50-255

**Date Entered:** Jan 12, 2001

**TO:** USNRC/WASHINGTON
JMCKNIGHT Copy Number: 145

TRANSMITAL NUMBER: **173209**

**PROCEDURE NUMBER:** EI-7.4

**TITLE:** POST ACCIDENT GAS AND LIQUID ACTIVITY ANALYSIS

**TRANSMITTAL:** LISTED BELOW ARE NEW/REVISED PROCEDURES WHICH MUST BE IMMEDIATELY INSERTED INTO OR DISCARDED FROM YOUR PROCEDURE MANUAL.

| Action Required | Section or Description |
|---|---|
| REMOVE AND DESTROY | EI-7.4, R/6, ENTIRE PROCEDURE |
| REPLACE WITH | EI-7.4, R/6, ENTIRE PROCEDURE |
| | EDITORIAL |

***SIGN, DATE, AND RETURN THE ACKNOWLEDGEMENT FORM WITHIN 10 DAYS TO THE PALISADES PLANT DOCUMENT CONTROL.***

SIGNATURE OR INITIALS _____ DATE _____

A045

Procedure No EI-7.4
Revision 6
Issued Date 1/12/01

**PALISADES NUCLEAR PLANT**
**EMERGENCY IMPLEMENTING PROCEDURE**

# TITLE: POST ACCIDENT GAS AND LIQUID ACTIVITY ANALYSIS

Michael Sullivan 10/08/01
Procedure Sponsor Date

GAMarr 5/5/97
Technical Reviewer Date

LFJohns 5/8/97
User Reviewer Date

# TITLE: POST ACCIDENT GAS AND LIQUID ACTIVITY ANALYSIS

## Table of Contents

# TITLE: POST ACCIDENT GAS AND LIQUID ACTIVITY ANALYSIS

**USER ALERT**
REFERENCE USE PROCEDURE

Refer to the procedure periodically to confirm that all procedure segments of an activity will be or are being performed. Where required, sign appropriate sign-off blanks to certify that all segments are complete.

## 1.0 PERSONNEL RESPONSIBILITY

The OSC Chemistry Supervisor shall implement this procedure.

## 2.0 PURPOSE

The purpose of this procedure is to outline the steps of operation necessary to analyze samples for gamma activity on the Gamma Spec counting system during a post accident condition.

## 3.0 INITIAL CONDITIONS AND/OR REQUIREMENTS

This procedure shall be implemented per Emergency Implementing Procedure EI-7.2, "Emergency Post Accident Analysis."

## 4.0 REFERENCES

### 4.1 SOURCE DOCUMENTS

4.1.1 Software Quality Assurance Plan SQAP-005, "Software QA Plan for the Palisades Isotopic Analysis System"

4.1.2 VAX/VMS Spectroscopy Application Package User's Manual, Nuclear Data Inc, 1987

4.1.3 Count Room Source Check Log Book

4.1.4 Count Room Log Book

4.1.5 Technical Specifications Chapter 5, Section 5.5.3, "Post Accident Sampling Program"

e

# TITLE: POST ACCIDENT GAS AND LIQUID ACTIVITY ANALYSIS

4.2 **REFERENCE DOCUMENTS**

4.2.1 Emergency Implementing Procedure EI-1, "Emergency Classification and Actions"

4.2.2 Emergency Implementing Procedure EI-7.2, "Emergency Post Accident Analysis"

4.2.3 Chemistry Procedure CH 4.39, "Gamma Ray Spectroscopy System"

4.2.4 Palisades Administrative Procedure 10.46, "Plant Records"

5.0 **PREREQUISITES**

5.1 Gamma Spec System with associated software and hardware operational.

5.2 Current efficiency calibration of the Gamma Spectroscopy System.

5.3 One 14 cc serum vial gas sample or one tritium vial liquid sample collected from the PASM Panel.

6.0 **PRECAUTIONS AND LIMITATIONS**

6.1 If a situation develops in which the Gamma Spectroscopy System is off line, refer to Chemistry Procedure CH 4.39, "Gamma Ray Spectroscopy System," for bringing the system on line.

6.2 In a problem situation, do not attempt to bring the system on line unless you are thoroughly familiar with the Gamma Spec System. It is better to notify the appropriate personnel than to risk damaging the equipment.

6.3 Heavy rubber gloves or remote handling tools may be used when handling radioactive samples to minimize beta exposure to the extremities.

