IV. GLOSSARY OF ABBREVIATIONS, DEFINITIONS, AND SYMBOLS

AAS	Atomic absorption spectrophotometry.
Acceptable range (biological)	The range of values of a biological monitoring analyte that would be expected in workers with exposure to the environmental chemical in the workplace at or below Federal Standard or TLV-recommended levels. These ranges are often method-specific.
Accuracy	The degree of agreement between a measured value and the accepted reference value. In this manual, accuracy is calculated from the absolute mean bias of the method plus the overall precision, $\hat{S}_{rT}$, at the 95% confidence level. For an individual measurement, it includes the combination of precision and bias (see *Documentation of the NIOSH Validation Tests*, U.S. Department of Health, Education, and Welfare Publ. (NIOSH) 77-185 and NIOSH Research Report, Development and Validation of Methods for Sampling and Analysis of Workplace Toxic Substances, USDHHS Publ. (NIOSH) 80-133).
ACGIH	American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Suite 600, Cincinnati, OH 45240, telephone: 513-742-2020. See TLV.
Ashing	The decomposition, prior to analysis, of organic matrix constituents of the sample and sampler. The most common ashing techniques are solvent, acid, or alkali dissolution; alkaline fusion; and oxidation using either low-temperature oxygen plasma or muffle furnace.
ASV	Anodic stripping voltammetry.
B	Media blank result for a single-section sampler (e.g., membrane filter).
B_b	Media blank result for back section of a sampler.
B_f	Media blank result for front section of a sampler.
Bias	Difference between the average measured mass or concentration and reference mass or concentration expressed as a fraction of reference mass or concentration.
Bioaerosol	Suspension of microorganisms in air.
Biological monitoring	The measurements of the absorption of an environmental chemical in the worker by analysis of a biological specimen for the chemical agent, its metabolites or some specific effect on the worker.
Blank	See Field blank, Media blank, and Reagent blank.
BP	Boiling point, °C.

Breakthrough	Elution of substance being sampled from the exit end of a sorbent bed during the process of sampling air.
C	1. Concentration of gaseous, liquid, or solid substance in air, mg/m^3; 2. Acceptable ceiling concentration (for a specified maximum time of exposure) when applied to personal permissible exposure limits.
Calibration graph	Plot of analytical response vs. known mass or concentration of analyte.
CAS #	Chemical Abstracts Service Registry Number.
CE	Collection efficiency, expressed as a decimal fraction.
49 CFR 171-177	Title 49 (Transportation), Code of Federal Regulations. U. S. regulations governing shipment of hazardous materials.
conc.	Concentrated.
Control (biological)	A value or group of values of a biological monitoring parameter collected from workers with little or no occupational exposure to the specific chemical.
C_v	Concentration of gaseous substance in air, parts per million (V/V). In this manual, C_v is referred to NTP such that $C_v = C \times 24.46/M.W.$
CV	See S_r.
d	Density, g/cm^3.
DE	Desorption efficiency; fraction of known quantity of analyte recovered from spiked solid sorbent media blank. DE may be a function of loading, and should be determined by the chemist for each lot of solid sorbent used for sampling, in the concentration range of interest. Plot (mass recovered minus average media blank)/mass added vs. (mass recovered minus average media blank).
Detection limit	See LOD.
DNE	Do not exceed.
D_s	Stokes diameter.
ECD	Electron capture detector.
EPA	U.S. Environmental Protection Agency.
est	Estimated.
f	Fibers.
FID	Hydrogen-air flame ionization detector.

