

PHILADELPHIA ELECTRIC COMPANY

PEACH BOTTOM UNITS 2 & 3

HPO/CO-3- Airborne Activity Survey Techniques

Purpose:

This procedure gives general methods for obtaining air samples and for evaluating airborne activity concentrations. Due to the nature of job for which the survey is done, location of survey, and plant conditions, parts of this may be changed at the discretion of the person making the survey as long as the change does not jeopardize safety.

References:

HPA-2
HPA-2a

Apparatus:

1. Air samplers or constant air monitors, as required.
2. Filter paper and charcoal cartridges, as required.
3. RCA sheet PECO Form No. 192-21268 or later revision.

Procedure:

1. Air samples may be taken on a fixed filter, a moving filter, or a charcoal cartridge in combination with a fixed filter. Samples may be taken by portable grab samplers or by continuous air monitors. Air samples may be taken to determine airborne beta activity, beta plus alpha activity, radioactive iodine concentration
2. Constant air monitors are used to sample and measure directly the airborne activity levels during long term jobs, on jobs where frequent fluctuations of airborne activity are expected, and in general plant areas where it is necessary to document and alert personnel to increases in airborne levels. These units collect activity on a fixed or moving filter for almost immediate analysis by internal detectors.
3. Portable filter paper samplers are used to take short, high volume samples or long, low volume samples. These filters are analyzed in the counting room for gross alpha, gross beta, or specific radionuclide activity. The minimum sample volume for alpha activity should be 30 ft³.
4. Charcoal cartridges are used with low volume samplers to sample for radioactive iodine. A piece of filter paper is placed ahead of the charcoal cartridge to minimize the amount of particulate activity collected on the charcoal.

5. The following are general recommendations for taking air samples:

- a. Identify flow direction where necessary and install the sampling medium in the sampler to prevent damage to the medium. Check carefully that the sampling medium is properly positioned so that there will be no leakage around it. If air bypasses the medium, the airborne activity measured will be lower than the true airborne activity.
- b. Set up the sampler so that the sample will be as representative as possible of the air that personnel will be or are breathing.
- c. Record the time and flow rate at the beginning (if sampler has flow meter, if not record the calibrated flow marked on sampler) and at the end of the sampling period.
- d. Place the sample medium in an envelope if necessary for transfer to the counting room. Being careful not to dislodge any deposited activity from the sample.

6. For detailed air sampling procedures for specific types of air samples see the following:

Constant Air Monitor	-HPO/CO-3a
Portable Fixed Filter Sample	-HPO/CO-3b
Charcoal Iodine Sampling	-HPO/CO-3c

7. Analysis of gross beta on filter paper

- a. Determine the net cpm per HPA-2 or 2a
- b. Determine the $\mu\text{Ci}/\text{cm}^3$ from the following equation:

$$\mu\text{Ci}/\text{cm}^3 = \frac{\text{Net CPM}}{\text{Counter eff.} \times 6.0 \times 10^{10} \times \text{Volume (ft}^3\text{)}}$$

- c. Use the counter efficiency for the counting equipment used.
- d. Record the appropriate data on an "Air Analysis Record" (Data Sheet HPO/CO-3), a "Radiation - Contamination - Airborne Survey" PECO Form 196-21268, or a CAM Inspection Report (Data Sheet HPO/CO-3a).

8. Derivation of 6.0×10^{10} conversion factor

$$\left(2.22 \times 10^6 \frac{\text{dpm}}{\text{uCi}} \right) \left(2.83 \times 10^4 \frac{\text{cm}^3}{\text{ft}^3} \right) = 6.28 \times 10^{10} \frac{\text{dpm cm}^3}{\text{uCi ft}^3}$$

$$\left(.95 \text{ filter eff. (constant)} \right) \left(6.28 \times 10^{10} \frac{\text{dpm cm}^3}{\text{uCi ft}^3} \right) = 6.0 \times 10^{10} \frac{\text{dpm cm}^3}{\text{uCi ft}^3}$$