6.4 The counting room should be cleared of all unnecessary sources of radiation while counting is taking place.

# TITLE: POST ACCIDENT GAS AND LIQUID ACTIVITY ANALYSIS

7.0 **PROCEDURE**

> **USER ALERT**
> REFERENCE USE PROCEDURE
>
> Refer to the procedure periodically to confirm that all procedure segments of an activity will be or are being performed. Where required, sign appropriate sign-off blanks to certify that all segments are complete.

**NOTE:** Detector 1 (Low Level Count Room), Detector 2, and Detector 3 (High Level Count Room) are calibrated for PASM sample analysis.

7.1 Perform a 500 second background count. May use the same menu number as is used in the analysis, just perform the count without the sample on the detector.

7.2 Verify that a daily source check has been successfully performed by a review of the Count Room Source Check Log Book.

7.3 Verify that the sample to be counted measures less then 1 mr/hr. If samples measure more then 1 mr/hr, perform dilutions as directed in Attachment 1, "Post Accident Samples Dilution for Analysis," of this procedure.

7.4 Sample Analysis

**NOTE:** The gamma spectral analysis should not be performed at the same time as the Boron, Chloride analysis is being done. The high dose rates during Boron, Chloride analysis may interfere with the gamma spectral analysis.

7.4.1 Wrap the sample to be analyzed in poly sheeting and place on the detector.

7.4.2 Enter the sample parameters for the sample to be analyzed in the Count Room Log Book.

# TITLE: POST ACCIDENT GAS AND LIQUID ACTIVITY ANALYSIS

7.4.3 At the Gamma Spec System terminal, click on the menu which corresponds to the sample geometry to be analyzed. Other sample geometries may be used if desired to reduce the number of dilutions required based on original sample dose rates.

7.4.4 A count time of 500 seconds should be used for each sample geometry, or as directed by the OSC Chemistry Supervisor.

7.4.5 Carefully enter the data prompted for into the Gamma Spec System terminal. PASM sample volumes are listed in the following table:

| SAMPLE TYPE | *VOLUME | UNITS |
|---|---|---|
| PCS Diluted Gas | 7.25E-5 | cc |
| PCS Diluted Liquid | 7.56E-4 | ml |
| Containment Air | 2.30E-2 | cc |

*Volume entered should be corrected if any dilutions were made per Attachment 1, "Post Accident Samples Dilution for Analysis." See Attachment 1 for dilution calculations.

7.4.6 After the sample data has been entered into the Gamma Spec System terminal, Spectral Data Acquisition will begin. The Gamma Spec System terminal will display to the user the approximate time required for sample analysis. At the end of data acquisition the Spectral Data will be written to a data file on the Disk Drive. The Gamma Spec System will then generate a hardcopy Spectral Data report.

7.4.7 To perform Spectral Analysis on the remaining PASM samples, follow Step 7.3 through Step 7.4.6.

# TITLE: POST ACCIDENT GAS AND LIQUID ACTIVITY ANALYSIS

7.5 Calculations:

a. The computer will make the necessary calculations and correct for the dilution factors as follows:

$$A\ \mu Ci/ml = \frac{(\text{net counts/sec})\, e^{\lambda td}}{(\varepsilon)(I_\gamma)(V)(3.7 \times 10^4\ \text{dps}/\mu Ci)}$$

Where:

(Td) is the difference between sample collection time and count time

(ε) is the detector efficiency

($I_\gamma$) is the absolute gamma intensity

(V) is sample volume as counted in the vial.

b. The results will be given on the summary page of the report, as $\mu$Ci/unit per individual isotope present with the total activity at the end.

c. Attach printouts to EI-7.2, "Emergency Post Accident Analysis," Attachment 1.

## 8.0 ATTACHMENT AND RECORDS

### 8.1 ATTACHMENT

Attachment 1, "Post Accident Samples Dilution for Analysis"

### 8.2 RECORDS

Records generated by this procedure shall be filed in accordance with Palisades Administrative Procedure 10.46, "Plant Records."

## 9.0 SPECIAL REVIEWS

None

e

# POST ACCIDENT SAMPLES DILUTION FOR ANALYSIS

## 1.0 PURPOSE

This attachment provides direction for sample dilution for analysis of Post Accident Samples. It provides a means to dilute samples to a low enough activity for counting on the Gamma Spec System.

## 2.0 PREREQUISITES

2.1 Serum vials available for dilutions.

2.2 Shielded aliquoter 1 cc syringe and laboratory syringes available to provide measured aliquotes of samples for dilution.

2.3 Rubber stoppers for sealing needle tips during syringe movements.

2.4 Appropriate needles for use with syringes. Longer needles may be needed for extraction of samples from transport casks.

