

c. For channel 5, PERFORM the following:

___ 1) PRESS "DSP"

___ 2) PRESS "5"

___ 3) PRESS "23"

___ 4) PRESS "ENT"

___ 4.10.8 PLACE an asterisk in channel number column on SP 2863–002 to designate "Active Channel."

ALARA

If flow was diverted, a high radiation condition may exist in the collectors.

4.10.9 IF operating the KERIC, PERFORM the following:

a. POSITION KERIC key switch to "DISABLE."

b. PROCEED to the 4160 Switchgear Room in the Turbine Building.

4.10.10 IF operating the KELIC, POSITION KELIC key switch to "REMOTE."

4.10.11 REPLACE filters not in service on an "Inactive Channel" as follows:

a. OPEN inactive channel sample chamber door.

b. INSERT reach rod into "quick release latch."

c. MOVE reach rod to right.

d. PLACE mechanical fingers around collector assembly.

e. WITHDRAW assembly.

f. PLACE assembly in properly labeled bag.

g. PLACE bagged assembly into lead transfer cask.

h. Using mechanical fingers, INSERT new collector assembly into assembly housing.

i. PERFORM following to raise collector assembly:

1) INSERT reach rod into "quick release latch."

2) MOVE reach rod to left.

j. CLOSE and LATCH sample chamber door.

k. IF filters for another "Inactive Channel" need to be changed, Go To step 4.10.11 a.

l. IF no other filters need to be changed Go To step 4.10.12.

4.10.12 IF operating in the KERIC, PERFORM the following:

a. PROCEED to KERIC panel located in Unit 2 Control Room on panel C101.

b. POSITION KERIC key switch to "ENABLE."

4.10.13 IF operating in KELIC, POSITION KELIC key switch to "LOCAL."

4.10.14 OBTAIN total collection time for "Inactive Channels" as follows:

a. For filter 3, PERFORM the following:

1) PRESS "DSP"

2) PRESS "3"

3) PRESS "45"

4) PRESS "ENT"

5) RECORD display as hours on SP 2863−002.

6) PRESS "EXP"

7) RECORD display as minutes on SP 2863−002.

8) PRESS "EXP"

9) RECORD display as seconds on SP 2863−002.

b. For filter 4, PERFORM the following:

1) PRESS "DSP"

2) PRESS "4"

3) PRESS "45"

4) PRESS "ENT"

5) RECORD display as hours on SP 2863−002.

6) PRESS "EXP"

7) RECORD display as minutes on SP 2863−002.

8) PRESS "EXP"

9) RECORD display as seconds on SP 2863−002.

c. For filter 5, PERFORM the following:

1) PRESS "DSP"

2) PRESS "5"

3) PRESS "45"

4) PRESS "ENT"

5) RECORD display as hours on SP 2863−002.

6) PRESS "EXP"

7) RECORD display as minutes on SP 2863−002.

8) PRESS "EXP"

9) RECORD display as seconds on SP 2863−002.

4.10.15 OBTAIN total sample volume for "Inactive Channels" as follows:

a. For filter 3, PERFORM the following:

1) PRESS "DSP"

2) PRESS "3"

3) PRESS "37"

4) PRESS "ENT"

5) RECORD volume on SP 2863−002.

b. For filter 4, PERFORM the following:

1) PRESS "DSP"

2) PRESS "4"

3) PRESS "37"

4) PRESS "ENT"

5) RECORD volume on SP 2863–002.

c. For filter 5, PERFORM the following:

1) PRESS "DSP"

2) PRESS "5"

3) PRESS "37"

4) PRESS "ENT"

5) RECORD volume on SP 2863–002.

NOTE

If the automatic sequence has stepped through all three filters and the radiation exposure rate for the "Active Channel" is greater than 100 mrem/hr, an automatic channel shift will occur when the next channel is cleared.

4.10.16 To clear data on "Inactive Channels" or clear a "FULL" light, PERFORM the following:

a. To clear channel 3, PERFORM the following:

1) PRESS "STP"

2) PRESS "3"

3) PRESS "ENT"

b. To clear channel 4, PERFORM the following:

1) PRESS "STP"

2) PRESS "4"

3) PRESS "ENT"

c. To clear channel 5, PERFORM the following:

1) PRESS "STP"

2) PRESS "5"

3) PRESS "ENT"

NOTE

Diverting flow from the "Active Channel" to the next channel allows for filter change on the former "Active Channel" and allows for rotating flow paths.

4.10.17 To divert flow to activate a channel, PERFORM the following:

a. To divert flow to channel 3, PERFORM the following:

1) PRESS "FTN"

2) PRESS "3"

3) PRESS "04"

4) PRESS "ENT"

5) RECORD start and date on SP 2863–002.

b. To divert flow to channel 4, PERFORM the following:

1) PRESS "FTN"

2) PRESS "4"

3) PRESS "04"

4) PRESS "ENT"

5) RECORD start and date on SP 2863–002.

c. To divert flow to channel 5, PERFORM the following:

1) PRESS "FTN"

2) PRESS "5"

3) PRESS "04"

4) PRESS "ENT"

5) RECORD start and date on SP 2863–002.

d. Refer To SP 2863–002 RECORD stop time and date of pervious active channel.

e. IF an automatic shift occurs while stepping channels, RECORD shift start and stop times for involved channels on SP 2863–002.

f. PLACE an asterisk next to new "Active Channel" in channel number column on SP 2863–002 to designate the "Active Channel."

4.10.18 For the former "Active Channel," PERFORM the following:

ALARA

If flow was diverted, a high radiation condition may exist in the collectors.

a. IF operating KERIC, PERFORM the following:

1) POSITION KERIC key switch to "DISABLE."