Air Analysis Data Sheet

Work Location _____ RWP Number _____

Work Conditions _____ Counting Date _____

Sample Collection

Type - Hi Vol Low Vol Lapel (Circle one)

Serial No. _____

Medium - Particulate Charcoal
(Circle Medium used)

Technician _____

	Date	Time	Flow Rate (cfm)
Off			
On			

Sample Duration _____ min. X Ave. Flow Rate _____ cfm = Sample Vol. _____ ft³
 Beta Alpha (circle one)

Time from the end of sampling to the beginning of counting		
Counting equipment and ident. no.		
Gross Counts		
Length of count (min)		
Gross cpm - <i>1100</i>		
Background cpm		
(1) Net cpm		
(2) Counter eff.		
(3) Volume (ft ³)		
(4) Activity (uCi/cm ³)		

$$\frac{\text{Counter Eff} \times \text{Vol (Ft)}^3 \times 6.0 \times 10^{10}}{\text{Net CPM}} = \text{uCi/cm}^3$$

(2) (3) (4)

PBAPS - RADIATION - CONTAMINATION - AIRBORNE SURVEY

P. NO. _____

RECORD - UNIT 2 - UNIT 3

SURVEY NO. _____

DATE - _____

TIME - _____

SURVEY BY- _____

AREA - _____

REASON - _____

- RADIATION - Instrument Serial No. _____

ITEM	BETA MRAD/HR.	GAMMA MR/HR.	NEUTRONS MREM/HR.	TOTAL MREM/HR.	DISTANCE
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					

- CONTAMINATION - Instrument Serial No. _____

ITEM	BETA+GAMMA DPM/100 cm ²	ALPHA DPM/100 cm ²
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		

- AIRBORNE - Instrument Serial No. _____

SAMPLING		AVERAGE FLOW RATE	COUNTER _____
START - _____		FT ³ /MIN. _____	EFF. _____
STOP - _____			
GROSS COUNTS	=	GROSS CPM (-)	BKGD CPM = NET CPM
+ _____			
COUNTING TIME	MIN		
		NET CPM	= _____ uCi/cm ³
		EFF x VOL(FT) ³ x 6.0 x 10 ¹⁰	
COUNTER:			
ISOTOPE(S)			

REMARKS.

PHILADELPHIA ELECTRIC COMPANY

PEACH BOTTOM UNITS 2 & 3

HPO/CO-3a Airborne Activity Survey Techniques - Constant Air MonitorsPurpose:

This procedure describes the techniques for operating constant air monitors.

References:

1. HPO/CO-3
2. NMC Instruction Manual for AM-2B, ANI-22P, AM-22I, and AM-3B CAM'S

Apparatus:

1. NMC Model AM-2B CAM (CRM-SIM) CAM
2. NMC Model AM-22P CAM (CRM-55M) CAM
3. NMC Model AM-22I CAM (CRM-54M) CAM
4. NMC Model AM-3B CAM (CRM-51M) CAM
5. Filter paper discs, 2" dia., as required
6. Charcoal cartridges, as required
7. Filter paper rolls for moving filter CAM (1 roll/30days of operation)

Procedure:

1. General Recommendations for Startup and Use of a CAM
 - a. Keep a CAM as close to the area being sampled as possible to minimize hose lengths but in an area where the radiation level is less than 10 mR/hr. Place sampling hoses such that all bends are as gradual as possible.
 - b. Periodically check that the blower is properly lubricated. See manufacturer's manual for filling instructions.
 - c. Check that recorder pens are inking properly. See manufacturer's manual for filling instructions.
 - d. Check that the MASTER and HIGH VOLTAGE switches are in the OFF position.
 - e. Plug the power cord into a 115VAC supply and turn the MASTER switch ON.
 - f. Turn the HIGH VOLTAGE switch ON. ON MODEL AM-22P CAMS, CONNECT AND START DETECTOR COUNTING GAS FLOW BEFORE TURNING HIGH VOLTAGE ON.
 - g. Install the sample medium as described in the specific procedure for the type of cam in sections 2,3,4, or 5.
 - h. Turn the BLOWER switch ON.
 - i. Mark on the recorder chart the date and time a unit is put into service.

