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THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY PLAN IMPLEMENTING PROCEDURE 1004.31
AIRBORNE RADIOACTIVITY SAMPLING AND ANALYSIS

Office of Nuc. Reactor Reg

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THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1 EMERGENCY IMPLEMENTING PROCEDURE 1004.31
AIRBORNE RADIOACTIVITY SAMPLING AND ANALYSIS

1.0 PURPOSE

The purpose of this procedure is to define the method of air sampling and analysis for Airborne Radioactivity in areas both in-plant and out-of-plant during an emergency.

The Radiological Assessment Coordinator is responsible for implementing this procedure.

2.0 ATTACHMENTS

2.1 Attachment I, Airborne Radioactivity Sampling and I-131 Analysis Data Sheet.

2.2 Attachment II, Iodine Air Sample Nomograph.

2.3 Attachment III, Particulate Air Sample Nomograph.

2.4 Attachment IV, Minimum Detectable Radioiodine Nomograph.

3.0 EMERGENCY ACTION LEVELS

3.1 This procedure shall be implemented at any time during any class of declared emergency, when a potential or actual release of radioactivity to the environment exists; or

3.2 As directed by the Emergency Director, Radiological Assessment Coordinator or their designee.

4.0 EMERGENCY ACTIONS

INITIALS

4.1 Emergency Equipment Required to be available for use:

____ 4.1.1 SAM-II/RD19 Detector Probe

____ 4.1.2 Radeco H-809 Air Sampler

____ 4.1.3 Stopwatch

____4.1.4 GY-130 Silver Zeolite Cartridge

____4.1.5 Particulate Filter

4.2 SAMPLE COLLECTION FOR OUT-OF-PLANT AREAS

____4.2.1 For particulate and radioiodine sampling, insert an iodine cartridge (charcoal or silver zeolite) with the arrow in the direction of air flow and particulate filter in the Air Sampler unit holder with the fibrous glass backing side of the particulate filter facing toward the sampler. The particulate filter must be upstream of the cartridge.

____4.2.2 With the filters in place, set the flow selector switch on the air sampler unit to variable and adjust the flow so as not to exceed (2) CFM. Run the sampler unit for sufficient time to obtain a minimum of ten (10) cubic feet. Record the sample time and volume on the data sheet. Periodically check the air flow indicator while the sampler is running.

NOTE:	A minimum of ten (10) cubic feet is required to obtain an MDA of 1E-8 µCi/cc. The larger the sample, the lower the MDA will be.

____4.2.3 To set up the Sam II, perform the following steps.

a. Check settings on the SAM-II unit to comply with the following table. Adjust settings as necessary:

SAM-II Operational Settings

	Channel 1	Channel 2
1. Threshold	3.44	3.44
2. Window	0.40	0.40
3. + off-	+	off
4. in out	in	out

b. Adjust HV to 7.50

c. Set the Scaler display switch to "ON", Count Mode to "2", "XI", "timed".

NOTE: This will set the SAM-II for a 2 minute count. For high radioiodine sample count rates as indicated on the count rate meter, lower counting times may be used.

d. Connect the detector to the front panel of the SAM-II.

e. Turn the power switch "ON" and the stabilizer "ON", and allow unit to stabilize for approximately five (5) minutes.

4.3 SAMPLE ANALYSIS

____4.3.1 Prior to counting the first sample, count a background with the SAM-II in set-up mode as defined in step 4.2.3. Count background whenever radiological conditions have changed or are suspected to have changed at the counting location. Count background after changing locations.

NOTE:	If the SAM-II unit is stable and not located in the plume or a high background area, the background count should be less than 50 counts per minute.

____4.3.2 Label a coin envelope with the necessary information, i.e., date, time, volume, location, and person taking sample. Then remove the sample cartridge and particulate filter from the air sampler unit, separate the filter disc from the radioiodine cartridge and place the filter disc in the coin envelope for later counting and analysis. Count and analyze in accordance with RCP 1605. Particulate air samples will then be saved for subsequent GeLi analysis at U-1 Rad Con Lab or the EACC.

NOTE:	A more rapid determination of airborne particulate radioactivity may be made using the AIRBORNE PARTICULATE SAMPLE NOMOGRAPH, ATTACHMENT III.

____4.3.3 Place the iodine cartridge in the SAM-II shield chamber, and count the sample for two (2) minutes. (Or less if the high count rate is indicated for the sample.)