2) PROCEED to 4160 Switchgear Room in Turbine Building.

b. IF operating KELIC, POSITION KELIC key switch to "REMOTE."

c. OPEN sample chamber door.

d. PERFORM the following to lower collector assembly:

1) INSERT reach rod into "quick release latch."

2) MOVE reach rod to right.

e. PLACE mechanical fingers around the collector assembly.

f. WITHDRAW assembly.

g. PLACE assembly into lead transfer cask.

h. INSERT new collector assembly into assembly housing.

i. PERFORM the following to raise collector assembly:

1) INSERT reach rod into "quick release latch."

2) MOVE reach rod to left.

j. CLOSE and LATCH sample chamber door.

4.10.19 IF operating in KERIC, PERFORM the following:

a. PROCEED to KERIC panel located in Unit 2 Control Room on panel C101.

b. POSITION KERIC key switch to "ENABLE."

4.10.20 IF operating in KELIC, POSITION KELIC key switch to "LOCAL."

4.10.21 OBTAIN total collection time for former "Active Channel" as follows:

a. For filter 3, PERFORM the following:

1) PRESS "DSP"

2) PRESS "3"

3) PRESS "45"

4) PRESS "ENT"

5) RECORD display as hours on SP 2863−002.

6) PRESS "EXP"

7) RECORD display as minutes on SP 2863−002.

8) PRESS "EXP"

9) RECORD display as seconds on SP 2863−002.

b. For filter 4, PERFORM the following:

1) PRESS "DSP"

2) PRESS "4"

3) PRESS "45"

4) PRESS "ENT"

5) RECORD display as hours on SP 2863−002.

6) PRESS "EXP"

7) RECORD display as minutes on SP 2863−002.

8) PRESS "EXP"

9) RECORD display as seconds on SP 2863−002.

c. For filter 5, PERFORM the following:

1) PRESS "DSP"

2) PRESS "5"

3) PRESS "45"

4) PRESS "ENT"

5) RECORD display as hours on SP 2863−002.

6) PRESS "EXP"

7) RECORD display as minutes on SP 2863−002.

8) PRESS "EXP"

9) RECORD display as seconds on SP 2863–002.

4.10.22 OBTAIN total sample volume for the former "Active Channel" as follows:

a. For filter 3, PERFORM the following:

1) PRESS "DSP"

2) PRESS "3"

3) PRESS "37"

4) PRESS "ENT"

5) RECORD volume on SP 2863–002.

b. For filter 4, PERFORM the following:

1) PRESS "DSP"

2) PRESS "4"

3) PRESS "37"

4) PRESS "ENT"

5) RECORD volume on SP 2863–002.

c. For filter 5, PERFORM the following:

1) PRESS "DSP"

2) PRESS "5"

3) PRESS "37"

4) PRESS "ENT"

5) RECORD volume on SP 2863–002.

NOTE

If the automatic sequence has stepped through all three filters and the radiation exposure rate for the "Active Channel" is greater than 100 mrem/hr, an automatic channel shift will occur when the next channel is cleared.

4.10.23 To clear data on former "Active Channel" or clear a "FULL" light, PERFORM the following:

a. To clear channel 3, PERFORM the following:

___ 1) PRESS "STP"

___ 2) PRESS "3"

___ 3) PRESS "ENT"

b. To clear channel 4, PERFORM the following:

___ 1) PRESS "STP"

___ 2) PRESS "4"

___ 3) PRESS "ENT"

c. To clear channel 5, PERFORM the following:

___ 1) PRESS "STP"

___ 2) PRESS "5"

___ 3) PRESS "ENT"

4.10.24 IF directed by MRDA or AMRDA, MONITOR the in–service filter radiation levels as follows:

a. For channel 3, PERFORM the following:

1) PRESS "DSP"

2) PRESS "3"

3) PRESS "23"

4) PRESS "ENT"

b. For channel 4, PERFORM the following:

1) PRESS "DSP"

2) PRESS "4"

3) PRESS "23"

4) PRESS "ENT"

c. For channel 5, PERFORM the following:

1) PRESS "DSP"

2) PRESS "5"

3) PRESS "23"

4) PRESS "ENT"

4.10.25 POSITION KELIC key switch to "REMOTE."

4.10.26 PROCEED to Control Room panel C101.

4.10.27 POSITION KERIC key switch to "DISABLE."

4.10.28 POSITION RV–8132, Stack Gas Effluent Purge Valve, switch to "ENABLE."

4.10.29 ENSURE Vent Gas High Radiation alarm is cleared.

4.10.30 NOTIFY MCRO that filter change is complete and system is restored to normal.

4.10.31 TRANSFER assemblies in lead transfer cask to chemistry lab.

– End of Section 4.10 –

4.11 KAMAN High Range System Filter Sample Analysis

___ 4.11.1 REMOVE filters from collector assembly.

___ 4.11.2 PLACE particulate filter in a properly labeled, clean plastic bag.

___ 4.11.3 PLACE silver zeolite cartridge in a purge holder.

___ 4.11.4 REMOVE silver zeolite cartridge.

___ 4.11.5 PLACE cartridge in a clean, labeled plastic bag.

___ 4.11.6 Refer To CP 801/2801/3801AT and PERFORM a 5 minute, open cave, background count using sample geometery and 1 cc volume on the detector to be used.