ON INITIAL SETUP AND CALIBRATION OF A CAM, LET IT WARM UP FOR A LEAST 24 HOURS BEFORE MAKING ANY ADJUSTMENTS OR CALIBRATIONS.

- j. Check that the sample flow rate indicated by the magnehelic gauge agrees with the posted flow rate within $\pm 15\%$. If it does not, contact HP&C supervision for adjustment.
- k. Turn the INPUT MODE switches to TEST. Check that the appropriate count rate meter reads 3600 cpm $\pm 10\%$. If it does not, report discrepancy to HP&C supervision. Return switches to the OP position.
- l. Recorder tracings for all CAMs except the Model AM-3B are interpreted as follows:
 - 1) On fixed filter CAMS use the family of curves (figure HPO/CO-3a) to convert change of recorder indications (B pen only) to $\mu\text{Ci/cc}$
 - 2) On the moving filter CAM Model AM-3B (CRM-54M), the recorder reading (in cpm) is multiplied by the conversion factor posted on the CAM to obtain $\mu\text{Ci/cc}$
- m. When the sample medium is removed from a CAM, place it in an envelope and identify it by location, time on and off, and flow rate. Take it to the counting room, if gross Beta and/or Gamma Isotopic analysis is required. Install new sample medium and mark the recorder chart with the date and time of sample change.

IF THE COUNT RATE METER AND RECORDER REMAIN UPSCALE WHEN THE SAMPLE MEDIUM IS CHANGED, CHECK THAT THE CHECK SOURCE IS IN THE "OUT" POSITION. IF THE MONITOR STILL REMAINS UPSCALE, CHECK THE RADIATION LEVEL AROUND CAM. IF IT IS LESS THAN 10 MR/HR, THE SAMPLE HOLDER MAY BE CONTAMINATED. CAREFULLY WIPE THE SURFACES OF THE SAMPLE HOLDER AND THE INTERIOR SURFACES OF THE SHIELD HOUSING USING A CLOTH MOISTENED WITH ALCOHOL. DO NOT WIPE THE SURFACE OF THE DETECTOR. IF DECONTAMINATION DOES NOT REDUCE THE RESPONSE OF THE CAM, REPORT THE DISCREPANCY TO HP&C SUPERVISION.

- n. Make an inspection of all operating CAMs at least once every 10 days. Record inspection results on the CAM Inspection Report Data Sheet HPO/CO-3a.
 - o. The filter medium should be counted for Gross Beta activity and possibly be Gamma scanned per HPO/CO-3 step 7 when unusual changes are detected in the pen traces.
2. Model AM-2B (CRM-51M) CAM
This monitor uses a fixed filter, 2" in diameter, to collect particulate activity and a beta scintillation detector to measure the activity.
- a. The filter paper is changed as follows:
 - 1) Turn BLOWER switch (inside hinged top of CAM) to OFF.
 - 2) Simultaneously pull and turn the filter assembly plug to slide the plug out of its shield.
 - 3) Remove the retaining ring from the assembly to release the filter paper.
 - 4) Identify the sample removed.
 - 5) Install a new filter paper on the screen support with the "soft" side facing away from the screen.
 - 6) Install the retaining ring to hold the filter paper in place.
 - 7) Return the filter assembly plug to its shield.
 - 8) Turn the BLOWER switch ON.
 - 9) Mark recorder chart with the date and time of filter change.

3. Model AM-22P (CRM-55M) CAM

This monitor uses a fixed filter, 2" in diameter to collect particulate activity and a gas flow proportional detector to measure both alpha and beta activity.

- a. Install counting gas and adjust the flow rate as follows:
 - 1) Connect a cylinder of P-10 gas equipped with a two stage regulator to the monitor.
 - 2) Turn the gas flow control on the detector assembly OFF.
 - 3) Adjust gas pressure with the cylinder regulator to between 5 and 10 psig.
 - 4) Adjust the gas flow control to give a flow of about 10 bubbles per second and hold for about 10 minutes. Reduce the flow to 1 or 2 bubbles per second for normal operation.

