

# CONTROLLED COPY MASTER COPY

## THREE MILE ISLAND NUCLEAR STATION STATION HEALTH PHYSICS PROCEDURE 1605 PORTABLE AIR SAMPLING FOR RADIOACTIVE PARTICULATES

1605  
Revision 4  
04/19/77

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Unit 1 Staff Recommends Approval

Approval NA Date \_\_\_\_\_  
Cognizant Dept. Head

Unit 2 Staff Recommends Approval

Approval NA Date \_\_\_\_\_  
Cognizant Dept. Head

Unit 1 PORC Recommends Approval

J. P. O'Connell Date 4-15-77  
Chairman of PORC

PORC comments of \_\_\_\_\_ included  
(date)

By \_\_\_\_\_ Date \_\_\_\_\_

Unit 2 PORC Recommends Approval

J. F. Seelinger Date 4/18/77  
Chairman of PORC

PORC comments of \_\_\_\_\_ included  
(date)

By \_\_\_\_\_ Date \_\_\_\_\_

Approval [Signature] Date 4-19-77  
Station Superintendent  
Unit Superintendent

THREE MILE ISLAND NUCLEAR STATION  
STATION HEALTH PHYSICS PROCEDURE - 1605  
Portable Air Sampling for Radioactive Particulates

1.0 PURPOSE

The purpose of this procedure is to describe the equipment and procedure for the collection of in-plant air samples.

2.0 DISCUSSION

The air survey is an evaluation of the concentration of air-borne radioactivity present in any area. Periodic air surveys will be made in the clean and controlled areas at frequencies dependent on the type of area, its use, its potential hazard, or whenever airborne radioactivity conditions are uncertain.

3.0 REFERENCES

- 3.1 Radiological Health Handbook
- 3.2 Radiation Protection Manual (Administrative Procedure 1003)
- 3.3 Richmond Laboratories Inc. (R.L.I.) Catalogue
- 3.4 CP 1958, Gamma Spectrometry

4.0 EQUIPMENT

A. At Sampling Point

- 1. Staplex with G-5 filter head, staplex with impactor or RLI cart mounted air sampler.
- 2. G-5 filters or equivalent filters.
- 3. Stainless steel planchet with silicone grease applied.
- 4. Stop watch.
- 5. Coin envelopes.

B. At Counting Point

- 1. Appropriate beta counting apparatus
- 2. Appropriate alpha counting apparatus

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3. Stainless steel planchet.
4. Sample report forms (see Form 1605-1 attached).
5. Geli/MCA Counting System.

#### 5.0 OPERATING INSTRUCTIONS

##### 5.1 Staplex Air Sampler With Impactor

- 5.1.1 On a stainless steel planchet put a small amount of silicone grease, on entire surface of planchet and wipe with a kimwipe until a light film remains.
- 5.1.2 Place the planchet into a coin envelope and proceed to the area to be sampled.
- 5.1.3 Remove the planchet from the coin envelope and place onto the impactor. Place the greased side of the planchet on the intake nozzle of the impactor.
- 5.1.4 Start the staplex air sampler and stop watch simultaneously, run the air sampler for the time posted on the air sampler to get a volume of  $4 \times 10^6$  cc.

NOTE: On occasions planchet may have to be held against the nozzle of the sampler until the sampler is started.

- 5.1.5 Stop the air sampler after the specified time allotment (each air sampler has a different time allotment posted).
- 5.1.6 Place the planchet into a coin envelope, labeled with the appropriate data (time, date and location) and return to the H.P. Lab.
- 5.1.7 Count, calculate and record the air activity as per 5.4 through 5.6.

##### 5.2 Staplex Air Sampler with G-5 Filter or Equivalent Filter Attached

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- 5.2.1 Place the G-5 filter or equivalent filter into a coin envelope and proceed to the area to be sampled.
- 5.2.2 Remove filter from coin envelope and place into filter holder of the air sampler.
- 5.2.3 Start the air sampler and the stop watch simultaneously, run the air sampler for the time posted on the air sampler to obtain a volume of  $4 \times 10^6$ cc.
- 5.2.4 Stop the air sampler after the specified time allotment (each air sampler has a different time allotment posted)
- 5.2.5 Remove the filter from the air sampler and place into a coin envelope and return to the H.P. Lab. Mark the coin envelope with the date, time and location.
- 5.2.6 Count, calculate and record the activity as per 5.4 through 5.6

5.3 R.L.I. Cart Mounted Air Sampler with G-5 Filter or Equivalent Filter Head.

NOTE: The R.L.I. cart mounted air sampler is utilized for long duration sampling periods and has an automatic timer so a stop watch is not needed.

- 5.3.1 Place the G-5 filter or equivalent filter in air sampler
- 5.3.2 Reset the automatic timer to a zero setting.
- 5.3.3 Start the air sampler.
- 5.3.4 Stop the air sampler remove the filter and place into a coin envelope, labeled with the appropriate time, date, sample duration, location and flow rate.
- 5.3.5 Count, calculate and record activity as per 5.4 through 5.6

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#### 5.4 Counting of Air Samples

NOTE: Prior to counting sample wait 15 minutes from stop time on air sampler for all air samples.

5.4.1 Place sample into appropriate counter and count for 4 minutes.

5.5 Calculate Radioactivity Concentrations Using the Following Formula:

$$\frac{\text{cc/m}}{(\text{vol})(\text{eff.})(2.22 \times 10^6)} = \mu\text{Ci/cc}$$

cc/m = Corrected counts/minute. Corrected counts are determined by dividing total counts observed by counting time and subtracting background counts/minute. Background is determined as per H.P.P. 1701

Vol = Volume in cubic centimeters (For RLI's the volume is cc/minute times time in minutes).