___ a. LIST all identified isotopes and associated activity on Attachment 3.

___ b. SAVE gamma spectrometer printout for future reference.

___ 4.11.7 PLACE cartridge on detector shelf.

___ 4.11.8 Refer To CP 801/2801/3801AT and INITIATE a 5 minute sample count.

___ 4.11.9 IF dead time is less than 20%, Go To step 4.11.11.

4.11.10 IF dead time is greater than or equal to 20%, PERFORM the following:[✣Ref. 6.17]

___ a. REMOVE cartridge and detector shelf.

___ b. PLACE shortest detector shelf extension tube on detector.

___ c. Starting with shortest tube and working up, PLACE cartridge on each tube until a dead time of less than 20% is achieved.

___ d. TERMINATE count.

___ e. Refer To CP 801/2801/3801AT and COUNT cartridge (open cave) for 5 minutes.

___ f. WHEN count is completed, Refer To Attachment 4, "Shelf Ratio Calculation" and DETERMINE shelf ratio.

4.11.11 CALCULATE activity for each isotope on Attachment 3, "Post Accident Particulate and Iodine Release Worksheet."

4.11.12 REMOVE cartridge and PLACE in lead brick shield.

4.11.13 IF detector shelf extension tube was used, REMOVE tube and REPLACE shelf on detector.

4.11.14 PLACE particulate filter on detector in gamma spectrometer.

4.11.15 Refer To CP 801/2801/3801AT and INITIATE a 5 minute sample count using 1 cc sample volume.

4.11.16 IF dead time is less than 20%, Go To step 4.11.18.

4.11.17 IF dead time is greater than or equal to 20%, PERFORM the following:[✣Ref. 6.17]

a. REMOVE filter and detector shelf.

b. PLACE shortest detector shelf extension tube on detector.

c. Starting with shortest tube and working up, PLACE filter on each tube until a dead time of less than 20% is achieved.

d. TERMINATE count.

e. Refer To CP 801/2801/3801AT and COUNT filter (open cave) for 5 minutes.

f. WHEN count is completed, Refer To Attachment 4, "Shelf Ratio Calculation" and DETERMINE shelf ratio.

4.11.18 CALCULATE activity for each isotope on Attachment 3, "Post Accident vent Particulate and Iodine Release Worksheet."

4.11.19 REMOVE filter and PLACE in lead brick shield.

4.11.20 REPORT analysis results to MRDA or AMRDA.

4.11.21 PREPARE two copies of data sheets and computer printouts.

4.11.22 SEND copy of data sheets and computer printouts to MRDA or AMRDA.

4.11.23 FORWARD original and a copy to Chemistry Supervision.

– End of Section 4.11 –

4.12 Low Range WRGM Particulate and Iodine Sample Collection

ALARA

Filters may be highly radioactive. Use caution when handling.

4.12.1 IF directed by MCRO, PREPARE to sample normal WRGM using silver zeolite cartridges.

4.12.2 COLLECT the following equipment:

- 2 silver zeolite cartridges
- Two 47 mm particulate filters
- Plastic bags
- Transport container
- Current SP 2815−002
- New SP 2815−002

4.12.3 DETERMINE sample collection time as directed or as follows:

a. MULTIPLY current RM 8169 flow rate by 28300 cc/cubic ft.

$$cubic\ feet/min \times 28300\ cc/cubic\ ft = cc/min$$

b. MULTIPLY result from 4.12.3a. times current RM 8169 reading µCi/cc.

c. DIVIDE 10 µCi by result from 4.12.3b.

$$10\ \mu Ci \div \mu Ci/\text{min} = \text{min}$$

d. MULTIPLY result from 4.12.3c. by 60 to obtain seconds.

$$Min \times 60\ sec/min = \text{sec}$$

4.12.4 PROCEED to WRGM Sampling Area.

4.12.5 RECORD the operating channel sample flow from FI−8169L on SP 2815−002, as the removed sample flow.

4.12.6 IF the "A" sample train is in service, CLOSE the following "B" sample train isolation valves:

a. 2−EB−216 Filter B−Inlet Isolation Valve

b. 2−EB−217 Filter B−Inlet Isolation Valve

c. 2−EB−218 Filter B−Outlet Isolation Valve

d. 2−EB−219 Filter B−Outlet Isolation Valve

4.12.7 IF the "B" sample train is in service, CLOSE the following "A" sample train isolation valves:

a. 2−EB−220 Filter A−Inlet Isolation Valve

b. 2−EB−221 Filter A−Inlet Isolation Valve

c. 2−EB−222 Filter A−Outlet Isolation Valve

d. 2−EB−223 Filter A−Outlet Isolation Valve

4.12.8 On the filter assembly out of service, PERFORM the following:

a. REMOVE filter holder ring clamp.

b. REMOVE top gasket.

c. REMOVE particulate filter and PLACE in plastic bag.

d. REMOVE screen plate.

e. REMOVE middle gasket.

f. REMOVE iodine cartridge and PLACE in plastic bag.

g. POSITION arrow indicator pointing into filter holder and LOAD a new silver zeolite cartridge into holder.

h. INSTALL middle gasket and screen plate.

i. INSTALL screen plate.

j. INSTALL particulate filter, fibrous side up into holder.

k. INSTALL top gasket.

l. INSTALL and TIGHTEN filter holder ring clamp.

4.12.9 IF "A" sample train is currently out of service OPEN the following to align sample path:

a. 2–EB–220 Filter A–Inlet Isolation Valve

b. 2–EB–221 Filter A–Inlet Isolation Valve

c. 2–EB–222 Filter A–Outlet Isolation Valve

d. 2–EB–223 Filter A–Outlet Isolation Valve

4.12.10 IF "B" sample train is currently out of service, OPEN the following to align sample path:

a. 2–EB–216 Filter B–Inlet Isolation Valve

b. 2–EB–217 Filter B–Inlet Isolation Valve

c. 2–EB–218 Filter B–Outlet Isolation Valve

d. 2–EB–219 Filter B–Outlet Isolation Valve

4.12.11 IF "A" sample train is currently in service, on grab sample control assembly panel (RIC 8169) SWITCH operation to the "B" train.