NOTE:	If problems are encountered with the Sam II while counting, check the following: 1. Power supply and connections. 2. Physical damage and proper probe connections. 3. Adjustments and settings per 4.2.3.a. 4. Response to provided source.

____4.3.4 Record the serial number of the SAM-II, counter factor (as indicated on the SAM-II), background count rate, and count time on the sample data sheet. (Att. I).

NOTE:	The "Count Factor" posted on the SAM II incorporates counting efficiency, geometry factor and activity conversion factors.

____4.3.5 After counting sample, record the iodine sample counts and counting time on the data sheet.

____4.3.6 Calculate the radioiodine activity by use of the data sheet or nomograph. If the gross count rate of the sample is low, (less than 2 X background) calculate the Minimum Detectable Count Rate (MDCR). If the MDCR is greater than the sample count rate, use the MDCR for activity calculations and report the measured activity as less than this activity. MDA for radioiodine samples may also be obtained by use of the Minimum Detectable Radioiodine Activity Nomograph (Att. IV).

NOTE:	Analysis of all samples may be performed by use of the TMI Unit 1 GeLi/MCA system in accordance with SCP 1958.3, the TMI-Unit 2 GeLi/MCA unit, or the GeLi/MCA unit operated by the Environmental Assessment Section.

NOTE:	A more rapid determination of radioiodine concentration may be made using the AIRBORNE IODINE SAMPLE NOMOGRAPH, ATTACHMENT II.

____4.3.7 For dose calculations due to off-site radioactive releases, refer to EPIP 1004.7.

NOTE:	If during sample analysis, the sample activity exceeds the ability of the instrument being used, (i.e., high count rate), one or all of the following alternatives may be used as directed by the RAC: a. Reduce the sample volume b. Utilize different counting geometries c. Utilize counting instrumentation with lower efficiency/sensitivity

____4.3.8 Place all samples in separate plastic bags and label the samples with sample date, time, location and calculated activity and return all samples taken to the OSC and give to the Rad Con Coordinator.

4.4 In-Plant air sampling for Radioactive Gas shall be performed in accordance with RCP 1607 with care to problems expressed in the note below 4.3.7.

4.5 In-Plant air sampling for Radioactive Iodine shall be performed in accordance with RCP 1605 with care to problems expressed in the note below 4.3.7.

NOTE:	A more rapid determination of radioiodine concentration may be made using the AIRBORNE IODINE SAMPLE NOMOGRAPH, ATTACHMENT II.

4.6 In-Plant air sampling for Radioactive Particulates shall be performed in accordance with RCP 1605 with care to problems expressed in 4.3.7.

NOTE:	A more rapid determination of airborne particulate radioactivity may be made using the AIRBORNE PARTICULATE SAMPLE NOMOGRAPH, ATTACHMENT III.

4.7 All air samples shall be handled in accordance with RCP 1605.1.

4.8 Post accident sampling of reactor containment air shall be performed in accordance with RCP 1631. Special consideration should be given to the potential for very high radiation and contamination levels of samples and sampling equipment.

CAUTION:	Obtaining a reactor containment atmospheric sample after an accident may involve high levels of gaseous and particulate activity. Special precautions as outlined in EPIP 1004.9 should be observed.

5.0 FINAL CONDITIONS

5.1 All samples taken after release has been terminated.

5.2 All monitoring teams ordered to return to base.

5.3 All samples given to radiological controls for analysis.

AIRBORNE RADIOACTIVITY SAMPLING AND IODINE - 131 ANALYSIS DATA SHEET

ATTACHMENT I

Sample Collection

1) Time on _____, Time off _____
Run Time _____ min.

2) Sample Flow _____ CFM,

3) Volume= _____ (1) min x _____ (2) CFM

x 2.832 x E 4 cc/ft3= _____ cc

4) Location: _____

5) Date: _____

6) Time: _____

7) Sampler Type: _____
Serial No.: _____

8) Collected by: _____

Iodine Sample Counting

1) Serial No. of SAM-II _____

2) Counter Factor _____

3) Background counts _____

4) Background count time _____ min

5) Background count rate-

_____ (3) ÷ _____ (4) min= _____ cpm

6) Sample Counts _____

7) Sample Count Time _____ min.

