



Standard Practice for Measuring the Concentration of Toxic Gases or Vapors Using Detector Tubes¹

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1. Scope

1.1 This practice covers the detection and measurement of concentrations of toxic gases or vapors using detector tubes (**1, 2**).² A list of some of the gases and vapors that can be detected by this practice, their 1994–95 TLV values recommended by the ACGIH, and their measurement ranges are provided in Annex A1. This list is given as a guide and should be considered neither absolute nor complete.

1.2 *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 Atmospheres³

2.2 Other Document:

29 CFR 1910 Federal Occupational Safety and Health Standard Title 29⁴

3. Terminology

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

4. Summary of Practice (3)

4.1 Detector tubes may be used for either short-term sampling (grab sampling; 1 to 10 min typically) or long term sampling (actively or passively; 1 to 8 h) of atmospheres containing toxic gases or vapors.

4.1.1 *Short-Term Sampling (Grab Sampling) (4-18)*—A given volume of air is pulled through the tube by a mechanical pump. If the substance for which the detector tube was

designed is present, the indicator chemical in the tube will change color (stain). The concentration of the gas or vapor may be estimated by either (a) the length-of-stain compared to a calibration chart, or (b) the intensity of the color change compared to a set of standards.

4.1.2 *Long-Term Active Sampling (Long-Term Tubes) (19-22)*—A sample is pulled through the detector tube at a slow, constant flow rate by an electrical pump. The time-weighted average concentration of the gas or vapor is determined by correlating the time of sampling either with (a) the length-of-stain read directly from the calibration curve imprinted on the tube or (b) the intensity of the color change compared to a set of standards.

4.1.3 *Long-Term Passive Sampling (Diffusion or Dosimeter Tubes) (25)*—The contaminant molecules move into the tube according to Fick's First Law of Diffusion. The driving force is the concentration differential between the ambient air and the inside of the tube. The time-weighted average concentration of the gas or vapor is determined by dividing the indication on the tube by the number of hours sampled (1 to 10 h according to the manufacturers' instructions).

4.2 Instructions are given for the calibration of the sampling pumps required in this practice.

4.3 Information on the correct use of the detector tubes is presented.

5. Significance and Use

5.1 The Federal Occupational Safety and Health Administration, in 29 CFR 1910, designates that certain gases and vapors must not be present in workplace atmospheres at concentrations above specific values.

5.2 This practice will provide a means for the determination of airborne concentrations of certain gases and vapors given in 29 CFR 1910.

5.3 A partial list of chemicals for which this practice is applicable is presented in Annex A1.

5.4 This practice also provides for the sampling of gaseous atmospheres to be used for process control or other purposes (2, 23-25).

6. Interferences (26, 27)

6.1 Some common interferences for the various tubes are listed in the instruction sheets provided by the manufacturers.

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

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² The boldface numbers in parentheses refer to the list of references at the end of this practice.

³ *Annual Book of ASTM Standards*, Vol 11.03.

⁴ *Code of Federal Regulations*, Part 1910.1000 Subpart 2 and Part 1926.55 Subpart D.