4.12.12 IF "B" sample train is currently in service on grab sample control assembly panel (RIC 8169) SWITCH operation to the "A" train.

4.12.13 Refer To SP 2815–002 and RECORD the following:

- Date/Time removed from service
- Technician initials for removal
- Sample train removed from service

4.12.14 Refer To Attachment 3 and RECORD the following:

- Operating channel sample flow as indicated on F1−8169L
- Sample train placed in service Date/Time
- Technician initials

4.12.15 IF "A" sample train was removed from service CLOSE the following to isolate filters:

___ a. 2−EB−220

___ b. 2−EB−221

___ c. 2−EB−222

___ d. 2−EB−223

4.12.16 IF "B" sample train was removed from service CLOSE the following to isolate filters:

___ a. 2−EB−216

___ b. 2−EB−217

___ c. 2−EB−218

___ d. 2−EB−219

4.12.17 On the filter assembly out of service, PERFORM the following:

___ a. REMOVE filter holder ring clamp.

___ b. REMOVE top gasket

___ c. REMOVE particulate filter and PLACE in plastic bag.

___ d. REMOVE screen plate.

___ e. REMOVE middle gasket.

___ f. REMOVE iodine cartridge and PLACE in plastic bag.

g. POSITION arrow indicator pointing into filter holder and LOAD a new iodine cartridge into holder.

h. INSTALL middle gasket.

i. INSTALL screen plate.

j. INSTALL particulate filter fibrous side up into holder.

k. INSTALL top gasket.

l. INSTALL and TIGHTEN filter holder ring clamp.

4.12.18 IF "A" sample train is currently out of service OPEN the following to align sample path:

a. 2–EB–220

b. 2–EB–221

c. 2–EB–222

d. 2–EB–223

4.12.19 IF "B" sample train is currently out of service OPEN the following to align sample path:

a. 2–EB–216

b. 2–EB–217

c. 2–EB–218

d. 2–EB–219

4.12.20 NOTIFY Operations that filter and iodine cartridge changeout is complete.

4.12.21 EXIT WRGM sample area and TRANSFER filters to chemistry lab.

4.12.22 As directed, ANALYZE sample filters.

4.12.23 WHEN sample time calculated in step 4.12.3 is reached, PROCEED to WRGM sample area to change out filters.

4.12.24 Refer To Attachment 3 and RECORD operating channel sample flow from FI−8169L as the removed sample flow.

4.12.25 IF "A" sample train is currently out of service OPEN the following to align sample path:

a. 2−EB−220

b. 2−EB−221

c. 2−EB−222

d. 2−EB−223

4.12.26 IF "B" sample train is currently out of service OPEN the following to align sample path:

a. 2−EB−216

b. 2−EB−217

c. 2−EB−218

d. 2−EB−219

4.12.27 IF the "A" sample train is currently in service on grab sample control assembly panel (RIC 8169) SWITCH to the "B" train.

4.12.28 IF the "B" sample train is currently in service on grab sample control assembly panel (RIC 8169) SWITCH to the "A" train.

4.12.29 Refer To Attachment 3 and RECORD the following:

- Date/Time removed from service
- Technician initials for removal
- Sample train removed from service

4.12.30 Refer To new Attachment 3 and RECORD the following:

- Operating channel sample flow as indicated on F1−8169L
- Sample train placed in service and Date/Time
- Technician initials

4.12.31 IF the "A" sample train was removed from service CLOSE the following to isolate filters:

___ a. 2–EB–220

___ b. 2–EB–221

___ c. 2–EB–222

___ d. 2–EB–223

4.12.32 IF the "B" sample train was removed from service CLOSE the following to isolate filters:

___ a. 2–EB–216

___ b. 2–EB–217

___ c. 2–EB–218

___ d. 2–EB–219

4.12.33 On the filter assembly out of service PERFORM the following:

___ a. REMOVE filter holder ring clamp.

___ b. REMOVE top gasket

___ c. REMOVE particulate filter and PLACE in plastic bag.

___ d. REMOVE screen plate.

___ e. REMOVE middle gasket.

___ f. REMOVE iodine cartridge and PLACE in plastic bag.

___ g. POSITION arrow indicator pointing into filter holder and LOAD a new iodine cartridge into holder.

___ h. INSTALL middle gasket.

___ i. INSTALL screen plate.

___ j. INSTALL particulate filter fibrous side up into holder.

k. INSTALL top gasket.

l. INSTALL and TIGHTEN filter holder ring clamp.

4.12.34 IF "A" sample train is currently out of service OPEN the following to align sample path:

a. 2–EB–220

b. 2–EB–221

c. 2–EB–222

d. 2–EB–223

4.12.35 IF "B" sample train is currently out of service OPEN the following to align sample path:

a. 2–EB–216

b. 2–EB–217

c. 2–EB–218

d. 2–EB–219

4.12.36 TRANSFER filters to the chemistry lab.

4.12.37 Refer To Section 4.9 or as directed and ANALYZE filters.

4.12.38 COLLECT silver zeolite cartridges and TRANSFER to Waste Services for disposal as hazardous waste.

– End of Section 4.12 –

4.13 Changing High Range Filters in Wide Range Gas Monitor

ALARA

Filters may be highly radioactive. Use caution and Health Physics support as directed during performance of this Section.

