Designation: D 5337 – 97

Standard Practice for Flow Rate Calibration of Personal Sampling Pumps[1]

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1. Scope

1.1 This practice describes the calibration of sampling pumps commonly used for monitoring personal exposure in the work place.

1.2 This practice includes procedures for describing primary and secondary calibration techniques.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 1356 Terminology Relating to Sampling and Analysis of Atmospheres[2]

2.2 *NIOSH and OSHA Documents:*

HSM-99-71-31 Personal Sampling Pump for Charcoal Tubes; Final Report[3]

NIOSH Manual of Analytical Methods[4]

OSHA Analytical Methods Manual[5]

3. Terminology

3.1 For definitions of terms used in this practice, refer to Terminology D 1356.

4. Summary of Practice

4.1 A bubble tube meter is used for primary calibration of personal sampling pumps. The practice is applicable to systems using sampling devices. Provisions are made for both manual and automated bubble meters.

4.2 Secondary calibration procedures for field applications are also included in the practice (see 7.3).

5. Significance and Use

5.1 Most methods require the use of a personal sampling pump to collect air volumes at typical workplace sampling rates specified by a particular procedure. The precision and bias of these methods are directly affected by the precision and bias of the pumps used to measure the air volume.

6. Apparatus

6.1 *Burets*, 1-L (for high flow) and 100-mL or 10 mL (for low flow).

6.2 *Manometer*.

6.3 *Precision Rotameter*.

6.4 *Stop Watch*.

6.5 Electronic Flowmeter (alternate), should be properly calibrated (see 7.3).

7. Procedure

7.1 Calibrate the personal sampling pumps before and measure after each day's sampling.

7.2 *Bubble Meter Method*:

7.2.1 Allow the pump to run five minutes prior to calibration to stabilize pump.

7.2.2 Connect pump to an appropriate sampling train. Sampling trains identical to that used in sampling for sorbent tubes, filter cassettes, and cyclones are shown in Figs. 1-3.

7.2.3 Check all connections to insure their integrity.

7.2.4 Wet the inside surface of the 1-L buret with the soap solution (use a 100-mL buret for low flow pumps).

7.2.5 Turn on the pump and momentarily submerge the opening of the buret into the soap solution to form a bubble.

7.2.6 With a stop watch, time the travel of a single film from the zero mark to the calibrated volume mark. Note the time and repeat this procedure at least three times.

7.2.7 Calculate the flow rate using the formula:

$$\text{Flow Rate (L/min)} = \frac{\text{Volume (L)}}{\text{Time (min)}} \quad (1)$$

7.2.8 If using a pump equipped with a rotameter, record the position of center of the float that corresponds with the flow rate.

7.2.9 An automated electronic flow meter may be used in place of manual types.

7.3 *Secondary Calibration Devices*:

[1] This practice is under the jurisdiction of ASTM Committee D-22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.04 on Analysis of Workplace Atmospheres.

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[2] *Annual Book of ASTM Standards*, Vol 11.03.

[3] Available from the U.S. Department of Commerce, National Technical Information Service, Port Royal Road, Springfield, VA 22161.

[4] U.S. Department of Health, Education and Welfare, 1987.

[5] OSHA Analytical Laboratory, Salt Lake City, Utah, 1985.