8) Sample Count Rate=

_____ (6) ÷ _____ (7) min= _____ cpm

9) Sample Net Count Rate (Net CPM)

_____ Sample(8) - _____ Bkgd(5) = _____ cpm

10) Date and Time of Counting: _____

11) Counted by: _____

Iodine Activity = $\frac{\text{Net CPM}}{(\text{Vol})\ (\text{Counter Factor})}$ = _____ µCi/cc

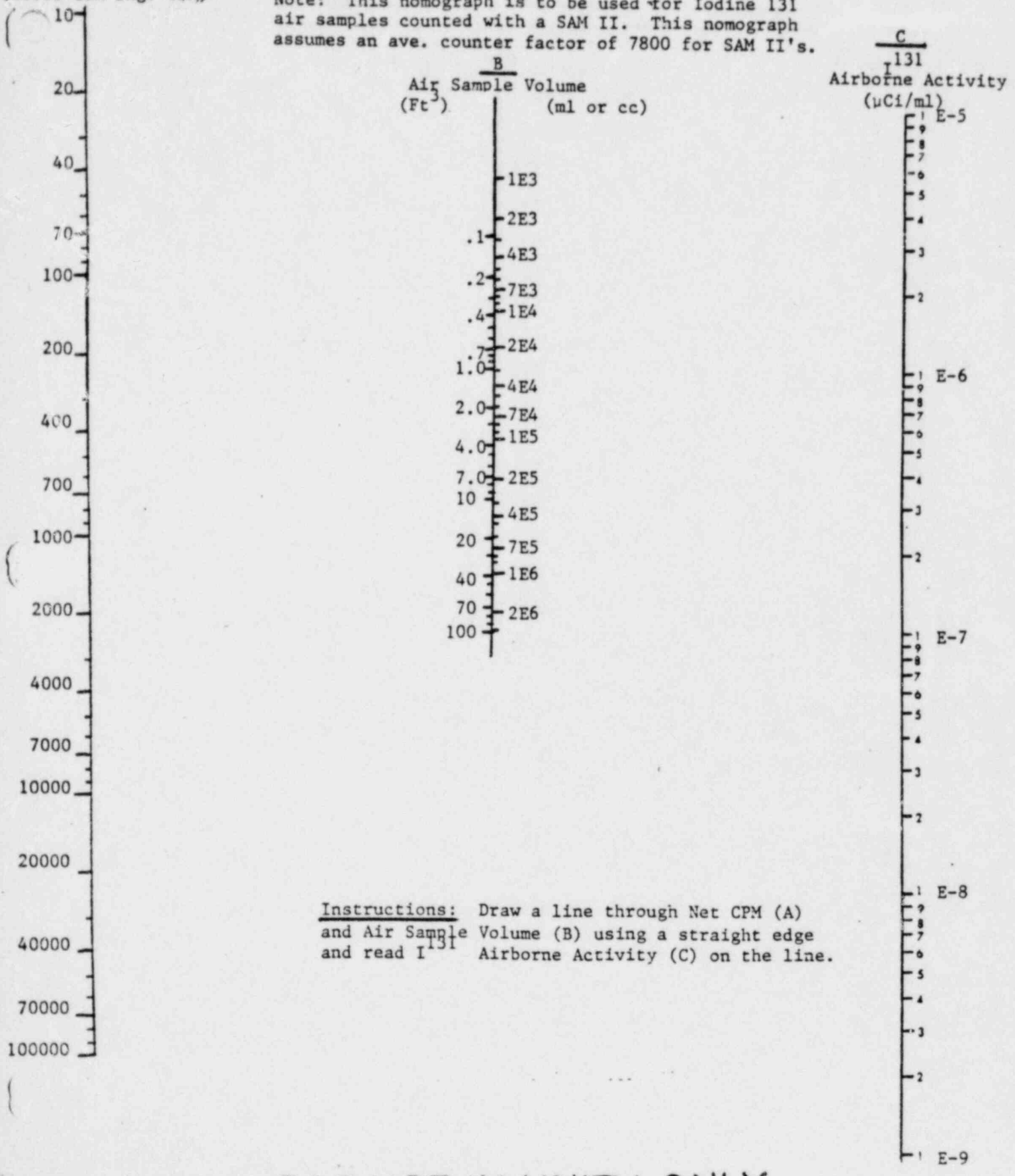
= $\frac{\text{CPM}}{(\quad \text{cc})\ (\quad)}$ = _____ µCi/cc

MDCR = 3.3 x $\sqrt{\text{Bkgd. Count Rate}}$ (NOTE: This is for 95 percent Confidence Level and is valid only if Bkgd Count Time and Sample Count Time both equal 2 minutes).

= 3.3 x $\sqrt{\text{CPM}}$ = _____ CPM

IODINE AIR SAMPLE NOMOGRAPH

Note: This nomograph is to be used for Iodine 131 air samples counted with a SAM II. This nomograph assumes an ave. counter factor of 7800 for SAM II's.