4.13.1 WHEN directed, COLLECT the following equipment for High Range WRGM filter sampling:

- Transfer container for filter assemblies
- Silver zeolite cartridges
- 47 mm particulate filters
- Plastic bags
- Wrenches, if necessary to remove cave from skid
- Transfer cart as directed

4.13.2 NOTIFY control room and DETERMINE date and time Mid/High range sample collection commenced.

4.13.3 Refer To Attachment 3 and RECORD Mid/High range sample collection date and time.

4.13.4 PROCEED to WRGM sampling area.

NOTE

Detector flow rate is controlled by the monitor at a nominal rate of approximately 0.06 SCFM (1.7 lpm).

4.13.5 DETERMINE which filter train is in operation and Refer To Attachment 3 and RECORD FI−8169H sample flow rate.

4.13.6 IF directed to secure sample skid, PERFORM the following:

a. POSITION the Mid/High range pump control to "OFF" to secure sample flow.

b. Refer To Attachment 3 and RECORD sample stop date and time.

4.13.7 IF directed to switch sample trains, PERFORM the following:

a. On grab sample control assembly panel RIC 8169, SWITCH to out of service sample train.

b. Refer To Attachment 3 and RECORD date and time of sample train switch and sample flow rate as indicated on FI−8169H.

4.13.8 IF changing out of service "C" train filters, PERFORM the following:

a. CLOSE Filter C–Inlet Isolation valve 2–EB–233.

b. CLOSE Filter C–Inlet Isolation valve 2–EB–234.

c. CLOSE Filter C–Outlet Isolation valve 2–EB–235.

d. CLOSE Filter C–Outlet Isolation valve 2–EB–236.

4.13.9 IF changing out of service "D" train filters, PERFORM the following:

a. CLOSE Filter D–Inlet Isolation valve 2–EB–237.

b. CLOSE Filter D–Inlet Isolation valve 2–EB–238.

c. CLOSE Filter D–Outlet Isolation valve 2–EB–239.

d. CLOSE Filter D–Outlet Isolation valve 2–EB–240.

4.13.10 IF removing out of service cave from sample collection skid, PERFORM the following:

a. LOOSEN and REMOVE bolts from the cave base plate.

b. DISCONNECT inlet and outlet tubing from quick disconnects.

c. REMOVE filter cave and PLACE on transport cart.

d. Go To step 4.13.13.

NOTE

If radiation levels permit, filters may be changed in WRGM sample area as directed.

4.13.11 IF replacing filter is sample area, PERFORM the following:

a. DISCONNECT supply and return tubing from holding bracket.

b. UNLATCH and OPEN sample cave door.

c. DISCONNECT inlet and outlet tubing from quick disconnects.

d. REMOVE filter assembly from cave.

e. LOOSEN and REMOVE filter holding ring.

f. REMOVE filter housing cover.

g. REMOVE top gasket.

h. REMOVE particulate filter and PLACE in plastic bag.

i. REMOVE screen plate.

j. REMOVE middle gasket.

k. REMOVE silver zeolite cartridge and PLACE in plastic bag.

l. POSITION arrow indicator pointing into filter and LOAD new iodine cartridge.

m. INSTALL middle gasket.

n. INSTALL screen plate.

o. INSTALL particulate filter fibrous side up into holder.

p. INSTALL top gasket.

q. ASSEMBLE filter housing and INSTALL filter holder ring clamp.

r. INSTALL filter holder into cave and CONNECT quick disconnects.

s. CONNECT supply and return tubing to holding bracket.

t. CLOSE and LATCH cave.

u. IF starting "C" sample train, OPEN the following:

1) Filter C–Inlet Isolation valve 2–EB–233.

2) Filter C–Inlet Isolation valve 2–EB–234.

3) Filter C–Outlet Isolation valve 2–EB–235.

4) Filter C–Outlet Isolation valve 2–EB–236.

v. IF starting "D" sample train, OPEN the following:

1) Filter D–Inlet Isolation valve 2–EB–237.

2) Filter D–Inlet Isolation valve 2–EB–238.

3) Filter D–Outlet Isolation valve 2–EB–239.

4) Filter D–Outlet Isolation valve 2–EB–240.

4.13.12 IF directed to start sample collection, PERFORM the following:

a. IF starting "C" sample train, ENSURE the following open:

1) Filter C–Inlet Isolation valve 2–EB–233.

2) Filter C–Inlet Isolation valve 2–EB–234.

3) Filter C–Outlet Isolation valve 2–EB–235.

4) Filter C–Outlet Isolation valve 2–EB–236.

b. IF starting "D" sample train, ENSURE the following open:

1) Filter D–Inlet Isolation valve 2–EB–237.

2) Filter D–Inlet Isolation valve 2–EB–238.

3) Filter D–Outlet Isolation valve 2–EB–239.

4) Filter D–Outlet Isolation valve 2–EB–240.

c. As directed, on grab sample control assembly panel RIC–8169, PLACE filter train selection switch to the "C" or "D" sample train.

d. IF sample skid was secured, POSITION Mid/High range pump control to "ON" to start sample flow.

e. Refer To Attachment 3 and RECORD start date and time and sample flow on FI−8169H.