2.5 Lab hood with shield available for dose reduction during sample manipulation.

2.6 Lead bricks with drilled holes for serum vial storage/shielding during sample manipulation.

## 3.0 PRECAUTIONS AND LIMITATIONS

3.1 Remote handling tools or heavy rubber gloves may be used to minimize beta exposure to the extremities.

3.2 The sample handling work area can be easily contaminated by highly radioactive sample manipulation. Exercise care to prevent drips or drops causing contamination spread from syringe manipulations.

3.3 Shielded syringes may be used for dose reduction as directed by the Health Physics Technician.

## POST ACCIDENT SAMPLES DILUTION FOR ANALYSIS

4.0 **PROCEDURE**

4.1 Gas Samples:

For gas samples dilution, follow Steps 4.1.1 through 4.1.9. These steps provide a 1:14 dilution of the gas to be counted. A larger dilution factor may be obtained by using a smaller aliquote of sample or larger dilution volume. If this is desired, substitute a smaller volume for the 1 cc as called out below. Dilution corrections for this are provided for in the calculations section of this attachment.

4.1.1 Prepare a serum vial for gas counting by placing a rubber septum on a glass serum vial. Label vial appropriately.

4.1.2 Using a lab syringe with needle, remove 1 cc of air from the vial.

4.1.3 Place vial in lead shield brick, behind shield in laboratory hood.

4.1.4 Extract 1 cc of sample gas from vial needing dilution. Sample may be extracted from a transport cask or vial in the lab hood. A rubber stopper may be placed on end of needle to limit gas escape during syringe handling, or use a gas tight syringe.

4.1.5 Inject the 1 cc of sample gas into the prepared serum vial. This provides a 1:14 dilution of the sample. Alternate dilutions are permitted if desired by the technician.

4.1.6 Keep syringe in lab hood pending decay and purge of remaining residual syringe contents.

4.1.7 Measure dose rate of diluted gas in the serum vial. Be aware of background contribution of other radioactive sources in the area. Goal is to dilute vial to 1 mr/hr or less for counting on the Gamma Spec System.

4.1.8 Repeat Steps 4.1.1 through 4.1.7 if additional dilutions are needed. Additional lead brick vial shields are available in the PASM equipment cabinet in the hot lab corridor.

4.1.9 Proceed with sample analysis per Step 7.4.1. of EI-7.4.

## POST ACCIDENT SAMPLES DILUTION FOR ANALYSIS

4.2 Liquid Samples:

For liquid samples dilution, follow Steps 4.2.1 through 4.2.9. These steps provide a 1:50 dilution of the liquid to be counted. A larger dilution factor may be obtained by using a smaller aliquote of sample or larger dilution volume. If this is desired, substitute a smaller volume for the 1 ml as called out below. Dilution corrections for this are provided for in the calculations section of this attachment.

4.2.1 Prepare a 50 ml bottle for liquid counting by placing 49 mls of DI water in the bottle. Label vial appropriately.

4.2.2 Place bottle behind shield in laboratory hood.

4.2.3 Extract 1 ml of liquid from vial needing dilution. Sample may be extracted from a transport cask or a vial in the lab hood. A rubber stopper may be placed on end of needle to limit liquid loss during syringe handling.

4.2.4 Inject the 1 ml of liquid into the prepared 50 ml bottle. This provides a 1:50 dilution of the sample. Alternate dilutions are permitted if desired by the technician, but proper counting geometry is 50 ml bottle.

4.2.5 Keep syringe in lab hood pending decay and purge of remaining residual syringe contents.

4.2.6 Measure dose rate of diluted liquid in the serum vial. Be aware of background contribution of other radioactive sources in the area. Goal is to dilute vial to 1 mr/hr or less for counting on the Gamma Spec System.

4.2.7 Repeat Steps 4.2.1 through 4.2.6 if additional dilutions are needed. Additional lead brick vial shields are available in the PASM equipment cabinet in the hot lab corridor.

4.2.8 Proceed with sample analysis per Step 7.4.1 of EI-7.4.

## POST ACCIDENT SAMPLES DILUTION FOR ANALYSIS

5.0 **CALCULATIONS**

5.1 Dilutions made will effect the volume to be entered into the Gamma Spec System in order for it to compute the proper activity per cc or ml.

5.2 Compute sample volume to be entered into the Gamma Spec System by using the following formula for each dilution made:

$$\text{(Volume to be entered)} = \frac{\text{(original volume*) x (syringe volume used)}}{\text{(final volume diluted to in ml or cc)}}$$

*Volume as per EI-7.4 Step 7.4.5 or computed volume from a previous dilution.

5.3 Repeat the calculation of Step 5.2 for each dilution step performed.