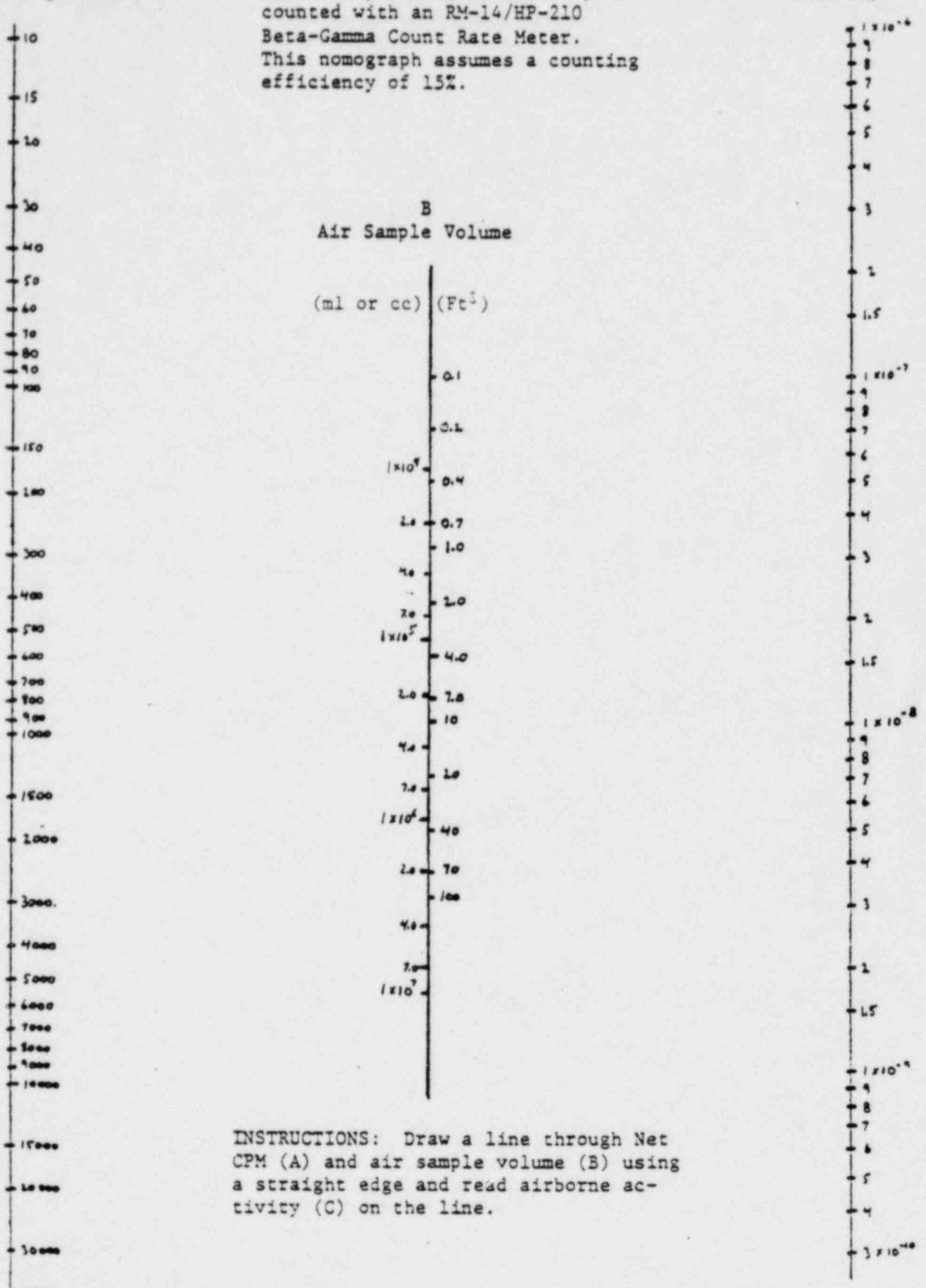


Instructions: Draw a line through Net CPM (A) and Air Sample Volume (B) using a straight edge and read I^{131} Airborne Activity (C) on the line.