4.13.13 TRANSFER filters or filter cave to chemistry lab.

4.13.14 IF filters are already removed from cave and assemblies, Go To step 4.13.16.

4.13.15 IF replacing filters, PERFORM the following:

a. DISCONNECT supply and return tubing from holding bracket..

b. DISENGAGE and OPEN sample cave door.

c. REMOVE filter assembly from cave.

d. LOOSEN and REMOVE filter holding ring.

e. REMOVE filter housing cover.

f. REMOVE top gasket.

g. REMOVE particulate filter and PLACE in plastic bag.

h. REMOVE screen plate.

i. REMOVE middle gasket.

j. REMOVE silver zeolite cartridge and PLACE in plastic bag.

k. POSITION arrow indicator pointing into filter and LOAD new iodine cartridge.

l. INSTALL middle gasket.

m. INSTALL screen plate.

n. INSTALL particulate filter fibrous side up into holder.

o. INSTALL top gasket.

p. ASSEMBLE filter housing and INSTALL filter holder ring clamp.

4.13.16 Refer To Section 4.9 and PERFORM sample analysis.

4.13.17 COLLECT silver zeolite cartridges for transfer to Waste Services for disposal.

– End of Section 4.13 –

4.14 U2 Main Station Stack High Range Gas Sampling

ALARA

Filters may be highly radioactive. Use caution when handling.

NOTE

Sample collection volume will be as directed, and determined by expected activity.

4.14.1 WHEN directed by MRCO, OBTAIN gas sample container and PROCEED to Main Station Stack WRGM sample room.

4.14.2 COLLECT sample as follows:

a. CONNECT sample container inlet to the sample source at 2–EB–244, sample conditioning skid–Mid/High range sample test valve.

b. CONNECT sample container outlet to sample pump inlet.

c. CONNECT sample pump outlet at 2–EB–257, sample return test isolation valve.

d. OPEN the following valves:

1) Sample container inlet

2) Sample container outlet

3) 2–EB–244, sample conditioning skid–Mid/High range sample test.

4) 2–EB–257, sample return test isolation valve.

e. START sample pump.

NOTE

Sample purge time will be dependent on a variety of factor and will be determined by Chemistry Supervision.

___ f. PURGE sample through sample container as directed.

___ g. STOP sample pump.

h. CLOSE the following:

___ 1) Sample container inlet

___ 2) Sample container outlet

___ 3) 2–EB–244, sample conditioning skid–Mid/High range sample test.

___ 4) 2–EB–257, sample return test isolation valve.

___ i. NOTE sample time.

j. REMOVE tygon tubing from the following:

___ 1) Sample container inlet

___ 2) Sample container outlet

___ k. TRANSFER sample to chemistry lab.

___ l. Refer To Section 4.15 and PERFORM sample analysis.

4.15 U2 Main Station Stack and Vent Gas Isotopic Analysis

4.15.1 Refer To CP 801/2801/3801AT and PERFORM a 5 minute, open cave, background count on the detector to be used using same sample geometry and volume of 1 cc.

a. LIST all identified isotopes and associated activity on Attachment 2, "Unit 2 Post Accident Sampling Gaseous Release Worksheet."

b. SAVE gamma spectrometer printout for future reference.

4.15.2 PLACE sample on detector shelf.

4.15.3 Refer To CP 801/2801/3801AT and INITIATE a 5 minute sample count using 1 cc sample count.

4.15.4 IF dead time is less than 20%, Go To step 4.15.6.

4.15.5 IF dead time is greater than or equal to 20%, PERFORM the following:[✣Ref. 6.16]

a. REMOVE sample and detector shelf.

b. PLACE shortest detector shelf extension tube on detector.

c. Starting with the lowest shelf and working up, PLACE the sample on each shelf until a dead time of less than 20% is achieved.

d. TERMINATE count.

e. Refer To CP 801/2801/3801AT and COUNT sample (open cave) for 5 minutes.

f. WHEN count is completed, Refer To Attachment 4, "Shelf Ratio Calculation" and DETERMINE shelf ratio.

4.15.6 CALCULATE activity for each isotope on Attachment 2, "Unit 2 Post Accident Sampling Gaseous Release Worksheet."

4.15.7 STORE sample in source locker for disposal.

4.15.8 COMPLETE Attachment 2.

4.15.9 REPORT analysis results to MRDA or AMRDA or as directed.

4.15.10 PREPARE two copies of data sheets and computer printouts.

4.15.11 SEND copy of data sheets and computer printouts to MRDA or AMRDA or as directed.

4.15.12 FORWARD original and a copy of data sheets and computer printouts to Chemistry Supervision.

– End of Section 4.15 –

4.16 PASS Equipment Inventory

4.16.1 Quarterly and after each PASS sample, Refer To Attachment 5 and PERFORM inventory of all equipment required to perform containment PASS sampling.

4.16.2 COMPLETE Attachment 5, "Containment PASS Equipment Inventory."

4.16.3 FORWARD Attachment 5 to Chemistry Supervision.

– End of Section 4.16 –

5. REVIEW AND SIGNOFF

5.1 Indicate (check) Subsections of this procedure which were performed:

☐ 4.1 ☐ 4.2 ☐ 4.3 ☐ 4.4 ☐ 4.5 ☐ 4.6
☐ 4.7 ☐ 4.15 ☐ 4.8 ☐ 4.9 ☐ 4.10 ☐ 4.11

5.2 If procedure was terminated prior to completion, specify cause:_____

_____

_____

_____

_____

_____

_____

5.3 This procedure was performed by the following personnel:

- Job supervisor (MRDA or designee):

_____	_____	____
Print Name	Signature	Initials

- PASS Team personnel:

_____	_____	____
Print Name	Signature	Initials
_____	_____	____
Print Name	Signature	Initials
_____	_____	____
Print Name	Signature	Initials
_____	_____	____
Print Name	Signature	Initials

5.4 This procedure was reviewed by Chemistry Supervision:

_____	_____	____
Print Name	Signature	Initials

5.5 All data recording for this procedure is located in Attachments 1, 2, and 3.

6. REFERENCES

6.1 "Final Safety Analysis Report Unit 2"

6.2 "Millstone Nuclear Power Station Emergency Plan"

6.3 NUREG–0654, Revision 1, "Criteria for Preparation of Radiological Emergency Response Plans, and Preparedness in Support of Nuclear Power Plants"

6.4 NUREG–0737, "Clarification of TMI Action Plan Requirements, Supplement 1, Requirements for Emergency Response Capability"

6.5 "Technical Manual for Containment Air Post Accident Sample System," General Dynamics Corporation, Electric Boat Division, Reactor Plant Services, May 1982.

