UNCONTROLLED

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

PLANT PROCEDURES MANUAL

WNP-2

PROCEDURE NUMBER	APPROVED	DATE
*12.10.5	J M Martin	06/21/83
VOLUME NAME 12 CHEMISTRY PROCEDURES		
SECTION 12.10 POST ACCIDENT SAMPLING PROCEDURES		
TITLE *12.10.5 GAS SAMPLE ANALYSIS		

12.10.5.1 Purpose

This procedure determines gas concentrations and activity from a sample taken from the post accident sample station.

12.10.5.2 Precautions/Prerequisites

A. Lab personnel shall be issued extremity dosimetry as per Health Physics policy.

B. Lead shielding must be setup prior to sample handling.

C. The gamma spectrometer system must be operable.

D. The gas chromatograph must be calibrated (see 12.10.5.5) prior to analysis.

E. The gas chromatograph must be operating 24 hours prior to analysis.

F. Carrier gas flow must be approximately 20cc/min (20 psi).

G. All sample handling must be carried out in a hood.

H. Appropriate dose rate meter must be available and in calibration. Use continuously to assure exposure ALARA.

12.10.5.3 Equipment

A. 1.0 ml and 0.1 ml gas tight syringes

B. Oxygen, hydrogen and nitrogen gas standards

C. 14 ml and 125 ml serum vials

WP-597 R1

12.10.5.4 Procedure

A. On HP3390 integrator enter scale setting:

1. OP ( ) 6

2. Scale setting

B. Open valve on gas tight syringe.

C. Insert 1.0 ml syringe needle into sample part and withdraw syringe plunger to 1.0 ml.

D. Allow a few seconds for pressure to equalized across the needle.

E. Close valve on syringe and release plunger.

F. Note actual volume sampled and record on Attachment I.

G. Withdraw syringe from sample.

H. Insert syringe into septum on the gas chromatograph.

I. Open valve on syringe and inject sample.

J. If not already depressed, press the AUTO button then press clear.

K. Read percent concentration from HP3390 integrator and calculate percent concentration in containment as per Attachment I.

12.10.5.5 Gamma Analysis

A. From sample dose rate determine what dilutions are needed to reduce sample dose rate to less than 5 mrem at 2 inches. Record dilutions on Data sheet, Attachment III.

B. Place septums or appropriate number of serum vials and evacuate.

C. Place vials behind lead shielding.

D. With an appropriate syringe inject a volume of H_2O equal to the desired aliquot then withdraw an aliquot and transfer to a 14 ml or 125 ml serum vial.

E. Complete required dilutions behind the lead shield as planned. Final dilution is into a 14 ml serum vial for counting.

F. Bag or wrap in plastic the final dilution, smear and survey then when less than 1000 dpm/100cm^2 contamination, remove to counting room.

G. Adjust sample counting time to reflect its activity as estimated by its dose rate.

12.10.5.6 Calibration

A. Using a gas tight syringe obtain a 100 micro liter sample of standard hydrogen gas.

B. Inject into gas chromatograph.

C. If not already depressed, press AUTO.

D. Press CLEAR.

E. When chromatogram is complete enter the data into the HP3390 integrator:

1. Del CALIB
2. CALIB ESTD
3. Ref RTW = 5
4. RTW = 5
5. RT = (retension time for hydrogen)
6. AMT = 10.0 (10.0 vol percent)
7. ENTER

F. Repeat Steps 12.10.5.5.A through 12.10.5.5.D for oxygen gas standard.

G. Enter data into HP3390 integrator:

1. EDIT CALIB
2. REF RTW = 5
3. RTW = 5
4. CAL # = 2
5. RT = (retension time for oxygen)

6. AMT = 10.0 (volume percent)

7. AMT/HT = (10.0 volume percent divided by peak height)

8. ENTER

H. Repeat Steps 12.10.5.5.A through 12.10.5.5.D for nitrogen.

I. Enter data into HP3390 integrator:

1. EDIT Calib

2. REF RTW = 5

3. RTW = 5

4. CAL# = 3

5. RT = (retension time for nitrogen)

6. AMT = 10.0 (volume percent nitrogen)

7. AMT/HT = (10.0 volume percent divided by peak height)

8. ENTER

J. Steps 12.10.5.5.A through 12.10.5.5.D can be repeated for any additional gases.

K. If a calibration table already exists, the calibration table can be updated by injection of a standard as in Steps 12.10.5.5.A through 12.10.5.5.D then pressing RCAL. This process would have to be repeated for each gas unless a mixed gas standard is available.

12.10.5.7 Documents

A. Attachment I, Calculation of Containment Gas Concentration

B. Attachment II, Conversion Factors

C. Attachment III, Dilution Data

D. Attachment IV, Final Concentration Calculation

Calculation of Containment Gas Concentration

Sample percent by volume concentration of each gas:

$$A_s = \frac{V_A + V_S}{V_A} A_T$$

Where:

A_T = volume percent analyzed

A_S = volume percent in vial before analysis

V_A = volume of aliquot removed from standard

V_S = volume of vial

Percent by volume of each gas in containment:

$$C_c = \frac{(A_s)(P_c)(T_v)}{(P_v)(T_c)}$$

P_C = (Containment Pressure) - (Partial Pressure of Water)

T_V = Vial Temperature = _____ ^oK

P_V = Vial Pressure = _____ mm Hg

T_C = Containment Temp = _____ ^oK

C_C = Containment concentration in percent by volume = _____ % H_2

_____ % O_2

_____ % N_2

Attachment I

pounds/square inch to mm Hg

$$(\text{measured lb/in}^2)\ \frac{760\ \text{mmHg}}{14.696\ \text{lb/in}^2} = \text{mm Hg}$$

^{o}F to ^{o}C

$$^{o}F = 9/5\ (^{o}C + 32)$$

^{o}C to ^{o}K

$$^{o}K = ^{o}C + 273$$

Dilution 1

aliquot _____cc (a)

final volume _____cc (b)

Dilution 2

aliquot _____cc (c)

final volume _____cc (d)

Dilution 3

aliquot _____cc (e)

final volume _____cc (f)

$\frac{b}{a} \times \frac{d}{c} \times \frac{f}{e}$ = dilution factor (df)

(measured uCi/cc)(df) = A_R, activity remaining in vial after gas chromotgraphy analysis

$$A_i = \frac{V_A + V_S}{V_S} A_R$$

A_i = initial uCi/cc in sample

V_A = 1 cc

V_S = volume of vial

Attachment III

Isotope	uCi/cc	df	$\frac{V_A + V_S}{V_A}$	Final Concentration uCi/cc
kr85				
kr88				
Xe-133				
Xe-135				

Attachment IV