NEVER INCREASE THE GAS FLOW MUCH IN EXCESS OF 10 BUBBLES PER SECOND BECAUSE THE BACK PRESSURE WILL STRETCH THE DETECTOR WINDOW.

- b. Change the filter paper when required in accordance with section 2a.

4. Model AM-22I (CRM-54M) CAM

This monitor uses a fixed filter, 2" in diameter, to collect particulate activity and a beta scintillation detector to measure the activity. The sample stream also passes through a charcoal cartridge for radioiodine collection which is measured by a Na I detector.

- a. Change the filter paper when required in accordance with section 2a.
- b. Change the charcoal cartridge as follows:
 - 1) Turn BLOWER switch (inside hinged top of CAM) to OFF.

IF THE IODINE COLLECTOR ASSEMBLY IS REMOVED WITH THE BLOWER ON, THE CHARCOAL CARTRIDGE MAY BE SUCKED FROM THE FILTER ASSEMBLY AND REMAIN INSIDE THE SHIELD.

- 2) Simultaneously pull and turn the iodine collector assembly plug to slide the plug out of its shield.
- 3) Remove the charcoal cartridges from the collector assembly.
- 4) Identify the cartridge removed.
- 5) Mark the flow direction on a new cartridge and install it in the assembly, checking that the cartridge seats in the assembly.
- 6) Return the iodine assembly plug to its shield.
- 7) Turn the BLOWER switch ON.
- 8) Mark recorder chart with the date and time of filter change.

5. Model AM-3B (CRM-51M) CAM

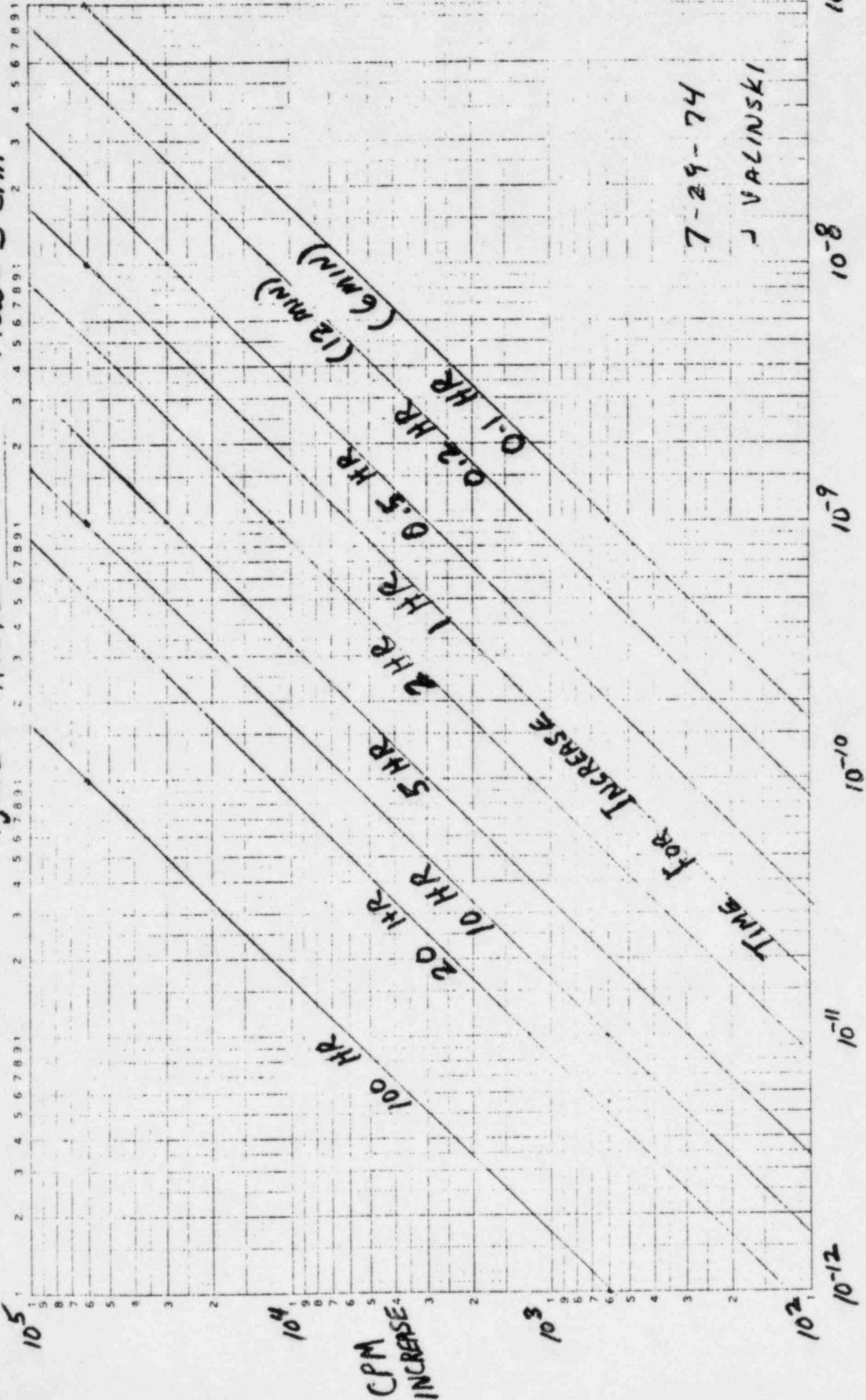
This monitor uses a moving filter to collect particulate activity and an end window GM detector to measure the activity.