6.6 "Kaman Sciences Corporation, Instruction Manual, Operation–Maintenance Instructions and Parts Catalog for Accident Range Gas Monitor, Model KMG–HRC"

6.7 "Instructions Model 8500 Gas Chromatograph," Perkin Elmer

6.8 "VAX/VMS Spectroscopy Applications Package User's Manual 07–0196"

6.9 "Radiological Effluent Monitoring and Off–Site Dose Calculation Manual," (REM ODCM)

6.10 Chemistry Memorandum from John Kangley to Jeff Broussard, CHEM–93–1212, dated January 18, 1993.

6.11 CP 801/2801/3801AT, "Computer Radioisotopic Analysis System"

6.12 CP 801/2801/3801AD, "Gas Chromatograph"

6.13 CP 2803/3803P, "Operation and Calibration for Perkin–Elmer Autosystem XL Gas Chromatograph"

6.14 SP 2814A, "Gaseous Effluents for Iodines and Particulates"

6.15 SP 2863, "High Range Gas Monitor Particulate Filter and Iodine cartridge Replacement"

6.16 NRC, B18443, Dated July 31, 2001 ①

6.17 NRC, Docket Number 50–245, 50–336, 50–423. Combined Inspection 50–245/87–24, 50–336/87–21, 50–423/87–19. November 17 1987, Page 10.

6.18 USNRC Reg Guide 1.97, May 1983, "Instrumentation for Light Water Coolant Nuclear Power Plants to Assess Plant and Environs Condition During and Following an Accident.

6.19 Memo 98–067, From Max Keyes to Tom Blount, PASS Procedure Meeting Minutes.

6.20 Sorrento Electronics, Wide Range Gas Monitor System RM–8169 Technical Manual, Revision A, October 2000

6.21 DCR M2–00010.

7. SUMMARY OF CHANGES

7.1 Incorporated instructions for collecting samples associated with the new Unit 2 Main Station Stack WRGM, RM 8169.

7.2 Changes made to reflect the removal of the Main Station Stack KAMEN and Normal Range monitoring systems from service. This equipment has been retired and replaced in part by the Unit 2 WRGM.

7.3 Revision includes incorporation of actions previously contained in EPOP 4446 which has been canceled.

7.4 Modifications to procedures were incorporated to accommodate Unit 1/Unit 2 Separation Project (DCR M2–00010).

Summary of Changes Rev. 001–01

7.5 Editorial Correction; Updated Reference 6.16 NRC commitment letter. B18443, AR #01005693–01.

Attachment 1
Unit 2 Post Accident Sampling Containment Gaseous Activity Worksheet

(Sheet 1 of 1)

Sample
Location: _____
Isolation Date: _____
Isolation Time: _____

Worksheet Completed by: _____
Print Name

Signature: _____

SAMPLE VOLUME = ml injected into 14.4 cc vial = _____ cc

(Printout Activity × *Shelf Ratio)* − *Background* = *Isotope Activity*

Isotope	Printout Activity	Shelf Ratio	Background	Isotope Activity
			Total Gaseous Activity:	

NOTE: Total Gaseous Activity = summation of all isotope activities.
NOTE: Data and calculations recorded to 3−significant figures when possible.

Gas Composition Analysis

Sample Location: _____ Sample Date: _____ Sample Time: _____
% Hydrogen: _____ % Oxygen: _____ % Nitrogen: _____

Reviewed by: _____ _____ Date:_____
(Chemistry supervision) Print Name Signature

Attachment 2
Unit 2 Post Accident Sampling Gaseous Release Worksheet

(Sheet 1 of 1)

Worksheet Completed by:_____ Signature: _____
Print Name

SAMPLE DATE/TIME _____
PROCESS FLOW_____ cfm

SAMPLE VOLUME = ml injected into 14.4 cc vial = _____ cc

RELEASE POINT
- ☐ **MP2 Vent**
- ☐ **MP2 to Main Station Stack**

(Printout Activity × *Shelf Ratio)* − *Background* = *Isotope Activity*

Isotope	Printout Activity μCi	Shelf Ratio	Background μCi	Isotope Activity μCi	Isotope Activity* $\mu Ci/cc$
				Total Gaseous Activity:	

***NOTE** Isotope activity (µCi/cc) = $\frac{\text{µCi}}{\text{Sample Volume cc}}$

NOTE: Total Gaseous Activity = summation of all isotope activities.
NOTE: Data and calculations recorded to 3–significant figures when possible.