Eff. = Efficiency of appropriate counter

•  $2.22 \times 10^6$  = Constant for converting DPM to  $\mu\text{Ci}$ .

5.6 If the corrected counts per minute (cc/m as per 5.5) are less than three times the square root of background in c/m divided by background counting time, then the activity on the sample is recorded as less than minimum detectable activity (MDA)

i.e.  $3\sqrt{\frac{\text{BKG(CPM)}}{\text{BKG TIME (+)}}}$

If gross activity is found greater than  $3.0 \times 10^{-10} \mu\text{Ci/cc}$  the sample may be counted, for identification of Radionuclides, on the GeLi/MCA System in accordance with CP 1958.

5.7 MDA Determination: If the background for the GM were 13188 240 c/m, the MDA, three times the square root of background in c/m divided by background counting time, is calculated as follows:

$$MDA = 3\sqrt{\frac{13.2}{20}} = 2.44$$

Example: Air sample taken with a portable air sampler is counted for four (4) minutes. The total counts are 56, background 13.2 c/m and efficiency 20%

$$56 \div 4 = 14$$

$$14 - 13.2 = 0.8$$

Since 0.8 CPM is smaller than 2.44 (MDA), activity on the filter is reported as less than MDA, or;

$$\frac{2.44}{(4 \times 10^6)(.20)(2.22 \times 10^6)} = 1.38 \times 10^{-12} \mu\text{Ci/cc}$$

$$\text{Activity of the air sample} = <1.38 \times 10^{-12} \mu\text{Ci/cc}$$

5.8 Enter information on sample form. (See Form 1605-1)

5.9 Return to H.P. Foreman for review and approval.

Example: A 4 Cu. meter air sample from a portable air sampler is counted for 4 minutes the total counts are 2757 background is 13.2 c/m the efficiency is 20%.

$$2757 \div 4 = 689.25$$

$$689.25 - 13.2 = 676.05$$

$$\frac{676.05}{(4 \times 10^6)(.20)(2.22 \times 10^6)} = 3.80 \times 10^{-10} \mu\text{Ci/cc}$$



## 1605

TYPE OF SAMPLE: Impactor

01/29/75  
Rev 1, 2

## PORTABLE AIR SAMPLERS

## R.L.I. Cart-mounted Air Sampler

Type of Filters	cuft	1 cuft	cc/min	Volume	Time to Run for vol. $4 \times 10^6$ cc	cc/hr
Charcoal	3.25	28,317 cc	$9.2 \times 10^4$ cc/min.	$4 \times 10^6$ cc	43 min. 28 sec.	$5.5 \times 10^4$ cc/hr
G-5 Filter	3.2	28,317 cc	$9.1 \times 10^4$ cc/min.	$4 \times 10^6$ cc	44 min. 8 sec.	$5.46 \times 10^4$ cc/hr
Charcoal and G-5 Filter	3.1	28,317 cc	$8.8 \times 10^4$ cc/min.	$4 \times 10^6$ cc	45 min. 34 sec.	$5.28 \times 10^4$ cc/hr

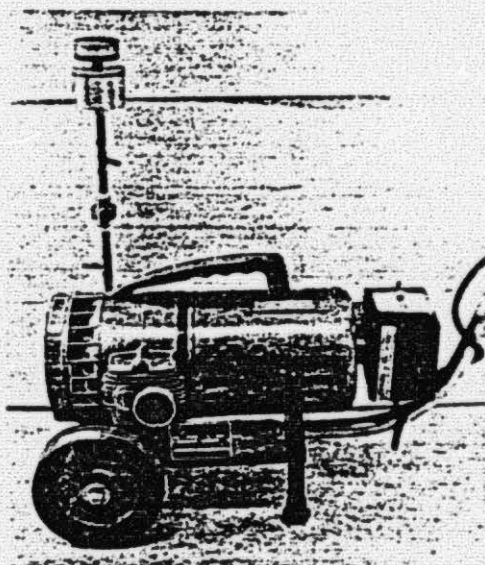
## STAPLEX

Charcoal	25	28,317 cc	$7.08 \times 10^5$ cc/min.	$4 \times 10^6$ cc	5 min. 39 sec.	-
G-5 Filter	25	28,317 cc	$7.08 \times 10^5$ cc/min.	$4 \times 10^6$ cc	5 min. 39 sec.	-
Charcoal and G-5 Filter	15.2	28,317 cc	$4.30 \times 10^5$ cc/min.	$4 \times 10^6$ cc	9 min. 18 sec.	-

7.0

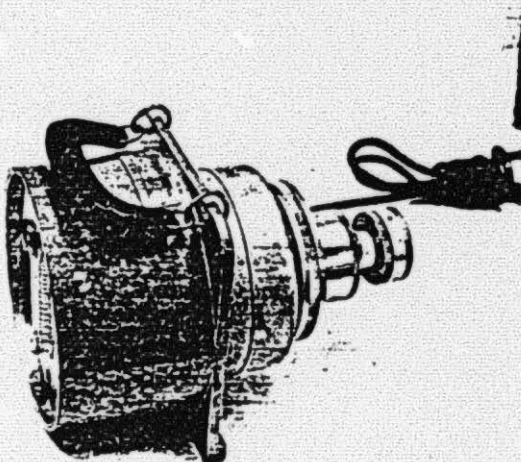
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R.M.I. CART-MOUNTED AIR SAMPLER

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STAPLEX AIR SAMPLER

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TMI DOCUMENTS

DOCUMENT NO: TM-074

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W.R.M.  
Wilda R. Mullinix, NRC

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