- a. The filter paper is changed as follows:
 - 1) Turn BLOWER switch (inside hinged top of CAM) to OFF.
 - 2) Tilt the front shield section completely forward.
 - 3) Lift the spring loaded idler wheel, located behind the capston plates, until it locks in a disengaged position.
 - 4) Remove the used roll of filter paper from the take-up (right) spindle.
 - 5) Place the new roll of paper on the supply (left) spindle.

- 6) Unwind about two feet of paper.
- 7) Slide the filter paper past the face of the detector and close the shield assembly.
- 8) Grasp the filter paper on each side of the shield assembly and move the filter paper until it slides freely in the slot.
- 9) Slide the paper between the capstan and idler roller and release the idler arm so that it moves against the paper.
- 10) Tape the end of the paper to the take-up spindle.
- 11) Turn BLOWER switch ON.
- 12) Check that the switch on the front of the filter paper drive box is in CONTINUOUS.
- 13) Push the RAPID-ADVANCE button and check that the filter paper advances through the shield assembly slot and that the take-up mechanism removes the slack from the filter paper and maintains a tight, smooth feed to the take-up spindle.

FIXED Filter GAMS - β pen
Flow = 5 cfm

Figure HPD/CO-3a



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J VALINSKI

$\mu\text{Ci/sec}$

PEACH BOTTOM ATOMIC POWER STATION

CAM Inspection Report-Data Sheet HPO/CO-3A

CAM #	CAM Location	On Date/Time	Off Date/Time	cpm μCi/cc	H.V.		Test		Resp.		Comments:
					s	u	s	u	s	u	

#	activity μCi/cc (fixed filter CAMs)	Net cpm (from HPA-2 or 2a) (Sample Time-hrs)(Flow-cfm)(60 min/hr)(Counter Eff.)(5.97 P10*)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)
	Net cpm ÷ (hrs ×	cfm × 60 min/hr × Eff. × 5.97 P10)

Remarks:

* THIS INCLUDES A FILTER COLLECTION EFFICIENCY OF 95 %

PHILADELPHIA ELECTRIC COMPANY
PEACH BOTTOM UNITS 2 AND 3

HPO/CO-3b - AIRBORNE ACTIVITY SURVEY TECHNIQUES - PORTABLE FIXED
FILTER SAMPLERS

PURPOSE:

This procedure describes the techniques for operating the portable fixed filter air samplers used at Peach Bottom.