Field blank	A sampler handled exactly the same as the field samples, except no air is drawn through it. Used to estimate contamination in preparation for sampling, shipment and storage prior to measurement, but not actually subtracted from sample readings (see media blank).
FPD	Flame photometric detector.
FTIR	Fourier transform infrared spectroscopy.
GC	Gas chromatography.
GFAAS	Graphite furnace atomic absorption spectrophotometry
GPO	U.S. Government Printing Office, Washington, DC 20402.
Hemolysis	Rupture of red blood cells due to improper collection and handling of whole blood.
HYAAS	Hydride generation atomic absorption spectrophotometry.
HPLC	High performance liquid chromatography.
IC	Ion chromatography; ion-exchange chromatography.
ICP-AES	Inductively coupled plasma - atomic emission spectrometry, also called ICP.
Interference equivalent	Mass or concentration of interfering substance which gives the same measurement reading as unit mass or concentration of substance being measured.
IR	Infrared.
LAQL	Lowest analytically quantifiable level; see LOQ.
LC	Liquid chromatography.
LOD	Limit of detection (detection limit); smallest amount of analyte which can be distinguished from background. A good estimate for unbiased analyses, with media blanks not distinguishable from background, is three times the standard error of the calibration graph for low concentrations, divided by the slope (instrument reading per unit mass or per unit concentration of analyte).
LOQ	Limit of quantitation; mass of analyte equal to 10 times the standard error of the calibration graph divided by the slope; approximately the mass of analyte for which relative standard deviation, $\bar{S}_r$, equals 0.10.
LTA	Low temperature (oxygen plasma) ashing.
MCEF	Mixed cellulose ester membrane filter.

Measurement range	Range of substance, in mass per sample, from the LOQ (or from 10 times the LOD, if LOQ is not known) to an upper limit characteristic of the analytical method, e.g., the limit of linearity or the mass at which precision of the method starts to become worse than $\bar{S}_r = 0.1$.
Media blank	An unexposed sampler, not taken to the field or shipped, used for background correction of sample readings or for recovery studies.
Metabolite	A substance produced directly by a biotransformation of a chemical. For example, phenol in urine is a metabolite of benzene and is representative of benzene absorption in the worker.
MP	Melting point, °C.
mppcf	Million particles per cubic foot.
MS	Mass spectrometry.
M.W.	Molecular weight.
NIOSH	National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Public Health Service, U. S. Department of Health and Human Services.
Normal range (biological)	The range of values of a biological monitoring analyte that would be expected in workers without exposure to the environmental chemical in the workplace. Normal ranges are often method-specific.
NTIS	National Technical Information Service, Springfield, VA 22161.
NTP	Normal temperature and pressure, 25 °C (298 K) and 760 mm Hg (101.33 kPa), at which the molar volume of an ideal gas is 24.46 L.
OSHA	Occupational Safety and Health Administration, U. S. Department of Labor.
P	1. Peak (maximum permissible instantaneous) concentration; 2. pressure.
PAH	Polynuclear aromatic hydrocarbons; PNAH.
P_c	Pressure, kPa, at which sampling pump was calibrated.
PCM	Phase contrast microscopy.
PEL	OSHPEL; OSHA permissible exposure limit, expressed as ppm or mg/m^3 of substance in air.
PID	Photoionization detector.

Plasma, blood	The clear supernatant from whole blood collected with anticoagulants. Blood is collected, mixed with the anticoagulant and centrifuged to separate the plasma from red blood cells. Plasma contains all clotting factors.
PLM	Polarized light microscopy.
Pool (biological)	A combination of biological specimens (i.e., urine or serum) from many workers that is used to prepare small aliquots to be run with each batch of analyses. The analyte must be stable in the biological matrix and under the storage conditions used. Aliquots of these pools are analyzed with each batch of samples and the data are used to develop quality control charts.
Precision	The repeatability or reproducibility of individual measurements expressed as standard deviation, S, or relative standard deviation, S_r (q.v.). See Accuracy.
Proficiency testing	Any interlaboratory testing program where stable specimens are sent to participating laboratories for analysis. Results from all participating laboratories are compared, pooled, and tabulated by the testing program operator with the purpose of improving laboratory performance.
P_s	Pressure, kPa, at which air sample was taken.
PTFE	Polytetrafluoroethylene; polyperfluoroethylene; tetrafluoroethene homopolymer; Teflon.
PVC	Polyvinyl chloride.
Q	Sampling flow rate, L/min.
Reagent blank	Reagent(s), without analyte or sampling media added, which are analyzed to determine their contribution to the total blank reading.
Recovery, R	Fraction recovered (see DE); previously associated with Analytical Method Recovery (AMR), a term which is no longer used.
Relative standard deviation	See S_r and Precision.
Respirable dust	Dust deposited in the non-ciliated portions of the lungs. Percent deposition is a function of the particle's aerodynamic diameter. Different definitions for the deposition of respirable dust have been given by the ACGIH (see reference under TLV), the British Medical Research Council and international dust sampling convention. Respirable dust is measured by a sampler whose collection efficiency is equivalent to one of these definitions [see International Standards Organization, TC146, "Size Definitions for Particle Sampling," Amer. Ind. Hyg. Assoc. J. 42(5), A64-A68 (1981)].