ATTACHMENT III

AIRBORNE PARTICULATE SAMPLE NOMOGRAPH

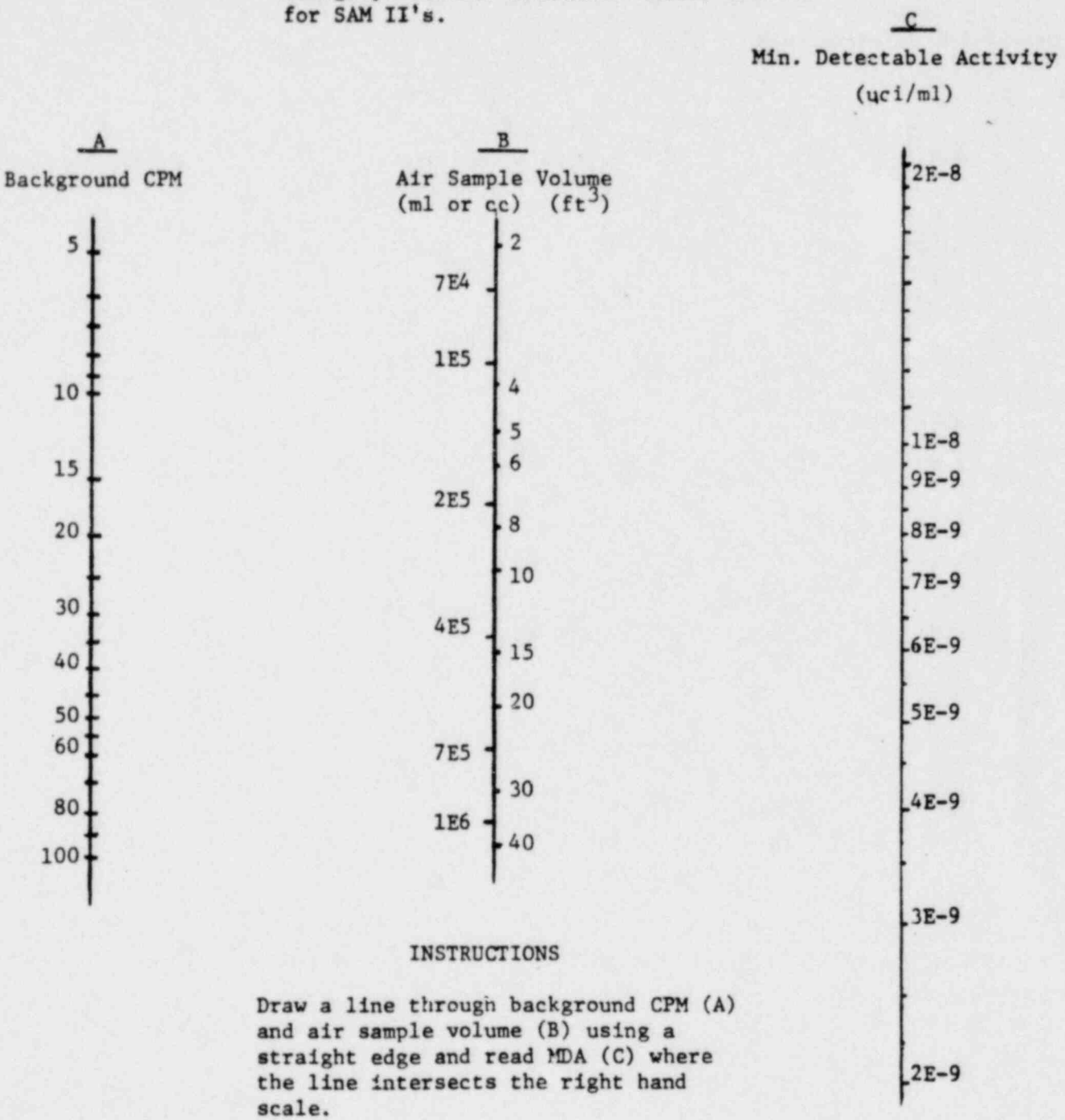
Note: This nomograph is to be used for particulate air samples counted with an RM-14/HP-210 Beta-Gamma Count Rate Meter. This nomograph assumes a counting efficiency of 15%.



INSTRUCTIONS: Draw a line through Net CPM (A) and air sample volume (B) using a straight edge and read airborne activity (C) on the line.

MINIMUM DETECTABLE RADIOIODINE ACTIVITY NOMOGRAPH

Note: This nomograph is to be used for determining the minimum detectable activity of airborne iodine samples counted with the SAM II. This nomograph assumes a counter factor of 7800 for SAM II's.



INSTRUCTIONS

Draw a line through background CPM (A) and air sample volume (B) using a straight edge and read MDA (C) where the line intersects the right hand scale.