REFERENCES:

1. HPO/CO-3

APPARATUS:

1. Low Volume Air Sampler
2. Staplex Hi Volume Air Sampler
3. Disc filter paper, 2" or 4" diameter, as required

PROCEDURE:

1. Low Volume Air Sampler
 - a. To install a sample filter, remove the retaining ring from the sample holder and place a piece of 2-inch (50 mm) diameter or 47 mm diameter filter paper in the filter holder. Be sure the filter is centered in the holder.
 - b. Reinstall the retaining ring so that it holds filter paper in place.
 - c. Locate the sampler as required and position the sample holder as necessary. (Some samplers have sample holders that are adjustable from 4' above the floor to 7' above the floor.)
 - d. Turn the pump on and inspect filter for tears and leakage paths.
 - e. Record date, time, flow rate (listed on the sampler, or read the flow meter if the sampler has one) sample location, and initials of technician on the envelope which will be used to transport the sample medium to the counting room.

- f. The Rade Co. "Goose-Neck" low volume air samplers have vacuum gauges that measure the vacuum at the pump, "Vacuum Pump Head", and the vacuum downstream of the filter, " Paper". The filter medium must be changed before the paper equals the vacuum pump head.
- g. Record the time at the end of the sample period and the flow meter reading if the sampler has one on the transport envelope.
- h. Turn the sampler off, remove the filter paper, and place it in the transport envelope.
- i. Analyze the sample in accordance with HPO/CO-3, Step 7.

2. Staplex Air Sampler (Hi Volume)

- a. Locate the sampler as required.
- b. Install a filter, if necessary, by removing the outside ring, placing a 4" diameter filter paper, on the filter support, and reinstalling the outer ring on the sampler.
- c. Turn the sampler on and inspect filter for tears and leakage paths.
- d. Record the date, time, flow rate (listed on sampler), sample location, and the initials of the technician on the envelope which will be used to transport the sample medium to the counting room.
- e. Record the time at the end of the sample period on the transport envelope.
- f. Turn the sampler off, remove the filter paper, and place it in the transport envelope.
- g. Analyze the sample in accordance with HPO/CO-3, Step 7.

PHILADELPHIA ELECTRIC COMPANY

PEACH BOTTOM UNITS 2 AND 3

HPO/CO-3c - AIRBORNE ACTIVITY SURVEY TECHNIQUES - CHARCOAL CARTRIDGES

PURPOSE:

This procedure prescribes the techniques for collecting radioiodine air samples.

REFERENCES:

1. HPO/CO-3

APPARATUS:

1. Low Volume Air Sampler
2. Charcoal cartridges, as required
3. Filter paper discs, 2", as required

PROCEDURE:

1. Low Volume Air Sampler
 - a. If installed, remove the filter paper holder from the sampler and install the filter paper and charcoal cartridge holder.
 - b. Remove the protective covering from a charcoal cartridge and mark the cartridge to indicate the direction of air flow through it.
 - c. Remove the retaining ring from the filter holder on the sampler and place the cartridge in the holder. Check that the cartridge seats properly and that the cartridge is installed as the flow marking indicates.
 - d. Place a piece of filter paper on the surface of the holder and replace the retaining ring.
 - e. Locate sampler as required and position sample holder as necessary. (Some samplers have sample holders that are adjustable from 4' above the floor to 7' above the floor.)
 - f. Turn the pump on and inspect the filter for tears and leakage paths.
 - g. Record date, time, flow rate (listed on sampler or read the flow meter if sampler has one), sample location, and your initials on the envelope which will be used to transport the sample

medium to the counting room.

- h. The Radē Co. "Goose-neck" low volume air samplers have vacuum gauges that measure the vacuum at the pump, "Vacuum Pump Head", and the vacuum downstream of the filter, " Δ Paper". The filter medium must be changed before the Δ paper equals the vacuum pump head.
- i. Record time at the end of the sample period and the flow meter reading if the sampler has one, on the transport envelope.
- j. Turn the sampler off, remove the filter paper and charcoal cartridge, and place them in the transport envelope.
- k. Analyze the paper filter and charcoal cartridge in accordance with HPO/CO-3, Step 7.