Release Rate:

$$\frac{\text{Total Activity Released } (\mu Ci/cc)}{} \times \frac{\text{Total Process Flow } (cfm)}{} \times \frac{28317\ cc}{ft^3} \times \frac{1\ \text{min}}{60\ \text{sec}} = \frac{\text{Release Rate}}{} \ \mu Ci/sec$$

Reviewed by: _____ _____ Date:_____
(Chemistry supervision) Print Name Signature

Attachment 3
Unit 2 Post Accident Sampling Particulate and Iodine Release Worksheet

(Sheet 1 of 3)

Worksheet Completed by:_____ Signature: _____
Print Name

RELEASE POINT
- ☐ **MP2 Vent**
- ☐ **MP2 to Main Station Stack**

DATE/TIME STARTED	_____	SAMPLE FLOW	_____ cfm
DATE/TIME STOPPED	_____	SAMPLE FLOW	_____ cfm
TOTAL SAMPLE TIME	_____ min	AVERAGE FLOW	_____ cfm
		AVE. PROCESS SAMPLE FLOW	_____ cfm

$$SCFM = \frac{lpm}{28.316}$$

Particulate Activities

(Printout Activity × *Shelf Ratio)* − *Background* = *Isotope Activity*

Isotope	Printout Activity μCi	Shelf Ratio	Background μCi	Isotope Activity μCi	Isotope Activity* μCi
				Total Particulate Activity:	

***NOTE** Isotope activity ($\mu Ci/cc$) = $\frac{\mu Ci}{\text{Sample Volume cc}}$

NOTE: Total Particulate Activity = summation of all isotope activities.

NOTE: Data and calculations recorded to 3−significant figures when possible.

Attachment 3
Unit 2 Post Accident Sampling Particulate and Iodine Release Worksheet

(Sheet 2 of 3)

IODINE ISOTOPES

(Printout Activity × Shelf Ratio) − Background = Isotope Activity

Isotope	Printout Activity μCi	Shelf Ratio	Background μCi	Isotope Activity μCi	Isotope Activity* μCi

*NOTE Isotope activity ($\mu Ci/cc$) = $\frac{\mu Ci}{\text{Sample Volume cc}}$

Total Iodine Activity: ____

NOTE: Total Iodine Activity = summation of all isotope activities.

NOTE: Data and calculations recorded to 3−significant figures when possible.

KAMAN/WRGM Sample Corrections:

$$\frac{\quad}{\textit{Particulate Concentration}} \times 2 = \frac{\quad}{\textit{Corrected Particulate Total Released}} \ \mu Ci/cc$$

$$\frac{\quad}{\textit{Iodine Concentration}} \times 10 = \frac{\quad}{\textit{Corrected Iodine Total Released}} \ \mu Ci/cc$$

Attachment 3
Unit 2 Post Accident Sampling Particulate and Iodine Release Worksheet

(Sheet 3 of 3)

Total Sample Volume:

$$\frac{\text{\_\_\_\_\_}}{\text{Average Sample Flow Rate (cfm)}} \times \frac{\text{\_\_\_\_\_}}{\text{Total Sample Time (min)}} \times 2.83E4\ cc/ft^3 = \text{\_\_\_\_\_}\ cc$$

Particulate Release Rate:

$$\frac{\text{\_\_\_\_\_}}{\text{Corrected Particulate Total Released } (\mu Ci/cc)} \times \frac{\text{\_\_\_\_\_}}{\text{Process Flow (cfm)}} \times \frac{28317\ cc}{ft^3} \times \frac{1\ \text{min}}{60\ \text{sec}} = \frac{\text{\_\_\_\_\_}}{\text{Release Rate}}\ \mu Ci/sec$$

Iodine Release Rate:

$$\frac{\text{\_\_\_\_\_}}{\text{Corrected Iodine Total Released } (\mu Ci/cc)} \times \frac{\text{\_\_\_\_\_}}{\text{Process Flow (cfm)}} \times \frac{28317\ cc}{ft^3} \times \frac{1\ \text{min}}{60\ \text{sec}} = \frac{\text{\_\_\_\_\_}}{\text{Release Rate}}\ \mu Ci/sec$$

Reviewed by: _____ _____ Date: _____
(Chemistry supervision) Print Name Signature

Attachment 4
Shelf Ratio Calculation
(Sheet 1 of 1)

In the event that a detector shelf extension tube was required during operation of the Computer Radioisotopic Analysis System, the appropriate shelf ratio must be determined for use in activity level correction calculations. To determine the shelf ratio, perform the following steps upon completion of the isotopic analysis:

1. REMOVE sample from gamma spectrometer.

2. PLACE a calibration source on the same detector shelf extension tube which was used for analysis of the sample.

3. COUNT calibration source using the following information:

   - Count time: Same as sample's count time
   - Volume: 1
   - Geometry: Particulate filter

4. Upon completion of count, REMOVE detector shelf extension tube.

5. PLACE calibration source on normal counting shelf.

6. With cave door open, COUNT calibration source using the information provided in step 3.

NOTE

Shelf ratio should be calculated to two significant digits only.

7. CALCULATE shelf ratio using the following equation and the activity levels obtained in steps 3 and 6:

$$\textit{Shelf Ratio} = \frac{\textit{Total Activity on Normal Counting Shelf (step \#6)}}{\textit{Total Activity on Elevated Shelf (step \#3)}}$$

Attachment 5
Unit 2 Containment Air Post Accident Sampling Equipment Inventory
(Sheet 1 of 1)

Equipment Name	Required	On Hand	Ordered
1 ml syringe with sideport needle	2		
500 µl syringe with sideport needle	2		
5 cc syringe with sideport needle	1		
Gas collection chamber	1		
KAMAN sample collector housing	3		
Mechanical finger tool	1		
KAMAN reach rod	1		
0.1 cc sample loop for gas chromatograph	1		
Shielded transport cask for KAMAN collector assemblies	3		
Shielded transport box for syringes	1		
Shielded transport container for 14.4 cc vials	2		
Shielded transport box for stack gas samples	1		
Transport cart	1		

Reason for Inventory: (circle one) Quarterly After Use

Remarks:_____

Date:_____ Signature:_____