R_f	In thin-layer chromatography, the ratio of distance travelled by the analyte from point of application to that of the solvent front.
RF	Radio frequency.
Rotameter calibration correction	See V, and Appendix B (page A-2) for an example.
RTECS	Registry of Toxic Effects of Chemical Substances (NIOSH).
Ruggedness test	Partial or complete analysis of variance using experiments in which operational parameters of a sampling and measurement method are varied within a small range to determine their effect on overall variance (see Youden, W. J. and E. H. Steiner, *Statistical Manual of the AOAC*, Association of Official Analytical Chemists, Arlington, VA, 1975).
S	1. Estimate of the standard deviation; 2. Specific mass, particles/mg.
S_b	Estimate of the standard deviation of media blank.
S_r	Estimate of the relative standard deviation, equal to S divided by the mean of a series of measurements. A measure of precision. Previously called CV (coefficient of variation).
$\bar{S}_r$	Pooled relative standard deviation. Formerly $\hat{C}V$.
$\hat{S}_{rT}$	Estimate of overall precision including pump error. Formerly $\hat{C}V_T$.
Screening test (biological)	An easily performed method, often relatively non-specific, to assess worker exposure to a class of compounds by use of biological monitoring.
SEM	Scanning electron microscopy.
Sensitivity	Change in measurement signal per unit change in analyte mass (e.g., slope of calibration graph).
Serum	The clear supernatant from whole blood collected without anticoagulants, allowed to clot (30 minutes) and centifuged to separate serum from the clotted blood. Serum does not contain clotting factors.
Solvent flush technique	Recommended manual gas chromatographic injection technique: 1. Flush syringe several times with solvent; 2. Draw into 10-µL syringe, in order: 3 µL solvent, 0.2 µL air, 5 µL sample, 1.2 µL air; and 3. Inject entire contents of syringe into GC.
Spike	A known mass of analyte added to a sampler for the purpose of determining recovery (analyst spikes), or for quality control (blind spikes). Also see DE.
sp.gr.	Specific gravity, relative to water at the same temperature.

Spot sample (urine)	Urine sample collected at a specified time.
STEL	Short-Term (15-min) Exposure Limit.
t	1. Temperature, °C; 2. time, min.
T_c	Temperature, kelvins (K), at which sampling pump was calibrated.
TEM	Transmission electron microscopy.
TLC	Thin-layer chromatography.
TLV	Threshold limit value, listed in *1998 TLVs® and BEIs®, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Indices* (American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1998).
t_r	Retention time, min.
T_s	Temperature, kelvins (K), at which air sample was taken.
TWA	Time-weighted average.
User check	An evaluation of a written procedure for clarity and accuracy in which an independent laboratory analyzes a small number of spiked samples following the procedure exactly.
UV	Ultraviolet.
V	Volume of air sample, in L, as taken at the sampling site, corrected if necessary for rotameter calibration at a different temperature and pressure: V = (flow rate)(time)$(P_c\ T_s/P_s\ T_c)^{0.5}$ (see Appendix II for an example).

Validated method	A method which meets or exceeds certain sampling and measurement performance criteria; for example, the criteria given in Chapter E, "Development and Evaluation of Methods," or *Guidelines for Air Sampling and Analytical Method Development and Evaluation* (NIOSH Technical Report).
V_m	Volume of 1 mole of ideal gas at the specified temperature and pressure (e.g., 24.45 L at 25 °C and 1 atm).
VOL-MAX	Maximum recommended air sample volume, L, based on sampler capacity or other limitation, @ OSHA PEL.
VOL-MIN	Minimum recommended air sample volume, L, based on an atmosphere at the OSHA PEL concentration and collecting a mass of substance which is equal to the LOQ. See also Working range.
VP	Vapor pressure.
W	Mass of analyte found on an exposed single-section sampler (e.g., membrane filter).
W_b	Mass of analyte found on the back section of an exposed sampler.
W_f	Mass of analyte found on the front section of an exposed sampler.
Working range	Range of air concentrations, in ppm or mg/m^3 at specified air sample volume, extending from the LOQ to a maximum determined by sampler capacity or measurement considerations.
XRD	X-ray diffraction.
XRF	X-ray fluorescence.