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PASSPORT DOCUMENT

TRANSMITTAL

Page: 1

Item	Facility	Type	Sub	Document Number / Title	Sheet	Revision	Doc Date	Copy #	Media	Copies
* 0001	MP	PROC	CH	CP 2804M UNIT 2 HIGH RANGE VENT STACK AND CONTAINMENT AIR PASS SAMPLING AND ANALYSIS		001			P	01

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06/27/00
Approval Date

06/30/00
Effective Date

Document Action Request

SPG # 010222-161503

A

Initiated By: Nileen Drzewianowski Date: 02/19/2001 Department SPG Ext 5139

Document No: CP 2804M Rev. No: 001 Minor Rev No. 00

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

B

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

DCR M2-00010.

Continued ☒

C

Change Instructions

Continued ☒

D

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 ☐ Rejected - See Comment

Activity: ☑ Revision ☐ Minor Revision ☐ Cleanup Rev ☐ Biennial Review ☐ Cancellation ☒ Supersedure
See DC-GDL01 for guidance

☐ TPC ☐ OTC ☐ Place in Void ☐ Edit Corr / Plant Mngt Staff Member - Approval / Date

Comments

/ RI/DPC Print Name and Date Continue ☒

F

Reviews	Print	Sign	Date	SQR Qualified Yes	SQR Qualified No	SQR Qualified Dept.	If Comments
☐				☐	☐		☐
☐				☐	☐		☐
E-PLAN ☑	J. RIGNEY	J Rigney	2/23/01	☐	☑	EPSD	☑
Writers Guide ☑	N. Drzewianowski	N Drzewianowski	2/19/01	☐	☐	DA	☐
Validation ☑	Don Cyr	FOR D Cyr	2/23/01	☐	☐	Chem	☑
RCD ☑	N. Drzewianowski	N Drzewianowski	2/19/01			DA	☐
Independent ☑	Guy Blackburn	G Blackburn	2/23/01	☑	☐	Chem	☐

G

Safety Evaluation attached ☐ Yes ☑ No Environmental Review attached Yes ☐ No ☑

H

1. ☑ **SQR Program Final Review and Approval**

Approval ☑ Disapproval ☐

G Blackburn 2/23/01
SQR Qualified Independent Reviewer / Date

L Cyr
Department Head/Responsible Individual

2-23-01
Approval Date

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

Department Head/Responsible Individual / Date

Meeting No.

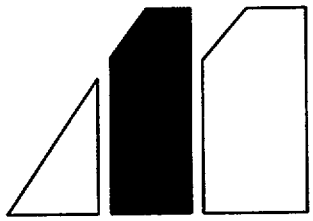
Approval Signature

Approval Date

I

Effective Date 2/27/01

MILLSTONE NUCLEAR POWER STATION
CHEMISTRY PROCEDURE



U2 High Range Vent/Stack and Containment Air PASS Sampling and Analysis [✣Ref.6.16]

CP2804M

Rev. 001

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. 6.19]

A review by the Radiological Engineering Services is required whenever modifications to this procedure may impact dose limit time and motion study calculations.

Approval Date: 2/23/01

Effective Date: 2/27/01

Level of Use
Continuous

Millstone Unit 2
Chemistry Procedure

U2 High Range Vent/Stack and Containment Air PASS Sampling and Analysis
[✣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

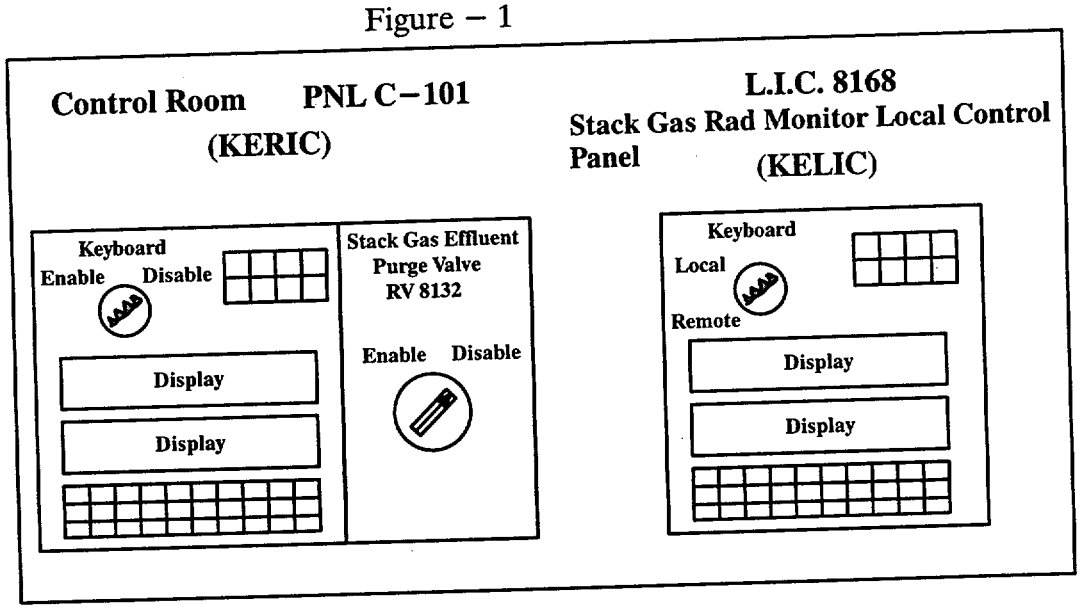
4.10.1 COLLECT the following equipment:

- 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
_____	_____	___
_____	_____	___
_____	_____	___
_____	_____	___

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, Docket Number 50–245. 50–336. Combined Inspection 50–245/80–18, 50–336/80–20. December 17 1980, Page 12.

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).

Attachment 1
Unit 2 Post Accident Sampling Containment Gaseous Activity Worksheet

(Sheet 1 of 1)

Worksheet Completed by: _____
Print Name

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

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* *μCi/cc*
				Total Gaseous Activity:	

***NOTE** Isotope activity (μCi/cc) = $\frac{\mu Ci}{\text{Sample Volume cc}}$

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 (µCi/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
				Total Iodine Activity:	

***NOTE** Isotope activity ($\mu Ci/cc$) = $\frac{\mu Ci}{\text{Sample Volume cc}}$

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:

$$\frac{\qquad}{\text{Average Sample Flow Rate (cfm)}} \times \frac{\qquad}{\text{Total Sample Time (min)}} \times 2.83E4\ cc/ft^3 = \qquad cc$$

Particulate Release Rate:

$$\frac{\qquad}{\text{Corrected Particulate Total Released } (\mu Ci/cc)} \times \frac{\qquad}{\text{Process Flow (cfm)}} \times \frac{28317\ cc}{ft^3} \times \frac{1\ \text{min}}{60\ \text{sec}} = \frac{\qquad}{\text{Release Rate}}\ \mu Ci/sec$$

Iodine Release Rate:

$$\frac{\qquad}{\text{Corrected Iodine Total Released } (\mu Ci/cc)} \times \frac{\qquad}{\text{Process Flow (cfm)}} \times \frac{28317\ cc}{ft^3} \times \frac{1\ \text{min}}{60\ \text{sec}} = \frac{\qquad}{\text{Release Rate}}\ \mu Ci/sec$$

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:_____